1. During the Repolarisation phase of Action Potential of a Neuron, which among the following takes place?

a) Increased permeability to K+ ion

b) Decreased permeability to K+ ion

c) Increased permeability to Ca2+ ion

d) Increased permeability to Na+ ion

Correct Answer - A
Increased Permeability to K^+ ion
REF: See previous question for explanation

2. Physiological dead space is?

a) 150 ml

b) 200 ml

c) 250 ml

d) 100 ml

Correct Answer - A
150 ml REF: Guyton physiology 11th edition page 478, http://en.wikipedia.org/wiki/Dead_space_%28physiology%29#Anatomical_dead_space
Indirect repeat from June 2009
"The normal dead space air in a young adult man is about 150 millilitres. This increases slightly with age"
Some of the air a person breathes never reaches the gas exchange areas but simply fills respiratory passages where gas exchange does not occur, such as the nose, pharynx, and trachea.This air is called *dead space air* because it is not useful for gas exchange.
TOTAL DEAD SPACE (also known as "PHYSIOLOGICAL" DEAD SPACE) can be divided into anatomical dead space and alveolar dead space.
..
ANATOMICAL DEAD SPACE
Anatomical dead space is the gas in the conducting areas of the respiratory system, such as the mouth and trachea, where air does not come into contact with the alveoli of the lungs. Birds, which, relatively, have a far longer and wider trachea than mammals, have a higher proportion of dead space.
It is normally equal in milliliters to your body weight in pounds. A 150 lb (68 kg) male would have an anatomical dead space of about 150 mL. 1 mL per lb or 2.2 mL per kilogram of body weight. This is the same conversion of kilograms to pounds, except the final unit is in

same conversion of kilograms to pounds, except the final unit is in mL. This is about a third of the resting tidal volume (450-500 mL). Anatomic dead space is the volume of the conducting airways. It may be measured by Fowler's method, a nitrogen washout technique.

.. ALVEOLAR DEAD SPACE

Alveolar dead space is caused by air contacting alveoli without blood flow in their adjacent pulmonary capillaries, i.e. ventilation without perfusion. As a result, no gas exchange can occur. Alveolar dead space is negligible in healthy individuals, but can increase dramatically in some lung diseases.

3. Daily sperm production is?

a) 3 million per day

b) 12 million per day

c) 30 million per day

d) 120 million per

Correct Answer - D
120 million per day REF: Guyton 11th edition page 999
The two testes of the human adult form up to 120 million sperm each day"
Note:

- The entire period of spermatogenesis, from spermatogonia to spermatozoa, takes about 74 days.
- Although sperm can live for many weeks in the suppressed state in the genital ducts of the testes, life expectancy of ejaculated sperm in the female genital tract is only 1 to 2 days.

The two testes of the human adult form up to 120 million sperm each day.

4. Which of the pairs about vasopressin receptors is incorrect:

a) V_l-smooth muscles

b) V_2-collecting ducts

c) V_3-anterior pituitary

d) V4-CNS

Correct Answer - D

V_4-CNS *[Ref: Ganong 23/e 279, 666; Journal- Clinical Science (2003) 105, (1-8) at }pebsite http://www.clinsci.org/cs/105/0001/cs1050001.htm]*

There are at least three kinds of vasopressin receptors: V_l (Vi_a), V2 and V3 (Vib). All are G protein-coupled. The VIA and Vig receptors act through phosphatidylinositol hydrolysis to increase the intracellular Ca^{2+} concentration. The V2 receptors act through G, to increase cAMP levels. These three receptors for vasopressin have unique tissue distributions.

Vasopressin receptors:	Distribution	Function
V_l (V_{ia})receptors	Vascular smooth muscle cells	Vasoconstriction
	Liver	Glycogenolysis
	Area postrema in brain	Decreased cardiac output
	Brain	Neurotransmitter
	Platelets	Platelet aggregation

V2 receptors	Kidney (Collecting ducts)	Antidiuretic action
V3 (V_{ib})receptors	Anterior pituitary	Increased ACTH secretion

5. In a 55 year old anion gap needs to be calculated. The anion gap is calculated as:

a) $[K^+]$ + [HCO3 + Cr]

b) [Na + [a- + HCO3-]

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

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

Correct Answer - C

Na^+ -($HCO_3^- + Cl^-$)

6. **The primary action of leptin is:**

a) To increase food intake

b) To decrease food intake

c) To increase gastric contraction

d) To increase intestinal motility

Correct Answer - B
LEPTIN

It is a 167 aa peptide secreted from adipocytes, blood leptin level reflects total body fat.
Its primary action: To decrease food intake. It in CNS decreases NPY and alpha MSH.
Leptin deficiency may lead to obesity.

Ref: Sleisenger and Fordtran's, Edition-9, Page-8.

7. The intake of Iodine in to the Thyroid Gland is an example of which of the followings means of molecular transport?

a) Primary active transport

b) Secondary active transport

c) Facilitated diffusion

d) Endocytosis

Correct Answer - B

Secondary active transport or co-transport, uses energy to transport molecules across a membrane against a concentration/electrochemical gradient.In contrast to primary active transport, there is no direct coupling of ATP; instead, the electrochemical potential difference created by pumping ions out of the cell is used.

Primary active transport, also called direct active transport, directly uses energy to transport molecules across a membrane.

Facilitated diffusion is a type of passive transport that allows substances to cross membranes with the assistance of special transport proteins.

Endocytosis is a process by which cells absorb molecules (such as proteins) by engulfing them.

8. When stereocilia of an auditory hair cell are deflected in the appropriate direction, potassium channels open in the apical membrane of the cell and?

a) Potassium ions flow out of the cell, hyperpolarizing the cell

b) Potassium ions flow out of the cell, depolarizing the cell

c) Potassium ions flow into the cell, hyperpolarizing the cell

d) Potassium ions flow into the cell, depolarizing the cell

Correct Answer - D

The opening of potassium channels in the apical membrane of auditory hair cells allows potassium ions to flow into the cell and depolarize the cell. The apical surface of these cells is exposed to endolymph, which contains potassium ions at a much greater concentration than is found inside the cell.

A potential difference of 160 mV (outside positive) exists across the apical membrane, and this results in a net movement of potassium ions into the cell when the stereocilia bundle is deflected and ion transduction channels are opened. The membrane potential of the hair cell moves in the positive direction (toward zero) and this results in depolarization of the cell.

9. **During ascent of sea diving a diver developed severe knee joint pain. What can be the reason for his problem?**

a) Increased 02

b) Increases N20

c) Increased C02

d) Increased N2

Correct Answer - D

Decompression Sickness (DCS):

- DCS is caused by the formation of bubbles from dissolved inert gas (usually nitrogen) during or after ascent (decompression) from a compressed gas dive.
- Decompression sickness occurs when the ascent is too rapid and gas bubbles form and cause damage depending on their location (eg, coronary, pulmonary, spinal or cerebral blood vessels, joints, soft tissue).
- Divers control their ascent for a given depth and time exposure using algorithms that often include periods where ascent is halted for a prescribed period at different depths to allow time for gas wash-out ("decompression stops").

Ref: Bennett M.H., Mitchell S.J. (2012). Chapter e52. Hyperbaric and Diving Medicine. 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.

10. **1 mole of myoglobin binds to how many moles of oxygen?**

a) 1

b) 2

c) 4

d) None of the above

Correct Answer - A

Myoglobin is an iron-containing pigment found in skeletal muscle. It resembles hemoglobin but binds 1 rather than 4 mol of O2 per mole. Its dissociation curve is a rectangular hyperbola rather than a sigmoid curve. Because its curve is to the left of the hemoglobin curve (Figure 36–5), it takes up O2 from hemoglobin in the blood. It releases O2 only at low PO2 values, but the PO2 in exercising muscle is close to zero. The myoglobin content is greatest in muscles specialized for sustained contraction. The muscle blood supply is compressed during such contractions, and myoglobin may provide O2 when blood flow is cut off.

Ref: Ganong's Review of Medical Physiology 23rd edition, Chapter 36.

11. **All of the following statements are correct about stomach, EXCEPT:**

a) Pylorus has more acid secreting cells

b) A high number of goblet cells are present in mucous lining

c) Chief cells secrete pepsinogen

d) Parietal cells secrete intrinsic factor

Correct Answer - A

In the cardiac and pyloric regions, these are called the cardiac and pyloric glands, respectively, secrete mucus only.Parietal cells secrete hydrochloric acid and intrinsic factor; chief cells secrete rennin and lipase in infancy and pepsinogen throughout life; and enteroendocrine cells secrete hormones and paracrine messengers that regulate digestion.

12. **Potassium (K+) is the most abundant intracellular cation. Highest concentration of potassium is seen in:**

a) Bile

b) Pancreatic juice

c) Ileal secretions

d) Rectum

Correct Answer - D

There is evidence that active potassium secretion occurs in the distal colon. This secretion combined with potassium in bacteria and colonic mucous in stool may explain the relatively high concentration of potassium, 50–90 mmol/L, in stool.

Ref: Essentials of General Surgery, 4e edited by Peter F. Lawrence, Richard M. Bell, Merril T. Dayton, 2006, Page 55.

13. **Serotonin is secreted by:**

a) Thyroid

b) Adrenal cortex

c) Adrenal medulla

d) Argentaffin cells

Correct Answer - D

Serotonin is a vasoconstricting hormone, produced in the brain and GI tract. In the GI tract it is produced normally by enterochromaffin cells (argentaffin cells). The principal function is to regulate smooth muscle contraction and peristalsis.

Serotonin: also called 5-hydroxytryptamine, is a chemical substance that is derived from the amino acid tryptophan.

Principally found stored in three main cell types;

(a) Serotonergic neurons in the CNS and in the intestinal myenteric plexus,

(b) Enterochromaffin cells in the mucosa of the gastrointestinal tract and

(c) Blood platelets

Synthesis:

Serotonergic neurons and enterochromaffin cells can synthesize serotonin from its precursor amino acid L-tryptophan, whereas platelets rely upon uptake of serotonin for their stores. The biochemical pathway for serotonin synthesis initially involves the conversion of L-tryptophan to 5-hydroxytryptophan by the enzyme **L-tryptophan hydroxylase**. This enzyme provides the rate limiting step for serotonin synthesis.

Metabolism of serotonin is carried out primarily by the enzyme monoamine oxidase (MAO), The action of MAO converts serotonin to 5-hydroxyindole acetaldehyde which in turn is readily metabolized by aldehyde dehydrogenase to produce 5-hydroxyindole acetic acid as the major excreted metabolite of serotonin.

Carcinoid syndrome: are neuroendocrine tumours (NETs) of predominantly enterochromaffin cell origin (Kulchitsky cells).Carcinoid syndrome is made up of a constellation of symptoms which are caused by the release of a variety of substances (serotonin, histamine, and substance P, among others) by the carcinoid tumor. It may cause trytophan deficiency and causes decrease in niacin synthesis leading to pellagra.

Ref: Principles of medical physiology, By Sabyasachi Sicar, Page 641.

14. **Which of the following inhibits gastrin secretion?**

a) Intrinsic factor

b) Enterogastrone

c) Histamine

d) Gastrin

Correct Answer - B

Enterogastrone is secreted in the ileum. To a minor extend it inhibits gastric and pancreatic secretions. It inhibits the secretion of gastrin.

Gastrin:
Gastrin is produced by G cells in the antral portion of the gastric mucosa. **Functions of gastrin:** It increases gastric HCl secretion, decreases insulin secretion, stimulates GI mucosal growth and cause constriction of lower esophageal sphincter.

Stimuli that increase gastrin secretion:

- Luminal: distention, peptides and amino acids
- Increased vagal discharge via GRP
- Calcium
- Epinephrine

Stimuli that inhibit gastrin secretion

- Luminal: acid, somatostatin
- Secretin, GIP, VIP, glucagon, calcitonin

Ref: Barrett K.E., Barman S.M., Boitano S., Brooks H.L. (2012). Chapter 25. Overview of Gastrointestinal Function & Regulation. In K.E. Barrett, S.M. Barman, S. Boitano, H.L. Brooks (Eds), *Ganong's Review of Medical Physiology*, 24e.

15. **Which of the following is the function of Tropomyosin?**

a) It slides over myosin

b) It causes release of calcium

c) It helps in the fusion of actin and myosin

d) It covers myosin and prevents attachments of actin and myosin

Correct Answer - D

Tropomyosin molecules lie on top of the active sites of the actin strands, thereby preventing the attraction between the actin and myosin filaments.

Ref: Ganong's Review of Medical Physiology, 23rd Edition, Chapter 5

16. **During which phase of cardiac cycle is coronary blood flow maximum?**

a) Isovolumetric contraction

b) Rapid ejection

c) Slow ejection

d) Isovolumetric relaxation

Correct Answer - D

Coronary blood flow is maximum during the isovolumetric relaxation phase of cardiac cycle. During this phase, coronary flow is maximum because of maximum fall of coronary vascular resistance or due to minimal compression of coronary artery by myocardium during this period.

Must know:

Variation of Coronary flow with Cardiac cycle:

- **During the phase of isometric ventricular contraction:** coronary flow falls sharply and reaches minimum or even falls below the level of zero due to back flow.
- **During the maximum ejection phase:** coronary inflow rises sharply due to the sudden rise of aortic pressure.
- **During the reduced ejection phase:** coronary inflow again falls below the previous level. This is because, aortic pressure is falling but myocardium is still compressing the coronary vessel.
- **During isovolumetric relaxation:** coronary blood flow rises sharply.

Ref: Textbook of Anesthesia for Postgraduates By T. K. Agasti page 109.

17. **The organ with maximum blood flow in ml/kg/min during resting is:**

a) Kidney

b) Liver

c) Brain

d) Lungs

Correct Answer - A

Resting blood flow of various organs in a normal man:

Region (in kg)	mL/min	mL/100 g/min
Liver (2.6)	1500	57.7
Kidneys (0.3)	*1260*	*420.0*
Brain (1.4)	750	54.0
Skin (3.6)	462	12.8
Skeletal muscle (31.0)	840	2.7
Heart muscle (0.3)	250	84.0

Ref: Barrett K.E., Barman S.M., Boitano S., Brooks H.L. (2012). Chapter 33. Circulation through Special Regions. In K.E. Barrett, S.M. Barman, S. Boitano, H.L. Brooks (Eds), *Ganong's Review of Medical Physiology,* 24e.

18. **What is the partial pressure of oxygen at 760mmHg atmospheric pressure?**

a) 76

b) 160

c) 120

d) 130

Correct Answer - B

The pressure of a gas is proportional to its temperature and the number of moles per volume.

P= nRT/V, where,

n= number of moles

P= Pressure

R = Gas constant

T= Absolute temperature

V= Volume

The pressure exerted by one gas in a mixture of gases is equal to the total pressure times the fraction of the total amount of gas it represents.

The partial pressure of oxygen in dry air is therefore 0.21 x 760= 160 mm of Hg at sea level.

Ref: Ganong, 23rd Ed, Page 588

19. **Major amount of angiotensin I is converted to angiotensin II in:**

a) Liver

b) Kidney

c) Lung

d) None of the above

Correct Answer - C

The lungs also activate one hormone; the physiologically inactive decapeptide angiotensin I is converted to the pressor, aldosterone-stimulating octapeptide angiotensin II in the pulmonary circulation. The reaction occurs in other tissues as well, but it is particularly prominent in the lungs.

Large amounts of the angiotensin-converting enzyme responsible for this activation are located on the surface of the endothelial cells of the pulmonary capillaries. The converting enzyme also inactivates bradykinin.

Circulation time through the pulmonary capillaries is less than 1 s, yet 70% of the angiotensin I reaching the lungs is converted to angiotensin II in a single trip through the capillaries.

Ref: Ganong's Review of Medical Physiology 23rd edition, Chapter 35.

20. **Where does capacitation of sperms occur in the reproductive tract?**

a) Epididymis

b) Vas deferens

c) Vagina

d) Uterus

Correct Answer - D

After ejaculation into the female, spermatozoa move up the uterus to the isthmus of the uterine tubes where they slow down and undergo capacitation.

- *Capacitation involves* two components : increasing the motility of spermatozoa and facilitating their preparation for the acrosome reaction. From the isthmuses the capacitated spermatozoa move rapidly to the tubal ampullas, where fertilization takes place.
- Spermatozoa attain progressive motility in the epidydimis. It involves activation of a unique set of proteins from the CatSper family, which are localized to the principal piece of the sperm tail.
- Ejaculation of the spermatozoon involves contractions of the vas deferens mediated in part by P2X receptors, ligand-gated cation channels that respond to ATP.

Ref: Ganong's Review of Medical Physiology, 24th Edition, Chapter 23

21. **In a 29 day menstrual cycle ovulation takes place at:**

a) 14th day

b) 15th day

c) 16th day

d) 17th day

Correct Answer - B

If the menstrual cycle is 29 days long, ovulation takes place on 15th day. **Date of ovulation is calculated by substracting 14 days from the duration of menstrual cycle.**

A surge in LH secretion triggers ovulation, and ovulation normally occurs about 9 hours after the peak of the LH surge at midcycle. The follicle that ruptures at the time of ovulation fills with blood and is called corpus hemorrhagicum. The granulosa and theca cells lining the follicle begin to proliferate and gets filled with yellowish lipid rich luteal cells forming the corpus luteum.

Ref: Ganong's Review of Medical Physiology, 24e, chapter 22

22. **The following causes can make an infant large for gestational age, EXCEPT:**

a) Hydrops fetalis

b) Genetic predisposition

c) Maternal diabetes mellitus

d) Maternal smoking

Correct Answer - D

When the infant's weight is above the ninetieth percentile, the infant is considered large for gestational age. It can be a consequence of genetic predisposition with similar large infants in previous pregnancies of the mother. Glucose crosses the placenta but insulin cannot. Consequently, fetal hyperglycemia and hyperinsulinemia develop and results in increased somatic growth of the fetus.

Beckwith-Wiedemann syndrome is multifactorial disorder which includes macrosomia, omphalocele, macroglossia, and hypoglycemia. Hydrops fetalis, is characterized by severe chronic anemia and hypoproteinemia, and it can also become apparent as an infant large for gestational age. On the other hand, maternal smoking results in asymmetric growth retardation due to adverse effect on fetal nutrition. Exposed infants are small for gestational age.

Ref: Burns D.M. (2012). Chapter 395. Nicotine Addiction. 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.

23. **Inhibin inhibits secretion of which of the following hormone?**

a) LH releasing hormone

b) LH

c) FSH

d) Estrogen and progesterone

Correct Answer - C

Inhibin is secreted by sertoli cells and is carried by blood to the anterior pituitary and possibly hypothalamus. This inhibin acts by negative feedback to inhibit secretion of FSH.

The principal functions of Sertoli cells are:

- Maintenance of blood testis barrier
- Secretion of tubular fluid
- Secretion of androgen binding protein
- Secretion of estrogen and inhibin
- Maintenance and coordination of spermatogenesis
- Phagocytosis of residual bodies of sperm cells

Ref: Human Embryology and Developmental Biology By Bruce M. Carlson page 20.

24. **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 subfornicial organ) and increase the secretion of vasopressin and ACTH.

25. **Actin filament is not present in which of the band zones?**

a) H band

b) I band

c) M band

d) Z band

Correct Answer - A

The myosin and actin filaments overlap in peripheral regions of the A band, whereas a middle region (called the H zone) contains only myosin. H-band is the zone of the thick filaments that is not superimposed by the thin filaments.

26. **Maintenance of the corpus luteum during the first trimester of pregnancy is accomplished principally by the secretion of:**

a) Antidiuretic hormone (ADH)

b) Follicle stimulating hormone (FSH)

c) Human chorionic gonadotropin (hCG)

d) Luteinizing hormone (LH)

Correct Answer - C

The corpus luteum secretes estrogens, progesterone, and relaxin. hCG, secreted by the syncytiotrophoblast lining the placental villi, maintains the corpus luteum during the first trimester of pregnancy.

Antidiuretic hormone does not play a significant role during pregnancy.

FSH acts on granulosa cells to promote the conversion of androstenedione to estradiol.

LH acts on theca cells to promote androstenedione secretion.

27. Estradiol is a powerful inhibitor of FSH (follicle stimulating hormone). What is another factor that is a powerful inhibitor of FSH in the female?

a) Testosterone

b) Progesterone

c) LH

d) Inhibin

Correct Answer - D

Inhibin, as its name implies, is an inhibitor. The specific action of inhibin is to inhibit the release of FSH. Inhibin occurs as a heterodimer It is produced in the male and the female. Inhibin is produced by the ovarian granulosa cells to prevent more than one follicle (in general) from becoming a mature follicle. The inhibin produced by the Sertoli cells of the testes acts to decrease FSH to help in regulation of spermatogenesis.

Ref: Molina P.E. (2013). Chapter 8. Male Reproductive System. In P.E. Molina (Ed),*Endocrine Physiology*, 4e.

28. **Which among the following is the function of ghrelin?**

a) Stimulation of appetite

b) Suppression of appetite

c) Stimulation of sleep

d) Suppression of sleep

Correct Answer - A

Ghrelin is a potent secretagogue of pituitary growth hormone (but not adrenocorticotropic hormone, follicle-stimulating hormone, luteinizing hormone, prolactin, or thyroid-stimulating hormone). Ghrelin appears to be an orexigenic regulator of appetite (i.e., when ghrelin is elevated, appetite is stimulated, and when it is suppressed, appetite is suppressed).

Ref: Dempsey D.T. (2010). Chapter 26. Stomach. In F.C. Brunicardi, D.K. Andersen, T.R. Billiar, D.L. Dunn, J.G. Hunter, J.B. Matthews, R.E. Pollock (Eds), *Schwartz's Principles of Surgery*, 9e.

29. **Where does spermatozoa attain maturity during its passage?**

a) Seminal vesicles

b) Epididymis

c) Testes

d) Prostate

Correct Answer - B

While passing through epididymis, sperm become motile and their surfaces and acrosomes undergo final maturation steps. Fluid within the epididymis contains glycolipid **decapacitation factors** that bind sperm cell membranes and block acrosomal reactions and fertilizing ability until the factors are removed as part of the capacitation process in the female reproductive tract.

Ref: Mescher A.L. (2013). Chapter 21. The Male Reproductive System. In A.L. Mescher (Ed), *Junqueira's Basic Histology*, 13e.

30. **Release of synaptic transmitter by exocytosis would be blocked most effectively by preventing the:**

a) Propagation of the action potential into the nerve terminal membrane

b) Depolarization of the nerve terminal membrane

c) Flow of Na+ into the nerve terminal membrane

d) Flow of Ca2+ into the nerve terminal membrane

Correct Answer - D

Preventing the flow of Ca2+ into the cell would prevent the release of transmitter, because Ca2+ initiates the intracellular events leading to the docking of the vesicle to its binding site on the active zone. Although Ca2+ normally enters the cell through voltage-operated channels that are opened by the depolarization of the nerve terminal that occurs as the action potential propagates along the nerve axon, release of transmitter will not occur if Ca2+ does not enter the nerve terminal.

The flow of Na+ into the nerve terminal would depolarize the membrane and open Ca2+ channels, leading to Ca2+ entry and exocytosis. However, Na+ entry does not directly stimulate exocytosis. K+ does not affect the nerve terminal membrane.

31. **Human body has rhythmic fluctuations in their function on a circadian cycle. Circadian rhythm is controlled by:**

a) Suprachiasmatic nuclei

b) Median eminence

c) Paramedian nuclei

d) Supraoptic nuclei

Correct Answer - A

Within the hypothalamus, a specific cell group, the **suprachiasmatic nucleus**, functions as an intrinsic clock. Cells within this nucleus show **circadian rhythms** in metabolic and electrical activity, and in neurotransmitter synthesis, and appear to keep the rest of the brain on a day–night cycle.

Ref: Waxman S.G. (2010). Chapter 9. Diencephalon. In S.G. Waxman (Ed), Clinical Neuroanatomy, 26e.

32. **Slow wave sleep is known as:**

a) REM sleep

b) NREM sleep

c) Both of the above

d) None of the above

Correct Answer - B

This is a straight forward memory question. There are two kinds of sleep: **rapid eye movement (REM) sleep** and **non-REM (NREM),** or **slow-wave sleep.**

Ref: Ganong's Review of Medical Physiology 23rd edition, Chapter 15.

33. The nucleus involved in Papez circuit is:

a) Pulvinar

b) Intralaminar

c) VPL nucleus

d) Anterior nucleus of Thalamus

Correct Answer - D
D i.e. Anterior nucleus of Thalamus

34. Cerebellar connection to other parts of the brain is projected through which cell:

a) Golgi cells

b) Basket cells

c) Purkinje cells

d) Oligodendrocytes

Correct Answer - C
C i.e. Purkinje cells

35. Which one of the following clearly states the role of cerebellum in motor performance:

a) Planning and programming of movement

b) Convert abstract thought into voluntary action

c) Initiation of skilled voluntary action

d) Smoothens and coordinates ongoing movements

Correct Answer - D
D i.e. Smoothens and coordinates ongoing movement
Cerebellum smoothens & coordinates ongoing movement in motor performance this is the reason why lesion of cerebellum causes: -
Ataxia (lack of coordination of movement)
- *Asynergia* (lack of coordination b/w different group of muscles)
- *Astasia* (Unsteady voluntary movement).

36. Which hormone is secreted from stomach that control intake of food:

a) Orexin

b) Insulin like growth hormone

c) Cholecystokinin

d) Ghrelin

Correct Answer - D

Ans. D i.e. Ghrelin

- Ghrelin, is released by stomachs, especially during fasting and stimulates appetites (orexigenic).
- CCK, Peptide YY/PYY (secreted from entire gitract but especially from ileum & colon), glucagon like peptide (secreted by intestines d/t presence of food) and insulin (produced in response to GLP) are gastrointestinal hormonal factors, which suppress feeding i.e. cause satiety (anorexigenic). Whereas, ghrelin another gastrointestinal hormone produced mainly by stomach is orexigenic (i.e. increase appetite).
- Growth hormone (GH) also k/a somatotropic hormone or somatotropin exerts much of its effects through intermediate substances called somatomedins secreted by liver (and to a much less extent, other tissues). Because many effects of somatomedins on growth are similar to those of insulin, therefore somatomedins are also called insulin like growth factors (IGFs). Out of 4 somatomedins isolated, the most important is somatomedin C (or IGF-1) and pygmies of Africa & Levi-Lorain dwarf have congenital inability to synthesize significant amount of IGF-1.
- Orexin (hypocretin) producing neurons occur in hypothalamus. Orexins A and B increase feeding (appetite) whereas, brains from

humans with narcolepsy have fewer orexin producing neurons in hypothalamus. - Cholecystokinin (CCK) is secreted by I cells of upper small intestine (jejunum) and decreases feeding (antiorexigenic / aorexigenic), inhibits gastric emptying, and stimulates secretion of pancreatic juice rich in enzymes, contraction of gall bladder, secretion of glucagon & insulin and small intestine & colonic motality.

- It is a gastrointestinal hormone synthesized & released mainly by oxyntic cells of stomach (Guyton) / P or **D1** cells of fundus of stomach. It is also produced by the intestine & epsilon cells of pancreas in small amounts. Ghrelin acts to stimulate hunger (appetite)Q. So blood levels rise during fasting, peak just before eating and then fall rapidly after a meal (orexigenic). In this way, it is counter part of hormone leptin, produced by adipose tissue, which induces satiation (i.e. is anti-orexigenic) when present at higher levels.
- Ghrelin is also produced in arcuate nucleus of hypothalamus and has marked growth hormone stimulating activity i.e. it stimulates GH secretion from anterior pituitary gland by acting directly on receptors in pituitary.
- G protein coupled ghrelin receptor formerly k/a growth hormone secretagogue (GHS) receptor is expressed in arcuate nucleus, lateral hypothalamus, vagal afferent cell bodies & vagal afferent endings through out gastrointestinal tract.
- It has an important role in neurotrophy, particularly in hippocampus and is essential for cognitive adaptation to changing environment and process of learning.

37. The cell bodies of orexinergic neurons are present in:

a) Locus ceruleus

b) Dorsal raphe

c) Lateral hypothalamic area

d) Hippocampus

Correct Answer - C

C i.e. Lateral Hypothalamic Area

'Orexins are synthesized in neurons located in the lateral hypothalamus'. And neurons that produce orexigenic substances NPY & AGRP have their cell bodies in arcuate nuclei and project to paraventricular nuclei of hypothalamus.

The Orexins (Hypocretins) System

Orexins were first described in 1998 as a result of signal substances *used both in CNS & periphery.*

In the CNS

- All the orexinergic neurons have their origin in the lateral hypothalamus from where they project wide
- They are believed to regulate:
  - Wakefulness and paradoxical sleep,
  - Appetite and food intake
  - Endocrine and Autonomic processes.

In the Periphery

- Orexins and orexin receptors have been have been found in the gastro-intestinal tract and in the endocrine organs.
- The prominent peripheral effects seen so far include regulation of gastro-intestinal motility and hormone production and release, especially in the adrenal gland

The orexins most often act in an excitatory manner both via putative pre-, post- and extrasynaptic mechanisms. The orexin system consists of

Orexin - A and Orexin B, two closely related neuropeptides, derived from the same gene (common precursor) by alternate splicing.

OX-1 and OX-2, the two orexin receptors. At most of the projection sites both OX1 & OX2 receptors are expressed. Mutation in one of the orexin receptor genes cause narcolepsy.

38. The frequency of beta waves (per sec) in EEG is

a) 0-4

b) 4-7

c) 7-13

d) 13-30

Correct Answer - D
D i.e. 13-30

39. During Flight or Fight reaction, which of the following is responsible for increase in local blood flow :

a) Sympathetic system mediated Cholinergic release

b) Local hormones

c) Para-sympathetic cholinergic

d) Endocrine factors only

Correct Answer - A
A i.e. Sympathetic mediated cholinergic release
The 'flight or fight' reaction is a *sympathetic alarm reaction wherein a large portion of sympathetic nervous system discharged at the same timeQ,* in response to a variety of stress.

40. Which of the following is an aminoneuro-transmitter

a) Acetylcholine

b) GABA

c) Lignocaine

d) Epinephrine

Correct Answer - B
B i.e. GABA

41. Find faulty statement regarding muscle spindle

a) Central zone has no active & myosin

b) Peripheral zone has no actin & myosin

c) Type 1 nuclear bag fibers has low myosin ATP ase activity

d) Type 2 nuclear bag fiber has has high level of myosin ATPase activity

Correct Answer - B
B i.e. Peripheral zone has no action & myosin

42. Lowest threshold potential in a motor nerve fibre is at:

a) Dendrite

b) Body

c) Axon hillock

d) Axon

Correct Answer - C
C i.e. Axon hillock

43. Resting membrane potential of nerve is equal to equilibrium potential of

a) Na+

b) Cl-

c) K+

d) HCO_3^-

Correct Answer - B
B i.e. Chloride ion

44. Phantom limb sensations are best described by:

a) Weber Fechner law

b) Power law

c) Bell-Magendie law

d) Law of projection

Correct Answer - D
D i.e. Law of projection

45. Which of the following triggers muscle contraction

a) Ca binding tropomyosin

b) Ca binding troponin C

c) ATP breakdown

d) Ca binding troponin I

Correct Answer - B
B i.e. Calcium binding troponin C

- In the resting state of skeletal muscle *tropomyosin molecule lie on top of active sites of actin filamentsQ,* so that attraction cannot occur between actin & myosin filaments to cause contraction.
  Mechanism of contraction: when Ca^{2+} are released during the contraction process, the troponin complex undergoes a confirmational change that in some way shifts the tropomyosin molecules into the groove between the two actin strands. This uncovers the active sites on actin thus allowing myosin to bind the actin & contraction proceed.
- In resting skeletal muscle *tropomyosin (a long filamentous protein) covers the active sites of actin filament where myosin head binds to actin*^{g}*.* So that the attraction cannot occur between actin and myosin filaments to cause contraction.
- Initiation of muscle contraction occurs, when Ca^{++} *binds toroponin CQ.* Binding causes lateral displacement of tropomyosin into the groove between two actin filaments. This uncovers active sites on actin thus allowing myosin head to bind the actin and contraction proceeds.

46. True for smooth muscle contraction is A/E

a) Catch bridge are less cycle less ATP bridges

b) Dephosphorylation causes definite relaxation

c) LC phosphatase is essential for binding

d) B & C

Correct Answer - D
B & C i.e. Dephosphorylation causes definite relaxation & LC phosphatase is essential for binding

47. Action of calmodulin is:

a) Ca^{2+} dependent

b) Through calmodulin dependent kinases

c) Through CAMP dependent kinases

d) A & B

Correct Answer - D

A i.e. Ca^{2+} dependent; B i.e. Through calmodulin dependent kinase

Calmodulin

- It has 148 amino acid residues & 4 Ca++ binding domains. It's 115^{th} aa. is trimethylated. It is extensively conserved & found in plants & animals both. Calmodulin is *involved in contraction of smooth muscle .Q* It helps in initiation of contraction, not by, uncovering active site on actin molecule but by activating the myosin cross bridges.
- Is a *Ca^{2+} binding proteinQ* present in many cells notably *in smooth muscles and brain cellsQ.*
- Is a counterpart of Troponin. (Troponin is present in skeletal muscles)
- Calmodulin binds with Ca^{t*} & capable of activating 5 *different calmodulindependent kinases* Q. They are:

  (i) Myosine high chain kinaseQ - it phosphorylates myosin head conferring with the capability of binding with actin filament. This brings about contraction in smooth muscle.

  (ii) Phosphorylase kinaseQ

  (iii) Ca^{2}V Calmodulin kinase I & II: concerned with synaptic function

  (iv) Ca^{2*} / Calmodulin kinase III: concerned with protein synthesis

48. The sigmoid nature of Hb-02 dissociation curve is because of

a) Binding of one 0_2 molecule increase the affinity for the next 02 molecule.

b) Alpha chain has more affinity for 0_2 than beta chain

c) Beta chain has more affinity for 0_2 than alpha chain

d) Haemoglobin in acidic in nature

Correct Answer - A
A i.e. Binding of one 0_2 molecule increase affinity for the next 0_2 molecule
Oxygen - hemoglobin dissociation curve is sigmoid (or S) shaped because *binding of one oxygen molecule to heme increases the affinity of second heme molecule for oxygenQ* an so on.
The relationship between partial pressure of 0_2 and the percentage saturation of hemoglobin with 0_2 can be explained graphically. And the graph is called 0,- hemoglobin dissociation Curve. It represents the affinity of hemoglobin for 02
Normal curve
S- shaped or sigmoid shapedQ due to interconversion of hemoglobin from *low affinity tightly bound Tense configuration (T state) to high affinity released configuration (R state)* as more 02 molecules are bound.
- Relaxed configuration exposes more oxygen binding sites & significantly increases 02 affinity.
- Combination of the first heme with 02 increase the affinity of second heme for 0_2 (due to TR interconversion) and oxygenation of

second increases the affinity of the third and so on.

* *P,0 - The partial pressure of 0_2 at which Hb saturation is* 50% Q. The normal value is 26.6 mmHg
* *Myoglobin has hyperbolic 0_2-binding curve.*

Bohr effect: The presence of CO_2 (4, pH) decreases the affinity of Hb for 02, this enhances further release of 0_2 to the tissue and the 0_2 dissociation curve is shifted to right. This is known as Bohr effect. *So decrease in 0_2 affinity of hemoglobin when pH of blood falls is called Bohr effectQ.* And it is caused by the fact that deoxygenated hemoglobin binds H+ more actively than does oxyhemoglobin.
All the factors, which shift the 0_2- dissociation curve to the right enhances the Bohr effect.
Binding of 0_2 to hemoglobin reduces its affinity for CO_2(2 or in other words CO_2 disociation curve shifts to right (i.e. blood begins to lose some CO_2 as it becomes oxygenated) is called Haldane - Christian - Douglas effect

49. Functional residual capacity is:

a) Volume remaining after forced expiration

b) Tidal volume + volume inspired forcefully

c) Volume remaining after normal expiration

d) Tidal volume + volume expired by forced expiration

Correct Answer - C
C i.e. Volume remaining after normal expiration

50. Spirometry can demonstrate and measure all of the following except :

a) Tidal volume

b) Residual volume

c) Vital capacity

d) Inspiratory reserve capacity

Correct Answer - B
B i.e. Residual Volume

51. True about normal expiration

a) At the end of normal expiration air in lung is ERV

b) At the end of normal expiration air in lung is ERV

c) In expiration pleural pressure is equal to alveolar pressure

d) Muscles that elevate the chest cage are classified as

Correct Answer - B

B i.e. At the end of normal expiration air in lung is ERV

- Muscles that elevate the chest cage (i.e. pull the ribs upwards and farwards, thus increasing both AP and lateral diameters = external intercostals) are muscles of inspiration whereas muscles that depress the chest cage (i.e. internal intercostals which pull ribs downward and inwards, decreasing the thoracic volume) are muscles of expiration.
- Elastic chest wall has a tendency to move outward which is balanced by inward recoil of alveoli. At FRC both are balanced
- *Pleural pressure is always lesser than alveolar pressureQ,* because it is a suction (slightly negative) pressure holding the lungs open

Amount of air remaining in lungs after a normal tidal expiration is functional residual capacity (FRC), which is equal to the sum of residual volume (RV) and expiratory reserve volume (ERV). ERV is the amount of air that can be enhaled with maximal effort in excess of tidal expiration. RV is amount of air remaining in lungs after maximum expiration; which keeps alveoli inflated between breathes and mixes with fresh air on net inspiration FRC = RV + ERV

Elasticity of Chest Wall and Lungs

- Chest wall and lung are elastic structures with an opposite

tendency to *move outwards and inwards respectivelyQ.* The effect of coupling the outward pull of thoracic cage to the inward recoil of lungs by means of intrapleural film is responsible for the constant negative intrapleural pressure and resists the total deflation of lungs. That is why if the chest wall is opened (in thoracici surgery) or pneumothorax is produced, the lungs collapse completely while the thoracic cage expunds (upto 600m1) and becomes barrel shaped. Elastic recoil of lungs is d/t *stretched elastic fibers of tracheo-bronchial tree (1/3,9* and (2/3rd is d/t) surface tension of film of fluid lining the inside of alveoli. That is why lungs retain their elastic recoil even after the elastic fibers have been destroyed by enzyme elastin and lungs inflated with saline have much larger compliance (i.e. are easier to inflate/distend) than air filled lungs (as saline abolishes) the surface tension).

- Surfactant, interdependence and *continuous outward pull of* chest wall prevent the alveoli from collapsing at the end of expiration. In a structure with many connecting links such as alveoli (except those immediately adjacent to pleural surface) that are surrounded and therefore supported by other alveoli, any tendency for one group of units to reduce or increase its volume relative to the rest of structure is opposed. This support is termed interdependence and is also the reason of development of low pressure around large blood vessels and airways as lung expands. So if few alveoli collapse, large expanding forces develop on them because surrounding parenchyma is expanded.

52. Ventilation perfusion ratio is maximum at :

a) Apex of lung

b) Base of lung

c) Posterior lobe of lung

d) Middle of the lung

Correct Answer - A
A i.e. Apex of lung

53. Which of the following is most prone to hypoxic injury ?

a) Thalamus

b) Hippocampus

c) Caudate nucleus

d) Caudate nucleus

Correct Answer - B
B i.e. Hippocampus

54. Transport of Carbon monoxide (CO) is diffusion limited because:

a) High affinity of CO for haemoglobin

b) Alveolar membrane is less permeable to CO

c) CO crosses epithelial barrier slowly

d) On exposure to air there is sudden increase in partial pressure

Correct Answer - A
A i.e. High affinity of CO for haemoglobin
Transport and toxicity of carbon monoxide (CO) *is limited to its diffusing capacity because hemoglobin combines with this gas so rapidlyQ* that its partial pressure never has time to build up and is essentially *zero* in blood. The affinity of Hb for CO is 210 greater than its affinity for 0_2. So the *partial pressure as low as 0.6mmHg of* CO *may be lethalQ. CO is toxic to tissue cytochromes at level that is 1000 times of lethal dose. Therefore tissue toxicity plays no role in clinical CO poisoningQ.* It is treated by hyperbaric pure oxygen and 5% CO2.
Carbon monoxide (CO) *poisoning shifts oxyhemoglobin dissocation curve towards leftQ (i.e.* reduces amount of 02 released in tissue). It reduces the amount of Hb that can carry 0_2 and causes anemic hypoxia.

55. Pacemaker of respiration?

a) Dorsal nuclear group

b) Apneustic centre

c) Pnemotaxic centre

d) Pre Botzinger complex

Correct Answer - D
D i.e. Pre Botzinger complex

56.

Transection at mid pons level results in?

a) Hyperventlation

b) Apneusis

c) Rapid and shallow breathing

d) Hypoxia

Correct Answer - B
B i.e. Apneusis

57. Central Chemoreceptors are mot sensitive to following changes in blood:

a) $TPCO_2$

b) i,PCO_2

c) TH'

d) $TP0_2$

Correct Answer - A
A i.e. TPCO2

58. Compensating mechanisms involved in acclimatization to altitude :

a) Hyperventilation

b) Hypoventilation

c) Respiratory depression

d) Respiratory depression

Correct Answer - A

A i.e. Hyperventilation

Acclimatization to altitude occurs through *respiratory alkalosis produced by the hyperventilationQ,* which shifts the O_2- Hb dissociation curve to left.

Ventilatory Response

- The initial ventilatory response is small as alkalosis tends to counteract effect of hypoxia. However ventilation increases over next 4days (d/t CSF PH). After 4 days, ventilatory response begins to decline slowly but it takes years of residence at higher altitudes for it to decline to the initial levels.
- The *respiratory alkalosis* produced by hyper ventilation *shifts O_2-Hb dissociation curve to the leftQ,* but a concomitant *increase in RBC 2, 3, BPG* tends to *decrease the* O_2 *affinity of hemoglobinQ*
- The net effect is a small increase in P_5o. The decrease in O_2 affinity makes more O_2 available to tissue. However the value of increase in

^{P}50 is limited because when the arterial PO_2 is markedly reduced, the decreased O_2 affinity also interferes with O_2 uptake by Hb in lung.

Hyperventilation cause respiratory alkalosis d/t CO_2 washout.

59. Basal cardiac output in an adult in nearly:

a) 7.5 litre

b) 5 litre

c) 12 litre

d) 10 litre

Correct Answer - B
Ans. B i.e. 5 litre

60. Which of the following increases turbulence in blood flow

a) Reynolds number less than 2000

b) Decreases in velocity of blood

c) Decrease in density of blood

d) Increase in diameter of blood vessel

Correct Answer - D

D i.e. Increase in diameter of blood vessels

Probability of *turbulence increases* with Reynolds number > 3000, increase in **velocity** (above critical level), density of blood and diameter of vessel or with **decrease** in viscosity.

Average **velocity of flow is inversely proportional** to the total cross sectional area of the vessel. Therefore the average velocity of flow is high in aorta declines steadily in smaller vessels and is lowest in capillaries. So the cause of laminar flow in small vessels mainly is *large area of cross section and less effective velocityQ*.

Laminar (Streamline) Flow

- A streamline flow is also K/ a laminar flow because it moves in layers (or lamina). So a dye carefully introduced into a given lamina (layer) remain in that lamina as the fluid moves longitudinally along the tube.

In laminar flow the layer touching the wall of tube adheres to it and hardly moves b/o friction, while the concentric layer or lamina next to it shear/slide against this motionless layer with less friction. In this way the inner lamina moves faster than laminae on their outside with the result that the portion of fluid at the center moves fastest. This is why the shape of progressing front is parabola.

The velocity at the center of stream (in stream line flow) **is** maximal

and equal to twice the mean velocity of flow across the entire cross section of the tube. Flow of blood in vessels is normally **laminar (stream line),** which means the layer in the center of stream has highest velocity & peripheral layer (near blood vessel wall) has lowest. Streamline flow is silent. Therefore no sounds are heard with stethoscope in normal arteries.

- Average velocity of flow is inversely proportional to the total cross section area of that vessel. Therefore the average velocity of blood is high (33 cm/s) in aorta (CS 2.5 cm^2), **declines steadily in smaller vessels** and is lowest in the capillaries (0.3 mm/s), which have 1000 times the total cross sectional area of aorta (i.e. 2500 cm2).

The average velocity of blood flow increases again in veins and is relatively high in venacava, although not so high as in the aorta. *So the cause of laminar flow in small vessels is large area of cross section and less average velocityQ.*

Turbulence

- Turbulent flow is a *chaotic flow* with *irregular motions* and *flows in all directions;* it forms *eddies or whirlpools* and fluid elements *do not remain confined to definite lamina,* but *rapid, radial mixing occurs.*
- Turbulent flow offers more resistance than laminar flow; so greater pressure is required to force a given flow of fluid through the same tube when the flow is turbulent than when it is laminar. In turbulent flow, pressure drop is approximately proportional to the square of flow rate whereas in laminar flow, the pressure drop is proportional to the square of flow rate whereas in laminar flow, the pressure drop is proportional to the first power of the flow rate. So to produce same flow a pump like heart must do considerably more work if turbulence develops.
- Laminar flow occurs at velocities upto *critical velocity,* at or above which the flow becomes turbulent, and creates sound. Turbulent flow accounts for development of heart **sounds, murmurs** a/w valvular heart disease, **Korotkov sounds** heard during the measurement of arterial blood pressure, bruits heard over arteries constricted by atherosclerotic phaque and **functional cardiac murmurs** heard in patients with *hyper dynamic circulation (as thyrotoxicosis & severe chronic anemia).*

Turbulence is more common in anemia because of **reduced viscosity** and **high flow velocities** a/w high cardiac output.
- Turbulence is usually accompanied by **audible vibrations. Blood clots** and **thrombi are** more likely to develop in turbulent flow than in laminarflow.

61. Amount of coronary flow per minute is?

a) 225 ml

b) 250 ml

c) 50 ml

d) 300 ml

Correct Answer - B
Ans. B i.e. 250 ml

62. Cephalic phase of gastric secretion is mediated by

a) Neurohormones

b) Parasympathetic

c) Sympathetic

d) Gastrin

Correct Answer - B
B i.e. Parasympathetic

63. True about secretin is:

a) Increased gallbladder contraction and HCO3 rich pancreatic fluid

b) Increased gastrin secretion

c) Gastric hypermotility

d) Increase enzyme rich pancreatic fluid

Correct Answer - A
A i.e. Increased gallbladder contraction and HCO_3 rich pancreatic fluid

64. TRUE regarding action of alpha amylase

a) Breaks glucose from carbohydrate end

b) Cleaves only at a 1-4

c) Cleaves only at a 1-6

d) b & c

Correct Answer - B
B i.e. Cleaves only at (a 1-4)
a Amylase is a *carbohydrate digesting* enzyme found in *saliva, pancreatic juice* and *intestinal juice. This enzyme hydrolyses* a-1—>4 *glycosidic bonds.*

65. In a normal person at resting condition GFR is:

a) 125 ml/min

b) 90 ml/min

c) 60 ml/min

d) 150 ml/min

Correct Answer - A
A i.e. 125mlimin
GFR in an normal person at resting condition is *125m1/nin or* 7.5 *I/hour or 180L/dayQ.* Whereas the normal urine volume is about 1L/day. Thus 99% of filtrate is reabsorbed.

66. The tubuloglomerular feedback is mediated by:

a) Sensing of Na^+ concentration in the macula densa

b) Sensing of Cl^+ concentration in macula densa

c) Sensing NaCl concentration in the macula densa

d) Opening up of voltage gated Na^+ channels in afferent arteriole

Correct Answer - C
C i.e. Sensing NaC1 concentration in the macula densa
'To perform the function of auto regulation, the kidneys have a feed back mechanism (tubuloglomerular feed back) that links changes in sodium chloride concentration at the macula densa (tubular component) with the control of renal arteriolar resistance. (glomerular component).

67. CAMP acts through:

a) Activation of protein kinase

b) Activation of adenylate cyclase

c) Ca^{2+} release.

d) All

Correct Answer - A
A i.e., Activation of protein kinase

68. What is role of insulin in lipid metabolism:

a) Active lipoprotein lipase

b) Increase lipolysis

c) Activate hormone sensitive lipase

d) All

Correct Answer - A
A i.e. Active lipoprotein lipase

69. Acromegaly is due to excess of:

a) Somatomedin

b) Growth hormone

c) Somatostatin

d) Insulin

Correct Answer - B
B i.e. Growth hormone
Tumors of somatortopes of the anterior pituitary secrete large amount of *growth hormone,* leading *in children to gigantism* and in *adults to acromegaly.*
Hypersecretion of GH is accompamied by *hypersecretion of prolactin* in 20 - 40% of patient with acromegaly.
Somatomedian: are polypeptide growth factors secreted by liver & other tissues. The effect of growth hormone on growth, cartilage and protein metabolism depend on interaction between GH & somatomedian.

70. The laboratory report shows values of gonadotropin and ovarian hormones of the blood sample taken, on day 20 of the menstrual cycle of a young woman. Whether her cycle was ovulatory or not may be validly assessed by the reported serum level of :

a) FSH

b) LH

c) Oestradiol

d) Progesterone

Correct Answer - D
D i.e. Progesterone
Whether the cycle is ovulatory or anovulatory can be studied by *plasma level of progesterone and LHQ.*

Plasma Progesterone

- Progesterone is secreted by *Corpus luteumQ* which is formed after ovulation
- Its concentration rises after ovulation & peaks at mid *luteal phase (around day 20)* and then declines as luteum degenerates.

Plasma LH

- LH is secreted by anterior pituitary gland LH surge causes ovulation and formation of corpus luteum.
- Its peak *(LH surge)* is reached about *24-36 hrs before ovulationQ.* - After ovulation its level start falling because of negative feedback of progesterone.

71. Which of the following statements can be regarded as primary action of Inhibin?

a) It inhibits secretion of prolactin

b) It stimulates synthesis of estradiol.

c) It stimulates secretion of TSH.

d) It inhibits secretion of FSH.

Correct Answer - D
D i.e. It inhibits secretion of FSH

- Inhibin is a *poi ypeptide hormone* and *inhibits FSH secretionQ* of anterior pituitary by direct action
- FSH is not essential for spermatogenesis; it acts on the Sertoli cells and produces androgen-binding protein.
- Sertoli cells produce anti-Miillerian inhibiting hormone, (MIH) and inhibin. Inhibin inhibits FSH secretion and MIH inhibits development of Miillerian system

72. True about placental hormone is WE

a) hCS is diabetogenic

b) hCG rise 1/t nausea

c) Progesterone production require fetal steroidogenic tissue

d) Luteal - placental shift at 8-10 weeks

Correct Answer - C

C i.e. Progesterone production require fetal steroidogenic tissue

- At 6-8 weeks there is transfer of functions of corpus luteum to placenta.
- Before 6 weeks corpus luteum secretes 17 hydroxy progesterone.
- After the development of trophoblast, progesterone is secreted and synthesized from placenta.
- The average levels of progesterone at 12th , 28th week and at term are 25 nglml ,8O ng/ml and 300 ng/ml respectively.
- After delivery plasma progesterone decreases rapidly and becomes undetectable after 24 hrs.

73. Equilibrium potential for an ion is calculated using:

a) Gibbs-Donnan equation

b) Nerst equation

c) Goldman equation

d) None

Correct Answer - B
B i.e. Nernst equation
Equilibrium potential (i.e., membrane potential at which equilibrium b/w concentration & electrical gradient exist) *for any (one) univalent ion is calculated by Nernst equationQ and for several different ions by Goldmann- Hodgkin-katz equation.*

74. True about facilitated diffusion are A/E:

a) Occur in direction of concentration gradient

b) Does not require energy

c) Occur in direction opposite to electrical gradient

d) Facilitated by charge of molecule

Correct Answer - C
C i.e. Occur in direction opposite to electrical gradient

75. Sequence of vesicle transport is

a) ER -3 Trans → Cis -3 lysosome

b) ER→ > Cis → Trans → Cell membrane

c) ER → Lysosome → Trans → Cis

d) Cis -3 ER → Trans → Cell membrane

Correct Answer - B
B i.e. ER → Cis → Trans→ Cell membrane
Golgi apparatus serves as a unique *sorting & packing deviceQ,* that receives newly synthesized proteins, all *containing signal or transit peptide* from endoplasmic retinaculum. It rejects proteins with no signal or transit peptide without processing and that remain as cytoplasmic protein.
Golgi complex (apparatus) / Dictyosome
It is a collection of smooth membrane enclosed sacs *(cisterns)* that are stalked like dinner plates, usually near the nucleus. It has membrane similar to those of smooth ER. It is usually composed of ..4 stalked layers of 6 sacs in each apparatus It is a polarized structure with a *cis (proximal) and trans (distal) sidesQ*

76. Mean pulmonary artery pressure is:
September 2007

a) 10 mm Hg

b) 15 mm Hg

c) 20 mm Hg

d) 25 mm Hg

Correct Answer - B

Ans. B:15 mm Hg

Pulmonary arterial pressure is generated by the right ventricle ejecting blood into the pulmonary circulation, which acts as a resistance to the output from the right ventricle. With each ejection of blood during ventricular systole, the pulmonary artery blood volume increases, which stretches the wall of the artery. As the heart relaxes (ventricular diastole), blood continues to flow from the pulmonary artery into the pulmonary circulation. The smaller arteries and arterioles serve as the chief resistance vessels, and through changes in their diameter, regulate pulmonary vascular resistance.
In hemodynamic terms, the mean pulmonary arterial pressure (PAP) can be described by
PAP = (CO x PVR) + PVP
Where CO = cardiac output, PVR = pulmonary vascular resistance, and PVP = pulmonary venous pressure.
The PVP is essentially the same as left atrial pressure. Therefore, increases in CO, PVR or PVP will lead to increases in PAP.
Normally, mean pulmonary artery pressure is about 15 mmHg, and the pulmonary artery systolic and diastolic pressures about 25 and 10 mmHg, respectively. Pulmonary venous pressure is about 8 mmHg. Therefore, the pressure gradient driving flow through the

pulmonary circulation is rather small at about 7 mmHg (mean pulmonary arterial minus venous pressures).

77. All are true for oxytocin EXCEPT:
March 2013

a) Polypeptide

b) Secreted by anterior pituitary

c) Causes ejection of milk

d) Secreted in both sexes

Correct Answer - B
Ans. B i.e. Secreted by anterior pituitary
Oxytocin is secreted mainly by Supraoptic and paraventricular nucleus of hypothalamus and is transported from hypothalamus to posterior pituitary. When suitable stimuli reach the posterior pituitary from hypothalamus, oxytocin is released into blood.

78. The hormone which helps in milk secretion:
September 2008, September 2010

a) Oxytocin

b) Growth hormone

c) FSH

d) Prolactin

Correct Answer - D
Ans. D: Prolactin
Prolactin causes milk secretion from the breast after estrogen and progesterone priming. Its effect on the breast involves increased action of mRNA and increased production of casein and lactalbumin. Prolactin also inhibits the effects of gonadotropins, possibly by an action at the level of the ovary.
The function of prolactin in normal males is unsettled, but excess prolactin secreted by tumors causes impotence. Remember oxytocin causes Ejection of milk.

79. Substance used to measure renal perfusion:
March 2007

a) Inulin

b) PAH

c) Creatinine

d) Mannitol

Correct Answer - B
Ans. B: PAH
Para-Aminohippurate (PAH) is a substance used in the measurement of renal blood flow.
It is useful in this measurement because it is primarily secreted by the renal tubules; only 20% is filtered by the glomerulus. The renal extraction ratio of PAH is a normal individual is approximately 0.92.

80. True regarding water absorption in tubules:
September 2007

a) Majority of facultative reabsorption occurs in proximal tubule

b) Bulk of water reabsorption occurs secondary to sodium absorption

c) 25% of water is reabsorbed irrespective of water balance

d) Obligatory reabsorption is ADH dependent

Correct Answer - B
Ans. B: Bulk of water reabsorption occurs secondary to sodium absorption
Water reabsorption keeps pace with the sodium reabsorption in the proximal tubules and hence the concentration of sodium and total osmolarity remains the same.

81. Ion which promotes glucose absorption in the gut region:
September 2007

a) Cl ?

b) K+

c) Na+

d) Ca2+

Correct Answer - C
Ans. C: Na+
Glucose enters cells by facilitated diffusion or, in the intestine and kidneys, by secondary active transport with Na+. In muscle, fat, and some other tissues, insulin facilitates glucose entry into cells by increasing the number of glucose transporters in the cell membranes.
The glucose transporters that are responsible for facilitated diffusion of glucose across cell membranes are a family of closely related proteins that cross the cell membrane 12 times and have their amino and carboxyl terminals inside the cell. They differ from and have no homology with the sodium-dependent glucose transporters, SGLT 1 and SGLT 2, responsible for the secondary active transport of glucose out of the intestine, although the SGLTs also have 12 transmembrane domains. Particularly in transmembrane helical segments 3, 5, 7, and 11, the amino acids of the facilitative transporters appear to surround channels that glucose can enter. Presumably, conformation then changes and glucose is released inside the cell.

82. Salivary amylase is activated by:
March 2007

a) Sodium Ion

b) Chlorine Ion

c) Potassium Ion

d) Bicarbonate Ion

Correct Answer - B

Ans. B: Chlorine Ion

Salivary Amylase break large, insoluble starch molecules into soluble starches (amythrodextrin, achrodestrin and ultimately maltose.

Ptyalin acts on linear alpha (1,4) glycosidic linkages.

Optimum conditions for ptyalin

- Optimum pH - 5.6 -6.9
- Human body temperature-37 degrees Celsius
- Presence of certain anions and activators:
  - **Chlorine** and bromine - **most effective**
  - Iodine - less effective
  - Sulfate and phosphate
  - least effective

83. Which of the following inhibits gastric phase of gastric secretion: *March 2011*

a) Amino acids in stomach

b) Vagus effect

c) Distension of the stomach

d) Low gastric pH

Correct Answer - D

Ans. D: Low gastric pH

Food in the stomach increase gastric acid secretion by stretching the receptors in the wall of the stomach (mechanical stimulus) The fibers from the receptor enter Meissner's plexus (site of ganglion cells of vagus nerve)

Products of digestion (specially amino acids) in the stomach also stimulates gastric mucosa (chemical stimulus)

Gastric secretion

Gastric acid is produced by parietal cells (also called oxyntic cells) in the stomach. There are three phases in the secretion of gastric acid:

- The cephalic phase: Thirty percent of the total gastric acid secretions to be produced is stimulated by anticipation of eating and the smell or taste of food

The gastric phase: Sixty percent of the acid secreted is stimulated by the distention of the stomach with food. Plus, digestion produces proteins, which causes even more gastrin production

The intestinal phase: The remaining 10% of acid is secreted when chyme enters the small intestine, and is stimulated by small intestine distention.

Regulation of secretion

- Gastric acid production is regulated by both the autonomic nervous system and several hormones.
- The parasympathetic nervous system, via the vagus nerve, and the hormone gastrin stimulate the parietal cell to produce gastric acid, both directly acting on parietal cells and indirectly, through the stimulation of the secretion of the hormone histamine from enterochromaffine-like cells (ECL).
- Vasoactive intestinal peptide, cholecystokinin, and secretin all inhibit production.
- The production of gastric acid in the stomach is tightly regulated by positive regulators and negative feedback mechanisms.
- Four types of cells are involved in this process: parietal cells, G cells, D cells and enterochromaffine-like cells.
- Besides this, the endings of the vagus nerve (CN X) and the intramural nervous plexus in the digestive tract influence the secretion significantly.
- Nerve endings in the stomach secrete two stimulatory neurotransmitters: acetylcholine and gastrin-releasing peptide. Their action is both direct on parietal cells and mediated through the secretion of gastrin from G cells and histamine from enterochromaffine-like cells.
- Gastrin acts on parietal cells directly and indirectly too, by stimulating the release of histamine.
- The release of histamine is the most important positive regulation mechanism of the secretion of gastric acid in the stomach.
- Its release is stimulated by gastrin and acetylcholine and inhibited by somatostatin.

84. Shivering is controlled by:
***September 2012, March* 2013**

a) Dorsomedial nucleus

b) Posterior hypothalamus

c) Perifornical nucleus

d) Lateral hypothalamic area

Correct Answer - B

Ans. B i.e. Posterior hypothalamus

Shivering/Shuddering

- It is a bodily function in response to **early** hypothermia in warm-blooded animals.
- When the core body temperature drops, the shivering reflex is triggered to maintain homeostasis.
- Muscle groups around the vital organs begin to shake in small movements in an attempt to create warmth by expending energy.
- Shivering can also be a response to a fever, as a person may feel cold, though their core temperature is already elevated.
- Located in the posterior hypothalamus near the wall of the third ventricle is an area called the primary motor center for shivering.
- This area is normally inhibited by signals from the heat center in the anterior hypothalamic-preoptic area but is excited by cold signals from the skin and spinal cord.

85. All or none law is obeyed by:

March 2005

a) Post synaptic potential

b) Non propagated potential

c) Action potential

d) Spike potential

Correct Answer - C
Ans. C: Action potential
Once threshold intensity is reached, a full fledged action potential is produced.
The action potential fails to occur if the stimulus is subthreshold in magnitude and it occurs with constant amplitude and form, regardless of the strength of the stimulus if the stimulus is at or above threshold intensity. Therefore action-potential obeys all or none law

86. A cut /lesion above the pyramidal tract decussation results in: *September 2007*

a) Paralysis of the opposite half of the body

b) Contralateral loss of propioception

c) Ipsilateral loss of pain and temperature

d) Contralateral loss of vibration and joint position

Correct Answer - A
Ans. A: Paralysis of the opposite half of the body
The Pyramidal Tract/corticspinal tract is group of fibers carries messages for voluntary motor movement to the lower motor neurons in the brain stem and spinal cord.
Approximately 80% of the cell bodies of the pyramidal tract are located on the precentral gyrus of the frontal lobe (the motor strip). Approximately 20% of the pyramidal tract fibers also originate in the postcentral gyrus of the parietal lobe, in Brodmann's areas 1, 2, and 3. Regardless of the location of their cell bodies, pyramidal tract fibers begin their descent from the cortex as a corona radiata (radiating crown) before forming the internal capsule.
This tract is direct and monosynaptic which allows messages to be transmitted very rapidly from the central nervous system to the periphery.
The fibers of the pyramidal tract that synapse with spinal nerves sending information about voluntary movement to the skeletal muscles form the cortico-spinal tract. As they descend through the brain, they form part of the posterior limb of the internal capsule. At the pyramids in the inferior part of the medulla, eighty-five to ninety percent of cortico-spinal fibers decussate, or cross to the

ninety percent of cortico-spinal fibers decussate, or cross to the other side of the brain. The remaining ten to fifteen percent continue to descend ipsilaterally. The fibers that decussate are called the lateral cortico-spinal tract or the lateral pyramidal tract. Because they descend along the sides of the spinal cord, the uncrossed or direct fibers that synapse with spinal nerves on the ipsilateral side of the body are called the direct pyramidal tract. They may also be referred to as the ventral pyramidal tract or the anterior cortico-spinal tract since they travel down the ventral aspect of the spinal cord.
The spinal nerves receive only contralateral innervation from the cortico-spinal tract. This means that unilateral pyramidal tract lesions above the point of decussation in the pyramids will cause paralysis of the muscles served by the spinal nerves on the opposite side of the body. For example, a lesion on the left pyramidal tract above the point of decussation could cause paralysis on the right side of the body.

87. Features of occipital lobe of brain *are all* except:
March 2008

a) Visual cortex lies in relation to calcarine fissure

b) Brodmann's area 17 corresponds to visual cortex

c) Geniculocalcarine fibres from the medial half of the lateral geniculate terminate on the superior lip of the calcarine fissure

d) Its the only area in the brain activated by visual stimuli

Correct Answer - D
Ans. D: Its the only area in the brain activated by visual stimuli

88. Dreaming is common in which stage of sleep:
September 2008

a) REM

b) NREM 1

c) NREM 2

d) NREM 3

Correct Answer - A
Ans. A: REM
Humans aroused at a time when they show the EEG characteristics of REM sleep generally report that they were dreaming, whereas individuals awakened from slow-wave sleep/ NREM do not. This observation and other evidence indicate that REM sleep and dreaming are closely associated. The tooth-grinding (bruxism) that occurs in some individuals is also associated with dreaming.

89. Function of a muscle spindle is:
September 2009

a) Regulates withdrawl reflex

b) Maintains muscle tone

c) Feedback device to maintain muscle length

d) Receptor for inverse stretch reflex

Correct Answer - C
Ans. C: Feedback device to maintain muscle

90. Sensory organ for responding to texture is:
September 2009

a) Meissner corpuscles

b) Merkel cells

c) Ruffini corpuscles

d) Pacician corpuscles

Correct Answer - A
Ans. A: Meissner corpuscles
Sensory organs and their responses:

- Meissner corpuscles-Responds to changes in texture and slow vibrations
- Merkel cells-responds to sustained pressure and touch
- Ruffini corpuscles-respond to sustained pressure
- Pacician corpuscles-respond to deep pressure and fast vibration

91. Which of the following is not carried in dorsal column of spinal cord: *March 2011*

a) Proprioception

b) Vibratory sense

c) Heat sensation

d) Touch

Correct Answer - C

Ans. C: Heat sensation

Lateral spinothalamic tract carries fibers of all type of pain and temperature impulses (both hot and cold)

Spinothalamic tract

- It transmits information to the thalamus about pain, temperature, itch and crude touch.
- The pathway decussates at the level of the spinal cord, rather than in the brainstem like the posterior column-medial lemniscus pathway and corticospinal tract.

Posterior column-medial lemniscus pathway/dorsal column-medial lemniscus pathway/dorsal white column-medial lemniscus system

- It is the sensory pathway responsible for transmitting fine touch, vibration and conscious proprioceptive information from the body to the cerebral cortex as well as tactile pressure, barognosis, graphesthesia, stereognosis, recognition of texture, kinesthesia and two-point discrimination.
- The name comes from the two structures that the sensation travels up: the posterior (or dorsal) columns of the spinal cord, and the medial lemniscus in the brainstem.

- Because the posterior columns are also called dorsal columns, the pathway is often called the dorsal column-medial lemniscus system, or DCML for short. (Also called posterior column-medial lemniscus or PCML pathway).
- The PCML is pathway is composed of rapidly conducting, large, myelinated fibers
- The pathway is tested with the Romberg's test.
- Lesions to the posterior column-medial lemniscus pathway below the decussation of its fibers produce loss of sensation on the same side of the body as the lesion.
  Above the decussation produces loss of sensation on the opposite side of the body than the lesion

92. Shift to right in Oxygen dissociation curve is seen in all except:
March 2007

a) Increased PaCO2

b) Decreased PaCO2

c) Increase in 2, 3 DPG

d) Decreased pH

Correct Answer - B

Ans. **B:** Decreased PaCO2

Haemoglobin is the primary vehicle for transporting oxygen in the blood.

The oxygen carrying capacity is determined by the amount of haemoglobin present in the blood. Oxygen is also carried dissolved in the blood's plasma, but to a much lesser degree.

A hemoglobin molecule can bind up to four oxygen molecules in a reversible way.

The oxygen-hemoglobin dissociation curve has a sigmoidal or S-shape.

The partial pressure of oxygen in the blood at which the hemoglobin is 50% saturated, is known as the P50. The P50 is a conventional measure of hemoglobin affinity for oxygen. An increased P50 indicates a rightward shift and a decreased affinity of the standard curve, which means that a larger partial pressure is necessary to maintain a 50% oxygen saturation. Conversely, a lower P50 indicates a leftward shift and a higher affinity.

Left shift of the curve is a sign of hemoglobin's increased affinity for oxygen (e.g. at the lungs). Similarly, right shift

shows decreased affinity, as seen in:

- An increase in body temperature,
- An increase in hydrogen ion,
- An increase in 2, 3-bisphosphoglycerate
- An increase in carbon dioxide concentration (the Bohr effect)

With fetal hemoglobin, the shift facilitates diffusion of oxygen across the placenta. The oxygen dissociation curve for myoglobin exists even further to the left.

93. Separation of first polar body occurs at the time of:
September 2007, March 2012

a) Fertilization

b) Ovulation

c) Implantation

d) Menstruation

Correct Answer - B
Ans. B: Ovulation
Asymmetrical cell division (cytokinesis) leads to the production of polar bodies during oogenesis. To conserve nutrients, the majority of cytoplasm is segregated into either the secondary oocyte and, or ovum, during meiosis I or meiosis II, respectively.
The remaining daughter cells generated from the meiotic events contain relatively little cytoplasm and are referred to as polar bodies. Eventually, the polar bodies degenerate.
There may be one or two polar bodies in the ovum. The first polar body is one of the two products in the first stage of meiosis, just before ovulation and is considered diploid, with 23 duplicated chromosomes. The second polar body is haploid, with 23 unduplicated chromosomes and is produced only when a sperm penetrates the oocyte.

94. Term period for embryonic period:
September 2006

a) 0-14 days of gestation

b) 14 days to 9 weeks of gestation

c) 9 weeks to birth

d) 22 weeks intrauterine to 7 days after birth

Correct Answer - B
Ans. B: 14 days to 9 weeks of gestation
The embryonic period in humans begins at fertilization (12-24hrs after ovulation, generally between the 2nd and 3rd week of gestational age) and continues until the end of the 9th week of gestation (8th week by embryonic age).

95. Most abundant ion in intracellular fluid is:
September 2008, September 2012, March 2013

a) Protein

b) Bicarbonate

c) Potassium

d) Sodium

Correct Answer - C
Ans. C: Potassium
Intracellular component of the body water accounts for about 40% of body weight and extracellular component for about 20%.
Concentration of potassium in cytosol is 139 millimeter and of Amino acids (in proteins) is 138 millimeter,

96. Main content of bilayer cell membrane is:
March 2009

a) Glycerol

b) Cholesterol

c) Cholesterol ester

d) Triacyl glycerol

Correct Answer - B
Ans. B: Cholesterol
Biological membranes typically include several types of lipids other than phospholipids. A particularly important example in animal cells is cholesterol, which helps strengthen the bilayer and decrease its permeability.
Cholesterol also helps regulate the activity of certain integral membrane proteins. Integral membrane proteins function when incorporated into a lipid bilayer.
Because bilayers define the boundaries of the cell and its compartments, these membrane proteins are involved in many intra- and inter-cellular signaling processes.

97. Amylin is secreted by ?

a) α-cells of pancreas

b) β-cells of pancreas

c) δ-cells of pancreas

d) None

Correct Answer - B
Ans. is 'b' i.e.,β-cells of pancreas
Pancreas is a structure which may be considered two organs in one : *Exocrine pancreas and endocrine pancreas.*
Its exocrine part secretes digestive enzymes and has been discussed in respective chapter.
The endocrine part, which secretes hormone will be discussed here.
The endocrine part forms only about 1% of weight of pancreas.
Histologically, the endocrine pancreas is formed by about a million of pancreatic islets (islets of langerhans).
The islets have four types of cells which secrete four different hormones.
i) A cells form about 25% of the islet cells and secrete glucagon.
ii) B cells form about 70% of the islet cells and secrete insulin and amylin.
iii) D cells form about 5% of the islet cells and secrete somatostatin.
iv) F cells are very few in number and secrete pancreatic polypeptide.

98. Following changes are seen during capacitation of a sperms except ?

a) Increased permeability to calcium

b) Decreased permeability to calcium

c) Removal of cholesterol from acrosome

d) Increased motility

Correct Answer - B
Ans. is 'b' i.e., Decreased permeability to calcium
Capacitation of sperm (spermatozoa)
Spermatozoa leaving the testis (seminiferous ubules) are not fully mobile. They continue their maturation and acquire their mobility during their passage through epididymis. From epididymis they come to vas deference, distal end of which also receives the secretions of seminal vesicle, and continues as the ejeculatory duct. The ejeculatory duct joins the prostatic urethra.
Once ejeculated into the the female, vaginal secretions improve the motility and fertilizing ability of sperms. Further exposure to secretions of female genital tract (in uterus and/or fallopian tube) further improves the mobility and fertilizing ability of the sperms. The beneficial effects of stay in the female genital tract are collectively called capacitation, from the isthmus, capacitated sperms move rapidly to the ampullas, where fertilization takes place.
Following changes occur during capacitation :-
i) Uterine and fallopian tube fluids wash away the various inhibitory factors that suppress sperm activity in male genital tract.
ii) Removal of cholesterol vesicle from acrosome so that acrosomal membrane becomes weak and can release enzyme at the time of fertilization.

iii) Increase membrane permeability to calcium ion.

99. Satiety centre is located at ?

a) Ventromedial nucleus of hypothalamus

b) Dorsomedial nucleus of hypothalamus

c) Peritrigonal area

d) Lateral nucleus

Correct Answer - A
Ans. is 'a' i.e., Ventromedial nucleus of hypothalamus

100. Right shift of oxygen dissociation curve is caused by?

a) Hypothermia

b) Hypoxia

c) Alkalosis

d) HbF

Correct Answer - B
Ans. is `b' i.e., Hypoxia

101. Sertoli cells in male secrete ?

a) Testosterone

b) Dehydroepiandrosterone

c) MIH

d) Progesterone

Correct Answer - C
Ans. is 'c' i.e., MIH
Sertoli cells are stimulated by FSH and secrete :-
i) Androgen binding protein (ABP)
ii) Inhibin
iii) Mullerian inhibiting substance (MIS) or Mullerian inhibiting hormone (MIH)
Leydig cells are stimulated by LH and secrete *androgens (testesterone), dihydrotestosterone, androstendione, dehydroepiandrosterone.*

102. Myosin and actin filaments are kept in place by ?

a) Tropomyosin

b) Troponin

c) Actinin

d) Titin

Correct Answer - D
Ans. is 'd' i.e., Titin

- The side-by-side relationship between the myosin and actin filaments is difficult to maintain.
- This is achieved by a large number of filamentous molecules of a protein called titin.
- *Titin molecules act as a framework that holds the myosin and actin filaments in place* so that the contractile machinery of the sarcomere will work.

Important muscle proteins

1. Myosin :- Myosin is the protein that constitutes the *thick filaments.* Myosin of skeletal muscle is *myosin-IL* Myosin participates in the contractile mechanism and also acts as an ATPase.
2. Actin :- Actin is the major protein of *thin filament.* It is the actin which slides over myosin during contraction.
3. Tropomyosin : - It is the other protein of *thin filament.* It covers the active sites (myosin binding sites) on actin. When Ca^{+2} concentration of cytoplasm (sarcoplasm) is raised, it uncovers the active sites of actin and allow the contraction So, *the 'cross-bridge cycling' is switched off or on by the tropomyosin molecule which slides on the actin molecule to cover or uncover the active sites on*

it.

103. True about cerebellar neuronal connections ?

a) Climbing fibres from inferior olivary nucleus

b) Mossy fibres from inferior olivary nucleus

c) Climbing fibres are inhibitory to Purkinje cells

d) Mossy fibres are inhibitory to Purkinje cells

Correct Answer - A

Ans. is 'a' i.e., Climbing fibres from inferior olivary nucleus

Neuronal circuit in cerebellum

Afferent for cerebellum comes through two fibers : climbing fibers and Mossy fibers. *Climbing fibers* which brings information only from the inferior olivary nuclei and establish excitatory synapes with purkinje cells. All other afferent input to the cerebellum is brought by the other types of fibers, called Mossy fibers which establish *excitatory synapse with granule cells* in the granular cell layer. The axon of granule cells, called *parallel fibers, stimulate the purkinje cells.* Thus mossy fibers, like the climbing fibers, also end up in stimulating the purkinje cells.

Granule cells are the only stimulatory (excitatory) cells in cerebellar cortex.

The *parallel fibers (axons of granule cells)* also stimulate three types of *interneurons :- Stellate and basket cells in the molecular layer,* and *Golgi cells in the granular layer.* Stellate and basket cells inhibit purkinje cells. Golgi cells, also activated by collateral from mossy fibers (besides parallel fibers), inhibit transmission from mossy fibers to granule cells.

Overall, *climbing fiber inputs exert a strong excitatory effect on a single purkinje cell, Whereas mossy fiber inputs exert a weak*

excitatory effect on many purkinje cells via the granule cells.
After complex inhibiting and excitatory interactions of various fibers and cells in the cortex, the output of cerebellar cortex, is projected to deep cerebellar nuclei by axons of pyramidal cells (only output cells of cerebellar cortex). The output of the Purkinje cells is inhibitory to the deep cerebellar nuclei. However, the output of deep cerebellar nuclei to the brain stem and thalamus is always excitatory because, beside inhibitory inputs of purkinje cells, deep cerebellar nuclei also receive excitatory inputs from afferent mossy and climbing fibers which usually are more prominent.

104. Pain is carried by which type of nerve fibres ?

a) aα

b) Aβ

c) B

d) C

Correct Answer - D
Ans. is 'd' i.e., C

105. Resting membrane potential in cardiac muscle ?

a) -70 mV

b) +70 mV

c) -90 mV

d) +90 mV

Correct Answer - C
Ans. is 'c' i.e., -90 mV
Normal RMP in myocardial fibers is about -90 mV.

106. Growth hormone does not cause ?

a) Gigantism

b) Acromegaly

c) Diabetes mellitus

d) Hypothyroidism

Correct Answer - D
Ans. is 'd' i.e., Hypothyroidism
Physiological effects of Growth hormone

- Growth hormone has two major action, i.e., (1) Stimulation of skeletal growth, and (2) Regulation of metabolism. 3) Stimulation of skeletal growth

The effect of GH on skeletal growth is mediated by somatomedins (Insulin-like growth factors : IGF). They are synthesized mainly *in the liver.* The growth promoting action of somatomedins is helped by their insulin like actions. GH, through somatomedin (IGF-1), stimulates proliferation of chondrocytes and osteocytes resulting in increased deposition of chondroitin sulfate in catilage and increased ossification of the newly formed cartilage.
GH deficiency in early life causes dwarfism (small height). GH excess in early life leads to *gigantism,* whereas growth hormone excess in adulthood results in acromegaly.
2) Regulation of metabolism
Protein metabolism : - GH has predominantly *anabolic effects* on skeletal and cardiac muscle where it promotes amino acid transport into cells and increase protein synthesis.
Carbohydrate and fat metabolism : - The effects of GH on carbohydrate and fat metabolism are complicated by the fact that *GH has anti-insulin effects, whereas somatomedins it produces have*

insulin like effects:-
i) Anti-insulin effects due to direct effect of GH include **decreased peripheral utilization of glucose, increased gluconeogenesis, hyperglycemia,** and lipolysis. Due to its anti-insulin effects GH excess can cause **insulin resistant diabetes mellitus.**
ii) Insulin like effects due to somatomedins (IGF) include **antilipolytic activity,** and other insulin like effects.

107. PR interval in ECG denotes ?

a) Isovolumetric contraction of ventricle

b) Insovolumetric relaxation of heart

c) Atrial contraction

d) None

Correct Answer - C
Ans. is 'c' i.e., Atrial contraction
PR interval represents atrial depolarization (atrial contraction) and condution throught AV nude
Electrocardiogram
Normal ECG in a bipolar limb leads typically shows five waves named P, Q, R, S and T. Q, R and S waves are collectively called QRS complex.

108. Most powerful BP regulator in normal arterial pressure range ?

a) Baroreceptors

b) Carotid body (chemoreceptor)

c) CNS ischemia

d) All are same

Correct Answer - A

Ans. is 'a' i.e., Baroreceptors

Baroreceptors are the main regulators when BP is between 70-150 mmHg.

Regulation of blood pressure

Blood pressure is regulated by following mechanisms.

A) Short term regulation

B) Long term regulation

A) Short term regulation

These mechanisms act immediately and correct the blood pressure quickly.

These are :-

i. *Baroreceptor reflex :* Works during BP range 70-150 mmHg.
i. *Chemoreceptor reflex :* Works when BP below 80 mmHg.
i. *CNS ischemic response :* This the only hope of survival when BP is below 40 mmHg.
*. *Hormonal release :* These are ?
*. *Antidiuretic hormone (ADH) :* Increases water reabsorption in kidney.
i. *Angiotensin II :* Causes vasoconstriction.

B) Long term regulation

- This is the mechanism which takes long time for regulation.

- This mechanism is present in kidneys.
- This mechanism adjusts the BP by adjusting valume of extracellular fluid and blood.
- These mechanism are -

i. *Pressure diuresis.*
i. *Pressure natreuresis.*
i. *Renin-angiotensin-aldosterone system.*

109. Central venous pressure is ?

a) Pressure in IVC

b) Pressure in SVC

c) Pressure in right atrium

d) Pressure in right ventricle

Correct Answer - C
Ans. is 'c' i.e., Pressure in right atrium
Central venous pressure (CVP) refers to pressure in right atrium because all the systemic veins open into right atrium.
Normal right atrial pressure (CVP) is *about 2 mm Hg.*

110. Function of cerebrocerebellum ?

a) Vestibulo-ocular reflex

b) Smoothening and coordination of movement

c) Planning of movements

d) Postural balance

Correct Answer - C
Ans. is 'c' i.e., Planning of movements
Functional divisions of cerebellum
From the functional point of view the cerebellum is divided into three parts : ?
1) Vestibulocerebellum (flocculonodular lobe)
This division contains flocculus, and nodulus, i.e., *flocculonodular lobe.* It receives afferent from the vestibular apparatus and sends efferents to the vestibular nuclei directly without projecting on deep nuclei. It works with vestibular apparatus to : -
i) Modulate muscular activity so as to achieve postural equilibrium or balance.
ii) Coordinate movements of the eyes with movements of head, i.e., vestibulo-ocular reflex .
2) Spinocerebellum
It consists of the vermis and the adjacent medial portion of cerebellar hemisphere. It receives proprioccptive information from the body as well as a copy of the "Motor plan" from the motor cortex. By comparing plan, it smoothens and coordinates movements that are ongoing.
3) Cerebrocerebellum (neocerebellum)
It is the large lateral portion of cerebellar hemisphere. They are the newest from a phylogenetic point of view and therefore also called neocerebellum. They interact with the motor cortex in planning and

neocerebellum. They interact with the motor cortex in planning and programming movements.

111. 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

112. Preaccelerin is ?

a) Eater II

b) Facter V

c) Facter VII

d) Facter X

Correct Answer - C
Ans. is 'c' i.e., Facter VII

113. 2-3 DPG is decreased in ?

a) Anemia

b) Acidosis

c) High altitude

d) Exercise

Correct Answer - B
Ans. is 'b' i.e., Acidosis
Factors which decrease 2,3 DPG and cause left shift of O_2 dissociation curve are :-
i) Acidosis
ii) Stored blood
iii) Fetal hemoglobin

114. Which one is excitatory ?

a) Putamen

b) Caudate nucleus

c) Striatum

d) Subthalamic nucleus

Correct Answer - D
Ans. is 'd' i.e., Subthalamic nucleus
Basal ganglia are richly connected with one another.
These connections include : ?
1) Dopaminergic nigrostriatal projection from the substantia nigra pars compacta (SNPC) to the striatum (caudate nucleus and putamen) and *corresponding GABAergic projection from striatum to substantia nigra pars reticulata (SNPR). Dopamine is the major neurotransmitter in Substantia nigra.*
2) The striatum has GABAergic projections (inhibitory) to both globus pallidus inner segment (IS) as well as globus pallidus external segment (ES).
3) Globus pallidus ES has GABAergic projections to Subthalamic nucleus and to Globus pallidus IS.
4) Subthalamic nucleus has glutamate-ergic (excitatory) projections on both globus pallidus IS as well as globus pallidus ES.
5) Cholinergic interneurons are there within the striatum.

115. 2, 3 DPG causes ?

a) Decrease binding of O_2 and hemoglobin

b) Increased acidity in RBC

c) Decreased acidity in RBC

d) Lysis of RBC

Correct Answer - A
Ans. is 'a' i.e., Decrease binding of O_2 and hemoglobin
DPG is an optional by-product of the glycolytic pathway . DPG binds with deoxygenated hemoglobin but not with oxygenated hemoglobin . Therefore raised DPG concentration releases oxygen from oxyhemoglobin by shifting thefollowing reversible reaction to the right : -
HbO, + DPGHb - DPG + 02
One molecule of DPG binds with one mole of deoxyhemoglobin. That is why in the presence of raised DPG concentration, less oxygen can combine with hemoglobin at a given PO_2. Hence an increase in DPG concentration shifts the oxygen-hemoglobin dissociation curve to the right. Thus 2,3 DPG causes delivery (unloading) of O_2 to the tissues.

116. Gastric emptying is delayed by ?

a) Distension of stomach

b) Gastrin

c) Acid in duodenum

d) Vagal stimulation

Correct Answer - C
Ans. is 'c' i.e., Acid in duodenum
<u>Gastric emptying</u>
The rate at which the stomach empties into the duodenum depends on the quantity and the type of food ingested. Distension of stomach triggers long (vagally mediated) and short (intrinsic neural plexus mediated) reflexes leading to strong peristaltic waves and increased gastric emptying. The local hormone gastrin also increases the rate of gastric emptying .
Certain signals from the duodenum have a more important regulatory control over the gastric emptying. Distension of the duodenum; Hyperosmolarity in the duodenum (hyperosmolar chyme) ; and presence of acid, fatsand products of protein digestion in duodenum decrease gastric emptying by : -
i) Hormonal mechanism :- Release of several intestinal hormones like secretin, cholecystokinin, VIP, GIP inhibit gastrin emptying, but also gastric acid secretion.
ii) Enterogastric reflex : - Inhibit gastric emptying through the intrinsic enteric neural plexus.
The rate at which the stomach empties into the duodenum depends on the type of food ingested. Food rich in carbohydrate leaves the stomach in a few hours. Protein rich food leaves more slowly, and emptying is slowest after a meal containing fat.

117. Which hormone increases with age ?

a) GI

b) Prolactin

c) FSH

d) Insulin

Correct Answer - C
Ans. is 'c' i.e., FSH
Increasing age affects the hormonal secretion of body.

118. ABO antigens are not present in ?

a) Saliva

b) CSF

c) Blood

d) Tear

Correct Answer - B
Ans. is 'b' i.e., CSF
"Soluble ABO antigens are detected in secretions and all body fluids except cerebrospinal fluid".

119. Longest life span among following ?

a) RBC

b) Plalalets

c) Neutrophils

d) Macrophages

Correct Answer - D
Ans. is 'd' i.e., Macrophages

120. Each hemoglobin molecule contains how many globin?

a) 1

b) 2

c) 3

d) 4

Correct Answer - A
Ans. is 'a' i.e., 1
Hemoglobin is the most important red cell constituent.
The hemoglobin molecule is an assembly *of four* globular protein.
Each subunit is composed of a protein (polypeptide) part, i.e., *globin* and a nonprotein part i.e., *heme, i.e.,* Each hemoglobin molecule contains four heme units and two pairs of similar protein, globin.
The heme part of globular protein is same in all types of hemoglobin.
The protein part vary in different hemoglobin : ?

1. Adult hemoglobin (Hemoglobin A) consist of two identical a-chains and two identical n-chains.
2. Fetal hemoglobin (H bF) consists of two identical a-chains and two identical y chains.
3. Minor hemoglobin (HbA_2) consist of two identical a-chains and two identical 8 chains.

Each hemoglobin molecule consists of globin *(4 polypeptide chains) and 4 heme molecules.*

121. Sensory fibers least susceptible to hypoxia ?

a) Type I

b) Type II

c) Type III

d) Type IV

Correct Answer - D
Ans. is 'd' i.e., Type IV
Type C fibers (Type IV Lloyd & Hunt) are least susceptible to hyproxia.
Local anesthesia, hypoxia and pressure can block the conduction of nerve impulses. Different fibers have different susceptibility :-
Most susceptible fibers to pressure are 'A' fibers and least susceptible fibers to pressure are C fibers. Amongst the A fibers, Aa are most susceptible to pressure.
Most susceptible fibers to hypoxia are B fibers *and least susceptible fibers to hypoxia are C fibers.*
Most susceptible fibers to local anesthesia are C fibers and least susceptible fibers to LA are A fibers.

122. Appetite is increased by ?

a) α-MHS

b) Leptin

c) Serotonin

d) Neuropeptide Y

Correct Answer - D
Ans. is 'd' i.e., Neuropeptide Y

123. Hormone with no change in levels in menstrual cycle?

a) Activin

b) Inhibin

c) FSH

d) GnRH

Correct Answer - A

Ans. is 'a' i.e., Activin

Hormonal regulation of the menstrual cycle

- Menstrual cycle involves the interplay of ovarian, pituitary and hypothalamic hormones.
- At the beginning of the cycle, the estrogen level is very low and progesterone level is negligible.
- Therefore, the pituitary and hypothalamus are free from the negative feedback effect of estrogen and progesterone.
- Hence the hypothalamus secretes GnRH and the anterior pituitary secretes FSH and some LH.
- FSH stimulates follicular development.
- Ovarian follicles secrete estrogen.
- Estrogen tends to suppress FSH secretion, but progressive follicular development ensures a rise in estrogen level.
- Around day 11 of the cycle, the estrogen level crosses a certain threshold.
- Above this threshold level. estrogen has a positive feedback effect on LH secretion, and to some extent also on FSH secretion.
- This leads to LH and FSH surge.
- The LH surge is essential for ovulation.
- After ovulation has taken place on day 14, the corpus luteum starts

developing under the influence of LH.

- Corpus luteum secretes estrogen, progesterone and inhibin.
- The combined effect of these hormones is to suppress the secretion of FSH and LH by negative feedback effect on the anterior pituitary, and to a lesser extent also on the hypothalamic GnRH secretion.
- Absence of support from FSH and LH leads to regression of the corpus luteum.
- Regression of the corpus luteum leads to a sharp decline in estrogen and progesterone levels.
- Withdrawal of support from estrogen and progesterone leads to menstrual bleeding.
- Thus one cycle ends and the next cycle begins.

124. Medullary chemoreceptors are sensitive to ?

a) H^+ in CSF

b) CO2 in CSF

c) H^+ in blood

d) CO2 in blood

Correct Answer - A

Ans. is 'a' i.e., H^+ in CSF

The primary direct stimulus for central chemoreceptors is increased H^+ concentration in the CSF and brain interstitial fluid.

Central chemoreceptors

- These receptors are located in a chemosensitive area on the ventral surface of the medulla near the exit of the ninth and tenth cranial nerves. The primary stimulus for the central chemoreceptors is an increase in the hydrogen ion concentration. Stimulation of central chemoreceptors by increased hydrogen ion concentration leads to excitation of the respiratory neurons, thereby producing an increase in the rate and depth of respiration.
- Although the primary stimulus for central chemoreceptors is an increase in hydrogen ion concentration, in actual practice the physiological stimulus is an increase in PCO_2. The reason is that hydrogen ions cannot cross blood - brain barrier. Therefore, a change in the blood hydrogen ion concentration does not change the hydrogen ion concentration in the immediate vicinity of the chemosensitive neurons (i.e., in CSF and brain interstitial fluid). On the other hand, CO_2 being lipid soluble can easily cross blood brain barrier. It enters the brain, where it is hydrated to give rise to *fr* and

HCO_2- ions. Now these H' directly stimulate the central chemoreceptors.

- Thus, central chemoreceptors are directly stimulated by an increase in H^+ concentration in CSF and brain inerstitial tissue, which is brought about by change in arterial PCO_2 ($PaCO_2$).

125. In peristalsis following are involved except ?

a) NO

b) Substance P

c) Noradrenaline

d) VIP

Correct Answer - C
Ans. is 'c' i.e., Noradrenaline

- Peristalsis requires an active myenteric (Auerbach's) plexus.
- Local stretch by chyme releases serotonin, which activates myenteric plexus.
- Cholinergic neurons of this plexus passing in a retrograde direction release substance P and acetylcholine, causing smooth muscle contraction.
- Cholinergic neurons passing in an antegrade direction activate neurons that secrete NO, VIP, and ATP, produing relaxation ahead of the stimulus.

126. BP is measured in ?

a) Axillary artery

b) Carotid artery

c) Brachial artery

d) Radial artery

Correct Answer - C
Ans. is 'c' i.e., Brachial artery
The standard location for noninvasive blood pressure measurement is the brachial artery, although there are several other sites where it can be done.

127. Pancreatic lipase that digests lipids requires ?

a) Vit B 12

b) Pyridoxine

c) Tocopherol

d) Colipase

Correct Answer - D
Ans. is 'd' i.e., Colipase

- Lipase requires colipase which prevents inactivation of lipase by bile salts.
- For fat digestion, following are required :- *Pancreatic lipase, colipase, bile-salts* activated lipase, cholesterol ester hydrolase, and phospholipase A2. Trypsin is also involved indirectly as it activates inactive procolipase to active colipase.
- Lingual lipase and gastric lipase are of very little significance in fat digestion.
- Bile salts help in fat digestion by : (i) Emulsification of fat and (ii) activating bile salt activated lipase.

128. True about body fluid osmolarity ?

a) Major contributor is proteins

b) Major contributor is Na^+

c) ECF osmolarity is 250 mOsm/L

d) Measured by dilution method

Correct Answer - B
Ans. is 'b' i.e., Major contributor is Na^+

129. Hyperthyroid state is characterized by ?

a) Increased protein synthesis

b) Decreased glycolysis

c) Lipolysis

d) Increased cholesterol

Correct Answer - C

Ans. is 'c' i.e., Lipolysis

In hyperthyroidism all effects of thyroid hormone are aggravated :-

i) Calorigenic effect :- Thyroid hormones enhance oxygen consumption, and hence the basal metabolic rate (BMR). This may be at least partly due to increase in the activity of membrane Nall(' ATPase. Thyroid hormones also increase the number and activity of mitochondria, which may be the cause or the effect of increase in oxygen consumption. By increasing the BMR, thyroid hormones *raise body temperature, loss of body weight and increase urinary nitrogen loss.*

ii) Growth and development :- Thyroid hormones are essential for normal growth and development.

iii) Carbohydrate metabolism :- Thyroid hormones have *both hypoglycemic and hyperglycemic effects.* The hypoglycemic effect is the *increased glycolysis.* The hyperglycemic effects are *stimulation of glycogenolysis and glucoconeogenesis.* The net effect is hyperglycemia and depletion of glycogen.

iv) Fat metabolism :- Thyroid hormone stimulates both lipogenesis and lipolysis. The lipolysis exceeds lipogenesis. Thus thyroid hormones moblize fat from adipose tissue, leading to an increase in plasma concentration of FFAs.

v) Protein metabolism : - Thyroid hormone has a protein anabolic effect but in large doses, it has a protein catabolic effect. Thus

effect but in large doses, it has a protein catabolic effect. Thus thyroid hormone increases both protein synthesis and protein degradation.

vi) Cardiovascular effects :- The thyroid hormones increase the heart rate, cardiac contractility, stroke volume and cardiac output, and consequently also the systolic BP. But the diastolic BP may fall due to vasodilatation in several vascular beds with decrease in peripheral vascular resistance. The cardiovascular effects of thyroid hormones are partly mediated by potentiation of effects of catecholamines.

vii) GIT :- Thyroid hormones increase GI secretion, absorption and motility.

viii) Nervous system :- Thyroid hormones are essential for normal formation of synapses and myelination in the developing brain.

ix) Respiratory system :- Thyroid hormones increase the rate and depth of respiration.

About option a & d

- In low concentration thyroid hormone increases protein synthesis, but in high concentration (as in hyperthyroidism) it is catabolic.
- Hyperthyroidism causes decrease in cholesterol due thyroxine induced increased LDL receptor synthesis in liver, and consequent increase in the removal of LDL from circulation.

130. Major thyroxine binding protein ?

a) Albumin

b) Prealbumin

c) Globulin

d) Transferrin

Correct Answer - C
Ans. is 'c' i.e., Globulin
Most of the circulating thyroid, hormones are protein bound, leaving only 0.02% T_4 and about 0.2% T_3 unbound or free.

There are three hormone binding plasma proteins, i.e., thyroxine binding globulin (major thyroid hormone binding protein), thyroxine binding albumin and thyroxine binding prealbumin.
Thyroid binding globulin level is raised in pregnancy and by drugs estrogens, methadone, heroin, tranquilizers, clofibrate.
TBG decreases by glucocorticoid, androgen, danazol, asparginase (cancer chemotherapy) and nephrotic syndrome.

131. Adrenal insufficiency in not associated with ?

a) Hyponatremia

b) Hyperkalemia

c) Hypoglycemia

d) Metabolic alkalosis

Correct Answer - D
Ans. is 'd' i.e., Metabolic alkalosis
Features of adrenal insufficiency (Addison's disease) are :-
i) Hypoglycemia
iv) Hyponatremia
ii) Hyperpigmentation
v) Hypotension
iii) Hyperkalemia
vi) *Metabolic acidosis*
Associated features are nausea, vomiting, diarrhea and abdominal cramps.

132. Lyedig cells secrete ?

a) Testosterone

b) Inhibin

c) Mullerian inhibiting substance (MIS)

d) ABP

Correct Answer - A
Ans. is 'a' i.e., Testosterone
The hormone-secreting cells in the testes are the leydig cells and sertoli cells. Leydig cells have receptors for LH and secrete all the androgens, i.e., testosterone (major androgen), dihydrotestosterone (DHT), androstendione and dehydroepiandrosterone (DHEA). All of theme have 19 carbon atoms.
Sertoli cells are under the control of FSH, i.e., have receptors for FSH. When stimulated by FSH, these cells secrete *androgen binding protein (ABP), in hibin* and MIS (mullerian inhibiting substance). Sertoli cells also contain aromatase; the enzyme that converts androgens to estrogens. Beside these hormonal function, junction between adjacent sertoli cells forms blood-testis barrier which does not allow harmful substances to enter the area where spermatogenesis is going on. *Sertoli cells also have receptors for androgens (testosterone) which stimulates spermatogenesis.*

133. Antimullerian hormone is secreted by ?

a) Granulosa cells

b) Lyedig cells

c) Sertoli cells

d) None

Correct Answer - C
Ans. is 'c' i.e., Sertoli cells
Antimullerian hormone or Mullerian inhibiting substance is secreted by sertoli cells.

134. In men LH controls secretion of ?

a) Inhibin

b) AMH

c) Testosterone

d) ABP

Correct Answer - C
Ans. is c i.e., Testosterone
Gonadotropins
Gonadotropins, as the name suggests, are tropic for gonads. The gonadotropins are FSH and LH.
Follicle stimulating hormone (FSH) stimulates follicular cells in female to promote the development of ovarian follicle and subsequent secretion of estrogen. In males, FSH stimulates the sertoli cells of the testis and thereby promotes spermatogenesis.
Leutinizing hormone (LH) stimulates the development of corpus luteum and the secretion of mainly progesterone and some estrogen by it. In males, LH stimulates the leyding cells (interstitial cells) to secrete testosterone. That is why LH is also called *interstitial cell stimulating hormone (ICSH).*

135. True about generator potential?

a) Graded

b) All or none

c) Propagated

d) No summation

Correct Answer - A
Ans. is 'a' i.e., Graded
Generator potential is a local potential with following features :
i) Graded in nature (not follows all or none law) :- Its magnitude depends upon the intensity of stimulus, (amount of neurotransmitter released) i.e., it increases in graded manner if the intensity of stimulus is increased. On the other hand, action potential is not-graded and is an all or none change, i.e., either all of the action potential is seen or not at all.
ii) Not-self propagated (Action potential is self propagated)
iii) Travels with decrement (Action potential travels without any decrement)
iv) May or may not followed by an effect (action potential, once developed, always has an effect).

136. Which decreases secretion of both insulin and glucagon ?

a) Epinephrine

b) Somatostatin

c) Increased blood glucose

d) None

Correct Answer - B
Ans. is b i.e., Somatostatin
Somatostatin inhibits secretion of :?
i) GH and TSH
ii) Both insulin and glucagon
About other options

- Epinephrine stimulates glucagon secretion and inhibits insulin secretion.
- Increased blood glucose stimulates insulin secretion and inhibits glucagon secretion.

137. Hepcidin inhibits ?

a) Absorption of cobalamine

b) Transfer of iron into enterocytes

c) Folic acid synthes

d) Respiratory oxidase

Correct Answer - B
Ans. is 'b' i.e., Transfer of iron into enterocytes
Hepcidin is iron *metabolism regulatory hormone* that inhibits iron absorption (transfer of iron into enterocytes).

138. Urine flow rate is 10 ml/min, plasma inulin is 2 mg/ ml and urine inulin is 25 mg/ml. Which of the following statement is true ?

a) Inulin clearance = GFR

b) Inulin clearance > GFR

c) Inulin clearance > GFR

d) GFR cannot be calculated by above data

Correct Answer - A
Ans. is 'a' i.e., Inulin clearance = GFR
Measurement of GFR

- If a substance is designated by letter 'X', the GFR is equal to the concentration of 'X' in urine (Ux) times the urine flow per unit time (v) divided by arterial plasma level of X (Px).

139. Human cardiac muscle contains?

a) Alpha heavy chain of myosin

b) Beta heavy chain of myosin

c) Both alpha and beta heavy chains of myosin

d) None of the above

Correct Answer - C
Ans. is 'c' i.e., Both alpha and beta heavy chains of mysion
The myosin heavy chain in human cardiac muscle exist in two isoforms, a and f3, both of which are present in fetal heart.
a-form persists as the adult isoform in atrial muscle, whereas 0-form predominates in ventricular muscle.

140. Development of spermatozoa (sperm) from spermatogonium takes how much time ?

a) 30-35 days

b) 40-45 days

c) 50-55 day

d) 70-75 days

Correct Answer - D
Ans. is 'd' i.e., 70-75 days

- Spermatogenesis refers to the process of *formation of spermatozoa (sperm) from primitive germ cells (spermatogonia).*
- Spermatogenesis begins at puberty and continues throughout adult life to decline in old age.
- In humans, *it takes an average of 74 days to form a mature sperm from primitive germ cells.*
- Spermatogenesis occurs in seminiferous tubules.

141. Processing of tactile stimulation occurs in Brodmann's area ?

a) 1,2,3

b) 4, 6

c) 44,45

d) 41,42

Correct Answer - A
Ans. is 'a' i.e., 1, 2, 3

- Processing of general sensory inputs primarily occurs in *primary somatosensory area of parietal* lobe.
- Primary somatosensory area is *Brodmann's areas 3, 1, 2.*

142. Stroke volume is increased by ?

a) Increased end-diastolic and end-systolic volumes

b) Decreased end-diastolic and end-systolic volumes

c) Increased end-diastolic volume and decreased end-systolic volume

d) Decrased end-diastolic volume and increased end-systolic volume

Correct Answer - C

Ans. is 'c' i.e., Increased end-diastolic volume and decreased end-systolic volume

- The stroke volume is the amount of blood pumped out by left ventricle in each stroke.
- *Stroke volume is given by the difference between end-diastolic ventricular volume (the volume of blood in the left ventricle at the end of diastole; normal 120 inl) and end-systolic ventricular volume (the volume of blood at the end of systole; normal 50 ml).*
- Stroke volume (70 ml) = End-diastolic ventricular volume (120 ml) - End-systolic ventricular volume (50 ml)

143. With increased flow to loop of Henle, decreased in GFR is by ?

a) Countercurrent exchanger

b) Glomerulotubular balance

c) Tubulo-glomerular feedback

d) Countercurrent multiplier

Correct Answer - C

Ans. is 'c' i.e., Tubulo-glomerular feedback

Autoregulation of GFR

- The GFR is normally well autoregulated in the range of 70-180 mm Hg of systemic pressure. Feedback mechanisms intrinsic to the kidney normally keep the renal blood flow and GFR relatively constant, despite marked changes in arterial blood pressure. The relative constancy of GFR and renal blood flow is referred to as *autoregulation.* The primary function of autoregulation in other tissues (other than kidneys) is to maintain the delivery of oxygen and nutrient at a normal level and to remove the waste products of metabolism, despite changes in arterial pressure. In the kidneys, the non-nal blood flow is much higher than that required for these functions. the major function of autoregulation in the kidney is to maintain a relatively constant GFR and to allow precise control of renal excretion of water and solutes.
- There are two plausible hypotheses for explaining the autoregulation of GFR (i) *Tubuloglomerular feedback hypothesis,* and (ii) *Myogenic hypothesis.*

Tubulo-glomerular feedback

- To perform the function of autoregulation, the kidneys have a feedback mechanism that *links changes in sodium chloride*

concentration at the macula densa with the control of renal arteriolar resistance. This feedback helps to ensure a relative constant delivery of sodium chloride to the distal tubule and helps prevent spurious fluctuations in renal excretion that would otherwise occur.

- The tubuloglomerular feedback mechanism has two components that act together to control GFR : - i) An *afferent arteriolar feedback mechanism* (usually this component is referred to as tubuloglomerular feedback, and ii) *An efferent arteriolar feedback mechanism.* These feedback mechanisms depend on the juxtaglomerular *apparatus* which consists of : (i) Macula densa, i.e., specialized epithelium of distal tubule where it comes in contact with afferent arteriole, (ii) *Juxtaglomerular cells, i.e.,* modified smooth muscle cells of afferent arteriole, and iii) *Lacis cells.*

i. Afferent arteriolar feedback mechanism : - Decrease in renal arteriolar pressure causes decrease in GFR and as a result low NaCI is delivered to distal tubules. This is sensed by macula densa and the signal is transmitted to afferent arterioles which causes *decreased resistance of afferent arterioles.* Decreased afferent arteriolar resistance increases glomerular hydrostatic pressure and therefore GFR. The transmitter involves is adenosine which causes opening of Ca^{*2} channels.

i. Efferent arteriolar feedback mechanism : - Decreases GFR causes delivery of less NaCl to distal tubule, which is sensed by macula densa cells and the signal is transmitted to *juxtaglomerular (JG) cells which secrete renin.* As a result renin angiotensin system is activated and there is generation of angiotensin II which causes constriction of efferent arteriole. This results in increased glomerular capillary hydrostatic pressure and increased GFR.

- Opposite occurs when there is increase arterial pressure and increased GFR. Increased NaCl is delivered to the macula densa which causes constriction of afferent arteriole and decrease,: renin by JG cells with decreased efferent arteriole resistance.
- It would be wise to know about glomerulotubular balance, which may be confused by tubuloglomerular feedback.
- Glomerulotubular balance : - Tubular reabsorption in proximal tubules is load-dependent, i.e., when the GFR increase, the reabsorption of the filtrate in the proximal tubule increases

proportionately. It occurs because tubular reabsorption is flow-limited. Because of glomerulotubular balance, the urinary Na+ output does not increase massively when the GFR increases.

Myogenic Autoregulation

- Afferent arterioles constrict in response to augmented blood pressure. Arteriolar constriction restores GFR to normal levels. Possibly, stretching of arterioles leads to the opening of stretch - sensitive Ca^{+2} channels on arteriolar smooth muscle cells resulting in a Ca^{+} influx that causes the cells to contract.

144. Basic rhythm of respiration is maintained by ?

a) Pneumotaxic centre

b) Pre botzinger complex

c) Dorsal group of neurons

d) Ventral pons group of neurons

Correct Answer - B
Ans. is 'b' i.e., Pre-Botzinger complex

145. Purkinje fibres are ?

a) Modified nerve fibres

b) Modified smooth muscle

c) Modified cardiac muscle

d) Fibrous tissue

Correct Answer - C

Ans. is 'c' i.e., Modified cardiac muscle

Conducting system of heart

The conducting system is made of specialized myocardium (cardiac muscle), that is capable for initation and conduction of cardiac impulse. It has following parts : ?

1) SA node :- SA node is located in the upper part of crista terminalis at the junction of SVC and the right atrium. It is the pacemaker of the heart and generates impulse at a rate of 70-100/min. SA node is sniffled by nodal artery, a branch of RCA in 65% cases and a branch of circumflex branch of LCA in 35% cases. SA node is supplied by right vagus/parasympathetic (inhibitory) and right Sympathetic (excitatory) system as it develops from structures on the right side of embryo.

2) AV node :- It lies in the right atrial floor near the interatrial septum in the 'triangle of koch'. It is supplied by AV nodal artery, a branch of RCA. AV node develops from left side of heart, thus is supplied by *left vagus and left sympathetic fibers.*

3) Atrioventricular bundle or bundle of His :- It arises from AV node and crosses the AV ring (annulus fibrosus).

In the muscular septum it divides into right and left branches. It has a dual blood supply from AV nodal artery (branch of RCA) and anterior descending (interventricular) branch of LCA.

4) Right bundle branch (RBB) and left bundle branch (LBB) :- These bundle branches consist of modifeid muscle fibers *(Purkinje fibers).* Both RBB and LBB are supplied by LCA, except a small part of the LBB which is supplied by RCA.

146. Following pubertal change is not due to estrogen ?

a) Vaginal cornification

b) Pubic & axillary hair growth

c) Cervical mucus production

d) Menstruation

Correct Answer - D

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

It is the lack of progesterone support (progesterone withdrawl) that causes mucosal shedding and bleeding during menstration.

Actions of estrogen

1. Sex organs

- Estrogen brings about pubertal changes in female .
- Growth of uterus, fallopian tube and vagina.
- Vaginal epithelium gets thickened, stratified and cornified.
- Estrogen induce watery cervical secretion.
- Proliferation of endometrium in preovulatory phase.
- Estrogen sensitizes the uterus to oxytocin.

2. Secondary sex character

- Estrogen produced at puberty causes growth of breast-proliferation of duct and stroma, accumulation of fat.
- Pubic and axillary hair appear.
- Feminine body contours and behaviour are influenced.
- Acne is common in girls at puberty → due to small amount of androgens produced simultaneously.

3. Metabolic effects

- Estrogens are anabolic
- Estrogens promotes fusion of epiphysis

- *Maintain bone mass by reducing bone resorption.*
- Promote *positive calcium balance* by inducing renal I a-hydroxylase.
- Cause salt and water retention.
- Estrogens decrease LDL while increase HDL and triglyceride → atherosclerosis is rare before menopause.
- Blood coagulability increases due to increased synthesis of factor II, VII, IX and X.
- Estrogens increase lithogenicity of bile by increasing cholestrol secretion and decreasing bile secretion.

147. All are true about reticular activating system except?

a) Involved in arousal

b) Polysynaptic pathway

c) Receives collateral from all sensory pathway

d) Produces α-block on EEG

Correct Answer - D
Ans. is 'd' i.e., Produces α-block on EEG
Reticular activating system (RAS) is the *ascending polysynaptic pathway* that extends from brainstem reticular formation to non-specific thalamic nuclei (intralarninar and midline nuclei) and projects diffusely to cerebral cortex.
Long sensory tracts give collateral to the RAS, as they ascend in brainstem. Thus RAS receives inputs from the medial and trigeminal leminisci as well as from the visual, auditory and olfactory systems. Therefore, the RAS is a non-specific system which *can be excited by any sensation.*
Activation of RAS causes activation of cerebral cortex and arousal from sleep.
On arousal from sleep, *the EEG pattern changes to high frequency low voltage activity (β - wave)* from high voltage slow waves (δ - waves) of sleep → δ-block (not α-block).

148. Damage to pneumotaxic center produces ?

a) Deep and fast respiration

b) Deep and slow respiration

c) Shallow and fast respiration

d) Shallow and slow respiration

Correct Answer - B

Ans. is 'b i.e., Deep and slow respiration

Respiratory effects of transection at different levels of brain

1) Transection above pons has no effect on respiration.

2) A *mid pontine transaction (Transection between upper and lower pons) or damage to pneumotaxic center.*

i. *When vagi are intact :-* The inhibitory effect of pneumotaxic center on apneustic center is abolished. However, inhibitory effect of vagus is intact. Therefore, the activity of apneustic center is increased a little bit which results in prolongation of inspiratory ramp. Thus , breathing *becomes deep and slow. But there is no change in rhythm.*

i. *With bilateral vagotomy :-* This eliminates the inhibitory influence of both pneumotaxic center and vagi on the apneustic center. The uninhibited effect of apneustic center results in *sustained gasping inspiration which is interrupted by brief inefficient expiration, i.e., Apneusis.*

3) Transection at pontomedullary junction :- Spontaneous respiration is maintained because the respiratory rhythm is generated in medulla which regulate the discharge of DRG and if required VRG. However, respiration is slight irregular and gasping.

4) Transection below the medulla :- Respiration is stopped

completely.
5) Bilateral vagotomy (without any brain lesion) :- Inhibitory effect of vagi on apneustic center is abolished; however, inhibitory effect of pneumotaxic center remains intact. Therefore, there is slight increase in activity of apneustic center. Thus breathing is *deep and slow.*

149. Which of the following is involved in peristalsis by causing relaxation ?

a) Substance P

b) Acetylcholine

c) VIP

d) Norepinephrine

Correct Answer - C
Ans. is 'c' i.e., VIP
In peristlasis :-

i. *Acetylcholine & substance P* → Causing smooth muscle contraction.
i. *VIP, NO & ATP* → Producing relaxation ahead of stimulus.

150. Amine hormone is ?

a) Insulin

b) Glucocorticoid

c) PTH

d) Thyroxine

Correct Answer - D
Ans. is 'd' i.e., Thyroxine

151. Auditory processing of spoken language is done by?

a) Parietal lobe

b) Temporal lobe

c) Occipital lobe

d) Frontal lobe

Correct Answer - B
Ans. is `b' i.e., Temporal lobe
The left temporal lobe holds the primary auditory cortex, which is important for the processing of semantics in both speech and vision.

152. Maximum equilibrium potential is for -

a) Na^+

b) K^+

c) Cl^-

d) None

Correct Answer - B
Ans. is 'b' i.e., K^+

153. In laminar flow, if diameter is reduced to half ?

a) Blood flow increases four fold

b) Blood flow decreases four fold

c) Blood flow increases sixteen-fold

d) Blood flow decreases sixteen-fold

Correct Answer - D
Ans. is 'd' i.e., Blood flow decreases sixteen-fold
If everything else remains constant, blood flow is direactly poroportional to 4^{th} power of radius.
Thus, if the diameter (or radius) is reduced to half, blood flow will decrease sixteen-fold.

154. False about estrogen action ?

a) Stimulates secondery sex characters in female

b) Stimulates osteoclasts

c) Decreases LDL

d) Increases blood coagulability

Correct Answer - B
Ans. is 'b' i.e., Stimulates osteoclasts
Major action of estrogen on bone is to *inhibit osteoclastic bone resorption.*
Estrogen blocks the action of IL-6, a potent stimulator of osteoclasts.
Estrogen also induces apoptosis of osteoclasts.
Other three options are correct.
Actions of estrogen have been explained in previous sessions.

155. Maximum air volme in the lung ?

a) 1200 ml

b) 2400 ml

c) 3000 ml

d) 5900 ml

Correct Answer - D
Ans. is 'd' i.e., 5900 ml.
Total lung capacity (TLC) : - It is the maximum volume of air in the lung at the end of maximal inspiration, i.e., maximum amount of air the lung can contain. In other words, TLC = TV + IRV + ERV + RV or TLC = VC + RV (because VC = TV + IRV + ERV). TLC is about 5900 ml.

156. C- peptide is secreted by ?

a) A cells

b) B cells

c) D cells

d) F cells

Correct Answer - B
Ans. is 'b' i.e., B cells
Insulin is a polypeptide hormone which is synthesized as a larger preprohormone (preproinsulin).
Asthepreprohormone enters the endoplasmic reticulum, 23 amino-acid signal peptide is removed and it is converted to prohormone (proinsulin).
Proinsulin is made up A and B chain connected by a connecting peptide (C-peptide or C-chain).
C-peptide is detached in the granules before secretion. Normally, 90-97% of the product released from B cells is insulin along with equimolar amounts of C-peptide.
Insulin is a *two chain polypeptide having 51 aminoacids :* The A chain has 21 while B-chain has 30-aminoacids.
Half life of insulin is about 5 minutes.

157. Receptor for inverse stretch reflex ?

a) Muscle spindle

b) Extrafusal fibers

c) Intrafusal fibers

d) Golgi tendon organ

Correct Answer - D

Ans. is 'd' i.e., Golgi tendon argan

Inverse stretch reflex (golgi tendon reflex)

- Golgi tendon reflex is a bisynaptic reflex, initiated by the Golgi tendon organ located in muscle tendons.
- This organ consists of a net-like (ramified) collection of knobby nerve endings among the fascicles of a tendon.
- There are 3-25 muscle fiber per golgi tendon organ.
- Golgi tendon organs are also stretch receptors.
- However, unlike the muscle spindle which acts as a length detecter, the Golgi-tendon organ acts as a muscle tension-detector.
- This difference in sensory function occurs because muscle spindle is located in parallel to the muscle fibers (extrafusal fibers) while the Golgi tendon organ is located in series to the muscle fibers (extrafusal fibers).
- Therefore, Golgi tendon organs are stimulated by both passive stretch and contraction of muscle (in contrast to muscle spindle which is stimulated by passive stretch but is inhibited by active contraction of muscle).
- *Stimuli for golgi tendon reflex are both passive strech and active contraction of muscle.*
- The golgi tendon organ is innervated by Aa sensory (afferent) fibers (type lb sensory).

- These afferent fibers terminate on *an inhibitory interneuron* in dorsal horn of grey matter in the spinal cord.
- These inhibitory interneuron terminates on the *a-motor neuron* (same a-motor neuron on which Ia (Aa) afferent of stretch reflex terminates) and has inhibitory effect on a-motor neuron.
- So, activation of Golgi tendon reflex results in relaxation of muscle.

158. Tonic neck relfex is lost in lesion of -

a) Cerebral cortex

b) Midbrain

c) Medulla

d) Spinal cord

Correct Answer - C
Ans. is 'c' i.e., Medulla

159. Maximum CO_2 is seen in ?

a) Pulmonary vein

b) Pulmonary artery

c) Left ventricle

d) Left atrium

Correct Answer - B
Ans. is 'b' i.e., Pulmonary artery
Pulmonary arteries carry deoxygenated blood (with maximum CO_2) to lung from right ventricle.
In lung CO_2 is removed and oxygenation of blood takes place.
Pulmonary veins, then, transport this oxygenated blood (with less CO_2) to the left atrium.

160. Neurotransmitter in subthalamic nuclei ?

a) Glutamate

b) GABA

c) Serotonin

d) Ach

Correct Answer - A
Ans. is 'a' i.e., Glutamate
Basal ganglia are richly connected with one another. These connections include :?
1) Dopaminergic nigrostriatal projection from the substantia nigra pars compacta (SNPC) to the striatum caudate nucleus and putamen) and *corresponding GABAergic projection from striatum to substantia nigra pars reticulata (SNPR).* Dopamine is the major neurotransmitter in substantia nigra.
2) The striatum has GABAergic projections to both globus pallidus inner segment (IS) as well as globus pallidus external segment (ES).
3) Globus pallidus ES has GABAergic projections to subthalamic nucleus and to globus pallidus IS.
4) Subthalamic nucleus has Glutamate-ergic *projections on both globus pallidus IS as well as globus pallidus ES.*
5) Cholinergic interneurons are there within the striatum.

161. Mean BP is ?

a) CO x TPR

b) CO x heart rate

c) Heart rate x TPR

d) Stroke volume x TPR

Correct Answer - A

Ans. is 'a' i.e., CO x TPR

- Arterial blood pressure is the product of the cardiac output and the total peripheral vascular resistance (TPR). *Mean blood pressure is the major determinant of adequate blood flow through the tissues.*

  Mean BP = Cardiac output x Total peripheral resistance
- If cardiac output is expressed as a product of stroke volume and heart rate, the formula blood pressure can be expressed as the product of three variables (the triple product) : -

  Mean BP = Stroke volume x Heart rate x TPR
- Blood pressure is therefore affected by conditions that affect any of these factors. Changes in cardiac output (or stroke volume) affect mainly the systolic pressure while changes in peripheral resistance affect mainly the diastolic pressure.

162. Active tension in a muscle depends upon ?

a) Number of muscle fibres

b) Number of motor units recruited

c) Aerobic capacity of muscle

d) Length of muscle fiber

Correct Answer - B
Ans. is 'b' i.e., Number of motor units recruited
A motor neuron (nerve fiber) with all its peripheral branches and muscle fibers innervated by it is called motor unit. The motor-unit obey all or none law, i.e., when the nerve fiber (neuron) of the motor unit is stimulated, all the fibers of motor unit will either contract maximally or not contract at all, depending upon whether the stimulus is of threshold or subthreshold intensity. *Since the unit of activation is nerve fiber, the unit of contraction is a motor unit. Muscles which are concerned with fine graded and precise movement (e.g., fingers and eye ball) have only 3-6 fibers in a motor unit.* On the other hand, muscles for gross movements (e.g., leg) contain 600-1000 muscle fibers per unit.

If an isolated muscle is stimulated the contractile response depends on the strength of stimulus. The dependence of the strength of contractile response on the strength of stimulus seem at first to violate the all or none followed by excitable tissue. But in fact skeletal muscle also follows all or none low at cellular level, i.e., at motor unit level (read above : motor unit). Each motor unit will either contracts with full force or not at all. But the number of motor units contracting can be altered. The larger the number of motor units

which contract, stronger is the contraction of muscle (whole muslce). So, with increasing strength of stimulus, it is the number of contracting motor units which increases and resulting in increased strength of contraction.

163. Affect of sympathetic stimulation on GFR ?

a) Increased GFR with afferent arteriolar dilatation

b) Increased GFR with efferent arteriolar constriction

c) Decreased GFR with afferent arteriolar constriction

d) Decreased GFR with efferent arteriolar dilatation

Correct Answer - C

Ans. is 'c' i.e., Decreased GFR with afferent arteriolar constriction

Sympathetic stimulation causes afferent arteriolar constriction with decrease in RBF and GFR.

Effect of sympathetic discharge on the renal regulation of body fluid and electrolytes

Sympathetic discharge on the kidney results in :-

- Decreased GRF.
- Increased reabsorption of Na^+ and water from the PCT.
- Increased reabsorption of Na^+ and water from the DCT.
- Thirst (due to angiotensin II production).
- The overall effect is fluid and electrolyte retention due to :-
- Decreased urinary output.
- Decreased urinary Na' excretion.
- Increased water intake.

164. Coronary blood flow regulated by

a) Sympathetic adrenergic system

b) Sympathetic cholinergic system

c) Local muscle action and reflexes

d) Parasympathetic system

Correct Answer - C

Ans. is 'c' i.e., Local muscle action and reflexes

Regulation of coronary blood flow mainly occurs by chemical regulation through autoregulation.

Regulation of coronary blood flow

- Regulation of coronary flow occurs by two mechanisms : ?

1) Chemical regulation (Autoregulation)

- Regulation of coronary blood flow occurs through local intrinsic regulation, i.e., autoregulation, most likely through the production of vasodilating metabolites in response to minimal degree of ischemia. The vasodilatory chemical stimuli are *low* PO_2*, High* PCO_2*,* H^+*,* K^+*, lactic acid, ADP AMP and adenosine.* Chemical regulation (autoregulation) of coronary blood flow is far more important than neural regulation.

2) Neural regulation

- Coronary arteries are supplied by autonomic sympathetic and parasympathetic system. Coronary arteries have both alpha and beta sympathetic (adrenergic receptors), with the beta receptors predominating. Beta receptor stimulation produces vasodilation whereas alpha receptor stimulation produces vasoconstriction. There are relatively few parasympathetic (vagal) fibers supplying the coronary arteries. The direct effect of these fibers is vasodilatation; But indirect effect causes vasoconstriction and predominates.

Indirect effect is the result of decrease in formation of vasodilator metabolites due to decrease in heart rate and cardiac contractility.

165. Relaxation volume of lung is documented as ?

a) Functional residual capacity

b) Residual volume

c) Vital capasity

d) Closing volume

Correct Answer - A

Ans. is 'a' i.e., Functional residual capacity

Relaxation volume

The relaxation volume is the volume of the relaxed respiratory system, i.e., the volume at which net elastic recoil of he total respiratory system is zero (the elastic recoil of chest wall is equal and opposite to that of lungs). In healthy subjects, this occurs at the end of quiet expiration, i.e., *at functional residual capacity.*

Therefore, in healthy adults at rest FRC is essentially equal to relaxation volume of respiratory system and FRC is usually treated as synonymous with relaxation volume.

However, in real sense FRC and relaxation volume are not synonymous terms and, while the two volumes are some times equal, more often they are not, i.e., active or passive mechanisms often operate to make FRC different from relaxation volume. For example, neonates have a more compliant (less stiff) chest wall. The chest wall thus has less elastic recoil to balance that of lung, thus decreasing the relaxation volume of lung. FRC then is often maintained above relaxation volume by active mechanisms like inspiratory muscle activity and slowing of expiration.

Another example where FRC and relaxation volume may differ is in obstructive lung disease where FRC is dynamically determined and

may be considerably above relaxation volume.

166. Fructose uptake in small intestine is via ?

a) Passive diffusion

b) Facilitated diffusion

c) Primary active transport

d) Secondary active transport

Correct Answer - B
Ans. is b' i.e., Facilitated diffusion

167. Fetal hemoglobin has more affinity for oxygen than adult hemoglobin because ?

a) Decreased 2,3 DPG concentration

b) Low affinity for 2,3 DPG

c) Increase 2,3 DPG concentration

d) Reduced pH

Correct Answer - B
Ans. is 'b' i.e., Low affinity for 2,3 DPG
Make it very clear in mind that higher affinity of fetal hemoglobin for oxygen is due to low affinity of HbF for 2,3DPG (not due to decreased 2, 3-DPG concentration). HbF does not combines to 2, 3-DPG as avidly as adult hemoglobin.

168. Troponin C mediated function is of which of the following?

a) Dystrophin

b) Calmodulin

c) Actin

d) Calcineurin

Correct Answer - C
Ans. is `c' i.e., Actin
Ca^{+} binds to troponin and this troponin - Ca^{+} complex cause lateral displacement of tropomysin.
As a result active sites of actin becomes uncovered and interact with myosin.
Important skeletal muscle proteins
1 .Myosin : - Myosin is the protein that constitutes the *thick filaments.* Myosin of skeletal muscle is *myosin-IL* Myosin participates in the contractile mechanism and also acts as an ATPase.
2.Actin : - Actin is the major protein of *thin filament.* It is the actin which slides over myosin during contraction.
3.Tropomyosin : - It is the other protein of *thin filament.* It covers the active sites (myosin binding sites) on actin. When Ca^{+2} concentration of cytoplasm (sarcoplasm) is raised, it uncovers the active sites of actin and allow the contraction So, *the 'cross-bridge cycling' is switched off or on by the tropomyosin molecule which slides on the actin molecule to cover or uncover the active sites on it.*
4. Troponin : - It is a protein also associated with thin filament. The regulatory action of Ca^{+2} on tropomysin is mediated by troponin, a

Ca^{+2} binding protein. When the cytoplasmic (sarcoplasmic) Ca^{+2} concentration rises Ca^{+2} ions bind to troponin-C. The troponin - Ca^{+2} complex induces changes in Troponin-I and Troponin-T, which in turn brings about a shift of tropomyosin away from the active sites of actin. When the sarcoplasmic Ca^{+2} concentration falls, Ca^{+2} dissociates from troponin-C and tropomyosin slides back on the actin filament to cover the active sites. Thus, the first event during muscle contraction, after cytoplasmic rise in Ca^{+2} concentration, is binding of troponin C to Ca^{+2} which trigers the further steps by sliding the tropomysin away from the active sites of actin.

There are additional structural proteins in skeletal muscles.

i) Actinin : It binds actin to Z-lines.

ii) Titin : It is the *largest known protein* and connects Z-lines to M-lines and is responsible for passive stiffness of muscle, by limiting range of motion of sarcomere in tension.

iii) Desmin : It adds structures to Z lines in part by binding the Z-lines to plasma membrane.

169. Loose fibrin accumulated in tight clot in coagulation pathway by factor ?

a) X

b) XI

c) XII

d) XIII

Correct Answer - D
Ans. is 'd' i.e., XIII
Loose (soluble) fibrin is converted to insuluble fibrin by thrombin and XIIIa.

170. Ferritin biosynthesis is regulated by serum level of ?

a) Ceruloplasmin

b) Hepcidin

c) Iron

d) Transferrin

Correct Answer - C
Ans. is `c' i.e., Iron
"The level of iron in plasma is sensed by specific iron regulatory proteins which control the rate offerritin synthesis and to maintain homeostasis" – Human physiology
Hepicidin regulates absorption of iron. But, it is also according to the serum iron level. If serum iron is deficiem, hepacidin level falls and there is increased iron absorption.

171. Plasma volume is measured by ?

a) Inulin

b) Evans blue

c) Mannitol

d) D_2O

Correct Answer - B
Ans. is 'b' i.e., Evans blue

172. Parathormone increases calcium absorption by acting at ?

a) PCT

b) DCT

c) Loop of henle

d) Collecting duct

Correct Answer - B

Ans. is 'b' i.e., DCT

Paratharmone

- Paratharmone is 84 aminoacid polypeptide hormone secreted from parathyroid glands.
- Its secretion is regulated by plasma Ca++ concentration — fall in Ca++ concentration increases the secretion of paratharmone.

Actions

- PTH increases resorption of calcium from bone → *most prominant action.*
- PTH increases calcium reabsorption from *distal* tubules of kidney.
- PTH decreases phophate reabsorption from *proximal* tubules of kidney.
- PTH has no direct effect on calcium absorption from intestine but increases it indirectly by enhancing the formation of calcitriol by activating la-hydroxylose.
- PTH decreases calcium level in milk, saliva, and ocular lens — may be responsible for development of cataract in hypothyroidism.

173. Hair cells baseline membrane potential O?

a) 30mV

b) -50mV

c) -40mV

d) -60mV

Correct Answer - D
Ans. is 'd' i.e., -60mV
The resting membrane potential of the hair cells is about -60 mV.
When the stereocilia are pushed toward the kinocilium, the membrane potential is decreased to about -50 mV.
When the bundle of processes is pushed in the opposite direction, the cell is hyperpolarized.
Displacing the process in a direction perpendicular to this axis provides no change in membrane potenital, and displacing the processes in directions that are intermediate between these two directions produces depolarization or hyperpolarization that is proportional to the degree to which the direction is toward or away from the kinocilium.
Thus, the hair processes provide a mechanism for generating changes in membrane potential proportional to the direction and distance the hair moves.

174. Iron absorption is increased by all except ?

a) High vitamin C in diet

b) High phosphates in diet

c) Ferrous form

d) Acidity

Correct Answer - B
Ans. is 'b' i.e., High phosphates in diet

175. Function of Golgi apparatus ?

a) Protein synthesis

b) Transcription

c) Glycosylation

d) Cholesterol synthesis

Correct Answer - C
Ans. is 'c' i.e., Glycosylation
Golgi apparatus (Dietyosomel
The golgi apparatus is a stack of six or more membrane-enclosed sacs (cisterns). The cell contains one or more Golgi apparatus, usually near the nucleus. Proteins and polypeptides synthesized in the rough ER are passed on to the golgi apparatus. These secretions (polypeptide) are stored in the golgi apparatus and also concentrated, processed and packed. Further, it is in the golgi apparatus that sorts out protein for their correct destinations, i.e., where the secretions to he sent.
Processing in Golgi apparatus may include addition of the carbohydrate moiety to proteins *(glycosylation)* to form *glycoproteins;* sulphation of mucopolysaccharides to form *hyaluronic acid & chondroitin sulfate;* cleavage of the polypeptide chain to form the active product, for example, proinsulin is cleaved by the Golgi apparatus to form insulin.
Each Golgi apparatus is a polarized structure with a cis (convex) side and a trans (concave) side. Membrane vesicles containing newly synthesized protein bud off from the rough ER and fuse with Cis (Convex) side of Golgi apparatus, i.e., Cis end is the receiving end. This protein is then process through Golgi apparatus to reach the trans (concave) side, from which vesicles bud off into the cytoplasm and are finally exocytosed from the cell. So, trans end is

cytoplasm and are finally exocytosed from the cell. So, trans end is secretory end.

176. Anticoagulant produced by mast cells -

a) Antithrombin III

b) Protein C

c) Protein C

d) Heparin

Correct Answer - D
Ans. is 'd' i.e., Heparin
Mast cells
Mast cells are bone marrow derived cells.
They are found predominantly near blood vessels and nerves and in subepithelial sites, where local immediate hypersensitivity reaction tend to occur.
Mast cells have cytoplasmic membrane-bound granules that contain a variety of biologically active mediators.
These granules are referred as metachromatic granules.
Mast cells are central to the development of immediate hypersensitivity.

177. Not a circumventricular organ ?

a) Subfornical area

b) Neurohypophysis

c) Adenophysis

d) OVLT

Correct Answer - C
Ans. is 'c' i.e., Adenophysis
Structures outside the blood brain barrier
Certain areas of brain have fenestrated capillaries and because of their permeability, are said to be outside blood-brain barrier. These areas are located around the third ventricle and are therefore called circumventricular organs. These areas are (i) *Posterior pituitary (neurohypophysis)* and the adjacent ventral part of *median eminence* of the hypothalamus; (ii) The *area postrema;* (iii) The organ vasculusum of lamina terminalis (OVLT); and (iv) Subfornical organs (SFO).
Although the blood-brain barrier is deficient in the circumventricular organs, the blood-CSF barrier in these organs is quite effective due to the presence of tight-junctions between the modified ependymal cells of the third ventricle called the `tancytes'.

178. Blood brain barrier is absent in ?

a) Adenohypophysis

b) Neurohypophysis

c) Hypothalamus

d) Thalamus

Correct Answer - B
Ans. is 'b' i.e., Neurohypophysis

179. Bile acids are reabsorbed from ?

a) Duodenum

b) Proximal jejunum

c) Distal jejunum

d) Ileum

Correct Answer - D
Ans. is 'd' i.e., Ileum

180. 2^{nd} messenger in vagal bradycardia ?

a) CAMP

b) Ca^{2+}

c) DAG

d) None

Correct Answer - A
Ans. is *'a' i.e.,* cAMP
Muscarinic receptors (cholinergic receptors) in heart are M_2 type.
These are responsible for vagus mediated bradycardia.
M_2 mediated actions are through cAMP.

TYPES OF RECEPTORS

Drug action on receptors is a two step process *?*
Step 1 → Binding of drug to receptors that leads to conformational change in receptors (in case of agonist) or prevention of conformational change by competing with agonist (in case of antagonist).
Step 2 → This conformational change induces changes in systems within the cell through a series of intermediate steps *(transduction)* that in turn brings about the response to the drug.

181. Counter current multiplier system is primarily driven by ?

a) Concentration of Na+

b) H+ at loop of Henle

c) Concentration of Na±

d) H+ at ascending loop of henle, Osmolality at Loop of Henle

Correct Answer - A

Ans. is 'a' i.e., Concentration of Na^+

Countercurrent multiplier

The loop of Henle[Q] gives the nephron a peculiar shape. The descending limb, in which the tubular fluid flows towards the hairpin bend (downwords) and the ascending limb, in which the tubular fluid flows 'upwards' lie close to each other. Two such tubes with fluid flowing through them in opposite directions provide an opportunity for the countercurrent multiplication.

The thick ascending limb of loop of Henle is impermeable to water but it actively reabsorbs NaCl. The thin descending limb of loop of Henle is relatively impermeable to solutes but highly permeable to water. The most important cause of the high medullary osmolarity is active transport of sodium[Q] and co-transport of potassium[Q], chloride[Q] and other ions out of the thick ascending limb of loop of Henle[Q] into the medullary interstitium. Most important among all these is NaCl[Q], for maintenance of high medullary interstitium.

Consider the Na^+ is continuously flowing in from glomerulus into the tubule. However, most of the Na^+, instead of flowing out, gets trapped in a circular path and recycles between the ascending and descending limbs of the loop of Henle. Consequently, the Na^+

concentration becomes very high at the tip of the loop.

182. What will be hemoglobin saturation, if $P0_2$ is 60 mm Hg at pH 7.4 and temperature 37°C ?

a) 50%

b) 60%

c) 75%

d) 90%

Correct Answer - D
Ans. is `d' i.e., 90%
Examiner is asking about Hb saturation at PO_2 60 mmHg, under normal physiological conditions (pH 7.4, temperature 37°C). At PO_2 60 mmHg, Hb saturation is 89%.

183. Lymph flow is increased by all except

a) Increased vacular permeability

b) Decreased capillary omotic pressure

c) Increased in interstial fluid

d) Decreased interstial osmotic pressure

Correct Answer - D
Ans. is 'd' i.e., Decreased interstial osmotic pressure
The formation of lymph is very slow, and only 2-4 L of lymph are drained into the great veins every day. Lymph flow is increased by following factors : *?*
1) *Any factor that increase in interstial fluid (e.g., edema) :* - Any cause of increased interstial fluid, except for obstruction in lymphatics, will cause increase in lymph flow. For example, venous obstruction results in decreased absorption of fluid into the capillaries, which results in increased lymph formation and lymph flow. So, any condition which either increae the fluid extravasation from capillaries or decrease fluid reabsorption into the capillaries, increases the lymph flow.
i) Increased capillary hydrostatic pressure
ii) Decreased plasma osmotic pressure
iii) Increased interstitial fluid osmotic pressure
iv) Increased capillary permeability
v) Deep vein valve incompitance
vi) Venous stasis due to standing or venous obstruction.
2) Lymphatic pump/suction pump : - This has already been explained. This includes : *?*
i) Skeletal muscle contraction (skeletal muscle pump); (ii) Squeezing action of smooth muscle lining the larger lymphatics; (iii) Positive

intra-abdominal and negative intrathoracic pressure. Therefore, *compression of tissues by objects outside the body (e.g., massage of foot) increases lymph flow.*
3) Sympathetic autonomic nervous system stimulation through the action of catecholamines receptors increase rate of lymph flow.

184. 1st urge at micturition comes at ?

a) 50 ml

b) 250 ml

c) 150 ml

d) 350 ml

Correct Answer - C
Ans. is 'c' i.e., 150 ml
"First urge to void is felt at a bladder volume of about 150 ml, and a marked sense of fullness at about 400 ml". – Ganong

185. Air volume in lung after normal expiration is called as ?

a) FRC

b) ERV

c) RV

d) TC

Correct Answer - A
Ans. is 'a' i.e., FRC
FRC is the amount of air remaining in the lungs after a normal tidal expiration (FRC = ERV + RV).

186. Two particles have same diameter. The one which will pass easily through glomerular membrane has ?

a) Positive charge

b) Negative charge

c) Any of the above

d) Charge has no relation

Correct Answer - A

Ans. is 'a' i.e., Positive charge

The filtration surface is a three-layered structure : - i) *Glomerular capillary endothelium;* ii) *The basement membrane (Basal lamina); and iii) Visceral epithelium of Bowman's capsule with their foot process (Podocytes).*

However, even the three layers put together do not provide an adequate structural basis for the degree of sieving achieved during filtration.

The fenestration in the endothelium are 50-100 nm in diameter, and the slits between the foot process of epithelial cells (podocytes) are 25 nm wide.

That leaves only the basement membrane to account for the selectivity and the filtration function of the glomerular membrane.

Basement membrane contains hydrated channels approximately 6 nm wide.

A further functional barrier in basement membrane is added by the fact that basement membrane glycoproteins are strongly negatively charged.

That is why filtration surface is almost impermeable to plasma proteins which are negatively charged, e.g., albumin (size 7 nm).

proteins which are negatively charged, e.g., albumin (size 7 nm).
The passage of *neutral or positively charged* molecules of comparable diameter is not so difficult.
Ultimately, molecules less than 4 nm is diameter are freely filtered while molecules larger than 8 nm are not filtered atall and the molecules between 4-8 nm diameter are filtered with difficulty which increases proportionately with size.

187. Smooth muscle physiology different from skeletal?

a) K^+ requires for contraction

b) Ca^{2+} required for contraction

c) Troponin is absent

d) Myosin is required for contraction

Correct Answer - C

Ans. is 'c' i.e., Troponin is absent

- Troponin is absent in smooth muscle, but required in skeletal muscles for contraction.
- Ca^+ and Myosin are required by both smooth muscles and skeletal muscles.
- K^+ has no direct role in contraction of smooth muscle and skeletal muscle.

Smooth muscle contraction

- In smooth muscle there is no troponin. Therefore calcium initiates contraction through a mechanism different from that employed by skeletal muscle. Smooth muscle contains a calcium binding protein called calmodulin. Increase in cytoplasmic (sarcoplasmic) calcium leads to its binding to calmodulin. The calcium-calmodulin complex activates myosin kinase, also called myosin light chain kinase (MLCK). MLCK is a phosphorylase which phosphorylates a light chain belonging to myosin chain, often called *cross-bridge phosphorylation.* The phosphorylated myosin head interact with actin, i.e., cross-bridging of myosin with actin. The cross-bridging leads to contraction.
- The reversal of contractile response depends on a reduction in

sarcoplasmic calcium by calcium pumps in the sarcoplasmic reticulum membrane and sarcolemma which pump calcium into sarcoplasmic reticulum and extracellular fluid respectively. Reduction in cytoplasmic (sarcoplasmic) calcium level activates an enzyme myosin phosphatase. Myosin phosphatase dephosphorylates the myosin head, thereby terminating the actin-myosin interaction and produces relaxation.

So, calcium influx has two functions in smooth muscles : -

i) Generation of action potential

ii) Essential for contraction initiation (Excitation contraction coupeling)

- It is intersting to know that although, dephosphorylation of myosin head is necessary for relaxation, dephosphorylation of myosin does not necessarily leads to relaxation of the smooth muscle. This is due to the latch effect, i.e., myosin bridges hold on to the actin filament like a latch. Due to this smooth muscle contracts, and it can maintain its contraction for prolonged period (sustained contraction) for a long period of time with minimal expenditure of energy → Characteristic feature of smooth muscle.
- As with skeletal, muscle ATP is required which is hydrolysed by myosin head which has ATPase activity (In a similar way as in skeletal muscle).

188. Acetylcholine on respiratory tract acts by all except?

a) Bronchoconstriction

b) Increases secretion

c) Stimulates chemoreceptor of aortic body

d) Inhibits chemoreceptor of carotid body

Correct Answer - D
Ans. is 'd' i.e., Inhibits chemoreceptor of carotid body
Actually both option c & d are incorrect as carotid body chemoreceptors are not found in respiratory tract. Carotid body and aortic odies are located in connective tissue associated with wall of common carotid artery and arch of aorta, respectively.
But, option 'C' can be considered correct as acetylcholine stimulates chemoreceptors (not inhibits).
"Acetylcholine increases chemoreceptor discharge in carotid body". – Principles of medical physiology
Thus best answer here is option 'd'.
About option a & b
Acetylcholine causes bronchoconstriction and increases tracheobronchial secretions.

189. Secondary active transport true is ?

a) Occurs only in same direction

b) Occurs only in opposite direction

c) Uses ATP molecule

d) No carrier required

Correct Answer - C
Ans. is 'c' i.e., Uses ATP molecule

190. In presence of Halden effect, CO_2 uptake is 2 ml/ 100 ml of blood in arteries, what will be CO_2 uptake in absence of Haldone effect in veins ?

a) 2 ml/100 ml of blood

b) 4 ml/100 ml of blood

c) 6 ml/100 ml of blood

d) 8 ml/100 ml of blood

Correct Answer - B
Ans. is 'b' i.e., 4 ml/100 ml of blood

191. Major hormone secreted by zona reticularis of adrenal cortex ?

a) Glucocorticoids

b) Mineralcorticoids

c) Aldosterone

d) Androgens

Correct Answer - D
Ans. is `d i.e., Androgens
The adrenal cortex is divided into three zones (outer to inner) : Zona glomerulosa, zona fasciculata and zona reticularis.
All three cortical zones secrete corticosterone, but the active enzymatic mechanism for aldosterone biosynthesis is limited to the zona glomerulosa whereas the enzymatic machanisms for forming cortisol and sex hormones are found in the two inner zones.
Furthermore, subspecialization occurs within the inner two zones, the zona fasciculata, secreting mostly glucocorticoids and the zona reticularis secreting mainly sex hormones.

192. Aldosterone secretion is maximally stimulated by?

a) Hyperkalemia

b) ACTH

c) Hypernatremia

d) Exogenous steroids

Correct Answer - A
Ans. is 'a' i.e., Hyperkalemia
Mineralocorticoid secretion is stimulated by hyperkalemia, angiotensin-H, ACTH and hyponatremia, in reducing order of efficacy.
1) Aldosterone secretion in response to hyperkalemia is the most important and forms the basis for renal regulation of body potassium balance.
2) Stimulation of aldosterone by angiotensin II (through renin-angioensin system) is important for the correction of hypovolemia and hypotension in conditions like salt depletion or renal ischemia.
3) Stimulation of aldosterone secretion by ACTH results in diurnal variation of aldosterone secretion. However, ACTH is not an important physiological regulator for aldosterone secretion.
4) Hyponatremia *is* a weak stimulator of aldosterone secretion.

193. Which of the following relays via interneurons on anterior horn cell ?

a) Muscle spindle

b) Corticospinal tract

c) Spinothalamic tract

d) Spinocerebellar tract

Correct Answer - B

Ans. is 'b' i.e., Corticospinal tract

Corticospinal tract terminates on α-motor neuron (anterior or ventral horn cells) via interneuron.

PYRAMIDAL TRACT (CORTICOSPINAL TRACT)

- Corticospinal tract is the most important tract through which the motor cortex controls the activity of the ventral horn cells (a-motor neurons) in the spinal cord. *It is also called pyramidal tract because they form the pyramid of the medulla.*
- *The corticospinal tract originates about 30 percent from primary motor cortex, 30 percent from premotor areas (premotor cortex & supplementary motor area) and 40% from the somatosensory area.* So, there are 40% sensory fibers in the corticospinal tract.
- After leaving the cortex, it passes through the posterior limb of internal capsule and then downward through the brainstem, forming the pyramids of medulla. The *majority (80%) of the pyramidal fibers then cross* the lower medulla to the opposite side and descend as the lateral corticospinal tract and finally *terminating principally on the interneuron* in the intermediate region of gray matter. Some also *terminate directly on the α-motor neuron,* especially those concerned with skilled movement.
- A *few fibers (20%) do not cross* to the opposite in the medulla and

descend ipsilaterally as anterior (ventral) corticospinal tract.

- The most impressive fibers in the pyramidal tract are a population of *large (16 pm) myelinated fibers* which originate from Giant pyramidal cells, called Betz cells, that are found only in primary motor cortex. These fibers transmit the nerve impulses to the spinal cord at fastest speed. However, these fibers form only 3% of the total. The other 97% are mainly fibers smaller than 4 m in diameter that conduct background tonic signals to the motor areas of the cord.
- Coricospinal tract is concerned with voluntary activities of body→ Voluntary control of movement is absolutely dependent on the activity of corticospinal fibers.

194. Sleep spindles 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 is 'c' i.e., Stage 2 NREM
Stages of sleep

- Sleep is basically divided into two phases :?
A) Non-REM (NREM) or slow-wave sleep :- It is called Non-REM sleep because no rapid eye movement (REM) is there on eletrooculogram, rather there is *slow or quiscent eye movement.* It is also referred as *S-sleep (synchronized sleep) or quiet sleep or orthodox sleep* because there is diminished physiological functions and a low level of overall activity. It is further divided into : *?*
1) Stage 1 :- It is a transition from wakefulness to sleep and is characterized by *disappearance of alpha activity and appearance of theta activity.* There is *slow eye movements.*
2) Stage 2 :- It is characterized by typical EEG activity i.e., *Sleep spindles and If-complex'. No eye movement* occurs.
3) Stage 3 & 4 :- Stage 3 & 4 are stages of *deep sleep.* These are also called *slow wave sleep* as these stages are characterized by *slow delta waves.* Delta wave appearance starts in stage 3 and dominated in stage 4.
B) REM sleep :- The REM sleep is so named as there is rapid roving movements of eye, i.e., rapid eye movement (REM)on electro-oculogram. It is also called paradoxical sleep because there is a

paradoxical elevation of brain activity & metabolism and physiological activity. The high-amplitude slow waves seen in stage 3,4 of REM sleep is replaced by rapid low voltage activity (Beta wave). Features of REM sleep are:-

i) EEG → Beta-wave, Reappearance of alpha wave, Saw-tooth wave (low voltage fast activity), Ponto-genital-occipital spikes.

ii) Dreaming

iii) Other features :- Generalized muscular atony, Penile erection, autonomic hyperactivity (Increased pulse rate & BP) and intermittent movement of small muscle groups.

The NREM (with its four stages) and REM sleep repeat several times a night in cyclic manner, 4-6 times depending on the length of sleep. A typical cycle starts with stage 1 of the NREM sleep which is followed by second, third and fourth stages. After this the sleep returns to stage 3 and 2. The first REM sleep occurs now, 7090 minutes after the the commencement of sleep (Note : - Stage 1 NREM sleep occurs only once at the start of the sleep as this is only a transition phase between wakefulness and sleep. Once the sleep starts the cycle rotates between stage 2, 3, 4 NREM and REM sleep). *REM sleep occupies 20-30% of total sleep and NREM sleep occupies 60-70%* (Stage-1 → 5-10%; Stage 2 → 40-50%; Stage 3 & 4 → 15-20%).

195.

Which of the following is not a part of glomerular filtration barrier ?

a) Mesangial cell

b) Endothelial cell

c) Podocyte

d) Basement membrane

Correct Answer - A
Ans. is 'a' i.e., Mesangial cell
The glomerular membrane (or the filtration barrier) is the *filtration surface* through which the fluid is filtered out from the blood into the uriniferous tubules.
The glomerular membrane (filtration barrier) comprises :
i) The glomerular capillary endothelium,
ii) The basement membrane (basal lamina) and
iii) The Bowman's visceral epithelium (podocytes).

196. Maximum prostaglandin secretion is seen in

a) Amniotic fluid

b) Saliva

c) Seminal fluid

d) Urine

Correct Answer - C
Ans. is 'c' i.e., Seminal fluid
"The concentrations in semen and mensural fluid probably reprent the highest concentrations of PGs found in human body" — www.reproductiveonline.org.

197. G protein coupled receptor ?

a) NMDA receptor

b) Steroid

c) M_2

d) Insulin receptors

Correct Answer - C
Ans. is 'c' i.e., M_2
M_2 muscarinic receptors are G-protein coupled receptors and act through cAMP.

198. Signal from Baroreceptors goes to ?

a) Caudal ventrolateral medulla

b) Rostral ventrolateral medulla

c) Nucleus of tractus solitarius

d) None of the above

Correct Answer - B
Ans. is 'b' i.e., Rostral ventrolateral medulla
Baroreceptors are *mechanoreceptors* that are located in the adventia of carotid artery and aorta, at specialized locations called sinuses.
1) Carotid sinus is a little bulge at the root of internal carotid artery, located just above the bifurcation of the common carotid artery. It is innervated by the sinus nerve, a branch of glossopharyngeal (IX cranial) nerve.
2) Aortic arch (aortic sinus) also contains mechenoreceptors (stretch receptors) which are similar to carotid sinus receptors. However, their afferent nerve fibers travel in the aortic nerve, a branch of Vagus (X cranial) nerve.
The sinus nerve (from carotid sinus) and aortic nerve/vagal fibers (from aortic sinus) are together called `Sinoaortic nerves'. They, together, are also refered to as 'Buffer nerves' because they are the afferents of cardiovascular reflexes that buffer abrupt changes in blood pressure.
Baroreceptors are highly sensitive to any change in mean blood pressure. *Sinoaortic nerves (buffer nerves)* normally discharge rhythmically, synchronous with the pressure fluctuation during systole and diastole. They respond to BP changes between 70 mm Hg and 150 mm Hg. *When BP rises, baroreceptors are stimulated*

and their afferents (through sinoaortic nerves) stimulate nucleus of tractus solitarus (NTS) which inturn inhibits the pressor area ofVMC, i.e., Rostral ventrolateral medula (RVLM). This results in decreased sympathetic outflow and therefore decreases in vasomotor tone and vasodilation. Vasodilation brings down the BP, thereby helping hemostasis. Activated NTS also stimulates nucleus ambiguous (cardioinhibitory center) of medulla, which increases parasympathetic (vagal) output, through vagus, that decreases heart rate. Reduction in heart rate reduces the cardiac output, which also reduces BP. Baroreceptor stimulation also weekly inhibits respiration.

When BP falls, for instance while changing the posture from lying down to standing, reverse change takes place. When a person stands up, his blood is pooled in the veins of lower limbs by the effect of gravity. Central venous pressure and venous return decrease, which causes a fall in stroke volume. Hence the systolic BP falls. As a result, the discharge rate of baroreceptors decreases leading to a decrease in the inhibitory influence on the pressor area of VMC. Hence vasomotor tone increases, leading to vasoconstriction, and consequently *an increase in BP.* Simultaneously, the nucleus ambiguous of the vagus is also inhibited, increasing the heart rate and *consequently stroke volume and eventually BR Thus fall in BP due to change ofposture is very brief (Transient).*

199. Normal respiratory compliance is ?

a) 200 ml/cm water

b) 50 ml/cm water

c) 100 ml/cm water

d) 150 ml/cm water

Correct Answer - A
Ans. is 'a' i.e., 200 ml/cm water
The lungs and thoracic cage are both elastic structures. Hence they display a constant relationship between distending pressure and change in volume.
The change in volume per unit change in pressure is called "compliance".
The total compliance of both lungs together in the normal adult human being is about *0·2 L/cm water.*
That is, every time the transpulmonary pressure increases by 1 centimeter of water, the lung volume will expand 0·2 L (200 ml).
Compliance is a measure of distensibility.

200. In which O_2 therapy is used ?

a) Hypoxic hypoxia

b) Anemic hypoxia

c) Histotoxic

d) Stagnant

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

201. Preload is determined by ?

a) Enddiastolic volume

b) Endsystolic volume

c) Ventricular ejection volume

d) None of the above

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

202. Negative intrapleural pressure is due to ?

a) Uniform distribution of surfactant over alveoli

b) Negative intraalveolar pressure

c) Absorption by lymphatics

d) Presence of cartilage in the upper airway

Correct Answer - C

Ans. is 'c' i.e., Absorption by lymphatics

- The pleural pressure is negative, more negative during inspiration, less negative during expiration, but always negative during quiet breathing.

This is because *both the thoracic cage and lungs are elastic structures;* therefore, both tend to recoil, but in opposite direction. This creates negative intrapleural pressure.

"A negative force is always required on the outside of the lungs to keep the lungs expanded. This is provided by negative pressure in the normal pleural space. The basic cause of this negative pressure is pumping of fluid from the space by the lymphatics (which is also the basis of the negative pressure found in most tissue spaces of the body)." - Guyton 12/e p 483

So, two important reasons of negative intrapleural pressure are :-

i) Elasticity of lungs and thoracic cage in opposite direction.

ii) Lymphatic drainage of pleural fluid.

203. Average menstrual flow during normal menses is?

a) 50ml

b) 100ml

c) 90ml

d) 120ml

Correct Answer - A
Ans. is 'a' i.e., 50ml
Average amount of blood loss during normal mensturation is 30-40 ml per cycle.
Heavy bleeding is considered if blood loss is more than 60-80 ml per cycle.

204. True about O_2 binding to myoglobin

a) Sigmoid shaped curve

b) More affinity than hemoglobin

c) Binds 4 molecule of O_2 to myoglobin

d) P_{50} is 26 mmHg

Correct Answer - B

Ans. is 'b' i.e., More affinity than hemoglobin

Myoglobin is present in higher concentration in red (slow) muscle fibers.

Myoglobin has greater affinity for oxygen than hemoglobin and its P_{50} is only 5 mm Hg (as compared to P_{50} of hemoglobin which is about 26 mm Hg).

Therefore, myoglobin-oxygen dissociation curve is shifted far to the left than Hb-O_2 dissociation curve.

It has shape of hyperbola as compared to sigmoid shape of Hb-O_2 curve because it binds 1 molecule of 0_2 per mole (in comparison to Hb which binds 4 molecules of O_2 per mole).

The role of myoglobin is to bind O_2 at very low PO_2 and release them at even lower PO_2, for example in *exercising muscles* where PO_2 close to zero.

205. Maximum storage of Mg in which of the following?

a) Liver

b) Bones

c) Kidney

d) Intestine

Correct Answer - B
Ans. is 'b' i.e., Bones
Human adult body contains about 25 gm of magnesium of which about half is found in the skeleton.

206. Iron absorption is inhibited by ?

a) Ascorbic acid

b) Vitamin C

c) Hepcidin

d) All of the above

Correct Answer - C
Ans. is 'c' i.e., Hepcidin

207. The basal ganglia function from thalamus is controlled by ?

a) Anterior nucleus

b) Intralaminar nucleus

c) Dorsal nucleus

d) Pulvinar nucleus

Correct Answer - A
Ans. is 'a' i.e., Anterior nucleus
Motor nuclei (ventral anterior and ventral lateral) of thalamus relay and process messages from basal ganglia (especially globus pallidus) and cerebellum to motor and premotor cortex.
From functional point of view, thalamic nuclei are divided into :?
A) Specific sensory nuclei (relay nuclei) :- These nuclei receive all sensory afferents from ascending pathways and project to the somatosensory cortex. These include *ventroposterior nucleus* and *medial & lateral geniculate bodies.*
B) Association nuclei :- These nuclei have reciprocal connections with the association areas of the cerebral cortex and therefore help in integration of different type of sensory information. These nuclei include *the lateral group of nuclei (Pulvinar, lateral dorsal, lateral posterior nuclei) and part of medial dorsal nucleus.*
C) Nonspecific nuclei :- These nuclei also receive sensory information but project to the cortex in a diffuse manner. Therefore they seem to be involved in the arousal induced by sensory stimuli. These nuclei are *intralaminar and reticular nuclei.*
D) Motor nuclei :- There nuclei relay and process messages from the basal ganglia and cerebellum to motor and premotor cortex. These

nuclei are *ventral anterior and ventral lateral nuclei.*

208. Nerve growth factor is required for growth of ?

a) Sympathetic neurons

b) Brain

c) Motor neuron

d) y-neuron

Correct Answer - A
Ans. is 'a' i.e., Sympathetic neurons
Nerve growth factor (NGF) promotes growth of neurons, particularly autonomic nervous system.
Antiserum against NGF can be prepared and injection of this serum causes total destruction of sympathetic ganglia - immunosympathectomy.
NGF is also required for growth of basal forebrain cholinergic neurons.

209. Fastest conduction is for -

a) Cold

b) Pain

c) Proprioception

d) Pressure

Correct Answer - C
Ans. is 'c' i.e., Proprioception

210. Among which hypoxia AV 0 difference is max ?

a) Histotoxic

b) Stagnant

c) Hypoxic

d) Anemic

Correct Answer - B
Ans. is 'b' i.e., Stagnant

211. Apneusis occur when ?

a) Lesion is above pons

b) Lesion is midpontine with intact vagus

c) Lesion is midpontine with damaged vagus

d) Lesion is at pontomedullary junction

Correct Answer - C
Ans. is 'c' i.e., Lesion is midpontine with damaged vagus

212. Down regulation of hormone means ?

a) Decreased secretion of hormone

b) Decreased affinity to receptors

c) Defective regulation in secretion

d) Regulation by low concentration of hormone

Correct Answer - B
Ans. is 'b' i.e., Decreased affinity to receptors
Down regulation is a mechanism in which a *hormone decrease the number or affinity of its receptors in target tissues.*
Down-regulation may occur by decreasing the synthesis of new receptors, by increasing the degradation of existing receptors or by inactivating receptors.
The purpose of down-regulation is to reduce the sensitivity of the target tissue when hormone levels are high for an extended period of time.

213. Vagal stimulation in heart causes decrease in heart rate by ?

a) Decrease in action potential spike

b) Decrease in slope of prepotential

c) Increase in repolarization

d) Decrease conduction

Correct Answer - B

Ans. is 'b' i.e., Decrease in slope of prepotential

Effect of autonomic nervous system

The SA node develops from structures on the right side of the embryo and the AV node from structures on the left. This is why right vagus (parasympathetic) is distributed primarily to SA node and the left vagus (parasympathetic) mainly to AV node. Similarly, the sympathetic innervation on the right side is distributed primarily to the SA node and the sympathetic innervation on the left side primarily to AV node.

Effects of ANS on cardiac physiology are as follow : ?

A) Parasympathetic (vagal) stimulation

i) Negative chronotropic (decreased heart rate) : - Vagal stimulation cause decrease in slope (flattening) of prepotential (pacemaker potential) and therefore the time taken to reach the threshold level is increased --> Heart rate is decreased.

ii) Negative dromotropic (decreased conduction).

iii) Increased refractory period of all type of cardiac cells.

B) Sympathetic stimulation

i) Positive chronotropic (Increased heart rate):- Sympathetic stimulation increases the slope of phase 4 prepotential (pacemaker potential); therefore, time taken to reach the threshold is decreased

and heart rate is increased.
ii) Positive ionotropic (Increased contractility).
iii) Positive dromotropic (Increased conduction velocity in conductive tissue).
iv) Decreased in refractory period of all type of cardiac cells.
v) Positive bathmotropic (Increased automaticity).

214. Pleural pressure at the end of respiration is ?

a) Zero

b) More negative

c) Positive

d) Less negative

Correct Answer - B
Ans. is 'b' i.e., More negative
During quiet breathing, the intrapleural pressure fluctuates between -3 and -6 mm Hg, depending upon the phase of respiration, more negative at the end of inspiration and less negative during expiration.
Intrapleural pressure (Pleural pressure)
It is the pressure between two pleural surfaces. The lung is covered with visceral pleura and the thoracic cage is lined on inside with parietal pleura. Between the two layers of pleura is a very narrow space, called the pleural cavity. *Intrapleural pressure is always negative and during quiet breathing the Intrapleural pressure fluctuates between -3.8 mm Hg (- 5.0 cm watery to -6.0 mm Hg (-8.0 cm water).*
Now let us examine why the pleural pressure is negative; more negative during inspiration, less negative during expiraion, but always negative during quiet breathing. The key to the answer is the fact that both the thoracic cage and lungs are elastic structures. Being elastic structure they both tend to recoil, but in opposite direction. The lungs have a tendency to collapse and thoracic cage has a tendency to expand. However, because of the anatomical relationships in the body, these tendencies do not normally

materialize. But the tendencies do create an inward pull on the visceral pleura (by lung) and an outward pull on parietal pleura (by thoracic cage). The results of these pulls is a negative pressure in the space between the pleural surfaces, i.e., in the pleural cavity.

215. Action of parathormone on phosphate level ?

a) Decreases phosphate level

b) Increases phosphate level

c) No effect

d) Variable effect

Correct Answer - A
Ans. is 'a' i.e., Decreases phosphate level

216. Sodium-potassium pump is a type of ?

a) Passive transport

b) Primary active transport

c) Secondary active transport

d) Counter transport

Correct Answer - B
Ans. is 'b' i.e., Primary active transport

217. Normal FSH level in adult male ?

a) 10-20 IU/L

b) 20-40 IU/L

c) 40-60 IU/L

d) 60-80 IU/L

Correct Answer - A
Ans. is 'a' i.e., 10-20 IU/L

218. Maximum pressure in left ventricle seen is ?

a) 2 mm Hg

b) 25 mm Hg

c) 80 mm Hg

d) 120 mm Hg

Correct Answer - D
Ans. is 'd' i.e., 120 mm Fig

219. Maximum pressure in left ventricle is seen in which phase of cardiac cycle ?

a) Isovolumetric contraction

b) Ventricular ejection

c) Protodiastole

d) Rapid ventricular filling

Correct Answer - B

Ans. is 'b' i.e., Ventricular ejection

During ventricular ejection phase, when the steeply rising left ventricular pressure exceeds the aortic pressure (120 mm Hg), it is able to push open the aortic valve and eject the blad into the aorta, making the onset of ventricular ejection.

PHASE OF CARDIAC CYCLE

A cardiac cycle refers to the interval between onset of one heartbeat to the onset of the next heart beat. It has two main phases : Ventricular systole and ventricular diastole.

Ventricular systole (or simply systole)

The systolic phase is divided into : -

i) Isovolumetric contraction : As the ventricular contraction starts, the intraventricular pressure begins to rise, leading to an abrupt closure of AV valves (mitral and tricuspid valves). The closure of AV valves produces first heart sound (S_1). the pressure is not enough to push open the semilunar valves (aortic and pulmonary) but causes the closed AV valve to bulge into the atrium, causing a small but sharp rise in atrial pressure called the 'C' wave on jugular venous pulse (JVP). Because both the valves (AV valves an semilunar valves) are closed, there is no change in volume, i.e.,

there is isovolumetric (isometric) contraction. Isovolumetric contraction ends with opening of semilunar (aortic and pulmonary) valves.

ii) Ventricular ejection : When the steeply rising ventricular pressure exceeds the pressure in aorta and pulmonary artery, the semilunar valves open and ventricular ejection begins. The ejection of blood is rapid at first (rapid ejection phase), but slows down during later part of systole (slow ejection phase). During rapid ejection phase, when the ventricles contract, the fibrous partition separating the ventricles from the atria (the AV ring) is pulled down. As a result, the atrial muscles get stretched and the atria dilate which causes a sharp fall in atrial pressure and the *X-descent in JVP.*

iii) Protodiastole : In this very short phase, ventricles start relaxing and ventricular pressure begins to fall very sharply but the semilunar valves are still open. As a result, the column of blood in aorta (or pulmonary artery for right ventricle) tries to fall into the ventricle, hitting on its way the semilunar (aortic or pulmonary) valves. This causes closure of the aortic/pulmonary valves which produces 2" heart sound (S_2). The venous blood flow continues to flow in the atria from great veins (SVC and ICC) and there is relaxation of fibrous AV ring due to ventricular relaxation; both of which cause a rise in atrial pressure and *production of `V' wave in JVP.*

<u>Ventricular diastole (or simply diastole)</u>

The diastole phase is divided into : -

i) Isovolumetric relaxation : - This phase is the period between the closure of semilunar valve and opening of the AV valve. The ventricles continue relaxing and there pressure continues to fall. However, as both valves (AV valves and semilunar valves) are closed, there is no change in volume, i.e., *isovolumetric relaxation.* Relaxation phase ends with opening of AV valve.

ii) Rapid ventricular filling : - When the ventricular pressure falls below atrial pressure, AV valves open and the accumulated blood in the atria rushes into the ventricle very rapidly. This passive filling contributes to 70% of ventricular filling, normally. This results in a sharp fall in atrial pressure which produces Y descent in JVP.

iii) Diastasis : - After the initial rapid ventricular filling, blood flows slowly and smoothly from the SVC and IVC through the right atrium

into the right ventricle without any turbulence anywhere along the path. Similarly, blood from the pulmonary veins flows into the left ventricle without any turbulence. This phase of nonturbulent ventricular filling is called diastasis. The atrial pressure remains slightly greater than the ventricular pressure because inflow to atrium exceeds the outflow the atrium.

iv) Last rapid filling phase (atrial systole) : - The atria contract and pump blood rapidly into the ventricles.Atrial systole is associated with sharp rise in atrial pressure which produces a-wave in JVP.

220. True about Generatory potential ?

a) Not graded

b) Magnitude increased in direct proportion to strength of stimulus

c) All or none phenomenon

d) Propagated

Correct Answer - B
Ans. is 'b' i.e., Magnitude increased in direct proportion to strength of stimulus
Generator potential is a local potential which is :-
i) Graded → Magnitude directly related to the strength of stimulus.
ii) Decreased → Fade out after traveling a short distance.
iii) Non-propagated.

221. Subnuclear cytoplasmic vacualization is seen in which stage of menstural cycle ?

a) Proliferative phase

b) During mensturation

c) Secretory phase

d) None

Correct Answer - B
Ans. is 'b' i.e., During mensturation

222. Least A-V O_2 difference is seen in ?

a) Hypoxic hypoxia

b) Anemic hypoxia

c) Stagnant hypoxia

d) Cyanide poisoning

Correct Answer - D
Ans. is 'd' i.e., Cyanide poisoning

223. Important role of distal tubule of kidney in acid-base balance ?

a) Secretion of Ammonia

b) Secretion of bicarbonate

c) Secretion of HCl

d) Absorption of Ammonia

Correct Answer - A
Ans. is 'a' i.e., Secretion of Ammonia
The H^+ ions secreted into the tubule are mopped up by urinary buffers present in the tubular fluid. The three important buffers are : -
i) Bicarbonate buffer : - Present in proximal segments (Proximal tubules, Thick ascending limb). It is nothing else but filtered HCO_3- ions which react with H^+ to form H_2CO_3. This is the most important buffer in proximal tubules.
ii) Phosphate buffer : - Especially important in distal tubules.
iii) Ammonia buffers : - Bind to H^+ and produce ammonium ion ($H^+ + NH_3 = NH_4$). The reaction with NH_3 occurs in the proximal and distal tubules but the main buffering mechanism is active in distal tubule and this is the most important buffer in distal tubule.
Thus, these buffers neutralize H^+ in the tubules and in exchange HCO_2 is reabsorbed. In case of bicarbonate buffer all filtered bicarbonates are reabsorbed. In case of ammonia and phosphate buffers, new HCO_3 is generated due to secretion of W. So, ammonia and phosphate buffers are excreted in exchange of HCO_3 absorption.

224. True about second messengers ?

a) Act on intracellular receptors

b) Mediate response of extracellular hormones and neurotransmitter

c) Mediate response of intracellular hormones

d) Act by stimulation of transcription

Correct Answer - B
Ans. is 'b' i.e., Mediate response of extracellular hormones and neurotransmitter

225. True about spermatid ?

a) Derived from primary spermatocyte

b) Derived from secondary spermatocyte

c) Undergoes mitotic division

d) Undergoes meiotic division

Correct Answer - B
Ans. is 'b' i.e., Derived from secondary spermatocyte

226. Pyrogens act on which site of brain ?

a) Basal ganglia

b) Limbic system

c) Thalamus

d) Hypothalamus

Correct Answer - D
Ans. is 'd' i.e., Hypothalamus
<u>Pyrogenes</u>
Pyrogenes are substances that cause fever.
Pyrogens may be exogenous or endogenous
Exogenous → Bacterial toxins
Endogenous → IL-1, TNF-a, IL-6, Interferons, Ciliory's neurotropic factor
These pyrogenes increase the level of *PGE,* in the hypothalamus that elevates the thermoregulatory set point and causes fever.

227. True about carotid body receptors ?

a) Most potent stimulus is high PCO2

b) Dopamine is neurotransmitter

c) Low blood flow

d) Afferent through vagus nerve

Correct Answer - B

Ans. is 'b' i.e., Dopamine is neurotransmitter

<u>Peripheral chemoreceptors</u>

The peripheral chemoreceptors which regulate respiration are located in the *carotid body and aortic bodies.* These bodies are located in the connective tissue associated with the vessel wall, at the bifurcation of the common carotid, and on the arch of aorta, respectively. The characteristic cells of both these structures are *called glomus cells.* Type I glomus cells have a high dopamine content, which they possibly employ as a neurotransmetter.

Peripheral chemoreceptors convey information to the DRG of neurons in medulla, for which purpose *the afferent neurons from the carotid bodies pass through glossopharyngeal nerve and from the aortic bodies pass through vagus nerve.*

The most potent natural stimulus for peripheral chemoreceptors is low arterial $P0_2$ (hypoxic hypoxia). The other stimuli which activate peripheral chemoreceptors are high arterial PCO_2, and an increase in arterial hydrogen ion concentration (acidosis or low pH). The response to activation of peripheral chemoreceptors is an increase in pulmonary ventilation through an increase in the rate and depth of breathing.

The blood flow to peripheral chemoreceptors, on per unit mass basis, is the highest to any tissue in the body. With a blood flow of

2000 ml/min/100 gm tissue, the carotid and aortic bodies, inspite of their high metabolic rate, hardly remove any oxygen from the blood supplies to them. That is why the arteriovenous oxygen difference is negligible in these bodies. Thus these structures are idealy built to sense change in arterial P02.

It is good to keep in mind that stimulation of peripheral chemoreceptors not only stimulates medullary respiratory centers but also medullary vasomotor center. Therefore, the response to their stimulation is tachycardia, vasoconstriction and increase BP along with hyperventilation.

228. Secretory vesicles are transported ?

a) Along concentration gradient

b) Against concentration gradient

c) May be along or against concentration gradient

d) Have no relation with concentration gradient

Correct Answer - D

Ans. is 'd' i.e., Have no relation with concentration gradient

Exocytosis

Exocytosis is a reverse of endocytosis. This process is involved when secretory granules are extruded from the cell. When secretory vesicle comes in contact with inside of cell membrane, the membrane of the vesicle fuses with cell membrane and then there is extrusion of the contents of vesicle from the cells as secretory granules. Similar to endocytosis exocytosis requires Ca^{++} and energy. Exocytosis is also called emiocytosis or reverse pinocytosis. Exocytosis (secretion from the cell) occurs via two pathways : - *Non-constitutive pathway :-* Proteins from the Golgi apparatus initially enter secretory granules, where processing of prohormones to mature hormones occurs before exocytosis. This pathway is sometimes called "regulated pathway". ii) *Constitutive pathway :-* Involves the prompt transport of proteins to the cell membrane in vesicles, with little or no processing or storage.

229. How will you calculate that how much inspired air actually ventilates the alveoli ?

a) Single breath N_2 method

b) Dalton's law

c) Bohr equation

d) Boyle's law

Correct Answer - A
Ans. is 'a' i.e., Single breath N_2 method
Examiner is simply asking that how will you measure anatomical dead space.
When air is breathed in, only the air that reaches the alveoli participates in gas exchange. The air in the airways (Trachea, bronchi) is breathed out unchanged as air in them does not participate in gaseous diffusion. Hence the airway space behaves as functionally dead so far as gas exhange is concerned. This is called 'anatomical dead space'. The volume of this space is 150 ml. That means only the first 350 ml of the 500 ml inspired with each breath (tidal volume) at rest mixes with the air in the alveoli. Conversely, with each expiration, the first 150 ml expired is gas that occupied the dead space, and only the last 350 ml is gas from the alveoli. So, normally dead space (V_d) : tidal volume (V_i) ratio is $0{\cdot}30$ (150: 500).
Anatomical dead space is calculated by single-breath N_2 method.
About option 'C'
Bohr equation is used to calculate physiological (total dead space).
Normally, 350 ml of air enters the alveoli, with each breath. However, not all the air that enters the alveoli necessarily

participates in alveolar gas exchange. In disease states, no diffusion (exchange) may take place between the gas in some of the alveoli and blood, and some of the alveoli may be overventilated. Such spaces in the alveoli constitues 'alveolar' dead space. The sum of anatomical dead space and alveolar dead space is called the 'physiological' dead space. Hence, the physiological dead space is the volume of inspired air, in airways (anatomical dead space) and in the alveoli (alveolar dead space), that does not participate in gaseous exchange. In healthy individuals, anatomical dead space and physiological dead space are identical because all the air entering into the alveoli participates in gaseous exchange (as alveolar diffusion, ventilation and perfusion are normal in healthy individuals).

230. Which of the following causes increase in conduction velocity of impulse through heart ?

a) Vagal stimulation

b) Parasympathetic stimulation

c) Sympathetic stimulation

d) All of the above

Correct Answer - C
Ans. is 'c' i.e., Sympathetic stimulation
Effects of sympathetic stimulation are :
i) Heart :- positive chronotropic *(1' heart rate),* ii) Positive ionotropic *(1' contractility),* iii) Positive dromotropic *(1' conduction velocity),* iv) Positive bathmotropic (increased automaticity), *v) Decreased refractory period in all cardiac cells.*
ii) Vasoconstriction :- T total peripheral resistance (due to arteriolar constriction), venous capacitance (due to venoconstriction)
iii) Increased stroke volume, cardiac output and BP.
Effects of parasympathetic stimulation are *:?*
i) Negative chronotropic (decreased heart rate) : - Vagal stimulation cause decrease in slope (flattening) of prepotential (pacemaker potential) and therefore the time taken to reach the threshold levelis increased --> Heart rate is decreased.
ii) Negative dromotropic (decreased conduction).
iii) Increased refractory period of all type of cardiac cells.

231. After ejaculation into vagina sperm retains motility for ?

a) 24hrs

b) 36hrs

c) 72 hrs

d) 1 week

Correct Answer - A
Ans. is 'a' i.e., 24hrs
"In ejaculated semen the maximum life span of sperm is 24-48 hours at body temperature". — Indu Khurana

232. Bilirubin bound inside hepatocyte to ?

a) Albumin

b) Ubiquinone

c) Ligandin

d) Globulin

Correct Answer - C
Ans. is 'c' i.e., Ligandin
Bilirubin metabolism
Bilirubin is the end product of heme degradation.
The heme is derived from -
i) Senescent erythrocytes by mononuclear phagocytic system in the spleen, liver and bone marrow (major source).
ii) Turnover of hemoproteins (e.g. cytochrome p.450).
Heme is oxidized to biliverdin by heme oxygenase.
Biliverdin is then reduced to bilirubin by biliverdin reductase.
Bilirubin is transported to liver in bound form with albumin.
Bilirubin is transferred to hepatocytes where it is bound to ligandin.
There is carrier mediated uptake of bilirubin in the liver.
This bilirubin is conjugated with glucuronic acid by UDP glucuronyl transferase (UGT1A1) to from conjugated bilirubin (bilirubin glucronides).
Conjugated bilirubin is excreted into bile.
Most of the conjugated bilirubin is deconjugated and degraded to urobilinogen.
The most of the urobilinogen is excreted in the feces.

233. Bilateral cutting of vagus nerve causes ?

a) Decrease heart rate

b) Decrease respiratory rate

c) Increase heart rate

d) Decreased BP

Correct Answer - C
Ans. is 'c' i.e., Increase heart rate
Aortic nerve (a branch of vagus nerve) carries :?
i) Baroreceptor afferent from Aortic sinus.
ii) Chemoreceptor afferent from Aortic bodies.
Bilateral sectioning of vagus nerve causes increase in heart rate and BP due to two reasons :?
i) Abolition of baroreceptor discharge of aortic sinus on RVLM → causing increasing in sympathetic output.
ii) Inhibition of nucleus ambiguous → causing decreased parasympathetic tone.
Effect on chemoreceptors afferent is minimal as chemoreceptors are stimulate by low PO, and normally they have no dischange.

234. Minimum filteration through glomerulatus ?

a) Glucose

b) Inulin

c) Creatinine

d) Myoglobin

Correct Answer - D
Ans. is 'd' i.e., Myoglobin
Water is freely filterable through glomerular barrier. A filterability of 1.0 means that the substance is filtered as freely as water; a filterability of 0.75 means that the substance is filtered only 75 percent as rapidly as water. Substances that are freely filterable (filterability 1.0) are water, sodium, glucose, Bicarbonate, inulin, and creatinine. *Myoglobin* is partially filterable (filterability of 0.75) and albumin is almost not filterable (filterability of 0·005) under normal conditions.

235. GFR is determined by ?

a) Afferent arteriolar resistance

b) Efferent arteriolar resistance

c) Arterial pressure

d) All of the above

Correct Answer - D
Ans. is 'd' i.e., All of the above
Determinants of GFR
A) Increase glomerular capillary hydrostatic pressure increases GFR. Glomerular hydrostatic pressure is determined by following variables : i) Arterial *pressure,* ii)Afferent *arteriolar resistance;* iii) *Efferent arteriolar resistance.*
i) Increased arterial pressure tends to raise glomerular hydrostatic pressure and, therefore, to increase GFR. Opposite is true for decreased arterial pressure, i.e., Hypotension causes decrease in GFR.
ii) Increased resistance of afferent arterioles (constriction of afferent arterioles) reduces glomerular hydrostatic pressure and decrease GFR. Conversely, dilation of the afferent arterioles increases both glomerular hydrostatic pressure and GFR.
iii) Efferent arteriolar constriction has a biphasic effect on GFR. At moderate levels of constriction, there is a slight increase in GFR, but with severe constriction, there is a decrease in GFR. Dilatation of efferent arterile decreases glomerular hydrostatic pressure and therefore decreases GFR.
B) Increased glomerular capillary colloid osmotic (oncotic) pressure decreases GFR. Decreased glomerular capillary colloid osmotic pressure increases GFR, .e.g, in hypoproteinemia. Increased renal blood flow increases GFR by decreasing glomerular capillary oncotic

blood flow increases GFR by decreasing glomerular capillary oncotic pressure. Increased RBF causes decrease in filtration fraction (filtration fraction = GFR/RPF). This results in more fluid remaining in the glomerular capillary and dilution of plasma proteins and as a result decrease in oncotic pressure. Conversely, by opposite effect, Decreased renal blood flow decreases GFR.
C) Increased Bowman's capsule hydrostatic pressure (due to increased tubular hydrostatic pressure as a result of obstruction) decreases GFR.
D) Decrease in glomerular capillary filtration coefficient (K_1) decreases GFR. *K_2 depends on the permeability of the glomerular membrane as well as its surface area.* Increased thickness of membrane decreases the permeability and K_rChronic hypertension and diabetes increases the thickness of glomerular membrane and decrease K_f and thereby GFR.$K_f$can be altered by the mesangial cells which contract and cause decrease in Kr by decreasing surface area of membrane. Relaxation of mesangial cells increase K1.
i) Contraction of mesangial cells (therefore decrease in GFR) is produced by : - Endothelin, angiotensin II, vasopressin, norepinephrine, PAF, PDGF, thromboxane A_2,PGF_2, Leukotrienes C4 & D4, Histamine.
ii) Relaxation of mesangial cells (therefore increase in GFR) is produced by : - ANP, Dopamine, PGE2, cAMP .

236. Chemical regulation of respiration is not affected by?

a) pH

b) pCO_2

c) pO_2

d) BP

Correct Answer - D
Ans. is 'd' i.e., BP

237. Osmolarity of 4·2% solution of sodium bicarbonate is ?

a) 500 osmole/litre

b) 1000 osmole/litre

c) 1500 osmole/litre

d) 2000 osmole/litre

Correct Answer - B

Ans. is 'b' i.e., 1000 osmole/litre

4·2% solution of sodium bicarbonate contains 0·5 mmol/mL (or 500 mmol/ml).

This solution will have osmoloarity 1000 mOsm/L (as solution contains two active osmoles, i.e., 500 mOsmole of Na^+ and 500 mOsmole of HCO_3^-).

One mole of osmotically active particles is called one osmole. In case of non-dissociated solutes, one gram molecular weight of any substance contain similar number of osmotically active molecules (osmoles), thus a molar solution of glucose contains 1 osmole. On the other hand, in case of dissociated solutes, one gram molecular weight of any substance contain the number of osmotically active molecules (osmoles) equal to the number of dissociated molecules, e.g., a molar solution of NaCl contains 2 osmoles (1 mole of Na+ and 1 mole of C1—). The osmolar concentration of a solution in osmole/litre is called osmolarity. When expressed in osmole/Kg of solution is called osmolality.

238. True about ascending limb of loop of Henle ?

a) Recieves hypertonic saline

b) Maximum absorption of fluid

c) Respond to ADH

d) None of these

Correct Answer - A

Ans. is 'a' i.e., Recieves hypertonic saline

Fluid leaving the descending limb of loop of Henle and entering the ascending limb of loop of Henle is very hypertonic.

Renal reabsorption and secretion

- The Glomerular filtrate enters the renal tubules and flows through the successive parts of the tubule (i.e. *the proximal tubule, loop of Henle, distal tubule and finally collecting ducts)* before it is excreted as urine. Along its course, the tubular cells may selectively secrete some substances from the blood into the tubular lumen *(tubular secretion),* or may selectively remove some substances *(tubular reabsorption)* from the tubular filtrate, or may do both. When the Glomerular filtrate is initially formed, its osmolarity is about the same as that of plasma i.e. 300mOsm/L. Its osmolalilty changes depending on the absorption of water and solutes in the segment.

Proximal convoluted tubule

- The PCT reabsorbs- sodium, chloride, bicarbonate, phosphate, potassium, glucose and amino acids.
- The PCT secretes- H+, organic acids and bases (such as bile salts, oxalate, urate and catecholamines)
- The PCT is highly permeable to water. In PCT solutes and water are reabsorbed in equal proportions, thus little change in the osmolarity

occurs i.e. the tubular fluid in the PCT is isotonic to the plasma.

Loop of Henle: Descending limb

- The thin descending segment is highly permeable to water and moderately permeable to most solutes, including urea and sodium. No active reabsorption or secretion takes place.
- The water is reabsorbed as the tubular fluid passes down the descending limb and the filtrate becomes concentrated, in equilibrium with the surrounding interstitial fluid of the renal medulla, which is very hypertonic. Thus fluid leaving Descending limb of loop of Henle is very hypertonic.

Loop of Henle: Ascending limb

- The thick ascending limb reabsorbs - sodium, chloride, and potassium, calcium, bicarbonate, and magnesium. o This segment also secretes- hydrogen ions into the tubular lumen.
- The thin segment of the ascending limb has a much lower reabsorptive capacity than the thick segment, and the thin descending limb does not reabsorb significant amounts of any of these solutes.
- The ascending limb, including both the thin and the thick portions, is *completely impermeable to water, even in the presence ofADH.* Since other solutes are being reabsorbed, the tubular fluid becomes hypotonic. Thus the fluid leaving the ascending limb of loop is *hypotonic,* with an osmolarity of only about one third the osmolarity of plasma i.e. 100 mOsm/L.

Early distal tubule

- Early distal tubule has properties similar to those of the thick ascending limb of the loop, that is, it avidly reabsorbs most of the ions, including sodium, potassium, and chloride, but is virtually impermeable to water so there is further dilution of the tubular fluid.

The late distal tubules and cortical collecting tubules

- The late distal tubules and cortical collecting tubules are composed of two distinct cell types, the principal cells and the intercalated cells.
- The principal cells reabsorb sodium from the lumen and secrete potassium ions into the lumen.
- The intercalated cells reabsorb potassium and bicarbonate ions from the lumen and secrete hydrogenions into the lumen.
- The reabsorption of water from this tubular segment is controlled by

the concentration of antidiuretic hormone.

Medullary Collecting Duct

- The medullary collecting ducts actively reabsorb sodium and secrete hydrogen ions and are permeable to urea, which is reabsorbed in these tubular segments.
- The reabsorption of water in medullary collecting ducts is controlled by the concentration of antidiuretic hormone.
- In late distal tubule, cortical collecting tubules and medullary collection tubules the tubular fluid osmolarity *depends on the presence or absence ofADH.* In presence of high levels of ADH these tubules are highly permeable to water and significant amounts of water are reabsorbed and the tubular fluid becomes *hypertonic,* up to 1200 mOsm/L (equal to osmolarity of the surrounding medullary interstitium). In the absence of ADH, these segments are almost impermeable to water; therefore osmolarity decreases even further because of continued active reabsorption of ions from these segments-tubular fluid thus becomes hypotonic with osmolarity as low as 50mOsm/L.

239. Na^+ reabsorption is maximum in ?

a) PCT

b) Loop of Henle

c) DCT

d) Collecting duct

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

240. Action potential generates from -

a) Cell body

b) Dendrites

c) Axon

d) Initial segment

Correct Answer - D
Ans. is 'd' i.e., Initial segment
Neuron is the functional unit (basic unit of nervous tissue). It is specialized for the function of reception, integration and transmission of information in the body. The basic structure of neuron is best studied in a spinal motor neuron. This cell has a 'cell body (soma)' with 5-7 small processes called 'dendrites'. There is a long process called 'axon' that originate from "axon hillock (A thickned area of cell body from which axon originates)". The first portion of the axon is called "initial segment". In a motor neuron, the axon hillock and the initial segment of axon have the lowest threshold for excitation. This is because they have *a much higher density of voltage gated sodium channels.*

241. Muscle tone is maintained by ?

a) Golgi tendon organ

b) Renshaw cells

c) Muscle spindle

d) None of the above

Correct Answer - C

Ans. is 'c' i.e., Muscle spindle

- Sensory receptors (stretch receptors) for stretch reflex are muscle spindles.
- Stretch reflex has two principal functions *:*
  1) *To maintain muscle tone*
- Tone is a tendency of a muscle to resist being stretched.
- Muscle tone is not only important for maintaining posture but also facilitates locomotion and makes all voluntary movement smooth.
  2) *To make muscles respond to stretch and release*
- Stretch reflex makes a muscle respond to stretch by contraction and to release by relaxation.
- both these responses, which oppose the triggering stimulus, help make voluntary movement smooth and graceful.

242. Genetic expression of Na-K-ATP'ase inducible by?

a) Aldosterone

b) Cortisol

c) Thyroxine

d) ACTH

Correct Answer - A
Ans. is 'a' i.e., Aldosterone
Mineralocorticoid actions
The principal mineralocorticoid secreted by adrenal cortex is *aldosterone.*
The main action of aldosterone is to enhance Na^+ *reabsorption in the distal convoluted tubule in kidney.*

243. ADH acts on ?

a) PCT

b) Loop of Henle

c) Collecting duct

d) All sites

Correct Answer - C
Ans. is `c' i.e., Collecting duct
<u>Antidiuretic hormone (ADH)</u>
ADH (vasopressin) is a *nonapeptide* secreted by *posterior pitutary (neurohypophysis)* along with oxytocin.
It is synthesized in *hypothalamus* (Supraoptic and paraventricular area) nerve cell bodies as large precursor peptide along with its binding protein *neurophysin* and is transported down the axons to nerve endings in the median eminence and pars nervosa.
The two main physiological stimuli for ADH release are rise in plasma osmolarity and contraction of ECF volume.
Other factors which can influence ADH secretion are:
Inhibit ADH secretion: Cold environemnt, ethyl alcohol
Stimulate ADH secretion: Pain, exercise, stress, sleep and drugs like morphine

244. Role of creatine phosphate in muscle ?

a) Helps in gluconeogenesis

b) Provides instant energy

c) Involved in action-contraction coupling

d) Helps in stretch reflex

Correct Answer - B

Ans. is 'b' i.e., Provides instant energy

- In muscles, creatine phosphate occurs as a reservoir of high-energy phosphate groups.
- It provides a *quick source of energy* for muscle fibres to contract when they need an initial burst of energy.
- Creatine phosphate helps generation of ATP in exercising muscles by substrate level phosporylation.
- Creatine phosphate liberates 10·3 Kcal/mole (AG = -10.3).

245. Insulin secretion is decreased by ?

a) Glucogen

b) Gastrin

c) Secretin

d) Somatostatin

Correct Answer - D
Ans. is 'd' i.e., Somatostatin

246. Maximum phosphate is reabsorbed in ?

a) PCT

b) DCT

c) Loop of Henle

d) Collecting duct

Correct Answer - A
Ans. is 'a' i.e., PCT
About 60% -70% of filtered phosphate is absorbed in proximal tubule and most of the remaining in distal tubule.

247. Cushing reflex is associated with all except ?

a) Hypotension

b) Increased intracranial pressure

c) Bradycardia

d) Tachyponea

Correct Answer - A
Ans. is 'a' i.e., Hypotension
A rise in intracranial pressure causes impaired blood supply to VMC (RVLM) neurons and the local hypoxia and hypercapnia increase their discharge to the systemic resistance vessels, i.e., cushing reflex. The resultant rise in BP tends to restore cerebral blood flow and over a considerable range, the BP rise is proportional to the increase in intracranial pressure. The increase in BP causes reflex bradycardia through arterial baroreceptors. That is why bradycardia rather than tachycardia is characteristically seen in patients with increase (ICP).
Cushing reflex consists of *hypertension (increased BP), bradycardia and tachyponea.*

248. Total lung capacity is ?

a) 2.4 L

b) 3.6 L

c) 6 L

d) 10 L

Correct Answer - C
Ans. is 'c' i.e., 6 L

249. At puberty true is ?

a) Decreased FSH and LH

b) Decreased GnRH

c) Increased progesterone

d) Decreased estrogen

Correct Answer - C
Ans. is 'c' i.e., Increased progesterone
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 -
i) Estrogen, progesterone and some testosterone in women.
ii) Testosterone in men.
Leptin facilitates release of gonadotropin releasing hormone (GnRH), thereby helping in pubertal onset.

250. Wernicke's area is located in ?

a) Inferior frontal gyrus

b) Superior temporal gyrus

c) Inferior temporal gyrus

d) Cingulate gyrus

Correct Answer - B

Ans. is 'b' i.e., Superior temporal gyrus

Wernick's area

It is located in the posterior end of superior temporal gyrus. It ***is*** the site of integration of secondary somatic, Auditory and visual areas. In response to words heard or read and interpreted by the secondary auditory or visual sensory areas, the *Wernicke's area formulate ideas* (words are planned) for expressive part of the speech and sends signals to the Broca's area *via arcuate faciculus. So, Wernicke's area is concerned with comprehension.* Lesion to this area results in sensory (fluent) aphasia.

Broca's area (Area 44)

Broca's area is located in the inferior frontal gyrus. It constitutes the center for *motor part of speech.* It receives information from Wernicke's area and sends it to the motor cortex concerned with control of larynx, lips and tongue for spoken speech and fingers for written speech. Lesions of the Broca's area produce an inability to express onself by spoken speech called motor aphasia or nonfluent aphasia.

251. Which of the following increases appetite ?

a) Insulin

b) Leptin

c) α-MSH

d) Neuropeptide Y

Correct Answer - D
Ans. is 'd' i.e., Neuropeptide Y

252. The major contributor to semen is from -

a) Seminal vesicle

b) Cowper's glands

c) Prostate

d) Urethral gland

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

253. Spinothalamic tract carries ?

a) Proprioception

b) Kinestheisa

c) Two point discrimination

d) Pain and temperature

Correct Answer - D
Ans. is `d' i.e., Pain and temperature

254. A wave in JVP is due to ?

a) Atrial systole

b) Atrial diastole

c) Ventricular systale

d) Ventricular diastole

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

255. Normal reduced hemoglobin in blood is ?

a) 3%

b) 10%

c) 20%

d) 30%

Correct Answer - A
Ans. is 'a' i.e., 3%
Normally 97% of hemoglobin is oxygenated.
3% of hemoglobin is deoxygenated hemoglobin or reduced hemoglobin.

256. **Na^+ uptake at basolateral surface of apical cells is by**

a) Active transport

b) Passive transport

c) Diffusion

d) Osmosis

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

257. Intracellular receptors are used by ?

a) ACTH

b) TSH

c) Glucocorticoids

d) Insulin

Correct Answer - C
Ans. is 'c' i.e., Glucocorticoids

258. Positive G effect ?

a) Red out

b) Black out

c) Increased cerebral arterial pressure

d) Increased cardiac output

Correct Answer - B
Ans. is 'b' i.e., Black out
Effects of positive G:

- **Venous return decreases** --> hence, **cardiac output decreases.**
- **Blood rushes towards lower limbs** --> hence **increased pressure in lower limb vessels.**
- **Blood is drawn away from upper body** --> hence **decreased cerebral arterial pressure.**
- **At very high positive G:**
  - Difficulty in blood flow to brain --> results in cerebral ischemia & unconsciousness.
  - **Moments before unconsciousness**, there is **gray-out.**
    - Everything appears gray - Due to **ischemia of cone & loss of color vision.**
    - Eg: Gray-out serves as warning **sign for pilots** - Indicates need **for slowing down aircraft & reduce positive'G'.**
- **Gray-out followed by black-out**
  - Black-out means total **loss of vision.**

259. 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 di/ferent 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-frequeney EEG activity. Stuge 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.'

260.

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

261. 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

262. True about summation is?

a) Temporal summation is the application of 2 stimuli together

b) Spatial summation is the application of two stimuli one after another

c) Subthreshold stimuli are used

d) All are true

Correct Answer - C
Subthreshold stimuli are used.
Summation

- A subthreshold stimulus does not produce a response, but when more than one subthreshold stimuli are applied in response is produced.
- The application of two subthreshold stimuli may be sufficiently quickly, one by another (temporal summation) or two subthreshold stimuli together at different places(Spatial summation).
- The summation is due summation of EpsP in synapses (at post-synaptic neuron).

263. Testosterone secreted by,

a) Leydig’s cells.

b) Somatotropic cells.

c) Acidophilic cells.

d) Gonadotropic cells

Correct Answer - A
Ans:A. Leydig’s cells.

- The hypothalamus sends a signal to pituitary gland to release gonadotrophic substances (follicle stimulating hormone and luteinizing hormone).
- Luteinizing hormone (LH) stimulates testosterone production.
- Testosterone is produced by gonads (by Leydig cells in testes in men & by ovaries in women).

264. True about decorticate rigidity?

a) Removal of cerebral cortex and basal ganglia

b) Flexion of lower limbs & extension of upper limbs

c) Rigidity is less pronounced than decerebrate rigidity

d) None of the above

Correct Answer - C
Ans:C. Rigidity is less pronounced than decerebrate rigidity.
Decorticate rigidity:

- Made by removing whole cerebral cortex but leaving basal ganglia intact.
- Characterized by flexion of upper extrimities at elbow & extension of lower extrimities.
  - Flexion due to rubrospinal tract excitation of flexors in upper extremities & hyperextension of lower extermity.
- Decorticate animal does not have intense hypertonia as decerebrate animal.
  - Due to intact basal ganglia in decorticate animal.

265. Peripheral chemoreceptors respond to hypoxia using which channel?

a) Calcium channel

b) Sodium channel

c) Potassium channel

d) Chloride channel

Correct Answer - C
Ans:C. Potassium channel.

- Carotid bodies are composed of glomus cells (also called type I), which are of neuronal phenotype and contain a variety of neurotransmitters.
- Glomus cells are in functional contact with the afferent nerve endings.
  - Glomus cells are initial site(s) of sensory transduction.
- Hypoxia releases transmitter(s) from glomus cells, which in turn by depolarizing the sensory nerve ending leads to an increase in sensory discharge.
- One hypothesis assumes that a K+-channel protein is an O2 sensor and that hypoxia depolarizes glomus cells by inhibiting the K+ channel, leading to an increase in cytosolic Ca2+, resulting in transmitter(s) release.

266. Functional residual volume is?

a) After normal inspiration

b) After normal expiration

c) After forceful expiration

d) After forceful inspiration

Correct Answer - A
Ans:A. After normal inspiration

- Functional Residual Capacity (FRC) is the volume of air present in the lungs at the end of passive expiration.

267. All of the following increases calcium absorption from the gut except:

a) Phytates

b) Vitamin D

c) Alkaline pH in gut

d) Protein in diet

Correct Answer - C

Ans: C. Alkaline pH in gut

(Ref. Ganong 25/e p483, 24/e p485; Harrison l9/e p2457)

Factors increasing Calcium Absorption		Factors decreasing Calcium Absorption	
• Vitamin D° • Parathormone° • Acidic pH°	• Lactose° • Amino acids° (protein rich diet)	• Oxalates° • Phytates° • Alkaline pH° • High phosphate°	• High Mg2+ • Caffeines° • Dietary fibers°

268. Two vessels are compared as shown belorv. 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
$F = (P_A – P_B) \times (\pi /8) \times (1/?) \times (r4/L)$
Where,
F= flow
P_A-P_B = pressure difference between two ends of the tube
? = viscosity
r = radius of tube
L = length of tube
Because flow is equal to pressure difference divided by resistance (R),
$R = 8?L/\pi r^4$

269. 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 Physiologt, 2!n ed., ch -7, pg. 677-78

- GFR = Kf [(PGC - PT) - (nGC - ztT)]
  - K.: Glomerular Ultrafiltration coelicient
  - P: Hydrostatic pressure,
  - II: Oncotic Pressure,
  - CC: GIomerular 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).

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

a) PCT

b) Collecting duct

c) Ascending thick loop Henle

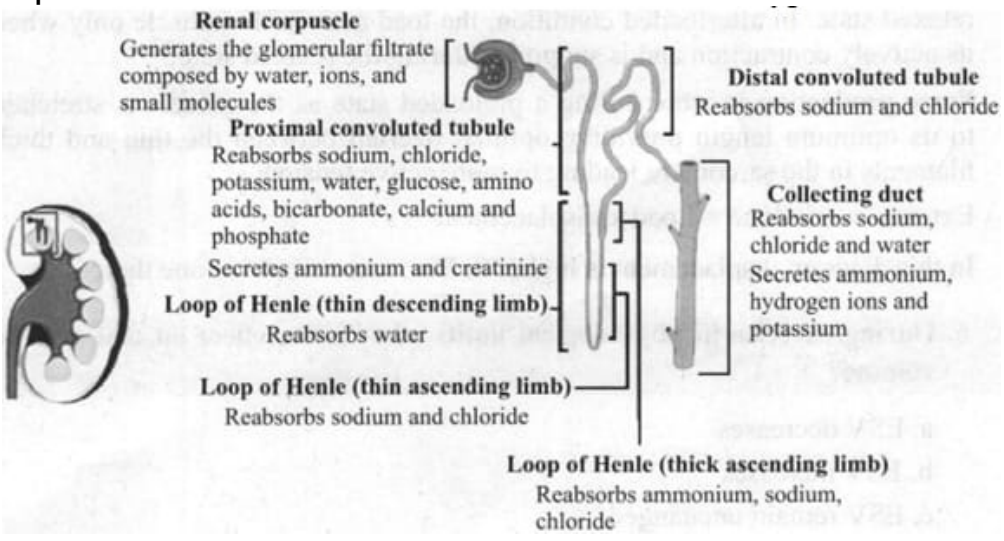
d) Descending loop of Henle

Correct Answer - C

Ans. C. Ascending thick loop Henle

Ref: Ganong's Review of Medical Physiology, 2lh 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.



271. Spermatozoa gets its nutrition from

a) Glucose

b) Fructose

c) Galactose

d) Starch

Correct Answer - B

Ans: B. Fructose

(Ref KS Sanoop 3'd/e p.171)

- Nutrition to sperms is mainly provided by fructose.
- Fructose (f .5-6.5 mg/ml).

272. Diffusion of lipid-insoluble substances across the cell membrane depends on all of the following except

a) Hydrated radius

b) Electrical charge

c) Lipid solubility

d) Shape

Correct Answer - C

Ans: C. Lipid solubility

(Ref: Principle of medicalphysiolog p. 712).

- Simple diffusion of lipid-soluble substances
- The rate of diffusion through the lipid bilayer of the cell membrane is directly proportional to the solubility of a substance in lipids.
- Therefore, molecules of substances like orygen, nitrogen, carbon dioxide, alcohol, steroid hormones and weak organic acids and bases, being lipid soluble, diffuse very rapidly through the lipid bilayer of the cell membrane.

273. BRD4 is required for stimulating kinase activity of

a) P-TEFB

b) HEXIMI

c) HOX-B

d) TSKsnRNA

Correct Answer - A

Ans: A P-TEFB

- Bromodomain-containing protein 4 is a protein that in humans is encoded by the BRD4 gene.
- The C-terminal domain of BkD4 has been implicated in promoting gene transcription through interaction with the transcription elongation factor P-TEFb.

274. Damage to which Brodmann area is responsible for motor aphasia

a) 22

b) 39

c) 40

d) 44

Correct Answer - D

Ans: D. 44

(Ref: Principles of medical physiology p. 713]

- Motor speech area (44. 45) - (Broca's area).
- **Location:** Inferior frontal gyrus.
- Lesion & features: Motor (Broca's/expressive) aphasia.

275. Location of GLUT 5 is

a) RBC

b) Liver

c) Small intestine

d) Placenta

Correct Answer - C
Ans: C Small intestine
(Ref: Ganong 25'h/e p. 433)

- GLUT 5 - Fructose transport - Jejunum, sperm

276. Which of the following results in increase in secretion of ADH?

a) Hypervolemia

b) Hypertension

c) Hypovolemia

d) Decrease osmolarity

Correct Answer - C
Ans: C Hypovolemia
Ref: Guyton 12th/e p. 9051

- Hypovolemia (Decreased ECF) stimulates the release of ADH.
- **Vasopressin secretion is increased by:** - i) Increased osmolarity (osmotic pressure) of plasma; ii) Decreased ECF volume; iii) Pain, emotion, stress, exercise; iv) Nausea and vomiting; v) Standing; vi) Clofibrate, Carbamazapine; vii) Angiotensin II.

277. Intracellular vesicle targeting, docting and fusion is done by which of the following

a) Rho

b) P 2 x 3

c) Rab

d) Ras

Correct Answer - C
Ans: C. Rab

- [Rel Textbook of cell and molecular biolog p. 786]

Small GTPase family:

- G proteins are divided into two groups, with a major family being the
- small G proteins or small GTPases (20 - 40 kDa).
- **Rab functions:** Intracellular vesicle targeting. docking and fusion.

278. A 65 years old male is having weight 60kg and serum creatining 3mg/d1. What is creatinine clearance [ml/ min]

a) 5

b) 10

c) 15

d) 20

Correct Answer - D

Ans: D. 20

(Ref: Textbook of clinical nephrology 4'h/e p. 136)

- Creatinine clearance is calculated by Cockcroft-Gault equation :-
- Creatinine clearance = [(140 - Age in yrs) x weight in kg] / 72 x serum creatinine in mg/dl.
- Creatinine clearance = [(140 - 65) x 60] / 72 x 3 = 20.83 ml/min

Note:

- In females the values are multiplied by 0.S5.
- Thus, for same values, creatinine clearance in female of 65 years = 17.7 (20.83 x 0.85).

279. Half life of T4 is

a) 20 minutes

b) 12 hours

c) 1 day

d) 6 days

Correct Answer - D
Ans: D. 6 days
(Ref: Ganong 25th/e p. 338-341; Understandings of medical physiology p. 7l9)

- Half life of T3 = 1 day
- Half life of T4 = 6 days.

280. All of the following are stress responses except

a) Increased ANS activity

b) Increased peripheral insulin resistance

c) Decrease in blood glucose

d) Loss of muscle protein

Correct Answer - C

Ans: C. Decrease in blood glucose

[Ref: Understanding of medical physiology p. 470, 471).

Neuroendocrine secretions cause following metabolic disturbances during stress: -

Protein catabolism:

- Most important metabolic change in the stress.
- Results in anemia, hypoproteinemia & loss of lean body mass (mainly muscle proteins).
- Most important hormone - Cortisol.

Hyperglycemia:

- Suppression of insulin secretion coupled with increased secretion of glucagon, growth hormone, glucocorticoids (cortisol), and catecholamines (epinephrine, norepinephrine) leads to hyperglycemia.

Increased Plasma FFA level:

- Increased lipolysis leading to elevated plasma FFA level is the result of suppression of insulin secretion as well as increased secretion of cortisol, GH and catecholamines.

Salt and water retention:

- Due to elevated secretion of ADH and aldosterone (Renin-angiotensin-aldosterone system).

281. Hand-eye cooridation is controlled by

a) Premotor cortex

b) Pre-sensory cortex

c) Posterior parietal cortex

d) Frontal eye field

Correct Answer - A:C
<u>Ans: 'c > a'i.e., Posterior parietal cortex and Premotor cortex</u>
[Rel Brain Mapping: An encyclopedia 3d/e p. 471)
Human posterior-parietal cortex (PPC) regions include :-
1. Posterior intraparietal sulcus (PIPS): Involved in the processing of visual motion, orientation and depth
2. Superior parieto-occipital cortex (SPOC): Involved in visual guided reaching and. Hand-eye coordination
3. Parietal eye field (PEF) : Involved in eye movements

282. In Caveola, the Caveolin molecule is attached to inner layer of plasma membrane by -

a) Desmin

b) Dynanin

c) Clathrin

d) Cavin

Correct Answer - D
Ans. is'd'i.e., Cavin
[Rel Principles of medical physiology 4th/e p. 712]

- Caveolae are small flask-shaped depressions in the cell membrane.
- They are considered to be specialized forms of lipid rafts.
- They are formed when Caveolin proteins embed in the phospholipid bilayer of the membrane and distort it so that forms small flask-like pits.
- Caveolae are produced at the Golgi apparatus when Caveolin joins together in small groups (oligomers) and binds to cholesterol.
- These vesicles move to the cell surface and merge with the cell membrane.
- Here Cavin-l allow caveolir-l to interact with cell membrane to form Caveolae.

283. Na^+-$1C^+$ ATPase is a -

a) Extrinsic protein

b) Peripheral protein

c) Transmembrane protein

d) Intracellular proteins

Correct Answer - C
Ans. is'c'i.e., Transmembrane protein
lRef: Principles of medical physiology p. 5I2) .

- Ion pumps (including Na* - K. ATPase) and channels are integral (Transmembrane) proteins.

284. Which cell in cerebellum produces feed-forward inhibition -

a) Golgy cell

b) Basket cell

c) Granule cell

d) Stellate cell

Correct Answer - B
Ans. is 'b' i.e., Basket cell
[Rel Principal of medical physiology 3'd/e p. 139).

- 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.

285. Secretors are those who?

a) Secrete enzymes in blood

b) Secrete immunoglobulin [IgA] in intestine

c) Secrete blood group antigen in sweat/saliva

d) Secrete hormones in response to stress

Correct Answer - C
Ans. is'c'i.e., Secrete blood group antigen in sweat/saliva

286. The minimum distance for two point discrimination on fingertips -

a) 2 mm

b) 5 mm

c) 7 mm

d) 10 mm

Correct Answer - A
Ans. is'a'i.e., 2mm
lRef: Ganong 25th/ep. 170 6 24'h/e p. 1621

- The magnitude of two point discrimination thresholds varies from place of place on the body and is smallest where touch receptors are most abundant.
- Stimulation points on the back must be separated by at least 65 mm before they can be distinguished as separate, whereas on the fingertips two stimuli are recognized if they are separated by as little as 2 mm.

287. a-receptor of estrogens are?

a) Membrane receptors in breast

b) Nuclear receptors in breast

c) Membrane receptors in ovaries

d) Nuclear receptors in ovaries

Correct Answer - B
Ans. is 'b' i.e., Nuclear receptors in breast
(Ref: Principles of medical physiologlt p. 777).

- Estrogen binds to nuclear receptors --> Estrogen receptors (ERs)

288. Rhomboid major is supplied by which type of neuron?

a) Unipolar

b) Pseudounipolar

c) Bipolar

d) Multipolar

Correct Answer - D
Ans. is 'd' i.e., Multipolar
(Ref: Principles of medical physiology p. 129)

- All skeletal muscles are supplied by motor neurons which are multipolar neurons.

289. Cortical area controlling vestibular function is located in ?

a) Frontal lobe

b) Parietal lobe

c) Occipital lobe

d) All of the above

Correct Answer - B
Ans. is'b'i.e., Parietal lobe
[Rel Gray's Anatomy'E book p. j20)

- Information from the vestibular nuclei also reaches the cerebral cortex by way of thalamus (probably via posterior parts of the ventroposterior complex and the medial pulvinar).
- The primary vestibular cortical area is located in the parietal lobe

290. True about calcium and phospharus metabolism?

a) Parathormone increases phosphate reabsorption in PCT

b) Parathormone increases calcium reabsorption in PCT

c) Calcitriol increases phosphate reabsorption in PCT

d) Calcitriol decreases phosphate absorption in intestine

Correct Answer - C

Ans. is'c'i.e., Calcitriol increases phosphate reabsorption in PCT

Calcitriol stimulates reabsorption of-

- Phosphate in PCT
- Ca+ in DCT

PTH has following effects on reabsorption in kidney-

- It increases Ca2+ reabsorption in DCT (not in PCT)
- It decreases Phosphate reabsorption in PCT

291. Sympathetic system has adrenergic nerve endings at all sites except?

a) Heart

b) Blood vessels in skeletal muscles

c) Eye

d) None

Correct Answer - B

Ans. is 'b' i.e., Blood vessels in skeletal muscles

(Ref: Principles of medical physiologY p. 241

- Sympathetic adrenergic fibers are those which secrete endogenous catecholamines (either adrenaline, nor-epinephrine / nor-adrenaline or dopamine)

Some sympathetic fibers do not secrete catecholamines but secrete acetylcholine -

1. Sweat glands
2. Blood vessels in skeletal muscles

292. In Autoregulation of hormone?

a) A hormone inhibits its own secretion directly

b) A hormone inhibits its own secretion by inhibiting regulatory hormone

c) Nervous system inhibits release of hormone

d) All of the above

Correct Answer - B

Ans. is 'b' i.e., A hormone inhibits its own secretion by inhibiting regulatory hormone.

Feedback control (Autoregulation):

- The process of inhibiting or stimulating the first step by the final step product in a hormonal reaction pathway, is called feedback regulation.

293. Enterohepatic circulation occurs in?

a) Duodenum

b) Jejunum

c) Proximal ileum

d) Distal ileum

Correct Answer - D
Ans. is'd'i.e., Distal ileum
(Ref: Principles of medical physiology p. j89l

- About 500 ml of bile is secreted per day (20.8 mVhr) by the liver. In the gallbladder, bile is stored and concentrated.
- After a meal contraction of the gallbladder transfers a large volume of bile into the duodenum. Most of the bile is reabsorbed into terminal ileum and undergoes enterohepatic circulation.

294. Basic electrical rhythm is not seen in?

a) Stomach

b) Duodenum

c) Esophagus

d) Cecum

Correct Answer - C
Ans. is 'c' i.e., Esophagus lRef: Ganong 24th/e p. 5041

295. Food causes reflex defecation?

a) Enterogastric reflex

b) Defecation reflex

c) Gastrocolic reflex

d) Rectoanal reflex

Correct Answer - C
Ans. is'c'i.e., Gastrocolic reflex
[Rel Guyton llth/e p. 771)

- Appearance of mass movements after a rneal is facilitated by gastrocolic and duodenum reflexes.
- These reflexes result from the distension of the stomach and duodenum.
- The best example of gastrocolic reflex is seen in early infancy where defecation often follows a meal.

296. In free water clearance, free water is generated in?

a) PCT

b) Descending limb of loop of Henle

c) Ascending limb of loop of Henle

d) All of the above

Correct Answer - C
Ans. is 'c' i.e., Ascending limb of loop of Henle
(Ref: Medical physiology for undergraduate E-book p' 4381

- Free water or solute free water is generated in the diluting segments of the kidney (i.e. thick ascending limb and early distal tubules, where NaCl is reabsorbed and free water is left in the tubular fluid.

297. Location of a-1 sympathetic receptors?

a) Blood vessels

b) Bronchi

c) Sweat glands

d) Heart

Correct Answer - A
Ans. is'a' i.e., Blood vessels
(Ref: Ganong 25thie p. 260)

298. Free water clearance is positive when urine is

a) Dilute

b) Concentrate

c) Isotonic

d) Any of the above

Correct Answer - A
Ans. is 'a' i.e., Dilute
(Ref: Principles of Medical Physiology p' 39Il

- Kidney excretes some solutes in the urine daily.
- The volume of tater in urine, excreted per unit time in excess of thot required to excrete the contained solutes is-osmotically with plasma.
- Free water clearance is positive in dilute urine, negative where concentrated urine is passed and zero when isotonic urine is passed.

299. Relaxation of Detrusor occurs via which receptors?

a) β-1 sympathetic

b) β-2 sympathetic

c) a-1 sympathetic

d) a-2 sympathetic

Correct Answer - B
Ans. is 'b' i.e., β-2 sympathetic

- Relaxation of detrusor is through beta-2 receptors.

300. Muscles have which efferent nerve fibers for regulating tone?

a) a-neuron

b) Gamma neuron

c) Beta neuron

d) Delta neuron

Correct Answer - B
Ans. is 'b' i.e., Gamma neuron
(Ref: Ganong 23'd/e p.158-162; Guyton 12n/e p. 657)

- Muscle tone is maintained by stretch reflex through muscle spindles (intrafusal fibers).

301. Non-specific nuclei of thalamus is related to which sense / function ?

a) Arousal / alerting

b) Pain & temperature

c) Olfaction

d) Posture

Correct Answer - A
Ans. is 'a' i.e., Arousal / Alerting
(Ref: Principles of medical physiology p. 717)
Non Specific Nuclei:

- These nuclei also receive sensory information but project to the cortex in a diverse manner.
- Therefore they seem to be involved in the arousal induced by sensory stimuli.
- These nuclei are intralaminar and reticular nuclei.

302. Which of following formula denotes free water clearance?

a) Urine flow rate multiplied by osmolal clearance

b) Urine flow rate minus osmolal clearance

c) Urine flow rate divided by osmolol clearance

d) Urine flow,rate plus osmolal clearance

Correct Answer - B
Ans. is'b'i.e., Urine flow rate minus osmolal clearance
Free water clearance (CH2O):

- CH2O = V- Cosm

303. Rate limiting step in facilitated diffusion?

a) Availability of contransport

b) Conformational change in transporter

c) Synthesis of carrier protein

d) Polarization of solute

Correct Answer - B
Ans. is'b'i.e., Conformational change in transporter
(Ref: Essentials of membrane Biophysics p. 25I).

- The relative slowness of the rate constant for conformational change reorienting the Solute-unoccupied transporter (Step-4) makes it the rate-limiting step in the process of facilitated diffusion.

304. Following occurs in living cells only?

a) Simple diffusion

b) Facilitated diffusion

c) Osmosis

d) Active transport

Correct Answer - D
Ans. is 'd' i.e., Active transport
[Ref Principles of medical physiology p.12]

- "Because the formation and breakdown of ATP require cell activity, active transport mechanisms occur through living membranes."
- Active transport require energy (ATP). Energy is produced in living cells. Therefore, active transport is possible only in living cells.

305. Concentration of urea on one side (side A) of permeable membrane is 20 and on other side (side B) is 40. If concentration on side A is increased to 40, what will happen to rate of diffusion?

a) It will become double

b) It will become four times

c) It will be zero

d) It will be reduced four times

Correct Answer - C

Ans. is 'c' i.e., It will be zero

[Ref: Principles of medical physiology p. 71)

- This question, the concentration gradient is zero as both sides (A & B) have same concentration (40) of urea.
- Thus there is no diffusion + Rate of diffusion is zero.

306. Which of the following are unmyelinated nerve fibers?

a) Proprioceptive fibers

b) Motor neuron to muscle

c) Postganglionic sympathetic fibers

d) Motor nerve to intrafusal fibers

Correct Answer - C
Ans. is 'c' i.e., Postganglionic sympathetic fibers
[Ref Ganong 24h/e p. 92; Principles of medical physiology p. 5I2l

- Type C fibers are unmyelinated fibers which include postganglionic autonomic fibers,

307. cGMP is involved in which pathway?

a) Taste

b) Phototransduction

c) Smell

d) Olfaction

- Correct Answer - B:C:D
  Ans. is'b> c & d'i.e., Phototransduction > Smell & Olfaction
  "cGMP regulates retinal phototransduction in rod cone photoreceptors, and cAMP d cGMP regulate olfaction".

308. Water reabsorption in loop of henle is?

a) Through aquaporin-1 in distending limb

b) Through aquaporin-1 in ascending limb

c) Due to ADH in ascending limb

d) Due to aquaporin-2 in ascending limb

Correct Answer - A

Ans. is 'a' i.e., Through aquaporin-l in descending limb

fRef: Principles of medical physiology p. 3I2l

- "Ascending limb of loop of Henle (especially thick ascending limb) is ako called the diluting segment of nephron because of its ability to dilute the urine,'

Thin descending segment (limb):

- This segment is highly permeable to water and relatively impermeable to solutes (sodium, chloride and urea).
- Therefore, only water is reabsorbed from the thin descending limb of loop of Henle and the fluid in the descending limb becomes hypotonic.
- This water absorption is also obligatory and occurs through aquaporin-l water channel.
- No active secretion or reabsorption takes place in this segment.

309. Sensory receptors with delayed recovery and least coverage?

a) Pacinion corpuscle

b) Ruffini endings

c) Meissner corpuscle

d) Merkel's disc

Correct Answer - D

Ans. D. Merkel's disk

Receptive field of sensory receptors :

- Smallest receptive field (Least coverage) : Merkel's disc, Meissner corpuscles ii) Wide receptive field : Pacinian corpuscle, Ruffini end organ (Ruffini corpuscle)

Adaptation of sensory receptors :-

- Rapidly adapting (rapid recovery) → Meissner's corpuscles, Pacinian corpuscles, II) Slowly adapting (delayed recovery) -4 Merkel's disc, Ruffini's end organs

310. Leptin is secreted by?

a) Ovaries

b) Adipose tissue

c) Liver

d) Hypothalamus

Correct Answer - B
Ans, B, Adipose tissue.
(Ref: ***Principles of medical physiology p.***p'704)

- Leptin is a protein hormone produced by fat cells of adipose tissue.
- It acts on hypothalamus to reduce food intake, decrease lipogenesis and increase lipolysis, thereby reducing the body fat stores.

311. In high potassium serum levels, kidney compensation occurs by?

a) Decreased reabsorption in PCT

b) Increased secretion in PCT

c) Increased secretion in DCT

d) Decreased reabsorption in loop of Henle

Correct Answer - C
Ans. is'c'i.e., Increased secretion in DCT
[Ref: Guyton & hall p. 201
Potassium transport:

- Potassium is one of the few substances that are both reabsorbed as well as secreted by the renal tubules.
- The reabsorption of about two-thirds of the filtered K+ occurs in the proximal tubules
- K+ reabsorption as weII as secretion takes place.
- Here also, reabsorption of K+ occurs independent of K+ status of the body.
- It is the secretory process that K+ regulated by aldosterone in response to the K+ and Na+ status of body.

312. Which extrapyramidal tract act along with lateral spinothalamic tract?

a) Reticulospinal tract

b) Rubrospinal tract

c) Tectospinal tract

d) Vestibulospinal tract

Correct Answer - B
Ans. b Rubrospinal tract
[Rpf Genong 2n/e P' 241)

- Descending tracts concerned with distal muscles of the limb those muscles which mediate fine skilled movements) occupy lateral white column and are called lateral pathways, Lateral pathways include lateral corticospinal tract and rubrospinal tracts.

313. Normal urea excretion rate is?

a) 1-2 gm per day

b) 10-20 gm/day

c) 20-40 gm per day

d) 50-100 gm/day

Correct Answer - B
Ans. is 'b' i.e., 10-20 gm/day
(Ref: Medical physiology E Book 2d/e p. 767)

- "The physiologically normal individual excrete 12-20 gm of urea nitrogen in 24 hours"

314. Position in decorticate rigidity ?

a) Flexion of elbow and extension of knee

b) Extension of elbow and flexion of knee

c) Flexion of elbow and knee

d) Extension of elbow and knee

Correct Answer - A

Ans. is 'a' I,e,, Flexion of elbow and extension of knee

[Ref Principles of medical physiology p, 629]

- A decorticate rigidity is made by removing the whole cerebral cortex but leaving the basal ganglia intact.
- Decorticate rigidity is characterized by flexion of upper extremities at elbow and extension of lower extremities.
- The flexion is due to rubrospinal tract excitation of flexors in the upper extremities and hyperextension of the lower extremity has same mechanism as in decerebrate rigidity.

315. Standard urea clearance in an normal adult is?

a) 20 ml

b) 50 ml

c) 100 ml

d) 200 ml

Correct Answer - B
Ans. is'b'i.e., 50 ml
[Dr Chatterjee, Shinile Sh/e p. 652]

- Standard clearance of urea (Cs) and average normal value is 54

316. In Kidney which of the following is true?

a) Osmolarity of tubular fluid in PCT gradually increases

b) Osmolarity of fluid in DCT is more than in Bowmann's capsule

c) Fluid coming out of descending limb of loop of Henle is hypotonic

d) Osmolarity of medullary interstitium is more than plasma

Correct Answer - D

Ans. is'd'i.e., Osmolarity of medullary interstitium is more than plasma

(Ref: Guyton 12/e p. 334)

- The renal medulla shows an increasing osmotic pressure with increasing depth.
- Starting, with an osmolarity of 300 mOsm/L in the cortex, the osmolarity reaches a level of 1200-1400 mosm/L at the pelvic tip of the medulla, i.e., The inner part of medulla has highest osmotic gradient.
- That means that the renal medullary interstitium has accumulated solute in greater excess of water.

317. All are true regarding corticospinal tract except?

a) Also called pyramidal tract

b) Maximum fibers arise from primary motor cortex

c) Forms pyramids in medulla

d) 80% fibers are crossed

Correct Answer - B

Ans. is 'b' I,e,, Maximum fibers arise from primary motor cortex

[Ref Principles of medical physiology p.238-239

- Corticospinal tract is the most important tract through which the motor cortex controls the activity of the ventral horn cells (alpha-motor neurons) in the spinal cord.
- It is also called pyramidal tract because they form the pyramid of the medulla.

318. Maximum potassium reabsorption occurs in?

a) Proximal convoluted tubule

b) Distal convoluted tubule

c) Cortical collecting duct

d) Medullary collecting duct

Correct Answer - A
Ans. is'a'i.e., Proximal convoluted tubule
[Rl Guyton 12n/e p. 334)
Most of the solutes and water are maximally absorbed in proximal tubule :-

- 60-70% of Na* is reabsorbed along with 6O-70% of Cl-
- 60-70% of K+ is reabsorbed

319. Slowest acting buffer system in the body ?

a) PCO, buffer

b) Respiratory buffer

c) Chemical buffer

d) Renal buffer

Correct Answer - D
Ans. is 'd' i.e., Renal buffer
(Re/ Principles of medical physiology p. 712)

- Not all buffer systems begin work at the same time.
- Chemical buffers respond first, followed by the respiratory system and finally, the renal system.

320. What is produced by lung tissue to be used in lungs?

a) Angiotensin I

b) Renin

c) Surfactant

d) Angiotensin II

Correct Answer - C
Ans. is'c'i.e., Surfactant
Among the given options, two substances are formed in lung-

- Surfactant: Used by lungs alveoli to reduce surface tension.
- Angiotensin II : ACE in lungs convert angiotensin I to angiotensin II. But angiotensin II mainly acts on blood vessels, kidney and adrenal cortex.

321. How to increase reabsorption of iso-osmolar fluid from glomerular filterate?

a) Increased peritubular capillary pressure

b) Decreased osmotic pressure in peritubular capillaries

c) Increased corticomedullary osmotic gradient

d) Increased filtered load

Correct Answer - D
Ans. is 'd' i.e., Increased filtered load
(Ref: Principles of medical physiology p.786]

- Glomerulotubular balance refers to the fact that the total rate of reabsorption increases as the filtered load increases, even though the percentage of GFR reabsorbed in the proximal tubules remains relatively constant about 65%

322. Non-respiratory function of lungs ?

a) Anion balance

b) Sodium balance

c) Potassium balance

d) Calcium balance

Correct Answer - B
Ans. is 'b' i.e., Sodium balance
(Ref: Lecture notes on human physiology 4th/e p. 400]
One of the most important metabolic (non-respiratory) function of lungs:

- As a part of renin-angiotensin-aldosterone system, lungs indirectly regulate sodium and water balance (and BP).
- However, lungs also directly affect Na+ balance is epithelial Na+ channels (E NaCs).

323. PAH is used to measure?

a) Extracellular fluid

b) Glomerular filtration rate

c) Renal plasma flow

d) Plasma value

Correct Answer - C
Ans. is'c'i.e., Renal plasma flow
[Rel Ganong 248/e p, 678-679)

- A substance which closely satisfies this description is para-aminohippuric acid (PAH), Therefore,
- PAH is used to measure renal plasma flow.
- The PAH clearance ln a normal adult lc about 625 mV minute. That's a measure of effective renal plasma flow (ERPF).
- PAH is only 90% excreted in the urine in a single passage through the kidney, i.e., its extraction ratio is 0.9 (90%).

324. Maximum voluntary ventilation is measured for?

a) 30 sec.

b) 60 sec.

c) 75 sec.

d) 120 sec.99.

Correct Answer - B
Ans. is'b'i.e., 60 sec.
(Ref: Guyton 12h/e p. 470]
Maximum voluntary ventilation (MW) :

- It is the maximum amount of air that can be moved into and out of lungs in 1 minute by voluntary effort.
- It is about 125-170 L/min.

325. True about cubulin receptors?

a) Present in small intestine

b) Prevents proteinuria

c) Prevents steatorrhea

d) All are correct

Correct Answer - B

Ans. is 'b' i.e., Prevents proteinuria

- Cubulin is a peripheral membrane protein, and therefore it does not have an endocytosis signaling sequence.
- Megalin is responsible for internalization of cubulin and its ligands in addition to internalizing its own ligands.
- The proteinuria observed in megalin-deficient mice, in dogs lacking functional cubulin and in patients with distinct mutations of the cubulin gene illustrates the importance of the receptors.

326. Delayed afterdepolarization implies?

a) Increased intracellular Ca"

b) Excessive catecholamines

c) Digitalis toxicity

d) All of the above

Correct Answer - D
Ans. is 'd' i.e., All of the above
[Ref Principles of clinical medicine 3'd/e p. 1196]

- Delayed afterdepolarizations occur in late phase 3 or early phase 4 when the action potential is nearly of fully repolarized.
- The mechanism is poorly understood; however, this type of arrhythmia is found to be associated with high intracellular Ca++ concentrations as occurs with digitalis toxicity or excessive catecholamine stimulation.
- The triggered impulse can lead to a series of rapid depolarizations (i.e. a tachyarrhythmia).

327. During normal inspiration diaphragm goes down by?

a) 1-2 cm

b) 3-5 cm

c) 5-7 cm

d) 7-9 cm

Correct Answer - A
Ans. is 'a' i.e., 1-2 cm
[Ref: Essentials of medical physiology p. 712]

- In normal inspiration, the diaphragm descends 1-2 cm into the abdominal cavity producing a pressure difference of 1-3 mm hg and the inhalation of about 500 ml of air.

328. Most common cause of Cheyne-Stokes breathing is?

a) Diabetic ketoacidosis

b) CHF

c) Bulbar polio

d) Pontine hemorrhage

Correct Answer - B
Ans. is'b'i.e., CHF
(Ref Clinicalmedicine p. 713)
Cause of Cheyne-Stokes respiration,

- Normally occurs during sleep at high altitude
- Congestive cardiac failure
- Damage to respiratory centers

329. Conduction velocity in AV node & SA node?

a) 0.05 meter/sec

b) 0.5 meter/sec

c) 1 meter/sec

d) 5 meter/sec

Correct Answer - A
Ans .a.0.05 meter/sec [ref Genong2}n/eP' 522)

330. Which vessel regulates blood flow?

a) Artery

b) Arterioles

c) Venules

d) Capillaries

Correct Answer - B
Ans. b' arteriole

- Distribution of blood flow is mainly regulated by arteriole, by alteration in their diameter.Increase or decrease the pertphenl resistance to blood flow.

331. Muscle hypotension is caused by?

a) Bradykinin

b) Actin

c) Myosin

d) Relaxin

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

- Only bradykinin cause hypotension → Local hypotension in skeletal muscle (If pressure BP to fall below 50 mm Hg).

332. Erythropoietin production is inhibited by ?

a) Estrogen

b) Progesterone

c) Thyroxine

d) Testosterone

Correct Answer - A
Ans. is 'a' i.e., Estrogen
[Ref: Principles and practice of maternal health]

- The most important stimulus for erythropoietin secretion is hypoxia.
- Other stimulus that can increase its secretion are cobalt salts, androgens, alkalosis due to high altitude, and catecholamines via beta-adrenergic mechanism.

333. Inracellular concentration of K' is -

a) 5.5 meq/L

b) 15 meq/L

c) 28 meq/L

d) 150 meq/L

Correct Answer - D
Ans. is'd' i.e., 150 meq/L
Ref: Principles of medical physiology p. 712)

- Intracellular K* concentration -+ 150 meq/L
- Extracellular K* concentration -+ 4.5 - 5 meq/L

334. Most Important hormone responsible for volume maintenance?

a) Aldosterone

b) Angiotensin

c) ADH

d) Renin

Correct Answer - C

Ans. is 'c' i.e., ADH

[Rel Principles of medical physiology p. 412; Ganong 2,{h/e p. 7041

- "Despite its effect on Na* and water reabsorption, aldosterone k a weak regulator of boily Na+ and water balance, the major
- regulator being the 'thirst-ADH' mechanism, Aldosterone k the sole regulator of external potassium balance'.
- - Principles of medical physiology

335. Least diffusible ion among following ?

a) Na'

b) K^+

c) Cl-

d) Urea

Correct Answer - A

Ans. is'a'i.e., Na+

- Permeability coefficient & permeability of some important molecules in increasing order of frequency are Na+< K+< Cl- < Glucose < Tryptophan < Urea = Glycerol< Indole < H2O.

336. Histamine acts on?

a) G protein coupled receptors

b) Ligand gated ion channels

c) Enzyme linked receptors

d) Intracellular recepters

Correct Answer - A
Ans. is'a' i.e., G protein coupled receptors
Ref: Principles of medical physiology p.7911

- Histamine acts on G-protein coupled membrane recePtors : -

337. Which does not cause relaxation of urinary bladder ?

a) Sympathetic Stimulation

b) Muscarinic receptors

c) Beta receptors

d) None of the above

Correct Answer - B

Ans. is'b'i.e., Muscarinic receptors

- Sympathetic stimulation causes relaxation of bladder (detrusor muscle) via beta-2 adrenoreceptors.
- Parasympathetic stimulation cause contraction of bladder (detrusor muscle) via muscarinic M3 receptors.

338. Major function of dihydrotestosterone?

a) Spermatogenesis

b) Development of male external genitalia

c) Erythropoiesis

d) Development of male internal genitalia

Correct Answer - B
Ans. is 'b' i.e., Development of male external genitalia.

339. Isometric contraction is seen in?

a) Extraocular muscles

b) Small muscles of hand

c) Abdominal muscles

d) Antigravity muscles

Correct Answer - D
Ans. is'd'i.e., Antigravity muscles
[Rel Prep.Manual For UG p.a51]

- Isotonic contraction means contraction in which there is change of length at constant tension.
- The tension is equal to the weight lifted during contraction of the muscle.
- Isometric contraction means contraction in which there is no change in length of the muscle (constant length) but there is an increase in tension.
- So, isometric contraction generate more force of contraction (tension).
- Best example of isometric contraction is the contraction of antigravity muscles to maintain tension in erect posture, without changing length.

340. Not true about pituitary gland ?

a) Lies in sella turcica

b) Corticotrophs are acidophilic

c) ADH is secreted by posterior lobe

d) Anterior lobe is developed from Rathke's pouch

Correct Answer - B

Ans. is'b'i.e., Corticotrophs are acidophilic

- Pituitary gland is situated in sella turcica.
- Anterior pituitary develops from Rathke's pouch and posterior pituitary develops from infundibular process from diencephalon.
- Corticotroph are basophils.
- ADH is secreted from posterior pituitary.

341. Increased ventilation at start of exercise is due to?

a) Stretch receptors

b) Proprioceptors

c) Pain receptors

d) T PCO

Correct Answer - B
Ans. is 'b' i.e., Proprioceptors
[Ref Ganong 23'd/e p. 636)

- In moderate exercise the abrupt increase in ventilation at the start of exercise is due to psychic stimuli and afferent impulsE from proprioceptors in muscles, tendons and joints.
- Arterial pH, PCO2, and PO2, remain constant during moderate exercise because increase in ventilation is proportionate to increase in O, consumption.

342. Stimulus for prolactin release is ?

a) Dopamine

b) Hyperglycemia

c) Sleep

d) Nipple stimulation

Correct Answer - D
Ans. is'd'i.e., Nipple stimulation
[Ref: Human physiology p.383)

- Prolactin is the only pituitary hormone which is primarily under inhibitory control of hypothalamus .
- Its secretion is suppressed by dopamine (Prolactin inhibitory substance) secreted by hypothalamus.

343. Increase heart rate just before starting exercise is due to?

a) Stretch receptors

b) Proprioceptors

c) Release of adrenaline

d) All of the above

Correct Answer - C

Ans. is 'c' i.e., Release of adrenaline

(Ref As level textbook p.54)

- Heart rate increase before the start of exercise , i.e, anticipatory rise in heart rate.
- It is caused by disease of adrenaline from the adrenal medulla acting directly on the heart and the impact of emotional excitement on the medulla.
- Heart rate increase further rapidly with the start of exercise.
- It is due to the following receptors.
- Proprioceptors (in muscle & joints) relating to increased motor activity.
- Chemoreceptors relating to increased CO, /lactic acid and decreased O2.
- These receptors send messages to cardiac control center causing an increase in heart rate.

344. Which hormone is converted into active form in liver?

a) Corticosteroid

b) ACTH

c) Thyroid hormone

d) Estradiol

Correct Answer - C
Ans. is'c'i.e., Thyroid hormone
(Ref Principles of medical physiology lt p.71)

- Thyroxine (T4) is converted to T, (active form) in liver (majority) and kidney.

345. Percentage of T4 and T3 released from thyroid gland?

a) 50% T_4 ; 50% T_3

b) 25% T_4 ; 75% T3

c) 80% T_4 ;20% T_3

d) 1000% T_4 ;0% T,

Correct Answer - C
Ans. is 'c' i.e., 80% T4 ;20% T3 ,
(Ref: Elsefier's medical laboratory science examination review p.246)

- Approximately 80% of secreted hormone is T4 & 20% T3 ," .

346. Sorensess and pain in muscels after vigrous exercise is due to ?

a) Hyperkalemia

b) Lactic acidosis

c) Hyperthermia

d) Hyponatremia

Correct Answer - B
Ans. is'b'i.e., Lactic acidosis
[Rel Exercise physiology p. 535)

- Immediate -onset Soreness is characterized by pain during and immediately after exercise,
- This type of soreness is thought to be caused by stimulation of pain receptors by metabolic by-products of cellular respiration, especially H+ associated with increased lactic acid levels.

347. Thyroid hormone receptor which is predominantly expressed in CNS/Brain ?

a) a - 1

b) a - 2

c) β-1

d) β-2

Correct Answer - C
Ans. is'c'i.e., β-1
There are three forms of thyroid hormone receptor that are able to bind thyroid hormone.

- TR - alpha 1+ Widely expressed with high expression in cardiac and skeletal muscle.
- TR- beta 1-+ Predominantly expressed in brain, liver and kidney.
- TR- beta 2-+ Expression primarily limited to hypothalamus & pituitary.
- Fourth isotypes TR- alpha2, is also widely expressed but is unable to bind thyroid hormone.

348. Thyroid hormones are transported into the cells by?

a) Transthyretin

b) MTC - 8

c) Transferrin

d) Ceruloplasmin

Correct Answer - B
Ans. is 'b' i.e., MTC - 8
Ref. Textbook of clinical endocrinology 4n/e p. 4I4)

- Transport across the target cell membrane is affected by a number of transport proteins including monocarboxylate transporter 8 (MTC 8) in the body and organic anion transporter polypeptide 1C1 (OATP1C1) in the brain.

349. JAK-STAT kinase receptors is associated with ?

a) T cAMP

b) IP3 - DAG

c) Ion channels

d) Nuclear transcription

Correct Answer - D
Ans. is'd'i.e., Nuclear transcription
JAK-STAT-Kinase binding receptors:

- These receptors differ in not having intracellular enzymatic action on receptor itself. Agonist binding induces interaction of these receptors with free intracellular tyrosine kinase - Janus kinase (JAK).
- jAK phosphorylates activators of transcription (STAT), which then regulate the nucleus transcription resulting in a biological response.
- Examples -+ Growth hormone, Prolactin,

350. Fast muscle fibers are?

a) Red

b) Oxidative

c) Tonic

d) Glycolytic

Correct Answer - D
Ans. is'd'i.e., Glycolytic
(Ref: Principles of medicalphysiolog p. 512)
TYPES OF MUSCLE FIBERS:
Two fibers types:

- **Type I/red fibers**
- **Type II/white fibers.**
- Motor unit contains only one muscle fibers type:
- I.e., All motor unit fibers are either type-I or type II.
- Hence, named accordingly.

CHARACTERISTICS OF MUSCLE FIBER TYPES:

Parameters/Characteristics	**Type I muscle fiber**	**Type II muscle fiber**
Difference according to fiber type	• Red - Due to ↑ed myoglobin & mitochondrial content.	• White - Lack myoglobin & have few mitochondria.
Subtypes	- Nil -	Type IIA & Type IIB • IIA - Oxidative & glycolytic. • IIB - Glycolytic.

Other names	1. "Slow-twitch" fibers: • Due to small fiber length & diameter. • Maintain relatively sustained contraction. 2. "Slow motor units" • Have early recruitment.	• Usually type IIB fibers refer type II fibers. 1. "Fast-twitch" fibers - • Short duration of twitch. • Due to bigger diameter & ↑ed myosin & actin filaments. • Generate greater tension comparatively. 2. Type IIa/"Fast Fatigue Resistant" (FR) units: • Intermediate fatigability. 3. Type IIb/"Fast fatigable units": • Late recruitment threshold
Metabolism	• Aerobic. • Slow oxidative.	• Anaerobic. • Fast glycolytic.
Glycolytic capacity &glycogen content	Low	High
Sarcoplasmic reticulum	Normal	Extensive
Blood supply	High	Normal
Myosin ATPase activity	Low	High
Conduction velocity	Slow	Fast
Contractile properties	Slow time to peak tension	• Type IIa - Fast time to peak tension. • Type IIb - Fastest

		time to peak tension.
Type of muscle	Red muscles - • In muscles required for prolonged contraction. • Also with muscles maintaining posture. • Back muscles (At back of hip) • Gluteus muscles . • Calf muscles.	White/Pale muscles - • Muscles helpful in rapid contractions & finer movements. • Hand & extraocular muscles.

351. Total fluid secreted by salivary gland, stomach, pancrease and itestine in a day -

a) 2000 ml

b) 4000 ml

c) 6500 ml

d) 10000 ml

Correct Answer - C
Ans. is'c'i.e., 6500 ml
Ref: Ganong 23'd/e p. 441)

- Endogenous secretions in GIT is 7000ml : 1500ml from salivary glands; 2500ml from stomach; 500m1 is bile; 1500ml from pancreas; and 1000ml from intestine,

352. Transport of glucose through apical membrane of enterocytes is ?

a) Simple diffusion

b) Facilitated diffusion

c) Primary active transport

d) Secondary active transport

Correct Answer - D
Ans. is'd'i.e., Secondary active transport
(Ref: Principles of medical physiology p. 789)

- Absorption of glucose - Secondary active transport (cotransport) with Na+
- Absorption of lipids - Passive diffusion.
- Absorption of fructose - Facilitated Diffusion.
- Absorption of amino-acids -Secondary active transport (cotransport) with Na+.

353. True about erythropoetin ?

a) Produced by liver

b) Activity is decreased in pregnancy

c) Is a glycoprotein

d) Hypoxia decreases its secretion

Correct Answer - A:C
Ans. is'c > a' i.e., Is a glycoprotein > Produced by liver
(Ref: Ganong 24th/e p.709)

- Erythropoietin is a glycoprotein hormone which stimulate erythrocyte production. Erythropoietin increases the number of erythropoietin sensitive committed stem cells in the bone marrow that are converted to red blood cells precursors and subsequently to mature erythrocytes.
- In the absence of erythropoietin, erythroid stem cells undergo apoptosis.

354. Which muscarinic receptor causes dilatation of vessels?

a) M_1

b) M_2

c) M_3

d) M_4

Correct Answer - C

Ans. is 'c' i.e., M_3

(Ref: Rapid Review of Physiology p.j32)

- M3 receptors are found in vessels (endothelium).
- Activation of these receptors causes vasodilation by release of EDRF(NO).
- Unique muscarinic receptors in that their activation does not cause release of acetylcholine, rather causes release of EDRF(NO).

355. Most important factor determining the strength of a pulse?

a) Mean BP

b) TPR

c) Pulse pressure

d) None

Correct Answer - C
Ans. is 'c' i.e., Pulse pressure
[Ref: Textbook of cardiovascular physiology p.851]

- The Strength (or amplitude or volume) of pulse depends on the volume of blood ejected out with each beat (Stroke volume)
- and extent of elasticity (compliance) of arterial wall, both of which are determinant of pulse pressure (i.e. systolic Pressure - diastolic pressure).
- "The pulse strength indicates the strength of ventricular contraction and cardiac output, If The pulse is strong, then systolic pressure is hiCh.
- If it is weak systolic pressure has fallen and medical intervention may be warranted."

356. V/Q ratio at the base of lung?

a) 1

b) 3

c) 0.6

d) 1.8

Correct Answer - C
Ans. is 'c' i.e., 0.6
(Ref: Ganong 24hle P.636-637

- OverallV/Qratio of lung 0.8
- V/Qratio at aPex 3.0 (maximum)
- V/Q ratio at base - 0.6 (Least)

357. Chemoreceptors are located in which area?

a) Medulla

b) Arch of aorta

c) Bifurcation of carotid artery

d) All of the above

Correct Answer - D
Ans. is'd'i.e., All of the above

- Central chemoreceptors - Ventral Surface Of Medulla.
- Peripheral chemoreceptors - At bifurcation of common carotid artery (carotid body) and arch of aorta (aortic bodies)

358. Hormone responsible for BP regulation after a fall due to blood loss.

a) ADH

b) ANP

c) Epinephrine

d) Aldosterone

Correct Answer - A

Ans. is 'a' i.e., ADH

(principles of medical physiology p. 573)

- Blood pressure is regulated by following mechanisms.

Short term regulation

- These mechanisms act immediately and correct the blood pressure quickly.

These are :-

1. Baroreceptor reflex: Works during Bp range 70-150 mmHg
2. Chemoreceptor reflex - Works when Bp below 80 mmHg.
3. CNS ischemic response : This the only hope of survival when BP is below 40 mmHg.

Hormonal release : These are -

1. Antidiuretic hormone (ADH) : Increases water reabsorption in kidney.
2. Angiotensin II: Causes vasoconstriction.

359. Normal expiratory reserve volume of adult?

a) 500 ml

b) 3000 ml

c) 1200 ml

d) 4500 ml

Correct Answer - C
Ans. is 'c' i.e., 1200 ml
(Ref: Ganong 24n/e p.629)

- Inspiratory reserve volume → 3000 ml
- Expiratory reserve voulume →1200 ml

360. Normal inspiratory reserve volume *(IRV)* is ?

a) 500 ml

b) 1200 ml

c) 3000 ml

d) 4900 ml

Correct Answer - C
Ans. is 'c' i.e., 3000 ml
(Ref: Ganong 24e/e p.629)

361.

Sodium channels are maximum in which part of neuron ?

a) Soma

b) Axon hillock

c) Dendrites

d) Axon

Correct Answer - B

Ans. is'b'i.e., Axon hillock

- In a motor neuron, the axon hillock and the initial segment of axon have the lowest threshold for excitation.
- This is because they have a much higher intensity of voltage gated sodium channel.

362. Normal residual volume is ?

a) 500 ml

b) 12 00 ml

c) 3000 ml

d) 2400 ml

Correct Answer - B
Ans. is'b'i.e., 1200 ml
(Ref: Ganong 24e/e p.629)

363. Dorsal root ganglion contains ?

a) Dendrides of motor neuron

b) Dendrides of sensory neuron

c) Body of motor neuron

d) Body of sensory neuron

Correct Answer - D
Ans. is 'd' i.e., Body of sensory neuron
(Ref Ganong 23'd/e p'153)

- Dorsal root ganglion contains body (soma) of sensory neuron, coming from the receptor.

364. Normal tidal volume is ?

a) 500 ml

b) 12 00 ml

c) 3000 ml

d) 2400 ml

Correct Answer - A
Ans. is'a' i.e., 500 ml
(Ref: Ganong 24e/e p.629)

365. EEG rhythm in full awake and alert state?

a) Alpha

b) Beta

c) Theta

d) Delta

Correct Answer - B
Ans. is 'b' i.e., Beta
[Ref: Ganong 24/e p. 273 & 23'd/e p. 233-235; Principles of medical physiology p. 6921]

- Beta wave is seen when the person is fully awake and alert and is thinking with maximum concentration.
- Therefore it is also called arousal or alert response.

366. Function of spinocerebellum is ?

a) Equilibrium

b) Smoothens and coordinates movement

c) Learning induced by change in vestibulocular reflex

d) Planning and programming

Correct Answer - B
Ans. b' i.e., Smoothens and coordinates movement

367. Bilateral damage to lateral hypothalamus causes?

a) Hyperthermia

b) Hypothermia

c) Anorexia

d) Increased sexuality

Correct Answer - C
Ans. is'c' i.e., Anorexia
Ref: Psychology As p'151)

- Feeding center is located in lateral hypothalamus, thus its damage will cause anorexia'
- Satiety center is located in the ventromedial hypothalamus, thus damage to this area causes overeating.

368. Reciprocal excitation is ?

a) Contraction of antagonist with relaxation of agonist

b) Contraction of agonist with relaxation of antagonist

c) Contraction of both agonist and antagonist

d) Relaxation of both agonist and antagonists

Correct Answer - A

Ans.is'a'i.e.,Contractionof antagonist with relaxation of agonist

- Principles Of medical physiology p.715)

Reciprocal inhibition:

- Seen in Stretch reflex.
- There is contraction of with relaxation of antagonists.

Reciprocal excitation:

- Seen in golgi tendon reflex (inverse stretch refelx).
- There is a relaxation of agonists with contraction of antagonists.

369. Unconscious proprioception is carried by ?

a) Dorsal column

b) Spinothalamic tract

c) Spinocerebellar tract

d) Reticulospinal tract

Correct Answer - C
Ans. is 'c' i.e., Spinocerebellar tract
(Ref. Principles of medical physiology p.712)

- Conscious proprioception → Dorsal column - medial lemniscal system.
- Unconscious proPriocePtion → Spinocerebellar tract.

370. Which of the following is a chemoreceptor?

a) Osmoreceptors

b) Rods & cones

c) Hair cells

d) Merkel's disc

Correct Answer - A
Ans. is'a'i.e. Osmoreceptors
Chemoreceptors are:-

- Taste buds (gustatory receptors) - Osmoreceptors
- Olfactory receptors - Glucoreceptors

371. Pain by massaging & liniments is relieved due to -

a) Gate control

b) Endogenous opioids

c) Inhibition of pain receptors

d) All of the above

Correct Answer - A
Ans. is 'a' i.e., Gate control
Ref: Medical physiology for UG students p. 86

- The gate control theory provides the basis for reducing pain by other tactile stimuli.
- For example, application of counterirritant balm or liniments; massage; transcutaneous electrical stimulation (TENS); stimulation of skin e.g. applying hot water bag over an area of visceral stimulation; or acuPuncture etc'

372. Orthodox sleep is -

a) REM sleep

b) NREM sleep

c) Narcolepsy

d) Alternate REM & NREM

Correct Answer - B
Ans is'b'i.e., NREM sleep
[Ry' Ganong 24e/e p. 274; principles of medical physiotogy p. 692]

- Orthodox sleep → Non-REM (NREM) or slow wave sleep.
- Paradoxical -+ REM (rapid eye movement) sleep

373. Arousal is most difficult in which stage of sleep -

a) Stage 1 NREM

b) Stage 2 NREM

c) Stage 3,4 NREM

d) REM

Correct Answer - C

Ans is 'c' i.e., Stage 3,4 NREM

- 'In general, the ease of arousal from sleep parallels the ordering of the sleep stages, with NEM and stage 1 being the easiest for arousal and stage 4 the most difficult.

374. CSF sugar is -

a) Half of blood sugar

b) 1/3 of blood sugar

c) 2/3 of blood sugar

d) Same as blood sugar

Correct Answer - C
Ans is'c' i.e.,2/3 of blood sugar
[Rl Ganong24/e p. 603 6 23d/e p. 571]

- CSF / plasma glucose ratio is 0.64.

375. Rubrospinal tract influences -

a) Posture and balance

b) Valuntary activity

c) Vestibuloocular stimuli

d) All of the above

Correct Answer - B
Ans. is'b' i.e., Voluntary activity

- Actions of extrapyramidal systems
- Reticulospinal (Rubrospinal tracts -+ voluntary and reflex (involuntary) activity.

376. Amount of blood in capillary pool at anytime -

a) 250 ml

b) 1000 ml

c) 2000 ml

d) 2500 ml

Correct Answer - A

Ans. is 'a' i.e., 250 ml

- Capillaries contain 5% of total blood volume, i.e., 250 ml out of 5000 ml of total blood.

377. Most important factor for maintaining intravascular fluid volume -

a) Hydrostatic pressure in capillaries

b) Osmotic pressure in capillaries

c) Hydrostatic pressure in interstitial space

d) Osmotic pressure in interstitial space

Correct Answer - B

Ans. is 'b' i.e., Osmotic pressure in capillaries

[Ref: Understanding medical physiology p. 331)

- Hydrostatic pressure in the capillaries, i.e., capillary blood pressure creates an outward driving force i.e., tries to force the fluid from the capillary to interstitial space.
- Osmotic pressure in the capillaries creates an inward driving force, ie., tries to keep the fluid in the capillary.

378. Windkessel effect in large arteries perform what function -

a) Maintain intravascular volume

b) Provide peripheral resistance

c) Prevent fluctuation in BP

d) Exchange of respiratory gases

Correct Answer - C

Ans. is'c'i.e., Prevent fluctuation in BP

- The elastic walls of large elastic arteries prevent abrupt changes in BP, a phenomenon called windkessel vessels.

379. Cerebral perfusion pressure is -

a) Arterial pressure minus peripheral venous pressure

b) Venous pressure minus arterial pressure

c) Arterial pressure minus intracranial pressure

d) Arterial pressure x venous pressure

Correct Answer - C
Ans. is 'c' i.e., Arterial pressure minus intracranial pressure
(Ref Principles of medical physiology p. 719.)

- Cerebral perfusion Pressure: is the difference between mean arterial pressure (MAP) and intracranial pressure.
- (ICP) or central venous pressure (CVP) whichever is greater. CPP is normally 80-100 mm Hg.

380. All are positive waves in JVP, except -

a) a

b) c

c) v

d) x

Correct Answer - D

Ans. is 'd' i.e., x [Ref: Guyton 12h/e p. 1061]

- Three visible major positive waves (a, c and v).
- Two negative waves (x and y).s

381. All are effect of parasympathetic system on heart except -

a) Negative chronotropic

b) Negative ionotrophic

c) Negative dromotropic

d) All are seen

Correct Answer - B
Ans. is 'b' i.e., Negative inotropic [Ref: Guyton 12'h/e p. 119]

382. Blood supply of liver [m1/100g/min]

a) 1500-2000

b) 1000-1500

c) 50-60

d) 250-300

Correct Answer - C
Ans. is'c'i.e., 50-60
[Ref: Ganong 23'd/e p. 570]

- Blood flow through various organs are as follow:-
- Total Blood Flow (blood flow to whole organ in ml/min) r Liver (1500) > kidney (1260) > skeletal muscle (540) > Brain (750) > Skin (,162) > Heart (250).

383. Most potent stimulus for renin release is -

a) Sympathetic stimulation

b) Decreased NaC1 in DCT

c) Prostacycline

d) Reduced renal perfusion pressure

Correct Answer - D

Ans. is 'd' i.e., Reduced renal perfusion pressure

- All the given four options are stimuli for renin release.
- But reduced renal perfusion pressure is most powerful among them.
- The most powerful stimulus for renin secretion is reduction in renal perfusion pressure.

384. Function of I cells of kidney -

a) Na^+ reabsorption

b) Cl- reabsorption

c) H^+ secretion

d) K^+ secretion

Correct Answer - C

Ans. is'c'i.e., H^+ secretion

Collecting duct has :-

1. Principal cells (P cells), which are involved in Na+ reabsorption and ADH stimulated water reabsorption.
2. Intercalated cells (I cells) which are concerned with acid (H.) secretion and HCO transPort

385. Hormone with distant site of action acts -

a) Autocrine

b) Paracrine

c) Endocrine

d) Any of the above

Correct Answer - C

Ans. is 'c' i.e., Endocrine

[Ref. Clinical physiology 3'd/e p. 712]

- Hormones are chemical mediators that control cellular functions.
- They are secreted into the blood stream by ductless endocrine glands and thereby exert widespread actions.

Hormone may have : -

- Autocrine action: - Acts on the cell from which it is secretec.
- Paracrine action : - Acts on neighboring cells, e.g., the effect of gastrin on D cells secreting somatostatin.
- Endocrine action: - Acts on cells distant to the cell from which it is secreted. Most of the hormones act by this mechanism.

386.

Proximal part of stomach is mostly used for -

a) Secretion

b) Digestion

c) Motility

d) Storage

Correct Answer - D
Ans. is'd'i.e., Storage

- Proximal stomach,serves primarily the function of storage.

387. Function of incretin is -

a) Increased heart rate

b) Increased insulin secretion

c) Increased respiratory rate

d) Stimulate erythropoiesis

Correct Answer - B
Ans. is 'b' i.e., Increased insulin secretion
[Ref: Principles of medical physiology 4n/e p. 534]

- Incretins are GI hormones which are secreted by enteroendocrine cells in response to m

388. In diseases of growth hormone cell death occurs by -

a) Aging

b) Apoptosis

c) Necrosis

d) All of the above

Correct Answer - B

Ans. is'b'i.e., Apoptosis

- GH and IGF-I (somatomedin) inhibit cell death by apoptosis.
- Thus, GH deficiency will cause accelerated apoptosis.

389. Special protein for motility of sperm is -

a) Actin

b) Myosin

c) Kinesin

d) Dynein

Correct Answer - D
Ans. is'd'i.e., Dynein
[Ref: Pathophysiology of male reproductive system p. 631]

- "Sperm motility k based on the active sliding of microtubules by axonemal dyneins".

390. Corticotrophs produce all except -

a) ACTH

b) β-endorphin

c) CLIP

d) β-enkephalin

Correct Answer - D

Ans. is'd'i.e., β-enkephalin

- Corticotrophs produce pOMC gene products.

Derivatives of pOMC are:-

1. Pituitary hormones:ACTH, MSH
2. beta-lipotropic hormone (beta-LpH)
3. gamma-lipotropic hormone (y-LpH)
4. beta-endorphin
5. CLIP (corticotropin-like intermediate lobe peptide).

391. Conversion of prekallikrein to kallikrein requires which clotting factor -

a) XIII

b) XII

c) XI

d) X

Correct Answer - B
Ans. is'b'i.e., XII
[Rel Essential of medical physiology p. 612]

- Initiation of intrinsic coagulation pathway occurs when factor XII is exposed to negatively charged surface.
- This leads to activation offactor XII to XIIa.
- Factor XIIa can then hydrolyze prekallikrein to kallikrein, which in turn activates more XII to XIIa.

392. Which of the following is used to treat pain -

a) Transcutaneous nerve stimulation

b) Subcaudate tractotomy

c) Cingulotomy

d) All of the above

Correct Answer - A
Ans. is'a'i.e., Transcutaneous nerve stimulation
lRef: Morgan 4'h/e p. 389-410)
Various modalities of treatment which are tried for chronic pain:-

1. Pharmacotherapy :- The various drugs (mentioned above) are used for chronic pain syndrome. The various routes can be used:- oral, intravenous, epidural' or Transcutaneous.
2. Neuro-surgical :- Anterolateral cordotomy, dorsal root entry zone lesion, selective rhizotomy, commissural myelotomy, sympathectomy mesencephalic tractotomy, cordectomy
3. Chemical neurolysis:- Glycerol, alcohol, phenol e.g. intrathecal hyperbaric phenol.
4. Other- Acupuncture, transcutaneous electric nerve stimulation, neuromodulation procedures(intracranial stimulation:- deep brain/subcortical and motor cortex stimulation)' cryoablation'

393. Half life of prothrombin -

a) 24 hours

b) 60 hours

c) 5 days

d) 10 days

Correct Answer - B
Ans. is 'b' i.e., 60 hours
Ref: Hematology : Clinical Principles & Applications By Bernadette F. Rodah George A. Fritsma, Kathryt Doig, Ph.D. p. 599

394. Micturition centre is present in -

a) Lateral temporal cortex

b) Medial temoral cortex

c) Lateral frontal cortex

d) Medial frontal cortex

Correct Answer - D
Ans. is'd'i.e., Medial frontal cortex lRef: Basic clinical neuroscience p. 2481

- Micturition centers are located in the brain-stem and cerebral cortex.
- In cerebral cortex (cortical center) : A cortical center for voluntary control of initiation and cessation of micturition is Located in the superior frontal gyrus on medial surface (meilialfrontal corter).

395. Percentage of Na+ in 0.9% of NaC1 -

a) 0.45%

b) 1.54

c) 0.9%

d) 2.84%

Correct Answer - A

Ans. is 'a' i.e., O.45%

- Normal saline (isotonic saline)
- This question is straightforward you can solve it even if you do not know the composition of 0.9% of NaCl 0.9 % NaCl is isotonic saline.
- 0..9%NaCl means 9.0 gm of salt (NaCl) in one litre (i.e.,0.9%) > Out of which Na- is half (0.45%) and Cl is half (0.045)

396. Endorphin release causes -

a) Analgesia

b) Allodynia

c) Hyperalgesia

d) None of the above

Correct Answer - A
Ans. is'a'i.e., Analgesia
[Ref: Principles of medical physiology p' 486)

- Primary action of endorphin (p-endorphin) is to inhibit Pain'

397. Plasma membrane is freely permeable to -

a) Glucose

b) Urea

c) Glycerol

d) Alcohol

Correct Answer - D
Ans. is'd'i.e., Alcohol

398. Lysosomal enzymes are maximally active at -

a) Acidic pH

b) Alkaline pH

c) Neutral pH

d) Has no relation with pH

Correct Answer - A
Ans. is'a'i.e., Acidic pH
[Ref: Quantitative Human physiology p. 82]

- Lysosomal enzymes of tissue cells have evolved for aphysiologic function in an acidic environment".

399. Curdling of milk is caused by -

a) Rennin

b) Lipase

c) Amylase

d) Elastase

Correct Answer - A
Ans. is'a'i.e., Rennin [Ref: Concise oxford dictionary p. 1218i

- Rennin is an enzyme secreted into the stomach of unweaned mammis causing the curdling of milk.

400. The only excitatory neurons in cerebellar cortex are?

a) Purkinje

b) Basket

c) Golgi

d) Granule cells

Correct Answer - D

Ans. is'd'i.e., Granule cells [Ref BDC Vol. 3 p 92)

- Purkinje cells are the only output cells from cerebellar cortex.
- Purkinje cells send inhibitory efferents to deep cerebellar nuclei.
- Basket cells inhibit body of purkinje cells while stellate cells inhibit dendrites of purkinje cells.
- Granule cells send facilitatory efferents to basket, stellate and purkinje cells through parallel fibers.
- Climbing fibers and parallel fibers stimulate purkinje cells.

401. Which are the cells of olfactory bulb that act as local integrator?

a) Sustentacular cells

b) Hair cells

c) Granular cells

d) Mitral cells

Correct Answer - D
Ans. is 'd' i.e., Mitral cells[Rel Ganong 23'd/e ch 15, Guyton 12th/e p. 649]

- In olfactory bulb axons of olfactory nerve synapse with dendrites of mitral cells to form the olfactory glomeruli.
- Mitral cells are the principal output neurons of olfactory bulb anil their axons form the olfactory tract

402. What is the function of synaptobrevin?

a) Presynaptic vesicle fusion

b) Post synaptic vesicle fusion

c) Inhibits synaptic transmission

d) Amplify synaptic transmission

Correct Answer - A
Ans. is 'a' i.e., Presynaptic vesicle fusion
Ref. Ganong 23'd/e p. 116-119; European Journal of Biochemistry Volume

- 249 issue 2 p. 540-546
- Synaptobrevins/VAMPs (vesicle associated membrane protein) represents a family of integral membrane proteins of 11-13 kDa with the N-terminal region exposed to the cytoplasm and a C-terminal transmembrane domain.
- Synaptobrevin/VAMP is an essential component of the exocytotic fusion machine, related to a larger protein family referred to as v-SNARES.
- The primary role of SNARE proteins is to mediate vesicle fusion, that is , the exocytosis of cellular transPort vesicles with the cell membrane at the porosome or with a target compartment (such as a lysosome).

403. Odorant molecule binds to which receptors?

a) C AMP

b) G protein coupled membrane receptors

c) JAK kinase pathway

d) NF receptors

Correct Answer - B

Ans. is 'b' i.e., G protein coupled membrane receptors

[Rel Ganong 23'd/e ch 15; Guyton 12h/e p. 649)

- Odour receptors are G-protein coupled receptors.
- Receptor-ligand interaction (adsorption of odorant molecules to the cilia of receptors) results in opening of Na+ channel through second messenger cAMP.
- Opening of Na* channels result in Na* influx and generation of action potentials.

404. Temperature centre is ?

a) Supraoptic nucleus of hypothalamus

b) Paraventricular nucleus of hypothalamus

c) Preoptic nucleus of hypothalamus

d) Suprachiasmatic nucleus of hypothalamus

Correct Answer - C
Ans. is'c'i.e., Preoptic nucleus of hypothalamus [Ry' Ganong 23'd/e p. 275)

405. Esophageal phase of deglutition is caused by?

a) Vagal tone

b) Primary peristalsis

c) Secondary peristalsis

d) Voluntary action

Correct Answer - B

Ans. is 'b' i.e., Primary peristalsis [Ref: Guyton l2hle p. 763-765]

Stages of deglutition

- Esophageal stage, another involuntary phase that transports food from the pharynx to the stomach.
- The esophagus functions primarily to conduct food rapidly from the pharynx to the stomach and its movements are organised for this purpose.
- The esophagus pharynx exhibits two types of peristaltic movements.
- Primary peristalsis is simply a continuation of the peristaltic wave that begins in the pharynx and spreads into the lower end of the esophagus even more rapidly than the peristaltic wave itself, in about 5 to 8 seconds, because of the additional effect of gravity pulling the food downward.

406.

Part of Basal ganglia, primarily involved in parkinsonism?

a) Subthalamic nudes

b) Substantia nigra

c) Globus pallidus

d) None

Correct Answer - B
Ans. is 'b' i.e., Substantia nigra [Rel Principles of medical physiology p. 189]

407. There are two electrodes placed at a distance of 4.5cm and it takes 1.5ms for current to be propagated along the nerve from one to another electrode. The velocity of nerve conduction is ?

a) 60m/s

b) 30m/s

c) 45m/s

d) 80m/s

Correct Answer - B

Ans. is'b'i.e., 30m/s [Ry' Requires no reference]

- Velocity = Distance traveled / Time taken to travel distance = 4.5 cm / 1.5 ms = 3 cm/ms = 30 m/sec

408. Normal intraabdominal pressure is ?

a) 0 - 8mmHg

b) 10 - 15mmHg

c) 15 - 20mmHg

d) 20 - 26mmHg

Correct Answer - A
Ans. is'a'i.e., 0 - 8 mmHg
[Ref: Essentials of medical physiolog p. 618]

- Normal intra-abdominal pressure is 0-6 mmHg.

409. Voltage gated sodium channels are?

a) Multimeric

b) Pentameric

c) Heterotrimer

d) Monomeric

Correct Answer - C
Ans. is 'c' i.e., Heterotrimer lRef: Principles of medical physiology p. 24

- There are two different types of Sodium channels:-
  l) Voltage-gated sodium channel:
- These Are Present inExcitable cells.
- These exist as heterodimers or heterotrimers of alpha and beta subunits, containing one alpha and one or two beta
- subunits.
  2) Epithelial sodium channels:
- These are present in the epithelium of absorptive or secretory epithelium,
- e.g. colon, sweat gland duct, pancreatic duct, respiratory passage, and distal tubule of kidney.
- These exist as heterotetramers of alpha, beta and gamma subunits, containing mostly two alpha, one beta and one gamma subunits.

410. ABC transporter ?

a) P. glycoprotein

b) Membrane sparing

c) Channel

d) Adenylyl cyclase

Correct Answer - A
Ans. is'a' i.e., P. glycoprotein
[Ref: Quantitative human physiology p. 727]

- ATP-binding cassette transporters (ABCtransporters) are integral transmembrane proteins that utilize ATP as an energy source to translocate a variety of substrates across membranes.
- P-glycoprotein is an ATP-binding cassette (ABC) transporter and is an important factor to limit membrane permeability in several tissues and/or elimination pathways into urine (rend tubles) and bile (liver).

411. All are true about neurotrophins except ?

a) Help integrity of postsynaptic neurons

b) TrK B is associated with brain derived neurotrophic factor

c) Helps in growth of cholinergic neurons in basal forebrain

d) Always transported antegrade along the axon

Correct Answer - D

Ans. is 'd' i.e., Always transported antegrade along the axon [Ref Ganong 24n/e p. 93; R.K. Marya 3d/e p. 236]

Neurotrophins

- This name is given to a group of proteins necessary for the survival and growth of neurons.
- Some of them are synthesized by extraneuronal structures innervated by the neurons, e.g. skeletal muscle innervated by alpha-motor neurons and tissue innervated by autonomic neurons.
- Many are produced by astrocytes.
- From the non-neural tissues, neurotrophins are taken up by endocytosis at the nerve terminal and transported to the soma by axonal retrograde transport mechanism.

412. Which of the following is not stored in cell ?

a) Insulin

b) Cortisol

c) Thyroxin

d) Renin

Correct Answer - B
Ans. is'b'i.e., Cortisol
[Ref Essentials of physiology P' 812]

- Peptides and amino hormones are stored in cells within secretory vesicle.
- In contrast, steroid hormones are not stored in secretory vesicles before their secretion.

413. Righting reflex is a ?

a) Cochlear reflex

b) Spinal reflex

c) Vestibular reflex

d) None of the above

Correct Answer - C
Ans. is 'c' i.e., Vestibular reflex
[Ref Understanding of medical physiology p. 662]
Vestibular reflexes

- The information collected by vestibular apparatus leads mainly to reflex adjustment in posture and eye movements.

Vestibular reflexes are -

- Tonic labyrinthine reflex
- Righting reflex (labyrinthine righting reflex)
- Visual reflex vestibulo-ocular reFlex)

414. Blood group antigen NAG transferase present but galactosyl transferase is absent is ?

a) Group A

b) Group B

c) Group AB

d) Group 0

Correct Answer - A

Ans. is'a'i.e., Group A

- ABO gene products are the products of enzymatic reactions, catalysed by enzymes called glycosyltransferase (galactosyltransferase).

415. Rate limiting step in cholinergic transmission ?

a) Synthesis of acetylcholine from choline

b) Active uptake of choline in axons

c) Active uptake of acetylcholine by synaptic vesicle

d) Release of acetylcholine from synaptic vesicle

Correct Answer - B

Ans. is'b'i.e., Active uptake of choline in axons

- Acetylcholine synthesis and release
- Choline is actively taken up by the axonal membrane by Na*; choline cotransporter. (Rate limiting step). This step is blocked by Hemicholinium.

416. Biphasic action potential of mixed nerve except?

a) All or none phenomenon

b) Two or more positive peaks

c) Refractory period

d) Recorded on surface

Correct Answer - B

Ans. is'b'i.e., Two or more positive peaks

- Action potential when recorded by putting two electrodes on the surface of a neuron (instead of putting on surface and one intracellularly), shows a biphasic response, i.e. Biphasic action potential.
- As the wave of depolarization reached the first electrode, this electrode becomes negative and an upward deflection (Peak) is recorded.

417. Ratio of motor units to number of muscle fibers in striated muscle of eyes is?

a) 1 : 3

b) 1: 30

c) 1 : 300

d) 1 : 3000

Correct Answer - A

Ans. is'a'i.e., 1:3

[Ref Medical physiology By Walter F. Boron, Emile L.Boulpaep 2d/e ch. 9]

- The innervations ratio refers to the number of muscle fibers supplied by a single motor neuron.
- In striated muscles the ratio varies between different muscle groups according to their function.

418. Fetal erythropoietin production is inhibited by?

a) Testosterone

b) Estrogen

c) Cortisol

d) Hypoxia

Correct Answer - B

Ans. is 'b' i.e., Estrogen

- Ref: Principles and practice of maternal health
- The plasma erythropoietin activity increases steadily during pregnancy.
- Estrogen antagonizes the erythropoietin-augmenting effect of placental lactogen.
- It inhibit utilization of erythropoietin by the marrow stem cells, and also impairs its production.

419. Pure word aphasia is inability to?

a) Read

b) Write

c) Comprehend

d) Speak

Correct Answer - C
Ans.is'c'i.e.,Comprehend

- Auditoryverbal agnosia (AVA), also known as pure word deafness, is the inability to comprehend speech.
- Individuals with this disorder lose the ability to understand language repeat words, and write from dictation.

420. IP3/DAG pathway is activated by which of the following?

a) Protein kinase A

b) Protein kinase C

c) Phospholipase C

d) Phospholipase A

Correct Answer - C
Ans. is'c'i.e., Phospholipase C
[Ref Guyton 12th/e p. 890 6 KDT 6h/e p. 46]
Phospholipase IP3-DAG system

- Activation of phospholipase (by stimulatory G protein) hydrolyses the membrane phospholipid phosphatidylinositol 4, 5 bisphosphate (PIP) to generate the second messenger inositol 1, 4, 5 - triphosphate (IP3) and diacylglycerol (DAG).

421. Rennin is present in ?

a) Gastric juice

b) Liver

c) Kidney

d) Lung

Correct Answer - A
Ans. is 'a' i.e., Gastric juice
[Ref: Principal of Medical physiology p. 786

- Rennin (also called chymosin) is a proteolytic enzyme is found in gastric juice. It is synthesized by chief cells in the stomach.