

1. A fertilized ovum reaches uterine cavity in?

a) 3-4 days

b) 5-6 days

c) 7-8 days

d) 10 days

Correct Answer - A

Ans. A. 3-4 days

REF: William's obstetrics 22nd ed, Langman's Medical Embryology 9th edition page 45

LH Surge	24 hours before ovulation	
Ovulation	0 hours	
Fertilization	24 hours after ovulation (Day 1)	
Reaches uterine cavity	3-4 days post fertilization (Day	4-5 post ovulation)
Implantation	7-9 day post fertilization	

2. Vasomotor centre of medulla is associated with?

a) Acts with the cardiovagal centre to maintain B.P.

b) Independent of corticohypothalamic inputs

c) Influenced by baroreceptors not chemoreceptors

d) Essentially silent in sleep

Correct Answer - A

Acts with the cardiovagal centre to maintain B.P. (*Ref Ganong 23/e p556*)

- Neural regulation of the blood pressure is brought about by 2 different centres located in medulla -
 - Vasomotor centre - Control sympathetic outflow.
 - Cardiovagal centre - Controls parasympathetic outflow.
- Vasomotor centre & Cardiovagal centre act together to maintain B.P.
- (Note: Mostly vasomotor centre referred for all neurons in medulla controlling B.P.)

3. Maximum postprandial motility is seen in:

a) >Ascending colon

b) >Transverse colon

c) >Descending colon

d) >Sigmoid colon

Correct Answer - C

Ans. is. C. Descending colon [Ref: Colonic diseases By Timothy R. Koch 039] Repeat from Nov 08]

Colonic diseases by Timothy R. Koch writes- "There is minimal colonic motility during fasting period. Eating stimulates colonic contractions. The fat component of the meal is the major stimulus to colonic contractions, whereas protein ingestion inhibits colonic contraction. The major postprandial increase in motility occurs in the proximal descending colon."

4. CSF pressure is mainly regulated by:

a) >Rate of CSF formation

b) >Rate of CSF absorption

c) >Cerebral blood flow

d) >Venous pressure

Correct Answer - B

Ans. is. B. Rate of CSF absorption [Ref: Guyton 11/e p765; Ganong 22/e p613] Repeat from May 08, Nov 08 Normal CSF pressure is mainly regulated by rate of absorption by arachnoid. The normal rate of CSF formation remains nearly very constant. It is independent of the CSF pressure.

Absorption by arachnoid villi is proportionate to the CSF pressure (Arachnoid villi act like valves and allow CSF fluid to flow into venous sinuses when CSF pressure is about 1.5 mm Hg greater than the pressure of blood in the venous sinuses. If the CSF pressure rises further, the valves open more widely, so that under normal conditions, the CSF pressure almost never rises more than a few mm of Hg higher than the pressure in the cerebral venous sinuses)

The above given chart shows that the rate of CSF formation is nearly constant.

At a pressure of 112 mm of CSF (a^y. normal CSF pressure) filtration and absorption are equal. As the CSF pressure decreases, the absorption also decreases and at CSF pressure of 68 mm absorption becomes zero. As CSF pressure rises the absorption increases

5. Which of the following statements about cutaneous shunt vessels is true:

a) Perform nutritive function

b) Have a role in thermoregulation

c) Not under the control of autonomic nervous system

d) These vessels are evenly distributed throughout the skin

Correct Answer - B

The cutaneous shunt vessels (arteriovenous anastomosis) are located in the distal parts of the extremities (hands and feet), the nose, lips and ear lobules. These vessels are wide, low-resistance connections that act as shunts and allow blood to bypass the superficial capillary loops and play a major role in thermoregulation.

Ref: Textbook of Medical Physiology By Khurana, Pages 374-5; Textbook of Medical Physiology By Guyton and Hall, 10th Edition, Pages 822-824

6. Why cyanosis does not occur in severe anemia?

a) Hypoxia stimulates erythropoetin production

b) Oxygen Hemoglobin curve shifted to the right

c) Oxygen carrying capacity of available hemoglobin is increased

d) Critical concentration of hemoglobin required to produce cyanosis is reduced

Correct Answer - D

Cyanosis refers to bluish color of the skin and mucous membranes which occur when the concentration of reduced hemoglobin is more than 5gm per cent. Patients suffering from severe anemia with hemoglobin content less than 5gram per cent may not show cyanosis as the total hemoglobin is less than 5 gram per cent.

Ref: Textbook of Practical Physiology By G.K. and Pal, 2nd Edition, Page 127; Harrison's Principles of Internal Medicine, 16th Edition, Page 210; Fundamentals of Medical Physiology By Joel Michael, Page 50

7. Which of the following is a TRUE statement regarding determinants of myocardial oxygen demand?

a) Inversely related to heart rate

b) Has constant relation to external cardiac work

c) Directly proportional to duration of systole

d) Is negligible at rest

Correct Answer - B

Myocardial oxygen demand has constant relationship to the cardiac work. Cardiac work is composed of external and internal cardiac work. External cardiac work refers to work done during the ejection phase of the cardiac cycle. Internal work refers to the work done during isovolemetric contraction. Even though the external cardiac work is less than half of the total cardiac work it has a constant relationship with the oxygen demand. The Oxygen demand increases with increase in external work done.

The three major determinants of myocardial oxygen demand are: ventricular wall stress, heart rate and contractility. If the heart rate increases the number of contractions and the amount of ATP consumed per minute increases and the oxygen requirement rises.

8. All of the following are true about blood pressure measurement, EXCEPT:

a) Cuff width should be 40% of arm. circumference

b) Diastolic blood pressure is indicated by fourth Korotkoff sound

c) Small cuff measures spuriously elevated Diastolic blood pressure

d) Monckeberg's sclerosis causes pseudohypertension

Correct Answer - B

The length and width of the blood pressure cuff bladder should be 80% and 40% of the arm's circumference, respectively. Use of an inappropriately small cuff, resulting in marked overestimation of true blood pressure, or an inappropriately large cuff, resulting in underestimation of true blood pressure.

Systolic and diastolic pressures are defined by the first and fifth Korotkoff sounds, respectively.

- *Monckeberg's sclerosis* causes pseudohypertension due to vascular stiffening.

Ref: O'Gara P.T., Loscalzo J. (2012). Chapter 227. Physical Examination of the Cardiovascular System. 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.*

9. Which of the following physiological change take place by Bainbridge reflex?

a) Increase in HR

b) Decrease in HR

c) Increase in BP

d) Distension of large somatic veins

Correct Answer - A

Atrial A and B receptors are located at the venoatrial junctions and have distinct functions. Type A receptors react primarily to heart rate but adapt to long-term changes in atrial volume. Type B receptors increase their discharge during atrial distension. C fibers arise from receptors scattered through the atria; these discharge with a low frequency and respond with increased discharge to increase in atrial pressure.

*The A and B receptors are thought to mediate the increase in heart rate associated with atrial distension (such as can occur with intravenous infusions) known as the **Bainbridge reflex**. In contrast, activation of atrial C fibers generally produces a vasodepressor effect (bradycardia and peripheral vasodilation).*

Ref: Hoit B.D., Walsh R.A. (2011). Chapter 5. Normal Physiology of the Cardiovascular System. In V. Fuster, R.A. Walsh, R.A. Harrington (Eds), *Hurst's The Heart*, 13e.

10. While measuring jugular venous pressure, 'a' wave is indicative of:

a) Atrial filling

b) Atrial relaxation

c) Atrial contraction

d) Ventricular relaxation

Correct Answer - C

The pressure pulsations that occur in the right atrium are transmitted in retrograde fashion to the large veins near the heart. *Atrial contraction produces the first pressure peak called the **a wave**.*

The **c wave** is the transmitted manifestation of the rise in atrial pressure produced by the bulging of the tricuspid valve into the atria during isovolumetric ventricular contraction. The **v wave** mirrors the rise in atrial pressure before the tricuspid valve opens during diastole.

Ref: Barrett K.E., Barman S.M., Boitano S., Brooks H.L. (2012). Chapter 30. The Heart as a Pump. In K.E. Barrett, S.M. Barman, S. Boitano, H.L. Brooks (Eds), *Ganong's Review of Medical Physiology*, 24e.

11. Surfactant acts to maintain the lung compliance by decreasing the following factor:

a) Pleural pressure

b) Intrathoracic pressure

c) Surface tension

d) Pleural fluid secretion

Correct Answer - C

Surfactant is a mixture of dipalmitoylphosphatidylcholine (DPPC), other lipids, and proteins. *The low surface tension when the alveoli are small is due to the presence of surfactant in the fluid lining the alveoli.* If the surface tension is not kept low when the alveoli become smaller during expiration, they collapse in accordance with the law of Laplace. Surfactant also helps to prevent pulmonary edema.

Ref: Barrett K.E., Barman S.M., Boitano S., Brooks H.L. (2012). Chapter 34. Introduction to Pulmonary Structure and Mechanics. In K.E. Barrett, S.M. Barman, S. Boitano, H.L. Brooks (Eds), *Ganong's Review of Medical Physiology*, 24e.

12. The primary direct stimulus for excitation of central chemo-receptors is:

a) $\uparrow H^+$

b) $\uparrow CO_2$

c) $\uparrow O_2$

d) $\downarrow CO_2$

Correct Answer - A

The primary direct stimulus for excitation of central chemo receptors is $\uparrow H^+$. Increased in blood pCO_2 causes CO_2 to diffuse the blood brain barrier with ease where it reacts with water to form carbonic acid. This carbonic acid in turn dissociates into H^+ and bicarbonate ions. This H^+ ions then have a potent stimulatory effect on the central chemo receptors.

Ref: Review of Medical Physiology, 22nd Edition By William F Ganong, Page 675; Textbook of Medical Physiology By Khurana, Page 458

13. What is the effect of constriction of efferent arteriole and dilatation of afferent arteriole on glomerular filtration rate?

a) Increases GFR

b) Decreases GFR

c) No change to GFR

d) First increase then decreases GFR

Correct Answer - A

Increase in renal blood flow increases GFR. Afferent arteriole brings blood to the nephron hence its dilation will increase renal blood flow, and efferent arteriole takes blood away from the nephrons, hence its constriction will cause increase filtration, hence increase in GFR.

- **Constriction of afferent arteriole:** decreases both renal blood flow and GFR, without change in filtration fraction.
- **Dilatation of afferent arteriole :** increases both renal blood flow and GFR, without change in filtration fraction.
- **Constriction of efferent arteriole:** decreases the renal blood flow and increases GFR and filtration fraction.
- **Dilatation of efferent arteriole:** increases the renal blood flow and decreases the GFR and filtration fraction.

14. Angiotensin II causes all of the following, EXCEPT:

a) Stimulation of thirst

b) Aldosterone secretion

c) Increased ADH secretion

d) Vasodilation

Correct Answer - D

"Angiotensin II is one of the most potent vasoconstrictors known, being four to eight times as active as norepinephrine on a weight basis in normal individuals". It produces arteriolar constriction and a rise in systolic and diastolic blood pressure. - Ganong

It also acts on the adrenal cortex to increase secretion of aldosterone.

It facilitates the release of norepinephrine by a direct action on postganglionic sympathetic neurons, contraction of mesangial cells with a resultant decrease in GFR and a direct effect on the renal tubules to increase Na⁺ reabsorption.

It acts on the brain to increase water intake (through subfornical organ) and increase the secretion of vasopressin and ACTH.

15. Which of the following statement is TRUE?

a) Fluid coming from the descending limb of loop of Henle is hypotonic

b) Descending limb of loop of Henle is permeable to solutes

c) If clearance of a substance is greater than GFR, then tubular secretion must be present

d) Clearance of a substance is always more than GFR if there is tubular secretion

Correct Answer - C

Renal Clearance:

$C_x = U_x V/P$ = volume of plasma from which the substance is cleared completely per unit time.

- If $C_x < GFR$, then there is net tubular reabsorption of X.
- If $C_x > GFR$, then there is net tubular secretion of X.
- If $C_x = GFR$, then there is no net secretion or reabsorption.

Ref: Eaton D.C., Pooler J.P. (2009). Chapter 3. Clearance. In D.C. Eaton, J.P. Pooler (Eds), Vander's Renal Physiology, 7e.

16. What is the use of Kinemyography?

a) Monitoring of neuromuscular function

b) Monitoring of muscle spindle activity

c) Monitoring of exercise capacity

d) Not Recalled

Correct Answer - A

Acceleromyography (AMG) and kinemyography (KMG) provide increasingly objective measures of **neuromuscular function**.

Kinemyography employs a piezoelectric transducer and consists of a moulded plastic device which mirrors the contour of the outstretched thumb and

index finger. **Acceleromyography** measures acceleration of a given end-organ, e.g., the thumb when moved by the AP. It is related to the actual force by the formula: **force = mass × acceleration**

Also Know:

At present, the most versatile technique to monitor neuromuscular function is AMG, since it can be applied at different muscles.

Ref: [http://faculty.washington.edu/ramaiahr/Review%20Articles/Neuromuscular Update-1.pdf](http://faculty.washington.edu/ramaiahr/Review%20Articles/Neuromuscular%20Update-1.pdf).

17. Nitrogen narcosis is caused due to

a) Nitrogen inhibiting dismutase enzyme

b) Increase production of nitrous oxide

c) Increased solubility of nitrogen in nerve cell membrane

d) Decrease in oxygen free radicals

Correct Answer - C

The cause of narcosis is due to the increased solubility of gases in the body tissues. Very high partial pressures of nitrogen directly affect the central nervous system causing euphoria, loss of memory, clumsiness, and irrational behavior.

This "rapture of the deep" occurs at depths of 100 ft or more and greater depths may result in numbness of the limbs, disorientation, motor impairment, and ultimately unconsciousness.

18. True regarding animals that are chronically exposed to cold?

a) Increased sympathetic stimulation

b) Increased vagal action

c) Increased insulin levels in blood Decrease

d) blood supply to adipose tissue

Correct Answer - A
A i.e. Increased sympathetic stimulation

19. Adverse effects of hypothermia are all except:

a) Cardiac arrhythmias

b) Renal failure

c) Decreased peripheral resistance

d) Reversible coagulopathy

Correct Answer - C

C i.e. Decreased peripheral resistance

Adverse effects of hypothermia are:

Bradycardia

Hypotension

Reduced cardiac output

Reduced stroke volume

Reduced blood flow and hyperviscosity

Microembolism

Coagulation is prolonged

Hypoxic injury to the liver.

20. Administration of pure O₂ to hypoxic patients is dangerous because:

a) Apnea occurs due to hypostimulation of peripheral chemo receptor

b) Pulmonary edema

c) DPG

d) Convulsions

Correct Answer - A

A i.e. Apnea occurs due to hypostimulation of peripheral chemo receptor

21. Clamping of the carotid arteries below (proximal) the carotid sinus is likely to produce:

a) Increase in Blood pressure and increase in Heart Rate

b) Decrease in Blood pressure and decrease in Heart Rate

c) Increase in Blood pressure and decrease in Heart Rate

d) Increase in Blood pressure and decrease in Heart Rate

Correct Answer - A

A i.e. Increase in Blood pressure and increase in Heart Rate

- Stretching of carotid sinus baroreceptors [d/t clamping of bilateral carotid arteries above (distal to) carotid sinus] stimulate their firing which leads to peripheral vasodilation decreased heart rate, decreased the strength of contraction, decreased cardiac output and decreased blood pressure (BP) by excitation of vagal parasympathetic center.
- Clamping of carotid arteries proximal (below) the carotid sinus, decreases pressure within the sinus reducing its
- discharge. This in turn stimulates vasomotor center in the medulla and inhibits vagal parasympathetic center. This induces reciprocal compensatory response causing peripheral vasoconstriction, increased heart rate, increased strength of contraction, increased cardiac output and increased blood pressure (BP). When bilateral vagotomy is also performed the BP rise $\approx 300/200$ mmHg and is unstable.
- Bilateral destruction of visceral afferent nucleus i.e. nucleus tractus solitaries (NTS), which is the site of termination of baroreceptor afferents, also causes a marked (severe maybe even fatal) hypertension.

22. Mean arterial pressure is calculated as:

a) $(SBP + 2DBP) / 3$

b) $(DBP + 2SBP) / 3$

c) $(SBP + 3DBP) / 2$

d) $(DBP + 3SBP) / 2$

Correct Answer - A
A i.e. $(SBP + 2DBP) / 3$

23. Chymotrypsinogen is a

a) Zymogen

b) Carboxypeptidase

c) Transaminase

d) Elastase

Correct Answer - A

A i.e. Zymogen

Chymotrypsinogen or prochymotrypsin is a proprotein/ proenzyme / or zymogen.

Proteins (Proenzymes or Zymogens)

* Zymogen is an inactive precursor of enzyme / protein that require selective proteolysis for activation. Selective proteolysis involves one or more highly specific proteolytic clips that may or may not be accompanied by separation of resulting peptide. So selective proteolysis often result in conformational changes that create the catalytic site of an enzyme or it unmasks the active site of an enzyme by removing small region of peptide chain (by hydrolysis of specific peptide bond).

* Enzymes needed intermittently but rapidly often are secreted in an initially inactive form since new synthesis and secretion of required proteins might be insufficiently rapid to respond to a pressing pathophysiological demand such as clot formation, clot dissolution, tissue repair etc. So proenzymes facilitate rapid mobilization of activity in response to physiological need.

Proteolytic digestive enzymes are known as proteases. These are secreted as inactive zymogens. The synthesis of enzymes as Zymogens protects the cell from being digested by its own product (autodigestion). Proteases are of two types

24. Which of the following is not the primary function of gut flora?

- a) Synthesis of short chain fatty acids
- b) Decreased proliferation of epithelial cells
- c) Production of vit. K
- d) Fermentation of mucin

Correct Answer - B

B i.e. Decreased proliferation of epithelial cells

Gut (colonic) microflora synthesize short chain fatty acids (SCFAs) by fermenting complex carbohydrate, resistant starches and other components of dietary fibers & mucin that escape digestion in upper gut. They also produce vitamin K and biotin, *detoxify xenobiotics, increase & mature immunity, , preventing allergy and growth of pathogenic bacteria*. They promote development of normal colonic epithelium and stimulate intestinal epithelial cell differentiation (ie increase not decrease proliferation of epithelial cells)

Fermentation & Digestion of Complex Carbohydrate

- Colonic bacteria metabolize meal components that are not digested by host enzymes and make their products available to the body via fermentation. It provides advantage to the host in that the colonic bacteria are capable of performing metabolic reactions that do not take place in mammalian cells.

-Formation of Short Chain Fatty Acids (SCFAs)- Colonic bacteria form SCFAs by fermenting carbohydrates (starches, fibers). SCFAs are 2-5 carbon weak acids with 80mmol/L average normal concentration in lumen. About 60% of this is acetate, 25% propionate and 15% butyrate.- SCFAs are absorbed & metabolized to make a significant contribution to total calory intake - butyrate is a

critical energy source for colonocytes.

- SCFAs exert a trophic effect on colonic epithelium cells. The colonic epithelium turns over rapidly even in health,

25. The most sensitive index for renal tubular function is:

a) Specific gravity of urine

b) Blood urea

c) GFR

d) Creatinine clearance

Correct Answer - A

A i.e. Specific gravity of urine

The *main function of renal tubules is concentration of urine* and this can be measured by *specific gravity of urine*.

26. Adrenaline, noradrenaline and dopamine act through

a) Single pass receptors

b) Four pass receptors

c) Seven pass receptor

d) Ligand gated channel

Correct Answer - C

C i.e. Seven pass - receptor

Catecholamines (epinephrine, norepinephrine and dopamine) act through G protein coupled receptors (GPCRs), which span the cell membrane 7 times; hence also referred to as seven pass (seven helix) or serpentine receptors.

- Catecholamines (adrenaline, noradrenaline & dopamine) act through G protein

coupled receptors. α_1 adrenargic

catecholamine use phospholipid C(IP_3 ?

DAG) and α_2 & adrenergic

catecholamines use C-AMP (adenyl

cyclase) second messenger system.

- Hetrotrimeric GTP

binding proteins (G? proteins) are cell membrane proteins that have *seven trans membrane segments that loop (pass) in & out of cell membrane*.

(serpentine protein)

- Cytoplasmic tail is coupled to GTP that has 3 part (trimeric) - α , β , γ subunits.

27. Hyperaldosteronism is associated with all except

a) Hypernatremia

b) Hypokalemia

c) Hypertension

d) Metabolic acidosis

Correct Answer - D

D i.e. Metabolic acidosis

Hyperaldosteronism is associated with metabolic alkalosis along with hypernatremia, hyponatremia, hypokalemia & hypertension.

Also know

- Primary Aldosteronism also k/a Conn's syndrome, is most commonly caused by unilateral adrenal adenoma
- It is characterised by
 - Diastolic hypertension without oedema
 - Low plasma renin activity levels
- Secondary aldosteronism with high renin activity is seen in cirrhosis, CHF, nephrosis & primary reninism (renin producing tumors)
- Aldosterone primarily acts on the principal cells (P cells) of the collecting ducts.

28. True regarding transport across a cell membrane is :

a) Cl⁻ with glucose symport

b) Na⁺ with glucose anteprot

c) Na⁺ with glucose symport

d) K⁺ with glucose symport

Correct Answer - C

C i.e. Na⁺ with glucose symport

- In this along with Na⁺, another substance is carried by the carrier protein called symport. The energy is obtained from diffusion process of Na⁺ due to concentration gradient across the cell membrane.
- Na⁺ depended glucose co-transporters (SGLT, members of a large family transporter. Gene name SLC5A).
- Facilitative Na⁺ independent sugar transporter (GLUT family, gene name SLC2A).
- The transport of most hexoses is dependent on Na⁺ in the intestinal lumen.
- The glucose and galactose both uses the same transport SGLT-1. SGLT-1 transports either glucose or galactose along with Na⁺ from intestinal lumen to cell (**Secondary active transport**).
- **Fructose** is absorbed by **facilitated diffusion** from the intestinal lumen into the enterocytes by GLUT-5. This process is Na⁺ independent.

29. True about semicircular canals is:
September 2005

a) Submerged in a fluid called endolymph

b) Base of cupula is in close contact with afferent fibres of cochlear division of the eight cranial nerve

c) Arranged at right angles to each other

d) Associated with hearing

Correct Answer - C

Ans. C: Arranged at right angles to each other

3 semicircular canals in each vestibular apparatus known as anterior, posterior and lateral (horizontal) semicircular canals. They are arranged at right angles to each other.

They are filled with endolymph

Base of cupula is in close contact with afferent fibers of vestibular division of the eight cranial nerve

30. All of the following are true about excitation contraction coupling except:

a) Acetylcholine is released at the nerve terminal

b) Calcium is pumped back into the sarcoplasmic reticulum during relaxation

c) Calcium is released from sarcoplasmic reticulum during contraction

d) Calcium binds to tropomyosin to initiate muscle contraction

Correct Answer - D

Ans. d. Calcium binds to tropomyosin to initiate muscle contraction

Calcium binds to Troponin C, not to the tropomyosin, to initiate muscle contraction.

'The calcium released into the cytosol binds to Troponin C by the actin filaments, to allow cross-bridge cycling, producing force and, in some situations, motion.'

31. Transcutaneous electrical nerve stimulation based on:

a) Central pain

b) Referred pain

c) Gate controlled theory of pain

d) Allodynia

Correct Answer - C

Ans. c. Gate controlled theory of pain

Transcutaneous electrical nerve stimulation is based on gate-controlled theory of pain.

Gate Control Hypothesis (Metzek and Wall, 1965): Explain the working of spinal pain suppression system. According to this hypothesis, the dorsal grey horn acts as gate for transmission of pain sensation and this gate can be partly or completely closed by segmental suppression and supraspinal suppression.

32. Weber Fechner law is related to ?

a) Phantom limb

b) Force of contraction in heart

c) Intensity of stimulus and sensation felt

d) Cortical plasticity

Correct Answer - C

Ans. is 'c' i.e., Intensity of stimulus and sensation felt

33. Feed forward inhibition synapse seen in

a) Medulla

b) Cerebellum

c) Basal ganglia

d) Hypothalamus

Correct Answer - B

Ans. is `b' i.e., Cerebellum

- *Feed forward control system is employed during the regulation of temperature.*
- In feed-forward inhibition, a neuron is connected through two pathways one excitatory and one inhibitory.
- For example, in cerebellum the stimulation of Basket cells produces IPSPs (inhibitory postsynaptic potentials) in Purkinje cells.
- However, the basket cells and the Purkinje cells are excited by the same parallel-fiber excitatory input.
- This arrangement is called *feed-forward inhibition* and helps to prevent the duration of the excitation produced by any given afferent impulse.

34. Hormones required during puberty ?

a) LSH

b) Testosterone

c) Leptin

d) All of the above

Correct Answer - D

Ans. is 'd' i.e., All of the above

Puberty is triggered by a release of gonadotropins (FSH and LH) from pituitary gland.

These hormones act as signals to the gonads (testes/ovaries) that trigger the production of -

- .. Estrogen, progesterone and some testosterone in women.
- 2. Testosterone in men.

In both males and females, testosterone is responsible for development of pubic hair, accelerated bone growth, body odor and acne during puberty. For boys, testosterone is responsible for the process of virilization, including the enlargement of the penis, increased libido and growth of facial and chest hair.

Estrogen is the major hormone responsible for female puberal development. It causes development of breast and thickening of endometrium.

Progesterone causes proliferation of acini in mammary glands and converts watery cervical secretion to viscid and scanty.

Leptin facilitates release of gonadotropin releasing hormone (GnRH), thereby helping in pubertal onset.

Other hormones which are involved in puberty are thyroxine and growth hormone.

35. Common precursor of mineralocorticoid, glucocorticoids and sex steroids ?

a) Pregnenolone

b) α -hydroxyprogesterone

c) Dehydrotestosterone

d) Deoxycortisol

Correct Answer - A
Ans. is 'a' i.e., Pregnenolone

36. All are true regarding blood supply increase in muscle during exercise except

a) Local metabolite

b) Sympathetic stimulation

c) Cholinergic stimulation

d) Inhibition of beta receptor

Correct Answer - D

Ans. D. Inhibition of beta receptor.

CHANGES IN MUSCLE BLOOD FLOW DURING EXERCISE

- The blood flow of resting skeletal muscle is low (2-4 ml./100 g/min). The muscle blood flow can increase a maximum of about 25 fold during the most strenuous exercise. Amount of blood flow to skeletal muscles during exercise : 50 to 75 mL/min of blood per 100 g of muscle.
- Dilation of arterioles in skeletal muscles due to cholinergic sympathetic nerve activity and stimulation of beta-adrenergic receptors by the hormone epinephrine leads to increased blood supply.
- The local mechanisms maintaining a high blood flow in exercising muscle include a fall in tissue P_{O2}, a rise in tissue P_{CO2}, and accumulation of K⁺, and other vasodilator metabolites. The rise in temperature further dilates the vessels.

37. End diastolic volume increases in:

a) Decrease in total blood volume

b) Increase in intrapericardial pressure

c) Increase in negative intrathoracic pressure

d) Decrease in ventricular compliance

Correct Answer - C

Ans. c. Increase in negative intrathoracic pressure

Factors Affecting End Diastolic Volume

- End diastolic volume increases in conditions associated with increase in negative intrathoracic pressure.

Factors Decreasing EDV

- Increased intra-pericardial pressure^o (as a result of infection of pressure from a tumor):
- Limits the extent to which ventricle can fill
- Decrease in ventricular compliance^o:
- Increase in ventricular stiffness produced by MI, infiltrative disease.
- Standing decreases venous return^o

Factors Increasing EDV

- Increased total blood volume increases venous return^o:
- Constriction of vein reduces the size of venous reservoir
- Increased negative intrathoracic pressure^o:
- Increases the pressure gradient along which blood flows to the
- Muscle activity^o: Increases venous return as a result of pumping action

38. Clamping of the carotid arteries below (proximal) the carotid sinus is likely to produce:

a) Increase in vasomotor centre activity

b) Increase in discharge of carotid sinus afferent nerves

c) Decreased heart rate and blood pressure

d) Baroreceptor adaptation

Correct Answer - A

Ans. a. Increase in vasomotor centre activity

- Clamping of the carotid arteries proximal to the carotid sinus elevates the blood pressure and heart rate because the procedure lowers the pressure in the carotid sinus (Baroreceptor reflex

39.

Self-stimulation is experimentally done from which part of brain

a) Medial forebrain bundle

b) Area around aqueduct of sylvius

c) PV region of hypothalamus

d) Radical radiotherapy

Correct Answer - A

Ans. a. Medial forebrain bundle

Medial forebrain bundle is one of the areas responsible for self-stimulation

Responsible Centres for Self-stimulation

- Ventral tegmentum°
- Medial forebrain bundleQ
- Nucleus accumbensQ
- Frontal cortex0
- Drugs that block post-synaptic receptors reduce it. The main site D3 receptors dopaminergic reduces the rate of self-stimulation. Dopamine agonist of the relevant receptor is the nucleus accumbens located at striatum base.

40. Which of the following is not a second messenger

a) c-AMP

b) IP3

c) Guanylyl cyclase

d) Diacylglycerol (DAG)

Correct Answer - C
Ans. c. Guanylyl cyclase

41. Enzymes found in CSF

a) GGT + ALP

b) ALP + CK-MB

c) CK + LDH

d) Deaminase and Peroxidase

Correct Answer - C

Ans. c. CK + LDH

Subunit composition BB) and LDH-3 (Subunit composition HHMM) are found in brain (CSF).

Tissue Distribution of Lactate Deh

Isoenzyme	Subunit composition	Tissue	Percentage
LDH-1	HHHH	Myocardium, RBC°	30
LDH-2	HHHM	Myocardium, RBC°	35
DH-3	HHMM	Brain°, kidney	20
LDH-4	HMMM	Skeletal muscle, liver°	10
LDH-5	MMMM	Skeletal muscle, liver	5

Characteristics of CK Isoenzymes

soenzyme	Subunit composition	Tissue	Percenta
CK	BB	Brain°	30

CK	MB	Heart°	35
CK	MM	Skeletal muscle°	20

42. Ventricular depolarization starts from:

a) Posterolateral area of ventricle

b) Base of left ventricle

c) Right part of interventricular septum

d) Left part of interventricular septum

Correct Answer - D

Ans. d. Left part of interventricular septum

- Ventricular depolarization starts from left part of interventricular septum

Spread of Depolarization in the Ventricles

- First to be depolarized is the left upper part of the interventricular septum; septal depolarization is from left to right(2.
- The wave of depolarization spreads down the septum to the apex. proceeding from endocardium to epicardiumQ

Last parts of the ventricles to be depolarized are

- Posterobasal portion of the left ventricleQ
- Pulmonary conusQ
- A small uppermost portion of the septumQ

43. During moderate exercise, blood flow to brain

a) Decreases

b) Increases

c) Does not change

d) First increase, then decreases

Correct Answer - C

Ans. c. Does not change

Exercise

- During exercise there is a redistribution of cardiac output Q
- Blood flow to the liver, kidneys and splanchnic circulation reduces Q .
- The blood flow to the exercising skeletal muscles and heart increases manifold Q
- The blood flow to the brain remains unchanged Q .

44. All of the following are true about action of ADH, except:

a) Post-operative increase in secretion

b) Secreted via neurosecretion

c) Increased secretion when plasma osmolality is low

d) Act on distal convoluted tube and increase permeability

Correct Answer - C

Ans. c. Increased secretion when plasma osmolality is low

45. Which scientific principle is the basis for thermodilution method used in measurement of cardiac output by pulmonary catheter

a) Hagen-Poiseuille principle

b) Stewart-Hamilton equation

c) Bernoulli's principle

d) Universal Gas Equation

Correct Answer - B

Ans. b. Stewart-Hamilton equation

Stewart Hamilton equation

- The thermodilution technique has become the de-facto clinical standard for measuring cardiac output because of its ease of implementation and the long clinical experience using it in various settings.
- It is a variant of the indicator dilution method°, in which a known amount of a substance is injected into peripheral vein and its concentration change measured over time in serial arterial samples.
- As its name implies, the thermodilution method uses a thermal indicator, whereas other indicator dilution methods use various substances, such as indocyanine green dye.
- The fundamental physical basis for the indicator dilution method is given by the Stewart-Hamilton equation°, named after the two investigators who were instrumental in the development of this technique

46. Which of the following is correct about adult critical closing volume is

a) Volume measured at the end of forceful expiration

b) Volume at the end of forceful inspiration

c) Volume remaining after functional residual capacity is measured

d) Close to residual volume

Correct Answer - D

Ans. d. Close to residual volume

47. In right handed individuals, the left cerebral hemisphere is more developed than the right cerebral hemisphere. The left cerebral hemisphere is mainly responsible for

a) Appreciation of music

b) Spatial orientation

c) Visual stimuli processing

d) Written and spoken language

Correct Answer - D

Ans. d. Written and spoken language

48. If the external causes are removed, the sleep-wake cycle in humans

a) Does not continue

b) Continue with cycle length of 24 hours

c) Continue with cycle length of less than 24 hours

d) Continue with cycle length of more than 24 hours

Correct Answer - D

Ans. d. Continue with cycle length of more than 24 hours

The sleep-wakefulness cycle follows a 24-hour, or circadian rhythm, and is related to the light-dark cycle. If the external cues in the form of light and darkness are removed, the sleep-wakefulness cycle still remains circadian although it has a tendency to lengthen to 25-30 hour

49. In humans, the brain is considered to be "responsive" because?

a) It has control centers for all motor actions and sensory inputs

b) Every cell of brain has got specific function

c) It is a closed system and so not influenced by changes occurring outside

d) Its functions are profoundly affected by changes in external environment

Correct Answer - D

Ans. d. Its functions are profoundly affected by changes in external environment

In humans, the brain is considered to be "responsive" as its functions are profoundly affected by changes in external environment

50. Which of the following is not a component of counter current multiplier mechanism?

a) Vasa-recta

b) Thick ascending limb of loop of Henle

c) Thin descending limb of loop of Henle

d) Collecting duct

Correct Answer - A

Ans. a. Vasa-recta

Counter-current Multiplier

Gradient of increasing osmolality along the medullary pyramid is produced by operation of the loops of Henle as counter current multipliers. It acts by:

Active transport of Na^+ and cotransport of Cl^- and K^+ and other ions out of thick ascending limb of Henle into medullary interstitium.

Active transport of ions from collecting duct into medullary interstitium
Passive diffusion of urea (large amounts) from medullary duct into interstitium

51. A short duration high frequency stimulation with 5 Hz of perforating substance pathway in hippocampus leads to:

a) Long term potentiation

b) Post tetanic potentiation

c) Long term depression

d) Habituation

Correct Answer - A

Ans. a. Long term potentiation

'The most frequently used form of conditioning stimulation to induce long-term potentiation (LTP) at synapses in the brain consists of high-frequency electrical stimulation (HFS, around 100 Hz) of an input pathway

52. Sleep spindles and K-complexes are seen in which stage of sleep?

a) REM

b) Stage 1 NREM

c) Stage 2 NREM

d) Stage 3 NREM

Correct Answer - C

Ans. c. Stage 2 NREM

'There are two different kinds of sleep: rapid eye movement (REM) sleep and non-REM (NREM), or slow-wave sleep.

NREM sleep is divided into four stages. A person falling asleep first enters stage 1, which is characterized by low-amplitude,

high-frequency EEG activity. Stage 2 is marked by the appearance of sleep spindles. These are bursts of alpha-like, 10-14

Hz, 50 uV waves. In stage 3, the pattern is one of lower frequency and increased amplitude of the EEG waves. Maximum

slowing with large waves is seen in stage 4. Thus, the characteristic of deep sleep is a pattern of rhythmic slow waves,

indicating marked synchronization.'

53. Attention and concentration is mediated by:

a) Hypothalamus

b) Frontal lobe

c) Parietal lobe

d) Basal ganglia

Correct Answer - B

Ans. b. Frontal lobe

Frontal lobe

FEATURES-

.Largest of the four lobes

. Responsible for many different functions involving conscious thought, voluntary movement and personality

. Facilitates word choice, organization, and behavior

. Frontal lobe damage can dramatically change personality and behavior, and impair judgment, attention span and organization

FUNCTION

Motivation

Judgment

Behavioral choices

Planning

Personality

Organization

Attention

Expressive language and word choice

Complications after Injury

Personality change

Lack of attention

- . Loss of executive function (planning, organizing, and reasoning)
- . Loss of judgment
- . Dramatic change in behavior
- . Loss of motivation

54. Which of the following technique is used to study current flow across a single ion channel?

a) Patch clamp

b) Voltage clamp

c) Iontophoresis

d) Galvanometry

Correct Answer - A

Ans. a. Patch-clamp

- Patch-clamp is a technique to record ion current flow through a single protein channel.
- The patch-clamp technique is a laboratory technique in electrophysiology, that allows the study of single or multiple ions channels in cells.
- The technique can be applied to a wide variety of cells but is especially useful in the study of excitable cells such as neurons, cardiomyocytes, muscle fibers, and pancreatic beta cells.
- It can also be applied to the study of bacterial ion channels especially prepared giant spheroplasts.
- In the patch-clamp experiment, a small pipette is carefully maneuvered to seal off a portion of a cell membrane. The pipette has an electrode bathed in an appropriate solution that allows for the recording of electrical changes through any pore in the membrane.

55. The triad of hypertension, bradycardia and irregular respiration is seen in:

a) Cushing's reflex

b) Bezold-Zarisch reflex

c) Herring-Bruer reflex

d) Bainbridge's reflex

Correct Answer - A

Ans. a. Cushing's reflex

Cushing's Triad

Increase in systolic blood pressure (Widening of pulse pressure)

Reduction of the heart rate (bradycardia)

Irregular respiration (caused by impaired brainstem function)

Cushing reflex (also referred to as the vasopressor response), is a physiological nervous system response to increased intracranial pressure (ICP) that results in Cushing's triad of increased blood pressure, irregular breathing, and a reduction of the heart rate.

It is usually seen in the terminal stages of acute head injury and may indicate imminent brain herniation.

These symptoms can be indicative of insufficient blood flow to the brain (ischemia) as well as compression of arterioles

56. Free nerve endings carrying nociceptive fibers are seen in:

a) Intestine

b) Spleen

c) Liver

d) Mesentery

Correct Answer - D

Ans. d. Mesentery

Free nerve endings carrying nociceptive fibers are seen in mesentery.

`Visceral nociceptors are thought to be free nerve endings which occur in the walls of most hollow viscera and mesenteries.'-Applied Basic Science for Basic Surgical training by Andrew T Puffery (2008)/211

`The afferent innervations of serosa and mesentery are provided by spinal afferent fibres which are mostly bare nerve endings. By contrast most nerve fibre endings in the muscle layer of the gut comprise two specialized endings — IGLEs and Intramuscular arrays (IMA) with only a small population of free nerve endings reported in the intestines. '- Physiology of the Gastrointestinal Tract by Kim E. Barrett, Fayez K. Ghishan, Juanita L. Merchant, Hamid M. Said, Jackie D. Wood p690

'Physiologic determinants of pain (nociception) include the nature of the stimulus, the type of receptor involved, the organization of the neural pathways from the site of injury to the central nervous system, and a complex interaction of moding influences on the transmission, interpretation, and reaction to pain messages. Sensory neuroreceptors in abdominal organs are located in the mucosa and

muscularis of hollow viscera, on serosal structures such as the peritoneum, and within the mesentery. Visceral pain is transmitted by C fibers that are found in muscle, periosteum, mesentery, peritoneum, and **viscera.** ' - Feldman: Sleisenger and Fordtran's Gastrointestinal and Liver Disease, 9/e

57.

In which of the following chronic conditions, degenerative changes in the brain are seen, which is not a part of normal ageing?

a) Amnestic syndrome

b) Dementia

c) Delirium

d) Pseudodementia

Correct Answer - A

Ans. a. Amnestic syndrome

In amnestic syndrome, degenerative changes in the brain are seen, which is not a part of normal ageing.

Amnestic Syndrome

- The amnestic disorders are characterized by problems with memory function.
- Some people experience difficulty recalling events that happened or facts that they learned before the onset of the amnestic disorder. This type of amnesia is called retrograde amnesia.
- Other people experience the inability to learn new facts or retain new memories, which is called anterograde amnesia.
- People with amnestic disorders do not usually forget all of their personal history and their identity, although memory loss of this degree of severity occurs in rare instances in patient

58. If a supramaximal stimulus is applied to an excitable tissue like a nerve or a muscle and it elicits a response, then the tissue is said to be in:

a) Absolute refractory period

b) Relative refractory period

c) Latent period

d) After-depolarization

Correct Answer - B

Ans. b. Relative refractory period

If a supramaximal stimulus is applied to an excitable tissue like a nerve or a muscle and it elicits a response, then the tissue is said to be in Relative refractory period.

"During the absolute refractory period, no stimulus, no matter how strong, will excite the nerve; but during the relative refractory period stronger than normal stimuli can cause excitation

59. Nuclear bag fibers are related to:

a) Force

b) Length

c) Tone

d) Length and velocity

Correct Answer - D

Ans. d. Length and velocity

"Nuclear bag Fibers can be divided into nuclear bagfibers type I and nuclear bagfiber type 2. The sum of these difference renders: (1) the nuclear bag type I fibers with little elasticity in their polar regions making them sensitive to dynamic changes (velocity of length change); and (2) nuclear bag type 2 with significant elasticity in their polar region making them sensitive to the changes in length

60. True about Golgi tendon organ is

a) Sense the dynamic length of the muscle

b) Are involved in reciprocal innervations

c) Are stimulated by alpha motor neuron

d) Sense muscle tension

Correct Answer - D

Ans. d. Sense muscle tension

The Golgi organ (also called Golgi tendon organ, GTO, tendon organ, neurotendinous organ or neurotendinous spindle) senses changes in muscle tension. It is a proprioceptive sensory receptor organ that is at the origins and insertion of skeletal muscle fibers into the tendons of skeletal muscle. It provides the sensory component of the Golgi tendon reflex."

"The Golgi tendon organ is another type of proprioceptor that provides information about changes in muscle tension

61. The mechanoreceptors in joints and ligaments are:

a) Fast adapting

b) Slow adapting

c) Non adapting

d) Adapt differentially for different stresses

Correct Answer - B

Ans. b. Slow adapting

- Rapidly adapting (phasic) receptors: Meissner's and Pacinian corpuscles.
- Slowly adapting (tonic) receptors: Merkel cells and Ruffini endings, muscle spindle and nociceptors.
- Light touch would be distracting if it were persistent; and, conversely, slow adaptation of spindle input is needed to maintain posture.
- Stretch receptors in joints and ligaments are needed to maintain the posture, hence, they are slowly adapting in nature
- The mechanostretch receptors in joints and ligaments are slow adapting

62. During hip replacement, loss of joint and ligament receptors leads to:

a) No loss of sensation

b) Loss of all sensations

c) Joint sensation lost in stable position

d) Decrease in movements and decrease in sensation

Correct Answer - A

Ans. a. No loss of sensation

- During hip replacement, loss of joint and ligament receptors leads to no loss of sensation.
- "Loss of joint and ligament receptors during hip replacement is not associated with any loss of sensations; whereas during knee replacement can lead to loss of proprioception in the involved limb/s."

63. Fast fatigue fibres are recruited during walking:

- a) In the beginning
- b) In the end
- c) Throughout the walking process
- d) When small neurons are excited

Correct Answer - B

Ans. b. In the end

Fast fatigue fibres are recruited during walking in the end.

Fiber Types in Skeletal Muscles-

S (slow) units

FR (fast, resistant to fatigue) units

FF (fast fatiguable) units

the small, slow units are first recruited for standing.

As walking motion is initiated, their recruitment of FR units increases.

As this motion turns to running or jumping, the FF units are recruited.

64. Which in the following when increased can cause a shift of the oxygen-hemoglobin dissociation curve to the left?

a) pH

b) Temperature

c) 2,3-BPG

d) pCO₂

Correct Answer - A

Ans. a. pH

Increase in pH (Alkalosis) can cause a shift of the oxygen-hemoglobin dissociation curve to the left.

Exercise: Oxygen dissociation Curve shifts to the right in exercising muscles.

Alkalosis (increased pH), hypothermia (decreased temperature), hypocarbia (decreased p CO₂, and decreased 2,3, DPG cause left shift of O₂, dissociation curve)

65. In the gr'cii circuit, the arc! flow pressure is 100 mm Hg and the outward flow pressure is 10 mm Hg. Each of the parallel circuit has a resistance of 5 mm Hg/mL/min. Calculate the flow across the circuit:

a) 45 mL

b) 90 mL

c) 3.6 mL

d) 135 mL

Correct Answer - A

Ans. b. 90 mL

Therefore, according to Ohm's law:

Inward flow pressure - Outward flow pressure

Net resistance

Hence,

Flow in the circuit = Inward flow pressure- outward flow pressure/ net resistance

flow in the circuit= $100 - 10 / 1 = 90 / 1 = 90 \text{ mL/min}$

66. The left atrial wave is larger than 'a' wave in comparison to right atrium because:

a) Left side is high pressure system

b) Left atrium is more compliant

c) Left atrium is compressed posteriorly by pulmonary veins

d) Right atrial pressure is transmitted into the pulmonary circulation

Correct Answer - A

Ans. a. Left side is high pressure system

The left atrial 'v' wave is larger than 'a' wave in comparison to right atrium because left side is a high-pressure system

67. The cells of the human body most sensitive to ischemia are:

a) Neurons

b) Nephrons

c) Cardiac myocyte

d) Hepatocytes

Correct Answer - A

Ans. a. Neurons

The cells of the human body most sensitive to ischemia are neurons.

"The susceptibility of a tissue to hypoxia influences the likelihood of infarction. Neurons are most sensitive to hypoxia (irreversible changes develop in 3-4 minutes) followed by myocardial cells (irreversible changes develop in 20-40 minutes). Fibroblasts are amongst most resistant cells to hypoxia.

"Brain cells, especially neurons, are very sensitive to various injuries, such as ischemia, hypoxia, hypoglycemia, infection, and trauma. The vulnerability is different even within neuronal populations. A brief period of global brain ischemia causes cell death in hippocampal CA1 pyramidal neurons days after reperfusion. Other neurons, such as parietal cortical or hippocampal CA3, are much less vulnerable. This phenomenon is commonly referred to as delayed neuronal death. A similar phenomenon occurs after ischemic injury in humans. Prolonged ischemia extends the area of neuronal death to the caudate and thalamic nuclei. However; because hippocampal CA1 neurons are most vulnerable to ischemia, the cell death has been thought to represent a sensitivity of the neurons to injuries."- Abe K, Aoki M, Kawagoe J, Yoshida T, Hattori A, Kogure K and Itoyama Y Ischemic Delayed Neuronal Death: A

Mitochondrial Hypothesis. Stroke. 1995;26;1478-1489

68. The most important hormone that increases gallbladder contraction after a fatty meal is:

a) Gastrin

b) Secretin

c) CCK

d) GIP

Correct Answer - C

Ans. c. CCK

Cholecystokinin (CCK)-

Stimulation of pancreatic enzyme secretion

Contraction of the gallbladder

Relaxation of the sphincter of Oddi

69. In the entire human genome, coding DNA constitutes?

a) 2%

b) 1%

c) 0.1%

d) 4%

Correct Answer - A

Ans. a. 2%

"Only 2% of human genome DNA codes for proteins. All of the genes needed to make a human being are encoded in only 2% of human genome DNA"

70. Release of synaptic vesicle from presynaptic terminal is inhibited by

a) Inhibition of conduction of nerve impulse

b) Prevention of sodium influx

c) Prevention of calcium influx

d) Prevention of depolarization of nerve terminal

Correct Answer - C

Answer- C (Prevention of calcium influx)

-The release of the synaptic vesicles from the presynaptic terminal is inhibited by the prevention of Ca^{2+} influx.

71. A standing person lies down. Which of the following occurs?

- a) Increase in cerebral blood flow
- b) Immediately increase in venous return to heart
- c) Decreased blood flow to the apex of lung
- d) Increase in heart rate

Correct Answer - B

Answer- B (Immediately increase in venous return to heart)

Factors Affecting End Diastolic Volume

Factors Decreasing EDV

- **Increased intra-pericardial pressure^Q** (as a result of infection of pressure from a tumor):
 - Limits the extent to which ventricle can fill
- **Decrease in ventricular compliance^Q:**
 - **Increase in ventricular stiffness** produced by **MI, infiltrative disease.**
- **standing decreases venous return^Q**

Factors Increasing EDV

- **Increased total blood Volume increases venous return^Q:**
 - Constriction of vein reduces the size of venous reservoir, decreasing venous pool and thus increasing venous return
- **Increased negative intrathoracic pressure^Q:**
 - Increases the pressure gradient along which blood flows to the heart
- **Muscle activity^Q:**
 - Increases venous return as a result of pumping action**

72. Which of the following statement is true regarding time of ovulation?

a) Occurs before LH surge

b) Occurs after biphasic rise in basal body temperature

c) Occurs after follicular ripening by FSH

d) Occurs after disappearance of cervical mucus thickening

Correct Answer - C

Answer- C (Occurs after follicular ripening by FSH)

(Ref: (Williams Obstetrics 2 3/e p355-356; Ganong 22/e p438; Shaw's 13/e p212)

- Follicular phase is under control of FSH and LH.
- Both FSH and LH are responsible for follicular ripening but a surge in LH secretion triggers ovulation.

73. Which of the following is true for tracheobronchial luminal neuroendocrine cells?

a) Contain serotonin

b) Contain catecholamines

c) Response to decrease pO₂

d) Have only cholinergic nerve supply

Correct Answer - A

Answer- A (contain serotonin)

Biologically Active Substances Metabolized by the Lungs

- | | |
|--|--|
| <p>Synthesized and used in lungs:</p> <ul style="list-style-type: none">• Surfactant <p>Synthesized or stored and released into the blood:</p> <ul style="list-style-type: none">• Prostaglandins• Histamine• Kallikrein | <p>Partially removed from the blood:</p> <ul style="list-style-type: none">• Prostaglandins• Bradykinin• Adenine nucleotides• Serotonin• Norepinephrine• Acetylcholine <p>Activated in the lungs:</p> <ul style="list-style-type: none">• Angiotensin I to angiotensin II |
|--|--|

74. Fick's law deals with

a) Passive diffusion of molecules along the concentration gradient

b) Active diffusion of molecules along the concentration gradient

c) Both passive and active diffusion of molecules along the concentration gradient

d) Not concerned with the diffusion of molecules

Correct Answer - A

Ans.A. Passive diffusion of molecules along the concentration gradient.

Fick's law of diffusion: The magnitude of the diffusing tendency is directly proportional to the cross-sectional area across which diffusion is taking place and the concentration gradient or chemical gradient, which is the difference in the concentration of the diffusing substance divided by the thickness of the membrane.

- The time required for equilibrium by diffusion is proportional to the square of diffusion distance.
- Diffusion is the process by which a gas or substance in solution expands, because of the motion of its particles, to fill all of the available volumes.

75. Embryonal hemoglobin is mainly composed of:

a) Epsilon and zeta

b) Epsilon and gamma

c) Alpha and delta

d) Beta and gamma

Correct Answer - A

Answer- A (Epsilon and zeta)

(Ref Ganong 24/e p559)

- Embryonic hemoglobin (Gower-I) is formed by Epsilon and zeta ($\zeta_2 \epsilon_2$).

Types of Hemoglobin

- | Embryonic | Fetal | Adult |
|--------------------------------------|--------------------------------|---|
| • Gower-1 ($\xi_2 \epsilon_2$) | | • Hb-A ($\alpha_2 \beta_2$) |
| • Gower-2 ($\alpha_2 \epsilon_2$) | • Hb-F ($\alpha_2 \gamma_2$) | • Hb-A ₂ ($\alpha_2 \delta_2$) |
| • Hb portland ($\xi_2 \text{g}_2$) | | |

76.

Biom mineralization is a process by which inorganic `metals' are incorporated in the body and made a part of biological structures. Example of Biom mineralization is seen in:

a) Pinna (anatomy)

b) Hooves of cattle

c) Honeycomb

d) Mollusc shell

Correct Answer - D

Ans. d. Mollusc shell (Ref en.wikipedia.org/wiki/Biom mineralization)

- The mollusc shell is a biogenic composite material that has been the subject of much interest in materials science because of its unusual properties and its model character for biom mineralization.
- Biom mineralization is the process by which, living organisms produce minerals, often to harden or stiffen existing tissues. Such tissues are called mineralized tissues.

77. A cell membrane is damaged by insertion of a micro needle, repair shall occur by which of the following process?

a) Lateral movement of proteins

b) Enzyme catalysed process

c) Hydrophobic interactions

d) An active process involving hydrolysis of ATP

Correct Answer - A

Ans. a. Lateral movement of proteins (Ref Harper 29/e p464, Ganong 24/e p36)

Harper says 'Another indicator of the dynamic nature of membranes is that a variety of studies have shown that lipids and certain proteins exhibit lateral diffusion in the plane of their membranes

78. Which of the following is not true about glomerular capillaries')

- a) The oncotic pressure of the fluid leaving the capillaries is less than that of fluid entering it
- b) Glucose concentration in the capillaries is the same as that in glomerular filtrate
- c) Constriction of afferent arteriole decreases the blood flow to the glomerulus
- d) Hematocrit of the fluid leaving the capillaries is less than that of the fluid entering it

Correct Answer - A

Ans-a. The oncotic pressure of the fluid leaving the capillaries is less than that of fluid entering it Guyton I LpJ1 4-.;anong 23/e p653-6_)

- Glomerular oncotic pressure (due to plasma protein content) is higher than that of filtrate oncotic pressure in Bowman's capsule
- "Since glucose is freely filtered and the fluid in the Bowman's capsule is isotonic with plasma, the concentration of glucose in the filtrate is the same as in the capillaries

79. Who discovered the structure and amino acid sequence of insulin as well as the interspecies differences in molecular structure and won the Nobel prize for?

a) Prof. JJ Abel

b) Frederick Sanger

c) Rutter, Goodman and Uhlich

d) Frederick Banting and Charles Best

Correct Answer - B

Ans: b. Frederick Sanger /Ref Lehninger 5/e p903-904, 292)

- Frederick Sanger discovered the structure and amino acid sequence of insulin as well as the interspecies differences in molecular structure and got the Nobel Prize for that.
- Fredrick Sanger again with Walter Gilbert got Nobel prize in 1980 for sequencing of large nucleic acid (DNA) molecule."

80. A motorcyclist after road traffic accident is having raised arterial pCO₂ on ABG. Probable cause can be:

a) Damage to respiratory apparatus

b) Damage to respiratory centre

c) Damage to both respiratory apparatus and respiratory centre

d) Massive lung contusion alone

Correct Answer - C

Answer- C. Damage to both respiratory apparatus and respiratory centre

- 'Depression of the respiratory center by a variety of drugs, injury, or disease can produce respiratory acidosis.
- This may occur acutely with general anesthetics, sedatives, and head trauma or chronically with sedatives, alcohol, intracranial tumors, and the syndromes of sleep-disordered breathing including the primary alveolar and obesity-hypoventilation syndromes.'- Harrison 18/e p371

81. If the interstitial hydrostatic pressure is 2 mm Hg, interstitial oncotic pressure is 7 mm Hg and capillary hydrostatic pressure is 25 mm Hg. What should be the capillary oncotic pressure to allow a net filtration pressure of 3 mm Hg?

a) 20

b) 21

c) 23

d) 27

Correct Answer - D

Ans: D. 27

Formula - $GFR = K_f [(P_{GC} - P_T) - (\pi_{GC} - \pi_T)]$

*** K_f - Glomerular ultrafiltration coefficient.**

- Product of glomerular capillary wall hydraulic conductivity (i.e. its permeability) & effective filtration surface area.

* P_{GC} - Mean hydrostatic pressure in glomerular capillaries = 25

* P_T - Mean hydrostatic pressure in tubule (Bowman's space) = 2

* π_{GC} - Oncotic pressure of plasma in glomerular capillaries

* π_T - Interstitial colloidal oncotic pressure = 7

* In this question,

- $GFR, 3 = K_f [(25 - 2) - (\pi_{GC} - 7)]$ $K_f [23 - \pi_{GC} + 7] = K_f [30 - \pi_{GC}]$.

- $\pi_{GC} = 27$ mm/Hg.

82. The clot formed is not stable unless extensive cross-linking occurs. This extensive cross-linking of blood clot is done by:

a) Plasmin

b) Thrombin

c) HMWK

d) Factor XIII

Correct Answer - D

Ans: D. Factor XIII

Conversion of fibrinogen into cross-linked fibrin:

- Thrombin directly converts soluble fibrinogen into fibrin monomers.
- Fibrin monomers polymerize into an insoluble clot & also amplifies coagulation process - By activating factor XI, factors V & VIII.
- Also stabilizes secondary hemostatic plug - By activating factor XIII.
- Factor XIII - Covalently cross-links fibrin.
- Ref: Robbins 9/e 119

83. Which of the following site doesn't contain brown adipose tissues?

a) Scapula

b) Subcutaneous tissue

c) Around blood vessel

d) Around adrenal cortex

Correct Answer - A

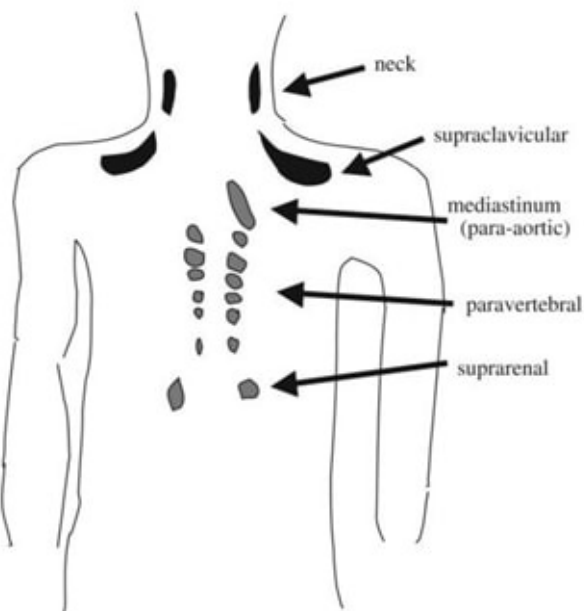
Ans: A. Scapula

Brown fat:

- More abundant in infants but also in adults.

Location:

- Between scapulas, at nape of neck, along great vessels in thorax and abdomen & in other scattered locations in body.



84. Which of the following is secreted by beta cells of pancreas along with insulin?

a) Somatostatin

b) Amylin

c) Pancreatic polypeptide

d) Glucose like peptide

Correct Answer - B

Ans: B. Amylin

Islet Cells Content

Alpha cells Glucagon, pancreastatin, glicentin, (PG)

Beta cells Insulin, amylin, pancreastatin(IAP)

D cells Somatostatin

D₂ cells VIP

G cells Gastrin

PP cells Pancreatic polypeptide

Amylin:

- 37-amino-acid peptide.
- Derived from islet amyloid deposits inside beta-cell granules of pancreas.
- Mainly from long-standing type 2 diabetes or insulinoma patients.
- Produced in concentration of 1-2% that of insulin.
- Co-secreted with insulin in pulsatile manner, responding as physiologic secretory stimuli.

Physiologic actions:

- Modulates insulin release - By acting as a negative feedback on insulin secretion.

At pharmacologic doses:

- Reduces glucagon secretion.
- Slows gastric emptying by a vagally mediated mechanism.
- Centrally decreases appetite.

85. Adrenergic beta-receptors having lipolysis property in fat cells is:

a) Alpha-1

b) Alpha-2

c) Beta-1

d) Beta-3

Correct Answer - C:D

Ans: c > d Beta-1 > Beta-3

Adrenergic Receptors and Function

Alpha Receptor

Vasoconstriction
Iris dilation
Intestinal relaxation
Intestinal sphincter contraction
Pilomotor contraction
Bladder sphincter contraction
Inhibits neurotransmitter release
(?2)

Beta Receptor

- Vasodilation (β_2)
- Cardio-acceleration (β_1)
- Increased myocardial strength (β_1)
- Intestinal relaxation (β_2)
- Uterus relaxation (β_2)
- Bronchodilation (β_2)
- Calorigenesis (β_2)
- Glycogenolysis (β_2)
- Lipolysis (β_1)
- Bladder wall relaxation (β_2)
- Thermogenesis (β_3)

86. Which of the following is true regarding alpha and gamma motor neurons during initiation of voluntary movements?

a) Alpha motor neurons are activated first followed by gamma motor neurons

b) Gamma motor neurons are activated first followed by alpha motor neurons

c) Both are activated together

d) Only alpha motor neurons get activated

Correct Answer - C

Ans: C. Both are activated together

In response to descending excitatory input to spinal motor circuits, both α - and γ -motor neurons are activated.

'Alpha-gamma coactivation':

- Stimulation of motor cortex & other higher centers send descending excitatory input to spinal circuit.
- **Results in simultaneous activation of alpha & gamma motor neurons.**
- In turn, produces sustained muscle contraction maintaining posture.

87. What is the rise of blood flow if the radius of blood vessels is increased by 50%?

a) 5 times

b) 10 times

c) 20 times

d) 100 times

Correct Answer - A

Ans: A. 5 times.

Poiseuille's law:

* Also referred as "**Hagen–Poiseuille law**".

* Poiseuille's equation states,

$$Q = \frac{P_1 - P_2}{8 \eta L} \pi r^4$$

- Q - Flow rate

- (P₁ - P₂) - Pressure difference across vessel (provided P₁ > P₂).

- η - Blood viscosity.

- r - Radius.

- L - Tube length.

* If parameter values remain constant,

- Blood flow is directly proportional to 4th power of radius.

* Resistance of vessel to blood flow can be calculated by combining Ohm's law with Poiseuille's equation.

- By substituting values of Q from Poiseuille's law in Ohm's law.

- Implying, resistance is mainly affected by,

1. Blood vessel radius,
2. Vasodilatation/vasoconstriction.

* Thus ultimately, if parameter values remain constant,

- Resistance to blood flow is inversely proportional to the 4th power of radius.

88. Stimulation of which of the following areas of brain is experimentally used to control intractable pain:

a) Periaqueductal grey matter

b) Mesencephalon

c) Subthalamic nucleus

d) Medial forebrain bundle

Correct Answer - A

Ans. a. Periaqueductal grey matter

Stimulation of Periaqueductal grey matter (*PAG*) is an established experimental therapy reserved for intractable

Deep Brain Stimulation for Intractable Pain somatogenic and/or nociceptive pain that remains poorly controlled despite all conservative measures.

Periaqueductal Grey Matter (PAG)/Periventricular Grey Matter (PVG) Deep Brain Stimulation

PAG/PVG deep brain stimulation has shown to maximally benefit patients with intractable somatogenic and nociceptive pain°

Sensory Thalamic Deep Brain Stimulation

Sensory thalamic deep brain stimulation has shown to maximally benefit patients with intractable neuropathic pain°

Scientific evidence demonstrating safety and efficacy is however, not robust to support widespread use of Deep brain Stimulation for the treatment of intractable pain.

89. A politician is shot in the back during a rally at level of T8 vertebral immediately after the shot he loses all the sensation below level of lesion. Chance of regeneration of spinal cord due to the fact that injured nerve is not able to regenerate is due to reason all except:

a) Lack of endoneural tubes

b) Lack of growth factors

c) Presence of glial scar

d) Lack of myelin inhibiting substance

Correct Answer - D

Ans. d. Lack of myelin inhibiting substance

(Ref GanonGr 90; Clinical Box 4-)

Following CNS injuries several events which provide inappropriate environment for regeneration are: (Ganong 23/e p90) Astrocytic proliferation)

- Activation of microglia
- Scar formation
- Inflammation

Invasion of immune cells

- **CNS neurons do not have *the* growth promoting chemical needed for the regeneration**
- CNS myelin *is* a potent inhibitor of axonal growth

Axon Regeneration in CNS

- The proximal stump of a damaged axon in the CNS will form short

sprouts, but distant stump recovery is rare, and the damaged axons are unlikely to form new synapses. This is because:

- CNS neurons do not have the growth promoting chemical needed for the regeneration
- CNS myelin is a potent inhibitor of axonal growth.
- That is why **treatment of brain and spinal cord injuries** frequently focuses **on rehabilitation rather than reversing the nerve damage.**

Following CNS injuries, several events which provide inappropriate environment for regeneration are:

- Astrocytic proliferation
- Activation of microglia
- formation
- Inflammation
- Invasion of immune cells
- **New research** is aiming to identify **ways to initiate and maintain axonal growth, to direct regenerating axons to reconnect with their target neurons and to reconstitute original neuronal circuit.**

90. Calculate the ejection fraction from the given volume pressure curve:

a) 40%

b) 50%

c) 55%

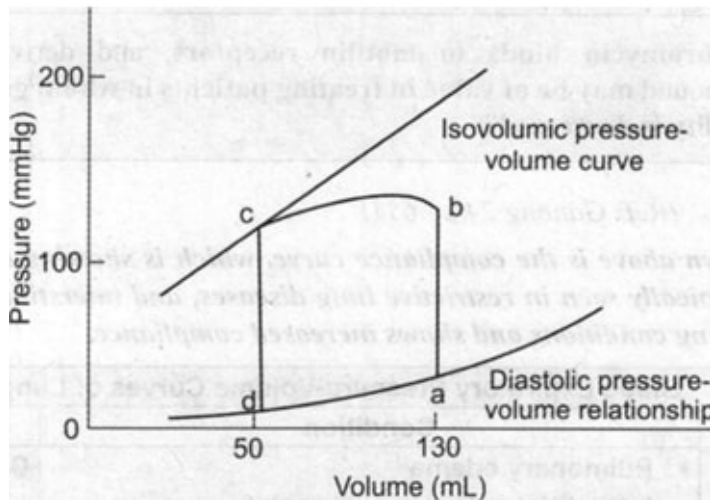
d) 60%

Correct Answer - D

Ans: D. 60%

(Ref Gunong 25/e p540 24/e p542)

- Ejection fraction calculated from the given volume pressure curve is 60%.



Pressure Volume Loop:

- ab: isovolumetric contraction
- bc: Ventricular contraction during systole
- cd: Isovolumetric relaxation.

Calculation:

- End-Diastolic Volume (EDV) (Point a) = 130 mL

- End Systolic Volume (ESV) (Point d) = 50 mL
- Stroke Volume (SV) = EDV–ESV = 80 mL
- Ejection Fraction = $SV/EDV = 80/130 = 0.6$ i.e. % EF = 60%.

91. Sodium iodide symporter is not present in

a) Pituitary gland

b) Placenta

c) Parotid

d) Thyroid

Correct Answer - A

Ans: A. Pituitary gland

- Sodium iodide symporter - Not present in the pituitary gland.

Sodium-Iodide Symporter (NIS) is present in

Thyroid° Ciliary body of the eye°

Salivary glands° Choroid plexus°

Gastric mucosa° Mammary glands°

Placenta° Certain cancers derived from these

92. Which of the following methods is used for calculation of anatomical dead space?

a) Xenon dilution technique

b) Bohler's method

c) Spirometry

d) Single breath nitrogen test

Correct Answer - D

Ans: D. Single breath nitrogen test

(Ref: Ganong 25/e p633, 634, 24/e p633, 634)

Anatomical dead space – Calculation:

- By Bohr's equation - Uses single breath nitrogen inhalation technique.

Xenon/Helium dilution technique:

- Used to measure functional residual capacity of lung.

Spirometry:

- Cannot measure residual or dead space volumes.

93. In the formula for urea clearance, $C = U \times V/P$, what does U stands for:

a) Urinary concentration in g/24 hour

b) Urinary concentration in mg/ml

c) Urine osmolarity

d) Urine volume per minute

Correct Answer - B

Ans: B. Urinary concentration in mg/ml

(Ref: Ganong 25/p p676. 21/c p678)

In given formula for measuring GFR:

- C = Clearance of the substance
- U = Urinary concentration of the substance in mg/ml
- P = Plasma concentration of the substance in mg/ml
- V = Volume of urine

94. Interstitial fluid volume can be determined by:

a) Radioactive iodine and radiolabelled water

b) Radioactive water and radiolabelled albumin

c) Radioactive sodium and radioactive water

d) Radioactive sodium and radioactive labelled albumin

Correct Answer - D

Ans: D. Radioactive sodium and radioactive labelled albumin

(Ref Ganong 25/e p3, 24/e p2; Guvton I p309, 310)

Fluid volume Indicator used

Total body water volume • Deuterium oxide: D₂O (MC used)^o

• Tritium oxide^o, Aminopyrine^o, Antipyrine^o

Extracellular fluid volume • Inulin (most accurate)^os

• 22Na, ¹²⁵I-iothalamate, thiosulfate^o

• Evans blue^o

Plasma volume • Serum albumin labeled with radioactive iodine^o (1-125)

Intracellular fluid • (Calculated as total body water - extracellular fluid volume)

Blood volume • ⁵¹Cr-labeled RBCs^o, or calculated as blood volume = plasma volume / (1 - hematocrit)

Interstitial fluid • (Calculated as extracellular fluid volume - plasma volume)

95. Considering the latent period of muscle twitch to be 10 ms, contraction time 40 ms and relaxation time 50 ms, what will be the tetanizing frequency for this muscle?

a) 25 Hz

b) 50 Hz

c) 100 Hz

d) 75 Hz

Correct Answer - A

Ans: A. 25 Hz

- Stimulation frequency at which summation of contractions occurs –
- Determined by twitch duration of the particular muscle under study.

Example:

- If twitch duration = 10 ms.
- Frequencies less than 1/10 ms (100/s) - Cause discrete responses interrupted by complete relaxation.
- Frequencies greater than 100/s cause summation.

Tetany:

- Continuous contraction of muscle fibers, without latent period & relaxation time.
- Hence tetanizing frequency depends only on contraction time, i.e. twitch duration.
- Twitch duration = 40 milliseconds = 0.04 sec
- Tetanizing frequency = $1/0.04 = 25$ Hz

96. All of these are actions of Atrial Natriuretic Peptide except:

a) Afferent arteriole dilation

b) Mesangial constriction

c) Decreased sodium absorption in PCT

d) Inhibition of sodium reabsorption in medullary collecting duct

Correct Answer - B

Ans: B. Mesangial constriction

(Ref Ganong 25/e p705, 24/e p707).

Actions of Natriuretic Hormones:

Renal actions:

- Increases renal Na⁺ excretion → Increase glomerular filtration.
- By dilating afferent arterioles & relaxing mesangial cells.
- Mainly circulating ANP & BNP.
- Act on renal tubules to inhibit Na⁺ reabsorption.
- Inhibits renin secretion.

Vascular effects:

- Increases capillary permeability → Fluid extravasation → reduced BP.
- Relax vascular smooth muscle in arterioles & venules.
- CNP - Greater dilator effect on veins than ANP and BNP.

Hormonal effects:

- Counteracts pressor effects of catecholamines & angiotensin II.

97. The extracellular potassium concentration is 100 mEq/mmol and intracellular potassium concentration is 10 mEq/mmol. What will be the equilibrium potential for potassium according to Nernst equation?

a) 0 V

b) —60 V

c) —90 V

d) +30 V

Correct Answer - B

Ans: B. —60 V

Equilibrium potential:

- Membrane potential at which equilibrium exists between influx & efflux of ions.

Nernst equation:

- Physiological application for calculating ion potential of charge z across membrane.
- Determined using ion concentration both inside & outside cell.

Concentration (mmol/L of 11_2O) of some ions inside and outside mammalian motor neurons

Ion	Inside cell	Outside cell	Equilibrium potential (my)
Na+	15.0	150.0	+60
K+	150.0	5.5	—90
Cl-	9.0	125.0	—70

98. Wave patterns of EEF, ECG and EMG are depicted below. The B pattern belongs to (Figure was not provided in the exam):

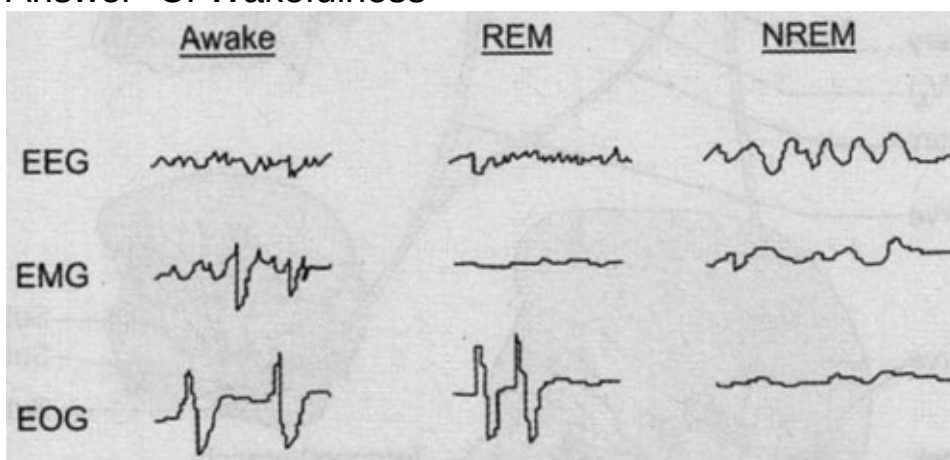
a) NREM sleep

b) REM sleep

c) Wakefulness

d) Quiet wakefulness

Correct Answer - C
Answer- C. Wakefulness



Beta (B) Wave- Parietal and frontal region. Patients awake, at rest with eyes open.

99. Which of the following defines the pressure in the vascular system in the absence of blood flow? (Asked twice)

a) Pulse pressure

b) Critical closing pressure

c) Mean circulatory filling pressure

d) Perfusion pressure

Correct Answer - C

Answer- C. Mean circulatory filling pressure

Mean Circulatory Filling pressure (MCFP) is equilibrium pressure that is reached throughout the cardiovascular system when cardiac output is stopped completely. MCFP can be measured by stopping blood flow (e.g., by stopping heart pumping by giving shock to heart with electricity) and allowing the pressure throughout the circulatory system to reach equilibrium. MCFP is equilibrium pressure everywhere in circulation.

100. Which of the following defines the pressure in the vascular system in the absence of blood flow?

a) Pulse pressure

b) Critical closing pressure

c) Mean circulatory filling pressure

d) Perfusion pressure

Correct Answer - C

Answer- C. Mean circulatory filling pressure

Mean Circulatory Filling pressure (MCFP) is equilibrium pressure that is reached throughout the cardiovascular system when cardiac output is stopped completely. MCFP can be measured by stopping blood flow (e.g., by stopping heart pumping by giving shock to heart with electricity) and allowing the pressure throughout the circulatory system to reach equilibrium. MCFP is equilibrium pressure everywhere in circulation.

101. The most serious complication of prolonged sitting position is:

a) Venous air embolism

b) Dysrhythmias

c) Hypotension

d) Nerve palsies

Correct Answer - A

Answer- A. Venous air embolism

- Venous air embolism (VAE), a subset of gas embolism, is an entity with the potential for severe morbidity and mortality.
- Venous air embolism is a predominantly iatrogenic complication that occurs when atmospheric gas is introduced into the systemic venous system.
- Side-Effects of Sitting All the day-
- Deep vein thrombosis
- Obesity
- Increased risk of heart disease
- Risk of diabetes
- Raised cholesterol
- Herniated disk
- Increases risk of depression
- Backaches and pain

102. Erythropoietin acts on:

a) CFU

b) Late erythtoblast

c) Normoblast

d) Burst forming unit (BFU)

Correct Answer - A

Ans. a. CFU

- Kidney-derived cytokine erythropoietin stimulates the terminal proliferation and differentiation of CFU-Erythroid progenitors.
- BFU-E cells respond to many hormones in addition to erythropoietin, including SCF, IGF-1, glucocorticoids, IL-3 and IL-6.

103. Which of the following heart sound may be a normal finding during pregnancy?

a) Fixed splitting of S2

b) S3

c) S4

d) Pericardial knock

Correct Answer - B

Ans. b. S3

Ref Ganong's Review of Medical Physiology 25¹¹ edn; Page no. 542

Heart Sounds

Cause

51-Vibrations set up by sudden closure of AV valves at the start of ventricular systole, during phase of isovolumetric contraction.

52 - Vibrations with closure of

semilunar valves at the onset of ventricular diastole.

Heard as a single sound during **expiration** but during

inspiration the increased output of the right

heart causes

Characters

Long & soft LUBB Duration –0.15 s
Frequency– 25 – 45 Hz

Short, loud High Pitched DUBB Duration B
0.12 s Frequency 50 Hz a

a physiological splitting.

Cause	Characters	Site of auscultation
<p>53 — Vibrations set up in cardiac wall by inrush of blood during rapid filling phase of ventricular diastole. It may be heard during late pregnancy. In children and young adults, is a normal finding.</p>	<p>Short, soft Low pitched Duration — 0.1 s</p>	<p>Normally cannot be heard by auscultation with stethoscope</p>
<p>54 — Vibrations set up during atrial systole Coincides with last rapid filling phase of ventricular diastole. Examples include concentric hypertrophy, aortic stenosis, and myocardial infarction.</p>	<p>Short, low pitched Duration — 0.03 s Frequency — 3 Hz</p>	<p>Normally cannot be heard by auscultation with stethoscope</p>

104. Maximum area in homunculus signifies?

- a) Low control and skilled movements
- b) More muscle fibers are present
- c) Increased precisiveness of movements
- d) None of the above

Correct Answer - C

Ans. C. Increased precisiveness of movements

Ref Ganong's Review of Medical Physiology 25th edn; Page no. 170

- In homunculus the largest areas represent the face, hands, and fingers, where precise localization is most important.

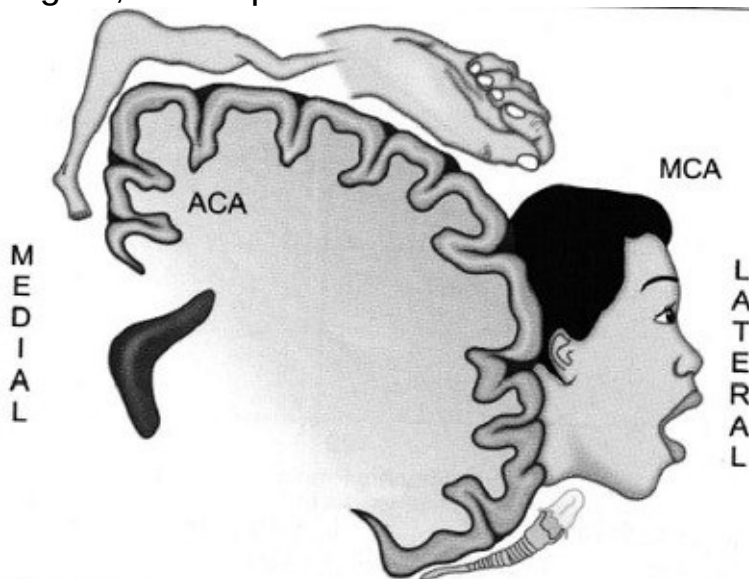
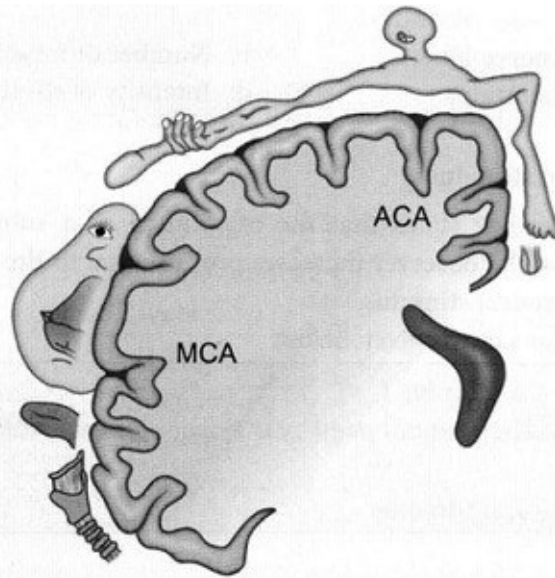


Fig: Motor homunculus in precentral gyrus (Area 4);
(Frontal lobe [Coronal section])



- In homunculus the size of the various parts is ProPortionate to the use of the part (skilled fine movement with precision).

105. Absolute refractory period is due to:

a) Opening of calcium channels

b) Closure of potassium channels

c) Closure of active gates of sodium channel

d) Closure of inactive gates of sodium channel

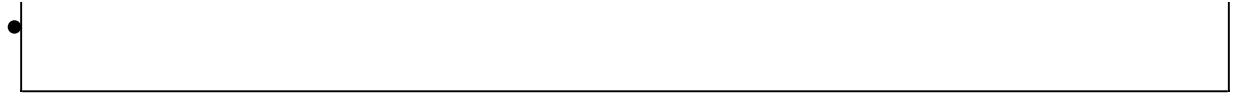
Correct Answer - D

Ans. d. Closure of inactive gates of sodium channel (Absolute refractory period is due to closure of inactive gates of sodium channel.

"Absolute Refractory Period; The Na⁺ channels rapidly enter a closed state called the inactivated state and remain in this state for a few milliseconds before returning to the resting state, when they again can be activated."

Compliance Curve

- The curve has inspiratory & expiratory components
- Inspiratory & expiratory compliance curves do not coincide. This difference is called hysteresis°.
- The difference between inflation & deflation paths—hysteresis—exists because a greater trans-pulmonary pressure is required to open a previously closed airway, owing to a deficit of surfactant at the air-water interface, than to keep an open airway from closing, reflecting abundant surfactant
- Lung volume at any given pressure is greater during expiration than during inspiration
- Compliance is greatest at mid pressure range°
- Pulmonary compliance = $\Delta V / \Delta P$
- ΔV is the change in volume or amount of air inhaled in mL or L
- ΔP is the change in intrapleural pressure in *cm H₂O*



106. X, Y, Z are the ee ions pet meaule.. \ and $V = -30$. If at resting membrane potential (RMP), when there is no net electro genic transfer, what is the value of Z?

a) +20

b) -20

c) +80

d) -80

Correct Answer - C

Ans. c. +80 Resting membrane potential (RMP) is the static state of a membrane, where the net transmembrane electric flux is zero. Non-electrogenic transfer at RMP means $X + Y + Z = 0$. Since $X = -50$ and $Y = -30$, then Z must be +80 since $(-50 - 30 + 80 = 0)$

107. Endo-cochlear potential is:

a) +45 mV

b) --45mV

c) -60mV

d) +85 mV

Correct Answer - D

Ans: D.+85 mV

(Ref Ganong 25/e p204, 24/e p203; Guyton I 3/e p677)

Endocochlear potential:

- Cells in stria vascularis have a high concentration of Na, K ATPase.
- Exists all time between endolymph & perilymph.
- Positivity inside scala media & negativity outside.
- This is called endocochlear potential.
- Generated by continual secretion of positive potassium ions into scala media by stria vascularis.
- **Normal:** +85 mV

108. Countercurrent mechanism is not seen in:

a) Kidney

b) Testes

c) Eye

d) Intestine

Correct Answer - C

Ans: C. Eye

(Ref Ganong 25/e p417, 420, 685, 24/e p687, 419, 422) .

Countercurrent mechanism:

- Not seen in eye.
- Inflow runs parallel to, counter to & in close proximity to outflow for some distance.
- Seen in kidney, limbs, testis & intestine.
- In renal system - Both loops of Henle & vasa recta in renal medulla.
- Intestine - Villi where oxygen directly diffuses from arterioles to vein.

109. Which of the following nerve root is the control center for the stapedial reflex?

a) Superior olivary complex

b) Lateral lemniscus

c) Inferior colliculus

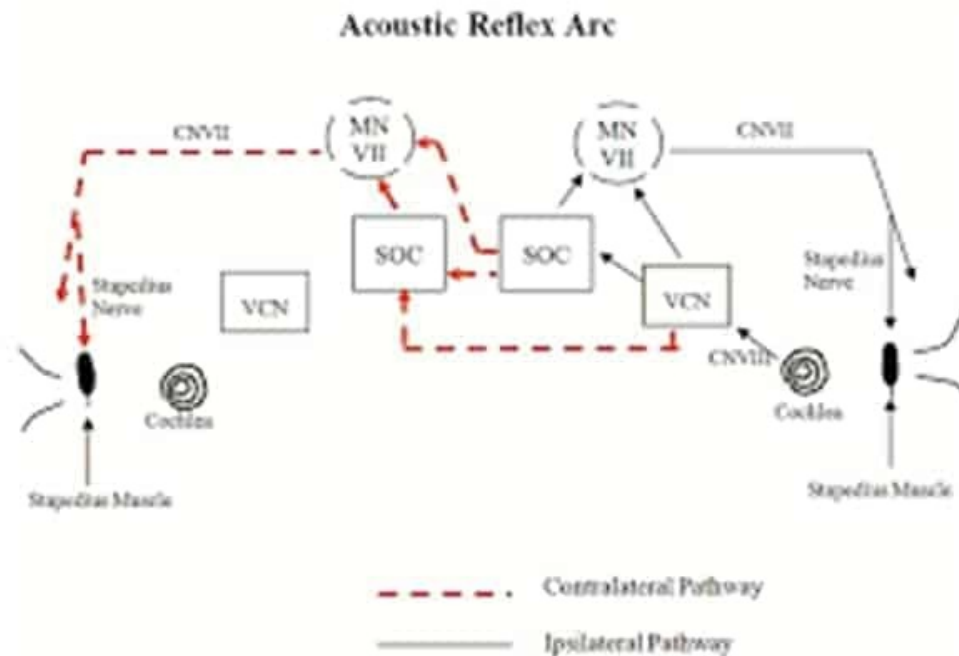
d) Medial geniculate body

Correct Answer - A

Ans: A. Superior olivary complex

(Ref Gray's 40/e p628, Ganong 25/e 207, 24/e p207)

- Superior olivary complex - Control center for stapedial reflex.



110. All of the following increases calcium absorption from the gut except

a) Phytates

b) Vitamin D

c) Alkaline pH in the gut

d) Protein in diet

Correct Answer - C

Ans: C. Alkaline pH in gut

Factors increasing Calcium Absorption		Factors decreasing Calcium Absorption	
• Vitamin D°	• Lactose°	• Oxalates°	• High Mg ²⁺
• Parathormone°	• Amino acids° (protein rich diet)	• Phytates°	• Caffeines°
• Acidic pH°		• Alkaline pH°	• Dietary fibers°
		• High phosphate°	

111. Which of the following is the function of Hyperpolarizing Cyclic Nucleotide (HCN) gated channels?

a) Cardiac rhythm generation

b) Generation of mitochondrial action potential

c) Myocardial muscle contraction

d) Memory formation

Correct Answer - A

Ans: A. Cardiac rhythm generation

Hyperpolarizing Cyclic Nucleotide (HCN) gated channels:

- Present in SA & AV nodes.
- Channel opens in hyperpolarization phase.
- Essential for generating pacemaker potential in SA Node (cardiac rhythm generation).

HCN-Nervous system

- **Controls neuronal excitability, synaptic transmission & rhythmic oscillatory activity** in individual neurons & neuronal networks.
- Play an important **role in synaptic plasticity** & memory, thalamocortical rhythms & somatic sensation.
- Some evidence indicates they also play a role in mechanisms of epilepsy & pain.

HCN-Cardiovascular system

- **HCN4** is the main isoform **expressed** in the SA node, but **low** levels of HCN1 & HCN2 are also seen.
- **Current** through HCN channels, called “funny current or pacemaker current”, plays a **key role in generation & modulation of cardiac rhythmicity**.

112. Which of the following is rapid source of energy by resynthesizing ATP for exercising muscles is?

a) Glycolysis

b) Glycogenolysis

c) TCA cycle

d) Phosphocreatine

Correct Answer - A

Ans: A. Glycolysis

(Ref Guyton 13/e p1087. Ganong 25/e p108, 24/e p106)

Phosphocreatine:

- Rapid source of energy by resynthesizing ATP for exercising muscles.
- During periods of high activity, cycling of phosphorylcreatine allows for quick release of ATP to sustain muscle activity.

113. Which of the following hormones will be affected most after the change in sex hormone binding globulin?

a) Testosterone

b) Estrogen

c) Progesterone

d) DHEA

Correct Answer - A

Ans: A. Testosterone

(Ref Ganong 25/e p 422, 24/e p424; Harper 30/e p 516. 517)

- Testosterone binds to SHBG with higher affinity than does estradiol.
- Hence SHBG level change à Greater change in free testosterone level than in free estradiol.

Sex hormone binding globulin:

- Glycoprotein binding sex steroids with high affinity as.

Order:

- DHT>Testosterone>>Esterone/ estradiol.
- Due to higher SHBG affinity for DHT & Testosterone, SHBG variation has profound effects on androgens levels.

114. Migratory motor complexes in the gut reappear after intervals of:

a) 60 minutes

b) 90 minutes

c) 120 minutes

d) 150 minutes

Correct Answer - B

Ans: B. 90 minutes

(Ref Ganong 25/e p496, 24/e p498)

- Migrating motor complexes in the gut reappear after intervals of 90 minutes.
- MMCs:**
- Initiated by motilin.
 - Circulating motilin increases at intervals of 100 min in interdigestive state.
 - Coordinated with contractile phases of MMC.
 - Contractions migrate aborally at a rate of about 5 cm/ min.

115. Diffusion capacity of carbon monoxide is decreased in all except:

a) Polycythemia

b) Interstitial lung disease

c) Emphysema

d) Pulmonary vascular disease

Correct Answer - A

Ans: A. Polycythemia

(Ref Ganong 25/e p635. 24/e p635)

- Diffusion capacity of carbon monoxide is increased in polycythemia.

Diffusing capacity of lung:

- Directly proportional to surface area of alveolo-capillary membrane.
- Inversely proportional to alveolo-capillary membrane thickness.

Diffusing capacity for- CO (DICO):

- Measured as an index of diffusing capacity.
- Due to diffusion-limited uptake.

Factors Affecting DLCO

Increased DLCO

Exercise
Supine position
Muller maneuver (inspiration against closed mouth & nose after forced expiration)
Pulmonary hemorrhage
Polycythemia
Left-to-right shunt (e.g. atrial septal defect°)
Obesity

Decreased DLCO

Post-exercise
Standing
Valsalva maneuve
Lung resection
Pulmonary emphysema
Pulmonary emphysema hypertension & chronic venous thromboembolism)
Interstitial lung diseases

Obesity

Asthma

Chronic bronchitis without major'

Pregnancy

Anemia

Drugs: Amiodarone, bleomycin,

Pulmonary lymphangitic

carcinomatosis

116. Potential generated due to movement of freely diffusible ions across a semi-permeable membrane is calculated using:

a) Nemst equation

b) Gibbs equation

c) Goldman-Hodgkin-Katz equation

d) Fick principle

Correct Answer - A

Ans: A. Nemst equation

(Ref Ganong 25/e9, p24/e Guyton 13ze p61).

Nernst equation:

- Calculates potential generated due to movement of freely diffusible ions across a semi-permeable membrane.
- Describes “relation of diffusion potential to ion concentration difference across a membrane”.

117. Localization of the receptor of a hormone X is found to be in the nucleus. What is likely to be X?

a) Adrenaline

b) Insulin

c) Thyroxine

d) FSH

Correct Answer - C

Ans: C. Thyroxine

Ref Ganong 25/e p300, 24/e p300; Harper 30/e p501).

- Thyroxine is a lipophilic hormone that acts on nuclear receptor.
- Steroids and thyroid hormones are distinguished by their predominantly intracellular sites of action, since they can diffuse freely through the cell membrane.
- They bind to a family of largely cytoplasmic proteins known as nuclear receptors.
- Upon ligand binding, the receptor–ligand complex translocates to the nucleus where it either homodimerizes, or associates with a distinct liganded nuclear receptor to form a heterodimer.
- In either case, the dimer binds to DNA to either increase or decrease gene transcription in the target tissue.

118. Which of the following hormones has a permissive action at the onset of puberty?

a) Insulin

b) Leptin

c) GnRH

d) Growth hormone

Correct Answer - B

Ans: B. Leptin

Ref: Ganong 25/e p397, 24/e p399; Knobil and Neill's Physiology of Reproduction 2014/p1607; Novaks 13/e p410).

- Leptin has a permissive action at the onset of puberty.

119. A couple comes for evaluation of infertility. The HSG was normal but semen analysis revealed azoospermia. What is the diagnostic test to differentiate between testicular failure and vas deferens obstruction?

a) Serum FSH

b) Karyotyping

c) Testosterone levels

d) Testicular FNAC

Correct Answer - A

Ans: A. Serum FSH

(Ref. Ganong 25le p419, 425, 24le p427)

- Prior to initiating treatment for a couple, in whom the man has azoospermia, it is important to distinguish whether the lack of sperm in the ejaculate is from an obstructive or non-obstructive process.
- The presence of normal volume testes with bilaterally indurated epididymis and/or absent vas deferens will point to an obstructive etiology for azoospermia.
- A history of cryptorchidism in the presence of small or soft testes suggests non-obstructive azoospermia, especially if associated with an elevated serum (FSH) level.
- A decreased spermatogenesis leads to decrease in production of inhibin, which causes an elevation in FSH.

120. Respiratory rhythm generation center is located at:

a) Dorsal respiratory group

b) Pre-Botzinger complex

c) Ventral respiratory neurons

d) Pneumotaxic center

Correct Answer - B

Ans: B. Pre-Botzinger complex

Ref: Ganong 25le p656, 24le p658)

- Rhythmic respiration is initiated by a small group of synaptically coupled pacemaker cells in the pre-Botzinger complex (pre-BOTC) on either side of the medulla between the nucleus ambiguus and the lateral reticular nucleus.
- The main components of the respiratory control pattern generator responsible for automatic respiration are located in the medulla. Rhythmic respiration is initiated by a small group of synaptically coupled pacemaker cells in the pre-Botzinger complex (pre-BOTC) on either side of the medulla between the nucleus ambiguus and the lateral reticular nucleus.

121. In relaxed state, chest wall and lung recoil are balanced at:

a) Minute volume

b) TLC

c) Residual volume

d) FRC

Correct Answer - D

Ans: D. FRC

(Ref: Ganong 25/e p629, 24/e p629; Guyton 13/e p502)

- In relaxed state, chest wall and lung recoil are balanced at functional residual capacity (FRC).
- Compliance is developed due to the tendency for tissue to resume its original position after an applied force has been removed.
- After an expiration during quiet breathing (e.g., at the FRC), the lungs have a tendency to collapse and the chest wall has a tendency to expand.

122. According to Weber-Fechner's law, strength of stimulus perceived is directly proportional to:

a) Intensity of stimulus

b) Amplitude of action potential

c) Number of neurons stimulated

d) Number of receptors stimulated

Correct Answer - A

Ans: A. Intensity of stimulus

(Ref: Guyton 13/e p615)

- According to Weber-Fechner's Law, strength of stimulus perceived is directly proportional to intensity of stimulus.
- "Weber-Fechner Principle—Detection of "Ratio" of Stimulus Strength: In the mid 1800s, Weber first and Fechner later proposed the principle that gradations of stimulus strength are discriminated approximately in proportion to the logarithm of stimulus strength.

123. Maximum alveolar arterial oxygen difference is seen in:

a) Pulmonary embolism

b) Severe asthma

c) Interstitial lung disease

d) Foreign body in upper airway

Correct Answer - A

Ans: A. Pulmonary embolism

(Ref: Ganong 25/e p634, 24/e p634)

- In pulmonary embolism gradient increases to very high level (10 to 83 mm Hg from normal level of 5 mm Hg).
- But normal PaO₂ level on arterial blood gas analysis does not exclude the diagnosis of acute pulmonary embolism.
- It is also increased in ILD.

124. During voluntary movements, Golgi tendon organ has an important role to play because it continuously relays to the efferent neurons:

a) Length of the muscle at rest

b) Change in angle of joint during motion

c) Change in length of muscle before and after the movement

d) Tension in the muscle

Correct Answer - D

Ans: D. Tension in the muscle

(Ref.: Ganong 25/e p232; Guyton 13/e p697, 701).

- Golgi tendon organ senses muscle tension.
- "The Golgi organ (also called Golgi tendon organ, GTO, tendon organ, neurotendinous organ or neurotendinous spindle) senses changes in muscle tension.
- It is a proprioceptive sensory receptor organ that is at the origins and insertion of skeletal muscle fibers into the tendons of skeletal muscle. It provides the sensory component of the Golgi tendon reflex.

125. Best index to measure cardiac afterload is:

a) Mean arterial pressure

b) LV end diastolic pressure

c) LV mean systolic pressure

d) Total peripheral resistance

Correct Answer - D

Ans: D. Total peripheral resistance

(Ref: Ganong 25/e p544, 24/e p546)

- Cardiac output depends on both preload & afterload.
- The preload is defined by the venous return & left ventricular end-diastolic volume while the afterload is defined by the mean arterial pressure, which then further depends on total peripheral resistance.

126. On standing from sitting position, a person has a fall in BP of 10 mm Hg. After correction, the baroreceptor sets back the BP by 8 mm Hg with an error of 2 mm Hg. What is the gain of the system?

a) 2

b) 4

c) 6

d) 8

Correct Answer - B

Ans: B. 4

(Ref: Guyton 13le p8-9)

- Gain = Correction/Error
- Correction = 8 mm Hg
- Persisting error after correction = $10 - 8 = 2$ mm Hg
- Hence, Gain = $8/2 = 4$

127. The concentration of a negative ion is 100 mM_oU_L extracellular and 10 mM_o1/1 intracellular. What will be the Nernst potential for this ion?

a) —10 mV

b) +10 mV

c) —61 mV

d) +61 mV

Correct Answer - C

Ans: C. —61 mV

Ref: Ganong 25^{le} p9, p24^{le} p9-10; Guyton 13^{le} p61

- $E_k = 61.5 \log C_i/C_e$
- Intracellular concentration $C_i = 100$
- Extracellular concentration $C_e = 10$
- $E_k = 61 \text{ C} \log 100/10 = -61 \text{ mV}$.

128. In the formula for urea clearance, $C = U \times V/P$, U denotes:

a) Urinary concentration in gm/24 hours

b) Urine osmolarity

c) Urinary concentration in mg/ml

d) Urine volume per minute

Correct Answer - C

Ans: C. Urinary concentration in mg/ml

In the Given Formula:

- C = Clearance of the substance
- U = Urinary concentration of the substance in mg/ml
- P = Plasma concentration of the substance in mg/ml
- V = Volume of urine

129. A spirometry curve of a patient has been provided below. Calculate the FEV₁/FVC ratio from the curve:

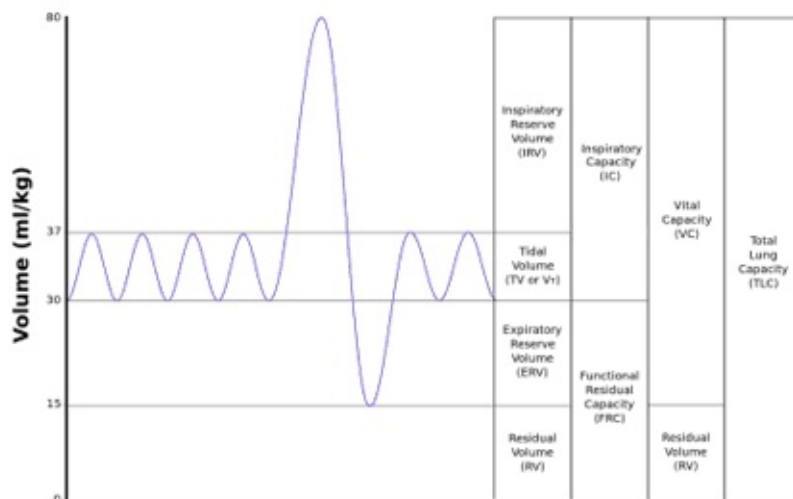
a) 60-69%

b) 70-79%

c) 80-89%

d) 90-99%

Correct Answer - C
Answer- C. 80-89%



130. Bezold-Jarisch reflex is mediated by:

a) Serotonin

b) Angiotensin

c) Prostaglandin

d) Histamine

Correct Answer - A

Answer- A. Serotonin

- The Bezold-Jarisch reflex involves a variety of cardiovascular and neurological processes which cause hypopnea (excessively shallow breathing or an abnormally low respiratory rate) and bradycardia (abnormally low resting heart rate). Serotonin can elicit Bezold-Jarisch reflex.
- Bezold-Jarisch reflex responds to noxious ventricular stimuli sensed by chemoreceptors & mechanoreceptors within the LV wall by inducing the triad of hypotension bradycardia & coronary artery dilatation.
- Stimulation of arterial baroreceptors or ventricular baroreceptors by any of a host of chemicals-veratrum alkaloids, nicotine capsaicin, anti-histamine serotonin snake and insect venoms--can also trigger the Bezold- Jarisch reflex.

131. Two vessels are compared as shown below. Assuming constant pressure along both the vessels and linear flow pattern, what will be the flow across the vessel 1 compared to vessel 2?

a) 2 times

b) 4 times

c) 8 times

d) 16 times

Correct Answer - C

Answer- C. 8 times

Poiseuille Hagen Formula

$$F = (P_A - P_B) \times (\pi / 8) \times (1/\eta) \times (r^4/L)$$

Where,

F= flow

$P_A - P_B$ = pressure difference between two ends of the tube

η = viscosity

r = radius of tube

L = length of tube

Because flow is equal to pressure difference divided by resistance (R),

$$R = 8\eta L/\pi r^4$$

132. A patient inhales a tidal volume of 500 mL. The intrapleural pressure was measured as – 4 cm of water before inspiration and – 9 cm of water after inspiration. Calculate the pulmonary compliance in this patient:

a) 0.1 L/cm

b) 0.3 L/cm

c) 0.2 L/cm

d) 0.4 L cm

Correct Answer - A

Answer- A. 0.1 L/cm

- The pulmonary compliance in this patient is 0.1 L/cm H₂O.
- Measure of the lung's ability to stretch & expand (distensibility of elastic tissue).
- Pulmonary surfactant increases compliance by decreasing the surface tension of water.
- Pulmonary compliance = $\Delta V / \Delta B$

133. What will be the oxygen carrying capacity of an 18-year-old patient with a hemoglobin of 14 g/dL?

a) 7

b) 14

c) 18

d) 28

Correct Answer - C

Answer- C. 18

Each gram of hemoglobin can bind with a maximum of 1.34 milliliters of oxygen (1.39 milliliters when the hemoglobin is chemically pure, but impurities such as methemoglobin reduce this).

- Here, Hb = 14.
- Hence, oxygen carrying capacity: $1.34 \times 14 = 18 \text{ mL O}_2/\text{dL}$

134. GFR is increased by all except?

a) Increased renal blood flow

b) Efferent arteriole constriction

c) Renal stone in ureter

d) Decreased oncotic pressure

Correct Answer - C

Ans. C. Renal stone in ureter

Ref: Ganong's Review of Medical Physiology, 2nd ed., ch -7, pg. 677-78

$$GFR = K_f [(P_{GC} - P_T) - (\pi_{GC} - \pi_T)]$$

* K_f: Glomerular Ultrafiltration coefficient

* P: Hydrostatic pressure,

* π : Oncotic Pressure,

* CC: Glomerular capillaries

* T: tubule

* Increased Renal blood flow. efferent arteriole constriction :

Increase GC hydrostatic pressure

* Decrease oncotic pressure in plasma : increased GFR

Renal stones:

* Tubular Obstruction can lead to increased hydrostatic pressure in tubule (Bowman's capsule).

135. Baroreceptor is which type of feedback?

a) Negative feedback

b) Positive feedback

c) Both negative and positive

d) Feed forward control

Correct Answer - A

Ans. A. Negative feedback

Ref: Ganong's Review of Medical Physiology, 25th ed., ch-32, pg. 587

- Baroreflex senses arterial pressure by means of wall stress at the baroreceptors and acts in a feedback way to control bp.

Examples of various control systems:

Positive Feedback

- Estrogen control of GnRH release at ovulation

Negative Feedback

- Blood pressure
- Plasma osmolarity.
- Plasma CO₂, pH.
- Endocrine gland secretion

Feed forward Control:

- Temperature regulation

136. Cell membrane of a cell is freely permeable to three ions X, Y and Z. At resting membrane potential, the respective equilibrium potentials of X and Y are -30mV and -40 mV. What will happen to the membrane potential if a drug is infused which can block the permeability of Z?

a) Depolarisation

b) Hyperpolarization

c) No change

d) Hyperpolarization following repolarization

Correct Answer - A

Ans. A. Depolarisation

Ref: Guyton & Hall 13' ed., ch-5, pg. 61-63.

- In this question if Z has a reversal potential or original RMP was more negative (e.g., -70 or -90 mV) then closure of C ion channels would shift the RMP closer to reversal potential of A, B thus depolarising the cell

137. Which of the following is the diluting segment of kidney?

a) PCT

b) Collecting duct

c) Ascending thick loop Henle

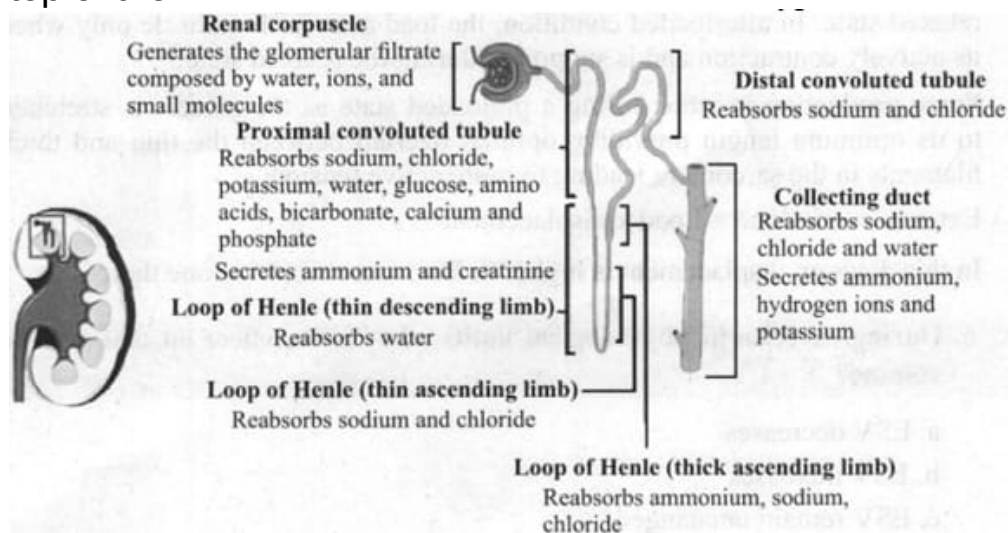
d) Descending loop of Henle

Correct Answer - C

Ans. C. Ascending thick loop Henle

Ref: Ganong's Review of Medical Physiology, 21st ed., ch-37, pg. 684

- TAL is permeable to solutes like Na^+ and Cl^- and impermeable to water.
- The tubular fluid is diluted and becomes hypotonic as it reaches the top of the TAL.



138. How an electrical synapse is different from a chemical synapse?

a) No cytoplasmic continuity between presynaptic and postsynaptic

b) The direction of impulse is unidirectional

c) Connexons are involved in electrical synapse

d) Electrical synapse has more latent period than chemical synapse

Correct Answer - C

Ans. C. Connexons are involved in electrical synapse

- Electrical synapses are composed of gap junctions that establish intercellular cytoplasmic continuity between cells for the flow of ions and messengers.
- Transmission across electrical synapses is faster as chemical synapses are associated with a synaptic delay created by neurotransmitter release, binding, and activation of second messenger systems.
- Electrical synapses are bidirectional in nature.
- Gap junctions are made of connexons that compose 6 connexin subunits.
- Two connexons aligned opposite to each other form a gap junction.

139. Anion gap is normally calculated by using which of the following methods?

a) $[K^+] + [HCO_3^- + Cr]$

b) $[Na^+] + [a^- + HCO_3^-]$

c) $[Na^+] - [HCO_3^- + Cl^-]$

d) $[Mg] + [HCO_3^- + Cl^-]$

Correct Answer - C

Ans. C. $[Na^+] - [HCO_3^- + Cl^-]$

- Formula for calculating anion gap = $Na^+ - (HCO_3^- + Cl^-)$
- Normal anion gap is (in mEq/L) = 10-12 mEq/L

140. What is responsible for rhythm generation of inspiration?

a) Dorsal nucleus of vagus

b) Pre botzinger complex

c) ventral respiratory neurons

d) Pneumotaxic center

Correct Answer - B

Ans. B. Pre botzinger complex

[Ref: Ganong 25le p656, 24le p658]

- Rhythmic respiration is initiated by a small group of synaptically coupled pacemaker cells in the pre-Botzinger complex (pre-BOTC) on either side of the medulla between the nucleus ambiguus and the lateral reticular nucleus.
- The main components of the respiratory control pattern generator responsible for automatic respiration are located in the medulla.
- Rhythmic respiration is initiated by a small group of synaptically coupled pacemaker cells in the pre-Botzinger complex (pre-BOTC) on either side of the medulla between the nucleus ambiguus and the lateral reticular nucleus.

141. In female adrenal gland secretes which hormone?

a) Progesterone

b) Testosterone

c) Estrogen

d) DHEA

Correct Answer - D

Ans. D. DHEA

- DHEA is an endogenous steroid hormone. This means it is naturally made by the body, and it spurs specific tissues or cells into action.
- It is also known as androstenolone, 3β -hydroxyandrost-5-en-17-one and 5-androsten- 3β -ol-17-one.
- DHEA is one of the most abundant steroid hormones in the human body. It is produced by the adrenal glands, the gonads, and the brain.
- It is normally found in the form of dehydroepiandrosterone sulfate (DHEAS).
- The body holds DHEAS in reserve and converts it to specific hormones when needed.
- It is important for creating estrogen and androgen sex hormones and contributes to the development of so-called androgenic effects, or masculinization.
- These changes include the production of oilier skin, changes in body odor, and the growth of armpit and pubic hair.

142. What is the sequence of clotting factors in coagulation pathway?

a) XII, XIII, X, XI

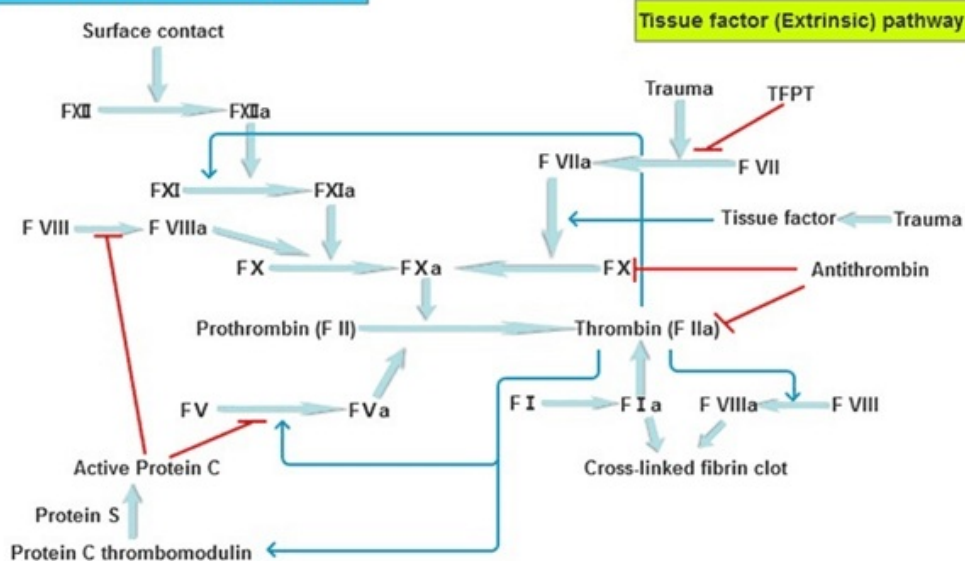
b) XIII, XII, XI, X

c) XII, XI, IX, X

d) X, XIII, XII, XI

Correct Answer - C
Ans. C. XII, XI, IX, X

Contact activation (Intrinsic) pathway



143. Which of the following is not a monomeric intermediate filament?

a) Vimentin

b) Keratin

c) Desmin

d) Tubulin

Correct Answer - D

Ans. D. Tubulin

- The building block of a microtubule is the tubulin subunit, a **heterodimer** of α - and β -tubulin.

144. Which of the following does golgi tendon organ detect?

a) Muscle Tension

b) Dynamic muscle length

c) Static muscle length

d) Muscle action

Correct Answer - A

Ans. A. Muscle Tension

(Ref.: Ganong 25/e p232; Guyton 13/e p697, 701).

- Golgi tendon organ senses muscle tension.
- The Golgi organ (also called Golgi tendon organ, GTO, tendon organ, neurotendinous organ or neurotendinous spindle) senses changes in muscle tension.
- It is a proprioceptive sensory receptor organ that is at the origin and insertion of skeletal muscle fibers into the tendons of skeletal muscle.
- It provides the sensory component of the Golgi tendon reflex.

145. Which hormone act by crossing cell membrane -

a) Thyroxine

b) Insulin

c) Glucagon

d) Calcitonin

Correct Answer - A

Ans. A. Thyroxine

- Intracellular receptors are transcription factors that have binding sites for the hormone (ligand) and for DNA and function as ligand (hormone)-regulated transcription factors.
- Steroid hormones and the steroid derivative vitamin D3 fulfill this requirement.
- Thyroid hormones must be actively transported into the cell.

146. Which of the following hormones is controlled by feedforward control?

a) ADH

b) Insulin

c) Corticosteroids

d) Prolactin

Correct Answer - A

Ans. A. ADH

- Osmolarity and volume status are the two greatest factors that affect ADH secretion.
- However, a variety of other factors promote ADH secretion as well.
- These include angiotensin II, pain, nausea, hypoglycemia, nicotine, opiates, and certain medications.
- ADH secretion is also negatively affected by ethanol, alpha-adrenergic agonists, and atrial natriuretic peptide.
- Ethanol's inhibitory effect helps to explain the increased diuresis experienced during intoxicated states as well as increased free water loss; without appropriate ADH secretion, more water is excreted by the kidneys.

147. Anatomical dead space measured by -

a) Bohler's method

b) Xenon dilution technique

c) Spirometry

d) Single breath nitrogen test

Correct Answer - D

Ans. D. Single breath nitrogen test

(Ref: Ganong 25/e p633, 634, 24/e p633, 634)

Anatomical dead space – Calculation:

- By Bohr's equation - Uses single breath nitrogen inhalation technique.

Xenon/Helium dilution technique:

- Used to measure functional residual capacity of lung.

Spirometry:

- Cannot measure residual or dead space volumes.

148. Which are all the factors determining the GFR?

a) Afferent arteriolar resistance

b) Efferent arteriolar resistance

c) Arterial pressure

d) All of the above

Correct Answer - D

Ans. D. All of the above

Determinants of GFR:

- Increase glomerular capillary hydrostatic pressure increases GFR. Glomerular hydrostatic pressure is determined by the following variables : i) Arterial pressure, ii) Afferent arteriolar resistance; iii) Efferent arteriolar resistance.
- Contraction of mesangial cells (therefore decrease in GFR) is produced by : - Endothelin, angiotensin II, vasopressin, norepinephrine, PAF, PDGF, thromboxane A₂, PGF₂, Leukotrienes C₄ & D₄, Histamine.

149. Which of the following nucleus has cardio inhibitory function?

a) Nucleus Ambiguus

b) Nucleus Tractus Solitarius

c) Rostral Ventrolateral Medulla

d) Dorsal motor nucleus of vagus

Correct Answer - A

Ans. A. Nucleus Ambiguus

- The nucleus ambiguus in its "external formation" contains cholinergic preganglionic parasympathetic neurons for the heart.
- These neurons are cardioinhibitory.
- This cardioinhibitory effect is one of the means by which quick changes in blood pressure are achieved by the central nervous system (the primary means being changes in sympathetic nervous system activity, which constricts arterioles and makes the heart pump faster and harder).

150. Detachment of myosin head from actin is caused by?

a) Entry of calcium into sarcoplasmic reticulum

b) Change in troponin C configuration

c) Binding of ATP

d) Release of ADP and Pi

Correct Answer - C

Ans.C. Binding of ATP

Binding of ATP on the free site of myosin leads to the detachment of myosin head from thin filament.

151. Which of the following rightly describes the mechanism of "Pressor Escape" in SIADH?

a) Characterized by sudden increase in urine volume with decrease in urine osmolality independent of circulating vasopressin levels.

b) Characterized by sudden increase in urine volume with decrease in urine osmolality dependent of circulating vasopressin levels.

c) Characterized by sudden decrease in urine volume with increase in urine osmolality independent of circulating vasopressin levels.

d) Characterized by sudden decrease in urine volume with increase in urine osmolality dependent of circulating vasopressin levels.=

Correct Answer - A

Ans. A. Characterized by sudden increase in urine volume with decrease in urine osmolality independent of circulating vasopressin levels.

* Also referred as "Vasopressin Escape".

* Characterized by sudden increase in urine volume with decrease in urine osmolality independent of circulating vasopressin levels.

152. Which of the following is the main component of surfactant, secreted by alveolar epithelial cells?

a) Proteins

b) Phospholipids

c) Lipoproteins

d) One of the above

Correct Answer - B

Ans. B. Phospholipids

* Nearly 77% of surfactant is composed of phospholipids

153. The following enzyme is responsible for thirst mechanism during dehydration?

a) ADH

b) Noradrenaline

c) Epinephrine

d) Dopamine

Correct Answer - A

Ans. A. ADH

* Because, arginine vasopressin (AVP) also known as antidiuretic hormone, cannot reduce water loss below a certain minimum level obligated by urinary solute load and evaporation from skin and lungs, a mechanism for ensuring adequate intake is essential for preventing dehydration.

* This vital function is performed by the thirst mechanism.

* Like AVP, thirst is regulated primarily by an osmostat that is situated in the anteromedial hypothalamus and is able to detect very small changes in the plasma concentration of sodium and certain other effective solutes.

154.

After resection of posterior pituitary all of the following hormones is given except?

a) Glucagon

b) Thyroxine

c) Estradiol

d) Mineralocorticoid

Correct Answer - D

Ans. D. Mineralocorticoid