1. Which one of the following condition is associated with palpable form of purpura?

a) Thrombocytopenia

b) Small-vessel vasculitis

c) Gonococcal infection

d) Acute meningococcemia

Correct Answer - A
Thrombocytopenia
Palpable purpura does not occur in thrombocytopenia.
Causes of palpable purpura

- Rocky mountain spotted fever
- Acute meningococcemia
- Disseminated gonococcal infection
- Ecthyma gangrenosum
- Henoch Schonlein purpura
- Polyarteritis nodosa
- Leucocytoclastic vasculitis

2. What does "cardiac polyp" means ?

a) Acute infarct

b) Cardiac aneurysm

c) Benign tumour

d) Fibrinous clot

Correct Answer - D
Fibrinous clot
"Postmortem fibrinous clot in the heart are called cardiac polyp".
-Moral thrombus in the right/left atrium of the heart at the time of postmortem examination appears as pedunculated mass attached to the wall of the heart and main mass in the lumen of the cavity

3. **Commonest histological finding in Benign Hypertension is:**

a) Proliferative endarteritis

b) Necrotizing arteriolitis

c) Hyaline arteriosclerosis

d) Cystic Medial Necrosis

Correct Answer - C

- The characteristic histological finding in Benign Hypertension is Hyaline arteriosclerosis.
- It refers to the thickening of the walls of arterioles by the deposits that appear as homogeneous pink hyaline material in routine staining.
- It is a type of arteriolosclerosis, which refers to the thickening of the arteriolar wall and is part of the aging process.
- It is associated with aging, hypertension, diabetes mellitus.

4. **A 25yr old female presents with anemia and jaundice since 2 years. On examination her spleen is enlarged. Peripheral smear showed presence of spherocytes. Which of the following investigation is used in diagnosing this condition?**

a) Osmotic fragility test

b) Coombs test

c) Reticulocyte count

d) Bone marrow aspiration

Correct Answer - A

Young female with 2 years history of anemia and peripheral smear showing spherocytes points towards the diagnosis of autoimmune haemolytic anemia (AIHA).
In the above question age, gender and history of patient favours AIHA. Most important differential diagnosis for AIHA is hereditary spherocytosis.
Diagnosis of hereditary spherocytosis is established by osmotic fragility test.

Hereditary spherocytosis is an autosomal dominant inherited disorder resulting from molecular abnormalities in the cytoskeleton of red cell membrane.

Diagnosis of hereditary spherocytosis is established clinically from

- Positive family history and splenomegaly
- Blood film showing spherocytes and reticulocytes
- Increased osmotic fragility
- Negative coombs test

5. **A 4 year-old boy, develops a large erythematous rash around the site of a mosquito bite. One month later, he is taken to a pediatrician because of a puffy face and swollen ankles. The scanty urine sample has a reddish-brown hue, and contains both red blood cells and protein. Which of the following distinctive features would be most likely to be seen on renal biopsy?**

a) Fusion of podocyte foot processes

b) IgA in the mesangium

c) Linear IgG deposits

d) Subepithelial electron dense humps

Correct Answer - D

Ans: D. Subepithelial electron dense humps

The disease is **poststreptococcal glomerulonephritis**, which can follow either streptococcal pharyngitis (one to two weeks after the infection) or skin infection (three to six weeks after the infection). The child is showing signs of both nephritis (hematuria) and nephrosis (puffy face and swollen ankles).

The characteristic feature of this disease on renal biopsy is the presence of subepithelial humps, visible either by light or electron microscopy.

Fusion of podocyte foot processes suggests minimal change disease.

IgA in the mesangium suggests Berger's disease.

Linear IgG deposits suggests anti-glomerular basement membrane disease, which is called Goodpasture's disease if it is accompanied by pulmonary damage.

Onion-skinning of renal arterioles suggests malignant

hypertension.

6. **What is the infraclavicular lesion of tuberculosis known as?**

a) Gohn's focus

b) Puhl's focus

c) Assman's focus

d) Simmon's focus

Correct Answer - C

Infraclavicular lesion of chronic pulmonary tuberculosis is Assman's focus.

Puhl's lesion: It is the site of isolated lesion of chronic pulmonary tuberculosis. It is situated at the apex of the lung because blood flow and diffusion are sluggish.

- These infraclavicular lesions are most commonly found in young persons between 15 and 25 years of age.
- They are more apt to occur in individuals who have been excessively exposed to tuberculous infection; who have lived with persons suffering from progressive tuberculosis; or who work with tuberculous material, as physicians, nurses and workers in pathological and bacteriological laboratories.
- These lesions are very earliest lung lesions.

7. The most common cause of SVC syndrome is *?*

a) Thrombosis

b) Extrinsic compression

c) Mediastinal lymphoma

d) Teratoma

Correct Answer - B
Ans. is 'b' i.e., Extrinsic compression
Superior venacava syndrome
o 'Superior vena caval syndrome' or 'SVCS' is the clinical manifeststion of superior vena cava obstruction with severe reduction in venous return from head, neck and upper extremities.

- *Most common cause (90%) appears to be extrinsic compression from malignant tumors such as Lung cancer, Lymphoma, and Metastatic tumors.*
- *of the malignant tumors, most common tumors is Lung cancer or Bronchogenic Carcinoma,* especially small cell Ca

o In young adults, malignant lymphoma is the leading cause of SVCS.
o Non-malignant causes of SVCS are include benign tumors, aortic aneurysm, thyromegaly, thrombosis and fibrosing mediastinitis from prior irradiation or histoplosmosis.
The diagnosis of superior vena cava (SVC) syndrome (SVCS) is a clinical one. The most significant chest radiographic finding is widening of the superior mediastinum, most commonly on the right side. Pleural effusion occurs in only 25% of patients, often on the right side. The majority of these effusions are exudative and occasionally chylous. However, a normal chest radiograph is still

compatible with the diagnosis if other characteristic findings are present. Computed tomography (CT) provides the most reliable view of the mediastinal anatomy. The diagnosis of SVCS requires diminished or absent °pacification of central venous structures with prominent collateral venous circulation.

8. True about Apoptosis are all except?

a) Inflammation is present

b) Chromosomal brekage

c) Clumping of chromatin

d) Cell shrinkage

Correct Answer - A

Ans. is 'a' i.e. inflammation is present

- In apoptosis there is no inflammation. Why is it so ? Lets see.
- In apoptosis the cell membrane remains intact, so that intracellular contents do not leak out to induce inflammatory response.
- *The most efficient mechanism that prevent inflammation is phagocytosis of apoptotic cells or apoptotic body by macrophage without release of proinflammatory cellular components.*

  Mechanism of phagocytosis of apoptotic cell

  o Normally phosphatidyl *serine* is located on the inner (cytosolic) surface of plasma membrane.

  o In apoptotic cell this *phosphatidylserine* is translocated to the outer (extracellular) surface of plasma membrane by *scrumplase.*
- Some times thrombospondin is also expressed on the surface of apoptosis bodies.
- These alterations permit the *early recognition* of apoptotic cells by *macrophages,* resulting in *phagocytosis without the release of proinflammatory cellular components.*

  o The process of apoptotic cells is so efficient that dead cells disappear without leaving a trace and *inflammation is virtually absent.*

  In Contrast, there *is* inflammation in necrosis
- In necrosis there is disruption of cell membrane —> cellular

components leak out and induce inflammatory response. *Processes of disposal of cellular debris whose results do not damage the organism, differentiate apoptosis from necrosis.*

Differtiating features of apoptosis and necrosis

Apoptosis

o Death of a single cell
o Cell size decreases (Shrinkage)
o Plasma membrane intact
o Lysosomal and other organelles remain intact o Cellular contents do not leak out
o Adjacent inflammation absent
o In early stage require protein synthesis o Active process : - Energy dependent
o May be pathological or physiological

Necrosis

o Death of many contiguous cells (usually) o Increased cell size (swelling)
o Disruption of plasma membrane
o Lysosomal breakdown with release of hydrolases o Cellular contents leak out.
o Adjacent inflammation persent.
o Protein synthesis
o Passive process : - Not energy dependent
o Always pathological

9. CD 95 is a marker of -

a) Intrinsic pathway of apoptosis

b) Extrinsic pathway of apoptosis

c) Monocyte

d) Leucocyte

Correct Answer - B
Ans. is 'b' i.e. Extrinsic pathway of apoptosis
CD 95 is a marker of extrinsic pathway of apoptosis.

10. Which of the following is not associated with Down's syndrome?

a) Trisomy 21

b) Mosaic 21

c) Translocation t (15,21), t (21,21)

d) Deletion of 21

Correct Answer - D
Ans. is 'd' i.e., Deletion of 21

11. An abnormal Ham test is most likely associated with which of the following ?

a) Defect in spectrin

b) Defective GPI anchor

c) Defect in complement

d) Mannose-binding residue defect

Correct Answer - B
Ans. is 'b' i.e., Defective GPI anchor
* Ham test is used for PNH, and you all know that in PNH there is deficiency of GPI-linked proteins (GPI anchor).

12. A 30 years old female, RBC Counts 4.5 million, MCV 55 fl, Tc 8000, no history of blood transfusion?

a) Iron deficiency anemia

b) Thalassemia major

c) Thalassemia minor

d) Megaloblastic anemia

Correct Answer - C
Ans. is 'c' i.e., Thalassemia minor
The clues in this question are :
(i) Normal RBC Count *(iii)* Normal WBC count
(ii) *Microcytosis* (reduced MCV) *(iv)* No History of blood transfusion
Option b & d' can be easily ruled out :
(i) Thalassemia major is transfusion dependent and it is not possible to survive upto the age of 30 years without blood transfusion.
(ii) In megaloblastic anemia MCV is increased
Now we are left with Thalassemia minor and iron deficienay anemia, both of them cause microcytic anemia (MCV). These can be differentiated by following fact :?
o In thalassemia minor the RBC count is normal because the marrow can keep on producing the cell at normal rate but it cannot fill them with hemoglobin. On the other hand in iron deficiency anemia the RBC production is also impaired and the decrease in RBC count is in proportion the decrease in hemoglobin.
There are many indices to differentiate between iron deficiency

There are many indices to differentiate between iron deficiency anemia (IDA) and beta-thalassemia (BT)

Index	Formula	Value for Iron deficiency anemia	Value for beta? thalassemia
Mentzer index	MCV / RBC count	>13	<13
Shine and Lal index	MCV2 x MCH x 0·01	>1530	<1530
England and Fraser index	MCV - RBC - (5 x Hb)- 5·19	>0	<0
Srivastava index	MCH / RBC	>3.8	<3-8
Green and king index	MCV2 ^{x} RDW x Hb/100	>65	<65
Red Cell Distribution Width index	MCV ^{x} RDW/RBC	>220	<220

13. A 25 year old lady on treatment for rheumatoid arthritis has following lab findings: Hb-9gm/dl, MCV- 55fl, serum iron-30microgm/d1, feritin200ng/ml, TIBC-298 microgm/dl. What is the most probable diagnosis?

a) Thalassemia minor

b) Thalassemia major

c) Anemia of chronic disease

d) Iron deficiency anemia

Correct Answer - C

Ans. is 'c' i.e., Anemia of chronic disease

o Information in this question are :-

i) Anemia : Hb- 9 gm/di (normal in female is > 12gm/d1).

ii) Microcytosis : MCV 55 fl (normal is 82-96 fl)

iii) Marginally low serum iron : 30 microgm/dl (normal value for female is 26- 170 microgm/dl).

iv) Increased serum ferritin : 200 ng/ml (normal value for female is 12-160 ng/ml or microg/L).

v) Normal TIBC : 298 microgram/di (normal value is 262-474 microgm/dl).

iv) Patient has chronc immune disorder, i.e., RA.

o So, the diagnosis is anemia of chronic disease which can occur in RA.

	Iron		Sideroblastic	Iron
Chronic		Thalassemia	anemia	refractory

	Deficiency Disease	Deficiency Trait (a or f3)			Iron deficiency anemia
MCV/MCH	Decreased	Decreased or Normal	Decreased		Decreased
Serum iron	Decreased	Decreased	Normal	Increased	Decreased
TIBC	Increased	Decreased or Normal	Normal	Normal	Decreased
Transferrin saturation	Decreased	Decreased	Normal	Increased	Normal
Serum ferritin	Decreased	Normal or Increased	Normal	Increased	Increased
Serum transferrin receptor	Increased	Normal	Normal	Normal or Increased	Normal
Serum hepcidin	Decreased	Increased	Normal	Decreased	Increased
Bone marrow iron stores	Decreased	Normal or Increased	Normal	Normal or Increased	Normal or Increased
Erythroblast iron	Decreased	Decreased	Normal	Ring forms	Increased

14. Which of the following regarding Bombay blood group is false?

a) Lack of H, A and B antigen on RBCs

b) Lack of H, A and B substance in saliva

c) Lack of antigens of several blood group systems

d) H, A and B antibody will always be present in serum

Correct Answer - C
Ans. is 'c' i.e., Lack of antigens of several blood group systems
ABO blood groups
* ABO blood groups are classified according to the presence of RBCs surface antigen :-
(i) Blood group A 'A ' antigen present
(ii) Blood group B —› 'B' antigen present (iii)Blood group AB —) Both 'A' antigen and B' antigen present
(iv) Blood group '0' Neither 'A' nor 73' antigen present
** The precursor proteins from which all ABO blood group antigens are formed is the "H antigen" :-*
If H. antigen is converted into 'A' antigen —) Blood group A
If H. antigen is converted into 'B' antigen ---> Blood group B
If H. antigen is converted both into A and B antigens --> Blood group AB
If H. antigen remains as such (as H antigen) Blood group '0'
* *In Bombay blood group the precursor antigen (H antigen) is absent, consequently A and B antigens which are derived from modification of H antigen are not formed. Thus, Bombay blood group lacks H, A and B antigen.* Since the person lacks all the ABO antigens the serum has Anti - A, anti-B and anti-H antibodies.
* Other blood group antigens like lewis antigen are directly

converted from precursor oligosaccharids and do not require intermediary H substance. So, these antigens are present in Bombay blood groups. These blood groups are Rh, Lewis, Kell, Duffy etc.

15. In acute inflammation due to the contraction of endothelial cell cytoskeleton, which of the following results -

a) Delayed transient increase in permeability

b) Early transient increase in permeability

c) Delayed permanent increase in permeability

d) Early permanent increase in permeability

Correct Answer - B
Ans. is 'b' i.e., Early transient increase in permeability
Increased vascular permeability
* *The hallmark of acute inflammation is increased vascular permeability*
The following mechanisms have ben proposed for increased permeability.
i) Formation of endothelial gaps in venules (immediate transient response)
* This is the *most common* mechanism of vascular leakage and is caused due to the mediators such as *histamine, bradykinin, leukotrienes, neuropeptide sustance*
* Classically this type of leakage affects *venules, leaving capillaries and arterioles unaffected.*
* The precise reason for this restriction to venules is uncertain, it may be because there is *greater density of receptors* for mediators in venular endothelium.
* Binding of mediators such as histamine to their receptors on endothelial cells *activate intracellular signaling* pathways that lead

to *phosphorylation* of *contractile and cytoskeletal proteins* such as myosin.
* *These proteins contract leading to contraction of endothelial cells and separation of intercellularjunction.*
* Thus the gaps in the vascular endothelium are largely intercellular or close to the intercellular junctions.
* This type of leakage *occurs rapidly* after exposure to the mediator and is *usually reversible and short lived* (15-30 minutes), it is thus known as *immediate transient response.*
* Cytokines such as *interleukin-1 (IL-1), tumour necrosis factor (TNF)* and *interferon* y also increase vascular permeability by inducing a structural reorganization of the cytoskeleton such that the *endothelial cells retract from one another.*
* In contrast to the histamine effect, the cytokine induced response is *somewhat delayed* (4-6 hrs) and *long lived* (24 hrs or more).

ii) Direct endothelial injury resulting in endothelial cell necrosis and detachment (immediate sustained response)

* This effect is usually encountered in *necrotizing injuries* and is due to *direct damage to the endothelium* by injurious stimulus e.g *severe burns* or *lytic infections.*
* The reaction is known as *immediate sustained response* because the leakage starts *immediately* after the injury and is *sustained at high levels for several* hours until the damaged vessels are thrombosed or repaired. *o All levels of microcirculation* are affected including venules, capillaries and arterioles.

iii) Delayed prolonged leakage

* This is curious but relatively common type of increased permeability that begins after a *delay of 2-12 hours,* lasts *for several hours* or even days and *involves venules as well as capillaries.*
* This type of leakage is caused by mild to moderate thermal injury, X-ray radiation or ultraviolet radiation and certain bacterial toxins.
* It is caused either by direct effect of injurious agent or by cytokine mediated endothelial retraction.

iv) Leucocyte mediated endothelial injury

* Leucocytes adhere to endothelium *relatively early* in inflammation.
* These leucocytes may be *activated* releasing toxic oxygen species and proteolytic enzymes which then cause endothelial injury or

detachment.
* This type of leakage affects *venules (mostly); pulmonary & glomerular capillaries.*

v) Increased transcytosis across the endothelial cytoplasm

* Transcytosis occurs across channels consisting of clusters of interconnected uncoated vesicles and vacuoles called the vesiculovacuolar organelle, many of which are located close to intercellular junctions.
* It usually occurs in venules.

vi) Leakage from new blood vessels

* During repair formation of new vessels occur *(angiogenesis)*
* New vessel sprouts, *remain leaky* until the endothelial cells mature.

16. True about integrin is -

a) Used in binding

b) Oncogene

c) Anti oncogene

d) All

Correct Answer - A
Ans. is 'a' i.e., Used in binding
Integrins have two main functions:-

- Attachment of the cell to the ECM
- Signal transduction from the ECM to the cell
  Integrins are calcium-independent adhesion molecules.
- The extracellular domains of integrins bind to fibronectin which further binds to collagen; these are components of extracellular basement membrane.
- The cytoplasmic portions of integrins bind to actin filaments.

17. Before sensitizing T-cells slight modification in antigen is induced by -

a) Langerhans cell

b) NK cell

c) Dendritic cells

d) a and c

Correct Answer - D
Ans. is 'a' i.e., Langerhans cells; 'c' i.e., Dendritic cells

18. In hemodialysis associated amyloidosis, which of the following is seen

a) Transthyretin

b) Beta-2 microglobulin

c) SAA

d) Alpha microglobulin

Correct Answer - B
Ans. is 'b' i.e., B2 microglobulin
Dialysis-related amyloidosis (DRA) is a disabling disease characterized by accumulation and tissue deposition of **amyloid** fibrils consisting of beta2-microglobulin (beta2-m) in the bone, periarticular structures, and viscera of patients with chronic kidney disease (CKD)

19. True regarding prothrombin time measurement?

a) Platelet rich plasma is required

b) Activate with kaolin

c) Should be measured within 2 hours

d) Immediate refrigeration to preserve coagulation factor viability

Correct Answer - C
Ans. is 'c' i.e., Should be measured within 2 hours
Major screening tests of coagulation
* In all of these tests, blood is collected with a *calcium- chelating anticoagulant (usually citrate)* and then centrifuged to remove the erythrocytes, leukocyte, and platelets.
* The remaining *platelet-poor plasma (PPP)* serves as the substrate for these tests.
* Depending upon the test, the *phospholipid* is added to the PPP to substitute for platelets and an *activating agent* is added.
* The PPP is then recalcified and the time needed for a clot to form is measured.
The sample to be kept at room temperature if it is to be used for prothrombin time, Lupus anticoagulant or factor VII assays and to be kept at 4° C for other assays.
Once blood is drawn for testing, the tests should be completed within a time frame of 30 minutes to 2 hours
Measurement of prothrombin time:
* The PT measures the function of the *extrinsic and common coagulation pathways.* It is commonly used *to monitor oral anticoagulant therapy.*
* *Method:-* A source of phospholipid and tissue thromboplastin (

rabbit or human brain extract) is added to platelet-poor *plasma,* and Ca2+ is added to initiate coagulation. The time for the appearance of fibrin strands (PT) is measured and is compared with the control.

* Normal PT is *11-13 seconds.*

20. A 10 year old child presents with pallor & history of blood transfusion 2 months back. On investigation, Hb -4.5gm, total count 60000, platelet count- 2lakhs and CD 10(+) ve, CD 19 (+)ve, CD 117 (+) ve, MPO (+) ve & CD 33(-)ve. What is the most likely diagnosis?

a) ALL

b) AML

c) Undifferentiated leukemia

d) Mixed phenotypic acute leukemia

Correct Answer - D
Ans. is 'd' i.e., Mixed phenotypic acute leukemia
* Immunological markers in this question are :-
* CD 10 (+) ve, CD 19(+) ve --> B cell lineage
Myeloperoxidase (MPO) (+)ve, CD117 (+)ve
Myeloid lineage
* Immunological markers of two lineage are present. Therefore,it is a case of biphenotypic leukemia (mixed phenotypic leukemia).
* Biphenotypic leukemia is a subtype of *"leukemia of ambiguous lineage" (a* new class of AML which has been added in 18th/e of Harrison. But in Harrison, detailed description of this class has not been given.. Acute leukemia with Ambiguous lineage
3 Human acute leukemias are broadly classified as myeloid or lymphoid according to the expression of surface and/or cytoplasmic antigens.

* Uncommonly, the lineage of origin is not clear ; either two separate blast populations are encountered, one myeloid and other lymphoid, or a single blast population demonstrating evidence of both myeloid and lymphoid differentiation concurrently.
* Acute leukemia with ambiguous lineage has following subtypes :-.
A) Acute undifferentiated leukemia
In this leukemia, the blast cells express none of the antigen that are useful in lineage attribution but rather express only markers that are linked to high stages of immaturity such as *CD 34, CD 38 and HLA-DR and at times CD* 7.
B) Mixed phenotypic acute leukemia
In this type of leukemia, immunological marker of more than one lineage are present. This is classifed intoi) *Bilinear acute leukemia*
* In this, two separate blast populations are encountered.
* For example blast cells of lymphoid and myeloid lineage are present simultaneously.
n) Biphenotypic *acute leukemia*
* Bipheotypic acute leukemia is also called " *hybrid acute leukemia"* or " *acute mixed lineage leukemia"* or *"simultaneous leukemia'.*
* In this leukemia, a single blast population demonstrates marker of more than one lineage (in contrast to bilinear leukemia where blasts of two different lineage are present).
* Coexpression of *myeloid with B lymphoid lineage is most common type (65%).* Co-presence of myeloid with T-lymphoid lineage is second most common type. Co-expression of T and B cells phenotype or trilineage phenotype (T, B and myeloid cells) is rare.
* According to the 2008 WHO classification, the requirements for lineage attribution are as follows :?
a) Myeloid lineage :- Presence of myeloperoxidase or at least 2 markers of monocytic differentiation CD11c, CD 14, CD64, lysozyme, non-specific esterase
b) T lineage :- Cytoplasmic or surface CD3
c) B lineage :- Strong CD19 expression with at least one of the following weakly expressed *CD 10,* CD 79a, cytoplasmic CD22; or weak CD 19 expression with at least 2 of the following strongly expressed CD 10, CD 79a, cytoplasmic CD22.
Clinical presentation

Clinical presentation

* Similar to other acute leukemias, acute leukemia with ambiguous lineage presents with symptoms related to depression of marrow function, i.e., cytopenia i.e. anemia, leukopenia, thrombocytopenia or pancytopenia.

Coming back to question

* Expression of B lineage (CD19 with CD 10) and myeloid lineage (myeloperoxidase) confirms the diagnosis of biphenotypic leukemia.

21. Which of the following statements is true ?

a) Chronic myeloid leukemia occurs beyond 50 years of age

b) Hairy cell leukemia in less than 50 years has a good prognosis

c) Acute lymphoid leukemia in less than 1 year has a poor prognosis

d) Chronic lymphocytic leukemia occurs in less than 50 years of age

Correct Answer - C

Ans. is 'c' i.e., Acute lymphoid leukemia in less than 1 year has a poor prognosis

* Age10 years at the time of diagnosis of ALL is considered an adverse prognosis.
* The median age at presentation of CML is approximately 50 years. The incidence of CML increases slowly with age until the middle forties where it starts to rise rapidly.
* The median age of onset of hairy cell leukemia is 52 years.
* CLL is considered to be mainly disease of the elderly with a median age at diagnosis of 70 years

22. In an ablated animal, myeloid series cells are injected. Which of following is sen after incubation period -

a) RBC

b) Fibroblast

c) T lymphocytes

d) Hematopoetic stem cell

Correct Answer - A
Ans. is 'a' i.e., R.B.C.
* Hematopoietic stem cells differentiate into two proginaturs *:?*
1) Common lymphoid proginator :- Which can give rise to lymphocytes (T-lymphocytes, B-lymphocytes and NK cells).
2) Common myeloid proginator :- Which can give rise to cells of myeloid series, i.e. erythrocytes (RBCs), granulocytes (neutrophils), monocytes and thrombocytes (platelets).
***** If the cells of myeloid series are injected, in an ablated animal, it will differentiate into cells of myeloid series. Amongst the given options, only RBC is of myeloid series.
***** If it would have been injection of hematopoietic stem cells (instead of myeloid series cells), then any of the hematopoietic cells (lymphoid series or myeloid series) can be formed as hematopoietic stem cells can generate multiple hematopoietic lineage.
* On the other hand progenitor cells are commited to cell lines, e.g. lymphoid progenitor cells will differentiate into lymphoid series only.

23. A person with radiologically confirmed reflux nephropathy develops nephrotic range proteinuria. Which of the following would be the most likely histological finding in the patient?

a) Focal segmental glomerulosclerosis

b) Nodular glomerulosclerosis

c) Membranous glomerulopathy

d) Proliferative glomerulonephritis with crescents

Correct Answer - A
Ans. is 'a' i.e., Focal segmental glomerulosclerosis
o Reflux nephropathy causes focal segmental glomerulosclerosis (FSGS).

24. The most common gene defect in idiopathic steroid resistant nephrotic syndrome -

a) ACE

b) NPHS 2

c) HOX II

d) PAX

Correct Answer - B
Ans. is 'b' i.e. NPHS-2 **Ref:** Lewis J.B., Neilson E.G. (2012). Chapter 283. Glomerular Diseases. In D.L. Longo, A.S. Fauci, D.L. Kasper, S.L. Hauser, J.L. Jameson, J. Loscalzo (Eds), *Harrison's Principles of Internal Medicine*, 18e.
Genetic basis of proteinuria in nephrotic syndrome
* Recently certain *gene mutations* have been recognized which are associated with *certain glomerulonephritis,* producing nephrotic syndrome.
* The gene mutations codes *certain proteins* and the common feature of these proteins is their *localization to the structures of the glomerular filtration barrier,* such as *slit diaphragm* and *podocyte cytoskeletal structures* such as *actin.*
* Their specific functions and interaction are incompletely understood, but it *is* clear that the integrity of each is *necessary to maintain the normal glomerular filtration barrier.*

Gene	*Chromosome*	*Protein*	*Location*	*Disease*
NPHS 1	19(413	nephrin	slipt diaphragm	Nephrotic syndrome of finnish type
NPHS2		podocin	slit diaphragm	Steroid

1x25-31	podocin	resistant nephrotic syndrome

25. Mutation in COL4A5 chain the diagnosis *?*

a) Alport's syndrome

b) Good pasture's syndrome

c) Hereditary Non-polyposis colon cancer

d) Keroderma pigmentosum

Correct Answer - A
Ans. is 'a' i.e., Alport's syndrome
Manifestations of Alport's syndrome are due to abnormal a_3 *(COL4A3),* a_4 *(COL4A4), or* a_5 *(COL4A5).* **o** This is due to mutations of :
COL4A5 in classic X-linked form
COL4A.3 or COL4A4 in autosomal forms.

26. A 20 year old female is diagnosed with granulosa cell tumor of the ovary. Which of the following biomarkers would be most useful for follow-up of patient?

a) CA 19-9

b) CA 50

c) Inhibin

d) Neuron-specific -enolase

Correct Answer - C
Ans. is 'c' i.e., Inhibin
o Granulosa call tumor is positive for vimentin, inhibin, CD99

27. In Alzheimer's disease, the pathology seen in the brain is -

a) Atrophy of parietal and temporal lobes

b) Atrophy of temporal lobes

c) Atrophy of temporal and occipital lobes

d) Atrophy of parietal and occipital lobes

Correct Answer - A
Ans. is 'a' i.e., Atrophy of parietal and temporal lobes
Gross pathology in Alzhiemer's disease:
o Diffuse cerebral atrophy of the hippocampus, amygdala and entorhinal cortex.
o *Enlargement of the ventricles caused by neuronal loss.*

- *Grossly the brain shows a variable degree of cortical atrophy marked by widening of the cerebral sulci.*
- *These changes are most pronounced in the temporal and parietal lobes:*
  Frontal lobes can also be involved.

28. Infection with HIV is associated with atrophy in all of the following parts of the brain except -

a) Anterior cingulate gyms

b) Caudate nucleus

c) Lower white matter volume

d) Globus pallidus

Correct Answer - A

Ans. is 'a' i.e., Anterior cingulate gyrus

HIV -1 associated neuronopathy is characterized by

The infiltration of macrophages into the CNS.

The formation of microglial nodule and multinucleated giant cell which result possibly from virus induced fusion of microglia and/macrophages in central white or gray matter

Astrocyte activation and damage, neuronal loss particularly in

Hippocampus

Basal ganglia

Caudate nucleus.

o *In addition a variable degree of white matter pathology with evidence of broad range of myelin damage ranging from pallor to widespread breakdown and loss leading to accumulation of lipid macrophages in extreme cases with axonal damage in the latter cases, and the presence of HIV-1 in the cerebrospinal spinal ¸fluid (CSF) has been reported..*

29. The anticoagulant of choice for performing coagulation studies is -

a) EDTA

b) Heparin

c) Tri sodium citrate

d) Double oxalate

Correct Answer - C

Ans. is 'c' i.e., Tri sodium citrate, 3.2% trisodium citrate *(Ref. Ronald Hoffman Hem, ,rogv/513, mtrobes 12/c 3.2% trisodium citrate is the anticoagulant of* ***choice for coagulation test***

The most commonly use anticoagulant for in vitro Coagulation Studies is Citric Acid.It is generally employed in the form of Sodium Citrate.

In Vitro use of anticoagulants

i) For coagulation studies-Sodium Citrate

ii) For Hematological studies-EDTA

iii) For estimation of ESR

.. Wintrobes method-Double oxalate.

?. Westergren method-Sodium Citrate.

30. If you are in PHC, which anticoagulant is used to sent the blood sample for blood glucose estimation?

a) EDTA

b) Heparin

c) Potassium oxalate

d) Potassium oxalate + sodium fluoride

Correct Answer - D
Ans. is 'd' i.e., Potassium oxalate and sodium fluoride
* *Sodium fluoride- potassium oxalate mixture* is used for glucose determination.
* NaF inhibits the glycolytic enzymes responsible for the breakdown of glucose in the blood (At room temperature, about 10% of the glucose is lost per hour from an untreated sample).
* The potassium oxalate is the primary anticoagulant, as NaF has a poor anticoagulant effect.

31. Which of the following is a special stain used to diagnose fungal hyphae in tissues-

a) Masson trichome

b) Silver methenamine

c) Congo Red

d) Alizarin Red

Correct Answer - B
Ans. is 'b' i.e., Silver methenamine
o Gomori methamine silver stain (GMS) and periodic acid Schiff (PAS) are the two most common stains used to look for fungi in tissues and cytology specimens.

32. Following are seen in polycythemia vera except:

a) Most common cause of polycythemia

b) Increased erythropoietin

c) Erythropoietin independent growth of red cell progenitors

d) Intrinsic abnormality of hematopoietic precursors

Correct Answer - B

Polycythaemia vera (PV) is a clonal disorder characterized by increased production of all myeloid elements resulting in pancytosis (i.e increased red cells, granulocytes, platelets) in the absence of any recognizable cause.

- The term ‘polycythemia vera’ or ‘polycythemia rubra vera’ is used for primary or idiopathic polycythemia only and is the most common of all the myeloproliferative disorders.
- Secondary polycythemia or erythrocytosis, on the other hand, may occur secondary to several causes e.g. high altitude, cardiovascular disease, a pulmonary disease with alveolar hypoventilation, heavy smoking, inappropriate increase in erythropoietin (renal cell carcinoma, hydronephrosis, hepatocellular carcinoma, cerebellar hemangioblastoma, massive uterine leiomyoma);

clinical features:

- headache, vertigo, tinnitus, visual alterations syncope or even coma.
- Increased risk of thrombosis due to accelerated atherosclerosis.
- Increased risk of hemorrhages due to increased blood volume and intrinsic platelet dysfunction e.g. epistaxis, peptic ulcer disease
- Splenomegaly producing abdominal fullness.
- Pruritus, especially after a bath

33. Real time polymerase chain reation is done for:

a) DNA detection only

b) RNA detection only

c) Both RNA and DNA detection

d) Monitoring amplification of target nucleic acid

Correct Answer - D
Ans. d. Monitoring amplification of target nucleic acid
Real time polymerase chain reaction is done for monitoring amplification of target nucleic acid.
'A quantitative polymerase chain reaction (qPCR), also called as real-time polymerase chain reaction, is a laboratory technique of molecular biology based on the polymerase chain reaction (PCR), which is used to amplify and simultaneously quantify the targeted DNA molecule.'

34. The earliest change seen in apoptosis is ?

a) Cell shrinkage

b) Pyknosis

c) Formation of apoptotic bodies

d) Fragmentation of cells

Correct Answer - A

Ans. is 'a' i.e., Cell shrinkage

Morphological changes in apoptosis

Features of apoptosis are :?

1. Cell shrinkage : It is the earliest changes. It is due to damage to cytoskeletal proteins.
2. Chromatin condensation (pyknosis)/nuclear compaction : It is the most characteristic feature.
3. Formation of cytoplasmic blebs : It is the end stage of apoptosis.
4. Cytoplasmic eosinophilia.
5. Chromosomal DNA fragmentation : It is due to activity of endonuclease and caspases.
6. Formation of apoptotic bodies : These are membrane bound round masses of eosinophilic cytoplasm with tightly packed orgaelles which may contain nuclear debries. Important examples of apoptotic bodies are civatte bodies, kamino bodies, councilman bodies, Tingible bodies, sunburn cells, satellite dyskeratotic cells, and eosinophilic globules.
7. Phagocytosis of apoptotic cells and bodies by adjacent macrophages or healthy parenchymal cells.
8. Considerable apoptosis may occur before it becomes apparent on histological section.

Two very important differentiating features from necrosis are :?

- Absence of inflammation.
- Intact cell membrane.

35. Alpha thalassemia is due to ?

a) Alpha chain deficiency

b) Alpha chain excess

c) Beta chain deficienc

d) Beta chain excess

Correct Answer - A
Ans. is 'a' i.e., Alpha chain deficiency
Alpha-thalassemia
People who do not produce enough alpha globin chain have alpha - thalassemia. Alpha globin chain is made by four genes, each gene contributes to 25% of the a-globin chains. The severity of a-thalassemia varies greatly depending on the number of a-globin genes affected -

- Silent carrier state
- Single a-globin gene is deleted. These individuals are completely asymptomatic.
- a-thalassemia trait
- Two a-globin genes are deleted. These individuals are asymptomatic with some red cell abnormalities like β-thalassemia minor.
- HbH disease
- Three genes of a-globin chain are deleted. With only one gene, the synthesis of a-chain is markedly reduced and tetramers of excess β-globin, called HbH, form. HbH has extremely high affinity for oxygen and therefore is not useful for oxygen exchange, leading to tissue hypoxia disproportionate to the level of hemoglobin. Patients have moderate to severe anemia that may require occasional blood transfusion.

- Hydrops fetalis
- There is deletion of all four a-globin genes. In the fetus, excess y-globin chains form tetramers, known as hemoglobin harts. Hemolgobin bart has such a high affinity for oxygen that it delivers almost no oxygen to tissues. Most individuals die before or shortly after birth. In utero blood transfusion have allowed the birth of children with hydrops fetalis who then require life long blood transfusions.

36. Turner syndrome, true is ?

a) XYchromosomal abnormality

b) Tall stature, small testes

c) Preductalcoarctation of aorta

d) Presence of testes

Correct Answer - C

Ans. is 'c' i.e., Preductalcoarctation of aorta

Turner's syndrome

- Turner's syndrome is the most common sex chromosomal disorder in phenotypic females.
- Turner's syndrome results from complete or partial loss of one X chromosome (45, X) and is characterised by hypogonadism in phenotypic females

Features of Turner syndrome in children :?

- The most severely affected patients generally present during infancy with edema (owing to lymph stasis) of the dorsum of the hand and foot and sometimes swelling of the nape f the neck.
- **Swelling of the neck is related to markedly distended lymphatic channels, producing so called** cystic hygroma.
- As these infants develop, the swelling subsides but often leave bilateral neck webbing and persistent looseness of skin on the back of the neck.
- **Congenital heart disease** is also common, particularly preductal coarctation of Aorta and bicuspid Aortic valve.
- C. VS abnormalities are most important cause of mortality in children with Turner 's syndrome.
- *Features of Turner's syndrome in Adolescents and Adult:-*
- At puberty there is *failure to develop normal secondary sex*

characteristics.

- The genitalia remains *infantile,* breast development is *inadequate* and there is little pubic hair. *Nipples are widely spaced.*
- Turner syndrome is the single most important cause of primary amenorrhoea accounting for approximately $^{1}/3$ of the cases.
- *Short stature* (height rarely exceeds 150 cm).
- The mental status of these patients *is usually normal* but subtle defects in nonverbal, visual spatial information processing have been noted *(mental retardation is associated with the presence of extra chromosome* not with loss of X chromosome).
- About 50% of the patients develop autoantibodies directed to the *thyroid gland* and upto one half of these patients develop *hypothyroidism.*
- Other features include *low posterior hairline, webbing of neck, cubitus valgus, streak ovaries.* o Glucose intolerance, obesity and insulin resistance are also seen.

37. Nanotechnology has found tremendous application in the diagnosis of cancers because of all of following advantages, except

a) Nanocrystals exibit bright, photostable fluorescence

b) Nonocrystals have a narrow spectrum wavelength

c) Peak spectrum wavelength is tunable

d) Nanocrystals exhibit a narrow difference between their excitation and emission peak spectra

Correct Answer - D
Ans'd. Nanocrystals exhibit a narrow difference between their excitation and emission peak spectra
Nanocrystals, also called Quantum dots, are inorganic crystals that exhibit **very strong fluorescent emissions.** These materials are considered semiconductors and range from one to fifty nanometers in diameter.
These semiconductor nanocrystals are **remarkably durable**
Ref http://www. semrock.com/fluorescence-imagin^{g}-with-quantum-dot-nanocrystals.aspx;

38. NA hich of the 10110N% ing is not a cause of point mutation

a) Paracentric inversion

b) Deletion

c) Substitution

d) Insertion

Correct Answer - A
Ans. a. Paracentric inversion
"(Ref Robbins 9/e p138, 160, 8/e p138, 160; Lippincot 5/e p433-434)
"Inversion refers to a **rearrangement** that involves **two breaks within a single chromosome** with **reincorporation of the inverted, intervening segment.**
An **inversion involving only one arm** of the chromosome is known as **paracentric.**
If the **breaks are on opposite sides of the centromere,** it is known as **pericentric.** Inversions are often fully compatible with normal development."- Robbins 9/e p160, 8/e p160

39. Hyperacute rejection is due to

a) Preformed antibodies

b) Cytotoxic T-lymphocyte medicated injury

c) Circulating macrophage mediated injury

d) Endothelitis caused by donor antibodies

Correct Answer - A
Ans. a. Preformed antibodies

- Hyperacute rejection is due to preformed antibodies.
- Hyperacute rejection:
- Immediate (within minutes to hours) graft destruction due to ABO or pre-formed anti-HLA antibodieso. Characterised by intravascular thrombosis°
- Kidney transplants are particularly vulnerable^{Q} to hyperacute graft rejection

40. Flow cytometry is done on

a) Polycythemia

b) Thrombocytosis

c) Basophil

d) Lymphocytes

Correct Answer - D
Ans. d. Lymphocytes
"Flow cytometry can rapidly and quantitatively measure several individual cell characteristics, such as membrane antigens and the DNA content of tumor cells. Flow cytometry has also proved useful in the identification and classification of tumors arising from T and B lymphocytes and from mononuclear-phagocytic cells."- *Robbins 8/e p324*

41. Which of the following does not indicate megaloblastic anemia

a) Increased reticulocyte count

b) Raised Bilirubin

c) Mild splenomegaly

d) Nucleated RBC

Correct Answer - A

Ans. a. Increased reticulocyte count

- Megaloblastic anemia is characterized by hypercellular bone marrow with abnormally large nucleated RBC, raised unconjugated bilirubin and mild splenomegaly

Characteristic Features of Megaloblastic Anemia

- Bone marrow: Hypercellular with a decreased myeloid/erythroid ratio and abundant stainable iron
- RBC precursors: Abnormally large° and have nuclei that appear much less mature than would
- be expected from the development of the cytoplasm (nuclear-cytoplasmic asynchrony°).
- Nuclear chromatin is more dispersed than expected and it condenses in a peculiar fenestrated pattern°
- Raised unconjugated bilirubin°
- Mild reversible splenomegaly° (Wintrobes 12/e p1151)

42. Myelofibrosis leading to a dry tap on bone marrow aspiration is seen with ach of the following condition

a) Burkitt's lymphoma

b) Acute erythroleukemia

c) Acute megakaryocytic leukemia

d) Acute myelomonocytic leukemia

Correct Answer - C

Ans. c. Acute megakaryocytic leukemia

- Bone marrow maybe difficult to aspirate in Acute megakaryocytic leukemia and more than 2/3rd of patients have significant fibrosis caused by release of fibrogenic cytokine

Erythroleukemia (M6) FAB

- Bone marrow findings:
- Usually hypercellular with megaloblastic changes°
- **-** Erythroid precursors commonly have multicentricity (65%), karyorrhexis (53%), morulae (25%) and cytoplasmic inclusions°**.**
- MC immunophenotypic marker for erythroleukemia: Glycoprotein 7 and transferring receptor (CD-71

Acute Megakaryocytic Leukemia (M7) FAB

- Bone marrow findings:
- Bone marrow maybe difficult to aspirate and more than 2/3' of patients have significant fibrosis° caused by release of fibrogenic cytokine

Burkitt's Lymphoma

- Bone marrow findings:
- When the bone marrow is involved, aspirates reveal tumor cells with

slightly clumped nuclear chromatin°, 2-5distinct nucleoli and royal blue cytoplasm containing clear cytoplasmic vacuole

Acute Myelomonocytic Leukemia (M4) FAB

- Bone marrow findings:
- Ultra-structures are present in association with monocytosis and myeloblastic/monoblastic infiltration of bone

43. Receptor on neuronal membrane that induces development of glioma

a) CD-117

b) CD-133

c) CD-33

d) CD-45

Correct Answer - B
Ans. b. CD-133
CD-133 is used as a marker for leukemia and glioblastoma (glioma) stem cell.
CD133 is used as a marker for leukemia and glioblastoma stem cell. It is also used for identifying immature leukemic stem cell in AML and Pro B leukemia.
CD-133 is a glycoprotein that spans the cell membrane five times and is first member to define this new family protein.
Used as a marker for leukemia° and glioblastoma stem cell
In AML and pro B-leukemia with MLL gene translocation, CD-133 identifies immature leukemic stem cell.

44. Lymphoma Marker is:

a) S-100

b) **HMB-45**

c) Leukocyte common antigen

d) Cytokeratin

Correct Answer - C
Ans. c. Leukocyte common antigen

- (LCA or CD45):
- "LCA or CD45 is expressed brightly in normal lymphocytes as well as in most of the lymphoproliferative disorder. It is also variably expressed in other leukocytes. It is absent in erythroid cells." - *Iochims Lymph Node Pathology 4/43*
- S-100: S-100 is a marker that comes positive in chondrocytes, schwann cells, fat cells, oligodendrocytes and other neural crest origin cells and tumors.
- HMB-45: HMB-45 is a activated melanocytic marker expressed in melanoma cells. Cytokeratin: Cytokeratin is expressed in normal and malignant epithelial cells.

45. A patient of more than 70 years, presented with generalized lymphadenopathy. WBC count was 20,000/ mm3 and blood film showed >70% mature looking lymphocytes. Next investigation that should be done

a) LN biopsy

b) Peripheral Immunophenotyping

c) Bone marrow aspiration

d) Peripheral blood cytogenetics

Correct Answer - B

Ans. b. Peripheral Immunophenotyping

A patient of more than 70 years, presented with generalized lymphadenopathy. WBC count was 20,000/mm^3 and blood film showed >70% mature looking lymphocytes. This clinical situation is suggestive of CLL

Harrison says "Differential diagnosis of typical B cell CLL is extensive. Immunophenotyping will eliminate the other T-cell disorders and can often help sort other B-cell malignancies."

Immunophenotyping confirms the monoclonal origin of the B cells

46. Most common fixative used in electron microscopy:

a) Glutaraldehyde

b) Formalin

c) Picric acid

d) Absolute alcohol

Correct Answer - A
Ans. a. Glutaraldehyde
(Ref Surgical Pathology by Rosai and Ackermann 9/e p27; Culling's Histopathology Technique/271 Glutaraldehyde fixes quickly, so it is good for electron microscopy

47. In a specimen of kidney, fibrinoid necrosis is seen and onion peel appearance is also present. Most probable pathology is

a) Hyaline degeneration

b) Hyperplastic arteriosclerosis

c) Glomerulosclerosis

d) Fibrillary glomerulonephritis

Correct Answer - B
Ans. B. Hyperplastic arteriosclerosis
Hyaline Arteriolosclerosis
associated with luminal narrowing.
These changes stem from plasma protein leakage across injured endothelial cells and increased smooth muscle cell matrix synthesis in response to chronic hemodynamic stress.
Although the vessels of elderly persons (either normal- or hypertensive) also frequently show hyaline arteriosclerosis, it is more generalized and severe in individuals with hypertension.
Major morphologic characteristic of benign hypertension
Also a common feature of diabetic microangiography; in that case, the underlying etiology is hyperglycemia-induced endothelial cell dysfunction.
In nephrosclerosis due to chronic hypertension, the arteriolar narrowing of hyaline arteriosclerosis causes diffuse impairment of renal blood supply and causes glomerular scarring.
Hyperplastic Arteriolosclerosis
Occurs in severe (malignant) hypertension
Vessels exhibit "onion-skin lesions," characterized by concentric, laminated thickening of the walls and luminal narrowing

laminated thickening of the walls and luminal narrowing.
The laminations consist of smooth muscle cells with thickened, reduplicated basement membranes
In malignant hypertension, they are accompanied by fibrinoid deposits and vessel wall necrosis(necrotizing arteritis), particularly in the kidney.
Characteristic of malignant hypertension

48. Staining done for sebaceous cell carcinoma

a) Red 0

b) PAS

c) Methamine silver

d) KOH

Correct Answer - A
Ans. a. Oil Red 0

Histopathology of Sebaceous cell carcinoma

- Tumor is composed of lobules or sheets of cells separated by a fibrovascular stroma.
- The cell extend deeply and often involve the subcutaneous tissue and even the underlying muscle.
- The cells show various sebaceous differentiation, manifest as finely vacuolated or foamy° rather than clear cytoplasm. There is more differentiation at the centre of the nest. Sometimes pseudoglandular formation° occurs.
- The vacuolated cells show abundant lipid, if a frozen section is stained with Oil Red '0' or Sudan Black°.

Sebaceous cell carcinoma

- Chlazion is tarsal or meibomian cyst and sebaceous cell carcinoma arises from the meibomian glands, so a recurrent chlazion should be subjected to histo-pathologic evaluation to exclude possibility of Sebaceous cell carcinoma°. Usually presents as a nodule (which maybe mistaken for chlazion)°, which then grows to form a big growth
- Surgical excision with reconstruction of the lids is the treatment of choice°

49. In Lewis Triple Response, redness when skin is scratched with a pointed object is seen due to

a) Axon reflex causing vasoconstriction

b) Histamine release due to local injury to mast cells

c) Free nerve endings injury

d) Endothelial damage leading to increase in permeability

Correct Answer - B

Ans. b. Histamine release due to local injury to mast cells

- /n Lewis Triple Response, redness when skin is scratched with a pointed object is seen due to histamine release due to local injury to mast cells

Lewis Triple Response

- Lewis triple response is a three-part response to blunt injury.
- It consists of the red reaction, wheal and flare.

Lewis Triple Response

Red reaction

- Red reaction appears at the site of injury within 10 seconds°.
- Due to dilation of pre- capillary sphincters by histamine and polypep aged skiff'.

Wheal

- Wheal is local edema due to increased permeability of the capillaries with conse- quent extravasation of fluid°
- Occurs due to histamine or histamine-like substances released from local mast cells°.

Flare response

- Flare response is a spread? ing redness is due to arte? riolar

dilatation produced by the axon reflee

50. A young female patient came for routine examination. On examination a mid systolic click was found. There is no history of RHD. The histopathological examination is most likely to show

a) Myxomatous degeneration and prolapse of the mitral valve

b) Fibrinous deposition on the tip of papillary muscle

c) Rupture of chordae tendinae

d) Aschoff nodule on the mitral valve

Correct Answer - A
Ans. a. Myxomatous degeneration and prolapse of the mitral valve

51. Which of the following is the characteristic of irreversible injury on electron microscopy

a) Disruption of ribosomes

b) Amorphous densities in mitochondria

c) Swelling of Endoplasmic reticulum

d) Cell swelling

Correct Answer - B
Ans. b. Amorphous densities in mitochondria

- One of the characteristic features of irreversible injury on electron microscopy is marked dilation of mitochondria with the appearance of large amorphous densities

Cell Injury

Reversible injury

- Occurs due to widespread effects of depletion of ATP (decreased activity of NW-K· ATPase), which occurs as a result of hypoxia[Q]
- Features of reversible injury:
- Cellular swelling"
- Loss of microvilli[Q]
- Bleb formation[Q]
- ER swelling: Detachment of ribosomes[Q]
- Myelin figures"
- Nuclear: Clumping of nuclear chromatin[Q]

Irreversible injury

- Membrane damage is a central factor in
- pathogenesis of irreversible injury".
- Features of irreversible injury include:

- A Severe swelling of mitochondria":
- Large,flocculant amorphous densities develop in
- mitochondria! matrix (Increased Ca" influx)"
- B Severe swelling of lysosomes": Injury to
- lysosomal membrane follows, various enzymes
- are released leading to:
- Decreased basophilia[Q]
- Nuclear changes (Pyknosis, •karyolysis,
- Karyorrhexis)"
- Protein digestion[Q]
- C. Severe damage to plasma membrane[Q]

52. Hematopoetic stem cell differ from progenitor stem cell in that they can

a) Form terminally differentiated cells

b) Have a role in bone marrow regeneration

c) Produce growth factors

d) Have receptors for anchoring proteins

Correct Answer - B

Ans. b. Have a role in bone marrow regeneration

- Hematopoietic stem cell differ from progenitor stem cell in that they can have a role in bone marrow regeneration.
- Progenitor stem cells are committed, don't have capacity of self-renewal and don't have a role in bone marrow regeneration, whereas hematopoietic stem cells have self-renewal capacity and thus, helps in bone marrow regeneration.

Progenitor Stem Cells

- *C*ommitted stem cells lose their capacity to self-renewal.
- They become irreversibly committed (i.e. form terminally differentiated cells)
- Certain hormones or substances regulate them, so that they can proliferate and can undergo maturation.
- Progenitor stem cells are committed, don't have capacity of selfrenewal and don't have a role in b*one marrow regenerations*

53. The role of bradykinin in process of inflammation is

a) Vasoconstriction

b) Bronchodilation

c) Pain

d) Increased vascular permeability

Correct Answer - D
Ans. d. Increased vascular permeability

- *The role of bradykinin in process of inflammation is to increase vascular permeability.*
- *"Bradykinin increases vascular permeability and causes contraction of smooth muscle, dilation of blood vessels, and pain when injected into the skin."- Robbins 8/e p65*

Kinins

- Kinins are vasoactive peptides derived from plasma proteins, called kininogens, by the action of specific proteases called kallikreins.
- The kinin and coagulation systems are also intimately connected.
- *The activ*e form of factor XII, factor XIIa, converts plasma prekallikrein into an active proteolytic form, the enzyme kallikrein, which cleaves a plasma glycoprotein precursor, high-molecular-weight kininogen, to produce bradykinin
- Bradykinin increases vascular permeability and causes contraction of smooth muscle, dilation of blood vessels, and pain when injected into the skinQ.
- These effects are similar to those of histamine.
- The action of bradykinin is short-lived, because it is quickly inactivated by an enzyme called kininase.
- Any remaining kinin is inactivated during passage of plasma through

the lung by angiotensin-converting enzyme.

- Kallikrein itself is a potent activator of Hageman factor, allowing for autocatalytic amplification of the initial stimulus.
- Kallikrein has chemotactic activity, and it also directly converts CS to the chemoattractant product C5aQ.

54. Following diagram indicates what type of inheritance

a) Mitochondrial

b) Autosomal recessive

c) Autosomal dominant

d) X-linked recessive

Correct Answer - A
Ans. a. Mitochondrial

55. HLA antigens observed on ocular dendritic cells are:

a) Class I

b) Class II

c) Class I and II

d) None

Correct Answer - B

- The human MHC, known as the human leukocyte antigen (HLA) complex, consists of a cluster of genes on chromosome 6
- Based on their chemical structure, tissue distribution, and function, MHC gene products fall into two main categories: class I & class II
- Class, I MHC molecules are encoded by three closely linked loci, designated HLA-A, HLA-B, and HLA-C
- They are found on the cell surface of all nucleated cells in the bodies of vertebrates. They also occur on platelets, but not on red blood cells. Their function is to display peptide fragments of proteins from within the cell to cytotoxic T cells; this will trigger an immediate response from the immune system against a particular non-self antigen displayed with the help of an MHC class I protein.
- Class II MHC molecules are encoded by genes in the HLA-D region, which contains at least three subregions: DP, DQ, and DR.
- They are found in antigen-presenting cells such as dendritic cells, mononuclear phagocytes, some endothelial cells, thymic epithelial cells, and B cells. These cells are important in initiating immune responses.

56. An Afroamerican boy DI car ui *age* presented with abdominal pain, chronic hemolysis and abnormal RBC shape on peripheral smear. Most likely disorder responsible for this condition:

a) Point mutation

b) Trinucleotide repeat

c) Antibody against RBC membrane

d) Genomic imprinting

Correct Answer - A
Ans. a. Point mutation
This patient is suffering from sickle cell anemia.
'Sickle cell anemia is an autosomal recessive disease that results from the substitution of valine from glutamic acid at
position 6 of the beta-globin gene (Point mutation)- Ghai
Sickle cell disease is a common hereditary hemoglobinopathy that occurs primarily in individuals of African descent.
In certain populations in Africa the prevalence of heterozygosity is as high as 30%. This high frequency probably stems from protection afforded by HbS against falciparum malaria.
Morphology:
* Peripheral blood demonstrates variable numbers of irreversibly sickled cells, reticulocytosis, and target cells,
* Howell-Jolly bodies (small nuclear remnants).
* The bone marrow is hyperplastic as a result of a compensatory erythroid hyperplasia.

* Expansion of the malrow leads to bone resorption and secondary new bone formation, resulting in prominent cheekbones and changes in the skull that resemble a crew-cut in X-rays.
* Increased breakdown of hemoglobin can cause pigment gallstones and hyperbilirubinemia.
* Splenic infarction, fibrosis, and progressive shrinkage (autosplenectomy)

57. Which of the following combination of immunohistopathological markers is incorrect?

a) Melanoma: S-100

b) Lymphoma: Common leucocyte antigen

c) Carcinoma: Desmin

d) Sarcoma: Vimentin

Correct Answer - C
Ans. c. Carcinoma: Desmin
Vimentin, Desmin- Mesenchymal tumors, Sarcomas

58. Which of the following induces apoptosis in a cell?

a) Glucocorticoids

b) Isoprenoids

c) Myristic acid

d) Oleic acid

Correct Answer - A
Ans. a. Glucocorticoids
Inducers of apoptosis:

- Growth factor withdrawal
- Detachment from matrix
- Glucocorticoids
- Cytotoxic drugs
- immune cytolysis

59. In a 70-year old man who was working in asbestos factory for 10-15 years. On routine X-ray, a mass,was seen in right apical region of lung. Biopsy was taken from the mass. Which of the following is seen on electron microscopic examination?

a) Numerous long, slender micros ilii

b) Neurosecretary granules in the cytoplasm

c) Melanosomes

d) Desmosomes

Correct Answer - A
Ans. a. Numerous long, slender microvilli
On electron microscopy, the presence of long microvilli snd abundant tonofilaments but absent microvillous roollets and lamella bodies favors the diagnosis of malignant mesothelioma. Electron microscopy (ultrasttuctural examination) has been acceptedfor many years as the 'gold standard'for the diagnosis of mesothelioma. Mesothelioma cells are characterized by a profusion of markedly elongated surface microvilli in the absence of secretory cytoplasmic granule.

60. A 65-year-old chronic smoker presented with a central lung mass with distal bronchiectasis and recurrent pneumonia. A greyish white tumor was resected. Which of the following histopathological finding is most likely to be seen?

a) Small cells with scant cytoplasm, ill-defined borders and hyperchromatic nuclei with nuclear moulding

b) Derivatives of all three germ layers are seen

c) Tall columnar cells with cytoplasmic and intraalveolar mucin

d) Palisading or rosette-like arrangement of cells separated by abundant fibrovascular stroma

Correct Answer - A
Ans. a. Small cells with scant cytoplasm, ill-defined borders and hyperchromatic nuclei with nuclear moulding
Histopathological Finding
1. Small cells with scant cytoplasm, ill-defined borders and hyperchromatic nuclei with nuclear moulding
Seen in
Small cell carcinoma of lung (more common in smokers and located centrally)
2. Derivatives of all three germ layers
Seen in
Teratoma
3. Tall columnar cells with cytoplasmic and intraalveolar mucin
Seen in

Seen in
Adenocarcinoma lung (more common in non-smokers, located peripherally)
4. Palisading or rosette-like arrangement of cells separated by abundant fibrovascular stroma
Seen in
Carcinoid tumours

61. A 27-year-old female presented with long-standing nodule in right lobe of size 2 cm x 2 cm and underwent right hemithyroidectomy. Histopathological findings are suggestive of:

a) Adenomatous goiter

b) Papillary carcinoma

c) Follicular adenoma

d) Graves disease

Correct Answer - B
Ans. b. Papillary carcinoma
'Papillary carcinomas can contain branching papillae having a fibrovascular stalk covered by a single to multiple layers of cuboidal epithelial cells. The nuclei of papillary carcinoma cells contain finely dispersed chromatin, which imparts an optically clear or emptlt appearance, giving rise lo the designation ground-glass or Orphan Annie elte nuclei. In acfulition, invaginations of the cytoplasm may in cross-sections give the appearance of intranuclear inclusions (pseudo-inclusions) or intranaclear grooves. The diagnosis of papillary carcinoma is made based on these nuclear features, even in the absence of papillary architecture.'

62. Which of the following is seen in Schwannoma?

a) Storiform pattern

b) Spindle cells

c) Antoni A and Antoni B pattern

d) Target cells

Correct Answer - C
Ans. C. Antoni A and Antoni B pattern
Antoni A and Antoni B pattern are seen in schwannoma.

- These are benign tumors that exhibit Schwann cell differentiation and often arise directly from peripheral nerves. They are a component of neurofibromatosis -2 (NF2). Microscopically, they are comprised of an admixture of dense and loose areas referred to as Antoni A and Antoni B areas, respectively.
- The dense eosinophilic Antoni A areas often contain spindle cells arranged into cellular intersecting fascicles. Palisading of nuclei is common and “nuclear-free zones” that lie between the regions of nuclear palisading are termed Verocay bodies.
- The storiform pattern is seen in dermato fibrosarcoma protuberance. This is composed of closely packed fibroblasts arranged radially.

63. A 50-year, old patient tSCIILS wnn n1 ea i–,ess and bleeding episodes. His leukocyte count was 48 x 109 cells/L and platelet count was 50 X 109 cells/L. There was dysplasia of neutrophils with a differential count showing 76% neutrophils, 8% blast cells, 12% myelocytes and metamyelocytes and 4% other cells Bonemarrow examination showed 14% blasts. Cytogenetics showed t(8, 21). The most likely diagnosis is:

a) Acute myeloid leukemia

b) Chronic myeloid leukemia

c) Chronic lymphoid leukemia

d) Myelodysplastic syndrome

Correct Answer - A
Ans. a. Acute myeloid leukemia
- Median presenting leukocyte count is about $15x10^9/L^Q$.
- Between 25 and 40% of patients have counts <5xl0^9/L, and2o% have counts >l00xl0^9/L.
. The morphology of the malignant cell varies in different subsets.
. In AML, the cytoplasm often contains primary (nonspecific) granules, and the nucleus shows fine'

lacy chromatinq with one or more nucleoli characteristic of immature cells.
. Abnormal rod-shaped granules called Auer rodss are not uniformly present, but when they are,
myeloid lineage is virtually certain.
. Platelet count:
. Platelet counts <100x10^9/L, are found at diagnosis in75% of patients, and about 25% have counts <25 xl0^9/L.
. Large and bizarre shapes with abnormal granulation and inability of platelets to aggregate or adhere normally
to one another

64. Wh,he follow morphogenic as well as mitogenic?

a) Fibroblast growth factor

b) Platelet derived growth factor

c) Bone morphogenetic protein

d) Insulin-like growth factor

Correct Answer - C
Ans. c. Bone morphogenetic protein
Both IGF-I and bone morphogenetic proteins (BMPs) are having morphogenic and mitogenic function but mitogenic
action of BMP is actually by augmenting the effects of IGF-1. So the better answer would be IGF-1.
Insulin like growth factor 1 (IGF-1)
Macrophages, fibroblast and other cells
Stimulates synthesis of sulfated proteoglycans, collagen, keratinocyte migration & fibroblast proliferation
(Both morphogenic & mitogenic)
Endocrine effects similar to growth hormone

65. ARDS is due to a defect

a) Type 1 pneumocytes

b) Type 2 pneumocytes

c) Clara cells

d) Endothelial cells

Correct Answer - D
Ans. d. Endothelial cells
The alveolar capillary membrane is formed b^{y} two separate barriers: Microvascular endothelium and Alveolar epithelium. In ARDS the integrity of this barrier is compromised by either endothelial or epithelial injury or, more commonly, both."
ARDS is a clinical syndrome associated with pathological findings including pneumonia, eosinophilic pneumonia, cryptogenic organizing pneumonia, acute fibrinous organizing pneumonia, and diffuse alveolar damage (DAD). Of these, the pathology most commonly associated with ARDS is DAD, which is characterized by a diffuse inflammation of lung parenchyma. The triggering insult to the parenchyma usually results in an initial release of cytokines and other inflammatory mediators secreted by local epithelial and endothelial cells."-http://en.wikipedia.otg/wiki/Acute_respiratory_ distress syndrome#Pathophysiology
"The intimal lining of all blood vessels is a single layer of functionally and structurally heterogeneous endothelial cells depending on organ and vascular bed location. Pulmonary microvascular endothelium is a metabolicall^{y} active organ essential for maintaining adequate pulmonary and systemic cardiovascular homeostasis. Noxious stimuli compromise pulmonary endothelial functional and structural integrity leading to noncardiogenic pulmonary edema and

parenchymal inflammation. Thus, pulmonary endothelium has a key role in the development of acute lung injury (ALI) and its most severe form, the acute respiratory distress syndrome (ARDS). "- Curr Opin Crit Care 14:22-30

Acute Respiratory Distress Syndrome

Pathogenesis:

- The alveolar capillary membrane is formed by two separate barriers:
- Microvascular endothelium
- Alveolar epithelium.
- In ARDS the integrity of this barrier is compromised by either endothelial or epithelial injury or, more commonly, both.
- Markers of endothelial injury and activation such as endothelin and von Willebrand factor can be detected at high levels in the serum of patients with ARDS.
- The acute consequences of damage to the alveolar capillary membrane include increased vascular permeability and alveolar flooding, loss of diffusion capacity, and widespread surfactant abnormalities caused by damage to type II pneumocytesQ
- Endothelial injury also triggers the formation of microthrombi that add the insult of ischemic injury.
- Hyaline membranes so characteristic of ALI/ARDS result from inspissation of protein rich edema fluid that entraps debris of dead alveolar epithelial cellsQ.

66. Verocay bodies are seen in:

a) Meningioma

b) Hemangioma

c) Glioma

d) Schwannoma

Correct Answer - D

verocay bodies are seen in schwannomas. Schwannomas are well-circumscribed, encapsulated masses that abut the associated nerve without invading it. Micro- scopically, they are comprised of an admixture of dense and loose areas referred to as Antoni A and Antoni B areas, respectively.

- The dense eosinophilic Antoni A areas often contain spindle cells arranged into cellular intersecting fascicles. Palisading of nuclei is common and “nuclear-free zones” that lie between the regions of nuclear palisading are termed Verocay bodies.
- In the loose, hypocellular Antoni B areas the spindle cells are spread apart by a prominent myxoid extracellular matrix that may be associated with microcyst formation.

67. Histopathologically rosettes are seen in

a) Retinoblastoma

b) Neurocysticercosis

c) PNET

d) Medulloblastoma

Correct Answer - A
Ans. A retinoblastoma
Rosettes are little round groupings of cells found in tumors.
Usually consist of cells in a spoke-wheel or halo arrangement surrounding a central, acellular region seen commonly in Retinoblastoma.
In well-differentiated retinoblastomas, the tumor cells are characteristically arranged in rosettes. The rosettes may be of 2 types— Flexner-Wintersteiner rosettes characterized by small tumor cells arranged around a lumen with their nuclei away from the lumen, and Homer-Wright rosettes having the radial arrangement of tumor cells around the central neurofibrillar structure
PNET (Primitive Neuro-Ectodermal Tumour) :
A PNET is composed of sheets of uniform small, round cells that are slightly larger than lymphocytes,

Medulloblastoma:
Individual tumor cells of medulloblastoma are small, with little cytoplasm and hyperchromatic nuclei that are frequently elongated or crescent-shaped

68. The fixative used in histopathology ?

a) 10% buffered neutral formalin

b) Bouins fixative

c) Glutaraldehyde

d) Ethyl alcohol

Correct Answer - A
Ans. is 'a' 10% buffered neutral formalin
Fixation

- In the field of histology and pathology, fixation is a chemical process by which biological tissues are preserved from decay, either through autolysis or putrefaction.
- Fixation terminates any ongoing biochemical reactions, and may also increase the mechanical strength or stability of treated tissues.
- Fixation preseves a sample of biological materiaktissues or cells) as close to its natural state as possible in the process of preparing tissue for examination.
- Chemicals used for chemical fixation are :-
- By far the most commonly usedfixative in histology is formaldehyde. It is usually used as 10% neutral buffered formalin (NBF) that is approximately 3.7% formaldehyde in phosphate buffered saline. It is the most commonly used fixative for light microscopy.
- For electron microscopy, the most commonly used fixative is glutaraldehyde.
- Other fixatives used for electron microscopy are osmium tetraoxide or uranyl acetate.
- Ethanol, methanol and acetone are used to fix frozen sections.
- Potassium dichromate, chromic acid and potassium permanganate all find use in certain specific histological preparations.

69. Gastrointestinal stromal malignancy arises from which of the following ?

a) Smooth muscle

b) Nerve cells

c) Interstitial cells of Cajal

d) Vascular Endothelium

Correct Answer - C
Ans. is 'c' i.e., Interstitial cells of Cajal

70. Shelf life of blood with CPDA

a) 2 weeks

b) 3 weeks

c) 5 weeks

d) 8 weeks

Correct Answer - C

Ans. is 'c' i.e., 5 weeks

- Once blood is removed from the donor, it starts a sequences of in vitro changes that change its physiological properties.
- Ensuring the blood and its products transfusion safe, their storage is a must.
- The main aim is to minimize damage to store blood.

Addition of some additive solutions increases the viability of blood, particularly RBCs:

Additive	Shelf life of RBC
Acid-citrate-dextrose (ACD)	21 days
Citrate phosphate dextrose (CPD)	21 days
Citrate phosphate dextrose-adenine (CPD-A)	35 days
Saline-adenine-Glucose-Mannitol (SAG-M)	42 days

71. Most common type of Non-Hodgkin's lymphoma in the orbit:

a) B-cell

b) T-cell

c) NK-cell

d) Plasma cell

Correct Answer - A
Answer- A (B- cell)

- MC type of cancer of the orbit in adults
- Usually a form of B-cell non-Hodgkin's lymphoma
- It may show up as a nodule in the eyelid or around the eye, or it may cause the eye to be pushed out.
- This type of eye cancer usually does not cause pain.

72. ESR is a very critical investigation in the diagnosis of Tb. Which of the following is true about ESR in TB?

a) No change in ESR

b) Confirms recovery from TB

c) ESR is raised because of increased RBC aggregate

d) ESR is raised due to decreased RBC size

Correct Answer - C

Ans. c. ESR is raised because of increased RBC aggregate *(Ref Robbins 9/e p99, 8/e p75)*

ESR

Increased	**Decreased**
• Pregnancy[Q]	
• Inflammation[Q]	• Polycythemia[Q]
• Anemia[Q]	• Sickle cell anemia[Q]
• Rheumatoid arthritis[Q]	• Hereditary spherocytosis[Q]
• Cancer[Q]	• Congestive heart failure[Q]
• Kidney disorders	

73. In which stage of neurocysticercosis, there is no edema?

a) Vesicular

b) Vesicular colloidal

c) Granular nodular

d) Nodular calcified

Correct Answer - D

Ans. d. Nodular calcified (Ref Robbins 9/e1)395, SA' 1)392-393)
Surrounding edema is seen in the colloidal vesicular and granular nodular stages.

Stage	Cyst wall	Scolex	Comment
Vesicular	Non-enhancing Wall defined membrane	Only one viable scolex Eccentric hyperdense **hole-with-dot"** appearance	Suggestive of **viable** larva
Colloidal	**Ring Enhancing** with perilesional edema	Degenerating scolex Fluid becomes more turbid	**Earliest** stage in t cyst involution - larval **degenerati**
Granular	Focal **nodular** enhancing necrotic lesions with perilesional edema	Degenerating scolex	**Eosinophilic** stru Bladder and scole in various stages disintegation
Calcified	Small hyperdense nodules without perilesional edema		

74. Division of a chromosome perpendicular to the normal axis of division leads to:

a) Ring chromosome

b) Isochromo some

c) Acrocentric chromosome

d) Subtelocentric chromosome

Correct Answer - B
Answer- B (Isochromosome)

- Isochromosome formation results when one arm of a chromosome is lost and the remaining arm is duplicated, resulting in a chromosome consisting of two short arms only or of two long arms.

75. Insulin resistance is seen in liver disease because of-

a) Decreased secretion of insulin

b) Hepatic steatosis

c) Hepatocytedysfunction

d) Low 'C'peptide level

Correct Answer - B
Ans. b. Hepatic steatosis (Ref Robbins 9/e p842, 845, 8/e p 1136, http://wwwnews-medical.net/health/What-is-InsulinResistance.aspx)

- 'Insulin resistance may also be caused by the damage of liver cells having undergone a defect of insulin receptors in hepatocytes.'
- 'Nonalcoholic fatty liver disease (NAFLD) refers to the presence of hepatic steetosis when no other causes for secondary hepatic fat accumulation (eg. heavy alcohol consumption) are present.

76. A 22-year-old female gives the history of recurrent joint pains. She has now developed petechial hemorrhages. She is most likely to have:

a) Megakaryocytic thrombocytopenia

b) Amegakaryocytic thrombocytopenia

c) Platelet function defects

d) Acquired factor VIII inhibitors

Correct Answer - D
Answer:. d. Acquired factor VIII inhibitors (Wintrobes p1442-144-.'74;Harrison19/ep734-735, 740, 18/e p982).

- The clinical presentation in a young female of recurrent joint pains with petechial hemorrhage is suggestive of an autoimmune disease.
- A female patient is unlike to have hemophilia, as it is an X-linked disorder. However, she can have autoantibodies against factor VIII.

77. The phenomenon where subsequent generations are at the risk of earlier and more severe disease is known as:

a) Mosaicism

b) Imprinting

c) Imprinting

d) Anticipation

Correct Answer - D

Ans: D. Anticipation

Anticipation:

- A phenomenon whereby symptoms of genetic disorder become apparent at an earlier age, as it is passed onto next generation.
- Mostly increased severity of symptoms noted.
- Common in trinucleotide repeat disorders (Huntington's disease & myotonic dystrophy).

Diseases showing anticipation

Autosomal dominant	**Autosomal Recessive**	**X-linked**	**Without Expression Type**
• **Several spinocerebellar** • Huntington's disease: **CAG°** • Myotonic dystrophy: **CTG°** • Dyskeratosis congenita°	• **Freidreich's axia:** (Freidreich's ataxia usually exhibit anticipation because it is an autosomal	• **Fragile X syndrome: CGG°**	• Crohn's disease Behcet's disease

recessive
disorder.)

- (Ref Robbins 9/e p168-171)

78. A 10-year old boy was presented with a mass in abdomen. On imaging, the para-aortic lymph nodes were enlarged. On biopsy, starry sky appearance was seen. What is the underlying abnormality?

a) p53 gene mutation

b) Rb gene mutation

c) Translocation involving BCR-ABL gene

d) Translocation involving Myc gene

Correct Answer - D

Ans: D. Translocation involving Myc gene

- Starry eye pattern on biopsy - Highly suggestive of Burkitt lymphoma.
- All forms of Burkitt lymphoma associated with translocations of c-MYC gene on chromosome 8.

Burkitt lymphoma:

- Tumor exhibiting high mitotic index & contains numerous apoptotic cells.
- Nuclear remnants of apoptopic cells are phagocytosed by interspersed benign macrophages.
- These phagocytes with abundant clear cytoplasm, creating a **characteristic "starry sky" pattern."**

Etiology:

- All forms of Burkitt lymphoma are associated with translocations of c-MYC gene on chromosome S.

Genetic mutation & associated conditions:

Translocation	Gene (Chromosome)	Malignancy
(9;22) (q34;q11)	**ABL-BCR**	**Chronic myeloid leukemia**
(11;14) (q13;q32)	**BCL1-IgH**	**Mantle cell lymphoma**
(8;21)	RUNX1-RUNX1T1	
(15;17)	PML-RARA	**Acute myeloid leukemia**
(16;16)	CBFB-MYH11	
(11;22) (q24;q12)	FLII-EWS	**Ewing's sarcoma**
(8;14) (q24;q32)	**MYC-IgH**	**Burkitt's lymphoma**
		B cell acute lymphocytic leukemia
Inv (2p13;p11.2-14)	REL-NRG	**Non-Hodgkin's lymphoma**
(1;3)(p34;p21)	TAL1-TCTAQ	**Acute T cell leukemia**

- (Ref: Robbins 9/e p597)

79. After an incised wound, new collagen fibrils are seen along with a thick layer of growing epithelium. The approximate age of the wound is:

a) 4-5 days

b) About 1 week

c) 12-24 hours

d) 24-72 hours

Correct Answer - A

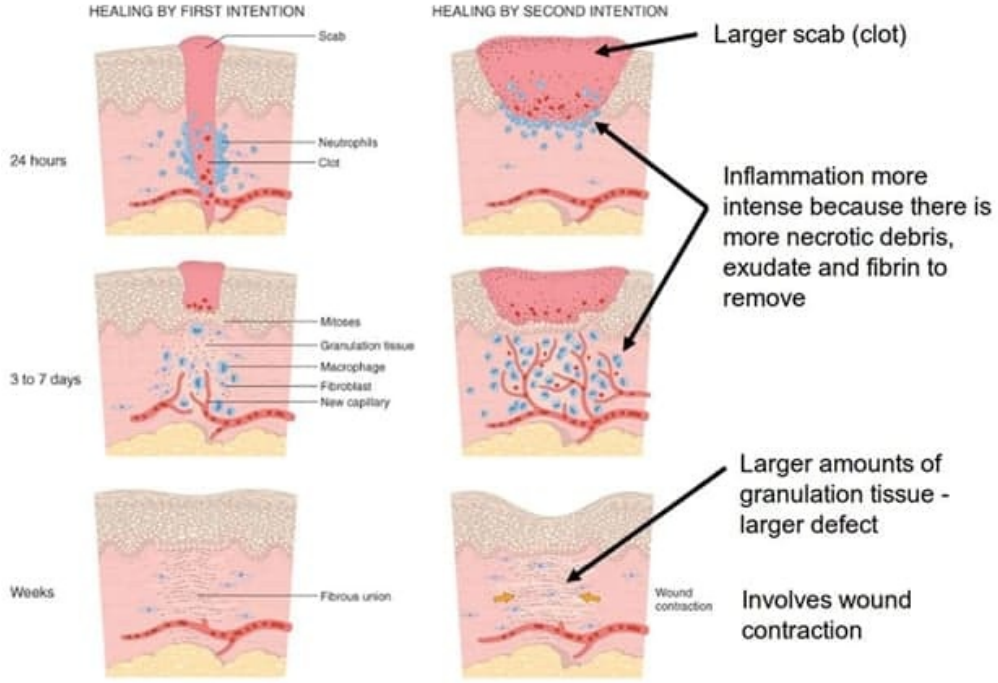
<u>Ans: A. 4-5 days</u>

- Approximate age of wound in an incised wound - 4-5 days.
- New collagen fibrils seen along with thick layer of growing epithelium.

Healing of Clean Uninfected Wound

Day	Features of Wound
Day 0	• Presence of **blood clot in the** incision/scab
Day 1 (within 24 hours)	• **Neutrophilic infiltration + blood clot°**
Day 2 (24-48 hours)	• Neutrophils + blood clot + **continuous thin epithelial layers°**
Day 3	• **Macrophages replace neutrophils** • Appearance of **granulation tissue** • **Deposition of type III collagen** but they do not bridge the incision • **Abundant granulation tissue.** • **Collagen fibrils bridge the incision**

Day 5	• **Neovascularization** is **maximum, full epithelial thickness with surface keratinization°**
End of 2"^{d} week	• **Accumulation of collagen, fibroblast proliferation** • **Disappearance of leucocyte inflammation**
1 month	• **Replacement** of collagen type III **with collagen type I (has greater tensile strength).** • **Dermal appendages are lost**



80. A 45-year old patient presented with fever, night sweats and weight loss. On X-ray, a mass was seen in apical lobe. On histopathology, caseous necrosis was present. What is the name of underlying process?

a) Enzymatic degeneration

b) Acute decrease in blood supply

c) Decreased supply of growth factor

d) Hypersensitivity reaction with modified macrophages, lymphocytes and giant cells.

Correct Answer - D

Ans: D. Hypersensitivity reaction with modified macrophages, lymphocytes and giant cells.

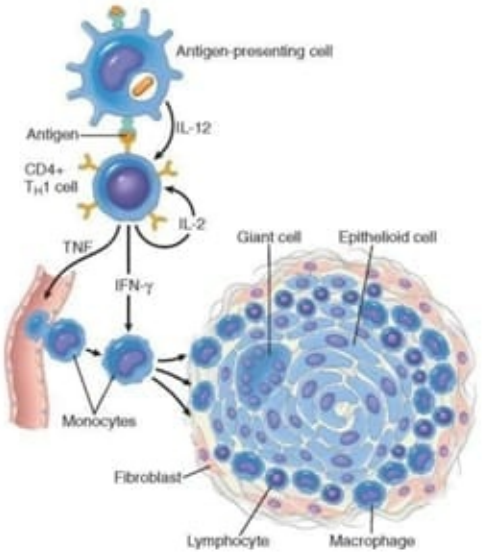
- **Clinical features like fever, night sweats and weight loss and X-ray finding of mass in apical lobe with histopathological findings of caseous necrosis are highly suggestive of tuberculosis.**

Mechanism:

- Type IV hypersensitivity.
- Characterized by presence of modified macrophages, lymphocytes & giant cells.

Schematic illustration:

- Events during granulomas formation in cell-mediated (type IV) hypersensitivity reactions.



- (Ref Robbins 9/e p208, 375,376; Anananarayan 10/e p169, 9/e p162).

81. Inheritance of ABO blood group is:

a) X-linked inheritance

b) Recessive inheritance

c) Mitochondria] inheritance

d) Codominance

Correct Answer - D
Ans: D. Codominance
Codominance:

- State where **both of the alleles of a gene pair contribute to the phenotype**
- Is a relationship between two versions of a gene.

Mechanism:

- Individuals receive one version of a gene, called an allele, from each parent.
- If the alleles are different, the dominant allele usually will be expressed, while the effect of the other allele, called recessive, is masked.
- In co-dominance, however, neither allele is recessive nor dominant & phenotypes of both alleles are expressed.
- E.g., ABO blood group - AB blood group both A & B as dominant.

(Ref. Robbins 9/e p140}

82. Most common nephropathy associated with malignaneN is:

a) Focal segmental glomerulosclerosis (FSGS)

b) Minimal change disease

c) IgA nephropathy

d) Membranous glomerulonephritis

Correct Answer - D

Ans: D. Membranous glomerulonephritis

- Most common nephropathy associated with malignancy - Membranous glomerulonephritis.
- In 25-30% - Associated with malignancy (solid tumors of breast, lung, colon), infection (hepatitis B, malaria, Schistosomiasis), or rheumatologic disorders like lupus or rarely rheumatoid arthritis.

Histopathology:

- Electron-dense deposits along the epithelial side of the basement membrane with effacement of foot processes overlying deposits.

(Ref Robbins 9/e p917-918; Harrison 19/e p1843).

83. Oil red '0' stain is used for:

a) Glutaraldehyde fixed specimen

b) Alcohol fixed specimen

c) Formalin fixed specimen

d) Frozen specimen

Correct Answer - D

Ans: D. Frozen specimen

For Connective Tissue and Lipids

Name of stain	Elements stained
Trichrome Stain	**Collagen**
Verhoeff-Van Gieson stain (Best for Elastin)	**Elastic fibers**
Luna stain	Elastin & **Mast cells**
Silver Methenamine stain	**Reticulin**
Oil red '0' stain (on Fresh specimen)	**Fat**
Sudan black (on fixed specimen)	
Mallory's **PTAH** stain	Muscle striations
Martius scarlet blue (MSB)	**Fibrin**
PAS, Silver Methenamine stain	**Basement membrane**
Bielschowsky (silver stain)	**Neurofibrillary tangles senile plaques**
Luxol fast blue	**Myelin**

(Ref Netter :s• Essential Histology 2/e p479)

84. Which of the following is responsible for adhesion of plate¬lets to the vessel IN all? (.4//MS May 2015, November 2013

a) Factor IX

b) Von Willebrand factor

c) Fibrinogen

d) Fibronectin

Correct Answer - B

Ans: B. Von Willebrand factor

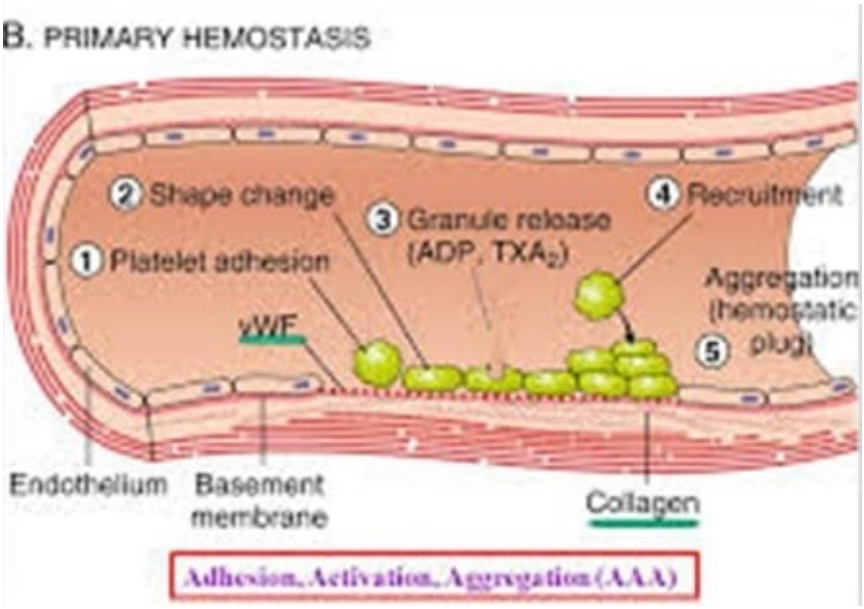
(Ref. Robbins 9/e pill), 660 & Robbins 9/e p116

Von-Willebrand factor:

- Product of normal endothelial cells.
- An essential cofactor for platelet binding to matrix elements (adhesion of platelets to vessel wall).

Events:

- **E**ndothelial injury allows platelets to contact underlying extracellular matrix à subsequent adhesion occurs through interactions with von Willebrand factor (vWF).


B. PRIMARY HEMOSTASIS
2 Shape change
3 Granule release (ADP, TXA_2)
4 Recruitment
1 Platelet adhesion
Aggregation (hemostatic plug)
5
vWF
Endothelium
Basement membrane
Collagen
Adhesion, Activation, Aggregation (AAA)

85. Lymphatic spread is most commonly seen in which type of thyroid malignancy:

a) Papillary carcinoma

b) Follicular carcinoma

c) Medullary carcinoma

d) Anaplastic carcinoma

Correct Answer - A

Ans: A. Papillary carcinoma

Papillary Carcinoma of Thyroid:

- MC thyroid cancer in children and individuals exposed to external radiation

Multifocality:

- Common (up to 85% of cases) on microscopic examination.

Metastates:

- Lymph node metastases – Common especially in children and young adults.
- Distant metastases - Uncommon initially.
- Ultimately develop in 20% patients.
- Associated with an increased risk of cervical nodal metastases, rarely invade adjacent structures such as the trachea, esophagus & RLNs.

"Lateral aberrant thyroid":

- Denotes invaded cervical lymph node by metastatic cancer.

86. In Langerhans Cell Histiocytosis, the characteristic abnormality seen is:

a) Foamy macrophages

b) Giant cell

c) Plasma cell

d) Birbeck's granules

Correct Answer - D

Ans: D. Birbeck's granules

(Ref Robbins 9/e p621,622, 8/e 1)631,632)

Langerhans Cell Histiocytosis:

Histiocytosis -

- An "umbrella" designation for variety of proliferative disorders of dendritic cells or macrophages.
- Spectrum of proliferations of special type of immature dendritic cell called “Langerhans cell”.

Characteristic abnormality –

- Birbeck's granules in cytoplasm.
- Pentalaminar tubules often dilated terminal end producing a **“tennis racket–like appearance”** containing protein tangerine.

87. Most important but nonspecific regulator of iron metabolism is:

a) Hepcidin

b) DMT I

c) Ferroportin

d) Ferritin

Correct Answer - A
Ans: A. Hepcidin
(Ref Robbins 91e p650 848 8/e p660)
Hepcidin:

- Main regulator protein for iron absorption.
- Encoded by HAMP gene.
- Small circulating peptide synthesized & released from liver in response to increased intrahepatic iron levels.

Proteins Involved in Iron Metabolism

- Ceruloplasmin° (ferrioxidase activity)
- DMT1°
- Ferrireductase° (cytochrome *b* reductase I)
- Ferritin°

Ferroprtin

- Heme transporter
- Hemojuvelin°
- Hepcidin°
- Hephaestin°

HFE°

- Iron-responsive element-binding protein°
- Transferrin° Transferrin receptors 1 & 2

88. About intraoperative histopathological analysis, all are true except:

a) Gives an immediate definitive diagnosis of tumor

b) Used for detecting positive margins after resection

c) Used to confirm suspected metastasis

d) Sentinel lymph node biopsy in breast carcinoma is an example

Correct Answer - A
Ans: A. Gives an immediate definitive diagnosis of tumor
(Ref http:/,www.nchi.iilm.nih.gov/pmc/arii,PMC3347896).
Intraoperative Histopathological Analysis:
Frozen section procedure/cryosection:

- Rapid microscopic specimen analysis.
- Used most often in oncological surgery.
- Slide quality produced by frozen section lower than formalin-fixed paraffin-embedded tissue processing.
- Used for presumptive diagnosis.
- More accurate diagnosis - Fixed tissue processing.

89. In genomic imprinting. DNA is modified by:

a) Acetylation

b) Methylation

c) Phosphorylation

d) Deamination

Correct Answer - B
Ans: B. Methylation
(Ref Robbins 9/e p180, 8/e pl)
Genomic imprinting:

- DNA modified by methylation.
- An epigenetic process resulting in differential inactivation of either maternal or paternal alleles of certain genes.

Mechanism:

- DNA methylation at CG nucleotide.
- Histone H4 deacetylation.
- Methylation.

90. Which of these is the most important prognostic factor in ALL?

a) Hyperploidy

b) Total leucocyte count greater than 50,000

c) Age

d) Response to steroids

Correct Answer - D

Ans: D. Response to steroids

(Ref Wintrobes Clinical Hematology 12/e p1892; Robbins 9/e 1)590-593, 8/e p627, 628)

Most important predictive factors in ALL:

- Age at diagnosis time.
- Initial leukocyte count.

Speed of steroid treatment response:

- **Most consistent prognostic marker.**
- Mainly acts by rapidly removing blast cells from marrow or peripheral blood.

91. Which of the following regarding cellular events in acute inflammation is not correct?

a) PECAM/CD3 1 is responsible for neutrophil activation

b) Components of complement can assist in chemotaxis

c) Neutrophil margination is assisted by selectins

d) I CA M- 1 /VCAM- 1 is responsible for neutrophil adhesion

Correct Answer - A

Answer- A. PECAM/CD3 1 is responsible for neutrophil activation

- PECAWCD31 is responsible for transmigration of leukocytes through endothelium, not the neutrophil activation
- PECAM (Platetet Endothelial Cell Adhesion Molecule)/CD3l :
- PECAM/CD37 is involved in leukocyte migration through endothelium

92. How will you differentiate a mediastinal mass being a thymoma or ALL?

a) Cytokeratin

b) CD1a

c) Cd3

d) Tdt

Correct Answer - A
Ans: A. **Cytokeratin**
Ref: Robbins and Cotran Pathologic Basis of Disease 9th edn; Page no. 627
Cytokeratin is an epithelial cell marker (absent in lymphoma).
Thymomas have T cells and mediastinal ALL is mostly T-ALL. So the marker which will help **to** distinguish is the Cytokeratin.
Positive in thymoma
Negative in ALL
CD Ia is positive for langerhans cells and thymic Lymphocytes and can be positive in some Lymphomas.
CD3: Signal transduction complement of T-cells

93. Antibody dependent killing:

a) NK cell

b) NK cell only

c) Macrophage

d) NK cells, neutrophils & macrophage

Correct Answer - D
Ans: D. NK cells, neutrophils & macrophage
Ref: Robbins and Cotran Pathologic Basis of Disease edn; Page no. 784

- Antibody depended cell-mediated cytotoxicity (ADCC) is the killing of an antibody-coated target cell by a cytotoxic effector cell through a nonphagocytic process, characterised by release of content of cytotoxic granules Tor by expression of cell death-inducing molecules.
- ADCC is triggered through interaction of target bound antibodies (IgA, IgG or IgE) with certain Fc receptors, glycoproteins present on the effectors cell surface that binds the Fc region of Ig.
- Effector cells that mediate ADCC include NK Cells, monocytes, macrophages, neutrophils, eosinophils and dendrite cells.

94. Which of the following can recognize dead material?

a) NET

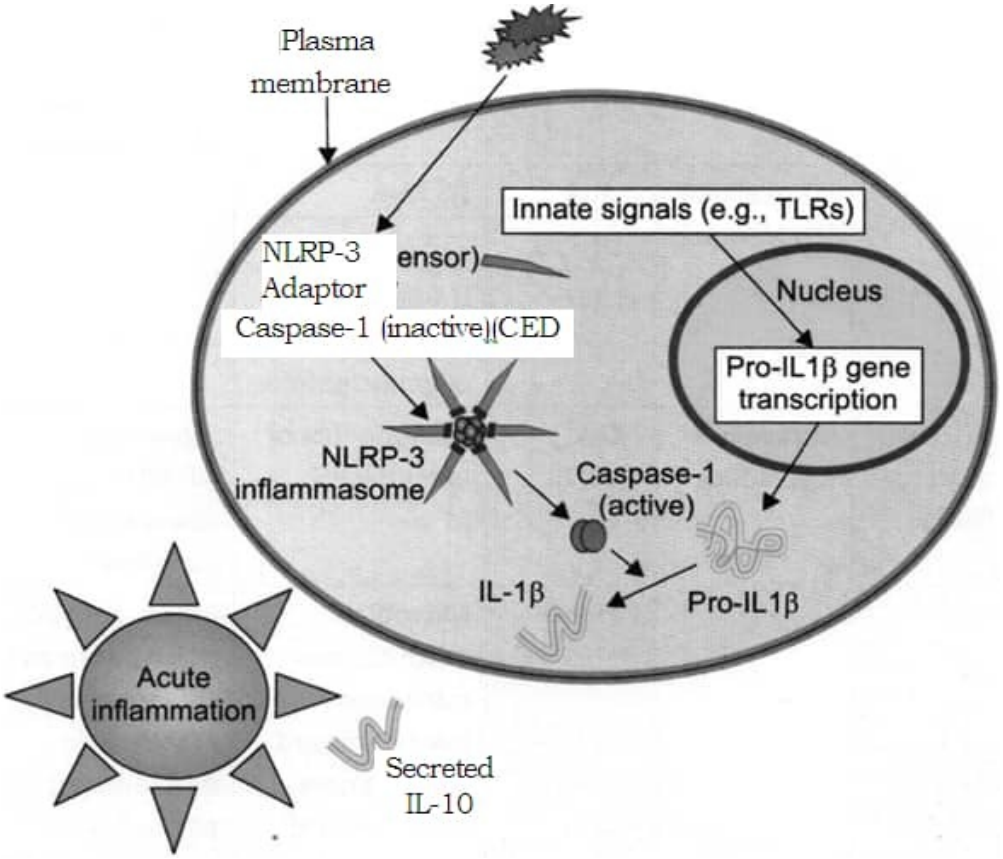
b) Inflammasome

c) Necrosis

d) Toll like receptor

Correct Answer - D
Ans: D
Refi Robbins and Cotran Pathologic Basis of Disease edn; Page no. 188

- Phagocyte has many types of receptors on its surface that are used to bind material.
They include opsonin receptors, scavenger receptors, and Toll-like receptors.
Binding to Toll-like receptors increases phagocytosis and causes the phagocyte to release a group of hormones that cause inflammation.



Receptors of the Innate Immune System

Receptor type	Location in cell	Receptor name	Pathoge
Toll-like receptors (TLR)	Extracellular	TLE-1, 2, 6	Bacterial
		TLR-2	Bacterial
		TLR-4	Lipopoly (LPS)
		TLR-5	Flagellin
	Intracellular (Endosomal)	TLR-3	DS RNA
		TLR-7, 8	SS RNA
		TLR-9	Unmethy CpG olig

NOD-like receptors (NLR)	Intracellular (cytosolic)	NOD1, NOD2	Compor of bacter
		NLRP-3	Microbia and mole damaged cells (AT acid crys reactive species)
RIG-like receptors (RLR)	Cytoplasmic	RIG-1, MDA-5	Viral RN

95. Immune privilege site is:

a) Optic nerve

b) Seminiferous tubule

c) Area posterna

d) Spinal cord

Correct Answer - B

Ans: b. Seminiferous tubules

Ref Robbins and Cotran Pathologic Basis of Disease 9th edn; Page no. 214

- Cornea, brain and testes are the immune privilege sites.
- The above are called immune privilege site because it is difficult to induce immune response to antigen introduced into these sites.
- In testis there occurs segregation of antigens in the seminiferous tubules from immune cells in the interstitial space by a layer of Sertoli cells connected by impermeable tight junctions which form a blood-testis barrier.

96. What is the correct order of blood sampling?

1. **Verification of patient's profile**
2. **Labeling at bedside**
3. **Sampling**
4. **Identification of patient**

a) 1, 2, 3, 4

b) 4, I, 3, 2

c) 4, 3, 1, 2

d) 1, 4, 2, 3

Correct Answer - B

Ans. b. 4, **1,** *3,* **2**

Procedure for drawing blood (WHO)

Step	**Procedure**
1	Assemble equipment, include needle & syringe or vacuum **tube,** depending on which is to be used.
2	• Perform hand hygiene (if using soap & water, dry hands with single-use towels).
3	Identify & prepare the patient.
4	Select the site, preferably at the antecubital area. Warming the arm with a hot pack, or hanging the hand down may make it easier to see the veins. Palpate the area to locate the anatomic landmarks. **Do not touch the site once alcohol or other antiseptic has been applied.**
5	• **Apply** a tourniquet, about 4-5 finger widths above **the selected venepuncture site.**

6	
7	• Put on well-fitting, non-sterile gloves.
8	Disinfect the site using **70% isopropyl alcohol for 30 seconds &** allow to dry completely (30 sec).
9	**.,Anchor the vein by holding the patient's arm & placing a thumb below the venepuncture site.**
10	• **Enter the vein** swiftly at a 30 degree angle.
11	• Once sufficient blood has been collected, **release the tourniquet before withdrawing the needle.**
12	• Withdraw the needle gently and then give the patient a clean gauze or dry cotton-wool ball to apply to the site
13	• Discard the used needle & syringe or blood-sampling device into a puncture-resistant container.
14	• Check the label & forms for accuracy.
15	• Discard sharps & broken glass into the sharps container. Place items that can drip blood or body fluids into the infectious waste.
16	,Remove gloves & place them in the general waste. Perform hand hygiene. If using soap & water, dry hands with single-use towels.

97. In Prothrombin time (PT) estimation, on addition of calcium and thromboplastin to platelet poor plasma. which of the following pathway is activated?

a) Extrinsic

b) Intrinsic

c) Fibrinolysis

d) Common

Correct Answer - A

Ans. a. Extrinsic

- In Prothrombin time (PT) estimation, addition of calcium and thromboplastin to platelet poor plasma activates extrinsic pathway.
- The prothrombin time (PT) assay assesses the function of the proteins in the extrinsic pathway (factors VII, X,
- and fibrinogen). In brief tissue factor, phospholipids, and calcium are added to plasma and the time for a fibrin clot to form is recorded.
- Prothrombin time (PT): This test assesses the extrinsic and common coagulation pathways. The clotting of plasma after addition of an exogenous source of tissue thromboplastin (e.g., brain extract) and Ca" ions is measured in seconds. A prolonged PT can result from deficiency or dysfunction of factor V, factor VII, factor X, prothrombin. or fibrinogen

98. Which of the following anticoagulant is used for electrolyte estimation?

a) EDTA

b) Citrate

c) Sodium fluoride

d) Lithium heparin

Correct Answer - D
Ans. d. Lithium heparin
Lithium heparin is the anticoagulant used for electrolyte estimation. Lithium-heparin is the preferred anticoagulant for hematology in non-mammalians because EDTA causes in vitro hemolysis in some amphibian, reptile, and fish species; moreover, plasma harvested from blood anticoagulated with lithium-heparin can be used for routine chemistry/electrolyte analysis, which is especially advantageous with small sample volumes.
"Commonly used anticoagulants are heparin, EDTA, oxalates, citrate and fluoride. Of these, lithium heparin is best suited for most of the biochemical estimations. All other anticoagulants the/ate calcium and hence unsuitable for calcium estimation. The possibility of enzyme inhibition especially creatine kinase, ALP, ACP, amylase and LDH are observed with several of these anticoagulants. Oxalates are unsuitable for estimation of sodium and potassium also."-

99. Which of the following statement is not true about glomerular basement membrane?

a) Type III collagen is present

b) Glomerular basement membrane is stained with PAS

c) Glomerular basement membrane acts as filtration barrier

d) Glomerular basement membrane is involved in charge dependent filtration

Correct Answer - A

Ans. a. Type III collagen is present

Type IV collagens (not the type HI collagen) are the main components of the basement membrane, together with laminin.

"The basement membrane is synthesized by contributions from the overlying epithelium and underlying mesenchymal cells, forming a flat lamellar "chicken wire" mesh (although labeled as a membrane; it is quite porous). The major constituents are amorphous nonfibrillar type IV collagen and lantinin." '

"Type IV collagens have long but interrupted triple-helical domains and form sheets instead of fibrils; they are the main components of the basement membrane, together with laminin

100. A 26 years old female presented with pallor and hemoglobin of 9.5 mg/dl, PCV 30 mm Hg and RBC count of 2 million/mm. What is the most likely diagnosis?

a) Iron deficiency anemia

b) Sideroblastic anemia

c) Thalassemia

d) Folic acid deficiency

Correct Answer - D

Ans: D. Folic acid deficiency

(Ref Robbins 9/e p631, 648)

- High MCV, MCH & MCHC - Suggestive of macrocytic, hyperchromic anemia.
- Typically seen in folic acid deficiency.
- Folic acid (pteroylmono- glutamic acid) deficiency à results in megaloblastic anemia.
- Same pathologic features as vitamin B12 deficiency.

Interpretation:

- In question, Hb= 9.5 mg/dL, PCV = 30, RBC count = 2 millions/mm3
- Hematocrit or PCV = MCV x RBC concentration
- MCV PCV/RBC count = 30/0.2 = 150 (increased/Macrocytic)
- MCH = Hb/ RBC count =9.5/0.2 = 47.5 (increased/Hyperchromic)
- MCHC = Hb/MCV = 31 (normal)
- Macrocytic, hyperchromic anemia is typically seen in folic acid deficiency.

101. Which of the following is the most consistent feature of rapidly progressing glomerulonephritis (RPGN)?

a) Crescent formation

b) Mesangial cell proliferation

c) IgAdeposition

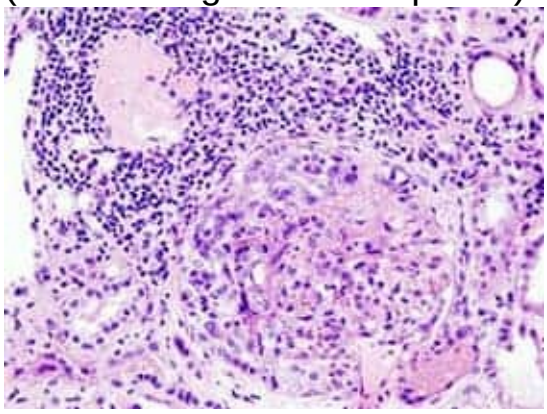
d) Loss offoot processes

Correct Answer - A

Ans: A. Crescent formation

Rapidly Progressive (Crescentic) Glomerulonephritis:

- Most common histologic - Presence of crescents in most glomeruli (crescentic glomerulonephritis).



Crescents:

- Produced by proliferation of parietal cells & infiltration of monocytes & macrophages.

102. During autopsy of a patient died due to suspected myocardial infarction, the heart was stained with triphenyltetrazolium tetrachloride dye. What will be the color of the viable myocardium?

a) White

b) Red

c) Blue

d) Dark Brown

Correct Answer - B
Ans: B
(Ref: Robbins 9/e p544)
Triphenyltetrazolium chloride (TTC) stain:

- Imparts a brick-red color to intact, non-infracted myocardium where dehydrogenase enzymes are preserved.

Acute Ml - Early morphologic recognition:
Infarct preceding death by 2 to 3 hours:

- Highlighting area of necrosis by immersion of tissue slices in a solution of triphenyltetrazolium chloride.
- Gross histochemical stain imparts brick-red color to intact, non-infarcted myocardium where lactate dehydrogenase activity is preserved.
- Dehydrogenases leaks out via damaged membranes of dead cells.
- Hence, an infarct appears as an unstained pale zone.

By 12 to 24 hours after infarction:

- MI identified grossly as a reddish-blue area of discoloration.
- Caused by stagnated, trapped blood.

By 2 days to 10 days:

- Infarct becomes progressively more sharply defined, yellow-tan & soft.

By 10 days to 2 weeks:

- Rimmed by a hyperemic zone of highly vascularised granulation tissue.

Over succeeding weeks:

- Fibrous scar

103. The resolving power of a microscope depends upon all of the following except:

a) Size of the aperture

b) Focal length of the eyepiece

c) Thickness of the film

d) Wavelength of light source used

Correct Answer - C

Ans: C. Thickness of the film

(Ref Bancroft Theory & Practice of Histochemical Techniques/p45-47).

Resolving power of microscope:

- Microscope specific.
- Inversely distance between two objects that can be resolved.
- Doesn't depend on specimen nature or thickness.
- According to Abbe's Criterion.

104. MHC antigens are absent on?

a) Platelet

b) Erythrocyte

c) Neutrophil

d) Monocyte

Correct Answer - B

Ans: B. Erythrocyte

(Ref: Ananthanarayan 10/e p141-143, 8/e p 132-135)

MHC antigens:

- Absent on erythrocytes.

HLA antigens:

- Class 1 antigens (A, B and C) – Found on surface of virtually all nucleated cells.
- Principal antigens.
- Involved in graft rejection & cell-mediated cytolysis.
- Function as components of hormone receptors.

HLA class II antigens:

- More restricted in distribution.
- Found only on cells of immune system-macrophages, dendritic cell activated T cells & mainly on B cells.

105. Stains used for identifying premalignant lesions of lip?

a) Toulidine blue

b) Alizarin rccl

c) Hcrlatorr,lin ancl cosin

d) Giemsa

Correct Answer - A

Ans: A. Toulidine blue

(Ref Ballenger's Otorhinolarvngology/p 1018; J Oral Pathol Med (2011)40:300-304) .

Oral cancer screening methods:

Clinical Examination:

- Current & most common method.
- Detects visible lesions.

Clinically undetectable lesions:

- Toluidine blue, brush biopsy and fluorescence imaging.
- Detects precancerous lesions.

Toluidine blue:

- Basic metachromatic dye.
- Stains nuclear material of malignant lesions, but not normal mucosa.
- Cancer cells nuclei show increased DNA synthesis à Increased toluidine blue pickup.

Toluidine blue mouthwash:

- Toluidine chloride dye as a mouthwash.
- Aids oral cancer diagnosis & potentially malignant lesions.
- Good sensitivity with very low false negative rate.
- Effective in demonstrating dysplasia & clinically unrecognizable early malignant lesion.

106. The surgical registrar successfully performs a testicu¬lar biopsy and hands over the specimen to the attend¬ing nurse. The sister asks you how to send the speci¬men to the pathologist. What fluid will you tell the sister to put the specimen in?

a) 95% ethanol

b) Zenker's solution

c) Bouin's solution

d) 10% formalin

Correct Answer - C
Ans: C. Bouin's solution
(Ref: Surgical Pathology by 'Rosai and Ackerman 9Ie p27; Upper Urinary tract Urothelial Carcinoma by Michael Grasso (2015)1p11)

- Testicular biopsy specimen should be put into Boitin's solution.
- "Bouin's is a noncoagulate picrate solution which is routinely utilized to fix testicular biopsies because it preserves nuclear detail."

107. Complement complex that attacks cell membrane is:

a) C12345

b) C23456

c) C34567

d) C56789

Correct Answer - D
Ans: D. C56789
(Ref: Robbins 9/e p88-89)

- Complement complex that attacks cell membrane (Membrane attack complex) is C56789.

108. Which of the following complement factors is a marker of humoral rejection?

a) C3d

b) C3b

c) C4d

d) C5a

Correct Answer - C
Ans: C. C4d
(Ref: Robbins 9/e p234)

- C4d factor is a marker for humoral rejection.
- Acute antibody-mediated rejection is manifested mainly by damage to glomeruli and small blood vessels.
- Typically, the lesions consist of inflammation of glomeruli and peritubular capillaries, associated with deposition of the complement breakdown product C4d, which is produced during activation of the complement system by the antibody- dependent classical pathway.
- Small vessels may also show focal thrombosis.

109. Antigen-presenting cells are all except:

a) M-cells

b) Macrophages

c) Langerhans cells

d) Thymocytes

Correct Answer - D
Ans: D. Thymocytes
(Ref Robbins 9/e p625, 788)

- Immature T lymphocytes of thymus are called thymocytes. Thymic epithelial cells are antigen presenting cells (Non¬professional) but not thymocytes.
- "M-cells or microfold cells are a part of GALT (gut associated lymphoid tissue) and an antigen presenting cells in intestine."
- Classical APCs include dendritic **cells**, macrophages, Langerhans **cells** and B **cells**.

110. RBCs are stored at what temperature?

a) –2 to –4 °C

b) 2-6 °C

c) 20-25 °C

d) 37 °C

Correct Answer - B
Ans: B. 2-6 °C
(Ref UK-NHS Guidelines; Harrison 19/e p138e-2).

- RBCs should be stored at a temperature of 2-6 "Celsius.

Component	**Storage & duration**
Whole Blood	**2-6°C** for **42 days°**
Packed RBCs	**2-6°C** for **42 days°**
Platelets	**22-24°C for 5 days°**
FFP	**–18°C** for **1 year°**
–18°C for **1 year°**	**–18°C** for **1 year**

111. RBC should be transfused:

a) With a 18-20 G needle within 4 hours of receiving at the patient's side

b) With a 18-20 G needle within 4 hours of receiving at the patient's side

c) With a 20-22 G needle within 4 hours of issue from the blood bank

d) With a 20-22 G needle within 4 hours of receiving at the patient's side

Correct Answer - C

Ans: C

(Ref: WHO Clinical Transfusion Guidelines/p22).

- RBCs should he transfused with 18-20 G needle within 4 hours of issue from the blood bank.
- Start infusion within 30 min of removing pack from refrigerator and complete the infusion within 4 hours.

An 18-gauge needle is standard, but a needle or catheter as small as 23-gauge can be used for transfusion if necessary within 4 hours of issue from the blood bank.

112. Direct Coombs test is positive in all the following except:

a) Hemolytic anemia due to transfusion

b) Hemolytic anemia due to transfusion

c) Aplastic anemia

d) Drug-induced AIHA

Correct Answer - C
Ans: C. Aplastic anemia
(Ref: Robbins 9/e p643).

- Direct Coomb's test is negative in aplastic anemia.

Direct Coomb's test
Also known as **direct antiglobulin test°**
Detect antibodies of complement bound to RBC surface antigens in vivo°.
It is used for:
Immune-mediated hemolytic anemia °
Hemolytic disease of the newborn°
Rh D-hemolytic disease of the newborn °
ABO hemolytic disease of the newborn°
Drug-induced immune-mediated hemolysis°
Mismatch transfusion reaction°.

113. Serum sickness is:

a) Type 1 hypersensitivity reaction

b) Type 2 hypersensitivity reaction

c) Type 3 hypersensitivity reaction

d) Type 4 hypersensitivity reaction

Correct Answer - C
Ans: C. Type 3 hypersensitivity reaction
(Ref: Robbins 9/e p207)

- Serum sickness is the prototype of a systemic immune complex disease or type III hypersensitivity reaction.

Immune Complex—Mediated (Type III) Hypersensitivity:

- Acute serum sickness is the prototype of a systemic immune complex disease; it was once a frequent sequela to the administration of large amounts of foreign serum (e.g., serum from immunized horses used for protection against diphtheria).

114. Most reactive free radical is:

a) Peroxide

b) Carboxyl

c) Hydroxyl

d) Superoxide

Correct Answer - C
Ans: C. Hydroxyl
(Ref Robbins 9/e p480)

- Hydroxyl radical (*OH) is the most potent reactive oxygen species.
- Most reactive oxygen-derived free radical.
- Principal ROS responsible for damaging lipids proteins & DNA.

115. Epstein-Barr virus-associated lymphomas are all of these except:

a) NK T-cell lymphoma

b) Nodular lymphocyte-predominant Hodgkin's lymphoma

c) Plasmablastic lymphoma

d) Lymphomatoid granulomatosis

Correct Answer - B

Ans: B. Nodular lymphocyte-predominant Hodgkin's lymphoma (Ref: Robbins 9/e p327, 609)

- Among Hodgkin's lymphomas, EBV is not associated with nodular sclerosis & lymphocyte predominant Hodgkin's lymphoma.

Epstein-Barr Virus (EBV):

- Member of the herpes virus family.
- Causative agent for African form of Burkitt lymphoma.
- B-cell lymphomas in immunosuppressed individuals (particularly in those with HIV infection or undergoing immunosuppressive therapy after organ or bone marrow transplantation).
- Subset of Hodgkin lymphoma.
- Nasopharyngeal.
- Some gastric carcinomas.
- Rrare forms of T-cell lymphoma.
- Natural killer (NK) cell lymphoma.

116. A new marker for mantle cell lymphoma especially useful in Cyclin DI negative cases is:

a) SOX 11

b) Annexin V

c) MYD88

d) ITRA I

Correct Answer - A
Answer- A. SOX 11

- SOXII expression h a highly specific for mantle cetl lymphoma and identifies the cyclin Dl-negative subtype.
- Mantle Cell Lymphoma (MCL)
  Immunophenotype:
- CD20 CD79a & PAX-5 positive establish B lineage
- CD5, CD43, FMC-7, cyclin Dl & SOX11 positive
- Surface IgM & IgD positive
- CDS+ve & CD23 -ve which help to distinguish it from CLL/SLL.

117. Which of the following is true about intracellular iron homeostasis in iron deficiency anemia?

a) Transferrin receptor-1 iron responsive elements increase transferrin receptor mRNA concentration and synthesis

b) Transferrin receptor-1 iron responsive elements decrease transferrin receptor mRNA concentration and synthesis

c) Apoferritin mRNA iron response element decreases and ferritin synthesis decreases

d) Apoferritin mRNA iron response element decreases and ferritin synthesis increases

Correct Answer - A
Answer- A. Transferrin receptor-1 iron responsive elements increase transferrin receptor mRNA concentration and synthesis

- In iron deficiency anemia, transferrin receptor-I iron responsive elements increase transfetin receptor mRNA concentration and synthesis.
- "The regulation of iron metabolism at the cytoplasmic mRNA level by interaction of iron regulalory protein (IRP-I) and the iron-responsive elements (IREs) to apoferritin mRNA and transferrin receptor mRNA. When the cytoplasmic iron concentration is low, IRP-I binds to the IREs of both mRNAs.

118. In a 30 years old female patient with polyarthritis, testing reveals nucleolar pattern of ANA staining. What is the likely course of this patient?

a) Malar rash, alopecia and renal failure

b) Sclerodactyly, esophageal dysmotility and Raynaud's phenomenon

c) Sjogren's syndrome

d) Painful genital and oral blisters and ulcers

Correct Answer - B
Answer- B. Sclerodactyly, esophageal dysmotility and Raynaud's phenomenon
Nucleolsr ANA positivity is most likely suggestive of systemic sclerosis or scleroderma, which comprises of diffuse or limited disease-CREST syndrome (Calcinosis, Raynaud syndrome, Esophageal dysmotility, Sclerodactyly, Telangiectasia)
Antinuclear antibodies are directed against nuclear antigens, grouped into: (I) antibodies to DNA (2) antibodies to histones (3) antibodies to non-histone proteins bound to RNA (4) antibodies to nucleolar antigens.

- Most widely used method for detecting ANAs: Indirect immunoffuorescence (identify antibodies that bind to a variety of nuclear antigens, including DNA, RNA & proteins).
- Pattern of nuclear fluorescence suggests the type of antibody present in the patient's serum.

119. Which of the following is anaplastic lymphoma kinase (ALK) positive neoplasm?

a) Synovial sarcoma

b) Fibromatosis

c) Ewing sarcoma

d) Inflammatory myofibroblastic tumor

Correct Answer - D

Answer- D. Inflammatory myofibroblastic tumor

- Inflammatory myofibroblastic tumor is anaplastic lymphoma kinase (ALK) positive neoplasm.
- Inflammatory myofibroblastic tumor, though rare, is more common in children, with an equal male-to-female ratio.
- Presenting symptoms include fever, cough, chest pain, and hemopytsis. It may also be asymptomatic.
- Anaplastic Lymphoma Kinase (ALK)- Anaplastic lymphoma kinase also known as ALK tyrosine kinase receptor or CD246 (cluster of diff-erentiation 246) is an enzyme that in humans is encoded by ALK gene.

Anaplastic Lymphoma Kinase (ALK) Positive Neoplasms

- Anaplastic large-cell lymphomas
- Adenocarcinoma of lung
- Familial neuroblastoma
- Inflammatory myofibroblastic tumor

120. Which of the following is a tool used in gene editing?

a) CRISPR

b) Gene Xpert

c) Big Data

d) HealthCare App

Correct Answer - A
Answer- A. CRISPR
A type of genetic engineering in which DNA is inserted, deleted or replaced in the genome of a living organism using engineered nucleases, or "molecular scissors.
Four Families of Engineered Nucleases being used

- Meganucleases
- Transcription Activator-Like Effector-based Nucleases (TALEN)
- Zinc finger nucleases (ZFNs)
- Clustered Regularly Interspaced Short Palindromic Repeats (CRISPR)-Cas system
- Form the basis of a genome editing technology known as CRISPR/Cas9 that allows permanent modification of genes within organisms.

121. All the following markers are expressed on the surface of T-cells at some stage of development except:

a) CDIa

b) PAX5

c) CD 34

d) Tdt

Correct Answer - B
Answer- B. PAX5

- PAXS is a B-cell transcription factor, essential in normal B-cell lymphopoiesis. T-cell never express PAXS throughout its development CD-1a, CD34 and Tdt are expressed on T-cells.
- T cell - CDl, CD2, CD3, CD4, CD5, CD7, CD8, cCD3, lymphoid TdT.

122. What will be the corrected reticulocyte count in a patient with a hemoglobin of 5 and absolute reti-culocyte count of 9%?

a) 1

b) 3

c) 4.5

d) 6

Correct Answer - B
Answer- B. 3

- Corrected reticulocyte count will be 3.
- Reticulocyte count needs to be corrected for anemia as it is a percentage of the total RBC count and spuriously elevated when the number of RBCs fall in anemia.
- Reticulocyte percentage may be increased due to more reticulocytes in circulation & fewer mature cells.
- Corrected reticulocyte count = Reticulocyte % x Hematocrit/ Expected hematocrit or= Reticulocyte % x Hemoglobin/Expected hemoglobin = 9 x 5/15= 3

123. Which of the following is a negative acute phase reactant?

a) Ferritin

b) Haptoglobin

c) Albumin

d) C-reactive protein

Correct Answer - C
Answer- C. Albumin

- Albumin is a negative acute phase reactant whereas ferritin, CRP and haptoglobin are positive phase reactants.
- "The serum levels of most proteins either increase or decrease during the acute phase response. Serum proteins that decrease levels during inflammation are called negative acute phase reactants.
- C-reactive protein, fibrinogen, protein S, and fibronectin are examples of positive acute phase reactants.

Positive Acute Phase Reactants

- C-reactive protein (CRP)
- Serum amyloid A
- Haptoglobin
- Ceruloplasmin
- alpha 2-Macroglobulin
- alpha l-Acid glycoprotein
- Fibrinogen
- Complement (C3, C4)

124. A 68 years old man had severe chest pain. The patient died on the way to the hospital. In the hospital, at autopsy tetrazolium chloride staining of the heart was done. What will be the color of viable myocardium?

a) Red

b) Blue

c) Dark brown

d) Pink

Correct Answer - A
Answer- A. Red

- Triphenyltetrazolium chloride (TTC) stain imparts a brick-red color to intact, non-infarcted myocardium where the dehydrogenase enzymes are preserved.
- If the infarct preceded death by 2 to 3 hours, it is possible to highlight the area of necrosis by immersion of tissue slices in a solution of triphenyltetrazolium chloride. This gross histochemical stain imparts a brick-red color to intact, non-infarcted myocardium where lactate dehydrogenase activily is preserved.

125. If the Rb gene phosphorylation is defective, which of the following will happen?

a) Cell cycle will stop at GI phase

b) Cell cycle will stop at G2 phase

c) The cell cycle will progress and the cell will divide

d) There will be no effect on cell cycle as for Rb gene phosphorylation is not needed

Correct Answer - A

Answer- A. Cell cycle will stop at GI phase

Rb is a tumor suppressor gene. It normally arrests cell division at G1-S phase. Phosphorylation of Rb gene allows the cell to divide, hence inhibition of phosphorylation (which is the constitutive scenario for Rb gene) arrests the cell in GI phase.

RB (Retinoblastoma) gene

- Located on chromosome on 13q14
- Tumor suppressive pocket protein that binds E2F transcription factors in hypophophorylated state
- Key negative regulator of G1/S cell cycle transition . Tumors associated: Retinoblastoma, osteosarcoma, Glioblastoma, small cell carcinoma of lung, CA breast & CA bladder
- Sequence: Go→ G1→ S→ G2 → M

126. A 20 years old boy presented with persistent cervical lymphadenopathy for the past 1 year. Histopathology of lymph node shows Reed-Sternberg cells with focal nodularity and background of T reactive lymphocytes. The cells were positive for CD20, LCA, EMA and negative for CD15 and CD30 and EBV negative. Diagnosis is:

a) Nodular lymphocyte predominant Hodgkin's lymphoma

b) Lymphocyte rich Hodgkin's lymphoma

c) Diffuse large B-cell lymphoma

d) Small cell lymphoma

Correct Answer - A

Answer- A. Nodular lymphocyte predominant Hodgkin's lymphoma

- This tumor contains so-called L&H (lymphocytic and histiocytic) variants, which have a multilobed nucleus resembling a popcorn kernel ("popcorn cell"). Eosinophils and plasma cells are usually scant or absent. In contrast to the Reed-Sternberg cells found in classical forms of HL, L&E variants express B-cell markers typical of germinal-cenler B cells, sach as CD20 and BCL6, and are usually negative for CD15 and CD30.
- Histological diagnosis is established by presence of Reed-Sterntrerg cells along with background of mixed inflammation consisting of neutrophils, plasma cells, eosinophils & histiocytes.

- Reed-Sternberg cells are large and are either multinucleated or have a bilobed nucleus (thus resembling an "owl's eye" appearance) with prominent eosinophilic inclusion-like nucleoli.
- Reed-Sternberg cells are CD30 & CD15 positive, usually negative for CD20 & CD45.

Nodular sclerosis

- MC subtype; usually stage I or ll disease frequent mediastinal involvement
- More common in females, most patients young adults

127. What does the red cell distribution width represents?

a) Anisocytosis

b) Poikilocytosis

c) Level of hypochromia

d) Anisochromia

Correct Answer - A
Answer- A. Anisocytosis
Red cell distribution width (RDW) is a parameter that measures variation in red blood cell size or red blood cell volume.
RDW is elevated in accordance with variation in red cell size (anisocytosis).
The "width" in RDW refers to the width of the volume curve (distribution width, here presented as the Coefficient of Variation, or CV), not the width of the cells.
Anisocytosis is a medical term meaning that a patient's red blood cells are of unequal size.
Poikilocytosis is variation in cell shape: poikilocytes may be oval, teardrop-shaped, sickle-shaped or irregularly contracted.
Anisochromia is a marked variability in the color density of erythrocytes (red blood cells), which indicates unequal hemoglobin content among the red blood cells.
Hypochromia means that the red blood cells have less color than normal when examined under a microscope.

128. In thymus, which gene is responsible for recognition of self-antigens?

a) AIRE

b) Rb

c) Notch 1

d) CPK

Correct Answer - A
Answer- A. AIRE

- Recognition of self-antigens in thymus is called as central tolerance, which is regulated by AIRE (Autoimmune regulator)protein. Notch-I signaling is used in maturation of T-cells and cell surface receptor expression.
- A protein called AIRE (autoimmune regulator) stimulates expression of some "peripheral tissue-restricted" self antigensin thymus
- Critical for deletion of immature T cells specific for these antigens.

129. V) hich of the following can change the gene expression by methylation and acetylation without affecting the content of the gene?

a) Epigenetics

b) Translocation

c) Inversion

d) Transduction

Correct Answer - A
Ans.: A. Epigenetics

- "Epigenetics is defined as changes that alter the pattern of gene expression that persist across at least one cell division but are not caused by changes in the DNA code. Epigenetic changes include alterations of chromatin structure mediated bymethylation of cytoosine residues in CpG dinucleotides, modification of histones by acetylation or methylation, or changesin higher-order chromosome structure- " Harrison"

130. Acetone free methyl alcohol is present in Leishmann's stain for:

a) It fixes cells to the slide

b) It colors the red cells

c) It prevents the cells from sticking to the slide surface

d) It stops metabolic and enzymatic activity of the cell

Correct Answer - D
Answer- D. It stops metabolic and enzymatic activity of the cell
Tt is a type of

- Acidic dye stains the basic components of cell & basic dye stains the acidic components of cell.
- Leishman's stain contains eosin & methylene blue in acetone free methyl alcohol.
- Methyl alcohol acts as a fixative.
- Acetone if present, will destroy the cell membrane
- Methylene blue ("polychromed"), the basic dye and eosin, the acidic dye exists as thiazine eosinate, which dissociates into the component dyes, when diluted with distilled water.
- Methyl blue stains the nucleus & basophilic granules of WBC, whereas eosin stains the eosinophilic granules.
- It is generally used to differentiate & identily leucocytes, malaria parasites & trypanosomas

131. In order to avoid liver biopsy, which of the following can be used as biochemical marker to diagnose liver fibrosis?

a) SGOT and SGPT

b) Serum hyaluronic acid and laminin

c) Serum ALP and GGT

d) Unconjugated and conjugated bilirubin

Correct Answer - B
Answer- B. Serum hyaluronic acid and laminin

- "Biochemical markers of liver fibrosis (pro-collagen peptides type III and IV the P1 fragment of laminin, hyaluronic acid, fibrosin, TNF-alphaR-II, sICAM-a, tissue inhibitor of matrix-metalloprotease-1 (TIMP-1), cytokeratin l8 and aspartare aminotransferase to platelet ration index (APRI) measured in serum have potential to provide a highly sensitive and cost-effective method for the assessment of schistosome-induced fibrosis.

132. Abnormality in elastin protein can lead to all except ?

a) Fractures

b) Joint laxity

c) Aortic aneurysm

d) Subluxation of lens

Correct Answer - A
Ans. A. Fractures
Ref Clinical Outcomes of Elastin Fibre DeJbcts, J Cytol Histol 201 3, 4: I

- Abnormality in elastin protein can lead to abnormality in nrany systern.
- It can lead to aortic aneurysm, joint laxity and subluxation of lens.

133. Which of the following malignancy is least commonly associated with lymphatic spread ?

a) Basal Cell Carcinoma

b) Squamous cell Carcinoma

c) Malignant melanoma

d) Merkel cell Carcinoma

Correct Answer - A

Ans. A. Basal Cell Carcinoma

Ref: Robbins & Cotran, 9" ed., pg. I155-l l 57

- Basal cell carcinoma is a locally aggressive cutaneous tumor.
- The rest of three tumors in the options have more tendency for lymphatic spread compared to BCC.

134. Which of the following is the correct sequence of cellular events of acute inflammation?

a) Rolling → Stable adhesion → Activation of integrins → migration via endothelium.

b) **Stable adhesion → Activation of integrins** → Rolling →- migration viaendothelium

c) Stable adhesion → Rolling- → Activation of integrins → migration via endothelium

d) Activation of integrins → migration via endotheliurn → stable adhesion → Rolling

Correct Answer - B

Ans. B. Stable adhesion → Activation of integrins → Rolling →- migration viaendothelium

Ref: Robbins & Cotran, th ed., pg. 74, 75

- Acute inflammation process involved are:

In the lumen-

- Margination,
- Rolling,
- Activation of Integrin and
- Adhesion to endothelium

135. A 5-years old child was presented with proptosis. Microscopic examination of the mass revealed a round cell tumor positive for Desmin immunohistochemical marker. Most likely diagnosis is ?

a) Leukemia

b) Embryonal rhabdomyosarcoma

c) Lymphoma

d) Primitive Neuroectodermal Tumor (PNET)

Correct Answer - B

Ans. B. Embryonal rhabdomyosarcoma

Ref: Robbins & Cotran, lh ed., pg. 1220-1222

- In the four options provided , all four show morphology of a round cell tumour.
- However Desmin positivity is seen only in cases of rhabdomyosarcoma.
- In Embryonal rhabdomyosarcoma, the tumor cells mimic skeletal muscle at various stages of embryogenesis and consist of sheets of both prirnitive round and spindled cells in a myxoid stroma.
- Immunohistochemistry for desmin and Myogenin confirm the rhabdomyoblastic differentiation.

136. Which of the following stain is used for Acidic mucin?

a) Alcian blue

b) PAS

c) Masson's trichrome stain

d) PTAH

Correct Answer - A
Ans. A. Alcian blue
Ref: Quick Reference Handbookfor Surgical Pathologists,20II, pg. 69-74

- Alcian blue stain is used for acidic mucin.
- Acid mucins are present in goblet cells and esophageal submucosal glands.
- They are Alcian Blue (AB.-positive (blue color).

137. Which among the following laboratory investigation is best to reveal bleeding in Disseminated Intravascular Coagulation (DtC.?

a) Increased PT

b) Increased aPTT

c) Decreased fibrinogen

d) Increased FDPs

Correct Answer - D

Ans. D. Increased FDPs

Ref: Essentials of Haematology by Shirish Kawathalkar, 2"d ed., pg. 442-147

- Two types of DIC are acute (decompensated and chronic cornpensated).

Acute DIC:

- Findings in acute DIC are low platelet, prolonged PT & APTT, low fibrinogen, and increased FDP and D-dimer.

Chronic DIC:

- Findings are normal platelet count, normal PT & APTT.
- However, FDP and D-dimer are increased.
- So in acute DIC, all the four options are correct, while if we consider the question as chronic DIC, then best possible answer is increased FDP.

138. Biopsy from an eight-year-old child with leg swelling showed smallround blue tumor cells consistent with diagnosis of Ewing's sarcoma. What will be the best method to detect translocation t(ll;22) in this malignancy?

a) Conventional karyotyping

b) Next generation sequencing

c) FISH

d) PCR

Correct Answer - C

Ans. C. FISH

- FISH is a molecular cytogenetic technique that uses fluorescent probes that bind to only those parts of the chromosome with a high degree of sequence complementarity.

139. Which of the following is true regarding blood transfusion of packed RBC?

a) Should be starled within 4 hours ol'receiving it fiom blood bank

b) Should be completed within 4 hours of receiving from blood bank

c) Wait till the patient is stable then transfuse, irrespective of any timing

d) Should be completed within 6 hours of receiving from blood bank

Correct Answer - B

Ans. B. Should be completed within 4 hours of receiving from blood bank

Ref: Essentials of'Haematology hy Shirish Kawathalkar, 2"d ed., pg. 487-4Bg.

- Whole blood after storing at 2-6 C loses functionally active platelets, Factor V and Factor VIII.
- It has shelf lif'e of 35 days (CPDA- I).
- Transfusion of blood should be commenced within 30 minutes after removing it fiom refrigerator and should be completed within 4 hours of starting transfusion.
- Indication for transfusing whole blood is fbr correction of both hypovolemia and red cell mass, such as acute massive blood loss.

140. Storage temperature of RBC, Platelet, and Fresh Frozen Plasma (FFP) are:

a) RBC 2-6'C, Platelet 20-22"C, FFP -30'C

b) RBC -30'C, FFP 2-6"C, Platelet 20-22"C

c) RBC 20-22"C, Platelet 2-6"C, FFP -30"C

d) RBC 20-22"C, FFP -30'C, PLATELET 2-6'C

Correct Answer - A

Ans. A. RBC 2-6'C, Platelet 20-22"C, FFP -30'C

Ref: Essentials of Haematologlt by Shirish Kawathalkar, 2"u ed.

- Whole blood and packed RBC is stored at 2-6 "C.
- One unit of whole blood increase hemoglobin by l gm/dl and Hematocritby 3%.
- Platelet is stored at20-24"C with shelf life of 5 days.
- Fresh frozen plasma (200m1) is collected from single donor and frozen within 6 hours from collection.
- Stored at -30 oC and has shelf life of 1 year.

141. Which of the following is not a provisional entity as per WHO 2016 classification of Acute leukemia?

a) AML with hyperploidy

b) B-ALL with BCR-ABL like mutation

c) AML with BCR-ABL

d) Early T-cell precursor leukemia/Lymphoma

Correct Answer - A

Ans. A. AML with hyperploidy

Ref: ,yHO Classification of Tumours of Haematopoetic and lymphoid tissue, Revised fourth ed. 2017.

- The classification of Hematolymphoid neoplasms was revised tn2016.

In this revision, followingprovisional entities were introduced:

1. Myeloproliferative neoplasms (MPN): Myeloid/lymphoid neoplasms with PCMI-JAK2
2. Myelodysplastic syndromes (MDS): Refractory cytopenia of childhood
3. Acute myeloid leukemia (AML) and related neoplasms: AMI- with BCR-ABLl
4. Acute myeloid leukemia (AML) and related neoplasms: AML with mu- tated RLINXl
5. B-lymphoblastic leukemia / lymphoma: B-lymphoblastic leukemia/lym- phoma, BCR-ABLI-like
6. B-ymphoblastic leukemia/lymphoma: B-lymphoblastic leukemia/lym-phoma with iAMP2l
7. T-lymphoblastic leukemia/lymphoma: Early T-cell precursor lympho-

blastic leukemia

3. T-lymphoblastic leukemia/lymphoma: Natural killer (NK) cell lymphoblastic leukemia/lymphoma

142. Best test that shows the integrity of intrinsic pathway of clotting mechanism

a) bleeding time

b) aPTT

c) prothrombin time

d) clotting time

Correct Answer - B
Answer- B (aPTT)
The aPTT measures the time necessary to generate fibrin from initiation of the intrinsic pathway.
PTT measures the integrity of the intrinsic system (Factors XII, XI, VIII, IX) and common clotting pathways.

143. Gene which inhibits cell cycle is -

a) p53

b) RB

c) p16

d) Notch receptor

Correct Answer - A
Answer-A. p53
Cell cycle inhibitors
1. **CIP/KIP family** → p21, p27, p57
2. INK4a/ARF **family** → p161 NK4a, pl4ARF

- A G1 arrest can result simply by the p53 induced expression of p21 WAF1/CIP1/Sdi1
- P53 also down regulates the expression of cyclin A, providing a secondary break on cell cycle progression into the through the S phase.

144. Vascular event of inflammation in order-

a) delayed prolonged- leukocytes mediated injury

b) immediate transient - mast cell activation lead to release of histamine bradykinin

c) immediate prolonged- direct endothelial injury by bacterial toxin

d) Somewhat delayed prolonged- sun exposure /heat stroke lead to mild endothelial injury

a) ABCD

b) DCBA

c) ACDB

d) BDCA

Correct Answer - D

Answer- D

B, D, C, A

Mechanisms of increased vascular permeability.

MECHANISM	MICROVASCULATURE	RESPONSE TYPE	PATHOGENESIS	EXAMPLES
1. *Endothelial cell contraction*	Venules	Immediate transient (15-30 min)	Histamine, bradykinin, others	Mild thermal injury
2. *Contraction or mild endothelial injury*	Venules, capillaries	Somewhat delayed (in 4-6 hrs) prolonged (for 24 hrs to days)	IL-1,TNF-α	Sunburns
3. *Direct endothelial cell injury*	Arterioles, venules, capillaries	Immediate prolonged (hrs to days), or delayed (2-12 hrs) prolonged (hrs to days)	Cell necrosis and detachment	Moderate to severe burns, severe bacterial infection, radiation injury
4. *Leucocyte-mediated endothelial injury*	Venules, capillaries	Delayed, prolonged	Leucocyte activation	Pulmonary venules and capillaries
5. *Neovascularisation*	All levels	Any type	Angiogenesis, VEGF	Healing, tumours

145. Match the following -

a) Dohle bodies- dilated rough ER

b) Auer rodes - DNA remnants

c) Flame cells - azurophilic and Howel jolly body- HbF

d) All of the above

Correct Answer - D
Answer- D. All of the above

146. Which process shows phases of acute inflammation-

a) Apoptosis

b) Pyroptosis

c) Necroptosis

d) Necrosis

Correct Answer - D
Answer- D Necrosis
Direct injury to the endothelium causes cell necrosis and appearance of physical gaps at the sites of detached endothelial cells.
In necrosis phospholipase activation occurs that leads to cell damage and leakage of enzymes outside the cell is followed by inflammatory cells resulting in inflammation.

147. All are features of reversible cell injury EXCEPT

a) ER swelling

b) Dens deposition of mitochondria

c) Bleb

d) Detachment of ribosome

Correct Answer - B

Answer- B. DENS DEPOSITION OF MITOCHONDRIA

The ultrastructural changes (seen on electron microscopy) are:-

1. Plasma membrane alterations → Blebbing blunting loss of microvilli.
2. Mitochondrial changes → Swelling, small amorphous densities.
3. Dilatation of ER and detachment of ribosome
4. Nuclear alterations

148. Which of the following Glomerulonephritis has Nephrotic syndrome except -

a) FSGS

b) Post-infectious Glomerulonephritis

c) MPGN

d) Minimal Change Disease

Correct Answer - B

Answer- B. Post-infectious Glomerulonephritis

- Focal segmental glomerulosclerosis is characterised by a sclerosis of segments of some glomerules. It is likely to present as a nephrotic syndrome.
- Membranous glomerulonephritis may cause either nephrotic or a nephritic syndrome.
- Post-infectious glomerulonephritis- present with malaise, a slight fever, nausea and a mild nephritic syndrome of moderately increased blood pressure, gross haematuria, and smoky-brown urine.
- Membranoproliferative GN (MPGN), also known as mesangiocapillary glomerulonephritis- present with the nephritic syndrome, hypocomplementemia.

149. Chimerism phenomenon is associated with which of the following-

a) Paternity test

b) Maternity test

c) Person identification test

d) organ transplantation case

Correct Answer - D
Answer- D. organ transplantation case
Chimerism can occur in animals is by organ transplantation, giving one individual tissues that developed from a different genome. For example, transplantation of bone marrow often determines the recipient's ensuing blood type.

150. Correct about regulatory T - cell?

a) Release of granzyme A or B by the TREG which induces apoptosis of target T cells

b) CD 8 associated with suppressive cells

c) CD 4 & CD 25 marker

d) All are true

Correct Answer - C
Answer- C. CD 4 & CD 25 marker
Tregs express the biomarkers CD4, FOXP3, and CD25.

151. Example of Dystrophic calcification-

a) Hyperparathyroidism

b) Sarcoidosis

c) Hypervitaminosis D

d) Myositis ossificans

Correct Answer - D

Answer- D. Myositis ossificans

Myositis Ossificans (MO) is an unusual pathological entity still largely unknown, characterized by dystrophic calcification leading to heterotopic ossification of intramuscular connective tissue.

DYSTROPHIC CALCIFICATION may occur due to 2 types of causes:

Calcification in dead tissue

Calcification of degenerated tissue.

Calcification in dead tissue:

1. Caseous necrosis in tuberculosis
2. Liquefaction necrosis in chronic abscesses
3. Fat necrosis following acute pancreatitis or traumatic fat necrosis in the breast results in the deposition of calcium soaps.
4. Gamma-Gandy bodies in chronic venous congestion (CVC) of the spleen is characterized by calcific deposits admixed with haemosiderin on fibrous tissue.
5. Infarcts may sometimes undergo dystrophic calcification.
6. Thrombi, especially in the veins, may produce phleboliths.
7. Haematomas in the vicinity of bones may undergo dystrophic calcification.
8. Dead parasites like in hydatid cyst, Schistosoma eggs, and cysticercosis are some of the examples showing dystrophic

calcification.
). Calcification in breast cancer detected by mammography.
.. Congenital toxoplasmosis involving the central nervous system visualized by calcification in the infant's brain.

Calcification in degenerated tissues

1. Dense old scars may undergo hyaline degeneration and subsequent calcification.
2. Atheromas in the aorta and coronaries frequently undergo calcification.
3. Mo?nckeberg's sclerosis shows calcification in the tunica media of muscular arteries in elderly people.
4. The stroma of tumors such as uterine fibroids, breast cancer, thyroid adenoma, goiter, etc shows calcification.
5. Some tumors show characteristic spherules of calcification called psammoma bodies or calcospherites such as in meningioma, papillary serous cystadenocarcinoma of the ovary and papillary carcinoma of the thyroid.
6. Cysts that have been present for a long time may show calcification of their walls e.g. epidermal and pilar cysts.
7. Calcinosis cutis is a condition of unknown cause in which there are irregular nodular deposits of calcium salts in the skin and subcutaneous tissue.
8. Senile degenerative changes may be accompanied by dystrophic calcification such as in coastal cartilages, tracheal or bronchial cartilages, and pineal glands in the brain, etc.

152. IgA deposits in dermal papilla are characteristically seen in?

a) A. Dermatitits herpetiformis

b) B. Pemphigus vulgaris

c) C. Bullous pemphigoid

d) D. IgA dermatosis of childhood

Correct Answer - A
A. Dermatitits herpetiformis
Dermatitits herpetiformis is diagnosed by a blood test for IgA antibodies, and by a skin biopsy in which the pattern of IgA deposits in the dermal papillae, revealed by direct immunofluorescence, distinguishes it from linear IgA bullous dermatosis and other forms of dermatitis.

153. Amyloid protein in Hemodialysis associated with amyloidosis is-

a) AA

b) A β

c) β- 2 microglobulin

d) Transthyretin

Correct Answer - C
Answer-C. β- 2 microglobulin
Hemodialysis-associated amyloidosis-
Associated disease is Chronic renal failure
Major fibril protein is A

154. Under polarised light, the congo red stained amyloid shows-

a) Pink or red color

b) White color

c) Apple green birefringence

d) None

Correct Answer - C

Answer- C. Apple green birefringence

- Amyloid has an affinity for Congo red stain; therefore this method is used for confirmation of amyloid of all types.
- If the stained section is viewed in polarised light, the amyloid characteristically shows apple-green birefringence due to cross- β-pleated sheet configuration of amyloid fibrils.
- The stain can also be used to distinguish between AL and AA amyloid (primary and secondary amyloid respectively).

155. In a patient with Hepatitis B infection. Which one of the markers will be increased?

a) HbsAg

b) HbcAg

c) Anti HbsAg IgG

d) Anti HbcAg IgG

Correct Answer - D

Answer- D. Anti HbcAg IgG

- Best marker for diagnosing acute hepatitis B is IgM anti-HBc as it is found only in the acute phase of hepatitis B (In chronic hepatitis IgG anti-HBc is found).

156. Medlar bodies are found in -

a) Sporotrichosis

b) Chromoblastomycosis

c) Mycetoma

d) Histoplasmosis

Correct Answer - B

Answer- B. Chromoblastomycosis

- Medlar bodies, also known as a sclerotic or muriform cell, When present in the skin or subcutaneous tissue, the cells are indicative of chromoblastomycosis.
- Chromoblastomycosis (CBM) is defined as a chronic cutaneous and subcutaneous fungal infection resulting from traumatic implantation of certain dematiaceous fungi through the skin.
- In the infected tissue, characteristic dark-colored, thick-walled, muriform cells i.e. sclerotic cells (Medlar bodies) are seen.

157. Which of the following is not a small round cell tumor?

a) Neuroblastoma

b) Retinoblastoma

c) Ewing's sarcoma

d) Hemangiosarcoma

Correct Answer - D

Ans. is 'd' i.e., hemangiosarcoma

Small round blue cell tumors:

* Histologically many of the malignant paediatric neoplasms are unique.
* They tend to have a more primitive (embryonal) rather than pleomorphic anaplastic microscopic appearance.
* Often characterized by sheets of cells with small round nuclei.
* Frequently exhibit features of organogenesis specific to the site of tumour origin (therefore these tumours are frequently designated by suffix - blastoma).
* Owing to their primitive histological appearance many childhood tumours have been collectively referred to as small round blue cell tumour

The differential diagnosis of small round blue cell tumours includes

Neuroblastoma	Rhabdomyosarcoma	Retinoblastoma
Wilms tumours	Ewings sarcoma	Medulloblastoma
Lymphoma	Primitive neuroectodermal tumours	Burkitt lymphoma

158. Match the following

A. HPV
B. CMV
C. Molluscum contagiosum
D. BK polyoma
1. Owl’s eye
2. Henderson–Patterson bodies
3. Decoy cell
4. Koilocytes

a) a-1,b-2,c-3,d-4

b) a-4,b-1,c -3,d-4

c) a-4,b-1,c-2,d-3

d) a-4,b-2,c-1,d-3

Correct Answer - C
Ans: C. a-4,b-1,c-2,d-3
*** Koilocytes**, also known as halo cells, are a type of epithelial cell that develops following a human **papillomavirus** (**HPV**) infection. **Koilocytes** are structurally different from other epithelial cells. For instance, their nuclei, which contain the cell's DNA, are an irregular size, shape, or color.
* Owl's eye appearance of inclusion bodies, which is highly specific for cytomegalovirus infection. Owl's eye appearance of entire nucleus - a finding in Reed–Sternberg cells in individuals with Hodgkin's lymphoma.
* Molluscum bodies, also called Henderson–Patterson bodies, are large, round cytoplasmic inclusions (within the enlarged cells of

large, round cytoplasmic inclusions (within the enlarged cells of epidermis), which push the nucleus to the periphery.
* In BK Virus Infection condition the urinary sediment contains variable numbers of decoy cells sufficient to diagnose reactivation of the viral infection

159. Match the following

A. Burkitt's lymphoma
B. Mantles tumour
C. Marginal tumour
D. Follicular tumour
1. t(11,14)
2. t(11,18)
3. t(8,14)
4. t(14,18)

a) a-1,b-2,c-3,d-4

b) A-2,b-1,c-4,d-3

c) A-2,b-3,c-1,d-4

d) a-3,b-1,c-2,d-4

Correct Answer - D
Ans: D. a-3,b-1,c-2,d-4
* All types of Burkitt lymphoma are characterized by dysregulation of the *c-myc* gene by one of three chromosomal translocations.The most common variant is t(8;14)(q24;q32), which accounts for about 85%of cases.
*** Mantle** cell lymphoma (MCL) is a type of non-Hodgkin's lymphoma (NHL), comprising about 6%, Specifically, the translocation is at **t**(11;14)(q13;q32).
* Extranodal marginal zone lymphomas are commonly associated with chromosomal abnormalities, including t(11;18)(q21;q21), t(14;18)(q32;q21), t(1;14)(p22;q32), t(3;14)(p12;q32), and trisomy 3

or 18.
* The chromosomal translocation **t**(**14;18**)(q32;q21) is characteristic of **follicular** lymphoma and a frequent abnormality in other types of non-Hodgkin lymphoma (NHL)

160. Correct order of cell cycle is:

a) GO-Gl-S-G2-M

b) GO-GI-G2-S-M

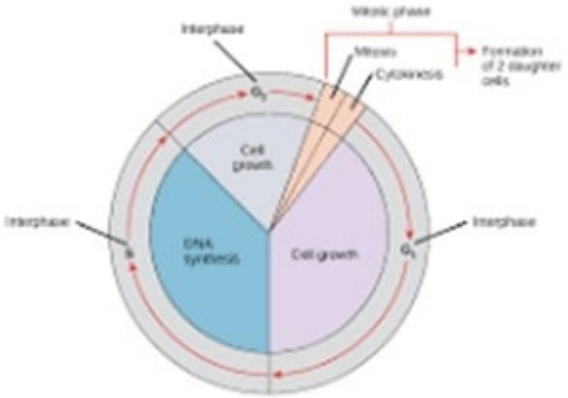
c) GO-M-G2-S-Gl

d) GO-G1-S-M-G2

Correct Answer - A

Ans: A. GO-Gl-S-G2-M

The eukaryotic **cell cycle** consists of four distinct **phases**: G_1 **phase**, S **phase** (synthesis), G_2 **phase** (collectively known as interphase) and M **phase** (mitosis and cytokinesis).



161. Iron is taken up into enterocytes through which of the following?

a) DMT-2

b) DMT-1

c) Ferroprotein 1

d) GLUT1

Correct Answer - B
Ans: B. DMT-1
Iron is brought into the cell through an active transport process Protein DMT-1 (Divalent Metal Transporter-1),
Expressed on the **apical surface of enterocytes in initial part of duodenum.**
DMT-1 is not specific to iron & transports other substances like zinc, copper, cobalt & manganese.

162. Which of the following is activated by intrinsic or extrinsic pathways?

a) Apoptosis

b) Necrosis

c) Necroptosis

d) Ferroptosis

Correct Answer - A
Ans: A. Apoptosis
Apoptosis can be **initiated** through one of two pathways. In the **intrinsic** pathway the cell kills itself because it senses cell stress, while in the **extrinsic** pathway the cell kills itself because of signals from other cells.

163. Which one of the following is not a criterion for making a diagnosis of chronic myeloid leukemia in accelerated phase:

a) Blasts 10-19% of WBC's in peripheral blood

b) Basophils 10-19% of WBC'S in peripheral blood

c) Increasing spleen size unresponsive to therapy

d) Persistent thrombocytosis (>1000 x 109/L) unresponsive to therapy

Correct Answer - D

Answer is D (Persistent thrombocytosis > 1000 x 10^9/L positive to therapy)

Accelerated phase is associated with thrombocytopenia (9/L) and not thrombocytosis.

Although multivariate analysis derived criteria also place blood or marrow basophils > 20% in disease criteria, other criteria do consider marrow and peripheral basophils > 10% as a criteria and hence option (D) is the single best answer here.

Accelerated phase of CML: It is defined by the development of increasing degrees of anemia unaccounted for by bleeding or chemotherapy and is defined by several criteria.

Multivariate analysis derived criteria	**Other commonly used criteria**
Cytogenetic clonal evolution	
Blood or marrow blasts between 10 and 20%	Increasing drug dosage requirement
	Marrow reticulum or

Blood or marrow basophils > 20%	collagen fibrosis
Platelet count < 100 x 10°/L unrelated to therapy	Marrow or peripheral blasts > 10%
Marrow or peripheral basophils eosinophils - 10% Triad of WBC > 50 x 10^9/L, haematocrit < 25% and Mai,100 liP/L not controlled ii1111 therapy Unexplained fever or bone pain	

164. Which of the following findings is diagnostic of iron deficiency anemia?

a) Increased TIBC, decreased serum ferritin

b) Decreased TIBC, decreased serum ferritin

c) Increased TIBC, increased serum ferritin

d) Decreased TIBC, increased serum ferritin

Correct Answer - A
Ans: A. Increased TIBC, decreased serum ferritin
* Iron deficiency anemia is associated with increased Total iron binding capacity (TIBC) and decreased ferritin.
*** Ref:** Harrison's Principles of Internal Medicine, 17th Edition, Page 631, 663; Davidson's principles and practice of Medicine, 20th Edition, Chapter 24, Page 1025-1027 &1030.

165. Vwf factor is produced by:

a) Platelets

b) Endothelial cells

c) Neutrophils

d) Monocytes

Correct Answer - B
Ans: B. Endothelial cells
Von willebrand factor (vWF)
* This is the larger component.
* It is produced by endothelial cells (main source) and megakaryocytes.
It has two major functions ?
* Helps in platelets adhesion by interacting with platelet membrane glycoprotein *ib-IX.*
* Stabilizes factor VIIIc.

166. True about yθT cells:

a) Are helper t cells

b) Oligoclonal proliferation

c) Antigen presentation

d) Opsonization

Correct Answer - B

Ans: B. Oligoclonal proliferation

Cell Type	Subset	Main mediators	Established role	Findings in allergic rhinitis (AR)
γδ T cell	* IFNγ * IL-17A * IL-17F * IL-22	* proinflammatory and immune-modulating functions at epithelial surfaces * innate and adaptive immunity participation		* γδT cytokines induce B cell IgE synthesis * support Th2 inflammatory response * oligoclonal proliferation in nasal mucosa (?) * ↑ circulating γδT cell percentages correlating with Th17 numbers in AR * negative correlation with T_{regs}

167. False about Bone marrow biopsy

a) Can be done in prone or lateral position

b) To find out infiltrative and granulomatous disorders

c) Breath holding not necessary

d) Contraindicated when platelet count is below 40,000

Correct Answer - D
Ans: D. Contraindicated when platelet count is below 40,000
CT-guided bone marrow biopsy is safe in thrombocytopenic patients, with a hemorrhagic complication rate below 1.6% for patients with a platelet count of 20,000–50,000/μL. Routine preprocedure platelet transfusion may not be necessary for patients with a platelet count of 20,000–50,000/μL.

168. Proto-oncogene to oncogene transformation occurs by

a) Point mutation

b) Promotor insertion

c) Amplification

d) Enhancer insertion

Correct Answer - A:B:D
Ans: A. Point mutation B. Promotor insertion D. Enhancer insertion
Enhancer insertion does not convert a proto-oncogene to oncogene.
An enhancer mutation in one gene intensifies the phenotype caused by a mutation in another gene.

169. Assertion: anaphylactoid reaction can be caused by first exposure
Reason: involves mast call degranulation but not IgE

a) Assertion and reason are correct and correlate

b) Assertion and reason are incorrect and do not correlate

c) Assertion is correct but reason is incorrect

d) Assertion is incorrect but reason is correct

Correct Answer - C
Ans: C. Assertion is correct but reason is incorrect
* Anaphylaxis is a severe allergic reaction of rapid onset affecting many body systems. It is due to the release of inflammatory mediators and cytokines from mast cells and basophils, typically due to an immunologic reaction but sometimes non-immunologic mechanism.
* In the immunologic mechanism, immunoglobulin E (IgE) binds to the antigen (the foreign material that provokes the allergic reaction). Antigen-bound IgE then activates FcεRI receptors on mast cells and basophils. This leads to the release of inflammatory mediators such as histamine. These mediators subsequently increase the contraction of bronchial smooth muscles, trigger vasodilation, increase the leakage of fluid from blood vessels, and cause heart muscle depression. There is also an immunologic mechanism that does not rely on IgE, but it is not known if this occurs in humans.

170. Match the following

A. anti jo1
B. anti topoisomerase
C. anti u1rnp
D. anti smith
1. systemic sclerosis
2. sle
3. anti synthetase
4. systemic sclerosis
5. dermatomyositis

a) a-2,b-3,c-1,d-4

b) a-3,b-2,c-5,d-1

c) a-2,b-5,c-4,d-3

d) a-5,b-3,c-2,d-4

Correct Answer - B
Ans: B. a-3,b-2,c-5,d-1
Antisynthetase syndrome is a chronic **autoimmune condition** that affects the muscles and various other parts of the body.
The signs and symptoms of antisynthetase syndrome vary but may include:
* Fever
* Loss of appetite
* Weight loss
* Muscle inflammation **(myositis)**

* Inflammation of multiple joints (polyarthritis)
*** Interstitial lung disease** (ILD) causing shortness of breath, coughing, and/or dysphagia
* Mechanic's hands (thickened skin of tips and margins of the fingers)
*** Raynaud phenomenon**
Myopathy occurs more often in patients with anti-Jo-1 or anti-PL-7; anti-Jo-1 is related to severe arthritis and "mechanic's hand", while anti-PL-12 with higher rates of Raynaud phenomenon; and anti-PL-7, anti-PL-12, anti-KS, and anti-OJ with cases of ILD.

171. Translocation seen in Ewing’s sarcoma is:

a) t(8,11)

b) t(11,22)

c) t(11,18)

d) t(14,18)

Correct Answer - B
Ans: B. t(11,22)
Genetic exchange between chromosomes can cause cells to become cancerous. Most cases of **Ewing's sarcoma** (85%) are the result of a **translocation** between chromosomes 11 and 22, which fuses the EWS gene of chromosome 22 to the FLI1 gene of chromosome 11.
Other **translocations** are at t(21;22) and t(7;22).

172. Match the following appearances of myocy following conditions they are seen
Column 1:

A. Boxcar nuclei
B. Myocyte disarray
C. Vacuolations in myocytes
D. Myocyte hypertrophy
Column 2:
1. HOCM
2. Hypertension
3. DCMP
4. Subendothelial ischemia

a) a-2 ,b-1,c-3,d-4

b) a-4 ,b-3,c-1,d-2

c) a-3 ,b-4,c-2,d-1

d) a-2 ,b-4,c-3,d-1

Correct Answer - A
Ans: A. a-2 ,b-1,c-3,d-4
* Hypertrophic obstructive cardiomyopathy results in abnormal thickening of the myocardium, most commonly in the interventricular septum, with pathologic “myocardial disarray” upon microscopic inspection. **HOCM** can lead to clinical heart failure, life-threatening

arrhythmias, mitral regurgitation and sudden cardiac death.
* HYPERTENSIVE HEART DISEASE HISTOPATHOLOGY • INCREASED FIBER (MYOCYTE) THICKNESS • INCREASED nuclear size with increased “blockiness” (boxcar nucleus)
Noncoronarogenic factors of myocardial ischemia:
* Intracardial factors - Aortic valve disease, arrhythmias, hypertrophy of myocytes
* Dilated cardiomyopathy (DCM) is characterized by a poorly contracting dilated left ventricle with a normal or reduced left ventricular wall thickness
*** Microscopic (histologic) description:** The individual myocytes are increased in length rather than in width, lose the normal number of intracellular contractile myofibrils and appear empty and vacuolated