PGI CHANDIGARH MAY-2019 [Questions]

ANATOMY / EMBRYOLOGY

1. **Remnants of omphalomescentric duct include?**
   a) Urachal sinus
   b) Umbilical sinus
   c) Meckel's diverticulum
   d) Patent vitelline duct
   e) Median umbilical ligament

2. **Which of the following structures are attached to the medial condyle of the femur?**
   a) Tibial collateral ligament
   b) Fibular collateral ligament
   c) Popliteus
   d) Capsular ligament
   e) Lateral head of gastronemious muscle

3. **Which of the following vessels supply blood to the pectoralis major muscle?**
   a) Superior thoracic artery
   b) Lateral thoracic artery
   c) Pectoral branch of thoracoacromial artery
   d) Thoracodorsal artery
   e) Internal mammary artery

4. **Trigeminal nerve supplies all of the following muscles except?**
   a) Anterior belly of diagastric
   b) Mylohyoid
   c) Tensor tympani
   d) Tensor velli palati
   e) Levator velli palate

5. **Tests used to detect ulnar nerve injury are?**
   a) Card test
   b) Egawa test
   c) Pen test
   d) Pointing index
   e) Book test

PHYSIOLOGY

6. **Action potential in cardiac muscle is generated by?**
   a) Voltage gated sodium channels
   b) Voltage gated potassium channels
   c) P type calcium channels
   d) Q type calcium channels
   e) L type calcium channels

7. **True regarding vitamin D receptor is/are?**
   a) Dimerises with retinoid X receptors
   b) Transcription factors
   c) Cytosolic
   d) Nuclear
   e) Located on the surface of smooth endoplasmic reticulum

8. **Pulmonary function tests in a normal individual can be affected by following factors?**
   a) Height
   b) Age
   c) Weight
   d) Gender
   e) Genetics

9. **False statement regarding ECG is/are?**
   a) QT interval corresponds to the initiation of Q wave to the termination of T wave
   b) ST interval is measured from the end of QRS complex to the end of T wave & its normal duration is 0.32 sec
   c) QRS complex corresponds to the phase 2 of action potential
   d) The P wave is produced by atrial depolarization and P wave is absent in atrial fibrillation
   e) There is no ECG wave corresponding to atrial repolarization

BIOCHEMISTRY

10. **Pellagra can be caused by?**
    a) Niacin deficiency
    b) Hartnup disease
    c) Tryptophan excess
    d) Leucine excess
    e) Carcinoid syndrome

11. **Tests used for protein detection are?**
    a) Western blot
    b) ELISA
    c) Flow cytometry
    d) Sequential polyacrylamide gel electrophoresis
    e) Chromatin immunoprecipitation assay

12. **Which of the following protein causes opening of double helix DNA in front of replication fork in DNA synthesis?**
    a) DNA polymerase I
    b) DNA polymerase II
    c) DNA ligase
    d) DNA helicase
    e) DNA topoisomerase

13. **Normally proteins are the linear polymers of amino acid polypeptide chains resulting from their folding. Sometimes these linear structures combine with each other to form homo and heterodimers. These include?**
    a) Denatured protein
    b) Primary structure
    c) Secondary structure
    d) Tertiary structure
    e) Quaternary structure

14. **True regarding next generation sequencing is/are?**
    a) Entire human genome can be sequenced within a single day
    b) Less sensitive than Sanger sequencing
    c) Can detect mosaic mutations
    d) More cost-effective for sequencing low numbers of targets
    e) Utilize RNA sequencing *(RNA-Seq)* to discover novel RNA variants

15. **In future, next generation sequencing can be used for?**
    a) Detection of synonymous small nuclear proteins [SNPs]
    b) Detection of non-synonymous SNPs
    c) Identification of genes with drug resistance
    d) Diagnosis of genetic diseases
    e) Better diagnosis of cancers

16. **Which of the following elongation / initiation factor acts as a GTPase switch during the process of translation?**
    a) EF-tu
    b) EF-g
    c) Rho factor
    d) Initiation factor – 2
    e) Elongation factor - 2

17. **Which of the following RNA(s) is/are required to read the genetic information contained in DNA and transfer it for the purpose of protein synthesis?**
a) mRNA b) tRNA
c) rRNA d) MiRNA
e) SiRNA

18. **Which of among the followings is not a purine nucleotide base?**
a) Adenine b) Guanine
c) Thymine d) Uracil
e) Cytosine

19. **Pentose phosphate pathway takes place in which part of a cell?**
a) Cytosol b) Nucleus
c) Mitochondria d) Lysosome
e) Golgi complex

20. **In which of the following condition(s) utilization of pyruvate is decreased?**
a) Pernicious anemia b) Scurvy
c) Rickets d) Beri beri
e) Pellagra

21. **Urea cycle enzymes include?**
a) Argininosuccinase
b) Ornithine transcarbamoylase
c) Argininosuccinate synthase
d) Glutamate dehydrogenase
e) Carbamoyl-phospahte synthatase -1

MICROBIOLOGY

22. **Which of the following can be used to culture Ureoplasma ureolyticum?**
a) Blood agar b) McConkey agar
c) PPLO d) SP4
e) Alkaline peptone water

23. **Mycoplasma genitalum can cause which of the following infections?**
a) Sepsis
b) Bacterial vaginosis
c) Non-gonococcal urithritis
d) Cervicitis
e) Osteomyelitis

24. **True regarding Chikungunya virus is/are?**
a) It is DNA virus
b) Transmitted by aedes aegypti mosquito
c) Cannot be detected in the blood during the acute illness
d) Resides in muscle and joints during active phase
e) Mostly presents as fever and athralgia

25. **Which of the following organisms can be grown on L-J media?**
a) Mycobacterium tuberculosis
b) Mycobacterium fortuitum
c) Mycobacterium leprae
d) Mycobacterium bovis
e) Nocardia

26. **True regarding Mycobacterium tuberculosis is/are?**
a) All produce niacin
b) Can be differentiated from other mycobacteria by BACTEC NAP test
c) At least 100 fields on the slide should be examined before reporting it negative
d) Mycobacterium microti is a part of MTB complex
e) XpertMTB/Rif is specific test for MTB

27. **Among the following pathogenic protozoa, which are the members of "Mastigophora"?**
a) Balantidium coli b) Plasmodium vivax
c) Giardia lamblia d) Toxoplasma gondii
e) Trypanosome cruzi

28. **Which of the following statement(s) is/are true regarding Mucor?**
a) Filamentous fungus found in decaying fruits and vegetables.
b) On tissue microscopy appear as septate hyphae with branching
c) Human infections are usually caused by thermolabile species
d) Vascular invasion is the most prominent feature of mucor infections
e) Colonies grow very rapidly at 37°C temperature

29. **Which of the following statements is/are true regarding Meiliodosis?**
a) Caused by a saprophyte found in soil and water
b) Main source of infection is contaminated water
c) May take years or even decades before becoming symptomatic
d) Can present with fever and rash
e) Treatment includes long term mentainance on co-trimoxazole or doxycycline

PREVENTIVE & SOCIAL MEDICINE

30. **In which of the following conditions live vaccines should not be given?**
a) Pregnancy
b) Immunodeficiency
c) Tuberculosis
d) Active acute infection
e) Allergy to any adjuvant like aluminium hydroxide

31. **Which of the following is/are included seven priorities of national health policy 2017?**
a) Yatri suraksha [saving from road and rail traffic accidents]
b) Improved screening of genetic diseases
c) Nirbhaya nari [action against gender violence]
d) Reducing the stress and improving the health in work place
e) Emphasis on "make in India" programme for invasive cardiac instruments

32. **Which of the following conditions can be diagnosed with surveillance under "Fever without localized signs" in integrated disease surveillance programme [IDSP]?**
a) Malaria b) Typhoid
c) Leptospirosis d) Hepatitis
e) Japanese encephalitis

33. **Which of the following are undifferentiated fevers under the syndromic approach to tropical fever?**
a) Dengue b) Malaria
c) Leptospirosis d) Typhus
e) Borreliosis

34. **Which of the following statements is true regarding dengue?**
a) Incubation period is about < 48 hours
b) Saddle back fever
c) Blanchable rashes over trunk and limbs
d) Maintains reservoir in rats
e) Self limiting disease

35. **True regarding lymphatic filarisis eradication programme is/are?**
a) Lymphatic filarisis control programme was started in 1965
b) Source reduction was the part of control strategy
c) Home remedies were included as a part of control strategy
d) Objectives included control through anti-larval measures
e) Aim for elimination was in year 2015

36. **Which of the following vaccines should not be given in a child with egg allergy?**
a) Measles
b) Rubella
c) Influenza
d) Rubella
e) Yellow fever

PHARMACOLOGY

37. **Which of the following agent is a T-type calcium channel blocker?**
a) Ethosuxamide
b) Zonasamide
c) Levetiracetam
d) Trimethadione
e) Mibefradil

38. **Which of the following agent can be used for managing alcohol withdrawal in liver disease patient?**
a) Chlordiazepoxide
b) Diazepam
c) Lorazepam
d) Flunitrazepam
e) Oxazepam

39. **Which of the following statement(s) is/are true regarding bioavailability?**
a) It is the proportion [fraction] of unchanged drug that reaches the systemic circulation
b) Bioavailability of an orally administered drug can be calculated by comparing the Area Under Curve after oral and intravenous [iv] administration
c) Can be measured by plasma concentration and urinary excretion data
d) Low oral bioavailability always and necessarily mean poor absorption
e) Bioavailability is studies in phase '0' of a clinical trial

40. **Which of the following drug has been approved by FDA to be used in the treatment of cystic fibrosis with G551D mutation?**
a) Ivacaftor
b) Lumacaftor
c) Ataluren
d) Tezacaftor
e) VX-661

41. **Which among the following drugs can cause gynaecomastia?**
a) Calcium channel blockers
b) Penicillamine
c) Valproate
d) Omeprazole
e) Rifampicin

42. **Which of the following agent is a racemic mixture of two enentiomers with different pharmacodynamics and pharmacokinetic properties?**
a) Digoxin
b) Phenytoin
c) Levodopa
d) Esomeprazole
e) Verapamil

43. **Which of the following agents have antisuicidal property?**
a) Lithium
b) Clozapine
c) Fluoxetine
d) Electoconvulsive therapy
e) Repeated intracranial transmagnetic stimulation

44. **Which of the following is true regarding thiazide diuretics?**
a) Act by blocking the sodium channels in interstitium
b) Retain responsiveness even if the GFR is decreased
c) Lead to decrease in absorption of sodium in distal tubule
d) Cause decreased renal blood flow
e) Can cause hyperglycemia

45. **Goiterogens which interfere with iodine trapping include?**
a) Vegetables of brassica family
b) Percholates
c) Para-amino ammonium sulphide *(PAAS)*
d) Idodides in large doses
e) Carbamizole

46. **Which of the following mentioned toxicity is associated with cisplatin use?**
a) Neurotoxicity
b) Nephrotoxicity
c) Cardiac toxicity
d) Neuropathy
e) Ototoxicity

47. **Which of the following agent acts by inhibiting alpha 2B beta 3 receptors?**
a) Clopidogrel
b) Abciximab
c) Heparin
d) Tirofiban
e) Eptifibitide

48. **Which of the following antibiotics cause time dependent killing?**
a) Aminoglycosides
b) Beta lactams
c) Macrolides
d) Linezolid
e) Clindamycin

49. **Which among the following is considered a type 'C' adverse drug reaction?**
a) Steroids- osteoporosis
b) Penicillin – anaphylaxis
c) Opioid – respiratory depression
d) Analgesics - nephropathy
e) Warfarin - bleeding

50. **Which of the following statements are true regarding anticholinesterase?**
a) They cannot inhibit pseudocholinesterase
b) They act by increasing the concentration of ACh by preventing its degradation
c) Reversible and irreversible anticholinesterases act by different mechanism of action
d) Anticholinesetrases inhibit the anionic site of acetylcholinesterase
e) All organophosphates anticholinesetrases are water soluble

PATHOLOGY

51. **In a case of Hodgkin's disease, classical Reid-Steenberg cells are positive for?**
a) CD10 b) CD20 c) CD30 d) CD45 e) MUM1

52. **Pierre Robbin syndrome is characterized by?**
a) Micrognathia
b) Craniosynostosis
c) Glossoptosis
d) Maxillary hypoplasia
e) Cleft palate

53. **Which of the following statements is/are true regarding the p53 gene?**
a) Most common gene mutation found in human cancers
b) p53 mediated senescence is temperature sensitive cell cycle arrest
c) Works at G1/S check point
d) Also called "guardian of genomes"
e) Induces DNA repair by arresting the cell cycle at G1 and inducing activation of DNA repair genes

54. **Which of the following are the histological features of typical ulcerative colitis?**
a) Crypt branching
b) Crypt distortion
c) Abundant lymphoplasmacytic infiltrate in basal layer
d) Granulomas
e) Hypertrophy of muscularis mucosal layer

55. **All of the following statements are true regarding Marfan syndrome except?**
a) Autosomal dominant disease of connective tissue
b) Occurs due to mutation in fibrillin 1 gene
c) There is defect in enzyme lysyl hydroxylase
d) Defective and excessive production of transforming growth factor beta
e) Results from defective collagen synthesis

56. **Which of the following is correct paring of plasma protein and its designated function?**
a) Cerulopalsmin – iron absorption
b) Hemopexin - heme binding
c) Heptaglobin - heme destruction
d) Transcortin – copper binding
e) Thyroxin binding globulin – thyroxin binding

57. **Which of the following are involved in etiopathogenesis of SLE?**
a) Interferon type 1
b) Interferon type 2
c) Failure of self tolerance in B cells
d) Exposure to UV rays
e) Early complement component deficiency

58. **All of the following are chromosomal disorders?**
a) Noonan syndrome
b) Kleinfelter syndrome
c) Pradder Willi syndrome
d) Fragile X-syndrome
e) Turner syndrome

59. **Which of the following is/are related to DICER1 gene mutation?**
a) Retinoblastoma
b) Pleuropulmonary blastoma
c) Ovarian sex cord tumor
d) Medulloepithelioma
e) Embryonal Rhabdomyosarcoma

60. **Two most common cardiac tumors are?**
a) Myxoma b) Fibroma c) Sarcoma d) Rhabdomyosarcoma e) Metastasis

61. **Which of the following result from defect in innate immunity?**
a) Burtton's agammaglobulinemia
b) Chediak Higashi syndrome
c) Common variable immunodeficiency
d) De George syndrome

FORENSIC MEDICINE

62. **Conduct money is given in?**
a) Civil case b) Criminal case c) Property dispute d) Only 304 A cases e) Medical negligence compensation cases

63. **Chronic arsenic poisoning is characterized by?**
a) Chronic constipation
b) Peripheral sensory motor neuropathy
c) Hypopigmentation
d) Increased risk of renal and bladder cancer
e) Lower limb gangrene

64. **Hatter's shake are a feature of which poisoning?**
a) Cannabis b) Nux vohimica c) Mercury d) Copper e) Arsenic

65. **Activated charcoal is not used in the management of which poisoning?**
a) Paracetamol poisoning
b) Salicylate toxicity
c) Ethylene glycol poisoning
d) Cyanide poisoning
e) Kerosene poisoning

66. **In which of the following hair cortex is thicker than medulla?**
a) Pig b) Horse c) Reptile d) Boys e) Girls

PEDIATRICS

67. **Which of the following is the most common cause of non-immune hydrops?**
a) Cytomegalo virus
b) Human papilloma virus
c) Herpes simplex virus
d) Hepatitis B virus
e) Parvovirus B 19

68. **Which of the following can cause hypertension in children?**
a) Multiple pituitary hormone deficiency
b) Hyperadrenalism
c) Pheochromocytoma
d) Hypothyroidism
e) Hyperthyroidism

69. **Which of the following is not a correct pairing of mile stone and its age of developing?**
a) 5 months – holding of objects with both hands
b) 6 months – transfer of objects
c) 6 months – tripod sitting
d) 9 months – pulls to sitting
e) 14 months – pincer grasp

70. **VACTERL anomalies include?**
a) Ventriculomegaly
b) Cardiomegaly
c) Tracheal stenosis
d) Anorectal anomaly
e) Radial limb anomaly

71. **Diphtheria in child is characterized by all of the following except?**
a) Incubation period is mostly 2-5 days
b) Pharyngo- tonsillar diphtheria commonly presents as sore throat.
c) Membrane can cover, pharyngeal walls, tonsils, uvula, soft palate and glottis
d) Fever, malaise & tachycardia
e) Anterior nares are the most common sites of infection

72. **Which of the following is true regarding presentation of dehydration in a child?**
a) Reduced skin turgor – mild dehydration
b) Dry mucus membrane – moderate dehydration
c) Urine output <0.5ml/kg/hour – moderate dehydration
d) Fluid deficit of 150ml/kg – severe dehydration
e) Rapid and deep breathing – severe dehydration

73. **Complications of hemolytic disease of newborn include all of the following except?**
a) Thrombocytopenia
b) Late anemia of infancy
c) Inspissated bile syndrome
d) Hypoglycemia
e) Cerebral palsy

74. **Congenital rubella syndrome is characterized by all of the following except?**
a) Microcephaly
b) Patent ductus arteriosus
c) Hutchinson teeth
d) Deafness
e) Mental retardation

ENT

75. **Which of the following is/are associated with empty nose syndrome?**
a) Widely patent nasal cavity
b) Previous history of nasal surgery with resection of turbinates
c) Chronic nasal discharge
d) Relieved by surgical resection of turbinates
e) Foul smell from the nose

76. **Atresia / stenosis of ear canal is seen in?**
a) Treacher Collins syndrome
b) Crouzon syndrome
c) De George syndrome
d) Pierre Robin syndrome
e) All of the above

77. **Which of the following statement(s) is/are true regarding subglottic cancer?**
a) More common location than glottis and supraglottic location
b) Mostly earliest symptom is hoarseness
c) May present as stridor
d) May involve upper and middle jugular lymph nodes
e) It has worst prognosis than glottic and supraglottic variety

78. **Which of the following is a feature of Ranula?**
a) Mucus retention cyst
b) Spontaneous resolution is possible
c) Is a premalignant condition
d) Translucent
e) Is a rare parotid gland tumor

OPHTHALMOLOGY

79. **Which of the following can increase the intra ocular pressure?**
a) Apple
b) Topical steroids
c) Ketamine
d) Norflox eye drops
e) Acetazolamide

80. **Which of the following statement(s) is/are not true regarding acute angle closure glaucoma?**
a) Aquous outflow blockage
b) Clear cornea
c) Cilliary congestion
d) Non-reactive pupil
e) Rapidly progressive vision loss

81. **True statement regarding macula lutea is?**
a) Temporal to optic disc
b) Presents as blind spot in visual field
c) Appears as a dark spot on ophthalmoscopy
d) Brighter than surrounding retina
e) Rich blood supply

82. **Correct regarding chalazion is/are?**
a) Chronic lipo-granulomatous inflammatory lesion
b) Acute infection of glands of Zeis or Moh's
c) Occurs due to blockage of mebomian duct and impaction of sebaceous material
d) Presents as round firm swelling within eyelid
e) Always tender

83. **Which of the following structure is preserved while doing enucleation?**
a) Eye lids
b) Iris
c) Sclera shell
d) Extraocular muscles
e) Bony orbit

84. **True regarding childhood ambylopia is/are?**
a) Usually bilateral
b) Most common cause is strabismus
c) Most patients are symptomatic
d) Diminished vision correlates with ocular pathology
e) Affected eye is occluded for treatment

85. **Foster Kennedy syndrome is characterized by?**
a) Ipsilateral optic atrophy
b) Contralateral anosmia
c) Contralateral papillidema
d) Contralateral central scotoma
e) Bilateral progressive optic neuropathy

86. **Which of the following statement is false regarding hereditary retinoblastoma?**
a) Occurs due to somatic mutation in Rb1 gene
b) Family history is positive in only 25% of cases
c) Manifests as an early age as compared to the sporadic retinoblastoma
d) More common unilateral than bilateral
e) Always requires biopsy for confirmation

ORTHOPEDICS

87. **Cock up splint is used for?**
a) Axillary nerve injury
b) Radial nerve palsy
c) Ulnar nerve palsy
d) Sciatic nerve palsy
e) Common peroneal nerve palsy

88. **Benign bone forming tumors is/are?**
a) Osteoblastoma
b) Osteosarcoma
c) Osteochondroma
d) Giant cell tumor
e) Adamantinoma

89. **Stability to the posterolateral corner is provided by all except?**
a) Hamstring
b) Biceps femoris
c) Popliteus tendon
d) Arcuate ligament
e) Lateral collateral ligament

90. **Costochondral junction swelling is associated with?**
a) Rickets
b) Scurvy
c) Chondrodysplasia
d) Achondroplasia
e) Acromegaly

91. **Bennet's fracture is?**
a) Fracture of palmar base of first metacarpal bone with dislocation of carpometacarpal joint
b) Fracture dislocation of first metatarsal
c) Fracture dislocation of the first metacarpophalengeal joint
d) Intra-articular communited fracture of the base of the first metacarpal
e) Fracture of palmar base of fourth metacarpal bone

92. **Milwaukee brace is used for?**
a) Spine deformity
b) Knee arthritis
c) Ankle and foot pain
d) Shoulder dislocation
e) Elbow pain

93. **Avascular necrosis is common at which of the following sites?**
a) Head of femur
b) Head of talus
c) Head of radius
d) Medial end of scaphoid
e) Calcanuem tuberosity

94. **Which of the following radiographic investigation is best for the estimation of bone age?**
a) Radiography of hand and wrist
b) Radiography of vertebrae
c) CT of the medial end of the clavicle
d) Ultrasonography of the hip joint
e) Ultrasonography of the distal head of radius

SURGERY

95. **Which of the following local flaps can be used for a convex surface?**
a) Bilobed flap
b) Bipedical flap
c) Rotation flap
d) Advancement flap
e) V-Y advancement flap

96. **Which of the following is true regarding deep vein thrombosis in legs?**
a) Usually bilateral swelling
b) Pain which is usually slowly progressive
c) Affected vein can be seen as like a cord and is palpable
d) Tenderness along calf on applying pressure
e) Skin is cold around the clot

97. **Which of the following is an absorbable suture material?**
a) Ethilon
b) Ethibond
c) Prolene
d) Monocryl
e) Polyglactin

98. **True statement regarding gall stone ileus is/are?**
a) Caused by mechanical blockage by impacted stones
b) Functional block by irritation caused by stone
c) Also called Mirizzi syndrome
d) Associated with enterobilliary fistula in most cases
e) Treatment requires surgery in all cases

99. **Treatment options for intermediate risk prostate carcinoma include?**
a) Radical prostatectomy
b) Radical radiotherapy
c) Medical castration
d) Orchiectomy
e) Chemotherapy

100. **All of the following are true statement regarding pre operative antibiotic prophylaxis?**
a) Should be started 1-2 hours before the induction of anesthesia
b) Maximum blood and tissue concentration of antibiotic should reach when handling the organ of surgical interest
c) Should be repeated if surgery is prolonged
d) Should ideally be continued post-operatively
e) Should be given according to sensitivity of the spectrum of organisms expected to be encountered during the surgery

101. **True about gas gangrene is/are?**
a) Painless
b) Soft tissue crepitations
c) Exudates thick pus
d) Discharge shows organism without neutrophils
e) Surgical debridement and antibiotic therapy is treatment

102. **Colorectal carcinoma involving local serosa and localized lymph nodes will come under the following stage?**
a) T2
b) T3
c) T4
d) N1
e) N2

103. **Which of the following is/are presenting symptoms of left sided colonic cancer?**
a) Anemia
b) Melena
c) Hematochezia
d) Altered bowel habits
e) Obstruction

104. **Which of the following is/are the causes of toxic megacolon?**
a) Hirschprung's disease
b) Inflammatory bowel disease
c) Colitis by clostridium difficile
d) Intestinal pseudo obstruction
e) Radiation colitis

105. **As compared to Billroth type 2 gastrectomy, Billroth type 1 gastrectomy is characterized by?**
a) Anastomosis between stomach and 1st part of duodenum
b) Anastomosis between stomach and 2nd/3rd part of duodenum
c) Anastomosis between stomach and jejunum
d) Closure of duodenum
e) Roux-en-Y anastomosis

106. **Which of the muscle is/are incised while doing standard thoracotomy?**
a) Latissmus dorsi
b) Rhomboidis
c) Trapezius
d) Serratous anterior
e) Pectoralis minor

107. **Sequestration of lung is characterized by?**
a) Female preponderance
b) Systemic artery
c) Systemic vein
d) Bronchial connections
e) Intralobar variety is more common

108. **Tertiary blast injury includes?**
a) Tympanic membrane rupture
b) Perforating abdominal trauma
c) Burn
d) Eye ball rupture
e) Fracture

109. **True regarding negative pressure wound dressing is/ are?**
a) - 25 mm/Hg pressure
b) Compression by a foam cells dressing covered with a non-adherent dressing film and the overlying foam is then sealed with a transparent film
c) Increases the blood supply to the wound which helps in healing
d) Prevents formation of granulation tissue
e) Enhances wound debridement

110. **Risk factors for esophageal adenocarcinoma include?**
a) Smoking
b) Alcohol
c) Obesity
d) Gastroesophageal reflux
e) Chronic achlasia

111. **Surgical treatment of hydatid cyst of liver includes?**
a) Puncture
b) Aspiration
c) Injection
d) Anesthesia
e) Cystectomy

112. **Which of the following statements is/are true regarding elephantiasis?**
a) Most commonly occurs due to lymphatic filiarisis
b) Occurs in areas where there is barefoot cultivation of volcano soil is done
c) Equally common in upper and lower extrimities
d) Starts in early adulthood
e) Can be prevented by wearing shoes

113. **External beam radiation used for prostatic carcinoma is?**
a) Alpha
b) Beta
c) Gamma
d) Proton
e) Neutron

OBS & GYNAE

114. **The gold standard test for detection beta HCG is?**
a) Radioimmunoassay
b) Immunoradiometric assay
c) Bioassay
d) Enzyme linked immunosorbent assay
e) Latex agglutination test

115. **Management options for transverse lie with hand prolapse in a partiruting woman include?**
a) Decapitation
b) Craniotomy
c) Cleidotomy
d) Cesarean section
e) Internal podalic version

116. **Which of the following can cause precocious puberty?**
a) Congenital adrenal hyperplasia
b) McCunne Albright syndrome
c) Granulosa cell tumor
d) Leydig cell tumor
e) Sex cord tumor

117. **True regarding Ashermann syndrome is/are?**
a) Can be caused by uterine tuberculosis
b) May result from uterine curettage
c) Progesterone challenge test is positive in all cases
d) Elevated prolactin level
e) Normal FSH & LH level

118. **Correct lower limits of semen analysis values published by WHO include?**
a) Volume – 1.5 ml
b) Sperm concentration - 55 million spermatozoa per ml
c) Total sperm count – 39 million spermatozoa per ejaculate
d) Morphology – 4% normal
e) Motility – 65% progressive

119. **Diagnosis of pre-eclampsia in pregnancy is defined as the presence of systolic blood pressure ≥ 140mm/hg and diastolic blood pressure ≥ 90 mm/hg and which of the following?**
a) Pulmonary edema
b) Platelet count - < 1 lakh/ ml
c) Intrauterine growth retardation
d) Urine output < .5 l/24 hours
e) Proteinuria - 0.3 g or more / 24-hour urine collection

120. **Cork screw glands are absent in which of the following condition?**
a) Polycystic ovarian disease
b) Metropathia haemorrhagica
c) Secondary amenorrhea
d) Halban's disease
e) Immature ripening

121. **Ultrasonographic criteria for the diagnosis of PCOD include?**
a) Number of follicles/ ovary
b) Ovarian volume
c) Stromal volume
d) Stromal echogenicity
e) Stromal blood flow

122. **Which of the following is/are used for brachytherapy for cervical cancer?**
a) I125
b) Cobalt60
c) Iridium 192
d) Radium226
e) Cesium 137

123. **Components of active management of third stage of labor include?**
a) Controlled cord traction
b) Injection of uterotonic drugs
c) Uterine massage
d) Early cord clamping
e) Crede's manovure

124. **Prenatal diagnosis of a 16 weeks pregnancy can be done by using?**
a) Amniotic fluid
b) Chorionic villi
c) Maternal blood
d) Maternal saliva
e) Fetal blood

125. **True statement regarding germ cell tumors is/are?**
a) Occur in young adults
b) Not seen commonly in Kleinfelter syndrome
c) Family history is a risk factor
d) Sacrococcygeal chrodoma and parachordoma are included in germ cell tumors
e) Teratocarcinoma is a combination of Teratoma and squamous cell carcinoma

126. **Markers for dysgerminoma include all except?**
a) Beta human chorionic gonadotropin
b) Alpha feto protein
c) Lactate dehydrogenase
d) CA 125
e) Placental-like alkaline phosphatase

127. **Cardiac disease in pregnancy associated with highest mortality is?**
a) Eisenmenger syndrome
b) Ebstein anomaly
c) Aortic stenosis
d) Severe mitral stenosis
e) Coarctation of aorta

128. **Possible complications in an infant of a diabetic mother are?**
a) Hypoglycemia
b) Hypocalcemia
c) Congestive heart failure
d) Hypothyroidism
e) Hyperkalemia

129. **Smallest diameter of true pelvis is?**
a) Bispinous diameter
b) Bituberous diameter
c) Antero-posterior diameter
d) Diagonal conjugate
e) True conjugate

130. **Which of the following are involved in second degree perinal tear?**
a) Skin and subcutaneous tissue in perineal area
b) Superficial perineal muscle
c) Deep perineal muscle
d) Internal anal sphincter
e) External anal sphincter

MEDICINE

131. **Which of the following is/are a feature of primary hyperparathyroidism?**
a) Hypercalcemia
b) Hyperphosphatemia
c) Elevated calcitriol level
d) Decreased level of parathyroid hormone
e) Hypophosphatemia

132. **Electrocardiographic findings of hypercalcemia include?**
a) Sinus tachycardia
b) Sinus wave
c) Prolonged QT interval
d) Shortened QT interval
e) Prominent U wave

133. **Acute severe mitral regurgitation is characterized by?**
a) Sudden increase in preload
b) Increased after load
c) Increased ejection fraction
d) Decreased left ventricular contractility
e) Decreased after load

134. **Hypervitaminosis A is not characterized by?**
a) Xerophthalmia
b) Hyperostosis
c) Desquamation of skin
d) Hirsutism
e) Spleen and liver enlargement

135. **MELD score for liver cirrhosis include all of the following except?**
a) Serum albumin
b) Serum bilirubin
c) Serum creatinine
d) INR
e) Nutritional status

136. **True regarding diabetic nephropathy is/are?**
a) Almost always associated with diabetic retinopathy
b) Aiways associated with proteinuria
c) May be associated with microscopic hematuria
d) Kidney size is normal initially
e) Angiotensin receptor inhibitors can reverse proteinuria

137. **Which of the following are features of diabetic neuropathy?**
a) Resting bradycardia
b) Nocturnal diarrhea
c) Erectile dysfunction
d) Dependent edema
e) Mydriasis

138. **Chemotherapy drugs for multiple myeloma include?**
a) Elotuzumab
b) Daratumumab
c) Panobinostat
d) Bendamustine
e) Bortezomib

139. **True regarding multifocal leukoencephalopathy in HIV?**
a) Caused by EBV
b) Cognitive impairment
c) Visual impairment
d) Repeated stroke attacks
e) Imaging shows enhancing white matter demyelinating lesions with surrounding edema

140. **All of the following are features of IgA nephropathy except?**
a) Hypertension
b) Haematuria
c) Self limiting exacerbations associated with minor respiratory infection
d) Absence of proteinuria is pathognomic
e) Angiotensin receptor blockers are useful in the treatment

141. **You are present at bedside of patient who is being intubated and ventilated. On examination patient's $EtCO_2$ value shows zero. Which of the following can be the reason?**
a) Endotrachial tube in esophagus
b) Endotrachial tube extubation
c) Pulmonary embolism
d) Ventilator circuit break
e) Ventilator disconnected

142. **Indications of eradication of H. pylori include?**
a) Gastro-oesophageal reflux disease
b) Asymptomatic patient with no risk of developing gastric carcinoma
c) Patient with positive family history of gastric carcinoma
d) Chronic use of NSAIDs
e) Long term use of proton pump inhibitors

143. **Differential diagnosis of SIADH includes?**
a) Primary polydypsia
b) Diabetes insipidus
c) Desmopressin therapy
d) Hypocortisolism
e) Cerebral salt wasting

144. **Which of the following are the causes of hypovolemic hyponatremia?**
a) SIADH
b) Primary polydypsia
c) Diabetes insipidus
d) Diuretics
e) Adrenocortical insufficiency

145. **Heat rigors occur due to?**
a) Coagulation of proteins
b) Heat stroke
c) Heat exhaustion
d) In burn
e) 65° burn

146. **Cauda equina syndrome?**
a) Is a spinal cord syndrome
b) Is associated with lower limb paresis
c) Causes saddle anesthesia
d) Characterized by increased deep tendon reflexes
e) Is associated with bladder, bowel and pudendal nerve dysfunction

147. **In which of the following conditions erythrocyte sedimentation rate is increased?**
a) Increased serum immunoglobulins level
b) Increased plasma viscosity
c) Increased level of C-reactive protein
d) Spherocytosis
e) Sickle cell anemia

148. **High SAAG ascites is seen in?**
a) Liver cirrhosis
b) Meigs syndrome
c) Budd chiari syndrome
d) Nephrotic syndrome
e) Hypothyroidism

149. **True about pheochromocytoma is/are?**
a) It is commonly a part of multiple endocrine neoplesia syndrome type-1
b) Arises early in Von Hippel Lindau syndrome
c) Mostly bilateral
d) Highly vascular
e) Alpha blockers are used before performing surgical treatment

150. **Cholesterol is absent in?**
a) HDL
b) LDL
c) Transudate
d) Exudate
e) Urine

151. **Amyloidosis is characterized by all except?**
a) Hepatomegaly
b) Proteinuria
c) Large fiber neuropathy
d) Congestive heart failure
e) Lytic bone lesions

DERMATOLOGY

152. **True statement regarding senile purpura is/are?**
a) Occurs over sun damaged skin
b) Occurs on the extensor surface of hands and forearm
c) Palpable
d) Dependent parts like buttock and legs are commonly affected
e) Responds to topical corticosteroids

153. **True statement about eczema herpaticum is/are?**
a) Can occur as a complication of atopic dermatitis
b) Caused by HSV
c) Lymph node swelling
d) Crusting papule, blisters and erosions
e) Multiorgan failure can occur

154. **Drug[s] used in severe psoriasis, which is an IL-12 and IL-23 inhibitor, is/are?**
a) Risankizumab
b) Ustekinumab
c) Guselkumab
d) Tildrakizumab
e) Brodalumab

155. **Bullous pemphigoid is characterized by all of the following features except?**
a) Pruritus
b) Flaccid bullae over trunk and limbs
c) More common in elderly
d) There are antibodies against epithelial cell surface antigen
e) Responds well to systemic corticosteroids and immunosuppressants

PSYCHIATRY

156. **"Match box" sign is seen in?**
a) Trichotilomanina
b) Pyromania
c) Erotic mania
d) Delusional parasitosis
e) Delusion of control

157. **Which of the following Schneider's first rank symptoms is/are hallucination?**
a) Thought insertion
b) Thought eco
c) Delusional perception
d) Somatic passivity
e) Hearing people talking about others

ANAESTHESIA

158. **True statement regarding propofol is/are?**
a) Available as clear aqueous fluid
b) Acts by acting on GABAA receptors
c) Safe to give general anesthesia in patient with hemodynamic instability
d) Inj in small veins can cause pain

159. **As compared to spinal block, epidural block has following features?**
a) Requires large dose
b) Requires large needle
c) There is a clear end point for the needle to be inserted in target space
d) Slow onset block
e) Denser block

160. **Minimum alveolar concentration [MAC] of an anesthetic gas is reduced in?**
a) Increasing age
b) Pregnancy
c) Hypercarbia
d) Hypernatremia
e) Anemia

161. **Fentanyl used in cancer pain, is characterized by?**
a) It is synthesized from poppy
b) Acts directly on dorsal horn cells
c) 100 times more potent than morphine
d) Metabolites into inactive metabolite norfentanyl
e) Reduces the release of dopamine

RADIOLOGY

162. **Which of the following is/are natural radioisotope?**
a) I^{129}
b) CO^{60}
c) Ra^{226}
d) Rn^{222}
e) Ir^{192}

163. **Radioiodine [I^{131}] is used in the treatment of?**
a) Follicular carcinoma of thyroid
b) Follicular adenoma
c) Papillary carcinoma of thyroid
d) Medullary carcinoma of thyroid
e) Anaplastic carcinoma of thyroid

164. **On abdominal radiography, air in rectum is seen in?**
a) Normal person
b) Large bowel obstruction
c) Short bowel obstruction
d) Paralytic ileus
e) Gall stone ileus

165. **Deep sulcus sign is seen in?**
a) Pleural effusion
b) Peritoneal effusion
c) Pneumothorax
d) Pulmonary embolism
e) Pulmonary edema

166. **All are true regarding FDG-PET scan except?**
a) Produces a 3-D image of functional processes in the body
b) Produces better anatomical details then MRI
c) Radiation exposure is high
d) Malignant cells show high uptake due to increased metabolism
e) Used to detect tumor recurrence in patients who have undergone surgery for brain tumor

167. **Which of the following appears bright on both T1 and T2 MRI images?**
a) CSF
b) Fat
c) Muscle
d) Hemorrhage
e) Melanin

■■■

ANATOMY/ EMBRYOLOGY

1. **Ans is 'b' i.e. Umbilical sinus, 'c' i.e. Meckel's diverticulum & 'd' i.e. Patent vitelline duct** [*Ref: BDC 6th/e vol 2 p. 265; Snell's anatomy 9th/e p. 187; IB Singh 9th/e p. 195*]

Omphalomesenteric duct (OMD) (vitellointestinal duct)

- Primitive midgut communicates ventrally with yolk sac (extraembryonic part) by **vitellointestinal duct**.
- Typically, it disappears between 9-16 weeks of pregnancy (gestation). However, in some cases, this does not happen and it results in a condition called Omphalomesenteric Duct Remnants. They include:-
  i) ***Meckel's diverticulum (persistent proximal part of vitellointestinal duct)***
  ii) ***Patent vitellointestinal duct***
  iii) Large remnants can cause swelling of the umbilical cord (umbilical edema)
  iv) It can also lead to the formation of ***cysts or an polyp in the umbilical cord***
  v) ***Umbilical fistulas, sinus tracts***, congenital fibrous bands, and mucosal remnants

2. **Ans. is 'a' i.e., Tibial collateral ligament** [*Ref: BDC Vol. II 5th/e p. 25-26*]

Distal end of femur and its attachments

- In consists of lateral and medial femoral condyles articulating with tibia and patella, forming knee joint. **Distal end of femur is the growing end.**

Lateral Condyle

- ***Fibular collateral ligament*** of the knee attaches to the lateral epicondyle.
- ***The popliteus*** arises from the deep anterior part of the popliteal groove. When the knee is flexed, the tendon of this muscle lies in the shallow posterior part of the grove.
- The muscular impression near the lateral epicondyle gives origin to the ***lateral head of the gastrocnemius***.

Medial Condyle

- ***Tibial collateral ligament of the knee*** – medial epicondyle
- Hamstring part of the adductor magnus – adductor tubercle

Intercondylar Notch

- Anterior cruciate ligament – posterior part of the medial surface of the lateral condyle.
- ***The intercondylar line provides attachment to the capsular ligament*** and laterally to the oblique popliteal ligament.
- The infrapatellar synovial fold is attached to the anterior border of the intercondylar fossa.

3. **Ans. is 'a' i.e. Superior thoracic artery, 'b' i.e. Lateral thoracic artery, 'c' i.e. Pectoral branch of thoracoacromial artery & 'e' i.e. Internal mammary artery** [*Ref: BDC 6th/e Vol. I p. 41; Gray's Anatomy 40th/e p. 109; radiopaedia.org*]

Blood supply of Pectoralis major:-

- ***The thoraco-acromial artery provides its major blood supply*, while the intercostal perforators arising from the internal mammary artery provide a segmental blood supply**. The thoraco-acromial artery arises from the second part of the axillary artery under the superior edge of the pectoralis minor. After piercing the clavipectoral fascia it divides into four branches- pectoral, acromial, clavicular and deltoid. ***The pectoral branch descends between the two pectoral muscles and is distributed to the pectoralis major and breast, anastomosing with the intercostal branches of the internal mammary artery and with the lateral thoracic artery***
- ***The lateral thoracic artery***, in addition to the pectoral branch, contributed significantly to the vascularity of the pectoralis major muscle.
- ***Superior thoracic artery (minimal)***
- The blood supply that provides circulation to these muscles perforates through to the breast parenchyma, thus also supplying blood to the breast.
- The venous drainage of the muscle accompanies the feeding arteries.

4. **Ans. is 'e' i.e., Levator velli palate** [*Ref: BDC 6th/e Vol. III p. 366; Gray's 40th/e p. 519, 544, 494*]

- ***Levator veli palatini is supplied by pharyngeal branch of vagus nerve (X) with its motor fibers from cranial accessory nerve (XI).***
- ***All the 5 paired muscles (tensor veli palatini, levator veli palatini, palatopharyngeus, palatoglossus & muscle of the uvula) of the soft palate are innervated by the pharyngeal plexus apart from tensor veli palatini which is innervated by the nerve to medial pterygoid (a branch of the mandibular division of the trigeminal nerve).***
- ***The motor component of the mandibular division (V3) of the trigeminal nerve controls the movement of eight muscles, including*** the four muscles of mastication: the masseter, the temporal muscle, and the medial and lateral pterygoids. The other four muscles are the ***tensor veli palatini, the mylohyoid, the anterior belly of the digastric and the tensor tympani***.

5. **Ans. is 'a' i.e., Card test, 'b' i.e. Egawa test & 'e' i.e. Book test** [*Ref: Maheshwari 4th/e p. 64, 65*]

- **Muscles examination (tests) done in ulnar nerve injury** :- Individual muscles which can be examined in ulnar nerve palsy are : -

1) ***Flexor carpi ulnaris : The patient is asked to palmar flex the wrist against gravity. In doing so, the hand deviates towards the radial side.*** The tendon of flexor carpi ulnaris just above the pisiform, does not stand out. On performing the same test against resistance, the tendon cannot be felt.
2) ***Abductor digiti minimi :*** The patient is asked to abduct the little finger against resistance while keeping the hand flat on the table (in order to avoid action of flexors of the finger).
3) ***Interossei :*** Palmar interossei do adduction (PAD), the dorsal interossei do abduction (DAB) of the fingers at metacarpo-phalangeal joints. These can be tested as follows : -
   i) ***Egawa's Test :*** This is for dorsal interossei (abductors) of the middle finger. With the hand kept flat on a table palmar surface down, the patient is asked to move his middle finger sideways.
   ii) ***Card Test :*** This is for palmar interossei (adductors) of the fingers. In this test, the examiner inserts a card between two extended fingers and the patient is asked to hold it as tightly as possible while the examiner tries to pull the card out. The power of adductors can thus be judged. In case of weak palmar interossei, it is easy to pull out the card. First dorsal interosseous muscle can be separately examinated by asking the patient to abduct the index finger against resistance.
4) ***The lumbricals :*** These are mainly responsible for flexion at the metacarpo-phalangeal joints but their isolated action cannot be tested.
5) ***Adductor pollicis :*** The patient is asked to grasp a book between the thumb and index finger. Normally, a person will grasp the book firmly with thumb extended, taking full advantage of the adductor pollicis and the first dorsal interosseous muscles. If the ulnar nerve is injured the adductor pollicis will be paralysed and the patient will hold the book by using the flexor pollicis longus (supplied by median nerve) in place of the inter-phalangeal joint of the thumb. This becomes more pronounced if the examiner tries to pull the book out while the patient tries to hold it. ***This sign is known as 'Froment's sign' or the 'book test'***
6) ***Wartenberg's sign :*** is inability to adduct the small finger in against the ring finger due to weakness of palmar interosseous muscles.

PHYSIOLOGY

6. Ans. is 'a' i.e., Voltage gated sodium channels, 'b' i.e. Voltage gated potassium channels & 'e' i.e. L type calcium channels

*[Ref: **Guyton 12th/e** p. 102; **Ganong 25th/e** p. 520, **24th/e** p. 523]*

- **Normal RMP in myocardial fibers is about -90 mV.** The AP in myocardial fibers **has 5 phases:** 0, 1, 2, 3, 4.
  i) **Phase 0 :** It is the ***phase of rapid depolarization*** and is due to ***opening of fast voltage gated sodium channels***.
  ii) **Phase 1 :** It is the ***initial phase of rapid repolarization***. It is due ***to closure of fast voltage gated Na+ channels***.
  iii) **Phase 2 :** This is **plateu phase**. It is due to ***opening of 'voltage gated slow Ca+ channels'*** also called **calcium-sodium** channels **which causes calcium influx**.
  iv) **Phase 3 :** This phase of final repolarization is due to ***opening of fast voltage gated K+ channels***. The membrane potential comes back to resting membrane potential.
  v) **Phase 4 :** It is the resting phase, i.e., the phase of resting membrane potential.

7. Ans. is 'a' i.e., Dimerises with retinoid X receptors, 'b' i.e. Transcription factors & 'd' i.e. Nuclear

*[Ref: **Ganong 24th/e** p.406; **Harper 28th/e** p.428]*

Vitamin D receptor (VDR)

- The **calcitriol receptor**, more commonly known as the **vitamin D receptor (VDR)** and also known as **NR1/1** (nuclear receptor subfamily 1, group I, member 1), ***is a member of the nuclear receptor family of transcription factors*** and shows similarity of sequence to the steroid and thyroid hormone receptors.
- ***Calcitriol, the active form of vitamin D, binds to the VDR, which then forms a heterodimer with the retinoid-X receptor.*** This then binds to hormone response elements on DNA resulting in expression or transrepression of specific gene products. The VDR not only regulates transcriptional responses but also involved in microRNA-directed post transcriptional mechanisms.
- In humans, the vitamin D receptor is encoded by the VDR gene. Mutations in this gene are associated with type II vitamin D-resistant rickets.
- The vitamin D receptor plays an important role in regulating the hair cycle. Loss of VDR is associated with hair loss in experimental animals.
- This receptor also functions as a receptor for the secondary bile acid lithocholic acid. Glucocorticoids are known to decrease expression of VDR.

Ans. is 'All i.e., a, b, c, d & e *[Ref:http://www.jpp.krakow.pl/journal/archive/09_06_s4/pdf/263_09_06_s4_article.pdf]*

Factors influencing or related to lung function

- *Gender*
- *Height*
- *Age*
- *Weight* (obesity, fat distribution, free fatty mass)
- Smoking (active, passive)
- Race
- *Genetic factor*

- Generation acceleration of growth
- Air pollution (occupational and/or environmental exposure)
- Asthma, bronchial hyperresponsivenes, chronic obstructive pulmonary disease chronic cough, dyspnea on exertion
- Heart failure, coronary artery disease,
- β-mimetics,
- Hypertension
- Diet (malnutrition, dietary antioxidants)
- Impaired glucose tolerance, diabetes mellitus
- Muscular disorders
- Hormonal disorders
- Equipment and technique of measurement others

9. **Ans. is 'c' i.e., QRS complex corresponds to the phase 2 of action potential** [*Ref:* ***Ganong 25th/e*** *p. 524;* ***Guyton 12th/e*** *p. 179-80;* ***Principles of medical physiology*** *p. 215;* ***Basics electrocardiography*** *p.737*]

- ***QRS complex corresponds to phase "0" and phase "1" of action potential.***
- ***QT interval is measured from the beginning of Q wave (or R wave if the Q wave is absent) to the end of T wave.***
- ***ST interval is measured from the end of QRS complex (J point) to the end of T wave. Its normal duration is 0.32 sec.***
- ***The P wave is produced by atrial depolarization. First half of P wave is inscribed by right atrial depolarization and 2nd half by left atrial depolarization***. P wave is characteristically absent in atrial fibrillation, sino-atrial block, AV nodal rhythm, ventricular tachycardia and hyperkalemia
- ***There is no ECG wave corresponding to atrial repolarization*** **because it is obscured by the large QRS complex.**

BIOCHEMISTRY

10. **Ans. is 'a' i.e., Niacin deficiency, 'b' i.e. Hartnup disease, 'd' i.e. Leucine excess & 'e' i.e. Carcinoid syndrome**
[*Ref :* ***Harper's 30th/e*** *p. 557 &* ***29th/e*** *p. 537*]

- ***Deficiency of niacin (nicotinic acid and nicotinamide) causes pellagra.***
- ***Nicotinic acid can be formed in the body from tryptophan (1 mg of the vitamin is formed from 60 mg of tryptophan). Therefore, deficiency of tryptophan causes deficiency of niacin leading to pellagra.***
- ***Hartnup disease can cause pellagra in which there is a defect in membrane transport of tryptophan.***
- ***Carcinoid syndrome can also cause pellagra*** as most of the tryptophan is used in the synthesis of serotonin (5-hydroxytryptamine).
- ***Excess of leucine inhibits the conversion of tryptophan into niacin causing pellagra.***

11. **Ans. is 'a' i.e., Western blot, 'b' i.e. ELISA, 'd' i.e. Sequential polyacrylamide gel electrophoresis & 'e' i.e. CHIP essay**
[*Ref:* ***Harper's 30th/e*** *p. 457;* ***Lippincott 6th/e*** *p. 473,* ***484, 85;*** *www.innovabiosciences.com; www.cellsignal.com*]

- ***In western blot (protein or immuno blot), the proteins (e.g.-antigen) electrophoresed and transferred to nitrocellulose paper and then probed with labeled antibodies.***
- ***Enzyme-linked immunosorbent assay (ELISA)*** specifically can detect protein down to pg/mL.
"Two-dimensional gel electrophoresis (2DGel) is a successful method used for the detection and analysis of proteins. It has been designed as a combination of the 2DGel, IEF and SDS-PAGE methods, and is used in the analysis of complex protein mixtures."
-https://www.sciencedirect.com/topics/neuroscience/two-dimensional-gel-electrophoresis
- ***Chromatin immunoprecipitation (ChIP) assay*** is a technique of precipitating a protein antigen out of solution using an antibody that specifically binds to that particular protein.
- ***Flow cytometry is used for the the quantification of proteins.????***

Specific methods which can detect amount of a single protein

A. **Spectrometry methods:**
   a. **High-performance liquid chromatography (HPLC):** Chromatography method to detect proteins or peptides
   b. **Liquid chromatography–mass spectrometry (LC/MS):** Can detect proteins at low concentrations (ng/mL to pg/mL) in blood and body fluids, such as for Pharmacokinetics.

B. **Antibody dependent methods:**
   a. ***Enzyme-linked immunosorbent assay (ELISA):*** Specifically can detect protein down to pg/mL.
   b. ***Chromatin immunoprecipitation (ChIP) assay :*** technique of precipitating a protein antigen out of solution using an antibody that specifically binds to that particular protein.
   c. **Immunoelectrophoresis :** separation and characterization of proteins based on electrophoresis and reaction with antibodies.
   d. ***Western blot :*** couples gel electrophoresis and incubation with antibodies to detect specific proteins in a sample of tissue homogenate or extract (a type of Immunoelectrophoresis technique).
   e. ***Dot blot (slot blot) :-It is a technique for detecting, analyzing, and identifying proteins. Dot blots are very similar to Western blots in that they involve the use of antibodies to identify a protein that has been bound to a membrane.***
   f. **Protein immunostaining**

12. Ans. is 'd' i.e., DNA helicase [*Ref: Harper's 30th/e p. 383, 422-24; Chatterjae 8th/e p. 264; Lippincott's 5th/e p. 399, 401, 405*]

Important enzymes and their functions	
DNA polymerases	*Deoxynucleotide polymerization*
Helicases	*Processive unwinding of DNA double helix ahead of replication fork*
Topoisomerases	*Relieve torsional strain that results from helicase-induced unwinding*
DNA primase	Initiates synthesis of RNA primers
Single-strand binding proteins	Prevent premature reannealling of dsDNA
DNA ligase	*Seals the single strand nick between the nascent chain and Okazaki fragments on lagging strand*
Telomerase (reverse transcriptase/RNA dependent DNA polymerase)	Responsible for telomere synthesis and maintaining the length of telomers (**replication of end of chromosome**). Thus, **telomerase provide longetivity to the cells.**

13. Ans. is 'e' i.e., Quaternary structure [*Ref: Harper's 30th/e p. 36-41; Lippincott 6th/e p. 13-20, 24*]

- Protein structure can be classified into four level of organization:-

1) **Primary structure**
   - *The linear sequence of amino acid residues* **and location of disulphide bridges, if any, in a polypeptide chain constitute its primary structure**. In simple words, *primary structure of proteins refers to the specific sequence of amino acids*.
   - Primary structure is maintained by **covalent 'peptide' bond**.
   - ***The two cysteine residues that react to form the disulphide bond may be a great distance apart in the primary structure (or on separate polypeptides), but are brought into close proximity the three dimensional folding of polypeptide chain.***
2) **Secondary structure**
   - For stability of primary structure, hydrogen bonding between the hydrogen of NH and oxygen of C = O groups of the polypeptide chain occurs, which give rise to twisting, folding or bending of the primary structure. Thus, *regular folding and twisting of the polypeptide chain brought about by hydrogen bonding is called secondary structure*.
   - Important types of secondary structure are **α-helix, β-pleated sheet** and **β-bends.**
3) **Tertiary structure**
   - *The peptide chain, with its secondary structure, may be further folded and twisted about itself forming three-dimensional arrangement of polypeptide chain,* ***i.e., tertiary structure refers to the overall folding pattern of polypeptide which forms three dimensional shape.***
   - **Tertiary structure (three dimensional shape) is maintained by weak non-covalent interactions** which include ***hydrogen bonds, hydrophobic interactions, ionic bond (electrostatic bonds or salt bridges)*** and Van-der wall forces. ***Covalent linkage (disulphide bond)*** also plays some (but minor) role.
4) **Quaternary structure**
   - Many proteins are made up of ***more than one polypeptide chains (polymers)***. Each polypeptide chain is known as ***protomer (or subunit). The subunits are linked with each other by non-covalent bonds.***
   - *The structure formed by union of subunits is known as quaternary structure,* ***i.e., spatial relation of subunits (peptide chains) with one another is called quaternary structure.***
   - ***Mainly three non-covalent bonds stabilize quaternary structure : Hydrophobic, hydrogen and ionic (electrostatic).***
   - *Dimeric proteins contain two polypeptide chains. Homodimers contain two copies of same polypeptide chain, while in a heterodimer the polypeptides differ.*
   - **Important quaternary structure include creatine *kinase*** (dimer), ***hemoglobin*** (tetramer), **immunoglobulin** and ***lactate dehydrogenase***

14. Ans. is 'a' i.e., Entire human genome can be sequenced within a single day, 'c' i.e. Can detect mosaic mutations & 'e' i.e. Utilize RNA sequencing (RNA-Seq) to discover novel RNA variants

[*Ref:* ***https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3841808***]

- *Using NGS an entire human genome can be sequenced within a single day,*
- *NGS sequencing provides a far more sensitive read-out than Sanger sequencing.*
- *The increased sensitivity of NGS allows detection of mosaic mutations.*
- *NSG is less cost-effective for sequencing low numbers of targets (1–20 targets) than Sanger sequencing.*
- *NSG utilizes RNA sequencing (RNA-Seq) to discover novel RNA variants* and splice sites, or quantify mRNAs for gene expression analysis

Next generation sequencing (NGS)(massively parallel or deep sequencing)

- NGS platforms perform sequencing of millions of small fragments of DNA in parallel. NGS can be used to sequence entire genomes or constrained to specific areas of interest, including all 22 000 coding genes (a whole exome) or small numbers of individual genes.
- ***Using NGS an entire human genome can be sequenced within a single day***. In contrast, the previous Sanger sequencing technology, used to decipher the human genome, required over a decade to deliver the final draft.

Potential uses of NSG

A. Clinical genetics

a. NGS captures a broader spectrum of mutations than Sanger sequencing

- Traditional Sanger sequencing is restricted to the discovery of substitutions and small insertions and deletions among the spectrum of DNA variation in a human genome. For the remaining mutations dedicated assays are frequently performed. However, these data can also be derived from NGS sequencing data directly, obviating the need for dedicated assays while harvesting the full spectrum of genomic variation in a single experiment.

b. Genomes can be interrogated without bias

- Capillary sequencing depends on preknowledge of the gene or locus under investigation. However, NGS is completely unselective and used to interrogate full genomes or exomes to discover entirely novel mutations and disease causing genes. ***In paediatrics, this could be exploited to unravel the genetic basis of unexplained syndromes***.

c. ***The increased sensitivity of NGS allows detection of mosaic mutations***

- Capillary sequencing may miss these variants. NGS sequencing provides a far more sensitive read-out and can therefore be used to identify variants which reside in just a few per cent of the cells, including mosaic variation. This has seen NGS employed for very sensitive investigations such as interrogating foetal DNA from maternal blood or tracking the levels of tumour cells from the circulation of cancer patients.

B. Microbiology

- The main utility of NGS in microbiology is to replace conventional characterization of pathogens by morphology, staining properties and metabolic criteria with a genomic definition of pathogens.
- Today, the use of NGS expended capabilities of diagnostic microbiology and epidemiology.
- ***It can identify genes that confer antimicrobial resistance***.

C. Oncology

- With the advent of NGS, cancer genomes can now be systemically studied in their entirety, an endeavour ongoing via several large scale cancer genome projects around the world. ***For the child suffering from cancer this may provide many benefits including a more precise diagnosis and classification of the disease***, more accurate prognosis, and potentially the identification of 'drug-able' causal mutations.

- The main disadvantage of NGS in the clinical setting is putting in place the required infrastructure, such as computer capacity and storage, and also the personnel expertise required to comprehensively analyse and interpret the subsequent data.

NGS allows researchers to:

i) Rapidly sequence whole genomes
ii) Zoom in to deeply sequence target regions
iii) ***Utilize RNA sequencing (RNA-Seq) to discover novel RNA variants*** and splice sites, or quantify mRNAs for gene expression analysis
iv) Analyze epigenetic factors such as genome-wide DNA methylation and DNA-protein interactions.
v) ***It has facilitated large-scale discovery of SNPs (synonymous as well as non-synonymous)*** in various model and nonmodel plant species. Large numbers and genome-wide availability of SNPs make them the marker of choice in partially or completely sequenced genomes.
vi) Sequence cancer samples to study rare somatic variants, tumor subclones, and more
vii) Study microbial diversity in humans or in the environment

Comparison of Sanger Sequencing and NGS

	Sanger Sequencing	Targeted NGS
Benefits	• Fast, ***cost-effective sequencing for low numbers of targets (1–20 targets)*** • Familiar workflow	• ***Higher sequencing depth enables higher sensitivity*** (down to 1%) • Higher discovery power • Higher mutation resolution • More data produced with the same amount of input DNA • Higher sample throughput
Challenges	• Low sensitivity (limit of detection ~15–20%) • Low discovery power • Not as cost-effective for high numbers of targets (> 20 targets) • Low scalability due to increasing sample input requirements	• ***Less cost-effective for sequencing low numbers of targets*** (1–20 targets) • Time-consuming for sequencing low numbers of targets (1–20 targets)

15. **Ans. is 'All' i.e., a, b, c, d & e** [*Ref:* ***https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3841808/***]

- ***It has facilitated large-scale discovery of SNPs (synonymous as well as non-synonymous)*** in various model and nonmodel plant species
- ***It can identify bacterial genes that confer antimicrobial resistance***.
- NGS is completely unselective and used to interrogate full genomes or exomes to discover entirely novel mutations and disease causing genes. ***In paediatrics, this could be exploited to unravel the genetic basis of unexplained syndromes***.
- ***For the child suffering from cancer this may provide many benefits including a more precise diagnosis and classification of the disease***, more accurate prognosis, and potentially the identification of 'drug-able' causal mutations.

- ***See the above explalnation.***

16. **Ans. is 'a' i.e., EF-tu, 'b' i.e. EF-g, 'd' i.e. Initiation factor – 2 &'e' i.e. Elongation factor - 2** [*Ref: Harper's 30th/e p. 422-24; Chatterjae 8th/e p. 264; Lehninger 5th/e p. 1088-90; https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5084732/*]

"Important steps of translation on the ribosome in bacteria are controlled by guanosine triphosphatases (GTPases), including initiation factor IF2, elongation factors EF-Tu and EF-G and release factor RF3. "
-https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3919573/

"Bacterial elongation and termination factors EF-Tu, SelB, EF-G, and RF3 have close homologs in eukaryotic organisms, eEF1A, EFsec, eEF2, and eRF3, respectively, which fulfill similar functions and also use the ribosome as a GAP." *— https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5084732/*

Translational GTPases (trGTPases/ GTPase switch)

- Translational GTPases (trGTPases) play key roles in facilitating protein synthesis on the ribosome. Translation entails four distinct phases: initiation, elongation, termination, and recycling. Every phase comprises several checkpoints that allow the ribosome to control protein production and to achieve the optimal speed and fidelity of translation. These steps are regulated by trGTPases.
- GTPases are molecular switches that alternate between two distinct conformations, active or inactive, depending on whether they are bound to GTP or GDP.
- The life cycle of a typical GTP-binding protein involves interaction with guanine nucleotide exchange factors (GEFs) that regenerate the active form of the GTPase by facilitating the exchange of GDP for GTP (switch on signal) and GTPase activating proteins (GAPs) which trigger rapid GTP hydrolysis (switch off signal).
- ***In bacteria, trGTPase initiation factor (IF) 2 recruits the initiator fMet-tRNAfMet to the P site of the small ribosomal subunit during initiation, thereby controlling correct reading frame selection***.
- ***A trGTPase elongation factor (EF) Tu (EF-Tu) is responsible for the delivery to the A site of the ribosome of all elongator aminoacyl-tRNAs (aa-tRNAs)***, except for the Sec-tRNASec which requires a specialized EF, SelB.
- ***After peptide bond formation EF-G catalyzes translocation of the ribosome along the mRNA***. The cycles of translation elongation continue until a stop codon is reached, which leads to the translation termination phase. The newly synthesized protein is released from the tRNA and the ribosome; release factor (RF) 3 is a GTPase involved in termination. ***Finally, during the recycling phase the ribosome complex is split into the ribosomal subunits with the help of EF-G in order to start a new translation cycle***. The GTPase activity of these factors is promoted by the ribosome which acts as a GAP.
- ***Bacterial elongation and termination factors EF-Tu, SelB, EF-G, and RF3 have close homologs in eukaryotic organisms eEF1A, EFsec, eEF2, and eRF3, respectively, which fulfill similar functions and also use the ribosome as a GAP***. In contrast the initiation phase is controlled differently in bacteria and eukaryotes. ***The initiator tRNAiMet is delivered to the eukaryotic ribosome by eukaryotic Initiation Factor 2 (eIF2), a trGTPase that has no similarity to bacterial IF2*** and is activated by a specialized GAP, eIF5, rather than by the ribosome. The homolog of bacterial IF2, eIF5B, is a factor that facilitates joining of the ribosomal subunits at the end of the initiation phase; similarly to IF2, this GTPase is activated by the ribosome.
- Except for eIF2, which binds to the small ribosomal subunit and is released upon subunits joining, trGTPases bind to the ribosome at the so-called GTPase associated center (GAC) located on the large ribosomal subunit
- With the exception of EF-Tu, trGTPases, including IF2, SelB, EF-G and their eukaryotic homologs typically bind GTP with similar or higher affinity than GDP. Nucleotide exchange occurs spontaneously due to the higher concentration of GTP in the cell. In contrast, EF-Tu has a much higher affinity for GDP than for GTP. Because the dissociation rate of GDP from EF-Tu is very slow compared to the rate of protein elongation.

17. **Ans. is 'a' i.e., mRNA** [*Ref:* ***Harper's 30th/e*** *p. 395 &* ***29th/e*** *p. 378*]

- ***The information needed to direct the synthesis of protein is contained in the mRNA in the form of a genetic code, which is transcribed from template strand of DNA and is therefore complementary to it***.
- ***The function of tRNA is to transport amino acids in an activated form from cytosol to ribosome for protein synthesis***.
- ***rRNA is present in ribosomes***. The eukaryotic ribosomes are made up of two subunits **40 'S'** and **60 'S'**. When proteins are not being synthesized, the two subunits (60 S and 40 S) remain separate. ***At the time of protein synthesis, two subunits combine to form an 80 S unit, on which mRNA and tRNA interact to synthesize a protein.***
- ***miRNAs and siRNA cause inhibition of gene expression***.

18. **Ans. is 'c' i.e. Thymine, 'd' i.e. Uracil & 'e' i.e. Cytosine** [*Ref:* ***Harper's 30th/e*** *p. 359 &* ***29th/e*** *p. 344*]

- Two types of bases are found in nucleotides : (i) **purines** and (ii) **pyrimidines**.
  I. ***Purines:- Two major purine bases found both in DNAs as well as RNAs are (i) adenine (A) and (ii) guanine (G).***
  II. ***Pyrimidines:- Three major pyrimidine bases are (i) cytosine (C), (ii) Uracil (U) and (iii) Thymine (T). Cytosine and uracil are found in RNAs and cytosine and thymine are found in DNAs. Uracil is not found in DNAs and thymine is not found in RNAs.***

19. **Ans. is 'a' i.e., Cytosole** [*Ref:* ***Harper 30th/e*** *p. 200,* ***28th/e*** *p. 174-176*]

- ***HMP shunt occurs in the cytosol***. It is highly active in ***liver, adipose tissue, adrenal cortex, lens, cornea***, lactating (but not the nonlactating) mammary gland, ***gonads (testis, ovary) and erythrocytes***. Activity of this pathway is minimal in muscle and brain, where almost all of the glucose is degraded by glycolysis.

Site	Cycle / Reactions
Cytosol	***Glycolysis (EMP Cycle)***, HMP shunt, **fatty acid synthesis**, glycogenesis, glycogenolysis, Bile acid/Salt synthesis, cholesterol synthesis.
Mitochondria	**Kreb's cycle (citric acid cycle), Electron transport chain (ECT), Fatty acid oxidation**, Ketogenesis.
Both cytosol and mitochondria	**Gluconeogenesis, Urea cycle**
Peroxisomes	**Oxidation of very long chain fatty acids**
Smooth endoplasmic reticulum	**Triglyceride synthesis, Steroid synthesis, cholesterol synthesis, phospholipid synthesis**
Rough endoplasmic reticulum (ribosomes)	Protein synthesis
Nucleus	DNA and RNA synthesis

20. **Ans. is 'd' i.e., Beriberi** [*Ref:* ***Harper's 30th/e*** *p. 556 &* ***29th/e*** *p. 534*]

- ***Pyruvate utilization is decreased in thiamine deficiency. Beriberi is due to thiamine deficiency.***
- ***Pernicious anemia is due to folic acid (vitamin B9) or vitamin B12 deficiency.***
- ***Scurvy is due to vitamin C deficiency.***
- ***Rickets is due to vitamin D deficiency.***
- ***Pellagra is due to vitamin B3 deficiency.***

- ***In thiamine deficiency, pyruvate cannot be converted to acetyl-CoA as thiamine pyrophosphate is a coenzyme for pyruvate dehydrogenase which catalyzes the conversion of pyruvate to acetyl-CoA. Hence, excess of pyruvate is metabolized to lactate by lactate dehydrogenase***.
- This results in **lactic acidosis**.
- Thus, if a person with thiamine deficiency takes high carbohydrate diet, excessive pyruvate is formed (by glycolysis) and pyruvate is converted to lactate leading to lactic acidosis.

21. **Ans. is 'a' i.e., Argininosuccinase, 'b' i.e. Ornithine transcarbamoylase, 'c' i.e. Argininosuccinate synthase & 'e' i.e. Carbamoyl-phospahte synthatase -1** [*Ref:* ***Harper 30th/e*** *p. 290-96;* ***29th/e*** *p. 277-278*]

Various enzymes involved in Urea cycle

- Biosynthesis of urea occurs in five steps.
  1) ***Carbamoyl phosphate synthase-I (CPS-I)***, a ***mitochondrial*** enzyme, catalyzes the formation of **carbamoyl phosphate** by condensation of CO2 and ammonia. Two molecules of ATP are required for the reaction. ***CPS-I is the rate limiting enzyme of urea cycle***. It is an allosteric enzyme and **allosterically activated by N-acetyl glutamate**.
  2) ***Ornithine transcarbamoylase*** catalyzes the formation of **citrulline from carbamoyl phosphate and ornithine**.
  3) ***Argininosuccinate synthase*** catalyzes the formation of argininosuccinate from citrulline and aspartate. This reaction requires ***1ATP, but 2 high energy phosphate*** bonds are consumed as ATP is converted to AMP + PPi. **The amino group of aspartate provides one of the two nitrogen atoms that appear in urea (The other one is provided by ammonia NH4).**
  4) ***Argininosuccinate lyase (argininosuccinase)*** catalyses the cleavage of argininosuccinate into arginine and fumarate. Fumarate enters in TCA cycle.
  5) **Arginase catalyses the formation of urea from arginine by hydrolytic cleavage** of arginine to **yield urea and ornithine**. Ornithine is thus regenerated and can enter mitochondria to initiate another round of the urea cycle.

22. **Ans. is 'c' i.e., PPLO & 'd' i.e. SP4** [*Ref: **Ananthanarayan 9th/e** p. 386 & **8th/e** p. 388; **Harrison 19th/e** p. 1163 & **18th/e** p. 1417; https://cmr.asm.org/content/cmr/24/3/498.full.pdf*]

Culture of Ureoplasma

- **Culture is considered the gold standard in the detection of Ureoplasma**. It may be cultivated in fluid or solid media.
- It is difficult since these fastidious organisms require the presence of serum, metabolic substrate and growth factors like yeast extract for isolation.
- Generally facultative anaerobes, growth being better aerobically. But, since organisms from primary tissue specimens frequently grow under anaerobic conditions, an atmosphere of 95% N2 and 5% CO2 is preferred.
- ***Mycoplasma and ureoplasma do not produce turbidity in liquid medium***.
- Grow in ***heart infusion peptone broth with 2% agar (pH 7.8) (P.P.L.O. broth)*** with fresh yeast extract and horse serum. For enrichment, 30% human ascetic fluid or animal serum (horse, rabbit) are added to the medium. (***Serum acts as a source of cholesterol***).
- The ***recommended culture media*** include
  i) ***SP4 broth and agar***
  ii) Shepard's 10 B broth and agar
  iii) ***PPLO broth and agar***.
- Since the organisms do not produce any turbidity on growth, pH indicators like phenol red are added. The growth of organisms leads to a change in pH of the media which is visualised as a change in colour of the indicator. Antibiotics like Penicillin G and antifungals like Nystatin are also incorporated to prevent growth of contaminants.
- ***The commonly used medium for isolating Ureoplasma is the PPLO broth containing urea***. The processed samples are serially diluted 10-fold from 1:10 to 1:10 5 for inoculation. The inoculated broths are incubated at 37°C under 5% CO 2. A rise in pH visualized by change in colour without any turbidity is indicative of growth. A concentration of > 10 4 CCU/ml is the cut off for Ureoplasma. **On PPLO agar, they show growth with a characteristic fried egg appearance** enhanced by Dienes stain.
- Mycofast Revolution (ELiTech Diagnostic, France) assay is a new commercial assay which provides easy identification and enumeration of Ureaplasma spp. and M. hominis within 24 h to 48 h. The advantage of the Mycofast Revolution assay is that antimicrobial susceptibility testing is performed against different antimicrobial agents. Antimicrobial susceptibility testing is performed against five antimicrobial agents that include levofloxacin, moxifloxacin, erythromycin, clindamycin and tetracycline.
- ***SP4 Media are recommended for the isolation, differentiation and maintenance of mycoplasma, including M. hominis, M. pneumoniae, and Ureaplasma urealyticum***.

23. **Ans. is 'b' i.e., Bacterial vaginosis, 'c' i.e. Non-gonococcal urithritis & 'd' i.e. Cervicitis** [*Ref: **Ananthanarayan 9th/e** p. 388-89; **Harrison 19th/e** p. 1163; **Greenwood 16th/e** p. 385; **Jawetz 27th/e** p. 337: https://cmr.asm.org/content/cmr/24/3/498.full.pdf*]

- ***Sepsis and osteomyelitis are not known to be associated with M. genitalum.***
- ***Other three mentioned diseases are caused by M. genitalum***.

Diseases caused by M. Genitalium

DISEASE IN MEN	• ***Acute Nongonococcal Urethritis*** • ***Chronic NGU*** • Balanoposthitis • Chronic Prostatitis • Acute Epididymitis
DISEASE IN WOMEN	• ***Nongonococcal Urethritis*** • ***Bacterial Vaginosis and Vaginitis*** • ***Cervicitis*** • Pelvic Inflammatory Disease • Endometritis • Salpingitis • Reproductive Disease in Women (eg: spontaneous preterm labor (SPTL) and preterm birth (PTB))
DISEASE IN BOTH MEN AND WOMEN	• Infertility • Arthritis (Sexually acquired reactive arthritis (SARA) / Reiter's disease) • Infection in Homosexual Men and in Immunodeficient or Immunosuppressed

24. **Ans. is 'b' i.e., Transmitted by aedes aegypti mosquito, 'd' i.e. Resides in muscle and joints during active phase & 'e' Mostly presents as fever and athralgia** [*Ref:* ***Park 24th/e*** *p. 310;* ***Ananthanarayan 9th/e*** *p. 440;* ***Harrison 19th/e*** *p. 1313*]

Chikungunya

- Chikungunya is a mosquito-borne viral disease caused by chikungunya virus (CHIKV). It is a ***single stranded RNA arbovirus involved are Aedes aegypti and Aedes albopictus***.

"After inoculation through the bite of an infected mosquito, CHIKV enters directly the subcutaneous capillaries, infecting susceptible cells in the skin, such as macrophages, fibroblasts or endothelial cells. Then, ***free virions and infected cells disseminate through the bloodstream in the host organism to the peripheral organs such as liver, spleen, muscles and joints, where further viral replication occurs***."

- Symptoms usually begin 3–7 days after being bitten by an infected mosquito.
- ***The most common symptoms are fever ("saddle back pattern") and joint pain. Joint pain is often debilitating*** and can vary in duration. Migratory polyarthritis of mainly small joints occurs.
- Other symptoms may include chills, headache, muscle pain, joint swelling, or rash. Rash may occur immediately or few days into the illness.
- It is a self limiting illness but the joint pain may persist for months especially in elderly.
- Occasionally petechiae and epistaxis may occur.

Lab Diagnosis

- The laboratory confirmation can be obtained by two principal methods, namely by the detection of viral RNA or by the identification of the specific anti-CHIKV antibodies.
- ***CHIKVRNA is detectable in plasma during the first week (4–7 days) of illness, typically with very high levels of viraemia. In this acute phase, diagnosis usually relies on detection of viral RNA in the serum through reverse transcription-polymerase chain reactions (RT-PCR).***
- In the later stage of infection (>5 days post onset) detection of IgM and IgG anti-chikungunya antibodies by serological tests such as immunofluorescence or enzyme-linked immunosorbent assays (ELISA) may confirm the diagnosis. IgM antibodies are usually detectable on average 5th day after disease onset and disappear over a period of several weeks to 3 months. Their level is highest 3 to 5 weeks after the onset of illness and persist for about 2 months. IgG response becomes detectable few days after IgM (7–10 days post onset) and may persist for years. Fourfold increase in IgG values in samples collected at least three weeks apart also confirms the diagnosis.
- Samples collected during the first week after the onset of symptoms should be tested by both serological and virological methods (RT-PCR).
- Blood may show elevated level of AST & CRP, thrombocytopenia, ***leucopenia with relative lymphocytosis***.

25. **Ans. is 'a' i.e., Mycobacterium tuberculosis, 'b' i.e. Mycobacterium fortuitum, 'd' i.e. Mycobacterium bovis & 'e' i.e. Nocardia** [*Ref:* ***Ananthanarayan 9th/e*** *p. 346, 365;* ***Harrison 18th/e*** *p. 1347*]

- ***The solid medium most widely employed for routine culture of M. tuberculosis is Lowenstein - Jensen Medium (L.J. medium).***
- ***Lowenstein Jensen with Iron is used to determine iron*** uptake as a means of differentiation between slow and rapid growing Mycobacterium species. This is done by using an aqueous solution of 20% ferric ammoninum citrate. ***The ability of certain species, such as M. fortuitum, to take up soluble iron salts from the culture media results in the growth of colonies with a rusty brown color.***
- ***M. leprae is obligate intracellular organism, thus cannot be grown in cell free culture medium***. Two animals are used for cultivation :- ***Armadillo (Nine banded armadillo) & Foot pad of mice***.
- ***LJ medium containing glycerol favors the growth of M. tuberculosis while LJ medium without glycerol but containing pyruvate encourages the growth of M. bovis.***
- ***Nocardia spp. can grow on media for mycobacteria isolation (LJ and BBL MGIT) and microscopy and colony morphology are very similar to some mycobacteria species.***

26. **Ans. is 'b' i.e., Can be differentiated from other mycobacteria by BACTEC NAP test, 'c' i.e. At least 100 fields on the slide should be examined before reporting it negative, 'd' i.e. Mycobacterium microti is a part of MTB complex & 'e' i.e. XpertMTB/Rif is specific test for MTB** [*Ref:* ***Ananthanarayan 9th/e*** *p. 346 - 365*]

- ***Niacin and nitrate reduction tests are used for differentiation of M. tuberculosis and M.bovis.***

"The Mycobacterium tuberculosis complex (M. tuberculosis, M. bovis, and M. africanum) can be differentiated from mycobacteria other than M. tuberculosis (MOTT bacilli) with the BACTEC NAP test (Johnston Laboratories, Becton, Dickinson & Co., Towson, MD), by selectively inhibiting their growth with p-nitro-alpha-acetyl-amino-beta-hydroxypropriophenone (NAP)."

— ***https://www.ncbi.nlm.nih.gov/pubmed/3147161***

- **Most commonly used method for staining is Ziehl-Neelsen acid fast staining. At least 100 fields are examined before giving a negative report.**
- **TB complex :** ***M. tuberculosis, M. africanum, M. bovis, M. microti, M. canettii.***

- *GeneXpert MTB/RIF detects DNA sequence specific for M. tuberculosis and rifampicin resistance by PCR. Results are obtained within 90 minutes.*

27. **Ans. is 'c' i.e., Giardia lamblia &'e' i.e. Trypanosome cruzi** [*Ref:* ***Paniker 6th/e p. 111***]

CLASSIFICATION OF PROTOZOA

Amoebae	Intestinal species :- Entamoeba histolytica, E. coli Free living :- Acanthamoeba, Naegleria
Ciliates	***Balantidium coli***
Flagellates (Mastigophora)	Intestinal species :- ***Giardia lamblia***, Trichomonas homins Oral and vaginal :- Trichomonas vaginalis Blood and tissue (hemoflagellates):- Leishmania, ***Trypanosoma***
Sporozoits	Intestinal species :- ***Plasmodium***, Babesia Blood species :- ***Toxoplasma*** Tissue species :- Isospora, Cryptosporidium

28. **Ans. is 'a' i.e., Filamentous fungus found in decaying fruits and vegetables & 'd' i.e. Vascular invasion is the most prominent feature of mucor infections** [*Ref:* ***Harrison 19th/e p. 1350 & 18th/e p. 1661; Ananthanarayan 8th/e p. 613-614***]

Mucor

- ***Mucor is a filamentous fungus found in soil, plants, decaying fruits and vegetables***. As well as being ubiquitous in nature and a common laboratory contaminant, Mucor spp. may cause infections in man, frogs, amphibians, cattle, and swine. ***Most of strains isolated from human infections are usually one of the few thermotolerant Mucor spp***
- ***They appear as nonseptate hyphae with obtuse or right angled branching in tissues***. Nonseptate or sparsely septate, broad (6-15 µm) hyphae, sporangiophores, sporangia, and spores are visualized. Apophysis, rhizoid and stolon are absent. Sporangiophores are short, erect, taper towards their apices and may form short sympodial branches. Sporangia are round, 50-300 µm in diameter, gray to black in color, and are filled with sporangiospores. The sporangiospores are round (4-8 µm in diameter) or slightly elongated.
- The branching of sporangiophores (branched or unbranched), the shape of the sporangiospores (round or elongated), maximum temperature of growth, presence of chlamydospores, assimilation of ethanol, and molecular analysis aid in differentiation of Mucor spp. from each other

Mucormycosis (zygomycosis)

- *Mucor* spp. are among the fungi causing the group of infections referred to as zygomycosis. **Although the term mucormycosis has often been used for this syndrome, zygomycosis is now the preferred term for this angio-invasive disease.**
- ***Vascular invasion that causes necrosis of the infected tissue, and perineural invasion are the most common and frustrating features of these infections***.
- Mucormycosis is most commonly caused by species of ***Rhizopus, Rhizomucor*** and ***Cunninghamella***, but species of ***Apophysomyces***, saksenaea, mucor and Absidia also are occasionally responsible.
- **Mucormycosis** involves :-
  a) ***Nose and paranasal sinuses (most common)*** : Fever, sinus pain, bloody discharge and **blindness** (due to invasion of globe at ophthalmic artery).
  b) ***Other sites*** **: skin and mucosa** (mucocutaneous) Lung (pneumonia), joint (septic arthritis), GIT (gastritis, perforating ulcers, dialysis-associated peritonitis), renal infections and hematogenous spread to brain.

Predisposing factors:-

- Diabetic ketoacidosis and immunosuppression are the most frequent predisposing factors.
  a) ***For paranasal sinus***
     i) Diabetes & Diabetic ketoacidosis
     ii) Hematological malignancies
     iii) Organ transplantation
     iv) Extensive burns
     v) ***Long term desferoxamine therapy***
  b) ***For Gastrointestinal mucormycosis***
     i) Uremia (renal failure)
     ii) Diarrheal disease
     iii) Severe malnutrition
     iv) Intravenous drug
- ***Most of the Mucor spp. are unable to grow at 37°C. Colonies of Mucor grow rapidly at 25-30°C and quickly cover the surface of the agar***. Its fluffy appearance with a height of several cm resembles cotton candy. From the front, the color is white initially and becomes grayish brown in time. From the reverse, it is white.

- Ischemic or hemorrhagic necrosis is the foremost histological finding.
- Treatment includes ***debridment along with amphotericin B.***

29. **Ans. is 'All' i.e., a, b, c, d & e** [*Ref:* ***Harrison 19th/e p. 1048 & 18th/e p. 1273; Ananthanarayan 9th/e p. 317 & 8th/e p. 318***]

- ***It is caused by aerobic gram negative bacillus Burkholderia pseudomallei (Pseudomonas pseudomallei). It is a free living saprophyte normally found in soil, ponds and rice paddies and on products from endemic areas.***
- ***The bacteria can be transmitted through wounds, inhalation, and ingestion of polluted water.***
- ***Patients with latent melioidosis may be symptom-free for decades;***
- ***Signs and symptoms can range from none to mild such as fever, skin rashes***, pneumonia, and abscesses to severe with inflammation of the brain, inflammation of the joints with dangerously low blood pressure which could easily results in death.
- ***Following the treatment of the acute disease, eradication (or maintenance) treatment with Co-trimoxazole is the drug of choice which should be used for at least 3 months. Co-amoxiclav and doxycycline are drugs of second choice.***

PREVENTIVE & SOCIAL MEDICINE

30. **Ans. is 'a' i.e., Pregnancy, 'b' i.e. Immunodeficiency & 'e' i.e. Allergy to any adjuvant like aluminium hydroxide**
[*Ref:* ***Park 23rd/e p. 103; carrington.edu***]

Condition	Live vaccine	Killed vaccine
Allergy to component	***Contraindicated***	Contraindicated
Encephalopathy	-	Contraindicated
Pregnancy	***Contraindicated***	Vaccinate if indicated (except HPV)
Immuno-suppression	***Contraindicated***	Vaccinate if indicated
Severe illness	Precaution	Precaution
Recent blood product	Precaution MMR & Varicella (except Zoster) only	Vaccinate if indicated

31. **Ans. is 'a' i.e., Yatri suraksha (saving from road and rail traffic accidents), 'c' i.e. Nirbhaya nari (action against gender violence) & 'd' i.e. Reducing the stress and improving the health in work place** [Ref: ***http://vikaspedia.in/health/nrhm/national-health-policies/national-health-policy-2017***]

- ***Yatri Suraksha, Nirbhaya Nari & Reducing the stress and improved safety in the work place are 3 of the seven priority components of preventing and promoting health under national health policy 2017.***
- ***Other two mentioned options are not included in this.***

Policy thrust of National Health Policy, 2017 (NHP, 2017)

1) **Ensuring Adequate Investment** - The policy proposes a potentially achievable target of raising public health expenditure to 2.5% of the GDP in a time bound manner.
2) **Preventive and Promotive Health** - The ***policy identifies coordinated action on seven priority areas for improving the environment for health:***
   a. The Swachh Bharat Abhiyan
   b. Balanced, healthy diets and regular exercises.
   c. Addressing tobacco, alcohol and substance abuse
   d. ***Yatri Suraksha – preventing deaths due to rail an d road traffic accidents***
   e. ***Nirbhaya Nari – action against gender violence***
   f. ***Reduced stress and improved safety in the work place***
   g. Reducing indoor and outdoor air pollution
   - The policy also articulates the need for the development of strategies and institutional mechanisms in each of these seven areas, to create **Swasth Nagrik Abhiyan** –a social movement for health. It recommends setting indicators, their targets as also mechanisms for achievement in each of these areas
3) **Organization of Public Health Care Delivery** - The policy proposes seven key policy shifts in organizing health care services.

2. **Ans. is 'a' i.e., Malaria, 'b' i.e. Typhoid & 'e' i.e. Japanese encephalitis** [*Ref:* ***Park 24th/e p. 498 & 22nd/e p. 426-27***]

Surveillance in integrated disease surveillance programme (IDSP)

Syndrome	Diseases under surveillance	Remarks
Fever	• *Malaria* • *Typhoid* • Dengue • *Japanese Encephalitis* • Measles	• All new patients with fever should be classified as follows: i) ***Fever less than seven days without localizing signs and with :*** ▪ Rash and running nose or conjunctivitis (suspected Measles) ▪ Altered sensorium or convulsions (suspected JE) ▪ Bleeding from skin, mucus membrane, vomiting blood or passing fresh blood through nose or ear or black motion (suspected dengue) ▪ With none of the above (suspected malaria) ii) Fever more than seven days (suspected typhoid)
Cough	• Tuberculosis • Acute Respiratory Infections	• Short duration cough (Cough less than 3 weeks) - Suspect ARI (common among children less than five years) • Long duration cough (Cough of more than or equal to 3 weeks) - Suspect Tuberculosis
Diarrhoea	• Acute Diarrhoeal Diseases • Cholera	• Acute Diarrhoeal Diseases: Any new case of watery diarrhoea (passage of even one large profuse watery stools in the past 24 hours) with or without dehydration. The total duration of illness should be less than 14 days. • Cholera
Jaundice	• *Hepatitis* • Malaria • *Leptospirosis* • Yellow fever	• A case with an acute illness (less than 4 weeks) and with the following symptoms: - jaundice, dark urine, anorexia, malaise, extreme fatigue and pain in the right upper abdomen
Unusual syndromes	• Anthrax • Plague • Emerging epidemics	• The sudden occurrence of unusual events, in a geographical region, causing death or hospitalization and which does not conform with the standard case/ syndrome definitions discussed earlier in the manual. • Some of the symptoms may be: ▪ Convulsions ▪ Alteration in consciousness ▪ Breathing Difficulty / Respiratory distress ▪ Bleeding ▪ Paralysis

33. **Ans. is 'a' i.e., Dengue, 'b' i.e. Malaria, 'c' i.e. Leptospirosis & 'd' i.e. Typhus** [*Ref:* ***http://www.apiindia.org/pdf/monograph_2015_update_on_tropical_fever/002_syndromic_approach.pdf***]

Syndromic Approach to Tropical Infections

- Tropical fevers were defined as infections that are prevalent in, or are unique to tropical and subtropical regions. Some of these occur throughout the year and some especially in rainy and post-rainy season.
- Indian Society of Critical Care Medicine (ISCCM) constituted an expert committee to develop a consensus statement and guidelines for management of these diseases in the emergency and critical care. The committee recommends a 'syndromic approach' to diagnosis and treatment of critical tropical infections and has identified five major clinical syndromes:

Undifferentiated fever	• ***Malaria (P. falciparum), scrub typhus, leptospirosis,*** typhoid, ***dengue*** and other common viral illness.
Fever with rash/thrombocytopenia (platelet count < 100,000)	• Dengue, rickettsial infections, meningococcal infection, malaria (usually falciparum), leptospirosis, measles, rubella and other viral exanthema.
Fever with ARDS	• Scrub typhus, falciparum malaria, influenza including H1N1, leptospirosis, hantavirus infection, meliodosis, severe community acquired pneumonias due to Legionella spp. and Streptococcus pneumoniae and diffuse alveolar hemorrhage due to collagen vascular diseases

Febrile encephalopathy	• Encephalitis (Herpes simplex virus encephalitis, Japanese B and other viral encephalitis), meningitis (S. pneumoniae, Neisseria meningitidis, Haemophilus influenzae, enteroviruses), scrub typhus, cerebral malaria and typhoid encephalopathy
Fever with multiorgan dysfunction	• Bacterial sepsis, falciparum malaria, leptospirosis, scrub typhus, dengue, hepatitis A or E with fulminant hepatic failure and hepato-renal syndrome, Hanta virus infection, hemophagocytosis and macrophage activation syndrome

34. **Ans. is 'b' i.e., Saddle back fever, 'c' i.e. Blanchable rashes over trunk and limbs & 'e' i.e. Self limiting disease** [*Ref: Park 24th/e p. 262-263 & 23rd/e p. 247-249*]

DENGUE FEVER

- Dengue fever is caused by **arboviruses.**
- There are ***4 serotypes.*** All four serotypes of dengue virus (1, 2, 3 and 4) have been isolated from India but at present type -1 (DENV1) and type-2 (DENV2) are widespread. ***Type-2 serotype is most virulent.***
- The disease is transmitted by **Aedes mosquito;** ***Aedes aegypti is the main vector. The reservoir of infection is both man and mosquito.***
- Dengue fever can ***occur both epidemically and endemically.*** Epidemics may be **explosive** and often start during the **rainy session** when breeding of the vector mosquitoes (Aedes aegypti) is generally abundant.
- ***Temperature also plays an important role in the transmission*** of dengue virus by mosquitoes. ***Mosquitoes kept at 26°C fail to transmit Type-2 dengue virus.***
- Aedes mosquito becomes infective by feeding on a patient from a day before onset to 5th day (viraemia stage) of illness.
- **Extrinsic incubation period** is 8-10 days. Once becomes infective, mosquito remains infective for life. **Transovarian transmission** occurs in the mosquito.
- Various **clinical manifestations** of dengue virus infection may be :
  - *i) Asymptomatic infection*
  - *ii) Undifferentiated fever*
  - *iii) Dengue fever (classical dengue fever)*
  - *iv) Dengue hemorrhagic fever*
  - *v) Dengue shock syndrome*
- **Dengue fever (classical dengue fever)** is the ***most common of all the arthropod-borne viral disease.*** It is also known as ***break bone fever or saddle back fever. Incubation period is 3-10 days*** and disease is characterised by chills, fever, joint pain, headache, myalgia and desquamation.
- ***The most common skin presentation is generalized macular blanchable erythema involving trunk and limbs.***
- ***It is a self limiting disease*** and represents majority of cases of dengue virus infection. ***Case fatality rate is very low.***
- **Dengue hemorrhagic fever (DHF)** is a severe form of dengue fever caused by ***infection with more than one dengue viruses. It results from re-infection with a virus of different serotype. Incubation period is 2-7 days.*** It is characterized by fever, ***hemorrhagic manifestations*** (epistaxis, petechiae, ***positive tourniquet test***), ***thrombocytopenia,*** and ***increased hematocrit due to hemoconcentration.*** There is hepatomegaly.
- **Dengue shock syndrome** is characterized by hypovolemic shock along with all findings of DHF.
- **Over the past three decades, there has been dramatic increase in the frequency of dengue fever, DHF and DSS and their epidemics.** It is found in tropical and subtropical regions around the world, predominantly in urban and semi-urban areas and are now spreading to rural areas.

35. **Ans. is 'b' i.e., Source reduction was the part of control strategy, 'd' i.e. Objectives included control through anti-larval measures & 'e' i.e. Aim for elimination was in year 2015** [*Ref: http://www.nihfw.org/NationalHealthProgramme/NATIONALFILARIACONTROLPROGRAMME.html*]

- ***The National Filaria Control Programme was launched in 1955.***
- ***Enviromental engineering through source reduction*** and water management was included in control strategy.
- ***Home remedies were not included as a part of control strategy***
- ***One of the objective was to control in urban areas through recurrent anti-larval and anti-parasitic measures.***
- ***The aim was "Elimination of Lymphatic filariasis by 2015"***

NATIONAL FILARIA CONTROL PROGRAMME

- Bancrftian filariasis caused by Wuchereria bancrofti, which is transmitted to man by the bites of infected mosquitoes - Culex, Anopheles, Mansonia and Aedes. Man is the definite host and mosquito is the intermediate host of Bancroftian and Brugian filariasis. The adult filarial worm lives in lymphatic vessels whereas microfilaria lives in peripheral blood and are able to infect mosquitoes when they come to feed. This infection causes lymphangitis, lymphadenitis, elephantiasis of genitals, legs and arms and cause tropical eosinophilia due to hypersensitivity. The disease may cause severe deformity, and disability.

- Lymphatia filaria is prevalent in 18 states and union territories. Bancrftian filariasis is widely distributed while brugian filariasis caused by Brugia malayi is restricted to 6 states - UP, Bihar, Andhra Pradesh, Orissa, Tamil Nadu, Kerala, and Gujarat.

National Health Policy

- ***"Elimination of Lymphatic filariasis by 2015"***

Programme

- ***The National Filaria Control Programme was launched in 1955.*** The activities were mainly confined to urban areas. However, the programme has been extended to rural areas since 1994.

Objectives

1) Reduction of the problem in un-surveyed areas
2) ***Control in urban areas through recurrent anti-larval and anti-parasitic measures.***

Control Strategy

1) Vector Control through anti-larval spray/application at weekly intervals with appropriate larvicides;
2) Biological control through larvivorous fishes;
3) ***Enviromental engineering through source reduction*** and water management;
4) Anti-parasitic measures through diagnosis and "treatment of microfilaria carriers and cases; and
5) Information, Education, and Communication to generate community awareness.

Anti-Mosquito and Anti-larval Measures

- One or two round of residual insecticide spray with DDT in areas which is known to be endemic for filariasis. Anti-larval measures with temephos in prescribed dosage in water storage tanks every week and application of Mineral Larvidcidal oils on water surface are practiced.

36. Ans. is 'c' i.e., Influenza & 'e' i.e. Yellow fever [*Ref:* ***Park 23rd/e p. 149; https://www.aafp.org; https://www.cdc.gov***]

- ***Individuals with a confirmed anaphylactic reaction to egg should not receive yellow fever vaccine. Individuals who have egg allergy may be at increased risk of reaction to some influenza vaccines.***
- ***All children with egg allergy should receive the MMR vaccination as a routine procedure in primary care (Clark et al., 2010).*** Recent data suggest that anaphylactic reactions to ***MMR vaccine are not associated with hypersensitivity to egg antigens.***

Egg allergy and vaccine

- Persons may be allergic to the vaccine antigen or to a vaccine component such as animal protein, antibiotic, preservative, or stabilizer. ***The most common animal protein allergen is egg protein found in vaccines prepared using embryonated chicken eggs (e.g., yellow fever and influenza vaccines).***
- ***Persons with histories of anaphylactic or anaphylactic-like allergy to eggs or egg proteins might be at risk from receiving yellow fever and egg-containing influenza vaccines.***
- Studies have shown that children who have a history of severe allergy to eggs rarely have reactions to MMR vaccine, probably because measles and mumps vaccine viruses are both grown in chick embryo fibroblasts, not actually in eggs. It appears that gelatin, not egg, might be the cause of allergic reactions to MMR. ***As a result, in 1998, the ACIP removed severe egg allergy as a contraindication to measles and mumps vaccines. Egg-allergic children may be vaccinated with MMR without prior skin testing.***

PHARMACOLOGY

37. Ans. is 'a' i.e., Ethosuxamide, 'b' i.e. Zonasamide, 'd' i.e. Trimethadione & 'e' i.e. Mibefradil

[*Ref:* ***https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4005039/***]

T-type calcium channel blockers (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4005039/)

- ***Of the three T-type calcium channel subtypes, CaV3.1 is expressed in the thalamocortical relay nucleus.*** CaV3.1 knockout mice provide protection from absence seizures. ***It is believed that ethosuximide and trimethadione effectively block this channel.*** Zonisamide is chemically classified as a sulfonamide is effective in the treatment partial seizures, childhood epilepsy, West syndrome (infantile spasms), and juvenile myoclonic epilepsy. ***Zonisamide blocks T-type calcium channels,*** blocks other channels, and binds to other proteins common for this type of blocker.
- Traditionally, many antihypertensive/antianginal CCBs were thought to function through their blockade of L-type calcium channels. However, many common CCBs are now known to block both L-type and T-type calcium channels with similar potencies. Among clinically relevant CCBs to treat hypertension, three separate classes exist: dihydropyridines (amlodipine), phenylakylamines (verapamil), and benzothiazepines (diltiazem). **Among the dihydropyridine class, one subclass blocks only L-type calcium channels and the other subclass blocks both L-type and T-type calcium channels. The latter subclass includes amlodipine, aranidipine, azelnidipine, barnidipine, benidipine, efonidipine, nicardipine, and nimodipine.** Of these listed, amlodipine, nicardipine, and nimodipine are FDA approved for use in the United States.

- Verapamil, a phenylakylamine, blocks both L-type and T-type channels with higher affinity for depolarized channels than for resting channels. ***Mibefradil, another phenylalkylamine, was withdrawn from the market due to its interactions with other drugs metabolized through the cytochrome P450 pathway although it is highly effective to block T-type calcium channels***.
- There are several other drugs able to block T-type calcium channels. T-type calcium channels are potently blocked by a subset of neuroleptic drugs such **as pimozide and penfluridol** from the diphenylbutylpiperidine family. The diphenyldiperazine **flunarizine can also block T-type calcium channels**, preferentially for α1G and α11. **Fluoxetine and trazodone**, primarily for treating depression, block T-type calcium channels. **Lomerizine** is an antimigraine medication used in Japan and has been shown to have neuroprotective effects. Many anesthetic agents such as isoflurane, propofol, and nitrous oxide can effectively block T-type calcium channels, although they also block many other ion channels as well.

38. **Ans. is 'c' i.e. Lorezapam & 'e' i.e., Oxazepam** [*Ref: Goodman & Gilman 11th/e p. 409; Katzung 11th/e p. 374; Niraj Ahuja 6th/e p. 43; Essentials of clinical psychiatry 4th/e p. 421*]

- BZDs are the drugs of choice to treat alcohol withdrawal. *Chlordiazepoxide is the 1st choice. Diazepam is the alternative.*
- ***But all BZDs (Chlordiazepoxide , Diazepam and flunitrezapam)*** *are metabolized extensively by enzyme CYP3A4 in liver* **and active metabolites are generated.**
- *Oxazepam, Lorazepam, Temazepam are not metabolized but directly conjugated therefore they are relatively safer in elderly patients and in those with liver disease. These agents should be used in preference to diazepam.*

39. **Ans. is 'a' i.e., It is the proportion [fraction] of unchanged drug that reaches the systemic circulation, 'b' i.e. Bio-availability of an orally administered drug can be calculated by comparing the Area Under Curve after oral and intravenous [iv] administration, 'c' i.e. Can be measured by plasma concentration and urinary excretion data & 'e' i.e. Bioavailability is studies in phase '0' of a clinical trial**

[*Ref: KDT 7th/e p. 16-17 & 6th/e p. 17; Katzung 11th/e p. 43 & 10th/e p. 40, 41*]

- *Bioavailability of a drug is frequently lower after oral ingestion because of two factors (not poor absorption alone):*
  1) *Extent of absorption*
  2) *First pass metabolism in intestinal wall, portal blood or liver (most common).*
- *Bioavailability of a drug is a measure of fraction of administered dose of a drug that reaches the systemic circulation in unchanged form.*
- *Bioavailability is determined by the area under the plasma concentration - time curve. Area under the curve of an orally administered drug when compared to the area under the curve for an I.V. administered drug (100%) can certainly give an idea of its bioavailability.*
- *The systemic bioavailability of a drug can be predicted from the extent of absorption (function of concentration in plasma) and extraction ratio. Bioavailability can also be calculated by comparing the excretion in urine.*
- *Bioavailability is studied in phase '0' of a clinical trial.*

40. **Ans. is 'a' i.e., Ivacaftor** [*Ref : https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4103577/*]

"On January 31, 2012, the FDA approved ivacaftor/ VX-770 (Kalydeco, Vertex Pharmaceuticals), a CFTR potentiator, for the treatment of CF patients 6 years of age and older with the G551D mutation, *which represents about 4% of patients with CF."*

— https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4103577/

- ***Lumacaftor (VX809) and tezafactor (VX-661) are useful in F508del CFTR mutation (a class II mutation)*** *which results in misfolded CFTR proteins in the endoplasmic reticulum of epithelial cells, which prevents the proteins from reaching the cell surface.* ***They are used in conjunction with Ivacaftor.***
- ***Ataluren (PTC124) has been developed by PTC Therapeutics as a first-in-class PTC suppressor that addresses class I CFTR gene mutations(G542X).***
- *VX-661 is another name for Tezacaftor.*

41. **Ans. is 'a' i.e., Calcium channel blockers, 'b' i.e. Penicillamine & 'd' i.e. Omeprazole** [*Ref : Harrison 16th/e p. 2192*]

Common drugs causing Gynaecomastia	
Antiandrogen	**Psychoactive drugs**
• Cyproterone acetate • Flutamide, bicalutamide, nilutamide • Finasteride, dutasteride • Ketoconazole • Spironolactone • Tea tree oil	• Haloperidol • Diazepam • Tricyclic antidepressants • Haloperidol • Phenothiazines

Cancer/chemotherapeutic drugs	Antimicrobials
• Alkylating agents • Methotrexate • Vinca alkaloids • Imatinib	• Antiretroviral therapy for HIV/AIDS (eg, indinavir) • Isoniazid • Ethionamide • Griseofulvin • Minocycline • Metronidazole • Ketoconazole
Cardiac and antihypertensive medications	**Drugs of abuse**
• ***Calcium channel blockers*** (verapamil, nifedipine, diltiazem) • ACE Inhibitors (captopril, enalapril) • Digoxin • Alpha-blockers • Amiodarone • Methyldopa • Reserpine • Nitrates	• Amphetamines • Heroin • Methadone • Alcohol • Marijuana
Hormones	**Others**
• Androgens • Anabolic steroids • Estrogens • Growth hormones • Chorionic gonadotropin	• Theophylline • ***Omeprazole*** • Auranofin • Diethylpropion • Domperidone • ***Penicillamine*** • Sulindac • Heparin

42. Ans. is 'e' i.e. Verapamil [*Ref : KDT 7th/e p. 631 & 6th/e p. 610 ; Katzung 11th/e p. 599*]

- ***Verapamil is prescribed as a racemate***. l-Verapamil is more potent calcium channel blocker than d-verapamil.
- ***Dopa (not levodoap) is a racemic mixture. L-dopa (levodopa)*** is an optically active form of dopa having L-configuration. It is a conjugate acid of a L-dopa(1-). ***It is an enantiomer of a D-dopa***.
- ***Omeprazole (not esomeprazole) is a racemate***, from which the R- and S-isomers can be isolated. ***Esomeprazole is an unichiral S (-) enantiomer form of Omeperazole*** based on the premise that therapeutic benefit would be achieved by less inter-individual variation, (slow versus rapid metabolizers), and that average higher plasma levels would provide higher dose efficiency in patients.
- ***Other two mentioned drugs are not optically active***.

43. Ans. is 'All' i.e., a, b, c, d & e [*Ref : Various references*]

Treatments for Suicidal Thoughts or Behaviors (Suicidality)

- There are no treatments that specifically stop suicidal thoughts. However, for each individual, identifying and treating any mental illness (eg:- major depression and bipolar disorder), and dealing with any stressors can reduce the risk of suicide. Some treatments which have been shown to reduce suicide risk of suicide include:-

Medications

- Treatment with lithium, atypical antipsychotics and antidepressants has shown to reduce death by suicide.
  1) **Lithium:-**
     - ***A mood-stabilizing medication used for bipolar disorder or major depression, has been shown to decrease suicide associated with depression***.
  2) **Antipsychotic drugs**
     - ***At this time, there is only one medication, clozapine, approved by the FDA for suicide risk reduction in patients with schizophrenia***.
     - Some evidence suggests that olanzapine may reduce suicidal ideation when given in combination with a mood-stabilizing agent in patients with bipolar I disorder mixed-episode.
     - Quetiapine may help prevent suicide in patients with bipolar depression. Quetiapine may reduce suicidal ideation and may be considered for patients with other diagnoses for which clozapine cannot or should not be used.

3) **Antidepressants**
   - ***It has been noted that antidepressants are more effective than placebo in decreasing suicidal ideation***, and ***selective serotonin reuptake inhibitors (fluoxetine***, Sertraline, paroxetine, fluvoxamine, venlafaxine and nefazodone) may act more rapidly in this regard than other agents. Tricyclic antidepressants should be avoided in patients with suicidal ideation because of their lethal potential in the event of overdose.
   - In contrast, there have been concerns that antidepressants actually increase the risk of suicidal thoughts. In fact, the U.S. Food and Drug Administration (FDA) has required a warning stating that antidepressants may increase the risk of suicidal thoughts in children, teens, and adults in their 20s. ***There was no evidence that these medicines increased suicidal behavior in older people***.

4) **Others**
   - Antiepileptic drugs (that act mostly to enhance GABAergic inhibitory function in the cortex)
   - Omega-3 supplements
   - Ketamine (an AMPA receptor antagonist and raises GABA levels)

Psychotherapy

- There are two proven psychotherapies for treating those who attempt suicide: cognitive behavior therapy for suicide attempters (CBT for suicide attempters) and dialectical behavioral therapy (DBT) for patients with borderline personality disorder and recurrent suicidal ideation and behaviors.
- DBT uses mindfulness and other coping skills to decrease impulsive and destructive urges that can lead to suicide attempts.

Brain stimulation therapies

1) **Electroconvulsive therapy (ECT)**
   - ***Electroconvulsive therapy (ECT) is an effective treatment for reducing suicidal ideation*** and intent in acutely depressed patients with mood and psychotic disorders. Patients with severe depression who are suicidal should be offered ECT as a treatment option early in the course of their illness.

2) **Repetitive high-dose transcranial magnetic stimulation (rTMS)**
   - rTMS is a non-invasive, non-systemic treatment that uses Magnetic Resonance Imaging (MRI)- strength, pulsed, magnetic fields to induce an electric current in a localized region of the cerebral cortex. TMS is recommended to treat severe depression only after medication and psychotherapy fail to work. ***It is effective in reducing suicidal thinking in a significant portion of people with hard-to-treat depression***.
   - While left unilateral rTMS is the most common type, the findings suggest that targeting the right frontal lobe may be key to treating suicidal thinking. Bilateral rTMS is the most effective at preventing the development of suicidal thoughts in people.

44. **Ans. is 'c' i.e., Lead to decrease in absorption of sodium in distal tubule & 'e' i.e. Can cause hyperglycemia**

[*Ref: KDT 7th/e p. 584-86; Katzung 12th/e p. 260*]

- ***Thiazide diuretics exert their diuretic effect via blockage of the sodium-chloride (Na/Cl) co-transporter (NCC) in the luminal membrane (not interstitium) of proximal segment of the distal convoluted tubule (DCT). The NCC facilitates the absorption of sodium from the distal tubules back to the interstitium and accounts for approximately 7% of total sodium reabsorption. By decreasing sodium reabsorption, thiazide use acutely results in an increase in fluid loss to urine***, which leads to decreased extracellular fluid (ECF) and plasma volume.
- ***With the exception of metolazone, thiazides are not effective when renal function is moderately impaired (GFR < 20 mL/min)***, because they are not filtered in sufficient concentration to inhibit the sodium-chloride (Na/Cl) channel.
- ***Thiazides have little effect on renal blood flow or total glomerular filtration rate***.
- ***Thiazides cause elevation of blood sugar*** in some patients due to decreased insulin release which probably is a consequence of hypokalemia.

45. **Ans. is 'a' i.e., Vegetables of brassica family & 'b' i.e. Percholates** [*Ref: KDT 7th/e p. 255*]

Goitrogens

- Goitrogens exert a direct effect on the thyroid gland to disrupt one of several steps in the biosynthesis and secretion of thyroid hormones. This includes:-
  i) ***Inhibition of the iodine-trapping mechanism*** (**Thiocyanate**, ***perchlorate***, pertechnetate and nitrates). In addition carbutamide, amiodarone, and acetazolamide are reported to inhibit iodide uptake, transport of iodide, or both in the thyroid follicle. ***Goitrogens, that interfere with the uptake of iodine in the thyroid, are present to a variable degree in a number of plants from the family Brassicacceae*** .Iodine is trapped in follicular cells by **Na^{+1}- symporter**.
  ii) The second step in thyroid biosynthesis, the action of thyroid peroxidase in catalyzing the binding of iodide to tyrosyl residues in thyroglobulin, shows particular vulnerability to chemical inhibition. Whole classes of chemicals are known to inhibit thyroid peroxidase action including the thionamides (e.g., thiourea, thiouracil, PTU, MMI, ***carbimazole***, and goitrin); aniline derivatives (e.g., sulfonamides, *para*-aminobenzoic acid, ***para-aminosalicylic acid***, and amphenone); substituted phenols (e.g., resorcinol, phloroglucinol, and 2,4-hydroxybenzoic acid). Other compounds known to inhibit thyroid peroxidase are aminoglutethimide (also an adrenocortical inhibitor), the antimicrobials cotrimoxazole and co-trifamole, the diuretic acetazolamide, and the polybrominated biphenyl congeners).

iii) Blockage of organic binding of iodine and coupling of iodothyronines to form thyroxine (T4) and triiodothyronine (T3) (e.g., sulfonamides, thiourea, methimazole, and aminotriazole, among others)
iv) Inhibition of thyroid hormone secretion by an effect on proteolysis of active hormone from the colloid (lithium or an excess of iodide).
v) Another large group of goitrogenic chemicals disrupts thyroid hormone economy by increasing the peripheral metabolism of thyroid hormones through an induction of hepatic microsomal enzymes. This group includes CNS-acting drugs (phenobarbital, benzodiazepines), calcium channel blockers (nicardipine, nifedipine), steroids (spironolactone), retinoids, chlorinated hydrocarbons (chlordane, DDT, TCDD), polyhalogenated biphen.
vi) Propranolol, the β-adrenoceptor antagonist that is used to slow the heart rate, is reported to inhibit thyroglobulin synthesis representing another target of direct-acting thyroid follicular functional inhibition.

46. Ans. is 'a' i.e., Neurotoxicity, 'b' i.e. Nephrotoxicity, 'd' i.e. Neuropathy & 'e' i.e. Ototoxicity

[Ref: KDT 7th/e p. 861 & 6th/e p. 828; Katzung 11th/e p. 943]

Cisplatin toxicity

- A major obstacle to more widespread use of cisplatin is the persistence of severe toxic side effects.

1) **Nephrotoxicity**
   - ***The major dose-limiting effect is nephrotoxicity***. It is dose-dependent, apparently irreversible in some cases, and primarily affects the proximal tubules.
2) **Ototoxicity**
   - ***Another dose-dependent effect of cisplatin is ototoxicity***. Again, it is a cumulative and irreversible side effect, which becomes more significant with irradiation therapy. The ototoxicity of cisplatin also appears to be most significant in children.
3) **Neurotoxicity & neuropathy**
   - ***At higher or prolonged doses, neurotoxicity becomes a factor***. Initial symptoms include numbness and/or tingling in hands or feet. ***Once preventive clinical interventions to reduce neurotoxicity have been achieved, the major dose-limiting toxicities are considered to be hyperyricemia and peripheral neuropathy, which is the irreversible degradation of the peripheral nerves***.
4) **Myelosuppression**
   - The reduction of bone marrow function, is mild relatively to other antineoplastics.
5) **Nausea and vomiting**
   - The nausea and vomiting caused by cisplatin is extremely severe. In addition to the severe nausea and vomiting, patients experience a loss of appetite and taste, and may find it difficult to eat. Consequently, diarrhoea and anorexia is commonly observed.
6) **Other side effects**
   - Hair loss
   - Angioedema
   - Erythema
   - Exfoliative Dermatitis
   - Facial Edema
   - Flushing
   - Hyperhidrosis
   - Rash
   - Alopecia
   - Hypomelanosis
   - Anaphylaxis
   - Gingival Discolouration
   - Injection-site cellulitis
   - Oral Mucosal Lesions

47. Ans. is 'b' i.e., Abciximab, 'd' i.e. Tirofiban & 'e' Eptifibitide

[Ref: KDT 7th/e p. 631 & 6th/e p. 610; Katzung 11th/e p. 599]

*"**The 3 intravenous αIIbβ3 antagonists that were approved by the FDA were abciximab**, a chimeric monoclonal antibody fragment; eptifibitide, a cyclic peptide based on a snake venom disintegrin; and tirofiban, a nonpeptide analogue of an RGD peptide. These agents, together with lamifiban, another nonpeptide antagonist, provide marked protection from ischemic events in patients undergoing PCI"*
*– **https://www.ahajournals.org/doi/full/10.1161/01.ATV.0000066686.46338.F1***

- ***Clopidogrel blocks ADP mediated platelet activation by irreversible antagonism of P2 Y12 receptor on ADP***.
- ***Heparin is indirect thrombin inhibitor acting by activating antithrombin III***, which then **inhibits factor IIa and Xa**.

Glycoprotein IIb/IIIa (GPIIb/IIIa, integrin αIIbβ3) antagonism

- **GPIIb/IIIa** is the most abundant integrin on the platelet surface acts as a receptor for fibrinogen and von Willebrand factor and aids platelet activation. Once platelets are activated after endothelial injury or rupture of an atherosclerotic plaque, granules secrete clotting mediators, including both ADP and TXA2. It leads to activation of GP IIb-IIIa that induces binding to fibrinogen and the aggregation of platelets.
- Glycoprotein (GP) IIb-IIIa antagonists inhibit the aggregation of activated platelets. These functions of αIIbβ3 have been targeted for antithrombotic therapy.
- The 3 intravenous $\alpha_{IIb}\beta_3$ antagonists approved by the FDA are ***abciximab***, a chimeric monoclonal antibody fragment; eptifibitide, a cyclic peptide based on a snake venom disintegrin; and ***tirofiban***, a nonpeptide analogue of an RGD peptide.
- The parenteral peptidomimetic antagonist lamifiban is not available for clinical use.
- Abciximab has a longer duration of effect than the other agents developed.

50. Ans. is 'b' i.e., They act by increasing the concentration of ACh by preventing its degradation *[Ref: KDT 7th/e p. 105; Katzung 13th/e p. 118]*

- *Pseudocholinesterase (butyrylcholinesterase) is also inhibited by anti-ChEs.*
- *Anticholinesterases inhibit cholinesterase and protect Ach from hydrolysis → Concentration of Ach increases → cholinergic effects are produced.*
- *Anti-chEs are referred to as reversible or irreversible because of marked difference in duration of action. However, the molecular mechanisms of action of these two groups are same.*
- *They inhibit esteratic (catalytic) site.*
- *All organophosphates are highly lipid soluble except echothiophate which is water soluble.*

PATHOLOGY

51. Ans. is 'b' i.e. CD20, 'c' i.e. CD30 & 'e' i.e. MUM1 *[Ref: Robbin's 9th/e p. 606; Harrison 19th/e p. 708]*

- *Classical Reed-Sternberg cells are giant cells with multiple nuclei or single nucleus with multiple lobes. These are positive for CD 15 and CD 30, and also PAX-5 (B-cell transcription factor).*
- *Reed–Sternberg cells are CD45–, CD45RO–, CD43–, and EMA–. Occasional cases are CD15–. Cells may occasionally marker CD20 and IRF4 / MUM1.*

Positive stains	• ***CD30 (almost all cases, membrane & Golgi zone),*** CD15 (75 - 85%, may be restricted to the Golgi zone), ***CD20 (30 - 40%),*** **CD79a** (10%), ***IRF4 / MUM1,*** **BLIMP1** (25%), **EMA** (rare), **Ki67, fascin** • **PAX5 / BSAP** shows weak nuclear expression in ~95% of cases, which demonstrates the B cell origin of HRS cells • **EBV** (40 - 60% of MCCHL and NSCHL but not LRCHL); see also individual subtypes; if positive, the HRS cells express **LMP1** and **EBNA1** but not **EBNA2** (latency type II) • May rarely show weak T cell antigen expression in a minority of HRS cels
Negative stains	• **ALK, TIA1, CD3,** ***CD45*** (may have focal globular cytoplasmic staining), J-chain, **CD75, CD68** (PGM1), **CD138, OCT2** (90%), **BOB.1** (90%), **PU.1**

52. Ans. is 'a' i.e. Micrognathia, 'c' i.e. Glossoptosis & 'e' i.e. Cleft palate *[Ref: PL Dhingra 6th/e p 449; ghr.nlm.nih.gov/condition]*

Pierre Robin syndrome (PRS)

- It is an autosomal dominant condition of facial abnormalities in humans, may be caused by genetic anomalies at chromosomes 2, 11, or 17.
- *The three main features are cleft palate,* ***micrognathia (abnormally small mandible)/ retrognathia (abnormal positioning of the jaw or mandible) and glossoptosis (airway obstruction caused by backwards displacement of the tongue base)***
- PRS may occur in isolation, but it is often part of an underlying disorder or syndrome. The most common is Stickler Syndrome
- The most common otic anomaly is otitis media followed by auricular anomalies, conductive hearing loss, external auditory canal atresia .
- Dental and philtral malformations occur in one third of cases. Laryngomalacia occurs in approximately 10-15% of patients
- Speech defects occur frequently

53. Ans. is 'a' i.e., Most common gene mutation found in human cancers, 'b' i.e. *p. 53* mediated senescence is temperature sensitive cell cycle arrest ??,c' i.e. Works at G1/S check point, 'd' i.e. Also called "guardian of genomes" & 'e' i.e. Induces DNA repair by arresting the cell cycle at G1 and inducing activation of DNA repair genes *[Ref: Robbin's 9th/e p. 294 & 8th/e p. 290-291]*

p53 : Guardian of genome

- ***TP53 (p53), the "guardian of the genome," is a central player in cellular responses to a variety of stresses, including DNA damage, inappropriate growth signaling, and hypoxia.***
- The mammalian p53 DNA-binding domain has marginal thermostability, which facilitates the identification of temperature-sensitive mutants and provides a powerful tool for controlling p53 function.
- p53 is a **tumor suppressor gene.** p53 gene is located on **chromosome 17.** p53 acts as **molecular policeman** that prevents the propagation of genetically damage cell. p53 gene product, i.e. p53 protein is a DNA binding protein in the nucleus, when called into action, it controls the transcription of several other genes.
- ***The major functional activities of the p53 protein are cell cycle arrest and initiation of apoptosis in response to DNA damage.*** When there is DNA damage due to irradiation, UV light or mutagenic chemicals, there is rapid increase in p53 levels.

- Abciximab, unlike tirofiban and eptifibatide, binds with equal affinity to GP IIb-IIIa and αvβ3 (vitronectin receptor). In addition, abciximab binds, albeit with lower affinity, to the leukocyte Mac-1 receptor. Abciximab inhibits αvβ3 receptor mediated smooth muscle migration and proliferation.
- Both eptifibatide and tirofiban exhibit a longer half-life in the fluid phase of blood compared with abciximab.
- **They are more complete inhibitors than either aspirin or clopidogrel / ticlopidinejj because they inhibit final pathway in platelet aggregation** (whether it is mediated by ADP or TXA2), while aspirin blocks only TXA2 pathway and clopidogrel blocks only ADP pathway.

48. **Ans. is 'b' i.e., Beta lactams, 'c' i.e. Macrolides, 'd' i.e. Linezolid & 'e' i.e. Clindamycin**

[*Ref: KDT 7th/e p. 697 & 6th/e p. 723; Katzung 11th/e p. 809*]

- ***Aminoglycosides cause concentration dependent killing.***
- ***All other mentioned options lead to time dependent killing of bacteria.***

Time dependent killing with no post-antibiotic effect	**All β-lactams, vancomycin**
Time dependent killing with prolonged post-antibiotic effect	**Azithromycin, clindamycin, Linezolid, Macrolides, tetracyclines, streptogramin, tigecyclin, telithromycin**
Concentration dependent killing with prolonged post-antibiotic effect	**Aminoglycosides, fluoroquinolones, daptomycin, metronidazole**

49. **Ans. is 'a' i.e., Steroids- osteoporosis & 'd' i.e. Analgesics - nephropathy** [*Ref: Lawrence 9th/e p. 93-95*]

- Steroids induced osteoporosis → *Type C adverse drug reaction*
- Penicillin induced anaphylaxis → *Type B adverse drug reaction*
- Opioid induced respiratory depression → *Type A adverse drug reaction*
- Analgesics induced nephropathy → *Type C adverse drug reaction*
- Warfarin induced bleeding → *Type A adverse drug reaction*

Classification of Adverse Drug Reactions

Type of Reaction (Mnemonic)	Features	Examples
Type A : Dose related (Augmented reaction)	• Common. ***May occur in everyone*** • Exaggerated pharmacologic response • Predictable • Low mortality	• Dry mouth with tricyclic antidepressants, • ***Respiratory depression with opioids,*** • ***Bleeding with warfarin,*** • Serotonin syndrome with SSRIs, • Digoxin toxicity • Postural hypotension with antihypertensives • Hypoglycemia with antidiabetics drugs
Type B : Non-dose related (Bizarre)	• Uncommon. ***Occur in some people*** • Not related to the pharmacologic action of the drug • Unpredictable • High mortality	• Immunologic reactions: ***anaphylaxis to penicillin*** • Idiosyncratic reactions: malignant hyperthermia with general anesthetics
Type C : Dose related and time related (Chronic)	• Uncommon • Related to the cumulative dose • Due to long term exposure,	• Hypothalamic-pituitary-adrenal axis suppression by corticosteroids, • Osteonecrosis of the jaw with bisphosphonates • ***Osteoporosis with corticosteroids*** • ***Analgesic nephropathy***
Type D : Time related (Delayed)	• Uncommon • Usually dose related • Occurs or becomes apparent sometime after use of the drug	• Carcinogenesis • Tardive dyskinesia • Teratogenesis • Leucopenia with lomustine
Type E : Withdrawal (End of use)	• Uncommon • Occurs soon after withdrawal of the drug	• Withdrawal syndrome with opiates or benzodiazepines (e.g., insomnia, anxiety)
Type F : Unexpected failure of therapy (Failure)	• Common • Dose related • Often caused by drug interactions	• Inadequate dosage of an oral contraceptive when used with an enzyme inducer • Failure of antitubercular therapy • Resistance to antimicrobial agents

- ***p53 causes :-***
  1. ***Cell cycle arrest :*** p-53 induces transcription of ***p21,*** a CDK inhibitor. p21 inhibit cyclin D-CDK-4 complex and there is ***arrest of cell cycle late in G1 phase.*** Cell multiplication stops. ***This allows time for DNA repair.***
  II. ***DNA repair:*** p-53 also helps in DNA repair directly by inducing transcription of ***GADD 45*** (growth arrest and DNA damage). GADD 45 encodes a protein that is involved in DNA repair.
- If DNA damage is repaired successfully, p53 activate **MDM-3** and this MDM-3 induces degradation of p-53 → Relieve in cell cycle block. If DNA damage cannot be successfully repaired, **p53 induces apoptosis** by inducing the activation of apoptosis inducing gene **BAX.**
- So p-53 prevents replication of cell with defective DNA → p53 functions as a critical gatekeeper against formation of cancer.
- **Mutation in p53 leads to loss of above protective mechanisms i.e. cell cycle arrest & DNA repair. It will lead to unarrested cell multiplication and finally carcinogenesis.**
- ***p-53 is the most common target for genetic alteration in human tumors; A little over 50% of human tumors contain mutation in this gene.***
- **Non-mutated (wild type) p53** reduces the chances of cancer.

54. **Ans. is 'a' i.e. Crypt branching, 'b' i.e. Crypt distortion, 'c' i.e. Abundant lymphoplasmacytic infiltrate in basal layer & 'e' i.e. Hypertrophy of muscularis mucosal layer** *[Ref: **Robbin's 9th/e** p. 800; **Love & Bailey 26th/e** p. 1145-52; **Sabiston 19th/e** p. 1244-54; **Harrison 19th/e** p. 1955; **Schwartz 10th/e** p. 1153-57]*

Histological features of ulcerative colitis

Macroscopic features

- UC is characterized by diffuse (contiguous and symmetrical) inflammation, restricted to the colonic mucosa with diffuse mucosal granularity, edema, and erythema with or without ulceration. These mucosal changes involve the rectum and variable lengths of the proximal colon in continuity; the distal colon should be more severely diseased than the proximal colon.
- The bowel wall maintains its normal thickness, reflecting the absence of transmural inflammation, and no fat wrapping, strictures, or fistula tracts should be present. In long-standing and severe cases, there may be 'cobblestoning' and slight but diffuse narrowing of the distal colon. Mucosal polyps of sessile, pedunculated, or filiform configuration may also be seen in long-standing disease.
- Microscopic features

A. Active/acute features

- UC usually exhibits a histological pattern of chronic active colitis. Active changes include:-
  i) Diffuse mononuclear inflammatory infiltrate in lamina propria, The presence of neutrophil-mediated epithelial injury, which may take the form of crypt abscesses (neutrophils in glandular lumen) and cryptitis (neutrophils infiltrating crypt epithelium) but usually no neutrophils in lamina propria and reduced intraepithelial mucin;
  ii) plasma cells are common at base of crypts (basal plasmacytosis), muscularis mucosa may be exposed by ulceration or be covered by granulation tissue and reepithelialization;
  iii) Submucosal fibrosis present; may have Schwann cell proliferation.

B. Chronic features

- Chronic changes include crypt architectural distortion, basal lymphoplasmacytosis, or Paneth cell metaplasia in the left colon:-
  i) ***Architectural distortion*** is represented by ***shortening of the crypts*** (i.e. presence of space between the bottom of the crypts and the upper edge of the muscularis mucosae) and prominent crypt budding (***branching crypts,*** bifid crypts), crypt dropout. In normal mucosa, the crypts are uniformly spaced, arranged perpendicular to the muscularis mucosae, and the crypt bases contact the upper edge of the muscularis mucosae.
  ii) ***Basal lymphoplasmacytosis*** refers to the presence of a lymphoplasmacytic infiltrate between crypt bases and the muscularis mucosae.
  iii) While Paneth cells are a normal component of the right colon, their presence in the left colon is a metaplastic process, due to chronic crypt epithelial injury.
  iv) Mucosal ulcerations and erosions, mucin depletion and ***diffuse thickening of the muscularis mucosae***
  v) ***Granulomas are not present in UC*** but isolated giant cells or a histiocytic reaction around a ruptured crypt, mimicking granuloma formation, can occasionally be seen. 'Cryptolytic lesions' or pericryptal granulomas present a special diagnostic problem.
  vi) Endarteritis obliterans in submucosal arteries (10%)
  vii) No fissures, no transmural inflammation (except in fulminant cases), no submucosal edema or inflammation, no neuronal hyperplasia
  viii) Rarely, pyloric gland metaplasia may also be seen in UC.
- Microscopically, these changes of chronic active colitis are diffuse and uniform in distribution: that is, every biopsy fragment from the diseased colon shows a similar degree of injury and inflammation.

C. Chronic ulcerative colitis in remission

- With spontaneous healing or medical treatment, UC may become inactive or quiescent. Histologically, inactive (quiescent) colitis is characterized by marked architectural abnormalities in the absence of active inflammation, and the most commonly observed architectural abnormalities include atrophy, irregularity and shortening of crypts, thickening of the muscularis mucosae, and metaplasia (Paneth cell metaplasia in the left colon, or pyloric-type glands in any location).

55. **Ans. is 'c' i.e., There is defect in enzyme lysyl hydroxylase & 'e' i.e. Results from defective collagen synthesis** *[Ref: Robbin's 9th/e p. 144 & 8th/e p. 144]*

- ***Marfan syndrome is an autosomal dominant disorder of the connective tissue due to mutation in fibrillin-1 gene on chromosomal 15. This mutation results in an increase in a protein called transforming growth factor beta, or TGF-β.***
- ***Fibrillin-1 is a part of elastic fibers, thus defect in fibrillin-1 affects elastin (not the collagen).***
- ***Lysyl hydroxylases (or procollagen-lysine 5-dioxygenases/ PLOD)*** are alpha-ketoglutarate-dependent hydroxylases enzymes that catalyze the hydroxylation of lysine to hydroxylysine. There are three lysyl hydroxylases (LH1-3) encoded in the human genome, namely: PLOD1, PLOD2 and PLOD3.
- ***Mutations in the PLOD1 gene have been linked to Kyphoscoliotic Ehlers–Danlos syndrome (kEDS, in the past EDS VI). Mutations in the PLOD2 gene have been linked to Bruck syndrome in humans.***

Marfan syndrome (MFS)

- ***Marfan syndrome is an autosomal dominant disorder of the connective tissue due to mutation in fibrillin-1 gene on chromosomal 15. This mutation results in an increase in a protein called transforming growth factor beta, or TGF-β.***
- Transforming growth factor beta (TGF-β) plays an important role in MFS. Fibrillin-1 directly binds a latent form of TGF-β keeping it sequestered and unable to exert its biological activity. ***The reduced levels of fibrillin-1 allow TGF-β levels to rise due to inadequate sequestration.***
- ***Fibrillin-1 is a major component of the 10-12 nm microfibrils, which are thought to play a role in tropoelastin deposition and elastic fibre formation in addition to possessing an anchoring function in some tissues.***
- Fibrillin-1 is a part of **elastic fibers,** thus defect in fibrillin-1 affects following systems :-
  1) **Skeletal abnormalities :** Tall with thin built; **arachnodactyly** (long and slender fingers and hand, spider like); decrease in **upper segment : Lower segment body ratio** (i.e. lower limbs are proportionately more lengthened); scoliosis and kyphosis; pectus excavatum and pectus craniatum; **Hypermobility (laxity) of joint with hyperextensibly;** high arched palate and dolicocephalic skull.
  2) **CVS abnormalities :** Mitral valve prolapse causing mitral regurgitation; **aortic aneurysm beginning at base** of aorta and **involving ascending aorta; cystic medial necrosis** causing dissection of aorta (**most common cause of death**).
  3) **Ocular abnormalities: Ectopia lentis (with bilateral superolateral lens dislocation),** elongated eyeball.
  4) **Others:** Spontaneous pneumothorax ; inguinal and incisional hernias.

56. **Ans. is 'b' i.e., Hemopexin - heme binding & 'e' i.e. Thyroxin binding globulin – thyroxin binding** *[Ref: http://www.gastrohep.com/ebooks/rodes/Rodes_2_4_1.pdf]*

- ***Ceruloplasmin is the major copper-carrying protein in the blood. It also helps in iron transport by causing oxidation of Fe2+ (ferrous iron) into Fe3+ (ferric iron), therefore assisting its association with transferrin, which can carry iron only in the ferric state.***
- ***Hemopexin is the plasma protein with the highest binding affinity to heme among known proteins. It's important to distinguish between hemopexin and haptoglobin, the latter one always binds to free hemoglobin.***
- ***Haptoglobin is the human blood plasma protein that binds to free hemoglobin.*** The haptoglobin-hemoglobin complex will then be removed by the reticuloendothelial system (mostly the spleen).
- ***Transcortin is an alpha-globulin protein with corticosteroid-binding properties. This is the major transport protein for glucocorticoids and progestins in the blood of most vertebrates.***
- ***Thyroxine-binding globulin (TBG) is a globulin that binds thyroid hormones in circulation.*** It is one of three transport proteins (along with transthyretin and serum albumin) responsible for carrying the thyroid hormones thyroxine (T4) and triiodothyronine (T3) in the bloodstream. Of these three proteins, ***TBG has the highest affinity for T4 and T3 .***

Major Circulating Transport Proteins	
Transport Protein	**Principal ligand Transported**
Albumin	Most steroids, thyroxine, triiodothyronine, fat soluble hormones, fatty acids to liver, unconjugated bilirubin, many drugs, Calcium, magnesium, cations & anions
Ceruloplasmin	Copper
Transcortin	cortisol, aldosterone and progesterone
Haptoglobin	free hemoglobin released from erythrocytes
Hemopexin	free heme released from hemoglobin
IGF binding protein	insulin-like growth factor 1
Hemoglobin	Oxygen from lung to tisuues
Transferrin	iron ions in the ferric form (Fe3+)
Afamin	Vitamin E
Alpha feto protein	Long chain fatty acids, bilirubin

Avidins	Biotin
Cholesterol ester transfer protien	Cholesterol
Corticosteroid-binding globulin	Steroid hormones
Folate-binding protein	Folic acid
Lipocalins	Retinoids, arachidonic acid, steroids, pheromones
Lipoproteins	Triglycerides, cholesterol, bile acids, vitamin E
Phospholipid transfer protein	Phospholipids
Retinol-binding protein	Retinol
Sex hormone-binding globulin	Testosterone, dihydrotestosterone, estradiol
Thyroxine-binding globulin	• thyroxine (T4) and 3,5,3'-triiodothyronine (T3)
Transcobalamins	Vitamin b12
Corticosteroid-binding globulin (transcortin)	**Cortisol,** aldosterone
Transthyretin	• thyroid hormone thyroxine (T4)
Vitamin D-binding protein	• Vitamin D
Major urinary proteins	• pheromones in rodents

57. **Ans. is 'All' i.e., a, b, c, d & e** *[Ref: **Robbin's 9th/e** p. 218; **Harison 17th/e p. 2076; various other references**]*

Etiopathogenesis of systemic lupus erythematosus

- SLE is an autoimmune disorder characterized by multisystem inflammation with the generation of autoantibodies. Although the specific cause of SLE is unknown, multiple factors are associated with the development of the disease, including genetic, epigenetic, ethnic, immunoregulatory, hormonal, and environmental factors. Many immune disturbances, both innate and acquired, occur in SLE.

Immune - etiopathogenesis of systemic lupus erythematosus (loss of B- cell and T- cell tolerance)	
Hyperactivated B cells	• Number of activated B cells producing Ig increased in peripheral blood • B cell abnormalities are present in unaffected family members and may precede SLE development • Lupus B cells are more prone to polyclonal activation by specific antigens • Raised IL-6 and IL-10 concentrations may promote B cell hyperactivity • B cell responses to activating signals are abnormal
Hyperactivated T cells	• Number of activated T cells increased in peripheral blood • Abnormal early events of T cell activation • T cell function skewed towards B cell help and Ig production • Lupus T cells produce little IL-2 on stimulation
Abnormal phagocytic functions	• Phagocytic cells cannot bind or process immune complexes efficiently • Phagocytosis of apoptotic cells impaired
Abnormal immunoregulation	• Defective clearance of immune complexes and apoptotic materials because of ***qualitative or quantitative defects of early complement proteins (C2, C4, C1q), Fcγ, CR1, and C1q receptors on cell surfaces*** • Suppressive activity of suppressor T cells and NK cells on activated T and B cell network is inadequate • Idiotypic control of antibody production is dysregulated

Environmental factors that may be relevant in the pathogenesis of systemic lupus erythematosus	
Chemical/physical factors	• Aromatic amines • Hydrazines • Silica dust • Drugs (procainamide, hydralazine, chlorpromazine, isoniazid, phenytoin, quinidine, penicillamine) • Tobacco smoke • Hair dyes • ***Ultraviolet light***

Dietary factors	• L-canavanine (alfalfa sprouts) • High intake of saturated fats • vitamin D deficiency
Infectious agents	• Bacterial DNA/endotoxins, Enterococcus gallinarum, • Retroviruses, Epstein-Barr virus (EBV)
Hormones and environmental oestrogens	• Hormonal replacement therapy, oral contraceptive pills • Prenatal exposure to oestrogens

Cytokines in patients with SLE	
IL-2	• ↑IL-2 expression in PBMCs • ↑IL-2 mRNA expression in lymphocytes • ↑Serum soluble interleukin 2 (sIL)-2 receptor expression • ↓IL-2 production to antigenic and mitogenic stimulation in T cells
IL-6	• ↑IL-6 mRNA expression in PBMCs • ↑IL-6 production in stimulated whole blood culture • ↑Serum IL-6 concentrations
IL-10	• ↑Spontaneous IL-10 production in PBMCs • ↑Ratio of IL-10:IFN-γ secreting cells in PBMCs • ↑IL-10 mRNA expression in PBMCs • ↑Serum IL-10 concentration and correlates with disease activity
IL-12	• Impaired production of IL-12 by stimulated PBMCs • IL-12 supplementation inhibits Ig and anti-DNA production by PBMCs • IL-12 inhibits the action of IL-10 on PBMCs
Other cytokines	• ↑Serum IL-15, IL-16, interleukin 17 and IL-18 concentrations • ↑IFN-γ mRNA expression in PBMCs (peripheral blood mononuclear cell) • ***↑Serum IFN-γ(type II class of interferons), ↑Serum IFN-α (type I class of interferons)***, and↑ tumor necrosis factor α (TNFα)

58. Ans. is 'b' i.e., Kleinfelter syndrome & 'e' i.e. Turner syndrome [*Ref: **Robbin's 9th/e** p. 161-70*]

CHROMOSOMAL DISORDERS

- Chromosomal disorders (***cytogenetic disorders***) may be caused by mutation which causes (i) Abnormal number, or (ii) Structural alteration.
  1) **Abnormal number of chromosomes**
     - There are 23 pairs of chromosomes (46, XX in females and 46, XY in males). An exact multiple of the 23 (haploid number) is called ***euploidy***. When the number of chromosomes are not an exact multiple of 23, it is referred as ***aneuploidy***. eg - Trisomy or monosomy.
  2) **Abnormal structure of chromosome**
     - Chromosomal structural changes usually result from chromosome breakage followed by loss or rearrangement.
     - Beside these chromosomal structural abnormalities some **autosomal recessive** genetic disorders are associated with such a high level of chromosomal instability that they are known as ***chromosomal breakage syndrome***. *eg:-* → *Ataxia - telangiectasis, bloom syndrome, xeroderma pigmentosa, and fanconi anemia.* There is ***significantly*** *increased risk of cancer* in these syndromes. **Hereditary non-polyposis cancer** is also chromosomal breakage syndrome, but it is autosomal dominant.
- Important chromosomal disorders are :-
  i) *Involving autosomes :* ***Down syndrome (Trisomy 21), Edward syndrome (Trisomy 18); Patau syndrome*** *(Trisomy 13).*
  ii) *Involving sex chromosomes:* ***Klinefelter syndrome*** (47, XXY), ***Turner syndrome*** (45X).

59. Ans. is 'b' i.e., Pleuropulmonary blastoma, 'c' i.e. Ovarian sex cord tumor, 'd' i.e. Medulloepithelioma & 'e' i.e. Embryonal Rhabdomyosarcoma *[Ref: **https://www.chop.edu/conditions-diseases/dicer1-syndrome**]*

***DICER1* syndrome (DICER1-related disorders)**

- ***A rare, inherited disorder that is caused by a mutation in DICER1 gene.*** The *DICER1* gene, located on chromosome 14, position q32.13, encodes the endoribonuclease Dicer protein of the ribonuclease III family. The Dicer protein aids in the production of a molecule called microRNA (miRNA).
- *DICER1* syndrome is a genetic disorder associated with an increased risk for developing benign or malignant tumors in the lungs, kidneys, ovaries, thyroid, and several other locations in the body such as cervix, testicle, brain, and eye. A goiter and polyps in the colon may also occur.
- *DICER1* syndrome is also known as *DICER1*-pleuropulmonary blastoma familial tumor predisposition syndrome.
- Not all people who have a mutation in the DICER1 gene will develop tumors.

- Individuals with DICER1 syndrome are at increased risk of developing:
  1) Lung :- ***Pleuropulmonary blastoma*** (PPB) (most common type of DICER1-associated tumor to affect infants and preschool-aged children).
  2) Kidney :- Cystic nephroma (The second most common after PPB)and less commonly, Wilms' tumor or anaplastic sarcoma of the kidney.
  3) Thyroid:- Multinodular goiter (MNG), and less commonly, differentiated thyroid cancer (follicular and papillary thyroid cancer)
  4) ***Ovarian sex cord-stromal tumors,*** most commonly Sertoli-Leydig cell tumor.
  5) ***Embryonal rhabdomyosarcoma*** of the uterine cervix (and less commonly, other locations).
- ***Less commonly,*** children with DICER1 syndrome may develop:
  1) Certain types of brain tumors, such as pineoblastoma and pituitary blastoma
  2) Nasal chondromesenchymal hamartoma
  3) ***Ciliary body medulloepithelioma***
  4) Medulloblastoma /infratentorial PNET, endometrial cancer, and seminoma
  5) Lung cysts
  6) Macrocephaly

60. **Ans. is 'a' i.e., Myxoma & 'e' i.e. Metastasis** [*Ref:* ***Robbin's 9th/e*** *p. 575* **&** ***8th/e*** *p. 583*]
- ***The most frequent cardiac tumor for all age groups is - Metastasis.***
- ***The most frequent primary cardiac tumor is - Myxoma.***
- The most frequent primary cardiac tumor in infants and children is - ***Rhabdomyoma.***

61. **Ans is 'b' i.e. Chediak Higashi syndrome** [*Ref:* ***Ananthanarayan 8th/e*** *p. 156;* ***Harrison 18th/e*** *p. 2702, 2703*]
- ***Chediak Higashi syndrome is the only disorder among the mentioned options which is due to defective innate immunity.***
- ***All other mentioned options are due to defective adaptive immunity.***
- ***Chediak Higashi syndrome is an autosomal recessive disorder caused by mutation in LYST gene, which codes for a protein known as lysosomal trafficking regulator*** leading to defective lysosomal function and structure. Thus there is impaired bactericidal activity due to **impaired phagolysosome formation.** ***Neutrophils also have defective chemotaxis. The neutrophils (polymorphs) show giant primary granules.***
- ***In X-linked agammaglobulinemia of Burton, there is defective humoral immunity with normal cell mediated immunity.***
- ***In common variable immunodeficiency there is hypogammaglobulinemia generally affecting all the antibody classes but sometimes only IgG. Patients have normal numbers of B cells.***
- ***Digeorge syndrome is an example of a T cell deficiency*** that results from **failure of development of the third and fourth pharyngeal pouches.** There is ***absence of normal thymus (thymic aplasia)*** with ***reduced T-cells. B-cells are normal.***
- ***Severe combined immunodeficiency (SCID) syndrome is characterized by gross functional impairment of both humoral and cell mediated immunity.***

Innate immunity (Native immunity)

- It is the ***first line of defence*** which is ***present since birth,*** i.e. even before infection. Thus ***antigen exposure is not required*** and there is ***no immunological memory.*** This type of immunity is ***non-specific*** (active against a wide range of infections). Important **components** of innate immunity are :-
  1) ***Cells : Phagocytic cells***(macrophages, neutrophils), dendritic cells, ***NK cells,*** eosinophils, mast cells, basophils, epithelial cells (forming epithelial barrier).
  2) ***Complement components,*** antimicrobial peptides (defensins, cathelin, probiotics), cytokines.
  3) ***Pattern recognition receptors (PRR)*** : There are two types of PRR :
     a. Soluble PRR (Mannose receptors, ***C-reactive protein***); and
     b. Surface PRR (Scavenger receptors on macrophages, ***Toll-like receptors***).

Adaptive immunity

- It is the ***second line of defence*** and develops ***after exposure to antigen.*** It has ***immunological memory.*** It is ***specific*** against particular infectious agent. **Components** of adaptive immunity are : -

Cell-mediated (cellular) immunity	Humoral immunity
• T-cells	• *B-cells* • Plasma cells • Antibodies

FORENSIC MEDICINE

62. **Ans. is 'a' i.e., Civil case & 'c' i.e. Property dispute** [*Ref:* ***Reddy 30th/e*** *p.7*]
- ***Conduct money is money paid under the compulsion of a summons to a witness (subpoena) to pay for their expenses to attend in court. It is given only in civil cases.***

- **Property dispute are related to 'Civil law'.**
- ***In the criminal cases, where state is the prosecuting party, Government Medical Officer will not get conduct money,*** but as per law (Section 312 CrPC), he or she will be paid the travel allowances (TA) by the court. This is also called **Witness bhatta.**
- ***304-A IPC deals with death caused by negligence (criminal negligence) which also includes medical negligence (Punishable up 2 years or fine or both). They are related to criminal law.***

63. **Ans. is 'b' i.e., Peripheral sensory motor neuropathy, 'd' i.e. Increased risk of renal and bladder cancer & 'e' i.e. Lower limb gangrene** [*Ref: Parikh 6th/e p. 9.8-11; Reddy 33rd/e p. 538-42*]

- ***There is classical 'rain drop pigmentation', i.e. patchy brown pigmentation of skin (not hypopigmentation) in chronic arsenic poisoning.***
- ***Chronic arsenic poisoning is characterized by diarrhea (not constipation).***
- Chronic arsenic poisoning is characterized by **sensory and motor (i.e. mixed) polyneuropathy, with painful paresthesia of hands and feet** and muscle tenderness.
- ***Chronic arsenic exposure can also cause* 'black foot disease'** a severe form of peripheral vascular disease, causing ***gangrene of lower limbs.***
- ***Arsenic is carcinogenic, can cause cancers*** of skin (squamous cell carcinoma and ***basal cell carcinoma***), lung, liver, bladder, ***kidney,*** larynx and lymphoid system (leukemia).

Chronic arsenic poisoning

- Chronic arsenic poisoning has four stages :
  a. **First stage (nutritional and gastrointestinal disturbances) :** The ***earliest sign is gradual emaciation.*** There is loss of appetite, nausea and ***intermittent vomiting*** and ***diarrhea.***
  b. **Second stage (catarrhal changes) :** It resembles common cold, i.e. conjunctivitis, running nose and eyes, coughing etc.
  c. **Third stage (skin rash) :**
     - There is classical **'rain drop pigmentation',** i.e. patchy brown pigmentation of skin. At initial stages, there is a vesicular ***eruption*** which may resemble nettle rash.
     - **Hyperkeratosis of palms and soles occur.**
     - There are **white transverse bands** crossing the nails, known as **Mee's line,** and indicate periods of arrested growth due to interference with normal metabolism. There is **alopecia** and exfoliative dermatitis.
  d. **Fourth stage (nervous disturbances) :** There is **sensory and motor (i.e. mixed) polyneuropathy, with painful paresthesia of hands and feet** and muscle tenderness.
- There may be evidence of liver (**fatty liver**) and kidney damage and bone marrow suppression (Causing **anemia** and other cytopenias). Heart may also be involved.
- Chronic arsenic exposure can also cause **'black foot disease'** a severe form of peripheral vascular disease, causing gangrene of lower limbs.
- Arsenic is carcinogenic, can cause cancers of skin (squamous cell carcinoma and ***basal cell carcinoma***), lung, liver, bladder, kidney, larynx and lymphoid system (leukemia).

64. **Ans. is 'c' i.e., Mercury** [*Ref: Parikh 6th/e p. 9.16-9.17; Reddy 30th/e p. 495-496*]

- ***Hatter's shake or Danbury tremors or glass blower's shake is seen in mercury poisoning.*** There are moderately coarse **intentional tremors** starting in fingers and hands, and legs.
- ***They are not seen in any other mentioned poisoning.***

65. **Ans is 'c' i.e. Ethylene glycol poisoning & 'd' i.e. Cyanide poisoning** [*Ref: Parikh 76th/e p. 8.17; Reddy 33rd/e p. 519*]

- ***Activated charcoal is useful in paracetamol, salicylates, kerosene poisoning.***
- ***Activated charcoal is contraindicated in poisoning with cyanides.***
- ***Activated charcoal does not adsorb glycols, therefore it is not recommended for their poisoning.***

Activated charcoal

- **Activated charcoal** is a mechanical (physical) antidote, which absorbs poisons and thus prevents their absorption. ***It is best in poisoning with amphetamines, antidepressants, atropine, digitalis, pyrethrins, antiepileptics, atropine, antihistamines, barbiturates, benzodiazepines, chloroquine, cimetidine, opium, theophylline, strychnine, phenothiazine, tetracycline, quinine and chloroquine.***
- ***Useful in paracetamol, salicylates, kerosene poisoning.***
- ***Activated charcoal is contraindicated in poisoning with phenol, corrosives, cyanides, heavy metals and hydrocarbons.***
- ***Activated charcoal does not adsorb glycols, therefore it is not recommended for their poisoning, as it will not be effective in preventing the absorption.***

66. **Ans. is 'NONE'** [*Ref: SK Singhal 4th/e p. 167-170*]

- ***The cortex in human hair is thicker as compared to the cortex in animal hairs. But it is still thicker than medulla in both***

Difference between human and animal hair

Feature	Human hair	Animal hair
Texture	Fine & thin	Coarse & thick
Color	Relatively constant along the shaft	In addition to constant color often shows naturally occurring abrupt color changes (banding) along hair shaft
Pigment (melanin)	More towards periphery/cuticle	More towards centre/medulla
Cuticular scales	Short, broad and discontinuous. Irregular wave similar along the length of the shaft. Imbricate.	Large step like projections with variety of configuration. Coronal or spinal.
Cortex	***Thick, 4-10 times as broad as medulla.***	***Thin, rarely more than twice as broad as medulla.***
Medulla	Thin, fragmented, amorphous. Continuous or discontinuous or and may be absent. Occupies less than 1/3rd of the hair shaft	Broad, continuous and always present. Occupies more than 1/3rd of the hair shaft
Medullary index	<0.3	>0.5
Root	Flattened or bulbous appearance depending upon the stage of growth.	Variety of shapes and forms. Usually distinct.

PEDIATRICS

67. **Ans. is 'e' i.e., Parvovirus B 19** [*Ref: Nelson 18th/e p. 770*]

"Parvovirus is the most commonly reported infectious cause of NIHF."

https://www.ajog.org/article/S0002-9378(14)02443-0/pdf

68. **Ans. is 'b' i.e., Hyperadrenalism, 'c' i.e. Pheochromocytoma, 'd' i.e. Hypothyroidism & 'e' i.e. Hyperthyroidism**

[*Ref: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3230094/*]

- ***Pediatric hypertension is not associated with Multiple pituitary hormone deficiency.***
- ***All other mentioned causes can cause hypertension in children.***

Endocrine causes of pediatric Hypertension

1) Low renin HT /Mineralocorticoid HT
   a. Adrenal steroid synthetic defects
   b. 11-beta hydroxylase deficiency
   c. 17-alpha hydroxylase deficiency
   d. ***Glucocorticoid remediable hyperaldosteronism (GRA)***
   e. Apparent mineralocorticoid excess (AME)
   f. Gordon syndrome
   g. Liddle syndrome
   h. Generalized glucocorticoid resistance
   i. Cushing's syndrome
2) Adrenocortical tumors – adenoma, carcinoma
   a. Adrenomedullary tumors
   b. ***Pheochromocytoma***
   c. Neuroblastoma
3) Rare causes
   a. ***Hyperthyroidism***
   b. ***Hypothyroidism***
   c. Hyperparathyroidism
   d. Hypervitaminosis D
4) Endocrine disease associated with primary HT
   a. Polycystic ovarian syndrome (PCOS)
5) Drugs
   a. Glucocorticoids
   b. Oral contraceptive Pills OCP
6) Low renin HT
   a. Low renin HT is a common variant of HT seen in children and may be due to various genetic causes which ultimately lead to excess levels and/or action of mineralocorticoids

69. **Ans. is 'e' i.e. 14 months - pincer grasp** [*Ref: O.P. Ghai 8th/e p. 49; Nelson 20th/e p. 66*]

- *Pincer grasp develops at the age of 9 months*
- *Rest all are correct pairs*

Age	Milestone
1 month	• In ventral suspension, starts lifting his head. • In prone position lifts the chinup momentarily in midline. • **Turns head to sound.** • Regards a lighted torch or the face of mother. • On pulling the child to sit, head lags behind and back is rounded **before 4 weeks of age.**
2 months	• **In ventral suspension, lifts his head in the horizontal plane (in the plane of the body).** • **Social smile develops.** • Follows object with steady movements of eye. • In **prone position** face is lifted to about 45°.
3 months	• **In ventral suspension lifts his head above horizontal plance (Neck holding).** • In prone position lifts his head and upper part of forearms. • **Head control.** • Starts cooing • Recognizes mother • **Can follow an object upto 180°** • On pulling the child to sit, head lags partially (between 2-3 months). After 3 months head control develops.
4 months	• Grasps rattle or rings when placed in hand and bring it to the mouth (mouthing). • Can bear some weight of body with straight legs in the mother's lap. • No head lag on pulling to sit.
5 months	• Gains control of head in supine position. • **Sits with support** • Reaches out to an object and holds it with both hands ***(bidextrous grasp)***. • Turns from back to side (**Rolls over**) • **Transfer the objects from one hand to another (between 5-7 months).**
6 months	• In prone position lifts his head and greater part of his chest while supporting weight on extended arms. • **Produces monosyllable sounds like da, ma.** • **Enjoys watching his own image in the mirror.** • Binocular vision develops (between 3-6 months). • **Purposeful movements in space (6-8 months)** • **Sits in tripode position**
7 months	• **Holds the objects with crude grasp from palm *(palmar grasp)*** • Pivots • **Shows strangers anxiety** • Resists if a toy is pulled from his hand. • ***Babbles***
8 months	• Rolls from back to stomach and from stomach to back. • **Crawls in the bed.** • **Sits without support (6-8 months)**
9 months	• **Stand with support** • Makes early stepping movements when feet are placed on the surface of the table. • Develops ***Pincer grasp*** with the index finger and thumb apposition. • Develops finer and more Cooridinated hand skills → Can scoop on a pellet crudely with his palm. • Waves bye-bye • Produces bisyllable sound like baba, mama.
10 months	• **Crawls and creeps, keeping his abdomen off the ground.** • **Can pull himself up from the supine to sitting position.** • Walks with support • Can understand spoken speech e.g., where is the light. • **Plays peek-a-boo game.** • Can be placed on the toilet seat.

70. **Ans is 'c' i.e. Tracheal stenosis, 'd' i.e. Anorectal anomaly & 'e' i.e. Radial limb anomaly**
[*Ref:* ***Love & Bailey 25th/e*** *p. 579;* ***Nelson 18th/e*** *p. 1543; radiopaedia.org*]

VACTERL anomaly

- It is an acronym that describes a non-random constellation of congenital anomalies. It is not a true syndrome as such and is equivalent to the VATER anomaly.
- The vast majority of VACTERL associations are thought to have a sporadic occurrence with occasional autosomal recessive forms. There is no known underlying genetic defect.
- VACTERL can be seen with some chromosomal defects such as Trisomy 18 and is more frequently seen in babies of diabetic mothers.
- The acronym VACTERL derives from:

V: vertebral anomalies	• Hemivertebrae, missing vertebrae, "butterfly" vertebrae, vertebral clefts and fusions • Absent ribs, supernumerary ribs, rib fusions and splitting • Congenital scoliosis • Caudal regression • Spina bifida
A: ***anorectal anomalies***	• Anal atresia or imperforate anus
C: cardiac anomalies; cleft lip	• Ventricular septal defects (VSDs) • Atrial septal defects (ASDs); ***hypoplastic left heart syndrome*** • Patent ductus arteriosus • Tetralogy of Fallot
TE: ***tracheo-oesophageal abnormalities***	• Atresia, stenosis and fistula
R: renal anomalies	• Renal aplasia • Renal dysplasia • Renal ectopia • Vesicoureteral reflux • Hypospadias
L: limb anomalies (radial and non radial)	• ***Radial ray anomalies (radial hypoplasia/aplasia)*** • Polydactyly • Oligodactyly • Triphalangeal tumb) • Radiaoulnarsynostosis) and lower limb malformations (such as clubfoot, and hypoplasia of the great toe and tibia).

- At least three of the above features (in each category) is considered necessary for the diagnosis of this condition
- The association does not include cranial / CNS anomalies. If there is accompanying hydrocephalus, the term VACTERL-H is used by some authors.

71. **Ans. is 'e' i.e., Anterior nares are the most common sites of infection** [*Ref:* ***API 6th/e*** *p. 127*]

- ***In more than 90% of patients, the primary foci of diphtheria infection are the tonsils or pharynx; the nose and larynx are the next most common sites.***

- ***After an average incubation period of 2-5 days,*** local signs and symptoms of inflammation develop.
- ***In its early stages, diphtheria can be mistaken for a bad sore throat. A low-grade fever, malaise*** *and swollen neck glands are the other early symptoms.*
- ***There is thick adherent pseudomembrane (grey or white) on one or both tonsils or adjacent pharynx and it grows to involve the pharyngeal walls, tonsils, uvula, and soft palate. The membrane may extend to the larynx and trachea, causing airway obstruction and eventual suffocation.***

72. **Ans. is 'b' i.e., Dry mucus membrane – moderate dehydration, 'c' i.e. Urine output <0.5ml/kg/hour – moderate dehydration, 'd' i.e. Fluid deficit of 150ml/kg – severe dehydration & 'e' i.e. Rapid and deep breathing – severe dehydration**

[*Ref:* ***O.P. Ghai 8th/e p. 73-76 & 7th/e p. 261; Nelson 17th/e p 199-201, 1200, 1856***]

- ***Reduced skin turgor is generally a sign of moderate dehydration.***
- ***Rest all mentioned options are correct (see the classification below).***

Symptoms	Degree of Dehydration		
	Mild (3% - 5% body weight lost)	Moderate (6-10% body weight lost)	Severe (9 -15% body weight lost)
Fluid deficit	30- 50 ml/kg	60 – 100 ml/kg	***90 -150 ml/kg***
Mental status	Normal, alert	Restless or fatigued, irritable	Apathetic, lethargic, unconscious
Heart rate	Normal	Normal to increased	Tachycardia or bradycardia
Quality of pulse	Normal	Normal to decreased	Weak, thready, impalpable
Breathing	Normal	Normal to increased	Tachypnea and hyperpnea; ***Deep, acidotic breathing***
Eyes	Normal	Slightly sunken	Deeply sunken
Fontanelles	Normal	Slightly sunken	Deeply sunken
Tears	Normal	Normal to decreased	Absent
Mucous membranes	Moist	***Dry***	very dry/Parched
Skin turgor	***No or slight delay***	***Delay = 2 - 5 seconds***	Delay > 5 seconds
Capillary refill	< 2 seconds	Prolonged (3 to 5 seconds)	Minimal (>5 seconds)
Extremities	Warm	Cool	Mottled, cyanotic
Blood pressure	Normal	Mild or orthostatic hypotension	Markedly decreased/ shock
Urine output	Reduced	***Oliguria***	Oligo-anuria

- ***Oliguria is defined as a urine output that is less than 1 mL/kg/h in infants, less than 0.5 mL/kg/h in children, and less than 400 ml per 24h in adults - this equals 17 /hour.***
- ***Anuria is clinically defined as less than 50mL urine output per day.***

73. **Ans is 'd' i.e. Hypoglycemia** [*Ref:* ***Nelson 18th/e p. 758; Dutta's obs 7th/e p. 480***]

- ***Hypoglycemia is not mentioned as a complication of HDN.***
- ***All other mentioned options are well known complications of HDN.***

Complications of hemolytic disease of newborn (hemolytic disease of the fetus and newborn, HDN, HDFN, or erythroblastosis fetalis)

- Erythroblastosis fetalis is caused by the transplacental passage of maternal antibody (IgG) active against paternal RBC antigens of the infant and is characterized by an increased rate of RBC destruction.
- ***Complications of HDN could*** include kernicterus, hepatosplenomegaly, ***inspissated (thickened or dried) bile syndrome*** and/or greenish staining of the teeth, hemolytic anemia and liver damage.

Complications of HDN	
During pregnancy	i) **Mild to severe anemia** ii) **Hyperbilirubinemia, and jaundice** iii) **Hydrops fetalis:-** This is a serious fetal condition characterized by abnormal accumulation of fluid in 2 or more fetal compartments, including ascites, pleural effusion, pericardial effusion and skin edema.
After birth	i) **Severe hyperbilirubinemia and jaundice.** ii) **Kernicterus** or **bilirubin encephalopathy**, is a condition caused by bilirubin toxicity to the basal ganglion and various brainstem nuclei. This is the most severe form of hyperbilirubinemia. This can cause seizures, brain damage, and deafness. It can even cause death. iii) ***Inspissated bile syndrome*** iv) ***Cerebral Palsy*** v) Neutropenia vi) ***Thrombocytopenia*** vii) Hemolytic anemia viii)***Late onset anemia of infancy*** - Can persist up to 12 weeks after birth.

74. **Ans. is 'c' i.e., Hutchinson teeth** [*Ref: Nelson 18th/e p. 1340; Myung 5th/e p. 27*]

- ***"Hutchinson's teeth" is a sign of congenital syphilis***. Hutchinson's teeth are centrally notched; widely spaced, peg shaped upper central incisors.
- ***Nerve deafness is the single most common clinical finding among infant with congenital Rubella syndrome.***
- ***PDA (Patent ductus arteriosus) is the most common CHD in congenital rubella syndrome.***
- ***Mental retardation and microcephaly are also common***.

Congenital rubella syndrome

- Maternal viremia associated with rubella infection during pregnancy may result in infection of the placenta and fetus. The most important factor in the pathogenicity of rubella virus for the fetus is gestational age at the time of infection. The earlier in pregnancy infection occurs, the greater the damage to the fetus. Maximum damage to fetus occurs when infection is acquired in first trimester of pregnancy. Infection in early 2nd trimester causes only deafness. Infection after 16 weeks causes no major abnormalities.
- **The classical triad of congenital rubella consists of cataract, deafness and CHD (congenital heart disease).**
- **Presence of IgM in blood at birth is diagnostic, as is the persistence of IgG after 6 months of age.**
- **Important clinical features of congenital rubella syndrome are :-**
  - i) Organ of corti : ***Sensorineural hearing loss (Most common clinical finding of congenital rubella)***.
  - ii) Heart : ***PDA (Most common CHD in congenital rubella)***, **PS, VSD, ASD** TOF, pulmonary artery hypoplasia.
  - iii) Eye : **Cataract,** retinopathy, microphthalmia, myopia, glaucoma.
  - iv) CNS : ***Mental retardation***, spastic diplegia, ***microcephaly***, seizures, behavioral disorders.
  - v) Other : IDDM, thyroid disorders, inguinal hernia, cryptorchidism, interstitial pneumonia.
  - vi) **Characteristic skin lesion of acquired rubella is absent.** The skin lesion in congenital rubella are:
    - a. Thrombocytopenic purpura
    - b. 'Blueberry muffin' lesion

ENT

75. **Ans. is 'a' i.e., Widely patent nasal cavity, 'b' i.e. Previous history of nasal surgery with resection of turbinates &'c' i.e. Foul smell from the nose** [*Ref: Dhingra 5th/e p. 171; Essential otolaryngology 2nd/e p. 523*]

Empty nose syndrome (ENS)

- ***It is a form of secondary atrophic rhinitis in which people who have widely clear nasal passages*** experience a range of nasal symptoms such as obstruction, nasal dryness and crusting.
- ***People who experience ENS have usually undergone a turbinectomy*** or other surgical procedures that interfere with turbinates.

Clinical features of ENS

- Symptoms are like atrophic rhinitis:-
  - i) A sensation of being unable to breathebecause they are not getting enough air.
  - ii) Patient complains of dryness & nasal obstruction inspite of ***unduly wide nasal chambers.*** **This is due to large crusts filling the nose.**
  - iii) ***There is foul smell from the nose*** making the patient a social outcast though patient himself is unaware of the smell due to **marked anosmia (merciful anosmia).**
  - iv) Epistaxis may occur when the crusts are removed.
  - v) Crusting may occur in the larynx and cause hoarseness.

vi) A person with ENS may complain of pain in their nose or face, an inability to sleep and fatigue, and feeling irritated, depressed, or anxious.

vii) Apart from nose, other sites may also be involved.

a) **Pharynx - Atrophic pharyngitis may be seen**
b) Larynx - Atrophic laryngitis may be seen which can lead to cough and hoarseness of voice.
c) Ear - Obstruction of eustachian tube can cause serous otitis media
d) PNS - Small/under developed and have thick walls. They appear opaque on X-ray.

- On physical examination generally, one or more turbinates may be reduced or absent with no sign of physical obstruction, the mucosa will be dry and pale, and there may be signs of secondary infection.

Treatment of ENS

A. **Medical treatment**
   - Initial treatment is similar to atrophic rhinitis.
   - ***Nasal irrigation and removal of crusts*** by warm normal saline or ***warm nasal alkaline douche made up of sodium bicarbonate, sodium biborate and sodium chloride in water.***
   - 25 % glucose in glycerine :
     - **Following removal of the crust the nose is painted with 25% glucose in glycerine.**
     - **Glucose-Inhibits proteolytic organisms, Glycerine is a hygroscopic agent.**
   - Other local antibiotics : Kemicetine antiozaena solution : 1 ml contains chloramphenicol (90 mg), estradiol dipropionate (0.64 mg), vit D2 (900 IU) and propylene glycol.
   - Potassium iodide : By mouth to increase the nasal secretion.
   - Human placental extract is given in the form of submucosal injections.
   - ***Other drugs :***
     - Rifampicin, Streptomycin to decreases the odour and crusts.
     - Oestradiol spray to increase the vascularity of nasal mucosa.
     - Placental extract injected submucosally.

B. **Surgical treatment**

a) **Young's operation** :- Closure of both the nostril following elevation of the nasal vestibular folds. They are opened after 6 months.
b) **Modified Young's operation** :- Partial closure of the nostril leaving behind a 3 mm hole. This remains for a period of 2 years.
c) **Narrowing of the nasal cavity by (Lautenslagers operation)**:- Submucosal injection of teflon paste. Insertion of fat, cartilage, bone or teflon strips under the mucoperiosteum of floor & lateral wall of nose. Section and medial displacement of lateral wall of nose.
d) **Lautenslagers operation:**- Surgical procedures aimed at medializing the lateral nasal wall using substances like : *Paraffin, teflon, Polythere cartilage*

76. **Ans. is 'a' i.e., Treacher Collins syndrome, 'b' i.e. Crouzon syndrome & 'd' i.e. Pierre Robin syndrome** –[*Ref: **Logan Turner 10th/e** p. 347*]

Auditory Canal Atresia or stenosis

- Auditory canal atresia is a developmental absence of the external auditory canal. It is often associated with microtia (a poorly developed outer ear). Usually unilateral, but bilateral involvement is seen in approximately one-third of patients. The inner ears and auditory nerves may be normal.
- Patients with atresia often have other developmental abnormalities of the external ear and middle ear, resulting in **conductive hearing loss.**
- Auditory canal stenosis refers to narrowing of the ear canal(s). This can also be associated with external and middle ear malformations. Patients with auditory canal stenosis are at high risk for ear canal **cholesteatoma** formation.
- Auditory canal atresia is congenital while stenosis can be congenital or acquired. Congenital atresia/stenosis may be associated with several different syndromes, including
  i) ***Treacher Collins syndrome***
  ii) ***Crouzon syndrome***
  iii) Goldenhar syndrome
  iv) ***Pierre Robin syndrome***
  v) Klippel-Feil syndrome
  vi) Branchio-Oto-Renal (BOR) syndrome
  vii) Hemifacial Microsomia.
- Acquired stenosis is unusual but is usually associated with infection, chronic inflammation, trauma, radiation therapy, or poor ear canal healing after surgery.

77. **Ans. is 'c' i.e., May present as stridor** [*Ref: **Dhingra 5th/e** p. 327; **Essentials otolaryngology** p. 521; **Current otolaryngology 2nd/e** p. 441; **Scott's Brown 7th/e Vol-2** p. 2608: **http://128.255.52.245/oto/Beta/database/contents***]

- ***It is the least common site for laryngeal cancer. Glottis is the most common site for laryngeal carcinoma.***
- ***Hoarseness is usually seen only if the recurrent laryngeal nerve becomes involved by extralaryngeal extension, this is a late feature.***
- ***Earliest presentation is stridor*** or laryngeal obstruction.

			Stage III-47%, Stage IV-32%

78. **Ans. is 'a' i.e., Mucus retention cyst, 'b' i.e. Spontaneous resolution is possible & 'd' i.e. Translucent** [*Ref: **Dhingra** 6th/e p. 224-25; **Logan turner** 10th/e p. 127*]

Ranula

- Ranula, also known as ***mucous retention cyst, is a type of*** mucous extravasation cyst (mucocele) ***found on the floor of mouth on one side of the frenulum.***
- It arises from sublingual salivary gland, due to obstruction of its duct and is almost always unilateral.
- Minor trauma to the floor of the mouth is thought to damage the delicate ducts that drain saliva from the sublingual gland into the oral cavity. ***The most usual source of the mucin spillage is the sublingual salivary gland, but ranulae may also arise from the submandibular duct or the minor salivary glands in the floor of the mouth.*** A cervical ranula occurs when the spilled mucin dissects its way through the mylohyoid muscle.

Types of Ranula

- Ranula may be of two types : -
  1) Simple : - Situated in the floor of mouth without any cervical prolongation.
  2) Deep/plunging : - Ranula with a cervical prolongation in submandibular region.

Clinical features

- Ranula is usually asymptomatic, and only complain is ***fluctuant swelling with a bluish translucent colour.***
- Swelling is painless and non-tender unless it becomes secondarly infected.
- Overlying mucosa is intact and ranula is not fixed. Surface is smooth and mucous membrane is mobile over the swelling.
- Mostly seen in young children and adolescents, both sexes are equally affected. Mostly unilateral, on one side of frenulum.
- Size varies from 1 – 5 cm in diameter
- Fluctuation test is positive
- ***Transillumination test is positive***
- Cervical lymph nodes are not enlarged.
- May or may not have prolongation in the neck.

Treatment

- If small and asymptomatic further treatment may not be needed, otherwise minor oral surgery may be indicated. Surgical excision of both the gland as well as the lesion.
- ***If size is too big, marsupialization is done.***
- Ranulas are likely to recur if the sublingual gland causing them is not removed with the lesion

Prognosis

- Recurrence of the ranula is possible despite surgical excision. ***Some ranulas have been noted to resolve spontaneously.***
- ***It is not premalignant.***

OPHTHALMOLOGY

79. **Ans. is 'b' i.e., Topical steroids & 'c' i.e. Ketamine** [*Ref: **Parson 21st/e** p. 290; **Khurana 4th/e p. 229; Katzung 11th/e** p. 437*]

*"Drug-induced glaucoma should be considered as a form of secondary glaucoma because it is brought about by specific systemic or topical medications. **Drugs that cause or exacerbate open-angle glaucoma are mostly glucocorticoids.** Several classes of drugs, including adrenergic agonists, cholinergics, anticholinergics, sulpha-based drugs, selective serotonin reuptake inhibitors, tricyclic and tetracyclic antidepressants, anticoagulants and histamine H(1) and H(2) receptor antagonists, have been reported to induce or precipitate acute angle-closure glaucoma, especially in individuals predisposed with narrow angles of the anterior chamber."*
-https://www.ncbi.nlm.nih.gov/pubmed/12908846

- ***Steroid-induced glaucoma is a form of open-angle glaucoma that usually is associated with topical steroid use,*** but it may develop with inhaled, oral, intravenous, periocular, or intravitreal steroid administration.
- ***Ketamine increases cerebral blood flow, metabolism, oxygen consuption and intracranial tension*** → Contraindicated in glaucoma & **open eye surgery.**
- ***Norflox eye drops have no effect on IOP.***
- ***Acetazolamide is used in the treatment of acut angle closure glaucoma.***
- ***Could not find anything about eating an apple affecting IOP.***

Drugs which can increase IOP (causing angle closure glaucoma)

Drugs	Examples
Ocular agents	• Topical cholinergic or anticholinesterase agents • Sympathomimetics, especially those with a-1 agonistic activity (such as Topical phenylephrine and its prodrugs dipivefrin and apraclonidine) • Topical anticholinergic/cycloplegics • Botulinum
Antibacterial agents	• Sulfa drugs • Gentamicine
CNS agents	• Antidepressants (with anticholinergic effects) • Tricyclic agents (amitryptiline and imipramine) and of the non-tricyclic drugs (mianserin hydrochloride, paroxetine, fluoxetine, maprotiline, fluvoxamine, venlafaxine, citalopram, and escitalopram) • Antipsychotics (such as perphenazine, trifluperazine, and fluphenazine) • Benzodiazepines (such as Diazepam, clotiazepam and alprazolam) • Anti-Parkinsonians like cabergoline, a dopamine D2 receptor agonist • Anticonvulsant agent (topiramate) • Ecstasy/ intranasal application of cocaine
Respiratory agents	• Epinephrine • Ipratropium bromide & Tiotropium bromide
Cardiac agents	• Disopyramide
Hematologic agents	• Anticoagulants
Antiinflammatory agents	• Promethazine, an H1-blocker agent • Mefenamic acid, a non-steroidal antiinflammatory agent
Gastrointestinal agents	• Cimetidine and ranitidine, H2-blocker agents
Anesthetics	• Succinylcholine (peak at 2-4 mins, resolves by 6 mins) • ***Ketamine*** • Nitrous Oxide

80. Ans. is 'b' i.e., Clear cornea [*Ref: **Parson 21st/e p. 290; Khurana 4th/e p. 229***]

- ***Acute angle closure glaucoma*** is a type of primary angle closure glaucoma, also called as **narrow angle glaucoma**, is a type of primary glaucoma ***where rise in IOP occurs due to blockage of the aqueous outflow by closure of a narrower angle of the anterior chamber.***
- **Acute primary angle glaucoma (acute congestive glaucoma or acute angle closure glaucoma):** - Is caused by sudden occlusion of the entire angle with a resultant acute rise of IOP to extremely high level. The attack usually does not ter¬minate of its own.
- The clinical features are :-
  - i. ***Symptoms: Sudden onset of very severe pain*** in the eye which radiates along the branches of 5th nerve and is frequently **associated with nausea, vomiting and prostrations.** ***Patient develops rapidly progressive loss of vision,*** redness **photophobia and lacrimation. Coloured halos are seen.**
  - ii. ***Signs***
    - i) Lid edema
    - ii) Conjunctiva is chemosed and congested (both conjunctival & ***ciliary vessels are congested***)
    - iii) ***Cornea is oedematous and insensitive***
    - iv) **Anterior chamber is very shallow** & with aqueous flare
    - v) Angle of anterior chamber is closed (on gonioscopy)
    - vi) Iris is discoloured
    - vii) ***Pupil is semidilated, vertically oval and fixed. It is non reactive to both light and accommodation.***
    - viii) **IOP is markedly raised (40- 70 mm Hg)**
    - ix) Optic disc is oedematous & hyperemic
    - x) Fellow eye shows shallow anterior chamber and a narrow angle.

81. Ans. is 'a' i.e., Temporal to optic disc, 'c' i.e. Appears as a dark spot on ophthalmoscopy, & 'd' i.e. Brighter than surrounding retina [*Ref: **Anatomy and physiology of eye 2nd/e p. 141***]

- ***Blind spot is optic disc (optic nerve head).*** There are no light sensitive rods or cones to respond to a light stimulus. Therefore it causes a break in the visual field called the **blind spot or physiological blind spot** which is presented as **physiological absolute scotoma** on visual field charting.
- Macula lutea is a small yellowish area ***5.5 mm in diameter,*** situated at the posterior pole of the eyeball, ***temporal to the optic disc.***
- ***The macula lutea is a deeper red (brighter) than the surrounding retina.***

- ***Note also that the blood vessels seem to stop at the periphery of this spot which suggests that this area is avascular.***
- ***Because of absence of blood vessels it appears as a dark spot on ophthalmoscopy.***

Macula lutea (yellow spot)

- Macula lutea is a small yellowish area ***5.5 mm in diameter,*** situated at the posterior pole of the eyeball, ***temporal to the optic disc. spot which suggests that this area is avascular. Because of absence of blood vessels it appears as a dark spot on ophthalmoscopy.***
- The darker point in the center of the macula is referred to as the fovea centralis.
- **Fovea centralis** is the central depressed part of the macula and has a diameter of ***1.5 mm.*** **It is situated about 2 Disc diameters (3 mm) temporal to the temporal margin of optic disc. It is the most sensitive part of retina, with lowest threshold for light and highest visual acuity because it contains only cones.**
- Following parts are related to fovea centralis :-
  a) ***Foveola*** :- Forms the central floor of the fovea (0.35 mm in diameter). Actually, it is foveola which is situated 2 Disc diameter (3 mm) temporal to temporal margin of the disc
  b) ***Umbo*** :- Is a tiny depression in the very centre of foveola.
  c) ***Foveal avascular zone (FAZ)*** :- It is located inside the fovea but outside the foveola. It is an area about 0.8 mm in diameter (including foveola and some surrounding area) which does not contain any retinal capillaries.

82. **Ans. is 'a' i.e., Chronic lipo-granulomatous inflammatory lesion, 'c' i.e. Occurs due to blockage of mebomian duct and impaction of sebaceous material & 'd' i.e. Presents as round firm swelling within eyelid** [*Ref: Yanoff & Duker Ophthalmology 2nd/e p. 708; Parson's 20th/e p. 427; Khurana 3rd/e p. 322-323*]

- ***Chalazion is chronic non-infective lipogranulomatous inflammation of meibomian gland. It results from obstruction of a meibomian gland duct. Extravasated lipid material produces a surrounding chronic lipogranulomatous inflammation.***
- ***Acute infection of Zeis (Moll) gland is known as stye (Hardoleum externum).***
- ***Patients present with round, painless, non-tender swelling of the lid. Swelling is usually firm to touch.***

CHALAZION (MEIBOMIAN CYST OR TARSAL CYST)

- ***Chalazion is chronic non-infective (non-suppurative) lipogranulomatous inflammation of sebaceous glands called meibomian glands. It results from obstruction of a meibomian gland duct. Extravasated lipid material produces a surrounding chronic lipogranulomatous inflammation.*** Obstruction is induced by low grade infection that causes proliferation of meibomian gland duct epithelium and infiltration of the wall of ducts.
- ***Patients present with round, painless, non-tender swelling of the lid. Swelling is usually firm to touch.*** Signs of acute inflammation are **not** present. ***Swelling is slightly away from lid margin.*** Occasionally, it may present on the intermarginal strip, i.e. ***marginal chalazion.***

Clinical course and complications

- Often chalazion ***slowly increases in size*** to become very large and causes blurred vision from induced astigmatism (due to compression on cornea) or eversion of the punctum. Rarely, complete resolution may occur. **Recurrence may occur in seborrhoeic dermatitis, acne rosacea and malignant change.** Secondary malignancy caused by chalazion is **Meibomian gland adenocarcinoma (sebaceous cell carcinoma).** ***Secondary infection*** may cause hordeolum internum.

Treatment

- Treatment of chalazion includes :-
  i) *Conservative* :- For small, soft and recent chalazion hot fomentation, **topical antibiotics eye drops** and **oral antiinflammatory drugs can be tried.**
  ii) **Intralesional injection of steroids.**
  iii) **Drainage by transconjunctival incision and curettage**
  iv) *Diathermy* for marginal chalazion.
  v) *Systemic tetracycline* is required in recurrent chalazion especially is associated with acne rosacea or seborrheic dermatitis.

83. **Ans. is 'a' i.e., Eye lids & i.e. Bony orbit** [*Ref: Clinical ophthalmology 5th/e p. 1715*]

- ***Eye lids & bony orbit are preserved in enucleation.***
- ***All other mentioned structures are removed in enucleation. An enucleation includes removal of eyeball. It detaches the extraocular muscles and removes the entire eyeball i.e. both the intraocular contents and the scleral shell.***

Orbital surgeries

- There are three main surgical techniques by which all or part of the orbital contents are removed :-
  1) ***Evisceration*** :- Removal of the eye with its inner two coats, i.e. intraocular contents while preserving the remaining scleral shell, extraocular muscle attachments, and surrounding orbital.
  2) ***Enucleation*** :- Removal of eyeball with a portion of optic nerve from the orbit while preserving all other orbital structures. ***An enucleation detaches the extraocular muscles and removes the entire eyeball i.e. both the intraocular contents and the scleral shell.***
  3) ***Exenteration*** :- It is the most radical of the three procedures and involves removal of the eye, adnexa and part of the bony orbit.

84. Ans. is 'b' i.e., Most common cause is strabismus [*Ref: Color atalas of strabismus surgery/e p. 43; Khurana 4th/e p. 313*]

Amblyopia

- Amblyopia refers to **a reversible decrease of vision,** either unilateral or bilateral, ***for which no cause can be found*** by physical ***examination of the eye,*** i.e., there is absence of any organic disease of ocular media, retina and visual pathway.
- Amblyopia represents diminished vision occurring during the critical period of visual development, i.e., first 6-7 years of life, secondary to abnormal visual stimulation. ***The diminished vision is beyond the level expected from the ocular pathology present.***
- Amblyopia occurs when one eye sees better than the other eye and the brain ignores the blurred images from the other eye. Connections between the brain and the stronger eye get stronger and the connections between the brain and the weaker eye decline.
- Amblyopia is a relatively common disorder and a major cause of visual impairment in children. It represents an insult to the visual system during the critical period of development whereby an **ocular** pathology (ex. strabismus, anisometropia, high refractive error, or deprivation) interferes with normal **cortical** visual development. Approximately 3-5% of children are affected by amblyopia.
- A positive family history of strabismus, amblyopia, or media opacities would increase the risk of amblyopia in the child. Children who have conditions that increase the risk of strabismus, anisometropia, or media opacities (ex. Down syndrome) would also be at increased risk for the development of amblyopia. Children born prematurely or who have developmental delays are also at greater risk.
- Depending upon etiology there are three kinds of amblyopia:
  1) Refractive amblyopia – This form of amblyopia may occur when there is a focusing difference between the two eyes. This may be caused by conditions such as astigmatism, hyperopia, or myopia.
  2) Strabismic amblyopia – This form of amblyopia may occur when the eyes are not aligned properly and one eye crosses outward or inward. Strabismus and amblyopia affect between 2 and 4 percent of the population.
  3) Deprivation amblyopia –Anything that prevents the light from getting into the eye, such as scars on the corneal surface or cataract, will cause amblyopia ***(stimulus deprivation amblyopia or amblyopia ex anopsia).***
- ***It is usually unilateral but it can be bilateral,*** Bilateral cases are caused by bilateral image blur (anterior visual pathway). Examples of etiologies for bilateral amblyopia include bilateral media opacities (ex. corneal opacities, infantile or childhood cataracts, or vitreous hemorrhages), or ametropia (bilateral high astigmatism or high hypermetropia). Unilateral causes of amblyopia also include the same types of media opacities seen in bilateral cases. ***However, the most common causes of unilateral amblyopia are strabismus and anisometropia, or a combination of the two.***
- ***Patients with unilateral amblyopia are often asymptomatic.*** Occasionally, patients will complain that one eye is blurry, or younger children may report discomfort in the affected eye. Torticollis occurs infrequently. Poor depth perception or clumsiness may be noted.

Treatment

- Treatment of amblyopia should be started as early as possible, younger the child, better the prognosis. **Amblyopia therapy works best when initiated in young children under 3 years of age.** ***Occlusion therapy is the mainstay of treatment in which the normal (sound) eye is occluded*** to forcing fixation to the amblyopic eye. Before starting occulusion therapy -
  i) **Referactive error (if any) of amblyopic eye should be fully correct e.g. by prescribing spectacles,** contact lenses, bifocal spectacles.
  ii) Any opacity in media (e.g. cataract, corneal scar) should be removed.
- Other methods used are :-
  i) ***Atropine penalization:***- In which vision in the normal eye is blurred with atropine and this will force the fixation by amblyopic eye.
  ii) ***Pleoptic exercise:***- To re-establish foveal fixation especially in older children.

85. Ans. is 'a' i.e., Ipsilateral optic atrophy & 'c' i.e. Contralateral papillidema [*Ref: Khurana 4th/e p. 298*]

- Foster-Kennedy Syndrome is characterized by the compression of the ipsilateral optic nerve by an intracranial mass, often an anterior cranial fossa meningioma (e.g., frontal lobe, olfactory groove, sphenoid wing).
- It consists of:-
  i) ***Progressive loss of vision in ipsilateral eye secondary to compressive optic atrophy*** (optic atrophy is a result of axon compression or ischemia secondary to vascular compression).
  ii) ***Papilledema in contralateral eye*** (e.g. enlarged blind spot) secondary to elevated intracranial pressure
  iii) ***Central scotoma in the ipsilateral eye***
  iv) ***Anosmia ipsilaterally***
- A relative afferent pupillary defect (RAPD) is typically present in the eye with optic atrophy

86. Ans. is 'd' i.e., More common unilateral than bilateral & 'e' i.e. Always requires biopsy for confirmation [*Ref: Khurana 4th/e p. 280*]

RETINOBLASTOMA

- Retinoblastoma is the most common intraocular tumor in children. The tumor is confined to ***infancy and very young children (1-2 years).*** There is ***no sex predisposition.*** **Retinoblastoma is unilateral in 70-75% of cases and bilateral in 25-30%** of cases. ***Inherited forms of retinoblastomas are more likely to be bilateral.*** Sporadic retinoblastoma tends to be unilateral.

Etiology

- Mutations in the RB1 gene are responsible for most cases of retinoblastoma. Retinoblastoma gene (RB gene) is located on 14 band on the ***long arm of chromosome 13 (13q14).*** RB1 gene is a tumor suppressor gene. Retinoblastoma develops when ***both the normal alleles of the RB genes are inactivated or altered.*** It is typical example of **Knudson's two hit hypothesis.** ***In Hereditary retinoblastoma first genetic change (first hit) in RB1 gene is inherited from an affected parent (germ line or constitutional mutation), where as second mutation (second hit) occurs in postnatal life (somatic mutation) and both alleles are lost.*** In ***non-hereditary*** retinoblastoma, both mutations (first and second hits) occur postnataly (somatic mutation).
- In hereditary retinoblastoma, mutations in the RB1 gene appear to be inherited in an autosomal dominant pattern. ***This type of retinoblastoma is often found when the child is slightly older compared with those who have the heritable form.***
- *Overall, only six percent of newly diagnosed retinoblastoma patients have a positive family history for the disease. Of the patients with hereditary disease, 25 percent have a positive family history.*
- The **diagnosis** is made by direct and indirect ophthalmoscopy that shows whitish mass that fills the vitreous chamber. **Plain x-ray, ultrasonograph and CT scan show calcification within the tumor.** MRI is the investigation of choice to study optic nerve and sellar or suprasellar regions of the brain.
- ***A biopsy to confirm the diagnosis is almost never done because it might harm the eye or risk spreading the cancer outside of the eye.***

Non- hereditary retinoblastoma	Hereditary retinoblastoma
• **Accounts for 60% of all retinoblastoma.** • ***All sporadic cases are unilateral*** and ***unifocal*** and accounts for 85% of unilateral cases • ***Diagnosed between 2–5 years of age.*** • Patient is not predisposed for non- ocular cancer • **1/3 of sporadic cases are heritable (can transmit their gene)**	• **Accounts for 40% of all retinoblastoma** • ***All bilateral cases*** and 15% of unilateral cases are hereditary. Most hereditary cases are ***multifocal.*** • ***Typically diagnosed before 12 months of age.*** • Non- ocular cancer like **osteosarcoma** may occur. • Tumor is transmissible more commonly • Some hereditary cases have **trilateral retinoblastoma** i.e., Bilateral ocular retinoblastoma along with tumor at other intracranial site, e.g. pineal (pinealoblastoma)

ORTHOPEDICS

87. **Ans. is 'b' i.e., Radial nerve injury** [*Ref: **Maheshwari 4th/e** p. 24*]

Name	Use
• Cramer-wire splint • Thomas splint • Bohler-Braun splint • Aluminium splint • Dennis Brown splint • ***Cock-up splint*** • Knuckle-bender splint • Toe-raising splint • Volkmann's splint • Four-post collar • Aeroplane splint • SOMI brace • ASHE (Anterior spinal hyperextension) • Taylor's brace • Milwaukee brace • Boston brace • Lumbar corset	• Emergency immobilisation • Fracture femur-anywhere • Fracture femur-anywhere • Immobilization of fingers • CTEV • ***Radial nerve palsy*** • Ulnar nerve palsy • Foot drop • Volkmann's ischaemic contracture (VIC) • Neck immbilisation • Brachial plexus injury • Cervical spine injury • Dorso-lumbar spinal injury • Dorso-lumbar immobilisation • Scoliosis • Scoliosis • Backache

88. **Ans. is 'a' i.e., Osteoblastoma** [*Ref: **Musculoskeletal imaging the requisites by David May** p. 58*]

- ***Osteoblastoma is primary benign bone forming tumor of bone.***
- ***Osteochondroma is a benign, cartilaginous neoplasm*** that is found in any bone that undergoes endochondral bone formation in its development. It is ***not a true neoplasm***, rather a developmental lesion.
- ***Osteosarcoma is primary malignant bone forming tumor of bone.***
- ***Giant-cell tumours is an osteolytic tumor arising from the epiphysis.***
- ***Adamantinoma occurs as a rare, slow growing osteolytic mass in the second and third decades***

Classification of bone tumours. Modified after Revised WHO classification Schajowicz (1994)

Predominant tissue	Benign	Malignant
Bone forming	Osteoma Osteoid osteoma *Osteoblastoma*	*Osteosarcoma* : - • Central • Peripheral • Parosteal
Cartilage forming	Chondroma *Osteochondroma* Chondroblastoma ? Chondromyxoid fibroma	Chondrosarcoma : - • Central • Peripheral • Juxtacortical • Clear-cell • Mesenchymal
Fibrous tissue	Fibroma Fibromatosis	Fibrosarcoma
Mixed	? Chondromyxoid fibroma	
Giant-cell tumours	*Benign osteoclastoma*	*Malignant osteoclastoma*
Marrow tumours		Ewing's tumour Plasma cell tumor Myeloma Lymphoma
Vascular tissue	Haemangioma Haemangiopericytoma Haemangioendothelioma	Angiosarcoma Malignant haemangiopericytomas pericytomas
Other connective tissue	Fibroma Fibrous histiocytoma Lipoma	Fibrosarcoma Malignant fibrous histiocytoma Liposarcoma
Other tumors	Neurofibroma Neurilemmoma	*Adamantinoma* Chordoma

89. **Ans. is 'a' i.e., Hamstring** [*Ref: Maheshwari 4th/e p. 146; Adam's Outline of fractures 12th/e p. 263*]

- ***Hamstrings play no role in providing stabilization to the posterolateral corner of knee (PLC).***
- ***The three major static stabilizers of the PLC are the fibular (lateral) collateral ligament (FCL), the popliteus tendon*** (PLT) and the popliteofibular ligament (PFL).
- ***Arcuate ligament and biceps femoris are the secondary dynamic stabilizers of PLC.***

Posterolateral corner of the knee (PLC)

- PLC provides both static and dynamic stabilization to the knee joint.

A. Primary Stabilizers

- The three major static structures based on biomechanical studies are:
  i. ***Lateral (fibular) collateral ligament (LCL or FCL)***
  ii. ***Popliteus tendon (PLT)***
  iii. Popliteofibular ligament (PFL) and the posterolateral capsule
- Together these structures prevent varus collapse at the knee and external rotation of the tibia on the femur.

B. Secondary Stabilizers

- Secondary structures help stabilize the knee in a static and dynamic manner. From deep to superficial these structures are
  i. Lateral capsular ligament, with its components consisting of the meniscofemoral and meniscotibial ligaments
  ii. The coronary ligament
  iii. ***The arcuate ligament***
  iv. Lateral gastrocnemius tendon.
  v. The fabellofibular ligament
  vi. ***The short and long heads of the biceps femoris***
  vii. The iliotibial band (ITB)
  viii. meniscopopliteal fascicles
- Injuries to the posterolateral corner of the knee are most commonly associated with athletic traumas, motor vehicle accidents and falls. PLC injuries account for 16% of all knee ligament injuries and often occur in combination with other cruciate ligament injuries.

90. **Ans. is 'All' i.e., a, b, c, d & e** [*Ref: Wofgang 5th/e p. 19, 133; Grainger 5th/e p. 1104*]

- ***All the mentioned conditions are associated with costochondral junction swelling.***

Differential diagnosis of enlargement of costochondral junction (Flaring of anterior margin of ribs)

- ***Rickets (Rachitic rosary)***
- Hypophosphatasia
- ***Scurvy***
- Metaphyseal dysplasia
- ***Achondroplasia/ Chondrodystrophy***
- ***Acromegaly***

91. **Ans. is 'a' i.e., Fracture of palmar base of first metacarpal bone with dislocation of carpometacarpal joint**

BENETT'S FRACTURE [*Ref: Maheshwari 4th/e p. 113*]

- Benett's fracture is an intra-articular *fracture dislocation of the **palmar base of first metacarpal bone** of the thumb with either **subluxation or dislocation of first carpometacarpal joint, i.e. trapezometacarpal joint. The common mechanism of injury is an axial blow directed against the partially flexed metacarpal, in most cases during "Fist fights".*** Patient complains of pain, swelling and tenderness over the base of the thumb. Movements of thumb are restricted.

Displacing force in Bennett's fractures

- Following are the deforming forces in Bennett's fracture :-
  i) At the distal fragment, it is the ***adductor pollicis.***
  ii) At the proximal fragment, it is the ***abductor pollicis longus.***
- ***Base of the thumb metacarpal is pulled dorsally and medially by the abductor pollicis longus, while the distal attachment of adductor pollicis further levers the base into abduction.***

92. **Ans. is 'a' i.e., Spine deformity** [*Ref: Maheshwari 4th/e p. 273*]

- ***The Milwaukee brace is an active corrective spinal orthosis.*** It consists of a neck ring with a throat mould and two occipital pads to avoid a high pressure in the neck. Other elements are a plastic pelvic girdle, aluminium uprights, leather L-shaped thoracic pads and metal bars in the front and in the back.
- ***A Milwaukee brace is used in the treatment of postural disorders like idiopathic scoliosis*** or Scheuerman disease.

93. **Ans. is 'a' i.e., Head of femur** [*Ref: Maheshwari 4th/e p. 49*]

- Blood supply of some bones is such that the vascularity of a part of it is seriously jeopardized following fracture, resulting in necrosis of that part. Some of the common sites where avascular necrosis occurs are :-

Site	Cause
Head of the femur	**Fracture neck of the femur.** Posterior dislocation of the hip
Proximal pole of scaphoid	Fracture through the waist of the scaphoid
Body of the talus	Fracture through neck of the talus

94. **Ans. is 'a' i.e., Radiography of hand and wrist & 'c' i.e. CT of the medial end of the clavicle**

[*Ref: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3955574/*]

"The most commonly used and extensively developed methods use Hand & Wrist radiographs in children under 18 years and computed tomography (CT) images of medial end of clavicle in individuals aged 18-22 years."
-https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3955574/

"The ***radiograph of the hand*** *in particular reveals many ossification centers, with progression over time, and it* ***is the standard for estimating bone ages in children older than 3 years of age. Children and infants younger than 3 years of age have changes in the knee that can be more easily appreciated and compared with changes in the hand; therefore, radiographs of the knee or even the hemiskeleton are often used for young children."***
- https://pediatrics.aappublications.org/content/pediatrics/early/2017/11/13/peds.2017-1486.full.pdf

"Radiography of the hand & wrist is the commonest modality used to calculate bone age. By the age of 18 years, bone age cannot be computed from hand & wrist radiographs, therefore the medial end of the clavicle is used for bone age calculation in individuals aged 18—22 years. CT visualization of the clavicle has been extensively studied *but requires a high dose of radiation. MRI based methods are being developed but require more research."*
-https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3955574/

"Traditionally, the extent of growth and development of hand bones has been visualized by plain wrist radiographs, however ***newer methods such as ultrasound of hand bones are being tried but have yet not been validated"***
-https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3955574/

SURGERY

95. **Ans. is 'a' i.e., Bilobed flap, 'c' i.e. Rotation flap** [*Ref: Bailey & Love 26th/e p. 408; Sabiston 19th/e p. 1916; http://ww jotscroll.com/forums/11/posts/173/flap-meaning-types-of-flaps-classification-surgery-operation-procedure.html*]

- ***Rotation flaps include basic rotation flaps and bilobed flaps. Rotation flaps are used for convex surfaces such as the sca buttocks and deltoid area of the shoulders.***
- ***Advancement flaps subtypes include V-Y advancement flaps and bipedicle advancement flaps***. Advancement flaps are m used in small defects whereby the skin is in excess and possesses an inherently good blood supply, such as in an aging face. V ***useful for flexor surfaces***; may need triangles excised at the base to make it work (commonly called ***Burrows triangles***).

96. **Ans is 'b' i.e. Pain which is usually slowly progressive, 'c' i.e. Affected vein can be seen as like a cord and is palpa & 'd' i.e. Tenderness along calf on applying pressure** [*Ref: CSDT 11th/e p. 313; Love & Bailey 26th/e p. 9 Sabiston 19th/e p. 295; Schwartz 9th/e p. 9*

Deep vein thrombosis (DVT)

- It is a serious but preventable medical condition in which blood clots occur, usually in veins in the lower leg, thigh, pelvis, a sometimes arms.

Symptoms

1) ***Pain, swelling and tenderness in one leg*** most commonly in the calf followed by thigh (***symptoms in both legs is uncommo*** There is a feeling of constant cramping in the calf. ***Pain initially occurs only on walking or moving. In advanced stages disease, pain can occur on rest also***.
2) In some, there may be no symptoms of DVT, but it suddenly presents with the features of pulmonary embolism such as ch pain, breathlessness & haemoptysis.
3) ***Warm & red skin around the area of the clot***
4) Skin turning to bluish colour (phlegmasia cerulia dolens i.e. painful blue leg) or pale (phlegmasia alba dolens i.e. painful wh leg) over the affected area.
5) ***Palpable, firm, swollen or thickened blood vessels appearing like a "cord"***.
6) Lipodermatosclerosis – due to chronic venous insufficiency, there is fibrosis and thickening of dermal and subdermal tissa leading to woody hard skin. There is pigmentation, inflammation and induration of skin.

Signs

Homan sign	Calf tenderness on passive forceful dorsiflexion of the foot with extended knee
Mose sign	***Calf tenderness on direct pressure on the calf***
Pratt sign	Calf tenderness on squeezing the calf from sides
Neuhof sign	Thickening and deep tenderness elicited while palpating deep in calf muscles
Linton's test	After applying a tourniquet at saphenofemoral junction patient is made to walk and without removing the tourniquet, limb is elevated – persisting superficial veins are observed.

97. **Ans is 'd' i.e. Monocryl & 'e' i.e.Polyglactin** [*Ref: Love & Bailey 26th/e p. 37; Sabiston 19th/e p. 233; S. Das 4th/e p. 18*

Absorbable sutures	
Natural	**Synthetic**
• Catgut	• ***Polyglycaprone (monocryl)*** • ***Polyglactin (Vicryl)*** • Polydioxanone (PDS) • Polyglyconate (Maxon) • Polyglycolic acid (Dexon)

Non -absorbable sutures	
Natural	Synthetic
• Silk • Cotton • Linen	• Nylon (*ethilon*/nurolon) • Polyester (*ethibond*/mersilene) • Polypropylene (*prolene*) • Polyhexafluoropropylene ▪ VDF (pronova) • Polybutester • Surgical steel • Tantalum • Silver

98. **Ans is 'a' i.e. Caused by mechanical blockage by impacted stones, 'd' i.e. Associated with enterobilliary fistula in most cases & 'e' i.e. Treatment requires surgery in all cases** [*Ref: Love & Bailey 26th/e p. 1182-84; Sabiston 19th/e p. 1500; Schwartz 9th/e p. 1320*]

- ***Gallstone ileus*** is an infrequent complication of cholelithiasis and ***is defined as a mechanical small bowel obstruction (not a functional block caused by irritation) caused by an impaction of a gallstone within the lumen of the small intestine.***
- ***The usual means of gallstone entry into the bowel is through a biliary enteric fistula,*** which complicates 2 to 3 percent of all cases of cholelithiasis with associated episodes of cholecystitis. Sixty percent are cholecystoduodenal fistulas, but cholecystocolonic and cholecystogastric fistulas can also result in gallstone ileus.
- ***Since gallstone ileus constitutes a form of mechanical small bowel obstruction, it can be a surgical emergency and requires open or laparoscopic surgery to remove an impacted stone.***
- ***Mirizzi's syndrome is a rare complication in which a gallstone becomes impacted in the cystic duct or neck of the gallbladder causing compression of the common bile duct (CBD) or common hepatic duct, resulting in obstruction and jaundice.***

99. **Ans is 'a' i.e. Radical prostatectomy, 'b' i.e. Radical radiotherapy, 'c' i.e. Medical castration & 'd' i.e. Orchiectomy** [*Ref: Love & Bailey 26th/e p. 1355-57; https://www2.tri-kobe.org/nccn/guideline/urological/english/prostate.pdf*]

- Chemotherapy is used as a palliative treatment in advanced and metastatic prostate cancer.

"For people with intermediate-risk localised prostate cancer, offer radical prostatectomy or radical radiotherapy *and consider active surveillance for people who choose not to have immediate radical treatment."*
-https://www.nice.org.uk/guidance/ng131/documents/draft-guideline

"Radical prostatectomy, external-beam radiation therapy (EBRT), and interstitial implantation of radioisotopes are each employed in the treatment of stage II prostate cancer with apparently similar therapeutic effects. *Radical prostatectomy and radiation therapy yield apparently similar survival rates with as many as 10 years of follow-up."*
-https://www.cancer.gov/types/prostate/hp/prostate-treatment-pdq#_69

"In patients with intermediate-risk localized prostate cancer, appropriate treatment options include *active surveillance,* ***interstitial prostate brachytherapy, external beam radiation therapy, and radical prostatectomy.*** *Cryotherapy should also be discussed."*
-https://emedicine.medscape.com/article/1967731-treatment#d8

- ***Androgen-deprivation therapy /Hormonal manipulations by orchiectomy or LH-RH agonists (medical castration) may be used as a palliative treatment of Unfavorable intermediate risk prostate carcinoma.***

"Androgen deprivation therapy (ADT) *has been the mainstay of palliative treatment in advanced and metastatic prostate cancer for many years.* ***It is also increasingly being used in patients with localized disease. Bilateral orchiectomy (castration) or subcutaneous application of LHRH agonists are the predominant forms of ADT."***
-https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2920692/

"Treatment with an LHRH agonist is called medical castration or chemical castration *because it uses drugs to accomplish the same thing as surgical castration (orchiechtomy)."*
"Men with early-stage prostate cancer that has an intermediate or high risk of recurrence often receive hormone therapy before, during, and/or after radiation therapy, or they may receive hormone therapy after prostatectomy"
-https://www.cancer.gov/types/prostate/prostate-hormone-therapy-fact-sheet

Risk grade	Treatment options	
	Initial therapy	Adjuvant therapy
Very low risk	• Active surveillance/ watchful waiting • Radical prostatectomy • Radical radiotherapy (EBRT/Brachytherapy)	• EBRT or observation • ADT ± EBRT
Low risk	• Active surveillance/ watchful waiting • Radical prostatectomy • Radical radiotherapy (EBRT/Brachytherapy)	• EBRT or observation • ADT ± EBRT

Favorable Intermediate risk	• Active surveillance/ watchful waiting • ***Radical prostatectomy*** • ***Radical radiotherapy*** (EBRT/Brachytherapy)	• EBRT or observation • ADT ± EBRT
Unfavorable intermediate risk	• ***Radical prostatectomy*** • ***EBRT + ADT (4-6 months)*** • ***EBRT+ Brachytherapy + ADT*** (4-6 months)	• EBRT or observation • ADT ± EBRT
High risk	• EBRT + ADT (2-3 years) • EBRT + HT • EBRT+ Brachytherapy + ADT (2-3 years) • Radical prostatectomy + PLND	• EBRT or observation • ADT ± EBRT
Very high risk	• EBRT + ADT (2-3 years) • EBRT+ Brachytherapy + ADT (2-3 years) • Radical prostatectomy + PLND	• EBRT or observation • ADT ± EBRT

- *ADT, androgen-deprivation therapy; EBRT, external-beam radiotherapy;*

100. Ans is 'b' i.e. Maximum blood and tissue concentration of antibiotic should reach when handling the organ of surgical interest, 'c' i.e. Should be repeated if surgery is prolonged & 'e' i.e. Should be given according to sensitivity of the spectrum of organisms expected to be encountered during the surgery

[*Ref:* ***Sabiston 19th/e p. 226; https://www.infectiousdiseaseadvisor.com***]

- Timing of antibiotic administration is critical to efficacy. ***The drug should be administered ideally within 30 minutes and certainly within two hours of the time of incision.*** The first dose should always be given before the skin incision is performed.
- ***The goal of administering preoperative systemic prophylactic antibiotics is to have the concentration in the serum and the tissues at its highest at the start and during surgery.***
- ***For longer procedures, readministration of the drug is indicated at intervals of one or two times the half-life of the drug (using the same dose).***
- ***Unless there is a known infection, prophylactic antibiotics should be discontinued within 24 hours.*** There remains controversy regarding the duration of therapy to 48 hours postoperatively following cardiothoracic surgery
- ***The prophylactic regimen in patients undergoing surgery should include an agent effective against the most likely infecting organisms,*** but need not eradicate every potential pathogen. The choice of antibiotic should be based on the local antibiogram. The relative relative costs of available agents should also be considered.

Antimicrobial Prophylaxis (AMP)

- Antimicrobial prophylaxis (AMP) refers to a short course of antimicrobial therapy administered prior to surgery to reduce microbial counts to a level that will not overwhelm host immune response. **Antimicrobial prophylaxis should be administered only for Class I (clean wound) and II wounds (clean/contaminated wound). Patients with Class III (contaminated wound) or IV wounds (Dirty wound) are presumed to be taking antimicrobial therapy already.** They are given by intra-venous route. Optimal AMP therapy requires:
  A. **Use of the correct agent for the type of operation,** based on clinical evidence:-
     a. ***An appropriate prophylactic antibiotic should (1) be effective against microorganisms anticipated to cause infection; (2) achieve adequate local tissue levels;*** (3) cause minimal side effects; (4) be relatively inexpensive, and (5) not be likely to select virulent organisms.
     b. The microbial context of the wound and the hospital environment may influence the choice of antibiotic, *but coverage* ***should primarily target those organisms known to cause postoperative infection.*** In general, a first-generation cephalosporin fulfills these criteria and is regarded as sufficient prophylaxis for the majority of procedures. Cefazolin provides adequate coverage for most types of procedures.
  B. **Appropriate timing of administration:**
     a. Timing of administration is critical. ***The goal of administering preoperative systemic prophylactic antibiotics is to have the concentration in the tissues at its highest at the start and during surgery. The drug should be administered within 30 minutes and certainly within two hours of the time of incision*** (i.e., enough time to reach bactericidal serum and tissue concentrations); The first dose should always be given before the skin incision is performed.
     b. ***For longer procedures, readministration of the drug is indicated at intervals of one or two times the half-life of the drug (using the same dose).*** This ensures adequate tissue levels throughout the duration of the procedure.
     c. ***Maintained at therapeutic levels in both serum and tissues*** throughout surgery
     d. ***Lasting no longer than 24 hours after the end of surgery to reduce risk of developing resistance.***

101. Ans is 'b' i.e. Soft tissue crepitations, 'd' i.e. Discharge shows organism without neutrophils & 'e' i.e. Surgical debridement and antibiotic therapy for treatment [*Ref:* ***Harrison 18th/e p. 1206***]

Gas gangrene (clostridial myonecrosis)

- It is caused most commonly by **Cl perfringens,** especially type A. C. perfringens cause 80% to 90%, of gas gangrene cases, but other species can cause infection. In order of prevalence, they are *Clostridium novyi* (40%), *C. septicum* (20%), *C. histolyticum*

(10%), *Clostridium bifermentans* (10%), *Clostridium fallax* (5%), *and C. sordellii.*

- Incubation period is very short **10-48 hours (1-2 days) in Cl perfringens, 2-3 days in Cl septicum** and **5-6 days in Cl novyi.**
- ***Gas gangrene is caused by Cl perfringens strains which produce heat-labile spores (in contrast to food poisoning which is caused by strains which produce heat resistant spores).***
- **Gas gangrene is characterized by rapid and extensive necrosis of muscle accompanied by gas formation and systemic toxicity.**

Presentation

- ***A sudden onset of pain is usually the first symptom of gas gangrene.*** The pain gradually worsens. Swelling that worsens around a skin injury may develop.
- A low to moderate grade fever and apathetic mental status may develop. Tachycardia disproportionate to body temperature is common.
- ***Local swelling and a serosanguineous exudate appear soon after the onset of pain.*** The skin characteristically turns to a bronze color, then progresses to a blue-black color with skin blebs and hemorrhagic bullae.
- The wound may be nonodorous or may have a sweet mousy odor. ***Crepitus follows gas production caused by gas escaping the necrotic tissue;*** at times, crepitus may not be detected with palpation owing to brawny edema. Pain and tenderness to palpation disproportionate to wound appearance are common findings.
- Progression to toxemia and shock is often very rapid. Late signs of gas gangrene include hypotension, renal failure, and a paradoxical heightening of mental acuity.

Laboratory Studies

- Rapidly developing hemolytic anemia with an increased lactate dehydrogenase (LDH) level is common.
- Despite serious infection, white blood cell counts may not show leukocytosis except in patients with toxic shock syndrome due to *C sordellii* or *C septicum*, the CBC count may show extreme leukocytosis.
- ***A Gram stain of the exudate or infected tissues reveals "box-car," large gram-positive bacilli without neutrophils.***
- Metabolic abnormalities (metabolic acidosis and renal failure) frequently associated.

Treatment

- ***The combination of aggressive surgical debridement and effective antibiotic therapy is the determining factor for successful treatment of gas gangrene***
- ***Surgical debridment is the most important prophylactic and therapeutic measure in gas gangrene.***
- Drug of choice is ***penicillin which is given along with clindamycin.***
- Other measures for treatment are anti-gas gangrene serum (AGGS) and hyperbaric O2.
- A combination of clindamycin and metronidazole is a good choice for patients allergic to penicillin.

102. **Ans is 'c' i.e. T4 & 'd' i.e. N1** [*Ref:* ***Love & Bailey 26th/e*** *p. 1163-65;* ***Sabiston 19th/e*** *p. 1350-53;* ***Schwartz 9th/e*** *p. 1041-50*]

- T2 - Tumor invades muscularis propria
- T3 - Tumor invades through the muscularis propria into the pericolorectal tissues
- T4 - Tumor invades the visceral peritoneum (serosa) or invades or adheres to adjacent organ or structure
- N1 - Metastasis in 1-3 regional lymph nodes
- N2- Metastasis in 4 or more lymph nodes

The 7th American Joint Committee on Cancer (AJCC) TNM Classification for Colon Cancer

Primary tumor (T)	
TX	Primary tumor cannot be assessed
T0	No evidence of primary tumor
Tis	Carcinoma in situ: intraepithelial or intramucosal carcinoma (involvement of lamina propria with no extension through the muscularis mucosa)
T1	Tumor invades submucosa (through the muscularis mucosa but not into the muscularis propria)
T2	Tumor invades muscularis propria
T3	Tumor invades through the muscularis propria into the pericolorectal tissues
T4	***Tumor invades the visceral peritoneum (serosa) or invades or adheres to adjacent organ or structure***
T4a	Tumor invades through the visceral peritoneum (including gross perforation of the bowel through tumor and continuous invasion of tumor through areas of inflammation to the surface of the visceral peritoneum)
T4b	Tumor directly invades or is adherent to other organs or structures

Definition of Regional lymph nodes (N)	
NX	Regional lymph nodes cannot be assessed
N0	No regional lymph node metastasis
N1	***Metastasis in 1-3 regional lymph nodes*** (tumor in lymph nodes measuring ≥0.2 mm) or any number of tumor deposits are present and all identifiable nodes are negative
N1a	Metastasis in 1 regional lymph node
N1b	Metastasis in 2-3 regional lymph nodes
N1c	***Tumor deposit(s) in the subserosa,*** mesentery, or nonperitonealized, pericolic, or perirectal/mesorectal tissues without regional nodal metastasis
N2	***Metastasis in 4 or more lymph nodes***
N2a	Metastasis in 4-6 regional lymph nodes
N2b	Metastasis in 7 or more regional lymph nodes

103. Ans is 'c' i.e. Hematochezia, 'd' i.e. Altered bowel habits & 'e' i.e. Obstruction [*Ref: **Love & Bailey 26th/e** p. 1163-67; **Sabiston 19th/e** p. 1350-53; **Schwartz 9th/e** p. 1041-50*]

Right colon carcinoma (cecum, ascending colon)	Left colon carcinoma (transverse colon, descending colon, descending colon)
• Presents as fungating mass or a cauliflower like growth • Food is relatively liquid in right colon therefore cancers can become large without any obstructive symptoms or any noticeable alteration in bowel habits. • Due to ulceration it results in chronic insidious blood loss without any change in appearance of stools. Therefore it may present with:- ▪ ***Melena*** ▪ Abdominal pain ▪ ***Anemia*** ▪ Fatigue, palpations ▪ Mass in right iliac fossa ▪ Intususseption (cecal carcinoma acts a lead point)	• Mostly presents as a stenosing mass. • Since the food is more formed & concentrated here, the carcinoma here impedes to the passage of stool, resulting in abdominal cramps, ***occasional obstruction*** and perforation in rare cases. • Associated symptoms are:- ▪ Decreased stool caliber ▪ ***Alteration in bowel habits*** (most often progressive constipation) ▪ ***Hematochezia*** ▪ Palpable lump ▪ Abdominal distention with pain which is relived by passing of flatus.

104. Ans is 'b' i.e. Inflammatory bowel disease, 'c' i.e. Colitis by clostridium difficile & 'e' i.e. Radiation colitis [*Ref: **Love & Bailey 26th/e** p. 121-22; **Sabiston 19th/e** p. 1848-49; **Schwartz 10th/e** p. 1625*]

- ***Although Pseudo-obstruction megacolon & Congenital megacolon (Hirschprung's disease) can cause megacolon, they're not due to inflammation or infection, which is the hall mark of toxic megacolon.***
- ***All other mentioned causes can cause toxic megacolon.*** *(see the explanation).*

Toxic megacolon (toxic colitis)

- Toxic megacolon is the clinical term for an acute toxic colitis with dilatation of the colon. The dilatation can be either total or segmental. ***The hallmarks of toxic megacolon (toxic colitis) are non-obstructive colonic dilatation larger than 6 cm and signs of systemic toxicity.***
- ***The histological hallmark is acute inflammation of all the layers of colon i.e. extending beyond the mucosa into the smooth muscle layers and serosa.*** Whereas the typical ulcerative colitis inflammatory response is limited to the mucosa, toxic megacolon is characterized by severe inflammation extending into the smooth muscle layer, thus paralyzing the colonic smooth muscle and leading to dilatation.
- Jalan et al described the diagnostic criteria, which are as follows :
  i) Radiographic evidence of colonic dilatation - The classic finding is more than 6 cm in the transverse colon
  ii) Any 3 of the following - Fever (>101.5°F), tachycardia (>120 beats/min), leukocytosis (>10.5 x 10^3/μL), or anemia
  iii) Any 1 of the following - Dehydration, altered mental status, electrolyte abnormality, or hypotension

Etiology	
Inflammatory causes	• *Ulcerative colitis* • *Crohn colitis*
Infectious causes	• **Bacterial** ▪ Salmonella species ▪ Shigella species ▪ Campylobacter species ▪ Yersinia species ▪ *Clostridium difficile (Pseudomembranous colitis)* • **Parasitic** ▪ Entamoeba histolytica ▪ Cryptosporidium • **Viral** ▪ Cytomegalovirus ▪ Rotavirus • **Fungal** ▪ Invasive aspergillosis
Other	• *Radiation colitis* • Ischemic colitis • Nonspecific colitis secondary to chemotherapy • Rarely as a complication of collagenous colitis • Behçet syndrome • Kaposi's sarcoma • Methotrexate therapy induced pseudomembranous colitis

- It's important to note that there are other types of megacolon. *Although these conditions can expand and damage the colon, they're not due to inflammation or infection.* Examples include:
  i) *Pseudo-obstruction megacolon*
  ii) Colonic ileus megacolon
  iii) *Congenital megacolon (Hirschprung's disease)*

105. **Ans is 'a' i.e. Anastomosis between stomach and 1st part of duodenum**
[*Ref: Love & Bailey 26th/e p. 1037; Schwartz 10th/e p. 1062*]

A. **Billroth I (Billroth's operation I)**
   - *Where a sufficient portion of duodenum remains, a Billroth I is performed where the remaining stomach is anastomosed directly to the duodenum* before the bile duct and pancreas ducts. Therefore the surgical procedure is called a **gastroduodenostomy.**

B. **Billroth II (Billroth's operation II)**
   - If the stomach cannot be reconnected to the duodenum, a Billroth II is performed, in which the *greater curvature of the stomach is connected to the first part of the jejunum* in end-to-side anastomosis *with closure of the duodenal stump.* The surgical procedure is called **gastrojejunostomy.**

Comparison of Billroth I and II Reconstructions	
Billroth I	**Billroth II**
• Potentially lower rates of remnant carcinoma	• Risk of marginal ulcer related to retained antrum
• Decreased rates of postprandial dumping	• Recurrent cancer unlikely to occur adjacent to the pancreatic head
• Potential improvement in gastroesophageal junction function	• Facilitates lymphatic dissection • Risk of afferent loop syndrome
• Histological changes related to gastritis in 80%–90% of patients	• Decreased rates of bile reflux and gastritis
• Retains normal physiologic passage of food into duodenum, maintaining innate regulatory pathways of bicarbonate and pancreatic enzymes	• Potentially lower rates of anastomotic stricture owing to anastomotic caliber • Anastomosis can be performed in context of extensive duodenal scarring

106. **Ans is 'a' i.e. Latissmus dorsi, 'b' i.e. Rhomboidis, 'c' i.e. Trapezius & 'd' i.e. Serratous anterior** [*Ref: https://emedicine.medscape.com/article/1972596-technique#c3; Farquarson's surgery 9th/e p. 132*]

Posterolateral thoracotomy (traditional/conventional/ standard thoracotomy)

- The patient is placed in a full lateral decubitus position. The anatomical markers will be a point 2–3 cm below the tip of the scapula, the mid-distance point between the middle of the spinal border of the scapula and the spinous process of the vertebra. The skin incision will join these two points and it is extended anteriorly until the anterior axillary line. ***After incision of the skin and subcutaneous layer, the latissimus dorsi muscle is carefully divided*** with cautery. ***The serratus anterior is in a deeper plane, and it is divided as low as possible, close to the muscular attachment, to minimize the amount of distal denervated muscle. In this same plane, posteriorly, a small portion of the trapezius or (higher up) the rhomboid muscles may have to be divided if necessary for additional exposure.*** After the muscular layers are divided, the surgeon will enter the chosen intercostal space.
- The traditional posterolateral thoracotomy allows the surgeon to perform the vast majority of thoracic procedures both in the elective and the emergency settings. The surgeon is able to visualise and control most parts of the lung, thoracic aorta and oesophagus, diaphragm and pleura. It can also extended as mentioned before towards abdomen by converting into a thoraco-phrenotomy by dividing the diaphragm or even Thoraco-laparotomy by division of the costal margin.
- Posterolateral thoracotomy is a very traumatic procedure, carrying a risk for early and long term pain and an early impact on respiratory function following surgery. Division of the latissimus dorsi muscle can cause shoulder movement dysfunction that can delay return to full activities.

107. Ans is 'b' i.e. Systemic artery, 'c' i.e. Systemic vein & 'e' i.e. Intralobar variety is more common

*[Ref: **Sabiston 19th/e** p. 1571; **Schwartz 8th/e** p.157]*

Pulmonary sequestration (accessory lung)

- ***It refers to the aberrant formation of segmental lung tissue that has no connection with the bronchial tree or pulmonary arteries.*** It is a bronchopulmonary foregut malformation (BPFM). ***Its arterial blood supply is from systemic circulation rather than the pulmonary circulation.*** This blood supply is mostly from aorta (mostly descending thoracic aorta) either above or below the diaphragm. Multiple feeding vessels may be present in 15-20% of cases. **More common in left lobes.**
- The estimated incidence is 0.1%. Pulmonary sequestration represents approximately 6% of all congenital pulmonary malformations. Anatomically it is classified into intralobar and extralobar sequestration.
- ***In the extrapulmonary form, males are affected approximately 4 times more often than females. Incidence is equal in males and females in the intrapulmonary type.*** The age of presentation is dependent on the type of sequestration.

Intrapulmonary / intralobar sequestrations	Extrapulmonary / extralobar sequestrations
• ***The most common form (75%).*** • The most common site is posterior basal segment of the left lower lobe. Bilateral involvement is uncommon. • Closely connected to the adjacent normal lung and do not have a separate pleura. • Venous drainage is usually via the pulmonary veins to the left atrium (left to left shunt). Abnormal connections to the vena cava, azygous vein, or right atrium may occur. • They are associated with other congenital malformations in 10% of cases & Foregut communication is very rare • More than one half of intrapulmonary sequestrations are diagnosed in later childhood or even in adulthood with recurrent pulmonary infections. Neonates and infants are usually asymptomatic.	• The less common form (25%) • Most common in the costophrenic sulcus on the left side. • Separated from any surrounding lung by its own pleura • ***Venous drainage is usually via the systemic venous system to the right atrium, vena cava, or azygous systems.*** • They are associated with other congenital malformations in more than 50% of cases & Foregut communication is more common. Associated anomalies include Congenital cystic adenomatoid malformation (CCAM), congenital diaphragmatic hernia, vertebral anomalies, congenital heart disease, pulmonary hypoplasia, and colonic duplication • More than one half of extrapulmonary sequestrations are diagnosed in patients younger than 1 year and commonly presents in newborns as respiratory distress, cyanosis, or infection

108. Ans is 'e' i.e. Fracture *[Ref: **Sabiston 19th/e** p. 1571; **Schwartz 8th/e** p.1571; **https://www.cdc.gov/masstrauma/preparedness/primer.pdf***

Mechanisms of Blast Injury			
Category	**Characteristics**	**Body Part Affected**	**Types of Injuries**
Primary	• Results from the impact of the overpressurization wave with body surfaces. • Associated with high-order explosives	• Gas filled structures are most susceptible • lungs, GI tract, and middle ear	• Blast lung (pulmonary barotrauma) • ***TM rupture*** and middle ear damage • ***Abdominal hemorrhage and perforation*** • ***Globe (eye) rupture*** • Concussion (TBI without physical signs of head injury)

Secondary	• Results from flying debris and bomb fragments	• Any body part may be affected	• Penetrating ballistic (fragmentation) or blunt injuries • Eye penetration (can be occult)
Tertiary	• Results from individuals being thrown by the blast wind and strike other objects • Caused by high-energy explosions	• Any body part may be affected	• ***Fracture and traumatic amputation*** • Closed and open brain injury
Quaternary	• All explosion-related injuries, illnesses, or diseases not due to primary, secondary, or tertiary mechanisms. • Includes exacerbation or complications of existing conditions.	• Any body part may be affected	• ***Burns (flash, partial, and full thickness)*** • Crush injuries • Closed and open brain injury • Asthma, COPD, or other breathing problems from dust, smoke, or toxic fumes • Angina • Hyperglycemia, hypertension

109. **Ans. is 'b' i.e., Compression by a foam cells dressing covered with a non-adherent dressing film and the overlying foam is then sealed with a transparent film, 'c' i.e. Increases the blood supply to the wound which helps in healing & 'e' i.e. Enhances wound debridement** [*Ref: https://advancedtissue.com/2014/08/healing-negative-pressure-wound-therapy/*]

- Once the dressing is sealed the vacuum pump can be set to deliver continuous or intermittent pressures, ***with levels of pressure depending on the device used, varying between −125 and −75 mmhg depending on the material used and patient tolerance.***
- ***A foam dressing or filler material is fitted to the contours of a wound (which is covered with a non-adherent dressing film) and the overlying foam is then sealed with a transparent film.***
- ***The continued vacuum draws out fluid from the wound and increases blood flow to the area.***
- ***The foam performs better when aggressive granulation formation (not prevention) and wound contraction is the desired goal.***
- ***Foam dressing encourages autolytic debridement*** and protects wounds against potentially damaging mechanical forces that could delay wound healing or allow infection to destabilize the wound.

110. **Ans. is 'a' i.e., Smoking, 'c' i.e. Obesity & 'd' i.e. Gastroesophageal reflux** [*Ref:* ***Robbin's 9th/e p. 759;*** ***Bailey & Love 24th/e p. 1009***]

Esophageal carcinoma risk factors	
Adenocarcinoma	1) ***Chronic gastric reflux (Barrett's esophagus)*** - single most important risk factor 2) ***Cigarette smoking*** 3) ***Obesity***
Squamous cell carcinoma	1) ***Alcohol and Cigarette smoking.*** 2) **Mucosal damage from physical agents → Hot tea, Lye ingestion,** 3) Radiation-induced strictures, ***Chronic achlasia.*** 4) Other ingested carcinogens → Nitrates, nitrites, nitrosamines, Smoked opiates, Fungal toxins in pickled vegetables 5) **Plummer - Vinson- Paterson Kelly syndrome** (Esophageal Web + glossitis + Iron deficiency). 6) **Tylosis plamaris et plantaris** (Congenital hyperkeratosis and pitting of palms and soles) 7) Dietary deficiencies of molybednum, Zinc, Vitamin A and selenium. 8) Celiac sprue 9) Bulimia (repeated microtrauma due to vomiting may contribute) 10) **Human papillomavirus (HPV) infection has also been implicated in esophageal squamous cell carcinoma in high-risk areas but not in low-risk regions.** 11) **Esophageal diverticula**

111. **Ans. is 'a' i.e., Puncture, 'b' i.e. Aspiration, 'c' i.e. Injection & 'e' i.e. Cystectomy** [*Ref:* ***Robbin's 9th/e p. 759;*** ***Bailey & Love 24th/e p. 1009***]

- ***The PAIR technique*** is performed using either ultrasound or computed tomography (CT) guidance, ***involves puncture followed by aspiration of the cyst*** contents via a special cannula, ***followed by injection of a scolicidal agent*** for at least 15 minutes, ***and then reaspiration of the cystic contents.***
- ***Anesthesia and cystectomy are not the past of PAIR technique.***
- ***Cystectomy is performed where PAIR is contraindicated or cannot be done.***

PAIR (Puncture, Aspiration, Injection, Re-aspiration)

- Basically, PAIR is percutaneous drainage of echinococcal cysts located in the abdomen. However, it can be performed on liver, bone, and kidney cysts but should not be performed on lung and brain cysts. The cysts should be larger than 5 cm in diameter and type I or II according to the Gharbi ultrasound classification of liver cysts (ie, type I is purely cystic; type II is purely cystic plus hydatid sand; type III has the membrane undulating in the cystic cavity; and type IV has peripheral or diffuse distribution of coarse echoes in a complex and heterogeneous mass). PAIR can be performed on type III cysts as long as it is not a honeycomb cyst.
- ***The PAIR technique involves puncture followed aspiration of the cyst*** contents via a special cannula or a fine needle or a catheter ***followed by injection of a scolicidal agent (15% hypertonic saline or 95% alcohol) for at least 15 minutes, and then reaspiration of the cystic contents.*** This is repeated until the return is clear. The cyst is then filled with isotonic sodium chloride solution. Perioperative treatment with a benzimidazole is mandatory (4 days prior to the procedure and for 1-3 months after).
- If a catheter is temporarily left in the cyst after the procedure for drainage (D), the acronym PAIRD should be preferred. If numerous and large daughter cysts are present, an alternative percutaneous technique "Percutaneous Puncture with Drainage and Curettage" (PPDC) may be used;
- It is feasible PAIR in types CE1, CE2 and CE3 of the WHO classification of Cystic Echinoccosis cysts
- PAIR is performed under ultrasound (US), sometimes Computer Assisted Tomography (CT) guidance.

Cystectomy

- ***Cystectomy is performed where PAIR is contraindicated or cannot be done.*** It consists in cyst de-roofing and cyst content evacuation without removal of the pericyst, plus or minus omentoplasty. No drainage is required except perhaps for infected or communicating cysts. Prior to this the cyst may be aspirated and protoscolicidal agent injected. Popular agents include 70–90% ethanol, 15–20% hypertonic saline, 0.5% cetrimide solution or 0.5% silver nitrate and hydrogen peroxide. They have to be left in place for 10–15 minutes to be effective.

112. Ans is 'a' i.e. Most commonly occurs due to lymphatic filiarisis, 'b' i.e. Occurs in areas where there is barefoot cultivation of volcano soil is done, 'd' i.e. Starts in early adulthood & 'e' i.e. Can be prevented by wearing shoes

[*Ref: **Love & Bailey 26th/e** p. 926-29; **Sabiston 19th/e** p. 1821-23; **Schwartz 10th/e** p. 934-35]*

- ***In areas where filariasis is endemic, the most common cause of elephantiasis is lymphatic filariasis and the terms lymphatic filariasis and elephantiasis may be used interchangeably.***
- ***Elephantiasis is also associated with a disorder known as podoconiosis.*** According to the World Health Organization *"Evidence suggests that podoconiosis is the result of a genetically determined abnormal inflammatory reaction to mineral particles in irritant red clay soils derived from volcanic deposits". Primary prevention consists of avoiding or minimizing exposure to irritant soils by wearing shoes or boots and by covering floor surfaces inside traditional huts.*
- ***In endemic areas, lymphatic filariasis is first contracted in childhood, and most individuals in endemic areas have been exposed by the third or fourth decade of life.***
- The main symptom of elephantiasis is gross enlargement and swelling of an area of the body because of the accumulation of fluid. ***It mostly affects the lower limbs, sometimes the arms, less commonly male genitalia, and rarely breasts and genital region in females.***

Elephantiasis (lymphatic filariasis)

- Elephantiasis is a condition characterized by gross enlargement of an area of the body, especially the limbs. Other areas commonly affected include the external genitals. Elephantiasis is caused by obstruction of the lymphatic system, which results in the accumulation of a fluid called lymph in the affected areas.

Etiology

- ***In areas where filariasis is endemic, the most common cause of elephantiasis is lymphatic filariasis and the terms lymphatic filariasis and elephantiasis may be used interchangeably.*** Lymphatic filariasis is caused by three different species of worms known as Brugia malayi, Brugia timori and Wuchereria bancrofti. The larval form of the worms is introduced into the human body through the bite of infected mosquitoes.
- Genital elephantiasis can also be caused by bacterial sexually transmitted diseases, specifically lymphogranuloma venereum (LGV) and donovanosis.
- ***Elephantiasis is also associated with a disorder known as podoconiosis. Evidence suggests that podoconiosis is the result of a genetically determined abnormal inflammatory reaction to mineral particles in irritant red clay soils derived from volcanic deposits. Primary prevention consists of avoiding or minimizing exposure to irritant soils by wearing shoes or boots and by covering floor surfaces inside traditional huts.***
- Additional causes of elephantiasis include a protozoan disease called leishmaniasis, tuberculosis, leprosy, and a repeated streptococcal infection. Elephantiasis may also occur secondary to trauma, surgery or radiation.

Presentation

- Elephantiasis occurs with the greatest frequency in tropical regions including Southeast Asia, India, Africa and South America as a manifestation of lymphatic filariasis. Elephantiasis can affect men or women of any age.
- ***In endemic areas, lymphatic filariasis is first contracted in childhood, and most individuals in endemic areas have been exposed by the third or fourth decade of life.***

- The main symptom of elephantiasis is gross enlargement and swelling of an area of the body because of the accumulation of fluid. ***It mostly affects the lower limbs, sometimes the arms, less commonly male genitalia, and rarely breasts and genital region*** **in females.**
- An entire limb may swell to several times its normal size resembling the thick, round appearance of an elephant's leg. The skin of the affected areas usually develops a dry, thickened, pebbly appearance and may become ulcerated, pitted and darkened (hyperkeratosis). Fever, chills, and a general feeling of ill health (malaise) may also be present.

113. **Ans. is 'c' i.e., Gamma & 'd' i.e. Proton** [*Ref:* ***https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6139853/***]

- ***External beam radiation used for prostate carcinoma includes x-rays, gamma rays and protons.***
- ***Other mentioned options are not used for the external beam radiation for prostate carcinoma.***

Radiation therapy for prostate cancer

- The 2 main types of radiation therapy used for prostate cancer are:
  1) External beam radiation
  2) Brachytherapy (internal radiation)

External beam radiation therapy (EBRT)

- External beam radiation therapy (EBRT) remains one of the primary treatment modalities for patients with localized or locally advanced prostate cancer. It is commonly used in the treatment of patients who have a greater likelihood of non–organ-confined disease. ***External beam radiation therapy (EBRT) uses a linear accelerator to produce high-energy x-rays that are directed in a beam towards the prostate.***

i) **Conventional EBRT**
   - Conventional EBRT is typically delivered by means of a 4-field technique. The 4 fields (anteroposterior [AP], posteroanterior [PA], left lateral, and right lateral) are designed to include the prostate, the seminal vesicles, and the regional lymphatic vessels.

ii) **3-Dimensional conformal radiotherapy**
   - In 3-dimensional conformal radiotherapy (3D-CRT), the radiation beam is shaped to include the 3D anatomic configuration of the prostate and any specified adjacent tissue (including the seminal vesicles and periprostatic adventitial tissues) which makes it less likely to damage normal tissues

iii) **Intensity modulated radiation therapy (IMRT)**
   - IMRT, an advanced form of 3D therapy, is the most common type of EBRT for prostate cancer. IMRT can achieve tightly conformal dose distributions with the use of nonuniform radiation beams. The intensity of the beams can be adjusted to limit the doses reaching nearby normal tissues.
   - Some newer radiation machines have imaging scanners built into them. This advance, known as **image guided radiation therapy (IGRT),**

iv) **Stereotactic body radiation therapy (SBRT)**
   - Stereotactic body radiation therapy (SBRT) is a highly conformal and precise method of delivering ultra-high dose radiation therapy a certain precise area, such as the prostate. Also called Stereotactic Ablative Radiation Therapy (SABR), this technique will ablate malignant tissue in just five treatments delivered over 1–2 weeks
   - SBRT is often known by the names of the machines that deliver the radiation, such as ***Gamma Knife,*** X-Knife, CyberKnife and Clinac.

v) ***Proton beam therapy***
   - In contrast to photon beam therapy, the entrance radiation dose in ***proton beam therapy*** tends to be significantly less than the maximum energy of the clinical beam. Proton beam radiation can be aimed with techniques similar to 3D-CRT and IMRT.

Brachytherapy

- Brachytherapy alone is generally used only in men with early-stage prostate cancer that is relatively slow growing (low-grade).
- Brachytherapy combined with external radiation is sometimes an option for men who have a higher risk of the cancer growing outside the prostate.
- There are 2 types of prostate brachytherapy.
  i) **Permanent (low dose rate, or LDR) brachytherapy**
     - Radioactive material (such as iodine-125 or palladium-103) are placed inside prostate and are left in place to give off low doses of radiation for weeks or months. It delivers a large amount of radiation in a very small area. This limits the amount of damage to nearby healthy tissues.
  ii) **Temporary (high dose rate, or HDR) brachytherapy**
     - Higher doses of radiation (Radioactive iridium-192 or cesium-137) are left in place for a short time (5 to 15 minutes). Generally, about 3 brief treatments are given over 2 days, and the radioactive substance is removed each time.
     - The advantage of this approach is that most of the radiation is concentrated in the prostate itself, sparing nearby normal tissues.

114. Ans is 'a' i.e. Radioimmunoassay [*Ref: **Human chorionic gonadotropin** p. 621, 2194, 2328*]

- ***All the mentioned tests are used for beta HCG detection. Among these, radioimmunoassay is the most sensitive test for measurement of ß HCG levels in serum. It uses antibodies to detect the hormone.***

LABORATORY TESTS FOR HUMAN CHORIONIC GONADOTROPIN

- These are classified into two main groups:
  1) Biological assays or bioassays
  2) Immunological assays

1) Bioassays

- In bioassay, effect of hCG is tested on laboratory animals under standardized conditions. There are several limitations of bioassays like need for animal facilities, need for standardization of animals, long time required for the test results, low sensitivity, and high cost. Therefore, ***bioassays have been replaced by immunological assays***.

2) Immunological Assays

- Immunological tests for the diagnosis of pregnancy depend on the detection of ß HCG in the maternal serum or urine.
- These are rapid and sensitive tests for detection and quantitation of hCG. Variable results are obtained by different immunological tests with the same serum sample; this is due to differences in specificity of different immunoassays to complete hCG, β-subunit, and β-core fragment.
- They are of various types:
  i) **Latex Agglutination inhibition test**
  ii) Direct agglutination test
  iii) **Enzyme linked immunosorbent assay (ELISA)**
  iv) Fluoroimmunoassay (FIA)
  v) **Radioimmunoassay (RIA)**
  vi) **Immunoradiometric assay (IRMA)**
- Radioimmunoassay, enzyme immunoassay, and radioimmunometric assay are more sensitive and reliable than agglutination inhibition assay.
- ***Radioimmunoassay is the most sensitive test for measurement of ß HCG levels in serum***.

115. Ans is 'd' i.e. Cesarean section & 'e' i.e. Internal podalic version [*Ref: **Dutta's Obs 8th/e** p. 395-97*]

- ***Caesarean section is the best and safest method of management in nearly all cases of persistent transverse or oblique lie whether the baby is dead or alive.***
- ***Internal podalic version is not recommended in modern obstetric practice in single tone pregnancy. But it is indicated in 2nd twin of transverse lie and followed by breech extraction.***
- ***Destructive procedures such as decapitation or evisceration, which used to be done earlier, are not performed in modern day practice.***
- Craniotomy is the most commonly performed destructive operation; ***the usual indication for craniotomy is a neglected labor resulting in fetal death and fetal head impaction in the pelvis.***
- ***Cleidotomy (deliberate clavicle fracture) is one of the last resort management options for shoulder dystocia.*** In it, one or both clavicles may be cut by scissors to reduce the shoulder girth. It is applicable as first choice in a living anencephalic baby or a dead fetus.

116. **Ans is All are correct** [*Ref:: Shaw's gynae 15th/e p. 56; Dutta's gyane 6th/e p. 50*]

Causes

Central precocious puberty	Peripheral precocious puberty
A. Idiopathic / constitutional (most common i.e. 80%) B. Other cause with specific etiology:- i) **Intracranial neoplasm** • Hypothalamic hamartoma (produces pulsatile GnRH) • Glioma • Craniopharyngioma • Astrocytoma • Ependymoma • Neurofibroma • Pineal tumor • Suprasellar arachnoid cyst ii) **Others** • Damage to the inhibitory system of the brain (due to infection, trauma, or irradiation), • Angelman syndrome • Langerhans cell histiocytosis • Infection – meningitis/encephalitis(CNS tuberculosis especially in developing countries) • Hydrocephalus • Rickets • Hypothyroidism • Von-Reckling-Hausen disease	A. **Endogenous sources** • Gonadal tumors (such as arrhenoblastoma, gynandroblastoma, lipoid cell tumor, hillus cell tumor), • Adrenal tumors, • Germ cell tumor • Sex cord tumors (Granulosa cell tumor, Leydig cell tumor, sertoli cell tumor) • Congenital adrenal hyperplasia, • Hepatoblastoma • McCune-Albright syndrome B. **Exogenous hormones** • Environmental exogenous hormones, • As treatment for another condition.

117. **Ans is 'a' i.e. Can be caused by uterine tuberculosis, 'b' i.e. May result from uterine curettage & 'e' i.e. Normal FSH & LH level** [*Ref: Shaw's gynae 16th/e p. 430-34; Dutta's gyane 6th/e p. 438-441*]

Asherman's syndrome

- Asherman syndrome is the formation of scar tissue in the uterine cavity and/or the cervix. Asherman's syndrome is also known as intrauterine synechiae or uterine synechiae or intrauterine adhesions (IUA).

Etiology

- ***Asherman syndrome occurs primarily after a dilation and curettage*** performed for an elective termination of pregnancy, a missed or incomplete miscarriage, or to treat a retained placenta after delivery.
- It can also occur after surgery to remove uterine fibroids or from scar tissue after a Cesarean section or from sutures used to stop hemorrhages
- In the developing world, ***it may also occur due to infections from schistosomiasis or tuberculosis***.
- Other causes include endometriosis and radiation treatment.
- Women with placental abnormalities (e.g., placenta increta) may have a higher risk of developing Asherman syndrome.

Presentation

- It is often characterized by a decrease in flow and duration of bleeding such as absence of menstrual bleeding, little menstrual bleeding, or infrequent menstrual bleeding (***amenorrhea***/ hypomenorrhea) and infertility.
- Pain during menstruation and ovulation is sometimes experienced and can be attributed to blockages.

Diagnosis

- The history of a **pregnancy** event followed by a D&C leading to secondary amenorrhea or hypomenorrhea is typical.
- ***Progesterone challenge test is negative.***
- ***Level of hormones (LH, FSH, TSH & prolactin) is normal***.
- ***Hysteroscopy is the gold standard for diagnosis***.
- Imaging by **sonohysterography** or **hysterosalpingography** will reveal the extent of the scar formation.

Treatment

- Asherman syndrome should be treated by a surgeon experienced with hysteroscopy, sometimes with sonographic or laparoscopic guidance.
- Preoperative and postoperative treatment with oral, transdermal, or intramuscular estrogen preparations may help to reduce scarring postoperatively and promote regeneration of the normal endometrium.

118. Ans. is 'a' i.e., Volume – 1.5 ml, 'c' i.e. Total sperm count – 39 million spermatozoa per ejaculate & 'd' i.e. Morphology – 4% normal

[*Ref:* ***https://www.institutobernabeu.com/foro/en/2014/02/17/semen-quality-parameters-according-to-the-world-health-organisation-who/***]

- Lower limits of semen analysis values published by WHO :-
  - *Volume* - *The normal volume of an ejaculate sample after 3 or 5 days of sexual abstinence is 1.5 ml approximately.*
  - *Sperm concentration* - *Normal values are around 15 million per ml ejaculated.*
  - *Total sperm count* - *39 million spermatozoa per ejaculate*
  - *Morphology* - *4% or more normal spermatozoa in an usual spermiogram*
  - *Motility* - *The progressive motility value should be over 32%.*

Latest semen quality parameters according to the World Health Organisation (WHO) (2010)

- The World Health Organization (WHO) has published several editions of the "*Manual for the Examination of Human Semen and Sperm-Cervical Mucus Interaction*", the last one in 2010.
- The concept of **Lower Reference Limit (LRL)** was established in the last manual of the WHO.
- There are many parameters obtained through a spermiogram, the most frequently studied are:
  1) **Liquefaction :** After the ejaculation, the sperm sample is coagulated and needs to be liquefied in order to perform any tests. In normal conditions the sperm is totally liquefied in 60 minutes after the ejaculation
  2) **Viscosity :** When the sperm sample is very viscous it may be a sign of a prostatic dysfunction.
  3) **Volume :** *The normal volume of an ejaculate sample after 3 or 5 days of sexual abstinence is 1.5 ml approximately.* Lower volumes might suggest hypospermia.
  4) **Color :** Sperm is usually opalescent white, lightly yellow. When the color is altered, it is recommended to study possible causes.
  5) **pH : Values should be greater than 7.1.** Lower values might be a sign of azoospermia (lack of spermatozoa) or chronic inflammatory processes.
  6) *Sperm concentration: Normal values are around 15 million per ml ejaculated or 39 million per complete semen sample.* When these values are lower it could indicate Oligozoospermia.
  7) *Motility* **:** The percentage of motile spermatozoa and progressively motile is analyzed. *The progressive motility value should be over 32%*, on the contrary it might indicate Astenozoospermia.
  8) **Vitality :** The percentage of vital spermatozoa must be over 58%. Lower values could indicate Astenoozoospermia.
  9) *Morphology : There might be 4% or more normal spermatozoa in an usual spermiogram*. Lower percentages could indicate Teratozoospermia.
  10) **Leukocytes :** When the leukocyte concentration is over 1 million per ml of sample it might indicate an infection (leukocytosis).
  11) **Antisperm Antibodies or Mar test :** The number of spermatozoa with adherent particles or cells is reflected. More than 50% spermatozoa clustered together suggests an immunological problem.

119. Ans is 'e' i.e. Proteinuria - 0.3 g or more / 24-hour urine collection

[*Ref:* ***Dutta's Obs 8th/e p. 276-77; William's Obs 23rd/e p. 707-08***]

- In addition to the blood pressure criteria, *proteinuria of greater than or equal to 0.3 grams in a 24-hour urine specimen, a protein (mg/dL)/creatinine (mg/dL) ratio of 0.3 or higher*, or a urine dipstick protein of 1+ (if a quantitative measurement is unavailable) is required to diagnose preeclampsia.
- *Oliguria (< 500 ml in 24 hours), Pulmonary edema, Thrombocytopenia (platelet count < 100,000/μL) & Intrauterine growth restriction are the severe features of pre-eclampsia. These features are not required for diagnosis*.

Preeclampsia

- Preeclampsia is a disorder of widespread vascular endothelial malfunction and vasospasm that occurs after 20 weeks' gestation and can present as late as 4-6 weeks post partum. It is clinically defined by hypertension and proteinuria, with or without pathologic edema.

Diagnostic Criteria for Preeclampsia

- Preeclampsia is defined as the presence of :-
  1) *A systolic blood pressure (SBP) greater than or equal to 140 mm Hg or a diastolic blood pressure (DBP) greater than or equal to 90 mm Hg or higher*, on two occasions at least 4 hours apart in a previously normotensive patient,

  OR

  2) An SBP greater than or equal to 160 mm Hg or a DBP greater than or equal to 110 mm Hg or higher (In this case, hypertension can be confirmed within minutes to facilitate timely antihypertensive therapy.).
- In addition to the blood pressure criteria, *proteinuria of greater than or equal to 0.3 grams in a 24-hour urine specimen, a protein (mg/dL)/creatinine (mg/dL) ratio of 0.3 or higher*, or a urine dipstick protein of 1+ (if a quantitative measurement is unavailable) is required to diagnose preeclampsia.
- **Preeclampsia with severe features** is defined as the presence of one of the following symptoms or signs in the presence of preeclampsia :
  i) SBP of 160 mm Hg or higher or DBP of 110 mm Hg or higher, on two occasions at least 4 hours apart while the patient is on bed rest (unless antihypertensive therapy has previously been initiated)
  ii) Impaired hepatic function as indicated by abnormally elevated blood concentrations of liver enzymes (to double the normal concentration), severe persistent upper quadrant or epigastric pain that does not respond to pharmacotherapy and is not

accounted for by alternative diagnoses, or both.
iii) Progressive renal insufficiency (serum creatinine concentration >1.1 mg/dL or a doubling of the serum creatinine concentration in the absence of other renal disease).
iv) ***Oliguria (< 500 ml in 24 hours).***
v) New onset cerebral or visual disturbances
vi) ***Pulmonary edema***
vii) ***Thrombocytopenia (platelet count < 100,000/μL)***
viii) ***Intrauterine growth restriction***

- In a patient with new-onset hypertension without proteinuria, the new onset of any of the following is diagnostic of preeclampsia:
  i) Platelet count below 100,000/μL.
  ii) Serum creatinine level above 1.1 mg/dL or doubling of serum creatinine in the absence of other renal disease
  iii) Liver transaminase levels at least twice the normal concentrations
  iv) Pulmonary edema
  v) Cerebral or visual symptoms
- ***Eclampsia*** is defined as seizures that cannot be attributable to other causes in a woman with preeclampsia. HELLP syndrome (hemolysis, elevated liver enzyme, low platelets) may complicate severe preeclampsia.

120. **Ans is 'b' i.e., Metropathia haemorrhagica** [*Ref: **Shaw's gynae 15th/e** p. 303, 307*]

Metropathia haemorrhagica

- It is a specialized form of DUB.
- Seen mostly in premenopausal women. Maximum incidence is between 40-45 years of age. But it may develop in young girls < 20 years of age.
- Parity is not related to the incidence.
- There is symmetrical enlargement of uterus to a size 8-10 cms.
- Basic defect lies in ovaries. One or the other ovaries have cystic follicles. There is slow increase in the secretion of estrogen with no feedback inhibition by FSH.
- Slow and study increase in estrogen leads amenorrhea. Because there is no progesterone to support endometrium, proliferated endometrium is shed leading continuous and heavy bleeding.
- Most common presenting complaint is prolonged amenorrhea (4-8 weeks) followed by excessive bleeding. Bleeding is always painless (anovulatory).
- Endometrium is thick and polypoidal. Thin polypi project into the uterine cavity.
- Hyperplasia of all endometrial components.
- The characteristic feature of endometrium in metropathia haemorrhagica is **cystic glandular hyperplasia**.
- ***Another important feature is absence of secretory endometrium with absence of corkscrew glands***.
- Some glands are small and some are large, giving it a "Swiss cheese appearance".
- Glands are empty and are lined by columnar epithelium.

121. **Ans is 'a' i.e. Number of follicles/ ovary & 'b' i.e. Ovarian volume**
[*Ref: **https://radiopaedia.org/articles/polycystic-ovarian-syndrome-1***]

- ***According to the consensus definition, polycystic ovaries are present when (a) one or both ovaries demonstrate 12 or more follicles measuring 2–9 mm in diameter, or (b) the ovarian volume exceeds 10 cm³.*** *Only one ovary meeting either of these criteria is sufficient to establish the presence of polycystic ovaries*
- ***Stromal Echogenicity and Volume have been described, but do not contribute to formal diagnostic criteria.***
- ***Stromal blood flow is not included in ultrasonographic diagnostic criteria for PCOD.***

Ultrasonographic criteria for the diagnosis of PCOD

- Ovaries may be normal in PCOS, and conversely, polycystic ovarian morphology (PCOM) may be seen in women without the syndrome. However, it is well accepted that women with PCOS tend to have larger ovaries with an increased number of follicles.
- The updated diagnostic criteria at the time of review are based on a 2018 international consensus guideline.
- In patients >8 years post menarche, and using a high-frequency endovaginal probe:
  i) ***Follicle number per ovary (FNPO) ≥ 20, and/or***
  ii) ***Ovarian volume ≥10 mL***, ensuring no corpora lutea, cysts or dominant follicles are present
- If using transabdominal scanning, or older technology where ovarian morphology is not well visualised, consider using the ovarian volume threshold of ≥10 mL on either ovary.
- The diagnostic criteria are adjusted in adolescent females (defined as within 8 years of menarche, or age <20 years) , in whom ultrasound should not be used for the diagnosis of PCOS due to the high incidence of multi-follicular ovaries in this life stage.
- This supersedes the initial Rotterdam criteria of ≥12 follicles and interim recommendations of 24 or 25 follicles per ovary. The presence of a single multifollicular ovary is sufficient to provide the sonographic criterion for PCOS
- Other ***morphological features have been described, but do not contribute to formal diagnostic criteria:***
  i) ***Stromal Echogenicity and Volume (hyperechoic central stroma)***
  ii) peripheral location of follicles (string of pearls sign)
  iii) follicles of similar size measuring 2-9 mm

122. Ans is 'b' i.e. Cobalt 60, 'c' i.e. Iridium 192, 'd' i.e. Radium226 & 'e' i.e. Cesium 137

*[Ref: **Novak gynae 15th/e** p. 1317; **Shaw's gynae 16th/e** p. 502; **Dutta's gynae 6th/e***

Brachytherapy (usually ICRT)

- In ICRT for cervical cancer, radioactive sources placed in the uterine cavity are used to deliver a very high dose to the cerv uterus with relative sparing of surrounding tissues, such as the bladder, rectum, small bowel, and superficial soft tissues.
- Radium was first used to treat uterine malignancies shortly after its discovery at the turn of the century and was conv because of its very long half-life. However, because the daughter product of radium—radon gas—can pose a radiation prot problem, ^{137}Cs, which provides similar energy, has now replaced radium in many practices.
- ***Low-dose-rate ICRT with cesium or radium*** provides an additional therapeutic advantage by permitting recovery of sub injury to normal tissues during the course of irradiation. In more recent years, computer technology has made it possi deliver ***ICRT at high dose rates (more than 100 cGy/min) using high-activity sources, usually*** ^{192}Ir. These approache discussed in further detail in the Dose Rate section.

Radioisotopes commonly used in treatment of cervical cancer

	Half-Life	Comments
Cobalt (CO60)	5.26 years	• Commonly used for EBRT in the past; occasionally used in HDR or LDR brachytherapy
Cesium (Cs137)	30.0 years	• Most commonly used source for LDR ICRT
Radium (Ra226)	1600 years	• Most commonly used source for LDR ICRT before 1980s; potential for leakage of radon gas led to gradual replacement
Iridium (Ir192)	74.2 days	• Most commonly used source for gynecologic interstitial brachytherapy and for HDR ICRT

- *EBRT, external-beam radiation therapy; ICRT, intracavitary radiation therapy; LDR, low-dose-rate; HDR, high-dose-rate.*

123. Ans is 'a' i.e. Controlled cord traction & 'b' i.e. Injection of uterotonic drugs

*[Ref: **Dutta's Obs 8th/e** p. 141-42; **JB Sharma Obs** p. 2*

- ***Components of active management of the third stage of labor (AMTSL) include:-***
  - i) ***Prophylactic administration of a uterotonic drug***
  - ii) ***Delayed cord clamping***
  - iii) ***Controlled cord traction (Brandt-Andrews maneuver) to deliver the placenta***
  - iv) Intermittent uterine tone assessment
- There is strong evidence supporting the routine administration of uterotonic agents for the prevention of post-partu hemorrhage (PPH). ***In fact administration of uterotonic agents is the single most important component of AMTSL.***
- ***Controlled cord traction (CCT) is gentle cord traction applied when the uterus is well contracted, and the uterus is manual controlled above the level of the symphysis with counter traction (Brandt-Andrews maneuver).***
- ***Current recommendations is clamping and cutting the cord after cord pulsations have ceased or approximately 2-3 minute after birth of the baby, whichever comes first (Delaying cord clamping).***

*"The Cochrane review on active versus passive management does not refer to the use of uterine massage as part of AMTSL whereas the **EIGO/ICM statement on AMTSL does include uterine massage as part of AMTSL."***

– https://www.ncbi.nlm.nih.gov/pmc/articles/PMC264752

- ***Fundal pressure (Crede manoeuvre) is also a maneuver to help in expulsion of placenta in third stage of labor.*** *But is not component of AMTSL.*

*"There are two basic interventions to help to deliver the placenta as part of the active management of the third stage of labour: fundal pressure or controlled cord traction. **Fundal pressure (Crede manoeuvre)** involves placing one hand on the top of the uterus (uterine fundus) and squeezing it between the thumb and other fingers to help placental separation and delivery. Controlled cord traction involves traction on the umbilical cord while maintaining counter-pressure upwards by placing a hand on the lower abdomen. The **review found no randomised controlled trials to assess the use of fundal pressure as part of the active management of the third stage of labour. Therefore, controlled cord traction should continue as the method of placental delivery in the active management of third stage of labour."***

– https://www.cochranelibrary.com/cdsr/doi/10.1002/14651858.CD005462.pub2/full

124. Ans is 'a' i.e. Amniotic fluid & 'b' i.e. Chorionic villi *[Ref: **Dutta's Obs 8th/e** p. 106-07]*

- ***Chorionic villus sampling (CVS) is done transabdominal at 10-13 weeks and transcervically from 10 weeks to term.***
- ***Amniocentesis is done at 15-17 weeks***
- ***Maternal blood is used for the triple screening test but not for diagnostic test.***
- ***Maternal saliva is not used.***
- ***Fetal blood sampling is done by cordocentesis. It is done in the 18-24 weeks gestational age.***

Invasive prenatal diagnostic methods

Method	Timing	Material needed	Miscarriage risk	Applications
Chorionic villus sampling (CVS)	• **Transabdominal – 10-13 weeks** • ***Transcervical – 10 weeks to term***	**Trophoblastic cells from chorionic villi**	**1-2%**	• Chromosome analysis (karyotyping) • Molecular genetic diagnosis • Biochemical diagnosis
Amniocentesis	• ***15-17 weeks*** • **Early – 12-14 weeks**	**Amniocytes and fibroblasts in amniotic fluid**	**≤ 0.5%**	• Chromosome analysis • Diagnosis of open neural tube defects • Molecular genetic diagnosis • biochemical diagnosis
Cordocentesis	***18-20 weeks***	**Fetal white blood cells**	**1-2 %**	• Chromosome analysis • Hematological and biochemical diagnosis
Placental biopsy	From 15 weeks	**Placental tissue**	**1%**	• Chromosome analysis • Molecular genetic diagnosis • Biochemical diagnosis
Fetal biopsy (usually not done)	from 20 weeks	**Fetal tissue**	**2%**	• Diagnosis of specific genetic dermatoses

125. **Ans is 'a' i.e. Occur in young adults & 'c' i.e. Family history is a risk factor**

[*Ref:* ***Novak gynae 15th/e*** *p. 1395-97;* ***Shaw's gynae 15th/e*** *p. 376-78;* ***Dutta's gynae 6th/e*** *p. 365-70*]

- ***GCTs are the most common solid tumors in adolescents, accounting for 14% of all cancers among those 15-19 years old.***

  "GCT predominantly affect young women*, but they do sometimes occur in infants and older women. GCT account for over 60% of ovarian neoplasms in children and adolescents, one-third of which are malignant. The frequency of OGCT is invariable throughout the world. There does not appear to be a racial predisposition, in contrast to epithelial ovarian cancers.* ***The incidence of OGCT increases from the age of 8-9 years, and peaks at 18 years (20 per million). The mean age of presentation of OGCT is 19 years****".*

  — http://atlasgeneticsoncology.org/Tumors/OvarianGermCellID5067.html
- ***Males with Klinefelter syndrome have a 50 times greater risk of GSTs***. In these persons, GSTs usually contain nonseminomatous elements, present at an earlier age, and seldom are gonadal in location.
- ***Family history of Germ cell tumor is a risk factor especially in males***.
- ***Chordomas are rare tumors that arise from embryonic notochordal remnants*** along the length of the neuraxis at developmentally active sites. ***Parachordoma is an extremely uncommon soft-tissue tumor, which mainly occurs in the deep soft-tissue of the distal parts of the limbs, such as deep fascia, muscle tendon, synovial or soft-tissue closed to the bone***. The immunohistochemical reactions indicate that the parachordoma is a neuroepithelial tumor with glial differentiation.
- ***Teratocarcinoma refers to a germ cell tumor that is a mixture of teratoma with embryonal carcinoma, or with choriocarcinoma, or with both***. This kind of mixed germ cell tumor may be known simply as a teratoma with elements of embryonal carcinoma or choriocarcinoma, or simply by ignoring the teratoma component and referring only to its malignant component: embryonal carcinoma and/or choriocarcinoma.

Germ-cell tumor (GCT)

- **A germ-cell tumor (GCT)** is a neoplasm derived from germ cells.
- Most GCTs occur inside the gonads (ovary and testis) but many germ cell tumors are now known to be congenital and originate outside the gonads. The most notable of these is sacrococcygeal teratoma, the single most common tumor diagnosed in babies at birth.
- Although germ cell tumors are rare in children under age 15, ***they are the most common solid tumors in adolescents, accounting for 14% of all cancers among those 15-19 years old***. In younger women, they are more common and in patients under the age of 21, 60% of ovarian tumors are of the germ-cell type, and up to one-third are malignant. In males, GCTs of the testis occur typically after puberty and are malignant (testicular cancer). In neonates, infants, and children younger than 4 years, most are sacrococcygeal teratomas
- Germ-cell tumors can be malignant or benign:-
  i) **Malignant:-** Germinoma (**seminoma**, dysgerminoma), embryonal carcinoma, endodermal sinus tumor (yolk sac tumor), choriocarcinoma, immature teratoma.
  ii) **Benign :-** Mature teratoma, **dermoid cyst**

Types of germ cell tumors

- They are broadly divided in two classes:-
  i) Germinomatous or seminomatous germ-cell tumors (GGCT, SGCT)
     - ***Seminoma*** is the **most common germ cell tumor of testis**. Female counterpart of seminoma is **dysgerminoma of ovary**.
  ii) Nongerminomatous or nonseminomatous germ-cell tumors (NGGCT, NSGCT)
     - This include all other germ-cell tumors, pure and mixed i.e. ***Non-seminoma germ cell tumors*** (NSGCT) are ***spermatocytic seminoma, embryonal carcinoma, Yolk sac tumor (also called endodermal sinus tumor or infantile embryonal carcinoma), teratoma***, and choriocarcinoma.
- Compared to germinomatous tumors, nongerminomatous tumors tend to grow faster, have an earlier mean age at time of diagnosis (around 25 years versus 35 years, in the case of testicular cancers), and have a lower five-year survival rate.
- Germinomatous tumors are very sensitive to radiation, and they also respond well to chemotherapy.

Risk factors for testicular germ cell tumors

1) Caucasians at higher risk than African Americans (9:1)
2) Undescended testis (***Cryptorchidism***)
   a) 10-40x increased risk
   b) Around 10% of all tumors are associated with undescended testis
   c) Higher risk if intra-abdominal testis compared with intra-inguinal i.e. higher the undescended testis more the chance of malignancy
   d) Increased risk in the contralateral normally descended testis
   e) Orchidopexy prior to puberty can reduce the tumor risk
3) Previous tumor in contralateral testis
4) Excess 12P copy number either in the term of i(12P) or increased 12P an aberranthy banded marker chromosome.
5) ***Family history of testicular germ cell tumor***
6) Testicular microlithiasis
7) Testicular dysgenesis
   a. Testicular feminization
   b. ***Klinefelter syndrome***
8) Other risk factors:-
   a. Infections such as HIV, orchitis
   b. History of trauma
   c. Organ transplant immunosuppression

126. Ans is 'b' i.e. Alpha feto protein & 'd' i.e. CA 125 [*Ref: https://www.sciencedirect.com/topics/medicine-and-dentistry/dysgerminoma*; ***Shaw's gynae 16th/e*** *p. 441-41*; ***Dutta's gyane 6th/e*** *p. 381-82*]

Dysgerminoma

- Dysgerminoma, the most common of germ cell tumors, accounts for approximately 1% of all ovarian cancers. The majority occur between the ages of 10 and 30. Stage IA is the most common stage at diagnosis, representing 75% of all cases. Ten percent may involve both ovaries. It predominantly spreads in an orderly progression to retroperitoneal lymph nodes, in contrast to the transcoelomic spread of epithelial ovarian cancer.
- ***LDH is a nonspecific tumor marker and is reported to be elevated in up to 95% of cases.***
- ***Dysgerminomas typically show positivity with*** vimentin, ***placental-like alkaline phosphatase (PLAP), Lactate dehydrogenase (LDH)***, neuron-specific enolase (NSE), OCT4 and c-kit (CD117).
- Unlike other germ cell tumors, dysgerminomas are usually negative for cytokeratin. Approximately 30% of dysgerminomas contain scattered cells positive for cytokeratin.
- Dysgerminomas are usually negative for hCG. ***Occasionally, dysgerminomas may become infiltrated with syncytiotrophoblastic giant cells, which produce beta-hCG.***
- ***They are negative for*** EMA, CEA, CD30, S-100 protein, leukocyte common antigen (LCA), and ***alpha feto protein*** (AFP).

127. Ans is 'a' i.e. Eisenmenger syndrome [*Ref:* ***Williams Obs 23rd/e*** *p. 970*]

- According to ***Clarke's classification for risk of maternal mortality caused by valvular heart disease, among mentioned options only coarctation of aorta and Eisenmenger syndrome are classified in highest mortality group i.e. group III (25-50% maternal mortality)***. Out of other 3 mentioned options, aortic stenosis & severe mitral stenosis are classified in group 2 i.e. 5-15% maternal mortality whereas Ebstein anomaly are classified in group 1 i.e. 0-1% maternal mortality.
- ***Eisenmenger syndrome is the heart disease which is associated with highest maternal mortality in pregnancy***. Therefore pregnancy is contraindicated. If diagnosed in first trimester, termination of pregnancy is advised.

"Maternal mortality in the presence of Eisenmenger syndrome is reported as 30-50% and even up to 65% in those with Caesarean section. *The major causes of death could be hypovolemia, thromboembolism and preeclampsia. Pregnancy should ideally be avoided in a woman with Eisenmenger syndrome concerning the high maternal mortality rate and probable poor prognosis of the baby."*

— ***https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5094***

*"**In patients with uncorrected coarctation**, pregnancy was once thought to carry such a severe risk to life that termination of pregnancy and sterilization were recommended. **More recently collected series in patients reveal a low maternal mortality: 0% to 3.5%, with good fetal outcome**."*

— http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.502.7242&rep=rep1&type=pdf

128. **Ans is 'a' i.e. Hypoglycemia, 'b' i.e. Hypocalcemia & 'c' i.e. Congestive heart failure**

[*Ref:* ***Dutta's obs 7th/e*** *p. 283-84;* ***COGDT 10th/e*** *ch 18*]

- ***Hypoglycemia may present within the first few hours of life***. *Although the infant is generally asymptomatic, symptoms may include jitteriness, irritability, apathy, poor feeding, high-pitched or weak cry, hypotonia, or frank seizure activity. Hypoglycemia that requires intervention may persist for as long as 1 week.*
- ***Hypocalcemia or hypomagnesemia may also be apparent in the first few hours after birth***. Hypocalcemia (levels < 7 mg/dL) is believed to be associated with a delay in parathyroid hormone synthesis after birth.
- Cardiomyopathy with ventricular hypertrophy and outflow tract obstruction may occur in as many as 30% of IDMs. ***The cardiomyopathy may be associated with congestive failure with a weakly functioning myocardium*** or may be related to a hypertrophic myocardium with significant septal hypertrophy and outflow tract obstruction.
- ***There is hypokalemia (not hyperkalemia) known to be associated in an infant born to diabetic mother.***
- ***There is no mention of hypothyroidism as a complication in an infant born to diabetic mother***

Complications of diabetes in pregnancy

Maternal	• Pre-term labor & PROM • PPH • Polyhdramnios • High risk of pre-eclempsia • Increased infections like UTI, vaginal candidiasis & asymptomatic bacteriuria • Chances of developing type 2 DM in future • Operative delivery
Fetal	• **Macrosomia** (birth weight > 4 kg in Indian context and > 4.5 kg acc to ACOG) • Recurrent first trimester abortions • Sudden IUFD at term • Birth injuries (brachial plexus injury) • **Shoulder dystocia** • Congenital anomalies (eg: **caudal regression syndrome**) • ***IUGR*** (in type 2 diabetic females with vasculopathy)
Neonatal	• Prematurity - Respiratory distress syndrome/ Hyaline membrane disease • ***Hypoglycemia*** • ***Hypocalcemia*** • Hypomagnesemia • ***Hypokalemia*** • Abnormalities of iron metabolism • ***Cardiomyopathy*** • Hyperviscosity syndrome (polycythemia & hyperbilirubinemia) • Congenital malformations i) Congenital heart defects, including single umbilical artery, VSDs (MC), atrial septal defects, TGA, coarctation of the aorta, cardiomegaly) ii) Renal (eg, hydronephrosis, renal agenesis, ureteral duplication), iii) Gastrointestinal (eg, duodenal or anorectal atresia, small left colon syndrome)

129. **Ans is 'a' i.e. Bispinous diameter** [*Ref:* ***Dutta's obs 7th/e*** *p. 87-90*]

- ***Bispinous diameter = 10.5 cm***
- ***Bituberous diameter = 11 cm***
- ***Antero-posterior diameter (true conjugate) = 11cm***
- ***Diagonal conjugate = 12.5 cm***

130. **Ans is 'a' i.e. Skin and subcutaneous tissue in perineal area, 'b' i.e. Superficial perineal muscle & 'c' i.e. Deep perineal muscle**

[*Ref:* ***Dutta's obs 7th/e*** *p422*]

Classification of perineal tears

- Tears are classified into four categories:
  1) **First-degree tear :** laceration is limited to the fourchette and superficial perineal skin or vaginal mucosa
  2) **Second-degree tear :** ***laceration extends beyond fourchette, perineal skin and vaginal mucosa to perineal muscles and fascia, but not the anal sphincter***

3) ***Third-degree tear*** : fourchette, perineal skin, vaginal mucosa, muscles, and ***anal sphincter are torn***; third-degree tears may be further subdivided into three subcategories:
   a) 3a: partial tear of the external anal sphincter involving less than 50% thickness
   b) 3b: greater than 50% tear of the external anal sphincter
   c) 3c: external and internal anal sphincters are torn
4) **Fourth-degree tear** : fourchette, perineal skin, vaginal mucosa, muscles, anal sphincter, and rectal mucosa are torn. Laceration extending through the anal epithelium (resulting with a communication of the vagina epithelium and anal epithelium)
5) **Button-hole tear** : the tear involves rectal mucosa with an intact anal sphincter complex

MEDICINE

131. Ans. is 'a' i.e., Hypercalcemia, 'c' i.e. Elevated calcitriol level & 'e' i.e. Hypophosphatemia [*Ref: Harrison 18th/e p. 3107; 17th/e p. 2382-83; 2210*]

Presentation of Primary Hyperparathyroidism

- **In primary hyperparathyroidism, when secretion of parathyroid hormone becomes excessive it is reflected in bone by :-**
  i) A marked increase of osteoclasts,
  ii) Rapid resorption of bone,
  iii) Decrease of osteoblasts and
  iv) Fibrous replacement of marrow
- Due to increased bone resorption calcium and phosphorus are mobilized from bone to the blood and both calcium and phosphorus are thrown into the bloodstream.
- Although both calcium and phosphorus are excreted mainly by the **kidneys**, elimination of phosphorus is accomplished more **readily** due to the effect of parathyroid hormone on kidney.
- Parathyroid hormone increases the reabsorption of calcium and decrease the reabsorption of phosphorus. *This results in* ***increased calcium level and decrease in serum phosphorus level***.
- The serum calcium level is also increased by stimulatory effect of parathyroid hormone on vit D which increases calcium absorption from the intestine. ***PTH increases conversion of 25-hydroxyvitamin D (calcidiol) to 1,25-dihydroxyvitamin D (calcitriol). Therefore the levels of 1,25-dihydroxyvitamin D are correspondingly often high or high-normal*** and there are normal or low-normal levels of serum 25-hydroxyvitamin D (calcidiol)
- **The alkaline phosphatase level is elevated supposedly because of a compensatory effort at restoring the resorbed bone.**
- Note, that serum alkaline phosphatase is elevated in hyperparathyroidism only when bone disease is present, otherwise, the alkaline phosphatase level is normal.
- **Hyperparathyroidism** (Increased PTH activity) results in:-

Organ	Action	Results
Kidney	• ***Stimulates vitamin D activation*** resulting increased Ca^{2+} absorption in the in the intestine • Increase Ca^{2+} reabsorption in the distal tubule • Decreased PO_4 reabsorption in the proximal tubule	• ***Increased serum Ca^{2+}*** • **Increased phosphate in urine** • ***Decreased phosphate in serum***
Bone	• A marked increase in osteoclastic activity resulting in ***bone resorption:-*** • Bone pain • Osteoporosis • Cyst formation & fibrosis • Brown tumours • Compensatory elevation in osteoblastic activity	• ***Increased serum Ca^{2+}*** • **Elevated serum alkaline phosphatase (due to increased bone turnover)**

Serum abnormalities in hyperparathyroidism

	Serum Ca^{2+}	Serum PO_4	Serum PTH	Alkaline phosphatase	Urine Ca2	Urine cAMP	Serum Calcitriol
Primary	Increased	Decreased	Increased	Increased	Increased	Increased	Increased
Secondary	Normal/ Increased	Normal/ Increased/ Decreased	Increased	Increased	Normal/ Increased/ Decreased	Increased	Decreased

132. **Ans. is 'd' i.e., Shortened QT interval & 'e' i.e. Prominent U wave**

ECG Changes in Hypercalcemia

- ***Hypercalcaemia has been shown to decrease cardiac conduction velocity and shorten the refractory time***. This facilitates re-entry mechanisms and the development of complex ventricular arrhythmias. Important ECG changes include:-
  i) ***Shortening of the QT (QTc) interval***, mainly due to shortening or absence of ST segment (***main ECG abnormality***). The QTc interval is inversely proportional to the serum calcium level up to 16 mg/dL(4 mmol/L). With marked hypercalcemia, the T wave appears to take off right from the end of the QRS complex.
  ii) No changes in the QRS and PR durations have been reported though sometimes it is associated with a slight prolongation of the PR and QRS-intervals. Bizarre QRS complexes have been noted.
  iii) In severe cases, **Osborn waves (J waves)** may be seen. Severe hypercalcemia may also mimic a ST-segment elevation myocardial infarction on the EKG.
  iv) In patients with severe hypercalcaemia (>3.4 mmol/l), second or third degree AV block can occur.
  v) Ventricular irritability and VF arrest has been reported with extreme hypercalcaemia. Cardiac arrhythmias are uncommon in patients with hypercalcemia. However, sudden death during hyperparathyroid crisis and other conditions associated with severe hypercalcemia may be caused by ventricular fibrillation
  vi) Hypercalcemia usually does not alter the morphology of the P waves or T waves
  vii) ***The U wave amplitude is either normal or increased***

133. **Ans. is 'a' i.e., Sudden increase in preload, 'c' i.e. Increased ejection fraction & 'e' i.e. Decreased after load** [*Ref: Braunwald 7th/e p. 1569, 1570; Harrison 18th/e p. 1935;17th/e p. 1470; O.P. Ghai Pediatrics 5th/e p. 279-281*]

Hemodynamics of mitral regurgitation

- Mitral regurgitation can be divided into the following 3 stages: acute, chronic compensated, and chronic decompensated.
- In the acute stage, which usually occurs with a spontaneous chordae tendineae or papillary muscle rupture secondary to myocardial infarction, ***a sudden volume overload (pre-load) occurs on an unprepared left ventricle and left atrium***.
- The volume overload on the left ventricle increases left ventricular stroke work. Increased left ventricular filling pressures, combined with the transfer of blood from the left ventricle to the left atrium during systole, results in elevated left atrial pressures. This increased pressure is transmitted to the lungs resulting in acute pulmonary edema and dyspnea.
- **Mitral regurgitation overloads the volume of the left ventricle as well as the left atrium.** The left ventricle has to cope with stroke volume and regurgitant volume. ***The ventricle can adapt in three ways, i.e. by increasing its:***
  i) Size,
  ii) ***Contractility***, or
  iii) Heart rate
- Usually all of these mechanisms are involved. However, in the setting of acute mitral regurgitation the ventricle is unable to increase its size rapidly. Thus, the ventricle has to rely on the other two mechanisms to maintain adequate stroke volume. ***Therefore, acute mitral regurgitation is characterized by a hyperdynamic, rapidly beating left ventricle that is either is normal or slightly enlarged***.
- ***In acute MR the ejection fraction is high*** and the size of the left ventricle is normal or slightly enlarged (unadapted). In chronic MR the ejection fraction is supranormal and the left ventricle dilated (adapted). In decompensated MR the left ventricle is significantly enlarged and ejection fraction starts to drop.
- It should be noted that ***mitral regurgitation is marked by a state of decreased afterload*** (unloaded left ventricle). The ventricle pumps against less resistance and blood is able to "escape" through the defect.
- Higher afterload (i.e. hypertension) may aggravate the degree of mitral regurgitation.
- In a setting of significant MR, an ejection fraction of 55% to 60% (which is otherwise considered normal) already denotes left ventricular failure.
- If the patient tolerates the acute phase, the chronic compensated phase begins. The chronic compensated phase results in eccentric left ventricular hypertrophy. The combination of increased preload and hypertrophy produces increased end-diastolic volumes, which, over time, result in left ventricular muscle dysfunction. This muscle dysfunction impairs the emptying of the ventricle during systole. Therefore, regurgitant volume and left atrial pressures increase, leading to pulmonary congestion.

134. **Ans. is 'b'i.e., Hyperostosis, 'c' i.e. Desquamation of skin, 'd' i.e. Hirsutism & 'e' i.e. Spleen and liver enlargement**
[*Ref: O.P. Ghai 6th/e p. 121; Harrison 16th/e p. 408*]

- ***Xerophthalmia (dry eye) occurs due to vitamin A deficiency (not excess).***
- ***All other mentioned side effects are noticed with vitamin A excess.***

Hypervitaminosis A

- Hypervitaminosis A results from excessive intake of preformed vitamin A. A genetic variance in tolerance to vitamin A intake may occur. Daily intakes of 1500 IU/kg body weight reportedly leading to toxicity. It usually manifests in children, and one recognized cause is administration from 13-cis retinoic acid for treatment of cancers such as neuroblastoma.

Manifestations of Hypervitaminosis A

A. ***Acute manifestations*** mainly include signs and symptoms are due to raised intracranial tension (***pseudotumor cerebri***) → **headache**, nausea, vomiting, drowsiness, bulging fontanelles, diplopia, **papilledema** and cranial nerve palsies.

B. *Chronic intoxication:-*

Skin and hair changes	• Pruritus, dry skin, dry lips, ***desquamation of skin***, Cracking at corners of the mouth, alopecia, Higher sensitivity to sunlight, Oily skin and hair (seborrhea), hirsutism, coarsening of hair, Yellow discoloration of the skin (aurantiasis cutis)
Bone and soft tissues	• Soft tissue nodules, Diffuse symmetric periostitis, Premature fusion of ossification centres, Abnormal softening of the skull bone (craniotabes—infants and children), Separation of cranial sutures, Tendinous/ligamentous calcifications (***Diffuse Idiopathic Skeletal Hyperostosis (DISH)***, Bone pain or swelling, Spontaneous fracture
Other	• Anorexia, weight loss, Gastric mucosal calcinosis, Heart valve calcification, Hypercalcemia, Poor weight gain (infants and children), • ***Hepatosplenomegaly***

- **Vitamin A is teratogenic if given in pregnancy.**

135. Ans. is 'a' i.e. Serum albumin & 'e' i.e. Nutritional status

[*Ref:* ***Harrison 19th/e*** *p. 1995 &* ***18th/e*** *p. 2526;* ***CMDT 2016*** *p. 693*]

The Model for End-stage Liver Disese (MELD)

- It is a prospectively developed and validated chronic liver disease severity scoring system that uses a patient's laboratory values for -
  - *i) Serum bilirubin*
  - *ii) Serum creatinine*
  - *iii) The international normalized ratio (INR) for prothrombin time to predict three month survival.*
- Patients with cirrhosis, and increasing MELD score is associated with increasing severity of hepatic dysfunction and increased three-month mortality risk.

136. Ans. is 'a' i.e., Almost always associated with diabetic retinopathy, 'c' i.e. May be associated with microscopic haematuria, 'd' i.e. Kidney size is normal initially & 'e' i.e. Angiotensin receptor inhibitors can reverse proteinuria

[*Ref :* ***Harrison 18th/e*** *p. 2982, 2983;* ***17th/e*** *p. 2288;* ***Robbin's 7th/e*** *p. 992*]

- ***Almost all patients with nephropathy and type 1 DM demonstrate signs of diabetic microvascular disease, such as retinopathy and neuropathy.***
- ***The overall prevalence of microalbuminuria and macroalbuminuria in both types of diabetes is approximately*** 30-35%.

*"**Although some patients with diabetic nephropathy with overt proteinuria have microscopic haematuria,** the pathological characteristics and clinical significance related to microscopic haematuria have not yet been clarified."*

https://www.ncbi.nlm.nih.gov/pubmed/23714227

- ***The glomeruli and kidneys are typically normal or increased in size initially.***
- Number of Hypertensives can control B.P. in diabetes mellitus but only ***ACE inhibitors and aldosterone receptor antagonist reduces the progression of microalbuminuria to overt nephropathy.***

137. Ans. is 'b' i.e., Nocturnal diarrhea, 'c' i.e. Erectile dysfunction, & 'd' i.e. Dependent edema

[*Ref:* ***Harrison 18th/e*** *p. 2984;* ***17th/e*** *p. 2289*]

- ***Diabetic neuropathy is characterized by Resting tachycardia (not bradycardia)***
- ***In Diabetic neuropathy there is characteristic involvement of the third nerve with prominent ptosis and ophthalmoplegia and normal pupillary constriction.***

*"**The postural regulation of blood flow is impaired in patients with diabetic neuropathy**. This disturbance is compatible with a loss of sympathetic vascular tone and arteriovenous shunting. In particular, the capability of effective precapillary vasoconstriction on standing is reduced. This exposes the capillary bed to a high hydrostatic load, resulting in hyperperfusion and increased shear force in the microcirculation on dependency which in turn leads to thickening of the capillary basement membrane and oedema of the feet and lower legs".*

https://journals.sagepub.com/doi/pdf/10.1177/147465141247233

- All other mentioned features are found in diabetic neuropathy.

Cardiovascular	• ***Resting tachycardia***/Persistent sinus tachycardia/ Sinus arrhythmia • Exercise intolerance • Orthostatic hypotension • Silent myocardial ischemia • Decreased heart variability in response to deep breathing • Near syncope upon changing positions from recumbent to standing

Gastrointestinal	• Esophageal dysmotility/ Dysphagia • Heartburn and bloating • Gastroparesis diabeticorum • Constipation • ***Diarrhea (including nocturnal diarrhea)*** • Nausea/vomiting • Fecal incontinence • Abdominal pain • Malabsorption
Genitourinary	• Neurogenic bladder (diabetic cystopathy) • Urinary incontinence (loss of bladder control) • Poor urinary stream • Feeling of incomplete bladder emptying • Straining to void • ***Erectile dysfunction*** • Retrograde ejaculation • Female sexual dysfunction (e.g., loss of vaginal lubrication) • Anorgasmia
Sudomotor	• Anhidrosis • Heat intolerance • Gustatory sweating • Dry skin
Metabolic	• **Hypoglycemia unawareness** :- Autoimmune neuropathy may reduce counter regulatory hormone release leading to hypoglycaemia unawareness, thereby subjecting the patient to risk of severe hypoglycaemia. This point is frequently asked in examinations. • Hypoglycemia-associated autonomic failure
Ophthalmologic	• **Pupillomotor function impairment** (e.g., decreased diameter of dark-adapted pupil) • Argyll-Robertson pupil • Vision changes
Other	• Dysesthesia, or a distorted sense of touch • Fasciculation • Muscle weakness • Facial, mouth and eyelid drooping • Dizziness

138. **Ans. is 'c' i.e. Panobinostat & 'd' i.e. Bendamustine**

[*Ref:* ***https://emedicine.medscape.com/article/1167145-overview#a8***]

- ***Panobinostat & 'bendamustine are used in chemotherapy for multiple myeloma***
- ***Other mentioned 3 drugs are used in targeted therapy for multiple myeloma.***

Treatment of multiple myeloma

- While there is no cure for multiple myeloma, the goals of treatment is to eliminate myeloma cells, control tumor growth, control pain, and allow patients to have an active life.
- Disease-directed treatment typically includes drug therapy, such as targeted therapy and/or chemotherapy, with or without steroids. Stem cell transplantation may be an option. Other types of treatments, such as radiation therapy and surgery, are used in specific circumstances.
- The treatment plan includes different phases:
  i) **Induction therapy** for rapid control of cancer and to help relieve symptoms
  ii) **Consolidation** with more chemotherapy or stem cell transplant
  iii) **Maintenance therapy** over a prolonged period to prevent cancer recurrence

Drug therapy

- The types of systemic therapies used for multiple myeloma include:
  i) Chemotherapy
  ii) Targeted therapy
  iii) Immunotherapy

Chemotherapy

- Chemotherapy drugs used successfully for the treatment of myeloma include cyclophosphamide, doxorubicin, vincristine, melphalan, etoposide, cisplatin, ***panobinostat***, carmustine and ***bendamustine***.
- It may also be recommended to combine chemotherapy with other types of treatment, including targeted therapies or steroids.

For instance, the combination of melphalan, the steroid prednisone, and a novel targeted therapy called bortezomib is approved by the U.S. Food and Drug Administration (FDA) for the initial treatment of multiple myeloma.

- The length of chemotherapy treatment varies from patient to patient and is usually given until the myeloma is well controlled.

Targeted therapy

- Targeted therapy is a treatment that targets the cancer's specific genes, proteins, or the tissue environment that contributes to cancer growth and survival. This type of treatment blocks the growth and spread of cancer cells while limiting damage to healthy cells.
- Targeted therapy for multiple myeloma includes:
  i) Proteasome inhibitors:- ***Bortezomib***, carfilzomib, and ixazomib
  ii) Panobinostat is an inhibitor of the enzyme histone deacetylase (HDAC).
  iii) Monoclonal antibodies:- ***Elotuzumab and daratumumab***
  iv) Other :- Thalidomide and lenalidomide
- Thalidomide and lenalidomide, bortezomib are targeted therapies approved to treat newly diagnosed patients.
- Targeted therapies may also be used in combination with chemotherapy or steroid medications.
- Thalidomide, lenalidomide, and bortezomib can also be effectively used as maintenance therapy to extend the disease's response to the initial therapy or after a stem cell transplant.

Immunotherapy (biologic therapy)

- Lenalidomide, pomalidomide, and thalidomide are drugs that stop the growth of myeloma cells in the bone marrow. These drugs strengthen the immune cells so they attack cancer cells. They starve the cancer cells by blocking angiogenesis.

Other drug therapy

- Steroids, such as prednisone and dexamethasone, may be given alone or at the same time as other drug therapy, such as with targeted novel therapy or chemotherapy.
- A new bone targeting agent called denosumab which is an antibody and is typically given monthly, was recently approved.

Bone modifying drugs

- These drugs help strengthen the bone and reduce bone pain and the risk of fractures.
- There are 2 types of bone modifying drugs available for treating bone loss from multiple myeloma:-
  i) **Bisphosphonates**, such as zoledronic acid and pamidronate. For multiple myeloma, either pamidronate or zoledronic acid is given by IV every 3 to 4 weeks.
  ii) **Denosumab** is an osteoclast-targeted therapy called a RANK ligand inhibitor. It may be a better option for people with severe kidney problems.
- Treatment with a bone modifying drug is recommended for up to 2 years.
- Bone modifying drugs are not recommended for people with the following conditions :
  i) Solitary plasmacytoma
  ii) Smoldering (indolent) myeloma
  iii) Conditions of abnormal plasma cells that are not myeloma but may eventually become myeloma, such as monoclonal gammopathy of undetermined significance (MGUS)

Bone marrow transplantation/stem cell transplantation

- There are 2 types of stem cell transplantation depending on the source of the replacement blood stem cells: allogeneic (ALLO) and autologous (AUTO).
- For multiple myeloma, AUTO is more commonly used. The goal is to destroy all of the cancer cells in the marrow, blood, and other parts of the body using high doses of chemotherapy (usually melphalan) and then allow replacement blood stem cells to create healthy bone marrow and better immunity.

Radiation therapy

- The most common type of radiation treatment is called external-beam radiation therapy.

Surgery

- Surgery is not usually a disease-directed treatment option for multiple myeloma, but it may be used to relieve symptoms. Surgery is used to treat bone disease, especially if there are fractures, and recent plasmacytomas, especially if they occur outside the bone.

139. Ans. is 'b' i.e. Cognitive impairment, 'c' i.e. Visual impairment & 'e' i.e. Imaging shows enhancing white matter demyelinating lesions with surrounding edema [*Ref:* ***https://emedicine.medscape.com/article/1167145-overview#a5***]

Progressive multifocal leukoencephalopathy (PML)

- ***PML is a demyelinating disease*** of the central nervous system characterized by widespread lesions due to *infection of* ***oligodendrocytes by JC virus, which is a human polyomavirus (formerly known as papovavirus)***. It is a small non-enveloped double-stranded DNA virus.
- **It occurs almost exclusively in immunosuppressed individuals, e.g., patients with AIDS**, hematological and lymphoreticular malignancies, autoimmune rheumatological diseases, or those having undergone organ transplantation.
- PML is associated with both HIV-1 and HIV-2. HIV infection accounts for almost 85% of the total cases. It is currently one of the AIDS-defining illnesses in HIV-infected patients.

- HIV-associated PML also occurs during immune recovery following the initiation of highly active antiretroviral therapy (HAART).
- Most patients with HIV infection develop PML in the setting of a poor immunological status expressed by a low CD4 cell count (< 200/μL).

Presentation

- PML causes lesions on the white matter of the brain. Patients with progressive multifocal leukoencephalopathy (PML) typically experience insidious onset and steady progression ***of focal symptoms that include behavioral, speech, cognitive, motor (eg, head tremor), and visual impairment***.
- PML demonstrates more rapid progression than AIDS dementia complex (ADC). Involvement of the brainstem is more commonly seen in PML associated with AIDS than with other entities.
- Although seizures have been considered a rare manifestation of PML, it usually responded well to treatment.
- Focal neurologic signs include aphasia, hemiparesis, ataxia, cortical blindness, limb apraxia, brainstem symptoms and, less frequently, head tremor. Focal signs tend to be related to posterior brain (eg, occipital lobes). Gait abnormalities occur in up to 65% patients, and ***cognitive dysfunction*** is seen at the time of presentation in up to 30% people.
- Conjugate gaze abnormalities are common. Abnormalities may progress to quadriparesis and coma.

Imaging

- MRI scan is far more sensitive than CT scan. CT scan may show hypodense lesions. On MRI, PML lesions characteristically are hypointense on T1-weighted images; On T2-weighted and fluid-attenuated inversion recovery (FLAIR) sequences, PML lesions are characteristically hyperintense.
- ***With CT scan or MRI of the brain, single or multiple confluent lesions without mass effects are seen, most frequently in the parieto-occipital white matter***. The demyelinating plaques involve subcortical U fibers but tend to spare the cortical ribbons and deep gray matter structures;
- PML sometimes can resemble lymphoma, toxoplasmosis, or HIV encephalitis. However, the absence of a mass effect or displacement of normal structures is more consistent with PML than these other disorders.
- ***Neuroimaging in patients with inflammatory PML may demonstrate atypical features, including a mass effect of the PML lesions with surrounding edema***.

Lumbar Puncture

- Cerebrospinal fluid (CSF) is usually normal, but protein levels may be elevated slightly. CSF pleocytosis can sometimes occur, but the cell count is usually less than 20/μL. JC virus culture in the CSF is usually unrevealing.

Brain biopsy

- Mild cortical atrophy may be seen on biopsy specimens. Immunohistochemistry or in situ hybridization is the best method to confirm JC virus in the biopsy specimen.
- Multiple demyelinative foci may be seen in the cerebral, cerebellar, and brainstem white matter and at the gray-white matter junction;

Treatment

- All treatments are experimental in progressive multifocal leukoencephalopathy (PML). The principal approach is antiretroviral therapy. Treatment guidelines for PML recommend (1) starting antiretroviral therapy immediately in patients with PML who are not on therapy and (2) optimizing the antiretroviral regimen for virologic suppression in patients who are receiving antiretroviral therapy but who remain HIV-viremic because of antiretroviral resistance.
- Intensive treatment with 4 classes of antiretroviral drugs, including enfuvirtide, has been reported as providing a possible survival benefit in PML patients with undetectable plasma HIV.]
- The use of drugs that block the serotonergic 5HT2a receptor (eg, olanzapine, ziprasidone, mirtazapine, cyproheptadine, risperidone) has been suggested as treatment for PML.
- Mefloquine has been suggested as one of the options based on its in vitro activity against the JC virus, but a recent trial showed the lack of efficacy.

40. **Ans. is 'd' i.e. Absence of proteinuria is pathognomic** [*Ref:* ***Robbin's 9th/e*** *p. 923-924*]

IgA nephropathy (Berger's nephropathy)

- It is the most common type of glomerulonephritis worldwide. **Children** and young adults are commonly affected. It occurs after an **upper respiratory tract infection or gastrointestinal infection**.

Clinical presentation

- ***The disease typically undergoes clinical exacerbations and remissions after an upper respiratory tract infection or less commonly gastrointestinal or urinary tract infection.***
- ***Presents as gross haematuria within 1-2 days after an upper respiratory tract infection and typically resolves within 5 days.*** This feature distinguishes it from PSGN. In PSGN haematuria occurs 7-21 days after respiratory infection or pyoderma.
- Can also present with **nephritic or nephrotic syndrome**.
- ***Mild to moderate hypertension***.
- ***Proteinuria may or may not be associated***.

Pathology

- IgA nephropathy is a ***mesangioproliferative GN as there is focal and segmental mesangial proliferation.***
- ***There is increase in serum polymeric IgA and circulating IgA containing immune complexes are present in some patients.***
- ***The sine qua non for diagnosis is the presence of mesangial IgA deposition on immunofluorescence microscopy. IgA deposition in mesangium is often associated with C3 and properidin (IgG is present in 50% of cases).***
- There is mesangial hypercellularity, sclerosis; with electron dense deposition.
- **Serum complement level is normal**. This feature also differentiates it from PSGN. In PSGN complement (C3) level is decreased.
- Whereas IgA nephropathy is an isolated renal disease, similar **IgA deposits are also found in systemic disorders of children like Henoch shonlein purpura, which also have renal vasculitis as a component In view of the high frequency of IgA nephropathy in children, IgA can be used as marker for renal vasculitis.**

Course

- ***The disease typically undergoes clinical exacerbations and remissions in the first year and then undergoes long term remission.*** This is also an important differentiating feature between IgA and poststreptococcal glomerulonephritis. In poststreptococcal glomerulonephritis recurrences are rare.
- Angiotensin-converting enzyme inhibitors (ACEIs) or ***angiotensin receptor blockers (ARBs) are the preferred agents for lowering blood pressure and decreasing proteinuria.***

141. Ans. is 'a' i.e. Endotrachial tube in esophagus, 'b' i.e. Endotrachial tube extubation, 'd' i.e. Ventilator circuit break & 'e' i.e. Ventilator disconnected [*Ref: http://bcrt.ca/wp-content/uploads/2010/09/capnography_quickguide.pdf*]

$EtCO_2$ changes	Causes
Sudden flat EtCO2 tracing ($EtCO_2$ - zero)	• *Ventilator disconnection* • Airway misplaced – *extubation, oesophageal intubation* • *Capnograph not connected to circuit* • Respiratory/Cardiac arrest • Apnoea test in brain death dead patient • Capnongraphy obstruction
Increased $ETCO_2$	• **CO_2 Production** ▪ Fever ▪ Sodium bicarbonate ▪ Tourniquet release ▪ Venous CO_2 embolism ▪ Overfeeding • **Pulmonary perfusion** ▪ Increased cardiac output ▪ Increased blood pressure • **Alveolar ventilation** ▪ Hypoventilation ▪ Bronchial intubation ▪ Partial airway obstruction ▪ Rebreathing • **Apparatus malfunctioning** ▪ Exhausted CO2 absorber ▪ Inadequate fresh gas flows ▪ Leaks in ventilator tubing ▪ Ventilator malfunctioning
Sudden drop in CO_2 to zero or to a low level	• It always indicates a technical disturbance or defect: ▪ Spontaneous breathing or ventilated patients:- • Kinked ET-tube • CO_2 analyzer defective ▪ Ventilated patients:- • Total disconnection • Ventilator defective

Decreased $ETCO_2$ (not to zero)	• **Decreased CO_2 production**
	  • Hypothermia
	• **Pulmonary perfusion**
	  • Reduced cardiac output
	  • Hypotension
	  • Hypovolaemia
	  • Pulmonary embolism
	  • Cardiac arrest
	• **Alveolar ventilation**
	  • Hyperventilation
	  • Apnoea
	  • Total airway obstruction (note high airway pressures)
	  • Extubation
	• **Apparatus malfunctioning**
	  • Circuit disconnection (note low airway pressures)
	  • Leaks in sampling tube
	  • Ventilator malfunctioning

Sudden change in baseline	• Calibration error • CO_2 absorber saturated (check capnograph with room air) • Water drops in analyzer or condensation in airway adapter
Sudden increase in $ETCO_2$	• ROSC during cardiac arrest • Correction of ET tube obstruction
Elevated inspiratory baseline	• CO_2 rebreathing (e.g. soda lime exhaustion) • Contamination of CO_2 monitor (sudden elevation of base line and top line) • Inspiratory valve malfunction (elevation of the base line, prolongation of down stroke, prolongation of phase III)

142. **Ans. is 'c' i.e. Patient with positive family history of gastric carcinoma, 'd' i.e. Chronic use of NSAIDs & 'e' i.e. Long term use of proton pump inhibitors**

[*Ref*: ***Harrison 19th/e*** *p. 1911-21;* ***CMDT 2015*** *p.607-612;* ***Various internet references***]

Eradication of H pylori infection indications

- Eradication of H pylori infection is recommended in :-
  a) Patients with gastroduodenal diseases such as peptic ulcer disease and low grade gastric, mucosa associated lymphoid tissue (MALT) lymphoma;
  b) Patients with atrophic gastritis;
  c) After gastric cancer resection
  d) ***First degree relatives of patients with gastric cancer.***
  e) Patients with unexplained iron deficiency anaemia; and
  f) Patients with chronic idiopathic thrombocytopenic purpura.
  g) ***In patients receiving long term maintenance treatment with PPIs***
  h) ***Before starting long term NSAID treatment***
  i) Patients wishes (after full consultation with their physician)
- Recurrent abdominal pain in children is not an indication for a "test and treat" strategy if other causes are excluded.

143. **Ans. is 'a' i.e., Primary polydypsia, 'c' i.e. Desmopressin therapy & 'e' i.e. Cerebral salt wasting**

[*Ref*: ***Harrison 18th/e*** *p. 345 (fig 45.5), 346 t. (45.1);* ***17th/e*** *p. 277 t. (46.2); 278;* ***C.M.D.T. 2004*** *p. 835*]

Differential diagnoses of SIADH

- ***The differential diagnoses of SIADH include other hyponatremic conditions***, which can be divided into those that cause impairment in urinary water excretion and those in which renal handling of water is normal.
  A. **Conditions in which renal water handling is impaired** include the following:
     a. Effective circulating volume depletion - GI losses (eg, diarrhea, vomiting), renal losses (eg, diuretic therapy, adrenal insufficiency, primary renal salt wasting), skin losses, edematous disorders (congestive heart failure, cirrhosis with portal hypertension, severe nephrotic syndrome)
     b. Renal failure - Acute kidney injury (AKI) or chronic kidney disease (CKD)
     c. Other states of ADH excess - ***Cortisol deficiency***, hypothyroidism, exogenous ADH (eg, deamino-D-arginine-vasopressin (***desmopressin***), ***vasopressin***, oxytocin)
     d. Decreased solute intake
     e. Exercise-induced hyponatremia

f. Nephrogenic syndrome of inappropriate anti-diuresis (NSIAD)

B. **Disorders with normal water excretion** include the following:
   a. ***Primary polydipsia***
   b. Reset osmostat
   c. ***Cerebral salt wasting***

144. Ans. is 'd' i.e., Diuretics & 'e' Adrenocortical insufficiency [*Ref: **Harrison 18th/e** p. 345, 346*]

Differential diagnoses of hyponatremic conditions

Hypovolemic Hyponatremia	Hypervolemic Hyponatremia	Euvolemic Hyponatremia
• Gastrointestinal fluid loss (diarrhea or vomiting) • Third spacing of fluids (pancreatitis, hypoalbuminemia, small bowel obstruction) • ***Diuretics use*** • Osmotic diuresis (glucose, mannitol) • Salt-wasting nephropathies • Cerebral salt-wasting syndrome (urinary salt wasting, possibly caused by increased brain natriuretic peptide) • Addison's disease and congenital adrenal hyperplasia in which the adrenal glands do not produce enough steroid hormones (***combined glucocorticoid and mineralocorticoid deficiency***) • Mineralocorticoid deficiency • Exercise-associated hyponatremia (EAH).	• Renal causes (Acute renal failure, chronic renal failure, Nephrotic syndrome) • Extrarenal causes (Congestive heart failure, Cirrhosis) • Iatrogenic • Excessive drinking of fluids	• Drugs as mentioned (vasopressin analogs such as desmopressin and oxytocin, SSRIs and other antidepressants, opioids, thiazide diuretics, carbamazepine, vincristine, nicotine, antipsychotics, chlorpropamide, cyclophosphamide, NSAIDs, Illicit drugs such as MDMA or ecstasy). • ***SIADH*** • Addison's disease • Hypothyroidism • High fluid intake in conditions like ***primary polydipsia***; or potomania (caused by a low intake of solutes with relatively high fluid intake) • Medical testing related to excessive fluids such as a colonoscopy or cardiac catheterization • Iatrogenic • Beer potomania • Normal physiologic change of pregnancy • Reset osmostat

145. Ans. is 'a' i.e. Coagulation of proteins, 'd' i.e. In burn & 'e' i.e. 65° burn [*Ref: **Essentials of Medical Physiology** p. 58*]

- ***Heat rigor is defined as coagulation of muscle protein induced by high temperatures (above 50-60°C)***.
- ***Heat stroke*** is the most severe heat-related illness and is defined as ***a body temperature higher than 41.1°C (106°F)*** associated ***with neurologic dysfunction***.
- ***Heat exhaustion is the milder form of heat injury then heat stroke***. Heat exhaustion can quickly turn into heatstroke if left untreated.

Heat rigor

- ***It is defined as coagulation of muscle protein induced by heat. At high temperatures (above 50-60°C)***, there occurs coagulation of muscle proteins leading to stiffness and shortening of muscle fibers. Condition is known as heat rigor. It is an irreversible phenomenon.
- Heat rigor does not occur in body as such a high temperature not compatible with life, though another type of rigor, rigor mortis can occur after death.

146. Ans. is 'b' i.e. Is associated with lower limb paresis, 'c' i.e. Causes saddle anesthesia & 'e' i.e. Is associated with bladder, bowel and pudendal nerve dysfunction

[*Ref: **Harrison 19th/e** p. 115, 1791, 2651*]

- ***Below the L1 or L2 vertebral bones the spinal canal contains only nerve roots with no spinal cord, forming the cauda equina, meaning "horse's tail". Compression, trauma or other damage to cauda equina region of the spinal canal can result in cauda equina syndrome.***

Cauda equina syndrome

- Compression, trauma or other damage to cauda equina region of the spinal canal can result in cauda equina syndrome.
- The cause is usually a disc herniation in the lower region of the back. Other causes include spinal stenosis, cancer, trauma, epidural abscess, and epidural hematoma.

Clinical presentation

- Patients can present with symptoms of isolated cauda equina syndrome, isolated conus medullaris syndrome, or a combination. The symptoms and signs of cauda equina syndrome tend to be mostly lower motor neuron (LMN) in nature, while those of conus medullaris syndrome are a combination of LMN and upper motor neuron (UMN) effects.
- It can present with:-

i) Severe back pain
ii) ***Saddle anesthesia*** i.e., anesthesia or paraesthesia involving S3 to S5 dermatomes, including the perineum, external genitalia and anus.
iii) ***Bladder and bowel dysfunction*** caused by decreased tone of the urinary and anal sphincters. Detrusor weaknesses causing urinary retention and post-void residual incontinence.
iv) Sciatica-type pain on one side or both sides.
v) ***Weakness of the muscles of the lower legs (often paraplegia)***
vi) Achilles (ankle) reflex & ***knee jerk are absent on both sides.***
vii) Sexual dysfunction
viii) Absent anal reflex and bulbocavernosus reflex
ix) Gait disturbance

- Severe back pain, saddle anesthesia, incontinence and sexual dysfunction are considered "red flags", i.e. features which require urgent investigation.

147. **Ans. is 'a' i.e. Increased serum immunoglobulins level & 'c' i.e. Increased level of C-reactive protein**

[*Ref:* ***Harrison 19th/e*** *p. 115, 1791, 2651*]

- ***The red cells settle at a faster rate in the presence of an increased level of proteins, particularly proteins called acute phase reactants. The level of acute phase reactants such as C-reactive protein (CRP) and fibrinogen increases in the blood in response to inflammation.***
- ***The ESR is decreased in*** polycythemia, ***hyperviscosity, sickle cell anemia, spherocytosis,*** leukemia, chronic fatigue syndrome, low plasma protein (due to liver or kidney disease) and congestive heart failure. ***Although increases in immunoglobulins usually increase the ESR, very high levels can reduce it again due to hyperviscosity of the plasma.***

Factors That May Influence ESR	
Increase ESR	• Old age • Female • Pregnancy • Anemia • Red blood cell abnormalities ▪ Macrocytosis • Technical factors ▪ Dilutional problem ▪ Increased temperature of specimen ▪ Tilted ESR tube • Elevated fibrinogen level ▪ Infection ▪ Inflammation ▪ Malignancy
Decrease ESR	• Extreme leukocytosis • Polycythemia • Red blood cell abnormalities ▪ ***Sickle cell disease*** ▪ Anisoctyosis • ***Spherocytosis*** ▪ Acanthocytosis ▪ Microcytosis • Technical factors ▪ Dilutional problem ▪ Inadequate mixing ▪ Clotting of blood sample ▪ Short ESR tube ▪ Vibration during testing • Protein abnormalities ▪ Hypofibrinogenemia ▪ ***Hypogammaglobulinemia*** ▪ ***Dysproteinemia with hyperviscosity state***
No clinically significant effect or questionable effect	• Obesity • Body temperature • Recent meal • Aspirin • NSAIDs

148. **Ans. is 'All' i.e. a, b, c, d & e** [*Ref:* ***Harrison 19th/e p. 287; CMDT 2015 p. 585***]

High gradient (SAAG >1.1 g/dL)	Low gradient (SAAG < 1,1 g/dL)
• *Cirrhosis* • Veno-occlusive disease (IVC obstruction) • Sinusoidal obstruction syndrome • Fulminant hepatic failure • *Hepatic vein obstruction (ie, Budd-Chiari syndrome)* • Congestive heart failure • *Nephrotic syndrome* • Protein-losing enteropathy • Malnutrition • *Myxedema (Hypothyroidism)* • *Ovarian tumors (Meigs syndrome)* • Pancreatic ascites • Biliary ascites • Malignancy • Trauma • Portal hypertension	• Tubercular peritonitis • Pyogenic peritonitis • Neoplasms ▪ Primary peritoneal mesothelioma ▪ Secondary peritoneal carcinomatosis • Pancreatic ascites (pancreatic pseudocyst) • Biliary leak • Fungal and parasitic infections (*eg, Candida, Histoplasma, Cryptococcus, Schistosoma mansoni, Strongyloides, Entamoeba histolytica*) • Sarcoidosis • Foreign bodies (ie, talc, cotton and wood fibers, starch, barium) • Systemic lupus erythematosus • Henoch-Schönlein purpura • Eosinophilic gastroenteritis • Whipple disease • Endometriosis

149. **Ans. is 'b' i.e. Arises early in Von Hippel Lindau syndrome, 'd' i.e. Highly vascular & 'e' i.e. Alpha blockers are used before performing surgical treatment** [*Ref:* ***Harrison 19th/e p. 2329; Robbin's 9th/e p.1134***]

- ***Pheochromocytoma is usually a part of multiple endocrine neoplesia syndrome type-2 . It is rarely associated with MEN type -1.***
- ***The peak incidence of pheochromocytoma is from the third to the fifth decades of life but pheochromocytomas in VHL patients usually present in the second to third decade of life.***

"Pheochromocytomas usually present in the second decade of life in VHL patients and rarely transform into malignant tumors."
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5541202/

- ***Only 10% of pheochromocytomas are bilateral.***
- ***They are highly vascular tumors.***
- ***Pheochromocytoma secrete large amount of catecholamine which results in hypertension crisis. Catecholamine secretion will be further increased during surgery. This effect of catecholamines are blocked by giving α blockers and β blockers.***

150. **Ans. is 'e' i.e., Urine** [*Ref:* ***Harper 30th/e p. 254 & 29th/e p. 238; Dinesh puri 3rd/e p. 237; Textbook of Pulmonary Medicine by D. Behera 2nd/e p. 1564; Clinical Hematology Theory and Procedures by Mary Louise Turgeon 4th/e p. 461***]

- *Urine of a healthy person does not contain cholesterol.*
- *All other mentioned options contain cholesterol in some amount.*

Composition of plasma lipoproteins

	Chylomicron	VLDL	LDL	HDL
1. Particle mass (kD)	400,000	10000-80,000	2300	175-360
2. Density (g\cm3)	< 0-95	0-95-1-006	**1-018-1-063**	1-063-1-21
3. Diameter (A)	1000-10,000	300-700	**150-250**	75-100
4. Apolipoproteins	A, B, C, E	B, C, E	B	A, C, D, E
5. Components (% dry weight) • Apolipoproteins • Triacylglycerols • *Cholesterol* • Phospholipids	 1-5-2-5 84-89 4-8 7-9	 5-10 50-65 15-23 15-20	 20-25 7-10 ***40-50*** 15-20	 40-55 3-5 ***15-18*** 20-35

Composition of Transudate and Exudate

Characteristics	Transudate	Exudate
Appearance	Clear	Cloudy, Turbid
pH	7.4- 7 .5	7.35 - 7.45
Specific gravity	<1.016	>1.016

Erythrocytes	Few < 500/mm3	Variable
Leukocytes	< 1,000 ***Typically < 250/mm3*** ***Few Neutrophils*** ***Few Lymphocytes, > 50% lymphocyte or mononuclear cells*** ***> 50 polymorphs***	>1,000 ***Typically > 1000/mm3*** ***> 50% lymphocytes (T.B. malignancy)***
Glucose level > 60 mg/dl	Equal to serum levels	Possibly decreased
Protein level (absolute value)	< 3.0g/dl	>3.0g/dl
Pleural fluid-serum Ratio of protein	< 0.5	>0.5
LDH level (absolute value)	Low (<200)	High (>200 IU/L)
Pleural fluid cholesterol	***≤ 55mg/dl***	***≥ 55mg/dl***

151. **Ans. is 'c' i.e., Large fiber neuropathy** [*Ref: **Robbin's 9th/e** p. 262; **Harrison 18th/e** p. 64*]

- ***Amyloidosis results in small fiber polyneuropathy.***
- ***Rest of the mentioned options can be seen in amyloidosis.***

ORGANS INVOLVED IN AMYLOIDOSIS

- In generalized amyloidosis any tissue can be involved, but commonly affected organs are -
  1) ***In secondory (AA) amyloid*** → Kidneys, Liver, spleen, lymph nodes, adrenals and thyroid.
  2) ***In primary (AL) amyloid*** → Heart, Kidney, GIT, peripheral nerves, skin and tongue.

Organ involved	Findings
Kidney (most common organ involved)	• ***Nephrotic range proteinuria (most common)*** • **Hypertension** (in 20-50%) • Fanconi syndrome • Edema • Nephrogenic diabetes insipidus • Azotemia (when there is tubular involvement) • Renal vein thrombosis • Renal tubular acidosis • Rarely chronic kidney disease. • Urine may show **RBC cast** • **The size of kidney is characteristically normal or increased.**
Heart (second most common organ involved)	• Cardiomegaly • Arrhythmias • Conduction abnormalities like atrioventricular block or sinus node dysfunction • ***Rapidly progressive congestive heart failure*** • **It is the leading cause of mortality**
Liver and spleen	• ***Hepatomegaly*** • Splenomegaly • Elevated liver enzymes (particularly alkaline phosphatase) • Elevation of bilirubin • Splenic dysfunction, leading to the presence of howell-jolly bodies on blood smear • Spontaneous rupture
Neuropathy	• Carpal tunnel syndrome • ***Small fiber sensorimotor polyneuropathy (SFP)*** (neuropathic pain, numbness and tingling sensations) • Autonomic neuropathy (diarrhea, constipation, hypohidrosis, postural hypotension, syncopal episodes & erectile dysfunction.
Skin	• Petechiae and ecchymoses, a susceptibility to bleeding with bruising around the eyes, termed "raccoon-eyes" • Waxy papules, nodules, or plaques on the eyelids, retroauricular region, neck, or inguinal and anogenital regions (most characteristic finding). • Diffuse infiltrates resembling scleroderma or myxedema. • Diffuse or patchy alopecia. • Dystrophic nail changes include brittleness, crumbling, and subungual striation. • Glossitis and a dry mouth (xerostomia)

Respiratory system	• Obstructive symptoms • Shortness of breath • Pleural effusion
Musculoskeletal system	• Arthropathy • Pseudomyopathy • Enlarged shoulders, "shoulder pad sign" shoulder pain • ***Myeloma like lytic bone disease***
Other	• Malabsorption • Macroglossia, that can lead to obstructive sleep apnea, difficulty in swallowing, and altered taste. • Hypothyroidism, adrenal insufficiency • Fatigue • Weight loss • Claudication of the legs or jaw. • Alzheimer disease

DERMATOLOGY

152. Ans is 'a' i.e. Occurs over sun damaged skin & 'b' i.e. Occurs on the extensor surface of hands and forearm

*[Ref: **Neena Khanna 5th/e** p. 54-59; **Roxburg 17th/e** p. 137-42; **IADVL text book of dermatology 3rd/e** p. 1047]*

Senile purpura

- Senile purpura is a common, benign condition characterised by the recurrent formation of ***purple ecchymoses (bruises) on the extensor surfaces of forearms following minor trauma.***
- It is also known as Bateman purpura, after British dermatology pioneer Thomas Bateman, who first described it in 1818 and ***actinic purpura, because of its association with sun damage***.
- ***With age and photodamage, the dermal tissues become thin and increase the fragility of blood vessels***. As a result, superficial vessels tear and rupture even with negligible trauma. The subsequent extravasation of blood into the surrounding dermis results in the development of dark purple ecchymoses. Notably, no inflammatory component is found in the dermal tissue.
- Senile purpura affects over 10% of those aged over 50 years old. It is equally common in males and females. ***Other risk factors include chronic sunlight exposure and the use of oral or topical steroids*** and anticoagulants.
- Senile purpura is characterised by irregularly-shaped macules, 1 – 4 cm in diameter, that are dark purple with well-defined margins. The lesions do not undergo the colour changes of a bruise and take up to three weeks to resolve. Persistent brown pigmentation following the resolution of the bruises results from the deposition of haemosiderin.
- The surrounding skin is typically thin, inelastic and pigmented in association with others signs of skin ageing and sun damage.
- ***The lesions are most commonly distributed on the extensor surface of forearms and dorsal aspect of hands.*** Infrequently, they also occur on necks and faces.
- Senile purpura is benign and self-resolving. Patients should be educated on sun protection measures, including sunscreen application and sun-protective clothing .
- Tretinoin has been observed to reverse many changes that occur with photodamage. The use of tretinoin may be beneficial in actinic purpura because photodamage is ultimately responsible for this disorder.
- More recently, it has been demonstrated that human epidermal growth factor may be a viable treatment of actinic purpura.
- A citrus bioflavonoid blend has been tested for the treatment of actinic purpura.
- Moisturizing creams may be useful to treat frequently associated skin xerosis.

153. Ans is 'All' i.e. a, b, c, d & 'e' *[Ref: **Neena Khanna 5th/e** p. 54-59; **Roxburg 17th/e** p. 137-42; **IADVL text book of dermatology 3rd/e** p. 1047]*

Eczema herpeticum

- ***Eczema herpeticum, also known as a form of Kaposi varicelliform eruption caused by a secondary viral infection, usually with the herpes simplex virus (either type 1 or type 2), is an extensive cutaneous vesicular eruption that arises from pre-existing skin disease, usually atopic dermatitis (AD).*** Other skin conditions associated with eczema herpeticum are psoriasis, eczema, irritant contact dermatitis, burns, and seborrheic dermatitis.
- Patients with some features of AD, such as early-onset AD and head and neck AD, or large body surface area involvement, have higher risks of eczema herpeticum. Children with AD have a higher risk of developing eczema herpeticum, in which HSV type 1 (HSV-1) is the most common pathogen.

Clinical presentation

- Initially, the involved skin might show erythematous changes presenting as itchy and painful, small, monomorphic, dome-***shaped papulovesicles that rupture to form tiny punched-out ulcers*** overlying an erythematous base. ***Older blisters crust over and form sores (erosions).***

- Patients often present with herpetic vesicles over an extensive mucocutaneous surface, most often the face, neck, and upper trunk. ***Patients might have accompanying symptoms like*** fever, malaise, and ***lymphadenopathy***.
- Secondary bacterial infection with staphylococci or streptococci may lead to impetigo and cellulitis.
- Lesions heal over 2–6 weeks.
- In severe cases where the skin has been destroyed by infection, small white scars may persist long term.
- ***Eczema herpeticum can be severe, progressing to disseminated infection affecting multiple organs,*** including the eyes, brain, lung, and liver and death if untreated. Bacterial superinfection and bacteremia are usually the complications that cause mortality.

154. **Ans is 'b' i.e., Ustekinumab** [*Ref: **Neena Khanna 5th/e** p. 54-59; **Roxburg 17th/e** p. 137-42; **IADVL text book of dermatology 3rd/e** p. 1047; https://link.springer.com/article/10.1007/s40674-015-0018-3]*

Pipeline biologic agents for treatment of psoriatic arthritis *(https://link.springer.com/article/10.1007/s40674-015-0018-3)*

Agent	Target	Stage
Ustekinumab	*P40 subunit of IL12 and IL23*	*FDA approved*
Secukinumab	IL17A	Phase III
Ixekizumab	IL17A	Phase III
Brodalumab	*IL17 receptor*	Phase III
Guselkumab	*P19 subunit of IL23*	Phase II
Tildrakizumab (MK-322)	*P19 subunit of IL23*	Phase II
Risankizumab (BI655066)	*P19 subunit of IL23*	**Phase II**
Fezakinumab	IL-22 inhibitor	**Phase II**

155. **Ans is 'b' i.e., Flaccid bullae over trunk and limbs**

[*Ref: **Neena Khanna 4th/e** p. 77-79; **Roxburg17th/e** p. 44; **Behl 10th/e** p. 284*]

BULLOUS PEMPHIGOID

- ***Bullous pemphigoid (BP) is an autoimmune blistering disease characterized by autoantibody deposition at the epithelial basement membrane zone.*** Bullous pemphigoid is a chronic, autoimmune, **subepidermal** blistering disorder. Bullous pemphigoid is characterized by the presence of immunoglobulin G auto-antibodies specific for the **hemidesmosomal pemphigoid antigens 1 (BPAG1) and 2 (BPAG2)**. There is deposition of **C3 and IgG at basement membrane** around dermoepidermal junction. ***Acantholysis is*** absent as the disease is subepidermal (acantholysis occurs in epidermal diseases).

Clinical features of BP

- ***Age group involved is 60-80 years.***
- ***There are tense bullae (in contrast to P. vulgaris where bullae are flaccid).***
- Bullae are on erythematous base (in contrast to P.vulgaris where bullae occur on normal skin).
- ***Bullae are distributed on lower part of body (lower abdomen, inner thigh, groins, intertriginous area).*** Distribution is ***bilaterally symmetrical*** (in contrast to P.vulgaris where assymmetric distribution is there). ***Moderate itching is there (in contrast to P.vulgaris where no or minimal itching occurs).***
- ***Nikolsky's Sign is negative*** (positive in P.vulgaris)

Treatment

- ***Localized BP often can be treated successfully with topical steroids alone. More extensive disease, which is often more difficult to control, is usually treated with systemic anti-inflammatory and immunosuppressive agents, oral corticosteroids being the mainstay of treatment.*** It is either administered alone or combined with cyclophosphamide (pulse threapy).
- ***Other immunosuppressive agents*** (for corticosteroid-sparing effect) frequently used agent are Azathioprine, cyclophosphamide, methotrexate, cyclosporine A, combination tetracycline/ minocycline along with nicotinamide and, more recently, mycophenolate mofetil (MMF).
- Up to 24% of patients with BP do not respond to conventional therapy. Other drugs for treating BP include biologicals (anti-TNF drugs, Omalizumab, rituximab), IVIg and plasma exchange.
- The anti-CD20 monoclonal antibody rituximab has been found to be effective in treating some otherwise refractory cases of pemphigoid.

PSYCHIATRY

156. **Ans. is 'd' i.e. Delusional parasitosis** [*Ref: **Niraj Ahuja 6th/e** p. 59*]

Delusion of infestations / delusion of parasitosis

- False /unshakeable belief that one is infested with small but visible organisms. As a monosymptomatic delusional disorder this is called **EKBOM SYNDROME**. In young patients, it can be the earliest manifestation of a major psychotic illness.

- It is seen in ***acute confusional state (due to drugs or alcohol withdrawal), in schizophrenia, in dementing illness,*** and as ***delusional elaboration of tactile hallucinatory experiences (secondary to fornication).***
- ***In a typical clinical vignette, patients of delusion of parasitosis present with "evidence of parasites" collected in a container (matchbox, pill container, or a sealed plastic bag). This "matchbox sign" or "specimen sign" is useful to make the diagnosis. The "matchbox sign" is typical of delusional infestation.***
- On microscopy, samples appear to be hair, skin, fabric, dust, dirt, serum, ants, and fleas, but devoid of real pathogenic organisms .The patient may even provide detailed description(s) and/or drawing(s) of the organisms' movement/life cycle.

157. **Ans. is 'b' i.e., Thought eco & 'e' i.e. Hearing people talking about others** [*Ref: **Niraj Ahuja** 7th/e p. 54-68; Kaplan & Saddock 11th/e p.300-325; www.epi.ch*]

- ***All the mentioned options are Schneider's first rank symptoms of schizophrenia but Audible thoughts or thought echo (Echo de la penses), Third-person auditory hallucinations (voices heard arguing) are hallucination.***

Kurl Schneider first rank symptoms of schizophrenia

- Kurt schneider attempted to make the diagnosis of schizophrenia more reliable. He listed a series symptoms which were characteristic of schizophrenia and are popularly referred as Schneider's first rank symptoms of schizophrenia which include :-
  - A) **Hallucinations:** - ***Audible thoughts or thought echo (Echo de la penses), Third-person auditory hallucinations*** (voices heard arguing), ***voices commenting on one's action or running commentary.***
  - B) ***Thought insertion*****, thought withdrawal, thought broadcasting.**
  - C) **Passivity phenomena**: - Made feeding (affect), made impulses, made volition (acts), ***somatic passivity.***
  - D) ***Delusional perception (Primary delusions).***
- Schneider also described **second-rank symptoms** of schizophrenia : - ***Other form of hallucination (other than, which are seen in 1st rank symptoms); sudden delusional ideas, perplexing, affect disturbances (depressive or euphoric mood change), feeling of emotional impoverishment.***

ANAESTHESIA

158. **Ans. is 'b' i.e., Acts by acting on GABAA receptors & 'd' i.e. Inj in small veins can cause pain**

[*Ref: **Morgan** 4th/e p. 200-204;*

- ***Propofol has been proposed to have several mechanisms of action, both through potentiation of GABAA receptor activity and therefore acting as a GABAA receptor positive allosteric modulator,*** **thereby slowing the channel-closing time,** and at high doses, **propofol may be able to activate GABAA receptors in the absence of GABA, behaving as a GABAA receptor agonist as well.**
- ***Propofol is slightly soluble in water and, thus, is formulated in a white, oil-in-water emulsion. It has been referred to as milk of amnesia because of the milk-like appearance of the intravenous preparation.***

"Propofol is the drug of choice for most types of anesthesia inductions but has limitations for use in the hemodynamically unstable patient. *Propofol induced hypotension (PIH) occurs due to a theoretical decreased systemic vascular resistance (SVR), myocardial depression, and baroreceptor blunting.* ***Etomidate has long been the drug of choice for intubating the hemodynamically unstable patient*** *due to rapid onset, cardioprotective nature, and hemodynamic stability."*

https://pdfs.semanticscholar.org/9c5c/6e26a7a486a2ca05eca3677f9718d81e67b0.pdf

"Flumazenil has been reported to reverse the hypnotic or anesthetic effect of benzodiazepine derivatives, e.g., midazolam; however, ***flumazenil was reported to have no effect in reversing propofol anesthesia."***

https://link.springer.com/article/10.1007%2Fs540-002-8087-2

- ***Pain on injection with propofol is a common problem*** and can be very distressing to the patient. The younger the child, the higher is the incidence and severity of propofol injection pain. ***This could be due to the smaller veins in children.***

159. **Ans. is 'a' i.e., Requires large dose, 'b' i.e. Requires large needle & 'd' i.e. Slow onset block**

[*Ref: **Fundamentals of anesthesia** 5th/e p. 815*]

- With a spinal block, small doses of local anaesthetic are required because they spread more easily in the spinal fluid. ***With an epidural block, the drugs are delivered outside the dura, larger doses of local anaesthetic are required*** because the spread is through tissues rather than fluid.
- ***A smaller needle is used to perform a spinal block than an epidural block.***
- ***There is loss of resistance in both spinal and epidural but it is easier to confirm in spinal as the presence of CSF from needle will confirm the space.***
- ***The onset of analgesia is approximately 15-30 minutes in an epidural, while it is approximately 5 minutes in spinal anesthesia.***
- ***Epidural anaesthesia is not as dense as spinal anaesthesia*** → ***Lower concentrations of local anaesthetic combined with an opioid*** can block the smaller sympathetic and sensory fibers with sparing of large motor fibers → **Analgesia without motor block** or epidural analgesia (not epidural anesthesia).

Comparison between spinal and Epidural anaesthesia	
Spinal anaesthesia	**Epidural anaesthesia**
• Delivers drug to the subarachnoid space and into the cerebrospinal fluid. • Acts on the spinal cord directly	• Delivers drugs outside the dura in epidural space (outside CSF)
• *A smaller needle is used* • *Small doses (1.5–3.5 mL) of local anaesthetic are required* • Spinal is almost always a one-shot only	• Has its main effect on nerve roots leaving the dura at the level of the epidural, rather than on the spinal cord itself. • *A larger needle is used* • *Larger doses (10–20 mL) of local anaesthetic are required* • Indwelling catheter may be placed that allows for redosing injections
• *Faster onset of action (15–30 minutes)* • Shorter duration of action • More reliable • Easier (loss of resistance and presence of CSF from needle can confirm the space) • Has limited duration of action → prolonged surgery cannot be performed. • *Denser block* • More often used for shorter procedures as compared to spinal • Used only for surgery of lower part of body → lower abdomen, lower limbs, gynaecological, and obstetrical surgeries, e.g. hystrectomy, caesarean section. • Dura is not pierced → so, chances of postdural puncture headache, meningitis and arachnoiditis are more	• *Slower onset of action (approx 5 minutes)* • Longer duration of action • Less reliable • Difficult • Duration can be prolonged by repeatedly injecting LA by an epidural catheter. • *Not as dense as spinal anesthesia* • More often used for longer procedures as compared to spinal • Can be used for upper abdominal, thoracic & neck surgery as well in addition to surgeries performed by spinal anaesthesia. • Dura is not pierced → so, chances of postdural puncture headache, meningitis and arachnoiditis are less.

160. **Ans. is 'a' i.e., Increasing age, 'b' i.e. Pregnancy, 'c' i.e. Hypercarbia & 'e' i.e. Anemia** [*Ref: Morgan 4th/e p. 165*]

Factor's decreasing MAC	*Old age*, acute alcohol intake, ***hypothermia***, hyperthermia, ***hypercalcemia, hyponatermia***, hypermagnesemia, Hypoxia, *Hypercarbia, Anemia, Pregnancy*, drugs
Factors increasing MAC	Young age, chronic alcohol intake, *hypernatremia*, Drugs

161. **Ans. is 'All' i.e., a, b, c, d & e** [*Ref: Morgan 4th/e p. 194; Katzung 10th/e p. 491; Miller 7th/e p. 788*]

- ***Fentanyl is synthetic, it is synthesized from the opium poppy,*** which is why opioids all have similar effects and characteristics

"An important mechanism of systemically administered opioids in causing analgesia is activation of neurons in the mid-brain and medulla with descending inhibitory projections to the spinal cord dorsal horn. *Chief among inhibitory neurotransmitters released is norepinephrine, which diminishes substance P release from primary A delta and C afferents, and reduces response of dorsal horn neurons to noxious stimulation."*

https://anesthesiology.pubs.asahq.org/article.aspx?articleid=1949387

- Fentanyl provides some of the effects typical of other opioids through its agonism of the opioid receptors. ***As a Mu-receptor agonist, it binds 50 to 100 times more strongly than morphine.***
- ***Fentanyl is metabolized in the liver and in the intestinal mucosa to norfentanyl.***
- Stimulation of the mu-subtype opioid receptor stimulates the exchange of GTP for GDP on the G-protein complex and subsequently inhibits adenylate cyclase. ***This results in a decrease in intracellular cAMP and leads to a reduction in the release of neurotransmitters such as substance P, GABA, dopamine, acetylcholine and noradrenaline.***

RADIOLOGY

162. **Ans. is 'a' i.e., I^{129}, 'c' i.e. Ra^{226} & 'd' i.e. Rn^{222}** [*Ref: https://www.britannica.com/science/radioactive-isotope; https://www.chemicool.com/examples/natural-radioactive-elements.html*]

"Iridium-192 does not typically occur naturally. *Instead, scientists must put iridium-191 in a nuclear reactor and bombard it with neutrons."* ***-www.livescience.com***

"Cobalt-60 (^{60}Co) is a synthetic radioactive isotope of cobalt *with a half-life of 5.2714 years. It is produced artificially in nuclear reactors."* ***-wikipedia.org***

- ***All other mentioned radioisotopes are naturally occurring isotopes.***

Natural sources of radiation (Background radiation)

A. **Cosmic rays:** Originate in outer space and pass through atmosphere. At normal living altitudes, exposure is 35 mrad/ year. At altitudes above 20 km cosmic radiation becomes important.

B. **Environmental:**
   a. *Terrestrial radiation:* Produced by radioactive elements such as thorium, uranium, radium and an iso-. tope of potassium (K40). Exposure is 50mrad/year. Highest in Kerala.
   b. *Atmospheric radiation:* From Radioactive gas as Radon, Thoron, and exposure is 2 mrad/year.

C. **Internal Radiation:** These radioactive materials include minute quantities of uranium, thorium and related substances, and isotopes of various substances. Exposure is 25 mrad/year but may be upto 70-80.

- ***Important naturally occurring radioisotopes*** are hydrogen (H-3), beryllium (Be-10), carbon (C-14), ***radium (Ra-226), radon (Rn-222)***, **cesium (Cs-37)**, sodium(Na-22), silicon (Si-32), chlorine (Cl-36), argon (Ar-39), krypton (Kr-81, Kr-78), ***iodine (I-129,*** I-131), potassium (K-40), **strontium (Sr 90)**, calcium (Ca-48), germanium (Ge-76), zirconium- (Zr-96), samarium, (Sm-147, 148)selenium (Se-82), rubidium (Ru-87), molybdenum (Mo-100), cadmium (Cd-113, Cd-116), xenon (Xe-136), barium (Ba-130), gadolinium (Gd-152), tungsten (Tn-180), platinum (Pt-190), bismuth (Bi-209), thorium (Th-232, Th-230) and uranium (U-235, 236, 237, 238)

163. Ans. is 'a' i.e., Follicular carcinoma of thyroid, 'b' i.e. Follicular adenoma & 'c' i.e. Papillary carcinoma of thyroid [*Ref: Textbook of radiation oncology: principles and practice: Rath & Mohanti p. 5936; KDT 5th/e 234; Harrison 18th/e p. 2937*]

Radioactive iodine (I^{131})

- It has a radioactive decay half-life of about eight days.
- About 90% of its radiation is beta radiation, and the rest is gamma radiation.
- Major uses of 131I include the treatment of thyrotoxicosis (hyperthyroidism) and differentiated thyroid cancers (papillary and follicular thyroid cancers (adenoma and carcinomas)) that absorb iodine.
- ^{131}I-metaiodobenzylguanidine (^{131}I-MIBG) for imaging and treating pheochromocytoma and neuroblastoma.
- Because of the carcinogenicity of its beta radiation in the thyroid in small doses, I-131 is rarely used primarily or solely for diagnosis. ***Instead the more purely gamma-emitting radioiodine*** *iodine-123 is* ***used in diagnostic testing. The longer*** *half-lived iodine-125* ***is also occasionally used when a longer half-life radioiodine is needed for diagnosis,*** and in brachytherapy treatment, where the ***low-energy gamma radiation without a beta component makes iodine-125 useful. The other radioisotopes*** *of iodine* ***are never used in brachytherapy.***
- ***I^{131} is contraindicated in pregnancy as it can damage fetal thyroid.***

164. Ans. is 'a' i.e., Normal person & 'd' i.e. Paralytic ileus [*Ref: Grainger 4th/e p. 1050-1070*]

- The rectum is fixed in the pelvis, and as a general rule, if ***gas is seen in the rectum the patient is presumed to not be functionally obstructed.***
- ***In mechanical obstruction, plain films reveal distended gas-filled proximal bowel loops with air fluid levels and absence of gas beyond the obstruction:*** - Proximal the obstruction, lesser the air fluid levels; and distal the obstruction more the air fluid levels. air-fluid levels. ***Gas seen in the rectum.***
- ***Gall stone ileus is a mechanical intestinal obstruction*** caused by impaction of one or more gallstones in the intestine, usually ***the terminal ileum***, but rarely in the duodenum or colon.

165. Ans. is 'c' i.e., Pneumothorax [*Ref: Grainger 4th/e p.1025*]

Pneumothorax

- Air entering the pleural space results in pneumothorax. **An expiratory film is particularly useful to detect** pneumothorax. So best view for pneumothorax is **PA view in full expiration.** X-ray findings of pneumothorax are : -
  1) Laterally convex pleural line that parellels the chest wall.
  2) **Absent pulmonary vascular markings lateral to this line.**
  3) **Collapse of ipsilateral diaphragm.**
  4) Widening of intercostal spaces.
  5) **Mediastinal shift to the contralateral site.**
  6) **Ipsilateral hypertranslucent (hypertransradiant) hemithorax**
  7) *Deep costophrenic sulcus (deep sulcus sign)*

166. Ans. is 'b' i.e., Produces better anatomical details then MRI & 'c' i.e. Radiation exposure is high
[*Ref: Love & Bailey 25th/e p. 136-37; Danhert radiology 5th/e p. 1085; www.acrin.org*]

- ***PET is a nuclear medicine medical imaging technique that produces a 3-D image of functional processes in the body.***
- ***Anatomical details are not as good as CT and MRI, but are better than SPECT.***
- ***Although a radioactive tracer is used during a PET scan, the amount of radiation exposure is low and short-lived.***
- ***FDG-PET scan provides valuable functional information based on the increased glucose uptake and glycolysis in tumor cells depicts metabolic abnormalities before morphological alterations occur.***
- ***FDG-PET scan is widely used to detect the tumor recurrence in brain after treatment.***

Positron Emission Tomography

- PET is a nuclear medicine medical imaging technique that ***produces a 3-D image of functional processes in the body.*** A PET scan uses a small amount of a radioactive drug, or tracer, to show differences between healthy tissue and diseased tissue. **The most commonly used tracer is called FDG (2-deoxy-2-[fluorine-18]fluoro-D-glucose (18F-FDG)) or simply 18- fluoro deoxy glucose, so the test is sometimes called an FDG-PET scan.**
- Areas with high metabolic activity (i.e. cerebral cortex and deep grey matter) show greater uptake as compared to the areas with low metabolic activity (i.e. white matter or CSF).
- Sites of high FDG intake are cerebral cortex, cerebellum, basal ganglia & thalamus.
- ***FDG-PET scan provides valuable functional information based on the increased glucose uptake and glycolysis in tumor cells, depicts metabolic abnormalities before morphological alterations occur.***
- The PET scanner detects the radiation given off by the FDG and produces color-coded images of the body that show both normal and cancerous tissue.
- ***Anatomical details are not as good as CT and MRI,*** **but are better than SPECT.**
- Currently, many PET scanners also include a conventional computed tomography (CT) scanner. This allows images of both anatomy (CT) and function (PET) to be taken during the same examination.
- **Uses include:- cerbrovascular accidents, dementia, complex partial seizures, tumors (including metastasis).** ***Widely used to detect the tumor recurrence in brain after treatment.***

Drawbacks:

1) ***Although a radioactive tracer is used during a PET scan, the amount of radiation exposure is low and short-lived.*** **However, substance may expose radiation to the fetus of a pregnant woman or to the infant of a woman who is breastfeeding.**
2) There is a rare risk of a major allergic reaction to the tracer.
3) Poor spatial resolution
4) Limited availability
5) High cost

167. **Ans. is 'b' i.e., Fat & 'd' Hemorrhage** [*Ref: Fundamentals of diagnostic radiology p. 18*]

- ***Chronic hemorrhage/hematoma has high signal intensity (Hyperintense/bright) both T1 & T2 images.***
- ***Fat (adipose tissue) has high signal intensity on both T1 & T2 images.***
- ***CSF shows low signal intensity on T1 and high signal intensity on T2 images.***
- ***Muscle shows low signal intensity both on T1 and T2 images.***
- ***Melanin shows high signal intensity on T1 and low signal intensity on T2 images.***

MRI of tissues and body fluids

Tissue / body fluids	Examples	T1-Weighted	T2-Weighted
Gas	**Air in lung,** gas in bowel	Absent	Absent
Mineral-rich tissue	**Cortical bone,** Calculi	Absent	Absent
Collagenous tissue	**Ligaments,** tendons, Fibrocartilage, Scar tissue	Low	Low
Fat	Adipose tissue, fatty bone marrow	***High***	***Intermediate to high***
High bound water tissue	Liver, pancreas, adrenal, ***muscle,*** hyaline cartilage	***Low***	***Low to Intermediate***
High free water tissue	Kidney, **testes, prostate, seminal vesicles, ovary, thyroid, spleen, penis, simple cyst, urinary bladder,** gall bladder	Low	High
Fluids	**Edema, Urine, Bile,** *CSF*	***Low***	***High***
Proteinaceous fluid	Complicated cyst, abscess, synovial fluid, nucleus pulposus	Intermediate	High
Hemorrhage	**Hyperacute** • Arterial • Venous **Acute** Chronic	Low Low Low ***High***	High Less bright than arterial Low ***High***

Note : -

1) ***Low or absent signal means hypointense (low intensity) → Image is black (dark).***
2) ***High signal intensity means hyperintense (High intensity) → Image is bright.***
3) Intermediate signal means Isointense → Image is in various shades of gray.

■■■