

Subject: **Biochemistry**

Paper name: **Physiological Chemistry and Metabolism I**

Paper No: **BC 2**

Semester: **2nd Semester**

A. Multiple choice questions [75 (15 from each unit)]

1. Which among the following is a component of the basic elements of a homeostatic mechanism?
 - a) Control Centre
 - b) Effector
 - c) Receptor
 - d) All of the above

2. The degree of effectiveness with which a control system maintains homeostasis is determined by:
 - a) gain of positive feedback
 - b) gain of negative feedback
 - c) degree of stimulus
 - d) effectiveness of receptor

3. The key enzyme that converts trypsinogen to trypsin is
 - a) Chymotrypsin
 - b) Secretin
 - c) Enteropeptidase
 - d) Elastase

4. Salivary amylase becomes inactive in the stomach mainly due to
 - a) inactivation by low pH
 - b) degradation by gastric pepsin
 - c) Inhibition by Cl⁻
 - d) Inhibition by peptides

5. The most efficiently absorbed monosaccharide is
 - a) Glucose
 - b) Galactose
 - c) Fructose
 - d) Mannose

6. Glucose from the intestinal lumen is transported inside the mucosal cell by a transporter called:
 - a) Na^+ dependent glucose transporter
 - b) $\text{Na}^+ \text{-K}^+$ ATPase
 - c) GLUT-2
 - d) GLUT -1
7. Plasma albumin performs which among the following functions
 - a) Transport
 - b) Osmotic
 - c) Nutritive
 - d) All of the above
8. The most abundant immunoglobulin in the body is:
 - a) IgG
 - b) IgE
 - c) IgD
 - d) IgM
9. The characteristic red colour of haemoglobin is due to
 - a) α -globin
 - b) β -globin
 - c) heme
 - d) all of the above
10. Which enzyme catalyses the formation of carbonic acid in the blood?
 - a) Carboxylase
 - b) Dehydrogenase
 - c) Carbonic anhydrase
 - d) Deoxycarboxylase
11. Which statement is not true regarding blood clotting?
 - a) The extrinsic pathway occurs in response to tissue injury
 - b) Fibronogen is cleaved to form fibrin monomers
 - c) The blood clotting factors are all lipid in nature
 - d) The extrinsic and intrinsic pathways are coupled together
12. The most abundant blood cells in the body are the
 - a) White blood cells
 - b) Macrophages

- c) Platelets
 - d) Red blood cells
13. Histamines, the chemicals which can dilate blood vessels are released by:
- a) Basophils
 - b) Monocytes
 - c) Eosinophils
 - d) Neutrophils
14. Which among the following functions is not exhibited by platelets?
- a) Blood clotting
 - b) Digest and destroy bacteria
 - c) Aid in allergic reactions
 - d) Secrete vasoconstrictors in broken blood vessels
15. If the blood group of an individual is A, then the antibody present is
- a) anti B antibodies
 - b) anti A antibodies
 - c) anti O antibodies
 - d) no antibodies present
16. The glomerular filtrate is mainly composed of
- a) Water and non- protein solutes
 - b) Water and small proteins
 - c) Water and nitrogenous wastes
 - d) None of the above
17. Removal of wastes from our body is due to a process called
- a) Respiration
 - b) Excretion
 - c) Secretion
 - d) Exhalation
18. Glucose is mainly reabsorbed in
- a) Henle's loop
 - b) PCT
 - c) DCT
 - d) Nephron

19. The outermost region of a kidney is the

- a) Cortex
- b) Medulla
- c) Pelvis
- d) Capsule

20. Which of the following is not an electrolyte?

- a) Calcium
- b) Potassium
- c) Creatinine
- d) Sodium

21. Approximately 1/3rd of our body water exists in the

- a) Kidneys and urinary bladder
- b) Blood
- c) Transcellular fluid compartment
- d) Extracellular fluid compartment

22. The hormones aldosterone and ADH both have an important function in

- a) Fluid balance in the body
- b) Acid- base regulation
- c) Activity of buffer system
- d) All of the above

23. Name the basic structural and functional unit of the nervous system.

- a) Neuroglia
- b) Glial cells
- c) Neurons
- d) Perikaryon

24. The action potential of a neuron

- a) Declines in amplitude as it moves along the axon
- b) Is terminated by efflux of K⁺
- c) Is initiated by efflux of Na⁺
- d) Is not associated with movement of K⁺ or Na⁺

25. Neurotransmitters are often stored in

- a) Synaptic buttons
- b) Microtubules
- c) Vesicles
- d) Endoplasmic reticulum

26. Interactions between neurons commonly occur across junctions called
a) Synapses
b) Juxtapositions
c) Presynaptic membranes
d) Postsynaptic membranes
27. Which of the following is the most abundant contractile protein of a muscle?
a) Actin
b) Myosin
c) Tubulin
d) All of these
28. The Sliding Filament Theory of muscle contraction was proposed by
a) Alexander Sandow
b) Graham Hoyle
c) R.E. Davies
d) A.F. Huxley and H.E. Huxley
29. The role of Ca^{2+} in muscle contraction is
a) To bind to tropomyosin and break actin-myosin cross bridges
b) To block the ATP binding site on myosin, enabling muscle to relax
c) To change the conformation of troponin, exposing myosin binding sites
d) To change the conformation of myosin head causing microfilaments to slide past each other.
30. Which of the following is not an Endocrine gland?
a) Thyroid
b) Pancreas
c) Spleen
d) Testis
31. A molecule that binds to a receptor is called a _____
a) Catalyst
b) Ligand
c) Hormones
d) Transmembrane protein
32. Which of the following hormone is not secreted by Hypothalamus
a) Thyrotropin-releasing hormone

- b) Corticotropin-releasing hormone
 - c) Thyroid stimulating hormone
 - d) Growth hormone-releasing hormone
33. Prader-Willi Syndrome, a condition in which a missing chromosome leads to short stature is caused by dysfunction of
- a) Hypothalamus
 - b) Pituitary
 - c) Thymus
 - d) Adrenal
34. _____ is called the master gland of the Endocrine system.
- a) Hypothalamus
 - b) Pituitary
 - c) Pancreas
 - d) Adrenal
35. Follicle-stimulating hormone (FSH), luteinizing hormone (LH) and human chorionic gonadotropin (hCG) are commonly known as
- a) Growth Hormones
 - b) Lactogenic hormone
 - c) Steroids
 - d) Gonadotropins
36. Name the hormone which is produced in response to fight, fright and flight
- a) Glucagon
 - b) Epinephrine
 - c) Aldosterone
 - d) Cortisol
37. The hormone which is required for the implantation of fertilized ovum and maintenance of pregnancy is
- a) Prolactin
 - b) Estrogen
 - c) Aldosterone
 - d) Progesterone
38. Insulin is secreted by :
- a) β cells of islets of Langerhans
 - b) α cells of islets of Langerhans

- c) anterior pituitary
 - d) posterior pituitary
39. The common precursor for the synthesis of all steroid hormones is:
- a) Dehydroepiandrosterone
 - b) Deoxycortisol
 - c) Pregnenolone
 - d) Deoxycorticosterone
40. The precursor of the thyroid hormones T₃ and T₄ is
- a) Thyroglobulin
 - b) Iodine
 - c) Dopamine
 - d) Aldosterone
41. Which among the following is not a function of androgens?
- a) Development of male reproductive organs
 - b) Spermatogenesis
 - c) Decreases the muscles mass
 - d) Maintenance of secondary sexual characteristics
42. What is the main function of glucagon?
- a) lower blood glucose
 - b) inhibit alpha and beta cells
 - c) increases protein synthesis
 - d) raise blood glucose level
43. Which hormone is responsible for the development and maturation of ovarian follicles?
- a) Follicular stimulating hormone
 - b) Luteinizing hormone
 - c) Progesterone
 - d) Prolactin
44. Abnormal increase in the size of thyroid gland is known as:
- a) Cretinism
 - b) Grave's diseases
 - c) Goiter
 - d) Myxoedema

45. Organism which feeds on dead organism are called

- a) Autotrophs
- b) Phototrophs
- c) Saprophytes
- d) Heterotrophs

46. The breaking down of molecules to obtain energy is called

- a) Metabolism
- b) Anabolism
- c) Catabolism
- d) All of the above

47. Glycolysis occurs in which region of the cell

- a) Nucleus
- b) Cytoplasm
- c) Plasma membrane
- d) Cell wall

48. What happens in pay off phase of Glycolysis

- a) ATP is consumes
- b) ATP is release
- c) ATP neither produced nor consumed
- d) none of the above

49. The process by which Pyruvate is converted into Glucose is called

- a) Glycolysis
- b) Gluconeogenesis
- c) Kreb's Cycle
- d) Ellectron transport Chain

50. The major site of gluconeogenesis in our body is the

- a) Bone marrow
- b) Pancreas
- c) Kidney
- d) Liver

51. Which of the following reaction is catalyzed by Aconitase

- a) Pyruvate to Acetyl CoA
- b) Acetyl CoA to Citrate
- c) Citrate to Iso-citrate
- d) Ketoglutarate to Succinyl CoA

52. 1 molecule of pyruvate undergoing TCA cycle will produce ____ GTP.

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

53. Which of the following is not a by product of Pentose Phosphate Pathway

- a) NADH
- b) FADH
- c) Pentoses
- d) Ribose-5-Phosphate

54. Which of the following is a Starter molecule for Kreb's Cycle

- a) Ribose
- b) Glucose
- c) Fumarate
- d) Acetyl CoA

55. Increase in concentration of hydrogen cation in blood causes

- a) increase in blood pH
- b) decrease in blood pH
- c) maintains blood pH neutral
- d) does not have any effect on blood pH

56. Which of the following step is common in glycolysis and pentose phosphate pathway?

- a) Conversion of glucose to glucose-6-P
- b) Conversion of glucose-6-P to ribose-5-P
- c) Conversion of glucose-6-P- to fructose-6-P
- d) Conversion of glucose to glucose-1-P

57. Which of these is not a product of fermentation?

- (a) Lactate
- (b) Oxygen
- (c) Carbon dioxide
- (d) Ethanol

58. Which of the following is a lactic acid-fermenting bacteria?

- a) Acetobacter
- b) Salmonella
- c) Lactobacillus
- d) Nostoc

59. Which of the following is also known as Krebs cycle?

- a) Electron transport chain
- b) Glycolysis
- c) TCA cycle
- d) DNA Replication

60. All the enzymes required for beta oxidation occurs in the

- (a) Cytoplasm
- (b) Nucleus
- (c) Ribosomes
- (d) Mitochondria

61. The acetyl CoA produced in the breakdown of fatty acids may be subsequently oxidized by means of

- a) ETC
- b) Glycolysis
- c) Krebs cycle
- d) None of these

62. The total energy generated from the complete oxidation of palmitic acid(16C) will be

- a) 129 ATP
- b) 150 ATP
- c) 108 ATP
- d) 175 ATP

63. Transport of fatty acids from the cytoplasm to the mitochondrial matrix requires

- a) ATP, carnitine, and coenzyme A
- b) ATP, carnitine, and pyruvate dehydrogenase
- c) ATP, coenzyme A, and hexokinase
- d) Carnitine, coenzyme A, and hexokinase

64. Carnitine is

- a) A15-carbonfattyacid
- b) An essential cofactor for the citric acid cycle
- c) Essential for intracellular transport of fatty acids
- d) One of the amino acids commonly found in proteins

65. Which of these is able to cross the inner mitochondrial membrane?

- a) Acetyl-CoA
- b) Fatty acyl-carnitine

- c) Fatty acyl-CoA
 - d) Malonyl-CoA
66. Saturated fatty acids are degraded by the stepwise reactions of β oxidation, producing acetyl-CoA. Under aerobic conditions, how many ATP molecules would be produced as a consequence of removal of each acetyl-CoA?
- a) 2
 - b) 3
 - c) 4
 - d) 5
67. Which of the following statements apply (applies) to the β oxidation of fatty acids?
- a) The process takes place in the cytosol of mammalian cells
 - b) Carbon atoms are removed from the acyl chain one at a time
 - c) Before oxidation, fatty acids must be converted to their CoA derivatives
 - d) NADP⁺ is the electron acceptor
68. In what compartment does the *de novo* fatty acid synthesis occur?
- a) Mitochondria
 - b) Peroxisome
 - c) Endoplasmic reticulum
 - d) Cytosol
69. What is the precursor for fatty acid synthesis?
- a) Acetyl CoA
 - b) Propionyl CoA
 - c) Succinyl CoA
 - d) Acetoacetyl CoA
70. The conversion of acetyl CoA to malonyl CoA is the rate-limiting step in the fatty acid synthesis. Which of the following enzyme catalyzes the above-mentioned reaction?
- a) Acetyl CoA carboxylase
 - b) Malonyl CoA synthetase
 - c) Acetyl CoA decarboxylase
 - d) Malonyl CoA synthase
71. The acetyl CoA is produced in the mitochondria and must be transported into the cytosol for synthesis of fatty acid. Which of the following is true regarding its transport?
- a) Acetyl CoA is diffused from the mitochondrial membrane

- b) Acetyl CoA is transported by its specific transporter protein
- c) Acetyl CoA is converted into pyruvate, enters into the cytosol and acetyl CoA is regenerated
- d) Acetyl CoA is converted into citrate, enters into the cytosol and acetyl CoA is regenerated

72. What is the allosteric regulator of acetyl CoA carboxylase?

- a) Fatty acid
- b) ATP
- c) Citrate
- d) Acetyl CoA

73. Which of the following enzyme statement is not true regarding fatty acid synthase?

- a) Fatty acid synthase is a multifunctional enzyme
- b) Fatty acid synthase is active as a dimer
- c) Fatty acid synthase is activated by high-calorie food
- d) Fatty acid synthase complex is inhibited by its phosphorylation

74. What is the source of NADPH required for fatty acid synthesis?

- a) Pentose phosphate pathway
- b) Malic enzyme
- c) Both
- d) None of these

75. What form of energy is required for fatty acid biosynthesis?

- a) ATP
- b) NADH
- c) NADPH
- d) FADH₂

B. Fill up the blanks [15 (3 from each unit)]

1. The process of maintaining a constant internal environment in living organisms is called _____.
2. _____ is the phenomenon of dispersion of lipids into smaller droplets due to reduction in the surface tension.
3. _____ causes the shift in the O₂ dissociation curve to the right.
4. The life span of Red blood cells is _____ days.
5. The ABO blood grouping system was discovered by _____.
6. The pyramids are area located within the _____ of the kidney.
7. A small and brief change in a membrane potential (E_m) is called _____.
8. The termination of muscle contraction is generally followed by _____, return of the muscle fibers to their low tension- generating state.
9. Glucagon binds its receptor in the plasma membrane of _____ cells
10. _____ from the hypothalamus inhibits the pituitary gland's secretion of growth hormone and thyroid stimulating hormone
11. _____ is essential for the synthesis of thyroid hormones.
12. _____ is the most predominant mineralocorticoid.
13. Androgens, the male sex hormones are produced by _____ cells of the testes.
14. _____ is the sum of the chemical reactions that take place within each cell of a living organism
15. Homolactic fermenters use the _____ pathway and directly reduce almost all their pyruvate to lactate
16. Glycerol is formed by breaking down of _____ in the fatty tissue
17. In TCA cycle succinate formed from succinyl-CoA is oxidized to fumarate by _____
18. NADH and FADH from Glycolysis and TCA cycle further enters _____
19. Lipid is a substance of biological origin which is insoluble in water and soluble in _____
20. _____ are carboxylic acids with hydrocarbon side chain
21. Actual beta- oxidation of fatty acids occurs within the _____

22. During oxidation, fatty acids are activated by enzyme _____
23. The _____ system transfers fatty acyl- CoA from cytosol into the mitochondria
24. The _____ serves as the cross- bridges connecting the actin and myosin.
25. _____ serves as a medium for cellular events, various biochemical reactions and enzyme actions.

Key Answers

A. Multiple choice questions

- | | | | | | | |
|--------|--------|--------|--------|--------|--------|--------|
| 1. d) | 2. b) | 3. c) | 4. a) | 5. b) | 6. a) | 7. d) |
| 8. a) | 9. c) | 10. c) | 11. c) | 12. d) | 13. a) | 14. c) |
| 15. a) | 16. a) | 17. b) | 18. a) | 19. a) | 20. c) | 21. d) |
| 22. a) | 23. c) | 24. b) | 25. c) | 26. a) | 27. b) | 28. d) |
| 29. c) | 30. c) | 31. b) | 32. c) | 33. a) | 34. b) | 35. d) |
| 36. b) | 37. d) | 38. a) | 39. c) | 40. a) | 41. c) | 42. d) |
| 43. a) | 44. c) | 45. c) | 46. c) | 47. b) | 48. b) | 49. b) |
| 50. d) | 51. c) | 52. a) | 53. b) | 54. d) | 55. b) | 56. a) |
| 57. b) | 58. c) | 59. c) | 60. d) | 61. c) | 62. a) | 63. a) |
| 64. c) | 65. b) | 66. c) | 67. c) | 68. d) | 69. a) | 70. a) |
| 71. d) | 72. c) | 73. d) | 74. a) | 75. c) | | |

B. Fill up the blanks

1. Homeostasis
2. Emulsification
3. Bohr Effect
4. 120
5. Karl Landsteiner
6. Medulla
7. Action potential
8. Muscle relaxation
9. Hepatocytes
10. Somatostatin
11. Iodine
12. Aldosterone
13. Leydig
14. Metabolism
15. Embden-Meyerhof
16. Triacyl-glycerol
17. Succinate dehydrogenase
18. Electron Transport Chain
19. Organic solvents
20. Fatty acids
21. Mitochondria
22. Thiokinases/ acyl-CoA synthetases

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- 23. Carnitine shuttle
- 24. Myosin head
- 25. Water