CHAPTER-1
BIOCHEMISTRY

MOLECULES & THEIR INTERACTION RELEVANT TO BIOLOGY

Unit-1.1: Structure of Atoms, Molecules & Chemical Bonds

[MH-2015]

1. Water is effective in screening the electrostatic interactions between dissolved ions because it has
   (A) a high dielectric constant
   (B) a high fluidity property
   (C) a high electrical conductivity
   (D) a neutral pH value

[MH-2015]

2. When two uncharged atoms are brought very close together, the two nuclei are said to be in van der Waals contact, when the net:
   (A) attraction is maximum
   (B) repulsion is maximum
   (C) attraction is equal to repulsion
   (D) attraction is minimum

[WB-2015]

3. The energy is most favourable at the van der Waals contact distance. Owing to electron-electron repulsion, the energy rises rapidly as the distance between the atoms becomes shorter than the
   (A) Contact distance
   (B) Polar distance
   (C) Bond length
   (D) Electric dipole

[CG-2017]

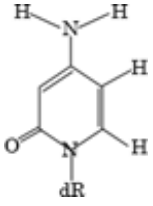
4. Which of the following covalent bond types are found in the structure of 'ATP'
   (A) N-glycosidic, thioester phosphodiester
   (B) Phosphoanhydride, phosphomonoester, N-glycosidic
   (C) Ester, ether, phospho anhydride
   (D) Ether, thioester, phosphomonoester

[MP-2017]

5. The magnitude of ionization potential depends upon:
   (A) Radius of the atom
   (B) Magnitude of positive charge on the nucleus
   (C) Number of electron orbits
   (D) All are correct

[TN-2017]

6. Name the following structure



   (A) Deoxy cystidine
   (B) 5-methyl – Deoxycystidine
   (C) heterochromatin
   (D) Deoxy uridine

[CG-2018]

7. The strong tendency of the water to exclude _____. is frequently referred to as hydrophobic bond.
   (A) Non-polar groups (B) Polar groups
   (C) Hydroxyl group (D) Both (B) and (C)

[JK-2018]

8. Which of the following shows the types of bonding in decreasing order of strength?
   (A) Covalent, hydrogen, Van der Waals
   (B) Covalent, Van der Waals, Hydrogen
   (C) Hydrogen, Van der Waals, Covalent
   (D) Van der Waals, Hydrogen, Covalent

[MH-2018]

9. Carbon-14 undergoes beta decay upon which it is converted into a new element having:
   (A) Increased atomic number
   (B) Decreased atomic number
   (C) Increased mass number
   (D) Decreased mass number

[MH-2019]

10. By what process does Thorium-230 decay to radium-226?
    (A) Gamma emission (B) Alpha emission
    (C) Beta emission (D) Electron capture

[WB-2020]

11. Configuration of a protein can only be altered by breaking
    (A) Hydrogen bond
    (B) Disulfide bond
    (C) Hydrophobic interaction
    (D) Ionic interaction

[GJ-2021-DEC]

12. Po (atomic mass 216 and atomic number 84) undergoes decay to form Po (atomic mass 212 and atomic number 84). Po →→→ Po. What radioactive particles are emitted in this decay?
    (A) $2a + 2^-$ (B) $a + \beta^-$
    (C) $2a + 2\beta^+$ (D) $a + 2\beta^-$

[GJ-2022]

13. Water is an excellent solvent for polar molecules. The reason is that water
(A) Greatly strengthens electrostatic forces
(B) Greatly weakens electrostatic forces
(C) Greatly strengthens hydrogen bond formation
(D) Greatly weakens hydrophobic interaction

[MH-2024]

14. Hydrogen bonds are present in water structure. Presence of hydrogen bonds gives a characteristic property to water, which is:
(A) High melting and high boiling points
(B) High melting and low boiling points
(C) Low melting and high boiling points
(D) Low melting and low boiling points

[GJ-2024]

15. Match the items in Group - A with their corresponding functions in Group - B, and choose the correct option.

Group - A	Group - B
1. C, H, O and N	a. elements that activate or inhibit enzymes
2. Mg and P	b. elements of biomolecules and structural elements
3. Na and K	c. elements of energy related chemical compounds
4. Zn and Mg	d. alters the osmotic potential of cell

Code:
(A) 1-d; 2-c; 3-a; 4-b (B) 1-b; 2-c; 3-d; 4-a
(C) 1-d; 2-a; 3-c; 4-b (D) 1-a; 2-c; 3-d; 4-b

Answer Key									
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
A	C	A	B	D	A	A	A	A	B
11	**12**	**13**	**14**	**15**					
A	D	C	A	B					

Unit-1.2: Composition, Structure and Function of Biomolecules

(Carbohydrates, Lipids, Proteins, Nucleic Acids and Vitamins).

[KA-2015]

1. The relationship between D-Glucose and d-Glucose is
(A) Both are the same
(B) D-refers to optical rotation and d-refers to configuration
(C) D-refers to configuration and d-refers to optical activity
(D) D configuration always gives rise to dextro rotation

[MH-2015]

2. What is the role of peptidoglycan?
(A) extracellular adhesive
(B) gives rigidity and strength to exoskeletons
(C) gives rigidity and strength to cell envelope
(D) energy storage

[MH-2015]

3. Which of the following enzyme reactions is termed as acyl group transfer reaction?
(A) Chymotrypsin (B) Lysozyme
(C) Hexokinase (D) Isomerase

[MH-2016]

4. Water readily dissolves charged biomolecules by replacing
(A) water molecules by solute molecules
(B) solute-solute hydrogen bonds by solute-water hydrogen bonds
(C) big molecules by small molecules
(D) positive charges by negative charges

[GJ-2016]

5. Which one of the following sugar is present in all cells of aquatics monocotyledons?
(A) Sorbose (B) Rhamnose
(C) Galactose (D) Apiose

[GJ-2016]

6. The most common storage polysaccharide in yeast is
(A) Glycogen (B) Starch
(C) Dextrans (D) Cellulose

[GJ-2016]

7. Which of the following is a keto triose?
(A) Glyceraldehyde (B) Dihydroxyacetone
(C) Erythrose (D) Arabinose

[GJ-2016]

8. Milk protein casein is a:
(A) Nucleoprotein (B) Phosphoprotein
(C) Lipoprotein (D) Glycoprotein

[GJ-2016]

9. Which of the following is not a conjugated protein?
(A) Peptone (B) Phosphoprotein
(C) Lipoprotein (D) Glycoprotein

10. Match Column I with Column II.

Column I	Column II
(a) Thiamine Pyrophosphate	(i) L-amino acid oxidase
(b) Biotin	(ii) Transaminases
(c) Pyridoxal phosphate	(iii) Pyruvate carboxylase
(d) Flavin mononucleotide	(iv) Pyruvate Decarboxylase

Codes:
(A) a-ii, b-i, c-iv, d-iii (B) a-I, b-iii, c-iv, d-ii
(C) a-iii, b-I, c-ii, d-iv (D) a-iv, b-iii, c-ii, d-i

[AP-2017]

11. The three amino acids present in glutathione are:
    (A) Glutamic acid, cysteine, Glycine
    (B) Cysteine, alanine, proline
    (C) Alanine, Serine, Aspartic acid
    (D) Leucine, Glycine, Glutamic acid

[CG-2017]

12. Glycogen is a branched polymer of glucose, it has:
    (A) No reducing ends.
    (B) No non-reducing ends.
    (C) One reducing end and several non-reducing ends.
    (D) One non-reducing end and several reducing ends.

[CH-2017]

13. Some inorganic elements that serve as co-factor for enzymes. Match Table-I and Table - II.

Table – I	Table – II
(A) Cytochrome oxidase	(i) K^+
(B) Pyruvate kinase	(ii) Cu^{2+}
(C) Dinitrogenase	(iii) Ni^{2+}
(D) Urease	(iv) Mo

Choose the correct answer:

	(A)	(B)	(C)	(D)
(A)	(i)	(ii)	(iii)	(iv)
(B)	(iii)	(iv)	(i)	(ii)
(C)	(ii)	(i)	(iv)	(iii)
(D)	(iv)	(i)	(ii)	(iii)

[GJ-2017]

14. Which one of the following is a structural homopolysaccharide?
    (A) Hyaluronic acid
    (B) Inulin
    (C) Chitin
    (D) Starch

[KA-2017]

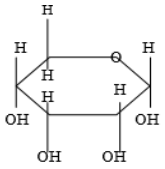
15. Why do fats give more energy than carbohydrates?
    (A) Fats have carboxyl group
    (B) Fats are more reduced than carbohydrates
    (C) Fats are larger than carbohydrates
    (D) Fats have more number of bonds than carbohydrates

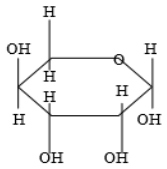
[MP-2017]

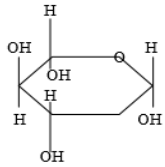
16. Chitin, is a linear polymer with:
    (A) α D-galactouronic units with (1→ 4) linkage
    (B) N - acetyl-D-glucosamine units with β (1→ 4)
    (C) 4-O-methylglucoronic acid with β (1→ 4) linkage 4
    (D) β-D-glucose units with β (1→ 4) linkage -D

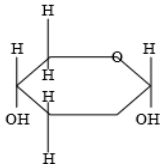
[TN-2017]

17. Which is the furanose form of D-ribose?

1) 

2) 

3) 

4) 

[TN-2017]

18. What products are obtained when 1-palmityl-2-oleyl-3-phosphatidyl serine is hydrolyzed by a phospholipase A1
    (A) palmitic acid and 2-oleoyl-3-phosphatidyl serine
    (B) oleic acid and 1-palmitoyl – 3- phosphatidyl serine
    (C) phosphoserine and 1-palmitoyl – 2 – oleoyl – glycerol
    (D) serine and 1-palmotyl – 2 – oleoyl – phosphatic acid

[MH-2017]

19. Raffinose is a carbohydrate and aminor constituent of sugar beets. Which class of arbohydrates from below does it belong to?
    (A) Monosaccharide (B) Disaccharide
    (C) Trisaccharide (D) Polysaccharide

[MH-2017]

20. Phytochelatins are low-molecular- weight thiols consisting of the:
    (A) Organic acids (B) Amino acids
    (C) Fatty acids (D) Nucleic acids

[MH-2017]

21. The genome of which of the following virus obeys Chargaff's rule?
    (A) TMV (B) Mu phage
    (C) ox 174 (D) Adenovirus

[TN-2017]

22. The empirical formula of thiamine is
    (A) C_{12} H_4 N_{17} OS (B) C_{12} H_{17} N_4 OS
    (C) C_{17} H_{12} N_4 OS (D) C4 H_{17} N_{12} OS

[WB-2017]

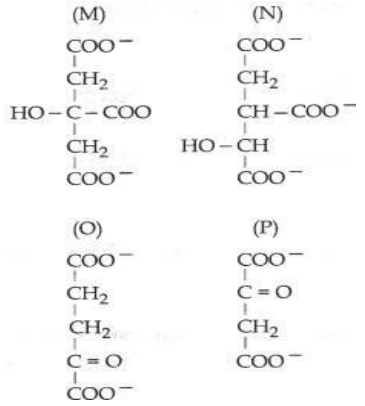
23. Teichoic acid is composed of repetitive units of
    (A) N-acetyl glucosamine
    (B) Ribitol phosphate
    (C) Glucose-6-phosphate
    (D) Glucosamine

[WB-2017]

24. The gla domain is found in
    (A) Fibrinogen (B) Fibrin polymer
    (C) Prothrombin (D) Kininogen

[CG-2018]

25. Indicate names of the following molecules:



(A) (M) - Citrate (N) - Oxaloacetate (O) - Isocitrate (P) -α-ketoglutarate
(B) (M) Oxaloacetate (N) - Isocitrate (O) -α-ketoglutarate (P) – Citrate
(C) (M) -Isocitrate (N) - Citrate (0) - Oxaloacetate (P) a-ketoglutarate
(D) (M) Isocitrate (N) - a-ketoglutarate (0) - Oxaloacetate (P) – Citrate

[AP-2018]

26. Which one of the following acts as the precursor for the biosynthesis of lysine?
(A) Cysteine
(B) Pyrroline-5-carboxylate
(C) 2-oxoglutarate
(D) Ornithine

[AP-2018]

27. Assertion (A): Storage polysaccharides show more branches than structural polysaccharides in their structure.
Reason (R): Branched polysaccharides have more free ends and can form more glycoside bonds.
(A) Both (A) and (R) are true and (R) is the correct explanation of (A)
(B) Both (A) and (R) are true, but (R) is not the correct explanation of (A)
(C) (A) is true but (R) is false
(D) (A) is false but (R) is true

[AP-2018]

28. If the average molecular weight of an amino acid is 120 daltons, then what is the weight in grams of a single molecule of protein containing 300 amino acids?
(A) 6.02×10^{-23} g (B) 270×10^{-18} g
(C) 53.85×10^{-22} g (D) 5.98×10^{-20} g

[GJ-2018]

29. Which one of the following aldose sugar is most abundant in biological systems?
(A) D-Mannose (B) D-Gulose
(C) D-Xylose (D) D-Arabinose

[JK-2018]

30. Which of the following statements is NOT true?
(A) Oxidation and reduction reactions occur simultaneously.
(B) When a sugar molecule is oxidized to CO, and H.0.0, molecules are reduced.
(C) Hydrogenation reactions are oxidation and dehydrogenation reactions are reduction
(D) Hydrogenation reactions are reduction and dehydrogenation reactions are oxidation

[JK-2018]

31. Which of the following is an example of structural polysaccharide?
(A) Starch (B) Cellulose
(C) Glycogen (D) Sucrose

[JK-2018]

32. Fatty acids are termed as unsaturated if
(A) they have one or more double bonds
(B) they are insoluble in water
(C) they are insoluble in alcohol
(D) they have no double bonds

[MH-2018]

33. Maleic acid and Fumaric acid are:
(A) Geometric isomers (B) Chiral isomers
(C) Enantiomers (D) Diastereomers

[MH-2018]

34. Artificial sweetener aspartame is:
(A) L- Aspartyl- L -Phenylalanine methyl ester.
(B) L-Aspartyl- D - Phenylalanine methyl ester
(C) D- Aspartyl - D - Phenylalanine methyl ester
(D) D- Aspartyl - L- Phenylalanine methyl ester

[WB-2018]

35. Name the vitamins that are found in the liver of marine fishes.
(A) Vit C & D (B) Vit B & D
(C) Vit A & B (D) Vit A & D

[WB-2018]

36. Cobalt is an essential component of
(A) Vitamin B (B) Vitamin B,
(C) Vitamin B (D) Vitamin B2

[WB-2018]

37. Besides its anti-oxidant activity, vitamin E causes
(A) Increased release of prostacyclin
(B) Increased adherence of blood cell components to inner lining of blood vessels
(C) Stimulation of protein kinase C
(D) Vasoconstriction

[WB-2018]

38. $CH_3(CH_2)_{16}.COOH$ represents
(A) An unsaturated fatty acid
(B) A saturated fatty acid
(C) A triglyceride
(D) A lipoid

[MH-2019]

39. Glycogen, starch and cellulose are polymers of glucose. Which of the following statements are true about these polymers?
    (i) β Glycogen and starch are having α1-4 and α 1-6 glycosidic bonds.
    (ii) Cellulose is having 1-4 glycosidic linkage.
    (iii) All these polymers are giving energy for the cells.
    (iv) Glycogen is present in animals and starch in plants.
    (v) Amylase enzyme is useful in digestion of these polymers.
    (A) (i), (ii) and (v) (B) (i), (ii) and (iv)
    (C) (ii), (iii) and (iv) (D) (ii), (iii) and (v)

[MH-2019]

40. Maple syrup urine disease, one of the inherited metabolic disorders is caused because of blockage of oxidative decarboxylation of -keto acids derived from valine, leucine and isoleucine. Which of the following enzyme is missing or defective in the patient?
    (A) Homogentisate reductase
    (B) Branched chain dehydrogenase
    (C) Oxaloacetate decarboxylase
    (D) Acetoacetate carboxylase

[MH-2019]

41. Isoenzymes are.....
    (A) Oligomeric proteins which have different physico-chemical properties and catalyse the same reaction.
    (B) Monomeric proteins which have different physico-chemical properties and catalyse the samereaction.
    (C) Oligomeric proteins which have same physico-chemical properties and catalyse different reactions
    (D) Monomeric proteins which have same physico-chemical properties and catalyse different reactions

[KA-2020]

42. The constituent monosccharide in chitin is
    (A) D-Glucose (B) D-Xylose
    (C) N-acetly D-glucosamine (D) D-Galactose

[MH-2020]

43. Which of the following statements about monosaccharides is correct?
    P- Epimers of monosaccharides differ in chemical properties.
    Q- In aldoses, C_1 is the anomeric carbonR- Anomers differ in configuration at the glycosidic carbon.
    S- Epimers differ in configuration at any carbon other than glycosidic carbon.
    (A) R and s (B) P and Q
    (C) Q, R and S (D) P, Q, R and S

[MH-2020]

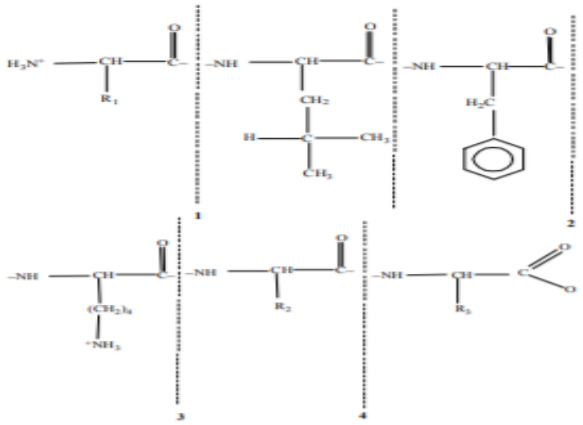
44. Fungi can synthesize one of the following structural polysaccharide from the beta-glucose:
    (A) amylopectin (B) chitin
    (C) cellulose (D) lignin

[WB-2020]

45. Collagen instability and connective tissue abnormalities are caused due to the absence of
    (A) Vitamin A (B) Vitamin C
    (C) Vitamin D (D) Vitamin H

[WB-2020]

46.



Aminopeptidase catalyzes the hydrolysis of amino acids from the N-terminal end of a protein, while carboxypeptidase catalyzes the hydrolysis of amino acids from the C-terminal end of a protein. Chymotrypsin catalyzes the hydrolysis of peptide bonds following aromatic amino acids, while trypsin catalyzes the hydrolysis of peptide bonds following lysine and arginine. Select the correct order from the following:
    (A) 1-Aminopeptidase, 2-Chymotrypsin, 3-Trypsin, 4-Carboxypeptidase
    (B) 1-Chymotrypsin, 2-Trypsin, 3-Aminopeptidase, 4-Carboxypeptidase
    (C) 1-Chymotrypsin, 2-Trypsin, 3-Carboxypeptidase, 4-Aminopeptidase
    (D) 1-Aminopeptidase, 2-Trypsin, 3-Chymotrypsin, 4-Carboxypeptidase

[WB-2020]

47. Protamines, small arginine rich proteins, are characteristically
    (A) large sized DNA fragments
    (B) sequences of DNA that are unique in nature
    (C) histone like proteins found in fish sperm
    (D) moderately repeated DNA sequence

[WB-2020]

48. Proteomics technique used to analyse the characteristics of molecular protein network involved in living cell is termed as
(A) Functional proteomics
(B) Expression proteomics
(C) Structural proteomics
(D) Protein mining

[GJ-2022]

49. Amino acid threonine has how many optical isomers?
(A) 1 (B) 2
(C) 3 (D) 4

[GJ-2022]

50. What happens to the osmotic potential of the pure water, if we add NaCl and sugars?
(A) Osmotic potential of the pure water becomes negative
(B) Osmotic potential of the pure water becomes positive
(C) Solutes do not show any effect on the osmotic potential
(D) Osmotic potential of the pure water becomes zero

[GJ-2022]

51. A drop of water on glass slide takes a bead shape and why not alcohol?
(A) Water has high surface tension
(B) Alcohol has high surface tension
(C) Water has low surface tension
(D) Both (A) and (C)

[JK-2022]

52. Name the two amino acids that are components of artificial sweetener, 'aspartame'.
(A) Aspartic acid and phenylalanine
(B) Arginine and tyrosine
(C) Aspartic acid and tryptophan
(D) Aspartic acid and glutamic acid

[WB-2023]

53. Which of the following statements is not correct for teichoic acids?
(A) Teichoic acids are anionic polymers found in the cell walls of Gram-positive bacteria.
(B) They are composed of glycerol phosphate orribitol phosphate residues joined through phosphodiester linkage.
(C) They are covalently linked to N-acetyl-muramic acid of the peptidoglycan layer.
(D) They are composed of N-acetylglucosamine residues linked by $\beta(1-4)$ linkages.

[RJ-2023]

54. Consider the following steps of beta oxidation:
1. Activation of fatty acid
2. Elongation cycle of fatty acid via ACP intermediates
3. Conversion of acetyl -Co A into Malonyl CoA
4. Transport of fatty acid in mitochondria
5. Breakdown of fatty acid in mitochondria matrix

Which of the following are not involved in beta oxidation?
(A) 1,2 and 3. (B) 2 and 3
(C) 3,4 and 5 (D) 3 and 5

[MH-2024]

55. Hookworm infection can lead to deficiency of:
(A) Vitamin B_{12} (B) Iron
(C) Vitamin B_6 (D) Folic acid

[NE-SLET-2024]

56. Match the items of Column-I with those of Column-II and select the correct match from the codes given below:

Column-I	Column-II
(a) The amino acid with maximum number of codons	1. Glutamine
(b) The characteristic amino acid in lysozyme active site	2. Tryptophan
(c) The amino acid precursor in heme biosynthesis	3. Serine
(d) The amino acid contributing the most to protein absorbance at 280 nm	4. Glycine

Code:
(A) a-2, b-1, c-4, d-3 (B) a-3, b-1, c-4, d-2
(C) a-4, b-2, c-3, d-1 (D) a-2, b-4, c-3, d-1

[CG-2024]

57. The correct composition of greenhouse gases is in the order of-
(A) $CO_2 > N_2O > CH_4 > CFCs$
(B) $CO_2 > CFCs > CH_4 > N_2O$
(C) $CO_2 > CH_4 > CFCs > N_2O$
(D) $CFCs > CO_2 > CH_4 > N_2O$

[MP-2024]

58. Which of the following Vitamins is water soluble?
(A) Vitamin-A (B) Vitamin-D
(C) Vitamin-K (D) Vitamin-B Complex

[GJ-2024]

59. The maximum buffering capacity at physiologic pH would be provided by a protein rich in
(A) Arginine (B) Glutamic acid
(C) Valine (D) Histidine

[GJ-2024]

60. In scurvy, which of the following amino acids that is normally part of collagen is NOT synthesized?
(A) Hydroxytryptophan (B) Hydroxytyrosine
(C) Hydroxyhistidine (D) Hydroxyproline

[GJ-2024]

61. Which of the following is the important reactive group of glutathione in its role as an antioxidant?
(A) Serine (B) Sulfhydryl
(C) Tyrosine (D) Carboxyl

[GJ-2024]

62. Which of the following is a modified monosaccharide that plays a crucial roll in the structure of bacterial cell walls, specifically in peptidoglycan?
(A) N-acetylmuramic acid
(B) N-acetylmannosamine
(C) N-acetylgalactosamine
(D) N-acetylneuraminic acid

Answer Key									
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
B	C	A	B	D	C	B	B	A	D
11	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
A	C	C	C	B	B	D	A	C	B
21	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
D	B	B	C	A	C	B	D	A	C
31	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**
B	A	A	A	D	D	A	B	B	B
41	**42**	**43**	**44**	**45**	**46**	**47**	**48**	**49**	**50**
A	C	D	D	B	D	C	A	B	A
51	**52**	**53**	**54**	**55**	**56**	**57**	**58**	**59**	**60**
A	A	D	D	B	B	B	D	D	D
61	**62**								
B	A								

Unit-1.3: Stabilizing Interactions

(Van der Waals, Electrostatic, Hydrogen Bonding, Hydrophobic Interaction, etc.)

[KA-2015]

1. Association of a nucleotide base with a complementary one by the formation of specific hydrogen bonding is
(A) Peptide bond (B) Base pairing
(C) Recombination (D) Mismatching

[KA-2016]

2. Which one of the following compounds have both covalent and coordinate bonds?
(A) NH_4Cl (B) Fe_3O_4
(C) $MgCl_2$ (D) H_2SO_4

[GJ-2016]

3. Which one of the following coenzymes acts as a donor of one carbon unit?
(A) Tetrahydrofolate
(B) Riboflavin
(C) Lipoic acid
(D) Pyridoxal phosphate

[KA-2016]

4. Which of the following is strongest among weak forces of interactions?
(A) Ionic (B) Hydrogen bond
(C) Van der waal's (D) Dipole-dipole

[MH-2016]

5. The forces that hold the non-polar regions of the molecules together are called:
(A) hydrophilic interaction
(B) hydrophobic interaction
(C) ionic interaction
(D) amphipathic interaction

[MH-2016]

6. Codon-anticodon pairing occurs by:
(A) Covalent bonds
(B) Electrostatic interactions
(C) Hydrogen bonds
(D) Hydrophobic interactions

[CG-2018]

7. The solubility of gases in water depends on their interaction with water molecules. Four gases i.e., Carbon dioxide, Oxygen, Sulphur dioxide and Ammonia are dissolved in water. In terms of their solubility, which of the following statements is correct?
(A) Ammonia > Oxygen > Sulphur dioxide > Carbon dioxide
(B) Oxygen > Carbon dioxide > Sulphur dioxide > Ammonia
(C) Sulphur dioxide > Oxygen > Ammonia > Carbon dioxide
(D) Ammonia > Sulphur dioxide > Carbon dioxide > Oxygen

[JK-2018]

8. Which type of bond is broken when ice melts?
(A) Ionic (B) Polar covalent
(C) Hydrogen (D) Non-polar covalent

[JK-2018]

9. Which of the following has the highest chemical bond energy?
(A) Hydrogen bond (B) Triple bond
(C) Ionic bond (D) Double bond

[MH-2018]

10. Hydrogen bond can be formed between the pair of atoms such as:
(A) Hydrogen and Carbon
(B) Hydrogen and Nitrogen
(C) Oxygen and Nitrogen
(D) Oxygen and Carbon

[KA-2020]

11. Match the following with reference to protein structure and modifying reagents.

Column A		Column B	
i	Mercapto ethanol	a	Peptide bond
ii	Guanidine hydrochloride	b	Disulphide bridge
iii	Urea	c	Hydrogen bond
iv	Dithiothreitol	d	Ionic bond

Code:
(A) i-a ii-d iii-b iv-c
(B) i-b ii-c iii-c iv-b
(C) i-c ii-b iii-a iv-d
(D) i-d ii-a iii-c iv-a

[RJ-2023]

12. Glycophorin A is the major sialoglycoprotein of the human erythrocyte membrane, which has 3 domains composed of 2 hydrophilic segments which are separated by a region of amino acids. How many amino acids are present in this region?
(A) 10 amino acids (B) 20 amino acids
(C) 37 amino acids (D) 5 amino acids

[MH-2023]

13. In which of the following the hydrogen bond is NOT formed?
(A) between water and amino group of an amino acid
(B) between carbonyl group of protein and amino group of protein
(C) between hydroxy group of alcohol and water
(D) between methyl group of alanine and water

(MP-2023)

14. What is the correct order of the following Hydrides according to decrease in their bond angles?
(A) $H_2O > H_2S > H_2Se > H_2Te$
(B) $H_2S > H_2Se > H_2Te > H_2O$
(C) $H_2Se > H_2Te > H_2O > H_2S$
(D) $H_2Te > H_2O > H_2S > H_2Se$

(MP-2023)

15. Intramolecular hydrogen bonding is-
(A) Hydrogen fluoride (B) m-Chlorophenol
(C) Water (D) o-Chlorophenol

[WB-2024]

16. Which one of the following organic groups has least probability of hydrogen bond formation with water?
(A) Amine (B) Methyl
(C) Hydroxyl (D) Carbonyl

Answer Key									
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
B	D	A	A	B	C	A	C	B	B
11	**12**	**13**	**14**	**15**	**16**				
A	C	D	A	D	B				

Unit-1.4:- Principles of Biophysical Chemistry

(pH, Buffer, Reaction Kinetics, Thermodynamics, Colligative Properties).

[KA-2015]

1. The entropy of a thermodynamic system refers to
(A) Heat given off by the reaction
(B) Tendency of a system to randomness
(C) Maximum energy of the transition states
(D) Effect of temperature on the reaction velocities

[MH-2015]

2. In a highly acidic solution (pH = 1.3) the amino acid glycine exists in:
(A) $^{+3}NH - CH_2 - COO^-$
(B) $^{+3}NH—CH_2—COOH$
(C) $NH_2 - CH_2 - COOH$
(D) $NH_2 - CH_2 - COO^-$

[MH-2015]

3. A beaker marked 'X' has 100 ml of water at 80°C while another beaker marked 'Y' has 200 ml water at 20°C. If we mix the two completely in 500 ml beaker and record the temperature immediately, the temperature will be closest to:
(A) 20°C (B) 40°C
(C) 80°C (D) 50°C

[KA-2016]

4. Which among the following is not a thermodynamic system?
(A) Open system (B) Isolated system
(C) Closed system (D) Surrounding

[KA-2016]

5. Which among the following is a buffer?
(A) Mixture of acid and base
(B) Mixture of weak acid and strong base
(C) Mixture of strong acid and weak base
(D) A weak acid and its conjugate base

[MH-2016]

6. A solution of acidic buffer with a pH of 4.0 is ……. times more acidic than same buffer with a pH of 6
(A) 2 (B) 100
(C) 1000 (D) 10

[MH-2016]

7. Which of the following reactions will not proceed in the direction written, assuming that the reactants are initially present in a 1 : 1 molar ratio ?
(A) ATP + Creatine ? Creatine Phosphate + ADP
(B) ATP + Glycerol ? Glycerol 3-phosphate + ADP
(C) ATP + Fructose ? Fructose 6-phosphate + ADP
(D) ATP + Glucose ? Glucose 6-phosphate + ADP

[AP-2017]

8. Which of the following statements is true?

(A) Free energy is kinetic energy
(B) If a reaction is endergonic the products are of lower free energy than reactants
(C) Entropy is the amount of order in energy
(D) In exergonic reactions, free energy of the products is lower than the reactants

[GJ-2017]

9. The solution of acetic buffer with pH 4.00 is how many times stronger than the same buffer with pH 6.
(A) 2 (B) 100
(C) 1000 (D) 10

[CH-2017]

10. The following small peptide substrate are used for determining elastase activity and the following data have been recorded

	Km(mM)	Kcat(S-1)
PAPA ↓ G	4.02	26
PAPA ↓ A	1.51	37
PAPA ↓ F	0.64	18

The arrow indicates the cleavage site. From the above observations, it appears that:
(A) PAPAF is digested more rapidly.
(B) PAPAG is digested most rapidly.
(C) A hydrophobic residue at the C-terminus seems to be favored
(D) A smaller residue at the C-terminus seems to be favored

[KA-2017]

11. Choose the right arrangement in the increasing order of energy.
(A) erg < calorie < joule (B) joule < calorie < erg
(C) erg < joule < calorie (D) calorie < erg < joule

[KA-2017]

12. The pka of acetic acid is 4.76. If a buffer is prepared using acetic acid sodium acetate, and the pH of the solution is 5.76, what will be the ratio of acetic acid concentration to sodium acetate concentration?
(A) 1:1 (B) 1:10
(C) 10:1 (D) 1: 100

[MH-2017]

13. In the antigen antibody reaction, the association constant (Ka at equilibrium is represented by:
(A) [Ag -Ab complex]
(B) [Free Ag] /[Free Ab]
(C) [Free Ag] [Free Ab]/[Ag - Ab complex)
(D) [Ag -Ab complex)/[Free Ag] [Free Ab]

[MH-2017]

14. When a weak acid is mixed with its salt, pH of the solution becomes:
(A) More acidic (B) Remains same
(C) Neutral (D) Less acidic

[MH-2017]

15. The amount of energy that must be added to break a bond is exactly equal to the amount that is released upon formation of the bond. Which law of thermodynamics among the following is applicable to this situation?
(A) First (B) Second
(C) Third (D) Fourth

[TN-2017]

16. Indicate the ionic species that predominates at pH 4, 8 and 11 for ammonia
(A) pH 4, NH4+; pH 8, NH4+; pH 11, NH3
(B) pH 4, NH4+; pH 8, NH3+; pH 11, NH2
(C) pH 4, NH4+; pH 8, NH3+; pH 11, NH3
(D) pH 4, NH3+; pH 8, NH3+; pH 11, NH2

[TN-2017]

17. Estimate the volume of a solution of 5 M NaOH that must be added to adjust the pH from 4 to 9 in 100 mL of a 100 mM solution of phosphoric acid
(A) 4 mL (B) 2 mL
(C) 1 mL (D) 0.5 mL

[AP-2018]

18. If the pH of a solution is 8, its hydroxyl ion concentration is
(A) 10^{-8}
(B) ten times more than that of pH 7 solution
(C) 10^{-2}
(D) 10^{8}

[AP-2018]

19. An increase in entropy
I. is an increase in order
II. occurs when a NaCl solution is diluted
III. occurs when a hydrocarbon molecule is removed from an aqueous environment
IV. occurs in the system when amino acids are linked to form a protein
(A) I, II are correct (B) I, IV are correct
(C) II, III are correct (D) II, IV are correct

[JK-2018]

20. In thermodynamics "free energy" refers to
(A) energy that can be harnessed to do work or drive chemical reaction.
(B) excess energy from a reaction that a cell does not use.
(C) energy required to initiate a chemical reaction
(D) energy which is left after a reaction has completed

[MH-2018]

21. If an aqueous solution has a hydrogen ion concentration of 10^{-3} M, what is the concentration of hydroxyl ion?
(A) 10^{-14} M (B) 10^{-10} M
(C) 10^{-11} M (D) 10^{-12} M

[MH-2018]

22. The feasibility of a biochemical reaction is decided by the equation G = H-TS. If both H and S have negative values, the reaction:
(A) is not favoured at any temperature
(B) happens spontaneously
(C) is exergonic, favoured below T = H/S
(D) is endergonic, favoured above T = H/S

[AP-2019]

23. Calculate the pH of a bicarbonate buffer that is composed of 0.5 m sodium carbonate and 0.05 M carbonic acid solution. The pK is 6.1
(A) 7.1 (B) 8.0
(C) 7.4 (D) 9.0

[CG-2019]

24. Following are few chemical reactions:
(a) Adenosine diphosphate (ADP) =AMP + P
(b) Adenosine Triphosphate (ATP) = ADP + P
(c) Phosphoenolpyruvate (PEP) = pyruvate + P
Arrange these reactions as per increasing order of AG
(A) (a), (b), (c) (B) (c), (b), (a)
(C) (b), (a), (c) (D) (b), (c), (a)

[MH-2019]

25. Such a set of opposing reaction shown as (A) and (B) in above figure is an example of:
(A) Reversible reaction (B) Substrate cycle
(C) Product cycle (D) Enzyme cycle

[MH-2019]

26. For the reaction A → B at 298 K, the change in enthalpy is – 7 $kJ.mol^{-1}$ and the change in entropy is – 25 $J.K^{-1}.mol^{-1}$. How much is the free energy change and whether the reaction is spontaneous or nonspontaneous?
(A) ΔG = 450 $J.mol^{-1}$ and reaction is not spontaneous
(B) ΔG = 450 $J.mol^{-1}$ and reaction is spontaneous
(C) ΔG = 900 $J\ mol^{-1}$ and reaction is spontaneous
(D) ΔG = 900 $J\ mol^{-1}$ and reaction is not spontaneous

[MH-2019]

27. A solution is made by mixing 50 ml of 2 M K_2HPO_4 and 25 ml of 2.0 M $KH_2\ PO_4$. The solution is diluted to a final volume of 250 ml. What is the pH of the final solution? (P^K = 6.82)
(A) 6.82 (B) 7.12
(C) 6.52 (D) 7.51

[MH-2020]

28. State, whether the following two statements (I and II), are true or false:
(I) A reaction is said to be spontaneous when it can proceed in either the forward or reverse direction.
(II) A spontaneous process can occur with a large decrease in entropy.
(A) I = False and II = False
(B) I = True and II = False
(C) I = False and II = True
(D) I = True and II = True

[KA-2020]

29. pH = pK, when
(A) [Proton acceptor] = ½ [Proton donor]
(B) [Proton acceptor] = [Proton donor]
(C) [Proton acceptor] = 2 [Proton donor]
(D) 2[Proton acceptor] = [Proton donor]

[MH-2020]

30. Calculate the pl value of aspartic acid from the given pK values.(Given : pK_1 = 1.99, pK_2 = 9.90 and PK_R = 3.90)
(A) 2.945 (B) 5.945
(C) 6.9 (D) 7.895

[WB-2020]

31. Succinate dehydrogenase converts succinate to fumarate. Which one of the following is true when the competitive inhibitor malonate is added to the reaction mixture?
(A) Both K_m and V_{max} increase
(B) Both K_m and V_{max} decrease
(C) K_m increases and V_{max} remains unchanged
(D) K_m increases and V_{max} decreases

[MH-2021]

32. A population of cells grown in adherent culture contains 0.4 mg protein per 10 cells. Actin comprises 4.5% of the total protein. Given the Mr of actin is 42000 daltons and Avogardo 23 number is 6.02 × 10, which of the following equals the mean number of actin molecules per cell?
(A) 2.58×10^{14} actin molecules
(B) 2.58×10^{11} actin molecules
(C) 2.58×10^{8} actin molecules
(D) 2.58×10^{10} actin molecules

[GJ-2022]

33. In an equilibrium reaction the value of ΔG
(A) $\Delta G = 0$ (B) $\Delta G = -1$
(C) $\Delta G = 1$ (D) $\Delta G = \Delta G°$

[GJ-2022]

34. What is the pl value of a nonstandard amino acid X whose pK_1 PK and PK values are 2.1,7.8 and 11.3 ?
(A) 6.7 (B) 4.95
(C) 9.55 (D) 7.06

[JK-2022]

35. Net charge on an amino acid at a pH less than pI will be
(A) Positive
(B) Negative
(C) Neutral
(D) Charge is not affected by pH

[MH-2023]

36. What is the pl value of a non-standard amino acid X, whose pK1, pK2, and pK3 values are 2.5, 7.5 and 9.0?
(A) 8.25 (B) 50
(C) 5.75 (D) 6.33

[WB-2023]

37. Probability of dissociation of a solution of DNA double helix into its component single strands by removing certain susceptible protons is the highest in which one of the following pH values?
(A) pH 3.0 (B) pH 5.0
(C) pH 7.0 (D) pH 9.0

(MP-2023)

38. For which the half-life period is directly proportional to initial concentration of a solution?
(A) First Order Reaction
(B) Second Order Reaction
(C) Third Order Reaction
(D) Zero Order Reaction

(MP-2023)

39. If the Hydrogen ion concentration in a solution is one gram mole per litre, then the pH of the solution is:
(A) 07 (B) 14
(C) 08 (D) 00

(MP-2023)

40. The substrate concentration at which an enzyme exhibits haif the maximum velocity is known as:
(A) V_{max} (B) [S]
(C) K_m (D) K_{eq}

(MP-2023)

41. Isoenzyme is characterized as:
(A) Non-protein part of enzyme
(B) Enzymes with same quaternary structure
(C) Similar enzymes that catalyse different types of reactions
(D) Multiple forms of given enzyme that catalyze same type of reaction

[MH-2024]

42. What is the resultant pH of a phosphate buffer made by mixing 0.2 M NaH_2PO_4 and 0.2 M Na_2HPO_4? (pKa = 6.86)
(A) 5.86 (B) 6.86
(C) 7.86 (D) 7.00

[MH-2024]

43. Beaker 'A' has 100 ml of some fluid at 80°C. Beaker B contains the some fluid 200 ml at 20°C. If both the fluids are mixed, what would be the temperature of the resultant mixture?
(A) 25°C (B) 65°C
(C) 40°C (D) 50°C

[MP-2024]

44. Acid is a proton donor and Base is a proton acceptor. This theory is:
(A) Arrhenius Theory
(B) Bronsted-Lowry Theory
(C) Sorensen Theory
(D) Britton-Robinson Theory

Answer Key

1	2	3	4	5	6	7	8	9	10
B	B	A	D	D	B	A	D	B	C
11	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
C	C	C	B	A	C	B	B	C	A
21	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
C	C	A	B	A	A	B	A	B	B
31	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**
D	A	A	A	A	A	A	A	D	C
41	**42**	**43**	**44**						
D	B	C	B						

Unit-1.5: Bioenergetics, Glycolysis, Oxidative Phosphorylation, Coupled Reaction, Group Transfer, Biological Energy Transducers.

[KA-2015]

1. In the glycolytic pathway, 1,3 bis phospho glycerate is converted into 3 phospho glycerate and the phosphate group is transferred to ADP to produce ATP. This type of reaction is called
(A) Futile cycle
(B) Substrate level phosphorylation
(C) Energy conservation reaction
(D) Oxidative phosphorylation

[KA-2015]

2. Which of the following is not an intermediate in the citric acid cycle?
(A) Pyruvate (B) Oxaloacetate
(C) Succinate (D) Malate

[KA-2015]

3. Methyl carbon of pyruvate was labeled with 14(C) If this pyruvate underwent gluconeogenesis, which carbon of glucose will be labelled?
(A) 1 (B) 1 and 3
(C) 3 (D) All

[MH-2015]

4. Which of the following high energy compound releases maximum amount of energy on hydrolysis?
   (A) ATP
   (B) 1, 3 bis-phosphoglycerate
   (C) Creatine phosphate
   (D) Phosphoenol pyruvate

[MH-2015]

5. Which of the following pentose is not formed during pentose phosphate pathway?
   (A) Ribulose 5-phosphate
   (B) Ribose 5–phosphate
   (C) Xylulose 5-phosphate
   (D) Xylose 5-phosphate

[MH-2015]

6. Which shuttle is operated to get 32 ATP molecule after complete oxidation of glucose?
   (A) Glycerol-3-phosphate (B) Malate-aspartate
   (C) Pyruvate-malate (D) Citrate-pyruvate

[MH-2015]

7. No net conversion of fatty acids to glucose occurs in mammals because ..... .
   (A) pyruvate dehydrogenase reaction is irreversible
   (B) of the presence of citrate synthase
   (C) lack of glycerol kinase
   (D) lack of acetyl CoA carboxylase

[MH-2015]

8. Which of the following biochemical reaction shows highest standard free energy change?
   (A) UDP-glucose + H_2O? UMP + glucose 1–phosphate
   (B) Glucose 1–phosphate? glucose 6–phosphate
   (C) Malate? fumarate + H_2O
   (D) Palmitate + $23O_2$? $16CO_2$ +$16H_2O$

[WB-2015]

9. The entry of ADP into mitochondria is coupled to the exit of ATP by
   (A) Malate - aspartate shuttle
   (B) Glycerol 3-phosphate shuttle
   (C) Dicarboxylate carrier
   (D) ATP-ADP translocase

[JK-2016]

10. A product or products of glycolysis is/are:
    (A) ATP (B) HO
    (C) CO, (D) Both (A) and (B)

[JK-2016]

11. Identify the type of reactions during the conversion of pyruvate to acetyl CoA:
    (A) Oxidation and reduction
    (B) Dehydrogenation and decarboxylation
    (C) Oxidation and dehydrogenation
    (D) Reduction and decarboxylation alone.

[MH-2016]

12. Which of the following compounds is not an inhibitor of electron transport chain?
    (A) Rotenone (B) Antimycin A
    (C) Cyanide (D) Dinitrophenol

[MH-2016]

13. Which of the following enzyme is carrying a reversible reaction in glycolysis?
    (A) Hexokinase
    (B) Phosphofructokinase
    (C) Phospho glycerate kinase
    (D) Pyruvate kinase

[MH-2016]

14. Coupling of oxidation and phosphorylation can be demonstrated by using oligomycin. This antibiotic inhibits which of the following process?
    (A) Inhibition of electron transfer
    (B) Inhibition of ATP synthase
    (C) Uncoupling of phosphorylation from electron transfer
    (D) Inhibition of ATP-ADP exchange

[AP-2017]

15. Match Column - I with Column – II with respect to oxidative phosphorylation.

Column I	Column II
(a) Oxidative phosphorylation	(i) Blocked by rotenone
(b) NADH reductase	(ii) Blocked by Antimycin A
(c) QH_2, to cytochrome C_1	(iii) Blocked by Cyanide
(d) Cytochrome oxidase to oxygen	(iv) Yields ATP in mitochondr

    (A) a-iv, b-i, c-ii, d-iii
    (B) a-iii, b-ii, c-i, d-iv
    (C) a-ii, b-i, c-iii, d-iv
    (D) a-i, b-iv, c-iii, d-ii

[AP-2017]

16. Arrange the steps in glycolysis in correct order:
    (a) Fructose . 6 . phosphate
    (b) Glyceraldehyde - 3 - phosphate
    (c) Glucose - 6. phosphate
    (d) Phospoenol pyruvic acid
    (e) Pyruvic acid
    Codes:
    (A) (c), (a), (b), (d), (e) (B) (b), (a), (c), (e), (d)
    (C) (b), (a), (d), (e), (c) (D) (b), (d), (c), (a), (e)

[CG-2017]

17. Match Table-I and Table-II inhibitors of electron transport system and their targets are presented in Table-I and Table-II

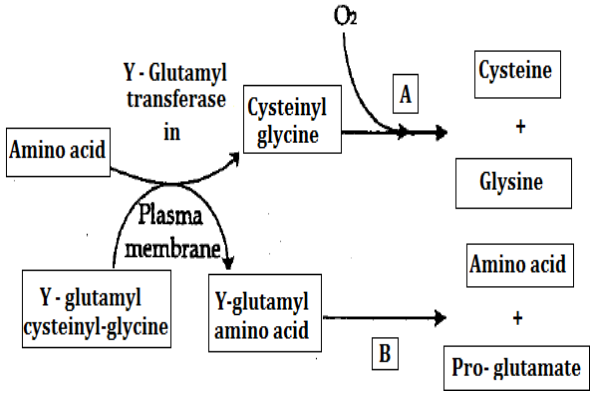
Table-I (Compound)		Table-II (Targets)	
(a)	Cyanide	(i)	Competes with QB for binding sites in PS-II
(b)	Antimycin A	(ii)	From Fe S centre to O
(c)	Retenone	(iii)	From cyt b to C_1
(d)	DCMU	(iv)	Cytochrome oxidase

Choose the correct answer:

	(a)	(b)	(c)	(d)
(A)	(iv)	(iii)	(ii)	(i)
(B)	(i)	(ii)	(iii)	(iv)
(C)	(ii)	(iii)	(iv)	(i)
(D)	(iii)	(iv)	(i)	(ii)

[CG-2017]

18.



From above flow chart denote A and B and detect the metabolic pool.

(A) A Peptidase, B -Y-glutamyl cyclotransferase and breakdown of glutathione.

(B) A-Peptidase, B-Y-glutamyl cyclotransferase and synthesis of glutathione.

(C) A-Carboxylase, B-Y-glutathione synthetase and synthesis of glutathione.

(D) A-Carboxylase, B-Y-glutathione synthetase and breakdown of glutathione

[MP-2017]

19. A remarkable feature for the activity of nearly all enzymes involved in glycolysis is a requirement of

(A) Mn^{+2} (B) Fe^{+2}

(C) Ca^{+2} (D) Mg^{+2}

[MP-2017]

20. Electrons are transferred from substrates to oxygen through electron carriers such as:

(A) Flavins

(B) Iron-sulfur complexes

(C) Quinones and hemes

(D) All are correct

[TN-2017]

21. If a cell require more NADPH than ribose – 5 – phosphate

(A) only the first phase of the pentose phosphate pathway would occur

(B) glycolytic intermediates would flow into the reversible phase of the pentose phosphate pathway

(C) there would be sugar conversions but no net release of carbons from glucose – 6 – phosphate

(D) the equivalent of the carbon atoms of glucose -6 – phosphate would be released as 6 CO2

[WB-2017]

22. Which one of the following compounds is the electron donor in most reductive biosynthesis?

(A) NADPH (B) NADH

(C) FADH, (D) FMNH

[WB-2017]

23. Which of the following steps in glycolysis is reversible?

(A) Glucose to Glucose-6-phosphate

(B) Fructose-1, 6-bisphosphate to Glyceraldehyde-3-phosphate

(C) Fructose-6-phosphate to Fructose-1, 6-bisphosphate

(D) Glucose-6-phosphate to Fructose-6-phosphate

[AP-2018]

24. Match the following :

List – I	List – II
I. DNA synthesis is cell free extracts	1. (^{3}H)- Thymidine
II. Determining chemical nature of the genetic material	2. (^{32}P)- Orthophosphate
III. Chromosome replication	3. (^{35}S)- amino acid
IV. Electron Transport	4. (^{18}O)- oxygen
	5. (α-^{32}P)-dATP

	I	II	III	IV
(A)	5	3	1	4
(B)	5	2	4	3
(C)	3	4	2	1
(D)	3	2	5	4

[JK-2018]

25. Which of the following is not an intermediate of citric acid cycle?

(A) Acetoacetate (B) Citrate

(C) Oxalosuccinate (D) Succinyl CoA

[JK-2018]

26. Nicotinamide adenine dinucleotide (NAD) acts as a cofactor that accepts electrons in some oxidation - reduction reactions in the cells. Structurally, component of NAD accepts electrons?

(A) Adenine (B) Ribose

(C) Pyrophosphate bridge (D) Nicotinamide

[JK-2018]

27. The final acceptors of electrons in lactate fermentation and alcohol fermentation, respectively, are
(A) pyruvate; acetaldehyde.
(B) oxygen; acetaldehyde.
(C) pyruvate; sulphate.
(D) acetaldehyde; oxygen.

[KA-2018]

28. Which of the following processes occur exclusively in the cytosol of an eukaryotic cell?
(A) Glycolysis and TCA cycle
(B) Glycolysis and fatty acid biosynthesis
(C) Fatty acid biosynthesis and beta oxidation
(D) TCA cycle and beta oxidation

[WB-2018]

29. Which one of the following biochemical reactions is an oxidative decarboxylation?
(A) Pyruvate to Acetyl COA
(B) Lactate to Pyruvate
(C) Pyruvate to Oxaloacetate
(D) Pyruvate to Lactate

[KA-2020]

30. During electron transport the extra energy carried by the electron is utilized in the formation of
(A) ATP (B) ADP
(C) NADP (D) NADPH

[MH-2020]

31. ATP can be formed from ADP by direct transfer of a phosphoryl group from phosphoenol pyruvate. Such type of reaction is called as:
(A) Photo-phosphorylation
(B) Oxidative phosphorylation
(C) Substrate level phosphorylation
(D) Reductive phosphorylation

[MH-2020]

32. What are (A), (B), (C) & (15) above diagram?
(A) Glycolysis, TCA cycle, homolactic fermentation and alcoholic fermentation
(B) Glycolysis, TCA cycle, alcoholic fermentation and homolactic fermentation
(C) Glycolysis, homolactic fermentation, TCA cycle and alcoholic fermentation
(D) Glycolysis, alcoholic fermentation, homolactic fermentation and TCA cycle

[WB-2020]

33. Consider a bacterial cell performs anaerobic respiration. If the bacterial cell had access to 20 molecules of glucose, how many molecules of ATP will be produced?
(A) 20 (B) 32
(C) 36 (D) 40

[WB-2020]

34. Glycogen synthase, the key regulatory enzyme for glycogenesis, is inactivated by
(A) Acetylation (B) Carboxylation
(C) Phosphorylation (D) Oxidation

[GJ-2021]

35. Oxidation of 6 molecules of glucose by pentose phosphate pathway produces the
(A) 6 molecules of pentose, 6 molecules of NADPH and 6 molecules of CO_2
(B) 6 molecules of pentose, 12 molecules of NADPH and 6 molecules Co_2
(C) 12 molecules of pentose, 12 molecules of NADPH and 6 molecules of Co_2
(D) 8 molecules of pentose, 6 molecules of NADPH and 6 molecules of CO_2

[GJ-2021]

36. Name the end product of oxidation of fatty acids.
(A) FAD (B) Acetyl CoA
(C) NAD (D) Malonyl CoA

[KA-2021]

37. Warburg effect is characterised by
(A) Increased glycolysis
(B) Decreased glycolysis
(C) Absence of glycolysis
(D) Malfunctional glycolysis

[MH-2021]

38. In bacterial glucose phospho- transferase system, glucose is converted to glucose 6-phosphate. What is the source of phosphate?
(A) ATP
(B) Inorganic phosphate
(C) Phosphoenol pyruvate
(D) Creatine phosphate

[MH-2021]

39. In non-competitive inhibition, ...
(A) Inhibitor binds to the active site of enzyme
(B) Inhibitor binds at a site other than active site and may bind to either E or ES complex
(C) Inhibitor binds at a site other than active site and binds only to the ES complex.
(D) Inhibitor binds to a site other than active site and binds only to E.

[MH-2021]

40. In anaerobic glycolysis, 2 moles of inorganic phosphate are used per mole of glucose consumed. Which of the following enzymes catalyzes the uptake of inorganic phosphate?
(A) Hexokinase
(B) Phosphofructokinase
(C) Glyceraldehyde 3-phosphate dehydrogenase
(D) Pyruvate kinase

[AAS-2021]

41. Match the items of Column-I with those of Column-II and select the correct match by using the codes given below:

Column-I	Column-II
(a) Phosphofructo-kinase	1. Pentose hosphate pathway
(b) Glucose-6 phosphate dehydrogenase	2. TCA Cycle
(c) Fructose bis-phosphatase	3. Glycolysis
(d) Aconitase	4. Gluconeogenesis

Codes:

(A) a-4, b-3, c-4, d-2 (B) a-3., b-1, c-4, d-2
(C) a-4, b-2, c-3, d-1 (D) a-1, b-3, c-2, d-4

[AAS-2021]

42. Match the items of Column-I with those of Column-II and select the correct form the codes given below:

Column-I	Column-II
(a) Glucosephosphate isomerise	1. Precursor to glycogen synthesis
(b) Glyceraldehyde-3 phosphate	2. Catalyzes lactic acid fermentation
(c) Lactate dehydrogenase	3. Catalyzes 2nd step of glycolysis
(d) UDP-glucose	4. Catalyzes 6th step of glucolysis

(A) a-3. B-4, c-2, d-1 (B) a-1, b-4, c-2, d-3
(C) a-2, b-4, c-3, d-1 (D) a-2, b-3, c-1, d-4

[AAS-2021]

43. Which one of the following enzymes is important for driving the malate-aspartate shuttle?
(A) Citrate synthetase
(B) -ketoglutarate dehydrogenase
(C) Lactate dehydrogenase
(D) Alcohol dehydrogenase

[AAS-2021]

44. ATP synthesis in mitochondria during oxidative phosphorylation is due to:
(A) Oxidation of glucose by glycolysis
(B) Electrochemical proton gradient
(C) Oxidation of pyruvate to acetyl Co-A
(D) Oxidation of NADH to NAD

[AAS-2021]

45. Select the correct answer from the following statements using codes:
(i) Pentose phosphate pathway provides alternative route for lipid metabolism
(ii) In muscle cells, a relatively small amount of ATP is present but a larger supply of creatine phosphate exists.
(iii) The production of ATP by oxidative phosphorylation is driven by the energy from the formation of NADH
(iv) An oxygen atom has to be added to each of the two carbon fragment of a fatty acid before it can be used in cellular respiration as respiratory substrate

	(i)	(ii)	(iii)	(iv)
(A)	False	True	False	True
(B)	True	True	False	False
(C)	True	False	True	False
(D)	False	False	True	True

[AAS-2021]

46. Select the correct answer for the following statements using the codes given below:
(i) Galactosyl transferases transfer galactose to lipid or protein
(ii) Lysolecithin acetyltransferase transfer acyl groups to phospholipid
(iii) Glucose-6-phosphatase helps in addition of phosphate.
(iv) Acid phosphatase helps in addition of phosphate.

	(i)	(ii)	(iii)	(iv)
(A)	False	True	True	False
(B)	False	False	True	True
(C)	True	True	False	False
(D)	True	False	True	False

[AAS-2021]

47. Examine the following statements and select the correct answer from the codes given below:
(i) Electrons released during the oxidative steps of glycolysis and citric acid produce 10 molecules of NADH and 2 molecules of $FADH_2$ per molecule of glucose.
(ii) Electrons released during the oxidative steps of glycolysis and citric acid cycle produce 20 molecules of NADH and 6 molecules of $FADH_2$ per molecule of glucose.
(iii) The coenzymes produced are oxidized by electron transfer chain.
(iv) The conversion of ADP and Pi to ATP takes place in the matrix of mitochondria.

Codes:

	(i)	(ii)	(iii)	(iv)
(A)	True	True	False	False
(B)	False	False	True	True
(C)	True	False	True	True
(D)	False	True	False	False

[AAS-2021]

48. Select the correct answer from the following statements using codes given below:

(i) Amino acids are an important source of dietary nitrogen.
(ii) Amino acids serve as a buffer.
(iii) In B-oxidation of fatty acids, oxidation occurs at-carbon ()
(iv) Oxygenase catalyses oxidation-reduction reactions.

Codes:

	(i)	(ii)	(iii)	(iv)
(A)	True	True	False	True
(B)	False	True	False	True
(C)	True	False	True	True
(D)	True	True	True	False

[JK-2022]

49. Which one of the following metabolic pathways is common to both fermentation and cellular respiration of a glucose molecule?
(A) Reduction of pyruvate to lactate
(B) The electron transport chain
(C) Synthesis of acetyl CoA from pyruvate
(D) Glycolysis

[JK-2022]

50. The table below lists compound in Group I and targets in Group II.

Group I	**Group II**
(Compounds)	(Target)
P. Cyanide	1. K ionophore
Q. Antimycin A	2. Electron transfer from cyt-b to cyt
R. Valinomycin	3. Prevents electron transfer from Fe-S centre ubiquinone
S. Rotenone	4. Cytochrome oxidase

Match the compounds in Group I with their correct targets in Group II.
(A) P-3, Q-2, R-4, S-1
(B) P-4, Q-3, R-1, S-2
(C) P-4, Q-2, R-1, S-3
(D) P-3, Q-4, R-2, S-1

[WB-2022]

51. Which one of the following enzyme systems does not perform oxidative decarboxylation?
(A) Pyruvate dehydrogenase complex
(B) Isocitrate dehydrogenase
(C) a-ketoglutarate dehydrogenase complex
(D) Succinate dehydrogenase

[WB-2022]

52. Which one of the following compounds blocks electron transfer from cytochrome b to cytochrome C_1?
(A) Rotenone (B) Antimycin A
(C) Oligomycin (D) Valinomycin

[MH-2023]

53. Glucose 6 phosphate and glyceraldehyde 3 phosphate are processed by glycolysis. How many ATP molecules will be generated respectively from each?
(A) 2 ATP and 3 ATP (B) 3 ATP and 3 ATP
(C) 3 ATP and 2 ATP (D) 4 ATP and 2 ATP

[MH-2023]

54. How many ATP molecules are formed when sucrose is metabolized during glycolysis by substrate level phosphorylation?
(A) 2 (B) 4
(C) 8 (D) 0

[RJ-2023]

55. Respiration, oxidation of 1 molecule of glucose gives rise to how many ATPs?
(A) 10
(B) 25
(C) 30 if one NADH gives 2.5 ATP and FADH2 gives 1.5 ATP
(D) 36 if one NADH gives 3 ATP and FADH2 gives 2 ATP

[RJ-2023]

56. What would the unfolding of regular secondary protein structure results into?
(A) No change in the entropy of protein
(B) Increase in the entropy of protein
(C) Decrease in the entropy of protein
(D) Entropy first increases and then decreases continuously

[RJ-2023]

57. An intermediate of the citric acid cycle that undergoes reductive amination with glutamine as nitrogen donor is
(A) Gluatamine (B) α-ketoglutarate
(C) H+ (D) NADPH

(MP-2023)

58. In oxidative phosphorylation, the oxidation of one molecule of NADH produces:
(A) 2 ATP molecules (B) 3 ATP molecules
(C) 4 ATP molecules (D) 1 ATP molecule

[NE-SLET-2024]

59. Match the items of Column-I with those of Column-II and select the correct match by using the codes given below:

Column-I	**Column-II**
(a) Norepinephrine	1. Stimulates gluconeogenesis
(b) Cortisol	2. Prevents glycogenolysis
(c) Glucagon	3. Stimulates glycogenolysis
(d) Insulin	4. Anti-inflammatory reaction

	(a)	(b)	(c)	(d)
(A)	3	4	2	1
(B)	3	4	1	2
(C)	3	1	4	2
(D)	4	3	2	1

[NE-SLET-2024]

60. Two statements are given below-one is Assertion (Ass) and the other is Reason (R). Select your current answer from the codes given below:
Assertion (Ass): 2, 4-dinitrophenol uncouples electron transport from ATP synthesis in mitochondria.
Reason (R): 2, 4-dinitrophenol causing dissipation of the proton gradient generated by the electron transport.
(A) Both (Ass) and (R) are true and (R) is the correct explanation of (Ass)
(B) Both (Ass) and (R) are true but (R) is not the correct explanation of (Ass)
(C) (Ass) is true but (R) is false
(D) Both (Ass) and (R) are false

[CG-2024]

61. Match the following & choose the correct combination from the option given-

List-I	List-II
(I) Free energy is absorbed	(a) Exergonic reaction
(II) That change food into energy	(b) Endergonic reaction
(III) Generating Electricity	(c) Metabolism
(IV) Release of free Energy	(d) Solar energy

Code:
(A) I-a, II-b, III-c, IV-d
(B) I-d, II-c, III-b, IV-a
(C) I-d, II-a, III-b, IV-c
(D) I-d, II-b, III-a, IV-c

[CG-2024]

62. In Glycolysis-
(A) Formation of glycogen from glucose.
(B) Breakdown of glycogen into Glucose.
(C) Conversion of Glucose into Pyruvic acid.
(D) None of these

[WB-2024]

63. In some organisms, the potent allosteric activator of phosphofructokinase-1, one of the key regulatory enzymes of glycolytic pathway is
(A) ATP
(B) Lactic acid
(C) Phosphoenolpyruvate
(D) Fructose 2,6-bisphosphate

[WB-2024]

64. The synthesis of monounsaturated fatty acid palmitoleate, 16: 1 (Δ^9) from palmitic acid is catalysed by fatty acyl-CoA desaturase in an oxidative reaction, the enzyme is a
(A) Mixed function oxidase (B) Dioxygenase
(C) Fatty acid synthase (D) Dehydrogenase

[MP-2024]

65. The enzyme glucose-6-phosphatase is present in:
(A) Endoplasmic reticulum (B) Lysosome
(C) Mitochondria (D) Nucleus

[MP-2024]

66. Ethyl alcohol is the end product of which of the following processes?
(A) Glycolysis (B) Citric acid cycle
(C) Fermentation (D) Glycolate cycle

[GJ-2024]

67. Which of the following reactions in glycolysis is coupled with the production of NADH, contributing to the cell's reducing power?
(A) Phosphoenolpyruvate to pyruvate
(B) Glucose to glucose-6-phosphate
(C) Fructose-6-phosphate to fructose-1,6-bisphosphate
(D) Glyceraldehyde-3-phosphate to 1, 3-bisphosphoglycerate

[GJ-2024]

68. Which of the following metal pairs is required for the function of Cytochrome C oxidase?
(A) Copper and Iron
(B) Iron and Zinc
(C) Magnesium and Copper
(D) Sodium and Iron

[GJ-2024]

69. Cyanide poisoning will immediately deplete cells of
(A) NAD+ (B) Citrate synthase
(C) Aconite (D) Acetyl-CoA

Answer Key									
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
B	A	C	D	D	B	A	C	D	D
11	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
B	D	D	B	A	A	A	B	D	D
21	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
B	A	C	A	A	D	A	B	A	A
31	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**
C	B	D	C	B	B	A	B	B	B
41	**42**	**43**	**44**	**45**	**46**	**47**	**48**	**49**	**50**
B	A	B	B	A	B	A	D	D	C
51	**52**	**53**	**54**	**55**	**56**	**57**	**58**	**59**	**60**
D	A	B	B	D	B	B	B	B	A
61	**62**	**63**	**64**	**65**	**66**	**67**	**68**	**69**	
A	B	D	A	A	C	D	A	A	

Unit-1.6: Principles of Catalysis, Enzymes and Enzyme Kinetics, Enzyme Regulation, Mechanism of Enzyme Catalysis, Isozymes

[KA-2015]

1. An enzyme formed 0.1% of the total protein in the homogenate. If this enzyme is to be purified to homogeneity, what is the fold purification that is required?
   (A) 100
   (B) 1,000
   (C) 10,000
   (D) It can never be purified

[MH-2015]

2. Mixed reversible inhibition is due to
   (A) binding of inhibitor to the active site of enzyme
   (B) inhibitor binds at separate site, but may bind to either E or Es
   (C) inhibitor binds to separate site but only to the Es complex
   (D) inhibitor binds at separate site but only to the E

[MH-2015]

3. In an enzyme-catalyzed reaction, Km (Michaelis-Menten constant) is a characteristic of an enzyme used for its substrate and is independent of the amount of enzyme used for its experimental determination, but Vmax (limiting value of the initial rate when all the active sites are occupied has no absolute value but varies with the :
   (A) Time
   (B) Km/2
   (C) substrate concentration beyond saturation
   (D) amount of enzyme used

[WB-2015]

4. Which one of the following is a stoichiometric co-factor of pyruvate dehydrogenase complex?
   (A) TPP (B) Lipoic acid
   (C) COA (D) FAD

[MH-2016]

5. A competitive inhibitor of an enzyme:
   (A) Decreases the Km
   (B) Decreases the Vmax
   (C) Increases both Vmax and Km
   (D) Increases the Km

[MH-2016]

6. The enzymatic activity of the L-19 IVS ribozyme results from:
   (A) Transesterification
   (B) Phosphodiester bond hydrolysis
   (C) Covalent bond formation
   (D) Triphosphate bond cleavage

[MH-2016]

7. All of the following statements about allosteric enzymes are true, except:
   (A) allosteric enzymes display Michaelis- Menten kinetics
   (B) allosteric enzymes are often subject to feedback inhibition
   (C) allosteric effectors can act to either increase or decrease affinity for substrates at the active sites
   (D) allosteric enzymes are often regulated by binding of ligands to sites different than the active sites

[GJ-2016]

8. Receptor ligand interaction are studied only
   (A) Scatchard plot
   (B) Lineweaver-Burk plot
   (C) Michaelis-Menton equation
   (D) Henderson Haselbalch plot

[GJ-2016]

9. Which one of the following coenzymes acts as a donor of one carbon uni?
   (A) Tetrahydrofolate
   (B) Riboflavin
   (C) Lipoic acid
   (D) Pyridoxal phosphate

[GJ-2016]

10. Enzymes that catalyse interconversion of optical, geometrical or positional Isomers are:
    (A) Ligases (B) Lyases
    (C) Hydrolase (D) Isomerases

[KA-2016]

11. Inorganic element that serves as cofactor in Glutathione peroxidase is
    (A) Copper (B) Magnesium
    (C) Nickel (D) Selenium

[MH-2016]

12. Aldolase is an enzyme that catalyzes conversion of fructose 1,6 bisphosphate to glyceraldehyde 3 phosphate and dihydroxy acetone phosphate. It belongs to which of the following enzyme class?
    (A) Oxidoreductases (B) Ligases
    (C) Hydrolase (D) Lyases

[GJ-2017]

13. The Lineweaver-Burk plot is used to graphically determine K_m and V_{miax} of enzymes that obey classic Michealis-Menten kinetics. When V is the reaction velocity at substrated concentration S, the Y axis experimental data in the Lineweaver-Burk plot are expressed as:
    (A) V (B) S
    (C) 1/V (D) 1/S

[KA-2017]

14. K_M is defined as
    (A) Substrate concentration at half maximal velocity
    (B) Half substrate concentration at maximal velocity
    (C) Half maximal substrate concentration
    (D) Half maximal velocity

[MP-2017]

15. Enzyme Succinic acid dehydrogenase catalyzing the conversion of succinic acid to fumaric acid, is an example of:
    (A) Competitive inhibition
    (B) Non-competitive inhibition
    (C) Feedback inhibition
    (D) All are correct

[MH-2017]

16. p-Aminobenzoate (PABA) is an important building block of:
    (A) Lipoate
    (B) Tetrahydrofolate
    (C) Biotin
    (D) S-Adenosylmethionine

[MH-2017]

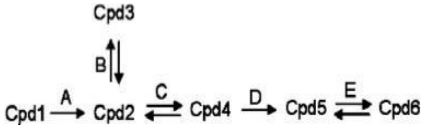
17. The following are some of the characteristic features of enzyme inhibitors. Which of the following are true with respect to competitive inhibitors?
    Select the correct answer from the options given below it:
    (i) Competitive inhibition can be overcome by a sufficiently high concentration of substrate.
    (ii) A competitive inhibitor diminishes the rate of catalysis by reducing the proportion of enzyme molecules bound to a substrate.
    (iii) The competitive inhibitor binds only to the enzyme substrate complex
    (iv) Competitive inhibitor can be used as drugs.
    (A) (i), (i), (iii), (iv) (B) (i), (ii), (iii)
    (C) (ii), (ii), (iv) (D) (i), (ii), (iv)

[TN-2017]

18. All of the following can be chemically isolated except
    (A) Enzyme – substrate complexes
    (B) Enzyme – Inhibitor complexes
    (C) Enzyme – Substrate covalent intermediates
    (D) Transition states

[TN-2017]

19. In the reaction sequence below the best point for controlling production of compound 6 is



    (A) A (B) B
    (C) C (D) D

[TN-2017]

20. Choose the correct pairs from the following:

A	Isocitrate lyase	1.	conversion of amino acid into glucose
B	PEP carboxykinase	2.	biotin
C	Pyruvate dehydrogenase complex	3.	synthesis of glucose from acetate
D	Phosphofructokinase	4.	lipoic acid
E	Pyruvate carboxylase	5.	an allosteric enzyme

    (A) A – 1, B – 2, C – 4, D – 5, E – 3
    (B) A – 3, B –1, C – 4, D – 5, E – 2
    (C) A – 3, B –1, C – 4, D – 2, E – 5
    (D) A –2, B –5, C –1, D – 4, E – 3

[WB-2017]

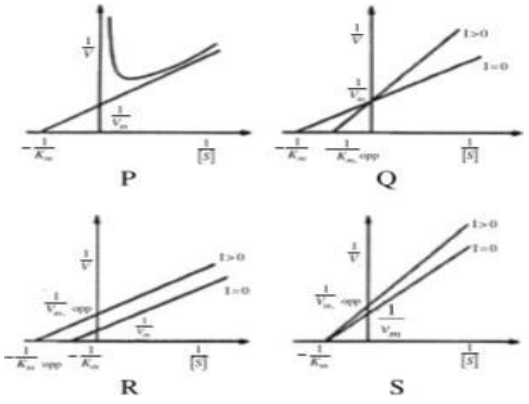
21. Which of the following enzymes forms a Schiff base with sedoheptulose-7-phosphate (S7P)?
    (A) Transketolase
    (B) Amylase
    (C) Dihydrolipoyl transacetylase
    (D) Transaldolase

[WB-2017]

22. The presence of a non-competitive inhibitor leads to
    (A) A decrease in the observed V_{max}.
    (B) A decrease in K_m and V_{max}.
    (C) An increase in K_m without affecting V_{max}.
    (D) Both an increase in the V_{max} of a reaction and an increase in K_m

[WB-2018]

23. Kinetics of different forms of enzyme inhibition are graphically represented in Figs. P, Q, R and S. Select the correct combination from the following:



    (A) P-Competitive, Q-Non-competitive, R-Substrate and S-Uncompetitive
    (B) P-Non-competitive, Q-Uncompetitive, R-Substrate and S-Competitive

(C) P-Substrate, Q-Non-competitive, R-Uncompetitive and S-Competitive
(D) P-Substrate, Q-Competitive, R-Uncompetitive and S-Non-competitive

[WB-2018]

24. Which of the following statements about the nature of enzyme catalysis is correct?
(A) The rate of formation of transition state intermediate determines the overall reaction rate
(B) The rate of formation of transition state intermediate determines the overall free energy change of the reaction
(C) The active site of an enzyme is complementary to the substrate in ground state
(D) Natural substrates bind to enzymes more tightly than transition state analogs

[CG-2018]

25. (a) All enzymes are not necessarily proteins.
(b) A class of DNA can perform catalytic activity.
Code:
(A) Both (a) and (b) are correct
(B) (a) is correct, but (b) is incorrect
(C) (a) is incorrect, but (b) is correct
(D) Both (a) and (b) are incorrect

[GJ-2018]

26. The KCat/Km is
(A) affinity constant (B) turnover constant
(C) efficiency constant (D) substrate constant

[GJ-2018]

27. Abzymes are:
(A) isozymes (B) oligomeric proteins
(C) non-protein catalysts (D) catalytic antibodies

[JK-2018]

28. Competitive inhibitor
(A) binds to enzyme substrate complex (ES).
(B) does not affect Vmax
(C) increases Km value.
(D) affects catalysis in ES.

[JK-2018]

29. Cellular isozymes of pyruvate kinase are allosterically inhibited by
(A) high concentration of AMP.
(B) high concentration of ATP.
(C) high concentration of fructose 1,6-diphosphate.
(D) low concentration of acetyl co-A.

[KA-2018]

30. 15 microgram of amylase (mol. wt. 150 kDa acts on starch to produce maltose. If at maximal velocity, the enzyme released 6.84 mg of maltose (mol. wt. 342) per min, what is the turnover number?
(A) 2×10^5 per min (B) 2×10^4 per min
(C) 0.2×10^3 per min (D) 2×10^6 per min

[MH-2018]

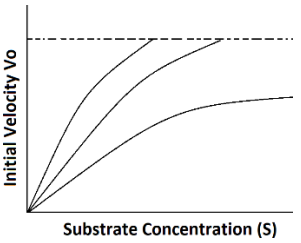
31. What is the value of Vmax for an enzyme which follows simple Michaelis-Menten Kinetics, if V_o = 2 μ mol min^{-1} at 10 km?
(A) 1.1 μ mol min^{-1} (B) 2.2 μ mol min^{-1}
(C) 3.3 μ mol min^{-1} (D) 11 μ mol min^{-1}

[GJ-2019]

32. In which of the following types enzyme activity decrases with increased substrate concentration:
(A) Non-competitive (B) Competitive
(C) Uncompetitive (D) Irreversible

[CG-2019]

33. The given figure shows three velocity substrate concentration curves for an enzyme reaction. What do the curves X, Y and Z depict respectively?



(A) X - normal enzyme reaction Y- competitive inhibitor Z- non-competitive inhibitor
(B) X - enzyme with an allosteric modulator added Y - normal enzyme activity Z - competitive inhibitor.
(C) X - enzyme with an allosteric stimulator Y - competitive inhibition added Z - normal enzyme reaction
(D) X - normal enzyme reaction Y-non-competitive inhibitor added Z - allosteric inhibitor added

[MH-2019]

34. Prostaglandin H_2 synthase a key enzyme in the synthesis of prostaglandins from linear fatty acid has two types of catalytic activities. They are:
(A) Cyclooxygenase and Reductase
(B) Monooxygenase and Reductase
(C) Monooxygenase and Peroxidase
(D) Cyclooxygenase and Peroxidase

[MH-2019]

35. A small organic non-protein molecule that carries chemical groups between enzymes is:
(A) Cofactor (B) Coenzyme
(C) Catalyst (D) Substrate

[MH-2020]

36. Which of the following is true for enzyme catalyzed reactions?
(A) K_m is affinity constant
(B) V_{max} can never be achieved
(C) K_m = ½ V_{max}
(D) K_m = V_{max}

[MH-2020]

37. Which one of the following is not a characteristic of competitive inhibition of an enzyme?
    (A) It results in increase of K_m
    (B) There is no change in k_m
    (C) The inhibitor binds to active site of enzyme
    (D) It can be relieved by increasing the concentration of substrate

[MH-2020]

38. A transcription unit is 8000 nucleotides long. If only 15% of this unit is exon, calculate the approximate molecular weight of the protein encoded:
    (A) 40 kDa (B) 1200 kDa
    (C) 44 kDa (D) 100 kDa

[MH-2020]

39. This type of enzyme regulation is irreversible in nature:
    (A) Allosteric regulation
    (B) Regulation by covalent modification
    (C) Zymogen activation
    (D) cAMP mediated regulation

[WB-2020]

40. In an enzyme catalysed reaction, the competitive inhibition by an inhibitor is mediated when it
    (A) binds at several sites of an enzyme
    (B) binds reversibly at the active site of enzyme
    (C) binds only to the ES complex
    (D) binds covalently to the enzyme

[KA-2021]

41. In an enzyme reaction, if the enzyme concentration is increased from 1 mg to 2 mg, which one of the following statements is CORRECT?
    (A) K_m and V_{max} will remain constant
    (B) K_m will change while V_{max} will remain constant
    (C) K_m will remain constant but V_{max} will increase
    (D) K_m and V_{max} both will increase

[MH-2021]

42. Which of the following is not a method of enzyme immobilization?
    (A) Entrapment (B) Adsorption
    (C) Absorption (D) Cross-linking

[MH-2021]

43. The enzyme acetyl CoA carboxylase belongs to which class of enzyme?
    (A) Transferases (B) Hydrolases
    (C) Lyases (D) Ligases

[MH-2021]

44. When the velocity of enzyme activity is plotted against substrate concentration, which of the following is obtained?
    (A) Hyperbolic curve
    (B) Parabola
    (C) Straight line with positive slope
    (D) Straight line with negative slope

[MH-2021]

45. Both the substrates A and B must be present at the enzyme active site simultaneously is a characteristic feature of
    (A) All bisubstrate reactions
    (B) Double displacement reactions
    (C) Single displacement reactions
    (D) Both (B) and (C)

[AAS-2021]

46. Match the items of Column-I with those of Column-II and select the correct match by using the codes given below:

Column-I	Column-II
(a) Allosteric enzyme	1. PDC
(b) Isoenzyme	2. Acctyl-CoA
(c) Multienzyme complex	3. LDH
(d) Coenzyme	4. ATPase

Codes:
(A) a-1, b-4, c-3, d-2 (B) a-4, b-3, c-1, d-2
(C) a-3, b-1, c-4, d-2 (D) a-2, b-4, c-3, d-1

[AAS-2021]

47. Two statements are given below, one is Assertion (Ass) and the other is Reason (R). Select the correct answer from the codes given below:
    Assertion (Ass): Allosteric enzymes show feedback inhibition Reason (R): The inhibition is competitive.
    Codes:
    (A) Both (Ass) and (R) are correct and (R) is the correct explanation of (Ass)
    (B) Both (Ass) and (R) are correct, but (R) is not the correct explanation of (Ass)
    (C) (Ass) is true but (R) is false
    (D) Both (Ass) and (R) are false

[GJ-2022]

48. The term Km was coined by
    (A) Michaelis Menton (B) Haldane and Briggs
    (C) Henri (D) Lineweaver Burk

[GJ-2022]

49. Ping-pong mechanism is observed with
    (A) Decarboxylase
    (B) Transaminase
    (C) Glutamate dehydrogenase
    (D) Glutamine synthetase

[GJ-2022]

50. Which one of the following is true for enzymes?
    (A) Enzymes change the rate of a chemical reaction
    (B) Enzymes affect the final equilibrium of reaction
    (C) Enzymes are consumed in a chemical reaction
    (D) Enzymes do not show specificity for a reaction

[JK-2022]

51. In presence of competitive inhibitor in enzyme catalysed reactions
(A) V_{max} $increases\ max$ (B) V_{max} decreases
(C) K_m increases (D) K_m decreases

[WB-2022]

52. Hexokinase-II is present predominantly in myocytes whereas hexokinase-IV is primarily present in liver. Muscles consume glucose and utilize it for nergy production. Liver maintains blood glucose homeostasis by either consuming glucose or producing glucose by gluconeogenesis. Considering these facts, choose the most appropriate statement.
(A) Km of hexokinase-II is higher than Km of hexokinase-IV.
(B) Km of hexokinase-II is lower than Km of hexokinase-IV.
(C) Km of hexokinase-II is equal to the Km of hexokinase-IV.
(D) Affinity of hexokinase-II for glucose is lower than affinity of hexokinase-IV for glucose.

[MH-2023]

53. In enzyme kinetics the rate constant Kcat refers to:
(A) Michaelis-Menten Constant
(B) Substrate concentration at Vmax
(C) Turn over number
(D) Total number of active sites on the enzyme

[MH-2024]

54. Efficiency of enzyme can be better measured in terms of:
(A) K_m (B) K_m/V_{max}
(C) K_{cat} (D) K_{cat}/K_m

[NE-SLET-2024]

55. Match the items of Column-I with those of Column-II and select the correct match by using the codes given below:

Column-I	Column-II
(a) NADH	1. Nucleic acid
(b) Ribozyme	2. Enzyme precursor
(c) Cofactor	3. High energy electron carrier
(d) Zymosan	4. Prosthetic group

	(a)	(b)	(c)	(d)
(A)	3	1	4	2
(B)	3	4	1	2
(C)	4	1	2	3
(D)	3	4	2	1

[NE-SLET-2024]

56. Two statements are given below, one is Assertion (Ass) and the other is Reason (R). Select the correct answer from the codes given below:
Assertion (Ass): The non-protein part of holoenzyme in a cofactor which together with coenzyme accelerate the rate of biochemical reactions.
Reason (R): Coenzyme is a non-protein part of a holoenzyme that always remains associated with apoenzyme.
Codes:
(A) Both (Ass) and (R) are true and (R) is the correct explanation of (Ass)
(B) Both (Ass) and (R) are true but (R) is not the correct explanation of (Ass)
(C) Both (Ass) and (R) are false
(D) (Ass) is true but (R) is false

[NE-SLET-2024]

57. The enzymatic reaction for which thiamin pyrophosphate acts as a cofactor is
(A) fixation of carbon dioxide
(B) peptide bond formation
(C) phosphate group transfer
(D) decarboxylation of α-keto acid

[GJ-2024]

58. The P450 cytochromes are members of
(A) Hydrolase (B) Lyase
(C) Oxidoreductase (D) Transferase

Answer Key									
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
B	B	C	A	D	A	A	A	A	D
11	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
D	D	D	A	B	B	D	D	C	B
21	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
D	A	D	A	A	B	D	C	C	A
31	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**
B	A	A	A	B	A	B	C	B	B
41	**42**	**43**	**44**	**45**	**46**	**47**	**48**	**49**	**50**
C	C	D	D	B	B	C	B	B	A
51	**52**	**53**	**54**	**55**	**56**	**57**	**58**		
C	A	C	D	A	D	D	C		

Unit-1.7: Conformation of Proteins (Ramachandran Plot, Secondary Structure, Domains, Motif and Folds).

[KA-2015]

1. The backbone atoms in a peptide linkage is as follows
(A) C-N-C-C (B) C-C-N-C
(C) C-O-N-C (D) C-C-O-N

[WB-2015]

2. A Ramachandran plot provides a convenient graphical depiction of the allowable combinations of angles. Which one of the following combinations is correct?

(A) phi (Φ) and alpha (α)
(B) phi (Φ) and psi (Ψ)
(C) psi (Ψ) and gamma (γ)
(D) alpha (α) and beta (β)

[GJ-2016]

3. The amino acid which occupies maximum area in Ramachandran plot is:
(A) Proline (B) Glycine
(C) Alanine (D) Leucine

[GJ-2016]

4. Chemical reaction of a disulfide bond with the following reagent is irreversible:
(A) Glutathione (B) Performic Acid
(C) DTT (D) Cysteine

[KA-2016]

5. The Z-DNA helix
(A) Has fewer base pair per turn than B-DNA
(B) Is favoured by alternate GC base pairs
(C) Tends to be found at 3' ends of gene
(D) Is the most common confermation of DNA

[KA-2016]

6. Secondary structures of collagen contains
(A) β-conformation (B) Triple helix
(C) α-helix (D) β-helix

[AP-2017]

7. Protein domain relates to:
(A) Single secondary structural motif arrangement
(B) Compact 3-D structure formed by several secondary structural motifs
(C) B-bends
(D) Only helix-loops

[AP-2017]

8. **Assertion (A):** Tertiary structure is absolutely necessary for many biological activities of proteins.
Reason (R): Tertiary structure is more stable, due to the existence of other kinds of bonds.
(A) Both (A) and (R) are true, but (R) is not the correct explanation of (A)
(B) Both (A) and (R) are true, and (R) is the correct explanation of (A)
(C) (A) is true but (R) is false
(D) (A) is false and (R) is true

[CG-2017]

9. A sample of DNA is found to have the base composition of adenine - 40; thymine - 22; guanine - 12; and cytosine - 19, what conclusion can be drawn?
(A) The DNA is a circular duplex.
(B) The DNA is a linear duplex.
(C) The DNA is single strand.
(D) The DNA has repetitive sequences.

[CG-2017]

10. The peptide bond is:
M. partially double bonded
N. polar
O. mostly trans in proteins
P. planar
Choose the correct answer:
(A) M and P (B) M, N, O and P
(C) O and N (D) O and P

[CG-2017]

11. (a) The degree of freedom in peptide bond of polypeptide chain is indicated by the dihedral angles.
(b) Ramachandran plots shows the possible conformations of y and f angles for a polypeptide.
Choose the correct answer:
(A) Both (a) and (b) are correct
(B) (a) correct, but (b) incorrect
(C) (b) correct but, (a) incorrect
(D) Both (a) and (b) are incorrect

[GJ-2017]

12. Which amino acid is not commonly found in an alpha helix?
(A) Glutanine (B) Arginine
(C) Proline (D) Tryptophan

[TN-2017]

13. Which of the following polypeptide is most likely to form an α- helix?
(A) CRAGNRKIVLETY (B) SEDNFGAPKSILW
(C) QKASVEMAVRNSG (D) CREDNFGKIVLET

[AP-2018]

14. Combinations of secondary structural elements found in different proteins molecules having similar functions are called
(A) Prosthetic groups (B) Pleated sheets
(C) Epitopes (D) Motifs

[GJ-2018]

15. Which one of the following non-standard amino acid is present in some naturally occurring proteins?
(A) 7-Aminobutyric acid
(B) Ornithine
(C) Homocysteine
(D) y-Carboxyglutamic acid

[JK-2018]

16. Three dimensional shape of the proteins formed and stabilized due to interactions between side chains is referred as its
(A) primary structure
(B) secondary structure
(C) tertiary structure
(D) quaternary structure

[KA-2018]

17. What would be the most likely confirmation of the following peptide?
Gly-Leu-Pro-Met-Asp-Phe-Pro-LysAla
(A) Alpha helix (B) Beta Sheet
(C) 310 helix (D) Random coil

[MH-2018]

18. Which of the following pair of amino acids belong to the class of polar amino acids?
(A) Serine and aspargine
(B) Aspargine and alanine
(C) Serine and valine
(D) Valine and methionine

[AP-2019]

19. Consider the following with reference to protein molecules
(i) Peptide bonds
(ii) α-helix
(iii) β-pleated sheet
(iv) Turns of polypeptide chains
Identify the combination of common forms of secondary structure from the above:
(A) (i), (ii) and (iii) (B) (i), (ii) and (iv)
(C) (i), (iii) and (iv) (D) (ii), (iii) and (iv)

[MH-2019]

20. The amino acid that interrupts α -helix conformation in protein by developing kinks in the structure:
(A) Serine (B) Valine
(C) Proline (D) Leucine

[KA-2020]

21. Ramachandran plot displays
(A) Allowed angles of Phi and Psi for polypeptide backbone
(B) Preferred amino acids in a helix
(C) The hydropathy of amino acids
(D) Angles of rotation of R-group of amino acids

[MH-2020]

22. A Ramchandran plot describes, for a particular amino acid in a polypeptide chain, stearically allowed angles for:
(A) Cα-C and Cα-CB bonds
(B) Cα-C and Cα-N bonds
(C) Cα-C and Cα-H bonds
(D) Cα-N and Cα-H bonds

[MH-2020]

23. Which of the following is the correct set of Lipinski's rules that helps in predicting poor absorption of a drug molecule in the human physiological system?
(A) (i) The molecular weight is greater than 500.
(ii) The number of hydrogen bonds is less than 5.
(B) (i) The molecular weight is greater than 500.
(ii) The number of hydrogen bonds is greater than
(C) (i) The molecular weight is less than 500.
(ii) The number of hydrogen bonds is less than 5.
(D) (i) The molecular weight is less than 500.
(ii) The number of hydrogen bonds is greater than 5.

[KA-2021]

24. Stabilization of the unique coiled structure of an alpha helix in a protein is primarily attributed to
(A) Hydrogen bonding between the peptide backbone atoms
(B) Disulphide bridges between cysteine side chains
(C) Carbohydrate moieties attached to polar amino acids
(D) Peptide linkages that covalently bond amino acids

[KA-2021]

25. Which of the following amino acids is mostly likely to disrupt an alpha helix?
(A) Leucine (B) Glycine
(C) Proline (D) Valine

[MH-2021]

26. Which of the following bonds in proteins have a partial double bond character?
(A) Cα – C (B) Cα – Cβ
(C) Cα – N (D) C – N

[AS-2021]

27. Which of the following is most unstable condition in protein folding?
(A) Non-polar side chain exposed to outside
(B) Polar amino acids exposed to outside
(C) Non-polar side chains in core of the protein
(D) Polar side chain present in core of the protein

[GJ-2022]

28. Which one of the following amino acids is glucogenic as well as ketogenic?
(A) Leucine (B) Lysine
(C) Isoleucine (D) Valine

[WB-2022]

29. The amino acid that shows buffering capacity near physiological pH range is
(A) Aspartic acid (B) Histidine
(C) Lysine (D) Proline

[WB-2022]

30. The amino acid that lacks PKR value is
(A) Glutamic acid (B) Lysine
(C) Glycine (D) Arginine

[WB-2022]

31. The probability of maximum number of hydrogen bond formation is observed in
(A) α-helix (B) B-Sheet
(C) B-Turn (D) Random coil

[WB-2022]

32. Paradox related to protein folding is:

(A) C-value paradox
(B) Sherman paradox
(C) Lombard's paradox.
(D) Levinthal's paradox

[WB-2023]

33. Which of the following amino acids cannot participate in a-helix conformation in protein by introducing a destabilizing Kink?
(A) Glycine (B) Leucine
(C) Lysine (D) Proline

[CG-2024]

34. Cry II Ab and Cry I Ab produce toxins that control-
(A) Cotton bollworms and corn borer respectively
(B) Corn borer and tobacco budworm respectively
(C) Corn borer and cotton bollworms respectively
(D) Tobacco budworm and cotton bollworm respectively

Answer Key									
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
C	B	B	C	A	B	B	B	B	B
11	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
A	C	A	D	D	C	D	A	B	C
21	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
A	B	D	A	C	C	A	B	B	D
31	**32**	**33**	**34**						
A	D	D	A						

Unit-1.8: Conformation of Nucleic Acids (helix (A, B, Z), t-RNA, micro-RNA).

[KA-2015]

1. Trypsin was formed to cleave the peptide Asp – Ala – Leu – Phe – Arg – Asp – Val The products will be
(A) Asp – Ala – Leu, Phe, Arg – A sp– Val
(B) Mixture of aminoacids
(C) Asp – Ala – Leu – Phe, Arg – Asp – Val
(D) Asp – Ala – Leu – Phe – Arg, Asp – Val

[MH-2015]

2. Sugar pucker conformation of B-form of DNA is
(A) C–2' endo
(B) C–3' endo
(C) C–2' endo for pyrimidines and C–3' endo for purines
(D) C–2' endo for purines and C–3' endo for pyrimidines

[WB-2015]

3. Which of the following has no DNA binding motif?
(A) Helix-turn-helix
(B) Zinc fingures
(C) Basic Helix-loop helix
(D) Isoleucine Zipper

[WB-2015]

4. During De-novo biosynthesis, the C-2 and N-3 atoms in the pyrimidine ring come from
(A) Aspartate
(B) Carbamoyl phosphate
(C) PRPP
(D) Ribose 5-phosphate

[GJ-2016]

5. There are base pairs per helical tum of Z-DN(A)
(A) 12 (B) 10.5
(C) 11.5 (D) 10.3

[MH-2016]

6. How many base pairs per helical turn are present in short stretches of Z-DNA in bacteria?
(A) 11 (B) 10
(C) 12 (D) 9

[AP-2017]

7. Which form of DNA helix is predominantly present in cells?
(A) A-form (B) Z- form
(C) B- form (D) T-form

[AP-2017]

8. Which one of the DNA and RNA base has no 'oxygen' in the molecular structure?
(A) Uracil (B) Adenine
(C) Guanine (D) Cytosine

[MH-2017]

9. Among the following three forms of DNA, which one has deeper major groove?
(A) A-Form (B) B-Form
(C) Z-Form (D) Both A and Z forms

[GJ-2018]

10. How much is the approximate propeller twist in B-form of DNA?
(A) 30° (B) -30°
(C) 36° (D) -36°

[MH-2018]

11. The glycosyl bond conformation in z-form of DNA is:
(A) Syn for pyrimidines and Anti for purines
(B) Anti for pyrimidines and Syn for purines
(C) Anti for both pyrimidines and purines
(D) Syn for both pyrimidines and purines

[AP-2019]

12. A certain double stranded DNA molecule is 200 kb long. The number of phosphorous atoms present in this molecule is
(A) 2×10^5 (B) 4×10^5
(C) 6×10^5 (D) 8×10^5

[CG-2019]

13. Three double stranded DNA molecules have same number of nucleotides, but differ in their form:
(a) B- form of DNA
(b) A form of DNA

(c) Z-form of DNA

Arrange these three different forms in increasing order of length (small large)

Code:

(A) (a) - (b) - (c) (B) (b) - (a) - (c)

(C) (c) - (b) - (a) (D) (b) - (c) - (a)

[KA-2020]

14. Left-handed helix is found in

(A) B-DNA (B) A-DNA

(C) C-DNA (D) Z-DNA

[MH-2021]

15. The propeller twist in B-form of DNA is approximately:

(A) 30º (B) –30°

(C) 36º (D) –36º

[WB-2023]

16. The direction of helix and rotation per base pair in ZDNA is

(A) Right handed, 32.7° (B) Left handed, 32.7°

(C) Right handed, -30° (D) Left handed, -30°

[RJ-2023]

17. Z-DNA is a form of DNA that has a different structure from the more common B-DNA form. It is a left-handed double helix wherein the sugar-phosphate backbone has a zigzag patter-due to the alternate stacking of bases. Which one of the following is correct regarding Z-DNAY

(A) Syn conformation of purines and pyrimidines

(B) Anti conformation of purines and pyrimidines

(C) Anti conformation of pyrimidines and syn conformation of purines

(D) Anti conformation of purines and syn conformation of pyrimidines

[MH-2024]

18. The screw sense of DNA can be right handed or left handed. Which of the- following statements is correct with respect to the screw sense of A, B and Z type of DNA?

(A) A and Z both right handed

(B) A and B both right handed

(C) A left handed and B right handed

(D) A right handed and B left handed

[GJ-2024]

19. Which motif in a protein strongly suggests that it is a DNA-binding, regulatory protein?

(A) α helix (B) β bend

(C) Triple helix (D) Zinc finger

Answer Key									
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
C	A	D	A	C	A	C	A	B	A
11	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	
A	D	C	D	A	B	C	B	D	

Unit- 1.9: Stability of Proteins and Nucleic Acids.

[WB-2015]

1. The heptad repeat of a coiled-coil protein is an imperfect repeats of a sequence of:

(A) 7 amino acids (B) 17 amino acids

(C) 300 amino acids (D) 30 amino acids

[WB-2015]

2. Which of the three amino acids are present in Tc AChe catalytic triad?

(A) Serine 200, histidine 440, glutamate 327

(B) Threonine 200, histidine 440, glutamate 327

(C) Tyrosine 440, lysine 200, phenylalanine 327

(D) Serine 300, histidine 540, glutamate 627

[GJ-2016]

3. N-acetyl-Neuraminic acid is:

(A) Sugar acid (B) Amino sugar acid

(C) Amino sugar (D) Sugar alcohol

[KA-2016]

4. The amino acid that can be synthesized directly by the incorporation of ammonia into oxalo acetic acid

(A) Aspartic acid (B) Alanine

(C) Glutamine (D) proline

[MH-2016]

5. The fluorescence of fluorescein mercuric acetate when reacted with RNase in 1 M NaOH is decreased due to:

(A) disulfide bond (B) peptide bond

(C) ionic bond (D) protein lysis

[MH-2018]

6. Which of the following amino acids among the following is preferred in a reverse turn?

(A) Proline (B) Histidine

(C) Glutamic acid (D) Alanine

[MH-2018]

7. Epinephrine is synthesized from which of the following amino acids?

(A) Tryptophan (B) Proline

(C) Glycine (D) Tyrosine

[GJ-2019]

8. In a polypeptide chain, which one of the following amino acids has the ability to form another covalent bond?

(A) Valine (B) Alanine

(C) Leucine (D) Cysteine

[GJ-2019]

9. Side chains of most of the amino acids present in a native protein are:

(A) Polar and charged

(B) Non-polar

(C) Polar and positively charged

(D) Polar and uncharged

[GJ-2019]

10. Which one of the following sets of amino acids have more propensity to attach with glycophorin to form complex oligosaccharides?
(A) Tyr, Thr (B) Ser, Asp
(C) Lys, Arg (D) Tyr, Lys

[MH-2019]

11. The conformation of the polypeptide chain is determined by the torsion or rotation angles around C_α –N and C_α–C bonds of each amino acid participating in it. Which of the following pairs of amino acids is conformationally the most and the least restricted amino acids?
(A) Glycine and Proline (B) Proline and Alanine
(C) Alanine and Proline (D) Proline and Glycine

[KA-2020]

12. An example of aromatic amino acid is
(A) Matheionine (B) Valine
(C) Alanine (D) Tyrosine

[KA-2020]

13. Which functional group is never found in alpha amino acids?
(A) NH_2 (B) COOH
(C) CHO (D) S-CH_3

[MH-2020]

14. Stringent response in bacteria leads to accumulation of these unusual nucleotides:
(A) pGpp and pGppp (B) ppGpp and pppGpp
(C) pppGp and ppGp (D) CGMP and CAMP

[MH-2021]

15. How many different linear tripeptides can be made from three different L-α neutral amino acids, using each amino acid only once in the chain?
(A) 3 (B) 6
(C) 12 (D) 27

[GJ-2021]

16. What is the approximate molecular mass of a protein with 250 amino words acid residues?
(A) 27500 daltons (B) 25000 daltons
(C) 13500 daltons (D) 12500 daltons

[GJ-2022]

17. Lysine is____type of amino acid on the basis of the product of degradation.
(A) Glucogenic
(B) Glucogenic and ketogenic
(C) Basic chain
(D) Ketogenic

[GJ-2022]

18. The biosynthesis of which amino acid is similar to nucleic acid biosynthesis
(A) Phenyl alanine (B) Tryptophan
(C) Glutamic acid (D) Histidine

[RJ-2023]

19. What is the hydrogen bonding pattern in alpha helices in Protein secondary structure?
(A) n to 1-1 (B)_n.to n + 1
(C) n to n – 4 (D) n to n +4

[RJ-2023]

20. The tertiary structure is the overall 3D Structure of a globular protein and is produced by folding the helices and sheets upon themselves with turns and loops forming the folds. Among the following which one is primarily responsible for stabilization of tertiary structure of globular protein?
(A) Ionic bonding
(B) Covalent bonding
(C) Electrostatic attraction
(D) Hydrophobic interaction

[MH-2024]

21. Which of the following would contribute to intrinsic fluorescence in a protein?
(A) Aromatic amino acids.
(B) Charged amino acids
(C) Branched chain amino acids
(D) Disulfide bonds

[MH-2024]

22. Which chiral angle in the peptide backbone does not undergo rotation?
(A) ϕ (Phi) (B) Ψ (Psi)
(C) ξ (Chi) (D) ω (Omega)

Answer Key									
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
A	A	B	A	A	A	D	D	A	D
11	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
D	D	C	B	D	A	B	D	D	D
21	**22**								
A	D								

Unit-1.10: Metabolism of Carbohydrates, Lipids, Amino Acids Nucleotides and Vitamins.

[MH-2015]

1. A precursor is converted by ultraviolet radiation into a molecule. The molecule is likely to be:
(A) Vitamin C (B) Vitamin K
(C) Vitamin A (D) Vitamin D

[JK-2016]

2. The disease beriberi is caused by a nutritional deficiency in vitamin B1 (thiamin). What key mitochondrial enzyme that is required for the production of acetyl CoA from glucose uses thiamine as a coenzyme in the reaction mechanism?

(A) Pyruvate dehydrogenase
(B) Citrate synthase
(C) Pyruvate carboxylase
(D) Pyruvate decarboxylase

[JK-2016]

3. Which one of the following is a citric acid cycle enzyme?
(A) Succinate dehydrogenase
(B) NADH oxidoreductase
(C) Cytochrome C oxidase
(D) Pyruvate dehydrogenase

[JK-2016]

4. How many moles of ATP are generated from the catabolism of one mole of glucose under anaerobic fermentation?
(A) 2 (B) 1
(C) 4 (D) 3

[JK-2016]

5. Which carbohydrate molecule is common to both the glycogen phosphorylase and glycogen synthetase?
(A) Glucose 1 Phosphate
(B) Glucose 6 Phosphate
(C) Fructose 1 Phosphate
(D) Fructose 6 Phosphate

[KA-2016]

6. Which among the following statements is correct about urea cycle?
(A) Nitrogens and urea enter cycle as ammonia and alanine
(B) Urinary area is increased by diet rich in protein
(C) Urea cycle occurs exclusively in cytosol
(D) Urea is produced from hydrolysis of Ornithine directly

[MH-2016]

7. Which of the following coenzymes is involved in transamination reaction of amino acid metabolism?
(A) Pyridoxal phosphate
(B) Thiamine pyrophosphate
(C) NADH
(D) Biotin

[MH-2016]

8. In coordinated control of metabolism, malate can cross the mitochondrial membrane and give rise to oxaloacetate in the cytosol, which further bio-transforms to
(A) Proline, arginine and glutamine
(B) Lysine, threonine and asparagine
(C) Phenylalanine, tryptophan and tyrosine
(D) Leucine and lysine

[AP-2017]

9. In PURINE Biosynthesis, AMP is formed in which of the following sequence?
(A) Inosine Monophosphate Adenylosuccinate → Adenylate
(B) Inosine Monophosphate Xanthylate → Adenylate
(C) Inosine Monophosphate + Ribose 5-P → Adenylate
(D) Inosine Monophosphate Ribulose 5-P – Adenylate

[CH-2017]

10. The intermediates of glycolysis pathway from glucose to 3-phosphoglyceral dehyde are:
(A) Glucose.
(B) Glucose - 6 - phosphate
(C) Fructose - 1, 6 - diphosphate,
(D) Fructose - 6 - phosphate
(E) 3 - phosphoglyceraldehyde
Arrange them sequentially.
(A) (A) → (B) → (C) → (D) → (E)
(B) (A) → (B) → (D) → (C) → (E)
(C) (B) → (C) → (E) → (D) → (A) →(A)
(D) (C) → (D) → (E) → (A) → (B)

11. Find out suitable match between. Column I and Column II:

Column I	Column II
(a) Cytidine diphosphate	(i) Donates sulphate for synthesis of mucopolysaccharide
(b) Uridin di-phosphate	(ii) Donates methyl group
(c) S-adenosyl methionine	(iii) Phospholipid synthesis act as carrier of choline and ethanolamine
(d) Phospho-adenosine phosphosulfate	(iv) Carrier of mono-saccharides required for glycogen synthesis

	(a)	(b)	(c)	(d)
(A)	(ii)	(iii)	(iv)	(i)
(B)	(i)	(iv)	(iii)	(ii)
(C)	(iii)	(iv)	(ii)	(i)
(D)	(iv)	(iii)	(i)	(ii)

[KA-2017]

12. A person with phenylketonuria cannot convert
(A) Phenyl alanine to tyrosine
(B) Phenylalanine to isoleucine
(C) Phenol into ketones
(D) Phenyl alanine to lysine

[MP-2017]

13. Substrate level phosphorylation takes place in Krebs' cycle in between:
(A) Succinyl CoA and succinic acid
(B) Succinic acid and fumaric acid
(C) Fumaric acid and malic acid
(D) Malic acid and oxaloacetic acid

[MP-2017]

14. Purine derivatives are derived from:
    (A) Six membered pyrimidine ring 6
    (B) Fused five membered imidazole ring
    (C) Related to uric acid
    (D) All are correct

[TN-2017]

15. A 45- year-old female with renal failure, missed her dialysis and was feeling sick, what could be the reason?
    (A) Metabolic Acidosis
    (B) Metabolic Alkalosis
    (C) Respiratory Acidosis
    (D) Respiratory Alkalosis

[MH-2017]

16. In plants and some microorganisms, a metabolic pathway is operated that allows the conversion of acetyl CoA generated from fat stores into glucose. Which of the following is that pathway?
    (A) Citric acid cycle (B) β- oxidation
    (C) Glyoxylate cycle (D) Urea cycle

[MH-2017]

17. Maple syrup disease is caused due to defect in:
    (A) the degradation of Tyrosine
    (B) urea synthesis
    (C) formation of Tyrosine
    (D) the degradation of branched chain amino acids

[WB-2017]

18. Match List / with List II and choose the correct answer from the codes given below:

List-I Vitamin		**List-II Deficiency disease**	
(a)	B_1	i.	Pellagra
(b)	B_3	ii.	Wernicke-Korsak off syndrome
(c)	B_5	iii.	Mental disorder
(d)	B_6	iv.	Achromotrichia

Codes:

	(a)	**(b)**	**(c)**	**(d)**
(A)	(ii)	(i)	(iv)	(iii)
(B)	(ii)	(iv)	(i)	(iii)
(C)	(i)	(ii)	(iii)	(iv)
(D)	(iii)	(i)	(ii)	(iv)

[TN-2017]

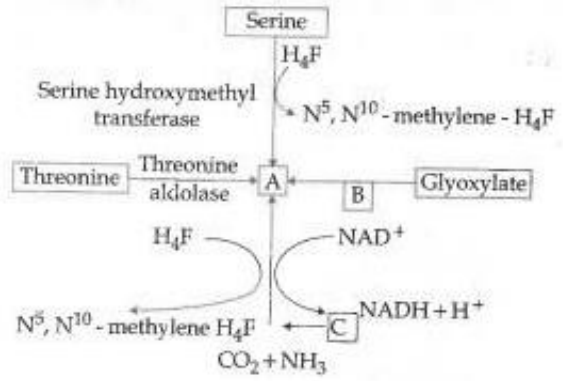
19. The severe form of galactosemia is
    (A) a genetic deficiency of a uridyl transferase that exchanges Galactose-1phosphate for glucose on UDP glucose
    (B) results from a deficiency of an epimerase
    (C) insignificant in infants but a major problem in later life
    (D) an inability to form galactose-1-phosphate

[TN-2017]

20. In the de-novo synthesis of pyrimidine nucleotides
    (A) a reaction take place exclusively in the cytosol
    (B) a free base is formed as an intermediate
    (C) PRPP is required in the rate limiting step
    (D) UMP and CMP are formed from a common intermediate

[CG-2018]

21.



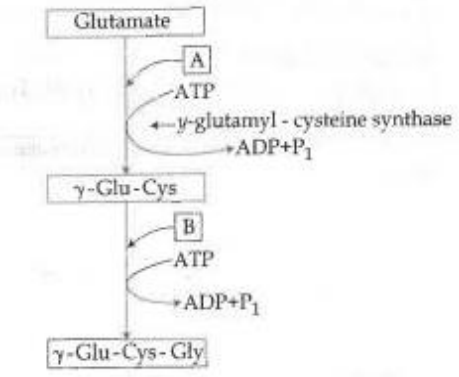
Detect compound at place A, B, C respectively and establish reaction concerned with biosynthesis of which compound?
    (A) Glycine, B-Transaminase, C-Glycine Synthetase and for Biosynthesis of Glycin
    (B) Transaminase, B-Glycine Synthetase, C-Glycine and for Biosynthesis of Glycin
    (C) Proline, B-Proline Synthetase, C-Glycin and for Proline Biosynthesis
    (D) Methionine, B-Methionine synthetase, C-Glycine and for Methionine Biosynthesis

[CG-2018]

22. Which of the following does not involve EMP cycle?
    (A) Conversion of glucose in ethyl alcohol
    (B) Conversion of glucose in PGAL
    (C) Reduction of glucose into Pyruvic acid
    (D) Conversion of Pyruvic acid into CO_2 and H_2O

[CG-2018]

23.



From above flow chart denote the position of A and B and establish the metabolic pool.

(A) Glutathione, B-Glycine and Biosynthesis of Cysteine.
(B) Glycine, B-Cysteine and Biosynthesis of Glycine
(C) Glycine, B-Cysteine and Biosynthesis of Cysteine
(D) Cysteine, B-Glycine and Biosynthesis of Glutathione

[JK-2018]

24. Glycolysis involves an oxidation step in which a hydrogen atom with a pair of electrons is removed. What happens to the hydrogen atom and its electrons?
(A) They diffuse into the cell.
(B) They reduce NAD.
(C) They combine with oxygen to form water.
(D) They combine with carbon dioxide to form carbon compounds.

[JK-2018]

25. What is the common product during the metabolic breakdown of amino acids and sugars?
(A) Pyruvic acid
(B) Dihydroxyacetone phosphate
(C) 3-phosphoglyceric acid
(D) Glyceraldehyde-3-phosphate

[JK-2018]

26. The primary energy source of resting skeletal muscles is/are
(A) Glucose (B) Lactic Acid
(C) Fatty Acids (D) Glycosides

[JK-2018]

27. Which of the following is a common nitrogen acceptor for all the reactions involving transaminase?
(A) Alpha-ketoglutarate (B) Pyruvate
(C) Oxaloacetate (D) Acetoacetate

[KA-2018]

28. The major amphibolic pathway in almost all living organism is
(A) Glycolytic pathway
(B) Beta oxidation pathway
(C) Photosynthetic pathway
(D) Citric acid cycle pathway

[MH-2018]

29. Supplemental nicotinamide or its analogue niacin relieves the dietary deficiency disease known as
(A) Pernicious anaemia (B) Marasmus
(C) Megaloblastic anaemia (D) Pellagra

[MH-2018]

30. A Biosynthetic pathway of which of the following amino acids is similar to purine biosynthesis?
(A) Proline (B) Tryptophan
(C) Histidine (D) Leucine

[MH-2018]

31. Electrons from cytoplasmic NADH are brought into mitochondria by malate-aspartate shuttle pathway. Select the correct option from below for which this shuttle specifically operate.
(A) Skeletal muscle (B) Pancreas
(C) Brain (D) Heart and Liver

[AP-2019]

32. The chemical name of one of the following amino acids is 2-Aminoethane-1-sulfonic acid. Identify the amino acid
(A) Methionine (B) Cysteine
(C) Taurine (D) Homocysteine

[CH-2019]

33. Read the given statements and select the correct option from those given below:
Statement - 1: Amino acids are capable of forming long polymeric peptide chain. Statement - 2: Amino acids are dipolar zwitter ions.
(A) Both statements are true and statement 2 is the correct explanation of statement - 1.
(B) Both statements are true but statement 2 is not the correct explanation of statement - 1.
(C) Statement - 1 is true but statement - 2 is false.
(D) Both statements are false.

[CH-2019]

34. The formation of acetyl coenzyme A from pyruvic acid is the result of its:
(A) Reduction
(B) Oxidative decarboxylation
(C) Dephosphorylation
(D) Dehydration

[GJ-2019]

35. Acetyl CoA can be produced by the breakdown of:
(A) Carbohydrates, DNA and Fatty acids
(B) Carbohydrates, Amino acids and RNA
(C) Carbohydrates, Amino acids and Fatty acids
(D) Amino acids, nitrogen bases and proteins

[MH-2019]

36. Which of the following enzymes is not a part of fatty acid synthetase complex?
(A) Enoyl reductase
(B) β -hydroxy acyl CoA dehydrogenase
(C) β -keto acyl reductase
(D) Acetyl transacylase

[MH-2019]

37. A Reducing power required for biosynthesis of fatty acids in liver is provided by:
(A) TCA cycle
(B) β -oxidation of fatty acid
(C) Hexose monophosphate shunt
(D) Glycogenolysis

[KA-2020]

38. Match the column A consisting of different vitamins with their names in Column B

Column A		Column B	
a	Vitamin D	i	Tocopherol
b	Vitamin E	ii	Thiamine
c	Vitamin B_6	iii	Pyridoxine
d	Vitamin B_1	iv	Calciferol

(A) a-(i) b-(ii) c-(iii) d-(iv)
(B) a-(i) b-(ii) c-(iv) d-(iii)
(C) a-(iv) b-(i) c-(iii) d-(ii)
(D) a-(iv) b-(i) c-(ii) d-(iii)

[KA-2020]

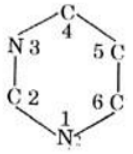
39. A metabolic pathway that involves part of the Kreb's cycle plus two unique enzymes, malate sysnthetase and isocitrate lyase is
(A) Glyoxylate cycle (B) Glycolate pathway
(C) Calvin cycle (D) TCA cycle

[MH-2020]

40. Which of the following phosphorylated compounds on hydrolysis will yield highest amount of energy?
(A) Glucose 6-phosphate (B) ATP
(C) 1, 3 BPG (D) PEP

[MH-2020]

41. A Various atoms of pyrimidine ring are derived from:



(A) N1, C4, C5, C6-Aspartate, C2- Bicarbonate and N3-Glutamine
(B) N1, C4, C5, C6-Glutamine, C2- Bicarbonate and N3-Aspartate
(C) N1, C4, C5, C6-Aspartate, C2- Bicarbonate and N3-Glutamate
(D) N1, C4, C5, C6-Aspargine, C2- Bicarbonate and N3-Glutamine

[MH-2020]

42. Which of the following enzymes is only involved in gluconeogenesis pathway?
(A) Hexakinase
(B) Phosphofructokinase
(C) 3-phosphoglycerate kinase
(D) Pyruvate kinase

[MH-2021]

43. Which of the following pairs of sugars is of non-reducing nature?
(A) glucose and galactose
(B) sucrose and trehalose
(C) trehalose and glucose
(D) sucrose and heptulose

[MH-2021]

44. The end product of adenosine mono- phosphate (AMP) and guanosine monophosphate (GMP) catabolism in normal humans is:
(A) Urea (B) Creatinine
(C) Xanthine (D) Uric acid

[MH-2021]

45. Anticancer drug, cyclophosphamide, is metabolised in the body by glutathionation reaction. What is the type of this reaction?
(A) Reduction (B) Glucuronidation
(C) Conjugation (D) Oxidation

[KA-2021]

46. Esterification of cholesterol in plasma is catalysed by
(A) Lecithin: Cholesterol acyl transferase
(B) Acetyl CoA: Cholesterol acyl transferase
(C) Succinyl CoA: Cholesterol acyl transferase
(D) Malonyl COA: Cholesterol acyl transferase

[GJ-2022]

47. Which one of the following vitamins plays important role in carboxylation reactions?
(A) Riboflavin (C) Niacin
(B) Folic acid (D) Biotin

[GJ-2022]

48. Which of the following pathways is both anabolic and catabolic?
(A) Glycolysis
(B) Tricarboxylic acid cycle
(C) Glyoxylate pathway
(D) Pentose phosphate pathway

[GJ-2022]

49. This enzyme is a marker enzyme of glyoxysomes
(A) Isocitrate lyase
(B) Aconitase
(C) Citrate synthase
(D) Malate dehydrogenase

[MH-2023]

50. The vitamin important role in conversion of proline to hydroxyproline in building the appropriate collagen protein is:
(A) Vitamin A (B) Vitamin B
(C) Vitamin C (D) Vitamin D

[MH-2023]

51. Name the water soluble non-B complex vitamin that is structurally similar to a monosaccharide:
(A) Pantothenic acid (B) Biotin
(C) Niacin (D) Ascorbic acid

[MH-2023]

52. In the absence of oxygen, the metabolic fate of pyruvic acid will be:
(A) Its partial oxidation will take place
(B) Its complete oxidation will take place

(C) It will be utilized for reoxidation of NADH
(D) It will be utilized depending on energy need

[RJ-2023]

53. In mammals, including humans, insulin is synthesized as a pro-hormone (like a pro- enzyme, the pro-hormone also needs to be processed before it becomes fully matured). This maturation of proinsulin into insulin takes place after which of the following steps?
(A) Removal of disulphide bridge
(B) Joining of c-peptide
(C) Removal of c-peptide
(D) Joining of disulphide bridge

[RJ-2023]

54. Which one of the following is correct for Biosynthesis of fatty acid?
(A) Condensation → Reduction → Dehydration→ Reduction
(B) Dehydration → Reduction →Dehydration →Reduction
(C) Reduction → Dehydration → Reduction→ Dehydration
(D) Reduction→Dehydration →Condensation →Reduction

[MP-2023]

55. In 1967 which of the following co- enzymes classified as Vitamin?
(A) COASH
(B) Co-enzyme Q
(C) TPP
(D) Pyrodoxal Phosphate

[MH-2024]

56. In addition to serving as the building blocks for nucleic acid, nucleotides have many functions. Which of the following is not a function of a nucleotide?
(A) They work as carriers of energy
(B) They are serving as secondary messengers in cells
(C) They are the components of coenzymes
(D) They provide electrons to the ETC

[MH-2024]

57. How many times more energy gained in aerobic respiration over anaerobic respiration?
(A) 8 (B) 12
(C) 18 (D) 32

[NE-SLET-2024]

58. Match Column I with Column II and select the correct answer using answer codes:

Column-I (Fatty acid)	Column-II (Occurrence)
(a) Arachidic acid	1. Brain lipid
(b) Palmitic acid	2. Metabolic intermediate
(c) Propionic acid	3. Adipose tissue
(d) Nervonic acid	4. Peanut oil

	(a)	(b)	(c)	(d)
(A)	4	2	1	3
(B)	2	4	1	3
(C)	4	3	2	1
(D)	3	1	4	2

[NE-SLET-2024]

59. Match the items of Column-I with those of Coloma-II and select the correct match from the codes given below:

Column-I	Column-II
(a) Catatase	1. Starch H2O→ Maltose
(b) Amylase	2. RNA +H2O Ribonucleotides
(c) Lactate dehydrogenase	3. Lactic acid → Pyruvic acid + H_2
(d) Ribonuclease	4. $2H_2O_2 \rightarrow 2H_2O + O_2$

	(a)	(b)	(c)	(d)
(A)	2	4	3	1
(B)	4	2	3	1
(C)	1	3	2	4
(D)	4	1	3	2

[NE-SLET-2024]

60. Two statements are given below-one is Assertion (Ass) and one is Reason (R). Select the correct answer from the codes given below:
Assertion (Ass): Pyruvate cannot be converted directly to phosphoenol pyruvate. The conversion requires 2 reactions that serve to bypass the irreversible pyruvate kinase step of glycolysis.
Reason (R): First reaction is the conversion of pyruvate to malate and second reaction is the conversion of malate to PEP.
(A) Both (Ass) and(R) are true and (R) is the correct explanation of (Ass)
(B) Both (Ass) and (R) are true but (R) is not the correct explanation of (Ass)
(C) (Ass) is true but (R) is false
(D) Both (Ass) and (R) are false

[NE-SLET-2024]

61. Examine the following statements and select the correct answer from the codes given below:
(i) Glycolysis is a process found only in eukaryotic cells.
(ii) The final electron acceptor in ETS is O_2, molecule.
(iii) First five reactions in glycolysis demand the expenditure of ATP
(iv) Acetyl-CoA is a connecting link between the 'Krebs' cycle and electron transport chain

	(i)	(ii)	(iii)	(iv)
(A)	True	True	False	True
(B)	True	False	True	False
(C)	False	True	True	False
(D)	False	True	False	True

[NE-SLET-2024]

62. Megaloblastic anemia, caused by diminished synthesis of purines and thymidine leading to inability of cells to make DNA, occurs due to the lack of
(A) folic acid (B) pyridoxin
(C) ascorbic acid (D) pantothenic acid

[CG-2024]

63. Which of the following statement is correct?
(A) Glycogen is formed in glycogenolysis
(B) Glucose is formed in Glycolysis
(C) Excess of Amino acids are converted into carbohydrate
(D) Glycerol is formed in lipogenesis

[CG-2024]

64. Which one of the following is important in oxidative fat metabolism?
(A) Acetyl CoA (B) Glucose
(C) Pyruvic acid (D) Oxaloacetic acid

[CG-2024]

65. Unused carbohydrates are -
(A) Given back to Blood
(B) Stored as glycogen
(C) Dissociate as and
(D) Used in fat synthesis

[CG-2024]

66. Sunshine vitamin is-
(A) Vitamin D (B) Vitamin A
(C) Vitamin K (D) Vitamin C

[CG-2024]

67. The nature of endotoxins are-
(A) Polypeptide (B) Polysaccharide
(C) Lipids (D) Hormones

[CG-2024]

68. A possible Auxin-binding receptor protein (ABP1) in plants has been identified which appears to be a-
(A) single polypeptide of about 22kD
(B) dimer of two polypeptides each of about 22kD
(C) tetramer of four polypeptides each of about 22kD
(D) A & B Both correct

[WB-2024]

69. Which of the following statements is not correct for chrysolaminarin?
(A) Chrysolaminarin is the reserve carbohydrate for Xanthophycophyta
(B) It is a neutral lipid triglycerol, an important precursor for the production of biodiesel
(C) It is a soluble polymer consisting of glucose monomers linked by β (1-3) bond with limited β (1-6) branching
(D) It is stored inside the cells being encapsulated in vacuoles

Answer Key									
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
D	A	A	A	B	B	A	A	A	B
11	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
C	A	A	B	A	C	D	A	A	D
21	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
B	D	C	B	A	C	A	D	D	C
31	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**
D	C	A	B	C	D	C	A	A	B
41	**42**	**43**	**44**	**45**	**46**	**47**	**48**	**49**	**50**
A	D	B	D	C	A	D	C	A	C
51	**52**	**53**	**54**	**55**	**56**	**57**	**58**	**59**	**60**
D	C	B	A	B	D	C	C	D	C
61	**62**	**63**	**64**	**65**	**66**	**67**	**68**	**69**	
C	A	C	A	D	A	B	B	B	

CHAPTER-5 DEVELOPMENTAL BIOLOGY

Unit - 5.1: Basic Concepts of Development

Potency, Commitment, Specification, Induction, Competence, Determination and Differentiation; Morphogenetic Gradients; Cell Fate and Cell Lineages; Stem Cells; Genomic Equivalence and the Cytoplasmic Determinants; Imprinting; Mutants and Transgenics In Analysis of Development

[KA-2015]

1. Which one of the following is not an internal factor of differentiation?
   (A) Polarity (B) Inductive effect
   (C) Mutual incompatibility (D) Cytoplasm

[AP-2017]

2. **Assertion (A)**: A nucleus taken from a somatic cell and implanted into an enucleated egg cell of a frog, often gives rise into an adult individual
   Reason (R): Differentiated donor nucleus could be totipotent
   (A) (A) is correct but (R) is not the correct explanation of (A)
   (B) Both (A) and (R) are true
   (C) (A) is false but (R) is true
   (D) (A) is true but (R) is false

[CG-2017]

3. Which of the inferences (A-(D) given below would you draw from the following tissue transplantation experiments performed with the early and late gastrula stages of the newt?

	Host regions	Donor regions	Differentiation of donor tissue
	Early Gastrula		
(i)	Prospective neurons	Prospective epidermis	Epidermis
(ii)	Prospective epidermis	Prospective neurons	Neurons
	Late Gastrula		
(i)	Prospective neurons	Prospective epidermis	Neurons
(ii)	Prospective epidermis	Prospective neurons	Epidermis

   M. Cells of early newt gastrula exhibit conditional development.
   N. Cells of early newt gastrula exhibit
   O. Cells of late newt gastrula exhibit conditional development.
   P. Cells of late newt gastrula exhibit autonomous development.
   The correct inferences are:
   (A) M and P (B) M and N
   (C) N and O (D) N and P

[KA-2017]

4. Identify the correct statement with regard to the Embryonic Stem cells (ES).
   (A) They are not derived from inner cell mass of Blastocyst
   (B) Cannot proliferate into different cell types
   (C) They can generate primitive ectoderm
   (D) They are not pluripotent cells

[MP-2017]

5. The initial cell division during the development is -
   (A) Anticlinal (B) Periclinal
   (C) Random (D) Oblique

[TN-2017]

6. Stem cell factor is produced mainly by
   (A) stem cells
   (B) thymic Epithelium
   (C) bone marrow stromal cells
   (D) megakaryocytes

[MH-2017]

7. In birds and reptiles the primordial germ cells originate in the:
   (A) Epiblast (B) Hypoblast
   (C) Germinal crescent (D) Embryonic allantois

[AP-2018]

8. Match the following:

List – I	List – II
I. Unipotent	1. Cell that can differentiate into cell types of the adult organism
II. Oligopotent	2. Cell that differentiates into multiple different, but closely related all types
III. Pluripotent	3. Cell is more restricted than multipotent but can still differentiate into a few closely related cell types
IV. Multipotent	4. Cell that differentiates into any one cell-type but capable of self renewal

	I	II	III	IV
(A)	4	3	1	2
(B)	2	3	4	1
(C)	4	1	3	2
(D)	4	3	2	1

[WB-2018]

9. Basic principles of embryonic development were pronounced by
   (A) Von Baer (B) Weismann
   (C) Haeckel (D) Morgan

[KA-2020]

10. Shinya Yamanaka received his Nobel Prize for discovery of
    (A) Induced pluripotent stem cells
    (B) Oncogene
    (C) Okazaki fragments
    (D) Cancer stem cells

[KA-2021]

11. Drosophila displays _____ method of embryonic development.
    (A) Ametabolous (B) Hemimetabolous
    (C) Holometabolous (D) Paurometabolous

[KA-2021]

12. Embryonic stem cells are obtained from the inner cell mass of the as a precursor.
    (A) Epiblast (B) Hypoblast
    (C) Tonoplast (D) Blastocyst

[JK-2022]

13. In chick, development of wing feather thigh feathers and claws depends on epithelial specificity conferred by induction from mesenchymal components from different sources of the dermis. This may be attributed to
    (A) Autocrine interaction
    (B) Regional specificity of induction
    (C) Genetic specificity of interaction
    (D) Autonomous development

[MH-2023]

14. In Drosophila, the fate of early blastomeres is determined through:
    (A) Autonomous specification
    (B) Conductional specification
    (C) Syncytial specification
    (D) Maternal specification

[RJ-2023]

15. The process by which the cells become structurally and functionally distinct during development is called as
    (A) differentiation (B) determination
    (C) specification (D) both (A) and (C)

[WB-2023]

16. The establishment of the anterior-posterior or dorsal-ventral body axis is called
    (A) Pattern formation (B) Morphogenesis
    (C) Differentiation (D) Growth

[MH-2024]

17. The mid-blastula transition is the point in the development when _____
    (A) Translation of maternal mRNA is initiated
    (B) Cell determination is fixed
    (C) Cell-division in the zygote begins
    (D) Transcription of zygotic genes begins

[MH-2024]

18. Which of the following is not a property of stem cells?
    (A) Ability to self-renew
    (B) Ability to differentiate into different types of cells
    (C) They are unspecialised cells with cell markers
    (D) They are actively dividing cells with cell marker changes

[WB-2024]

19. Which of the following statements is incorrect?
    (A) In meiosis, one cycle of DNA replication is followed by two rounds of chromosome segregation
    (B) Astral type of mitosis is present in majority of the animal cells
    (C) Two homologous chromosomes in meiotic prophase I are held together by synaptonemal complex
    (D) Pluripotent cells have the ability to regenerate an entire organism in vitro

[MP-2024]

20. In animals Nervous system is derived from:
    (A) Ectoderm (B) Mesoderm
    (C) Endoderm (D) All of the above

Answer Key									
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
D	A	A	C	A	C	C	A	A	A
11	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
C	D	B	D	A	A	D	D	D	A

Unit- 5.2: Gametogenesis, Fertilization and Early Development:

(Production of Gametes, Cell Surface Molecules In Sperm-Egg Recognition In Animals; Embryo Sac Development and Double Fertilization In Plants; Zygote Formation, Cleavage, Blastula Formation, Embryonic Fields, Gastrulation and Formation of Germ Layers In Animals; Embryogenesis, Establishment of Symmetry In Plants; Seed Formation and Germination.)

[WB-2015]

1. Which is the correct sequence of the events leading to the formation of mature sperm?
   (A) Primary spermatocytes-secondary spermatocytes-spermatids-spermatogonia-sperms.
   (B) Spermatogonia-spermatids-primary spermatocytes-secondary spermatocytes-sperms.
   (C) Spermatogonia-primary spermatocytes-secondary spermatocytes-spermatids- sperms.
   (D) Spermtogonia-spermatid-secondary-spermatocytes –sperm

[GJ-2016]

2. Double fertilization is a characteristic feature of:
   (A) Dicots
   (B) Monocots
   (C) Gymnosperms
   (D) Both dicots and monocots

[GJ-2016]

3. One of the following sequences is correct for vertebrate development:
   (A) Blastula - Gastrula - Neurula
   (B) Blastula - Morula - Neurula
   (C) Gastrula - Morula - Blastula
   (D) Neurula - Morula - Gastrula

[JK-2016]

4. Odd number of cells during cleavage is found in the embryo.
   (A) Mice (B) Frog
   (C) Fish (D) Snake

[JK-2016]

5. Fertilization of ova and implantation of zygote in human takes place in:
   (A) Fallopian tube and uterus, respectively
   (B) Uterus and cervix, respectively
   (C) Ovary and fallopian tube, respectively
   (D) Vagina and cervix, respectively

[KA-2016]

6. The correct sequence of process of development after fertilization and cleavage is
   (A) Gastrulation - Organogenesis – growth
   (B) Organogenesis – gastrulation – growth
   (C) Gastrulation – blastulation – growth
   (D) Organogenesis – morulation – blastulation

[KA-2016]

7. A series of mitotic cell divisions that changes zygote into multicellular embryo
   (A) Gastrulation
   (B) Gametogenesis
   (C) Blastulation
   (D) Cleavage

[KA-2016]

8. Following events in the basic life cycle are in the right order?
   i. Fertilization, cleavage
   ii. Adulthood, senescence
   iii. Gastrulation, Germ layer formation
   iv. Organogenesis, metamorphosis
   Which of the statements given above are right?
   (A) i, ii, iii, iv (B) i, iii, iv, ii
   (C) i, iv, iii, ii (D) i, ii, iv, iii

[MH-2016]

9. Which of the following (in sperm) is primarily responsible for hydrolytic activity during sperm-egg interaction?
   (A) ZP-1 (B) Acrosin
   (C) Spermease (D) Glycolipase

[AP-2017]

10. Dolly sheep was genetically similar to:
    (A) The mother from which nucleated fertilized egg was taken
    (B) The mother from which nuclear DNA of udder cell was taken
    (C) The surrogate mother
    (D) Father from which the sperm was taken

[AP-2017]

11. The correct sequence of events during fertilization in mammals is:
    (A) Capacitation, activation of egg, acrosomal reaction and entry of sperm in egg
    (B) Capacitation, acrosomal reaction, activation of egg and entry of sperm in egg
    (C) Acrosomal reaction, activation of egg, capacitation and entry of sperm in egg
    (D) Activation of egg, acrosomal reaction, entry of sperm in egg and capacitation

[AP-2017]

12. Match the extraembryonic fetal membrane with its functional significance in birds:

List I	List II
(a) Amnion	(i) Excretion
(b) Chorion	(ii) Protection against mechanical shock
(c) Yolk sac	(iii) Nutrition
(d) Allantois	(iv) Absorption of water, albumen and gases exchange

Codes:

	(a)	(b)	(c)	(d)
(A)	(i)	(ii)	(iv)	(iii)
(B)	(ii)	(iv)	(iii)	(i)
(C)	(iii)	(i)	(ii)	(iv)
(D)	(iv)	(iii)	(i)	(ii)

[AP-2017]

13. Consider the following process:
(a) Involution
(b) Epiboly
(c) Invagination
Which of the above accomplish the gastrulation in frog ?
(A) (a) and (b) (B) (b) and (c)
(C) (a) and (c) (D) (a), (b) and (c)

[CG-2017]

14. Which of the following statements are correct?
M. Genes may affect the competence of tissues to respond normally.
N. The blastula is a multi-layered hollow spherical structure enclosing a cavity, the blastocoel.
O. The function of Acrosome in sperm head is to protect the nucleus.
P. The animal pole of the ovum marks the anterior end of the embryo.
Choose the correct answer:
(A) O and P (B) P and N
(C) N and M (D) P and M

[GJ-2017]

15. The embryonic stage in the frog in which differentiation of mesoderm takes place, is called as:
(A) Blastula (B) Gastrula
(C) Morula (D) Nerula

[GJ-2017]

16. A mesolecithal egg undergoes holoblastic cleavage, is represented in:
(A) Birds (B) Amphioxus
(C) Amphibians (D) Echinoderms

[KA-2017]

17. The sphere of relatively nondescript cells that result from a rapid series of mitotic divisions of the zygote is called a
(A) Determination (B) Gastrulation
(C) Blastula (D) Morphogenesis

[KA-2017]

18. The process in which undifferentiated cells are assigned developmental fates is called
(A) Blastula (B) Gastrula
(C) Determination (D) Morphogenesis

[MP-2017]

19. The plane of second cleavage division with respect to animal-vegetal axis is always
(A) Vertical and at right angle to first cleavage
(B) Horizontal and right angle to first cleavage
(C) Vertical and parallel to first cleavage
(D) All are correct

[MP-2017]

20. Axial filament of spermatozoon is formed from
(A) Nucleus (B) Mitochondria
(C) Distal centriole (D) Proximal centriole

[MP-2017]

21. The rate of cleavage is
(A) Inversely proportional to the amount of yolk
(B) Directly proportional to the amount of yolk
(C) No effect
(D) All are correct

[MP-2017]

22. Capacitation of mammalian sperm takes place in
(A) Epididymis
(B) Female reproductive tract
(C) Seminiferous tubule
(D) All are correct

[MH-2017]

23. Which of the following are responsible for prevention of polyspermy?
(A) Change in the membrane potential of egg plasma membrane
(B) Cortical granule exocytosis/cortical reaction
(C) Both (A) and (B)
(D) Molecular changes in the zona pellucida proteins

[MH-2017]

24. The embryonic stage in frog in which differentiation of mesoderm takes place is called:
(A) Blastula (B) Gastrula
(C) Morula (D) Neurula

[TN-2017]

25. Animals that exhibit discoidal cleavage pattern in their meroblastic eggs
(A) Sea Urchin and Amphioxus
(B) Annelids and Mollusks
(C) Mammals and Nematodes
(D) Birds and Reptiles

[TN-2017]

26. Which of the following is the correct pair if you relate Cleavage to the Animal Group

(i) Radial cleavage – Echinoderms
(ii) Spiral - Annelids
(iii) Bilateral - Tunicate
(iv) Rotational cleavage - Mammal
(A) i and ii correct (B) iii and iv correct
(C) ii and iii correct (D) All are correct

[WB-2017]

27. The kind of cleavage found in an oligolecithal egg is
(A) Meroblastic (B) Holoblastic
(C) Spiral cleavage (D) Superficial cleavage

[TN-2017]

28. Polyspermy, the process where two sperms are likely to fertilize the egg, shall be blocked by
(i) Electrical impulse mediated by sodium ions
(ii) Depolarization of the egg membrane
(iii) Calcium ion mediation
(iv) Released content of the cortical granule
(A) i and ii correct
(B) ii and iii correct and iv is incorrect
(C) iii is correct while i and iv are incorrect
(D) iv is correct whereas ii and iii are incorrect

[TN-2017]

29. Match the types of egg with animal group and find the odd man out
(a) Microlecithal – Mammal
(b) Centrolecithal –Insects
(c) Mesolecithal – Birds
(d) Telolecithal – Amphibians
(A) a, b and c are correct
(B) b is correct and c and d are incorrect
(C) c is correct while a and d are incorrect
(D) d is correct whereas b and c are incorrect

[AP-2018]

30. The protein of zona pellucida that induces sperm to undergo acrosome reaction
(A) Zona protein 1 (B) Zona protein 2
(C) Zona protein 3 (D) Zona protein 4

[CG-2018]

31. Match Group A with Group B.

Group A	Group B
(M) Non-flagellate sperm	(1) Ascaris
(N) Meiosis	(2) Early cleavage stage cells
(O) Sertoli cells	(3) Nutrition
(P) G1 phase of the cell cycle is absent	(4) Reduction Division

Code:

(M)	(N)	(O)	(P)
(A) (2)	(1)	(3)	(4)
(B) (1)	(4)	(2)	(3)
(C) (1)	(4)	(3)	(2)

(D) None of the above

[CG-2018]

32. During fertilization in amphibians, the fusion of egg and sperm plasma is preceded by the sequence:
(M) Release of enzymatic content from the acrosomal vesicle through exocytosis.
(N) Binding and interaction of the sperm to vitelline membrane.
(O) Passage of sperm through an extracellular envelope.
(P) Chemo attraction of the sperm to the egg by soluble factors secreted by the egg.
Which of the following is the correct sequence?
(A) (M), (P), (O) and (N)
(B) (P), (M), (N) and (O)
(C) (M), (O), (N) and (P)
(D) (O), (N), (M) and (P)

[CG-2018]

33. Space filled with fluid in the center of blastoderm:
(A) enteron (B) archenteron
(C) blastocoel (D) enterocoel

[JK-2018]

34. Capacitation refers to changes in the
(A) sperm before fertilization.
(B) sperm after fertilization.
(C) ovum before fertilization.
(D) ovum after fertilization.

[JK-2018]

35. The equivalent of the amphibian dorsal blastopore lip in birds is
(A) Nucleus of Pander.
(B) Hensen's node.
(C) intermediate mesoderm.
(D) roof of foregut

[JK-2018]

36. *C. elegans* is a powerful developmental model because
(A) its genome resembles the human genome.
(B) the fate of every cell has been mapped.
(C) the fate of germ cells is predetermined.
(D) each cell glows green with GFP.

[KA-2018]

37. During which stage of development, an embryo becomes triploblastic?
(A) Organogenesis (B) Fertilization
(C) Gastrulation (D) Blastulation

[MH-2018]

38. Organisms where various blastomeres become restricted to form only specific structures as soon as they are formed or during development the first few cleavages are:
(A) Tunicates (B) Amniotes
(C) Amphibians (D) Mammals

[MH-2019]

39. Starting with a fertilized egg (zygote), a series of sequential five cell divisions would produce an early embryo with how many cells?
(A) 8 (B) 16
(C) 32 (D) 64

[AP-2019]

40. A chemotactic molecule isolated from the egg jelly of sea urchin that acts as a sperm activating peptide
(A) Bindin (B) Resact
(C) Dynein (D) Fertilin

[AP-2019]

41. The correct sequence of gastrulation in frog
(i) Involution
(ii) Epiboly
(iii) Invagination
(A) (ii)→(iii) →(i) (B) (iii) →(i) →(ii)
(C) (i) →(iii) →(ii) (D) (ii) →(i) →(iii)

[CH-2019]

42. During development of which one of the following organisms, bilateral meroblastic cleavage is found?
(A) Bird (B) Mollusc
(C) Snake (D) Fish

[KA-2021]

43. In amphibians, vegetal cells opposite the region of sperm entry will form the _____ part of the body.
(A) Dorsal (B) Ventral
(C) Lateral (D) Tectum

[MH-2021]

44. Which of the following is NOT true of Spermatogenesis?
(A) Four gametes are formed per meiosis
(B) Sex chromosomes are excluded from recombination and transcription during the first meiotic prophase
(C) Meiosis occurs continuously in mitotically dividing stem cells
(D) Differentiation of the gamete occurs; while in diploid, during first meiotic prophase

[MH-2021]

45. In the fertilized egg, cortical granule reaction required for slow block polyspermy, is initiated by:
(A) Na^+ (B) Mg^{2+}
(C) K^+ (D) Ca^{2+}

[AS-2021]

46. Match the items of Column-I with those of Column-II and select the correct match by using the codes given below:

Column-I	Column-II
(a) Radial cleavage	1. Echinoderms
(b) Spiral cleavage	2. Tunicates
(c) Bilateral cleavage	3. Mammals
(d) Rotational cleavage	4. Annelids

Codes:
(A) a-1, b-2, c-3, d-4 (B) a-3, b-2, c-1, d-4
(C) a-4, b-3, c-1, d-2 (D) a-1, b-4, c-2, d-3

[AS-2021]

47. Match the items of Column-I with those of Column-II and select the correct match from the codes given below:

Column-I	Column-II
(a) Bindin	1. Sperm activating peptide
(b) Cortical granule reaction	2. N-acetyl glucosamine sugar
(c) Resect	3. Calcium ion
(d) Acrosome reaction	4. Sperm-egg contact

Codes:
(A) a-4, b-3, c-1, d-2 (B) a-4, b-2, c-3, d-1
(C) a-4, b-2, c-3, d-1 (D) a-2, b-3, c-1, d-4

[AS-2021]

48. Two statements are given below, one of them is Assertion (Ass) and the other one is Reason (R). Select the correct answer by using the codes given below:
Assertion (Ass): The yolk sac stores vitellus, which is the main source of nutrition in non-placental embryonic development.
Reason (R): Extra embryonic membranes of mammals are derived from the trophoblast
Codes:
(A) Both (Ass) and (R) are true and (R) correctly explains (Ass)
(B) Both (Ass) and (R) are true, but (R) does not correctly explain (Ass)
(C) (Ass) is true but (R) is false
(D) Both (Ass) and (R) are false

[GJ-2022]

49. Brain and central nervous system develop from which germ layer or layers?
(A) Ectoderm
(B) Mesoderm
(C) Endoderm
(D) Ectoderm and mesoderm

[JK-2022]

50. Which one of the following shows holoblastic cleavage?
(A) Mammal (B) Fish
(C) Bird (D) Insect

[JK-2022]

51. During sea urchin gastrulation the sheet of epithelial cells (future endoderm) infolds into the blastocoel. This type of cell movement during gastrulation is called as
(A) Invagination (B) Involution
(C) Ingression (D) Epiboly

[JK-2022]

52. Izumo, present in the acrosomal membrane and Juno, an oocyte membrane protein involved in sperm-egg fusion in mammals. Which one of the following experiments and their outcomes unequivocally demonstrate that Izumo's interaction with Juno will lead to sperm-egg fusion?
    (A) Immunostaining of sperms and egg with antibodies against Juno and Izumo demonstrating their specificity of expression
    (B) Overexpression of Juno in the oocyte to demonstrate sperm binding
    (C) Developing independent kidney cell lines expressing either Juno or Izumo and demonstrating that these cells adhere to each other
    (D) Demonstrating interaction of Izumo and Juno by FRET (Fluorescence Resonance Energy Transfer)

[JK-2022]

53. When a sperm fuses with a sea urchin egg, a wave of calcium release is seen starting from the point of sperm entry that propagates across the egg. The calcium wave can be viewed if the egg is stained with a dye that fluoresces on binding to calcium. Compounds like A23187 and EDTA are used to analyze the origin and outcome of these waves. A23187 is a calcium ionophore that allows the diffusion of Ca^{2+}, across lipid membranes, permitting them to travel across otherwise impermeable barriers EDTA chelates Ca^{2+}, by binding to and holding onto it. In order to find out if the observed wave is due to release of Ca^{2+}, from within the cell or influx of Ca^{2}, from outside, different experiments were proposed. Which one of the following treatments will help in answering the question?

    (A) Placing sea urchin eggs in seawater containing A231872
    (B) Inducing fertilization of sea urchin eggs in calcium free water
    (C) Treating sea urchin eggs with EDTA before fertilization
    (D) Treating sea urchin eggs with A231872 before fertilization

[WB-2022]

54. 'Abruptio Placentae' is a condition in which the placenta detaches prematurely from the wall of the uterus and can result in fetal death. The most likely reason for fetal death in this condition would be
    (A) a lack of placental steroid production
    (B) vaginal blood loss
    (C) inability to get oxygen and nutrients from the mother to the fetus
    (D) hypersecretion of pituitary gonadotropins in response to loss of fetal steroid production

[WB-2023]

55. During gastrulation, splitting of one cellular sheet into two parallel sheets is known as
    (A) Epiboly (B) Delamination
    (C) Involution (D) Ingression

[WB-2023]

56. Cleavage polyembryony in plant is a type of polyembryony where
    (A) multiple embryos originate as a result of cleavage of the zygote into small units.
    (B) multiple embryos originate from cells of the embryo sac other than the egg.
    (C) multiple embryos arising from cells outside the embryo sac.
    (D) multiple embryos originate from outside the ovular tissue.

[WB-2023]

57. Which one of the following statements is not true regarding differentiation of different cell types originating from embryonic germ layers?
    (A) Neurons of brain originate from ectoderm layer
    (B) Bone tissues originate from mesoderm layer
    (C) Facial muscles originate from mesoderm layer
    (D) Red Blood cells originate from endoderm layer

[MP-2023]

58. Which type of cell division takes place in Gametogenesis?
    (A) Amitotic and Mitotic
    (B) Amitotic and Meiotic
    (C) Only Meiotic
    (D) Mitotic and Meiotic

[MP-2023]

59. The surface layer of sperm contains a proteinous substance, known as:
    (A) Antifertilizin (B) Zygotin
    (C) Fertilizen (D) Tubulin

[MP-2023]

60. Prime function of 'Corpus luteum' is:
    (A) Secreation of digestive juices
    (B) Exocrine
    (C) Endocrine
    (D) Functionless

[MP-2023]

61. Which cavity is found in Gastrula stage of an embryo?
(A) Blastocoel (B) Gastrocoel
(C) Amphiblastula (D) Uterine Cavity

[MP-2023]

62. In which egg micropyle is present?
(A) Insects (B) Elephant
(C) Frog (D) Birds

[MH-2024]

63. Which of the following groups of transcription factors (TFs) is responsible for maintaining the pluripotency of stem cells?
(A) Oct 4, Nanog and Stat 3
(B) Oct 4, Nanog and SOX 2
(C) Eomesodermin, Cdx 2 and SOX 2
(D) Cdx 2, Nanog and SOX 2

[MH-2024]

64. In plants, when the apical cell of the 2-celled pro-embryo divides longitudinally and further the basal cell plays only a minor role or none in the development of the embryo proper then the embryo is type.
(A) Asterad (B) Onagrad
(C) Solanad (D) Chenopodial

[CG-2024]

65. The function of fertilization membrane is-
(A) To protect the egg
(B) To protect the sperm head
(C) Favours fusion of egg & sperm
(D) Prevent the entry of late arriving Spermatozoa

[CG-2024]

66. A Human Sperm can penetrate an Orum when it remains for sometime in the fallopian tube of the female, this is called as-
(A) Maturation (B) Capacitation
(C) Resistance (D) Fertilization

[CG-2024]

67. Match the following-

Column A (Ovular structure)	Column B (Post-fertilization structure)
(I) Ovule	(a) Endosperm
(II) Funiculus	(b) Aril
(III) Nucellus	(c) Seed
(IV) Polar nuclei	(d) Perisperm

Code:
(A) I-a, II-b, III-c, IV-d (B) I-c, II-b, III-d, IV-a
(C) I-d, II-c, III-a, IV-b (D) I-a, II-d, III-c, IV-b

[CG-2024]

68. Barr body is found in man and associated with-
(A) Male Sex Organ
(B) Female Autosome
(C) Male Autosomes
(D) Female Sex Chromosomes

[WB-2024]

69. The 'mid-blastula transition' is the point in development when
(A) translation of maternal mRNA is initiated
(B) cell division in the embryo ends
(C) transcription of zygotic genes begins
(D) blastocoel formation occurs

[WB-2024]

70. During development in placental mammal, the fertilized egg undergoes division to form a blastocyst. The outermost cells of the blastocyst differentiate to form 'a thin layer of cells', which then invades the uterus and begins to form the placenta. This 'thin layer of cells' is known as
(A) Allantois (B) Endometrium
(C) Myometrium (D) Trophoblast

[MP-2024]

71. Rotational cleavage is unique and different from other animals in:
(A) Amphibians (B) Protostomes
(C) Mammals (D) Echinoderms

[MP-2024]

72. The correct sequence of process of development after fertilization and cleavage is :
(A) Gastrulation-organogenesis-growth
(B) Organogenesis-gastrulation-growth
(C) Gastrulation-blastulation-growth
(D) Organogenesis - Morulation - blastulation

[GJ-2024]

73. Holoblastic cleavage
(A) is absent in invertebrates
(B) is restricted to a discoidal region of the egg
(C) occurs throughout the egg
(D) is exhibited in aves

Answer Key

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

Unit - 5.3: Morphogenesis and Organogenesis in Animals:

Cell Aggregation and Differentiation In Dictyostelium; Axes and Pattern Formation In Drosophila, Amphibia and Chick; Organogenesis – Vulva Formation In Caenorhabditis Elegans, Eye Lens Induction, Limb Development and Regeneration In Vertebrates; Differentiation of Neurons, Post Embryonic Development- Larval Formation, Metamorphosis; Environmental Regulation of Normal Development; Sex Determination.

[KA-2015]

1. A cell or its group alters the developmental fate of another cell. This phenomenon is called
   (A) Induction (B) Competence
   (C) Germplasm theory (D) Cell fate

[KA-2015]

2. Which of the following statements is correct?
   (A) In the presence of sry, all sexual differentiation follows the female pathway in humans
   (B) In the absence of sry, all sexual differentiation follows the female pathway in humans
   (C) In the absence of her – 1, all sexual differentiation follows the female pathway in humans
   (D) In the absence of her – 1, all sexual differentiation follows the male pathway in humans

[WB-2015]

3. Which chromosomes serve as MALE sex switch in Birds?
   (A) XY (B) ZZ
   (C) ZW (D) XO

[GJ-2016]

4. Environmental sex determination is observed in.
   (A) Bonelia (B) Corals
   (C) Nereis (D) Starfish

[JK-2016]

5. Which one of the following genes in relation to sex determination/differentiation is most conserved in several organisms?
   (A) dmrt1 (B) sry
   (C) vasa (D) sox9

[KA-2016]

6. Dictyostelium morphogenesis requires
   (A) GTP (B) ATP
   (C) cAMP (D) CTP

[MH-2016]

7. Sex in Drosophila is determined by:
   (A) X/A ratio
   (B) ZZ/ZW chromosomes
   (C) XX/XY chromosomes
   (D) Environmental regulation

[MH-2016]

8. Dorsal lip of blastopore of frog is equivalent to …… of chick embryo.
   (A) Koller's sickle
   (B) Hensen's node
   (C) Area opaca
   (D) Area pellucida

[MH-2016]

9. The male sex differentiation in the echiuroid worm Bonellia is:
   (A) governed by the temperature of sea water in which the larvae live
   (B) determined by an XO type of chromosomal interaction
   (C) determined when the larvae come in contact with bonellin secreted by the female
   (D) induced when the number of females becomes very large

[CG-2017]

10. Match Column - A with Column - B:

Column-A		Column-B	
(a)	Acrosome	(i)	Evocator
(b)	Neural	(ii)	Molting Induction Hormone
(c)	Alimentary	(iii)	Penetration of canal ovum
(d)	Ecdysone	(iv)	Endoderm

Choose the correct answer:

	(a)	(b)	(c)	(d)
(A)	(iii)	(i)	(iv)	(ii)
(B)	(ii)	(iii)	(iv)	(i)
(C)	(iii)	(iv)	(i)	(ii)
(D)	(i)	(ii)	(iii)	(iv)

[CG-2017]

11. During lens formation in the Xenopus, the following statements have been proposed:
    M. Lens induction can be achieved in the absence of an optic vesicle after priming the head ectoderm by the anterior neural plate.
    N. The optic vesicle can induce the presumptive trunk ectoderm to form the lens.
    O. Only the head ectoderm can respond to direct signals from the optic vesicle, to form the lens.
    P. The anterior neural plate primes the head ectoderm via BMP4 and Fgf8 prior to signals from the optic vesicle.

    Which of the above combinations is correct?
    (A) M and O (B) O and P
    (C) N and O (D) N and P

[CG-2017]

12. Segmentation genes in Drosophila are divided into three groups (gap, pair rule and segment polarity) based on their mutant phenotype. Below are some of the major genes expressed in a sequential manner (with respect to the group) affecting segmentation pattern.
    M. $Hairy \rightarrow Paired \rightarrow tailless \rightarrow patched$
    N. $Hunchback \rightarrow even-skipped \rightarrow fushi\ tarazu \rightarrow wingless$
    O. $odd-skipped \rightarrow giant \rightarrow paired \rightarrow wingless$
    P. $Tailless \rightarrow hairy \rightarrow fushi\ tarazu \rightarrow gooseberry$
    Which of the above sequence(s) of gene expressed from early to late embryo is/ are **correct**?
    (A) M and N (B) M only
    (C) P only (D) M and P

[CG-2017]

13. In tadpoles, if the tail is amputated it can regenerate. However if the tail is amputed and then exposed to retinoic acid, it develops limbs instead of regenerating the tail. This could be due to the following reason:
    M. Retinoic acid is a morphogen and induces genes responsible for limb formation.
    N. Retinoic acid raises the positional values in that region for limb development to take place.
    O. This is a random phenomenon and is not well understood
    P. Retinoic acid possibly acts as a mutagen and the phenotype observed is a result of several mutations.
    Which combination of the above statements is true?
    (A) M and O (B) M and P
    (C) N and O (D) M and N

[GJ-2017]

14. Temperature dependent sex determination (TSD) is frequently observed in one of the following chordates:
    (A) Cephalochordates (B) Fishes
    (C) Crocodilians (D) Birds

[KA-2017]

15. "Bicoid" mRNA is localized in the region of Drosophila egg.
    (A) Anterior (B) Posterior
    (C) Dorsal (D) Ventral

[KA-2017]

16. Wings of Drosophila are attached to segment.
    (A) Prothorax (B) Mesothorax
    (C) Metathorax (D) Abdomen

[MP-2017]

17. The mechanism of sex determination in Coccinia indica is through _____
    (A) XY machanism XY
    (B) Pheromonal cross talk
    (C) Hormonal regulation
    (D) XO system

[KA-2017]

18. GFP is used as a Drosophila
    (A) Reporter (B) Inhibitor
    (C) Activator (D) Enhancer

[MP-2017]

19. In mammals the power of regeneration is greatest in organ
    (A) Lung (B) Liver
    (C) Heart (D) Pancreas

[MP-2017]

20. During the development of Triturus the presence of grey crescent in egg causes
    (A) Formation of "belly"
    (B) Normal development of embryo
    (C) Abnormal development of embryo
    (D) All are correct

[WB-2017]

21. What happens when 'loss of function' mutation occurs in 'tra' and tra-z genes of Drosophila?
    (A) Both XX and XY embryo will die.
    (B) Only XX embryo will develop as male.
    (C) Only XY embryo will develop as male.
    (D) Both XX and XY embryo will develop as male

[MH-2017]

22. Drosophila fly with only one X chromosome (XO condition in the absence of Y chromosome will develop as:
    (A) Female (B) Male
    (C) Meta-male (D) Intersex

[AP-2018]

23. Out of 1090 cells produced during development of *Caenorhabditis elegans*, how many cells are normally destined to die by apoptosis?
    (A) 111 (B) 121
    (C) 131 (D) 141

[WB-2017]

24. Spemann's organizer in amphibians is
    (A) Epidermal in origin
    (B) Endodermal in origin
    (C) Mesodermal in origin
    (D) Ectodermal in origin

[TN-2017]

25. In-situ DNA nick labeling technique is used to quantitate the fraction of cells in
    (A) apoptotic pathways
    (B) S phase
    (C) M phase
    (D) G1 phase

[AP-2018]

26. Match the following:

List – I	List – II
I. ZW-ZZ	1. Grasshopper
II. ZO-ZZ	2. Drosophila
III. XX-XO	3. Hen
IV. XX-XY	4. Butterfly

Code:

	I	II	III	IV
(A)	1	4	3	2
(B)	3	2	1	4
(C)	3	4	1	2
(D)	2	4	1	3

[CG-2018]

27. The third cleavage in frog's development is:
(A) meroblastic and vertical
(B) vertical and equatorial
(C) holoblastic and unequatorial
(D) holoblastic and equatorial

[CG-2018]

28. In amphibians, when due to some injury, the eye lens is damaged, the fully differentiated iris cells can regenerate the lens. It is achieved through the following possible processor:
(M) Iris cells through some signaling undergo differentiation into lens cells to regenerate the lens.
(N) Stem cells present in iris tissue differentiate into lens cells.
(O) Iris cells transform into lens cells spontaneously.
(P) Iris cells induce in a stepwise manner, specific genes responsible for their differentiation and then conversion to lens cells.
Which of the following is correct?
(A) (M) and (N) (B) (M) and (O)
(C) (M) and (P) (D) (N) and (O)

[KA-2018]

29. The classical four wings mutant fly Drosophila melanogaster resulted from
(A) Overexpression of ultrabithorax protein
(B) Homozygous for three mutant alleles of the ultrabithorax gene
(C) Loss of abdominal A gene products
(D) Over expression of abdominal A gene products

[KA-2018]

30. Match the following:

Category-1		Category-2	
(A)	Nanos	1.	Gap gene
(B)	Bicoid	2.	Formation of anterior structures of embryo
(C)	Kruppel	3.	Segment polarity gene
(D)	Engrailed	4.	Formation of posterior structures of embryo

(A) a – 2, b – 4, c – 3, d – 1
(B) a – 4, b – 2, c – 1, d – 3
(C) a – 3, b – 1, c – 2, d – 4
(D) a – 1, b – 3, c – 4, d – 2

[KA-2018]

31. What would be the phenotype of Drosophila, when the X chromosomal: Autosomal set ratio (X: A ratio) is 0.67?
(A) Male (B) Intersex
(C) Metamale (D) Met female

[MH-2018]

32. Difference in chromosomal determination of sex between Drosophila and human is because:
(A) In Drosophila, the ratio of X chromosome to autosome determines maleness or femaleness whereas in human, the Y chromosome determines maleness.
(B) As seen in human, mere presence of two X chromosomes triggers female developmental pathway in Drosophila.
(C) In both human and Drosophila the Y chromosome determines maleness
(D) As seen in Drosophila, presence of single X chromosome in the absence of Y chromosome can tigger maleness in human.

[MH-2018]

33. Wolffian lens regeneration in Amphibia is an example of
(A) Differentiation only
(B) De-differentiation only
(C) De-differentiation followed by proliferation
(D) Trans-differentiation

[AP-2019]

34. The egg of the following group contains the nucleus of Pander
(A) Mammal (B) Hen
(C) Frog (D) Reptile

[AP-2019]

35. The following fetal membranes consist of ecto and endoderm
(i) Yolk sac
(ii) Amnion
(iii) Chorion
(iv) Allantois
(A) (i) and (ii) are correct
(B) (ii) and (iii) are correct
(C) (iii) and (iv) are correct
(D) (i) and (iv) are correct

[AP-2019]

36. The correct sequence of appearance of the following during development of central nervous system of vertebrate
(i) Neural plate
(ii) Neural groove
(iii) Neural tube
(A) (iii)→(ii) →(i) (B) (ii) →(i) →(iii)
(C) (i) →(ii) →(iii) (D) (ii) →(iii) →(i)

[AP-2019]

37. The transcription factors necessary for eye lens induction
(i) SOX 9
(ii) SOX 2
(iii) PAX 6
(iv) DAX 1
The correct combination is
(A) (ii) and (iii) (B) (i) and (ii)
(C) (iii) and (iv) (D) (i) and (iv)

[CG-2019]

38. Match the following from Group - I with Group-II:

Group-I		Group-II	
a	Auditory placode	i	Changing cell shape
b	External gills	ii	Mesoderm
c	Microfilaments	iii	Protrusions of epidermis
d	Notochord	iv	Lateral line sense organ
e	Colouration in Insects	v	Cooperation of genes
f	Hormonal control of development	vi	Mammary gland development in mice

Code:

	(a)	(b)	(c)	(d)	(e)	(f)
(A)	(iv)	(ii)	(v)	(ii)	(i)	(vi)
(B)	(iv)	(iii)	(i)	(ii)	(v)	(vi)
(C)	(iii)	(ii)	(i)	(vi)	(v)	(iv)
(D)	(ii)	(iii)	(i)	(iv)	(vi)	(v)

[MH-2019]

39. Hox genes are critical for the proper placement of segment structures of animals during early embryonic development except:
(A) Different vertebrae of humans
(B) Caecum in humans
(C) Antennae in fruit flies
(D) Wings in fruit flies

[MH-2019]

40. ..... is involved in the specification of germ cells in all animals studies
(A) Sry (B) Sox 9
(C) Wnt 4 (D) Vasa

[KA-2020]

41. During morphogenesis, the formation of anterior structure in the Drosophila embryo requires the product of _____ gene.
(A) Hunchback (B) Pax-6
(C) Bicoid (D) Nanos

[KA-2020]

42. Which of the following is the master gene involved in sex determination in Drosophila?
(A) Sxl (B) Sdc
(C) Xol (D) Nanos

[WB-2020]

43. Which of the following pair of proteins regulate production of anterior structure in Drosophila embryo?
(A) Bicoid and Nanos
(B) Bicoid and Hunchback
(C) Caudal and Nanos
(D) Caudal and Hunchback

[KA-2020]

44. Products of maternal genome molecules that are placed in the Drosophila egg are
(A) DNA (B) Proteins
(C) RNA (D) Enzyme

[KA-2021]

45. The gene that is NOT involved in body patterning in Drosophila
(A) Gap gene
(B) Segment polarity gene
(C) SXL gene
(D) Pair rule gene

[KA-2021]

46. Which one of the following is maternally contributed RNA in the early development of Drosophila embryo?
(A) Sevenless (B) Engrail
(C) Bicoid (D) Wingless

[KA-2021]

47. In vertebrates the combination of Pax 6, Sox 2, Sox 3 and L-Maf transcription factors in the ectoderm of optic vesicle ensures the production of eye
(A) Retina (B) Lens
(C) Lid (D) Cornea

[AS-2021]

48. Match the items of Column-I with those of Column-II and select the correct match by using the codes given below:

Column-I	Column-II
(a) Yolk Sac	1. elimination of metabolic waste
(b) Chorion	2. shock absorption
(c) Allantois	3. food storage and digestion
(d) Amnion	4. exchange of substance between mother and embryo

Codes:

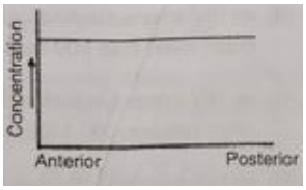
	(a)	(b)	(c)	(d)
(A)	4	3	1	2
(B)	4	3	2	1
(C)	3	4	2	1
(D)	3	4	1	2

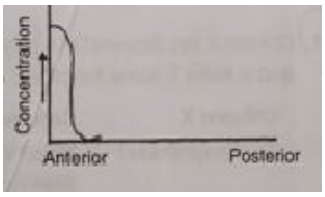
[AS-2021]

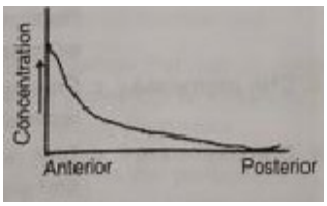
49. The anteroposterior axis in Drosophila is created by the regional synthesis of transcription factor encoded by the
(A) Bicoid and Nanos protein
(B) Hunchback and Caudal genes
(C) Twist and Snail genes
(D) Zerknult and Decapentaplegic

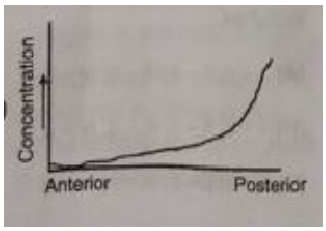
[JK-2022]

50. The level of bicoid protein was measured in early cleavage embryo of Drosophila.
Which one of the following graphs is a correct representation of bicoid gradient along the anterior-posterior axis?

(A) 

(B) 

(C) 

(D) 

[MH-2023]

51. The folding of sheet of cells, the migration of cells and apoptosis are all mechanisms of:
(A) cleavage pattern (B) pattern formation
(C) morphogenesis (D) differentiation

[RJ-2023]

52. What could be the possible reason that prevents the cell adjacent to the progenitor vulva cell from differentiating into the vulva cell in *C. elegans*?
(A) Inability of these cells to bind and respond to LIN 3-signaling.
(B) These cells are too far to receive LIN 3 signal.
(C) These cells undergo apoptosis by receiving signals from hypodermal cell.
(D) Cells deactivate LIN 3 signal due to condensed chromatin in the regions responsive to LIN 3 signal.

[RJ-2023]

53. There are signaling centers responsible for vertebrate limb development. Which of the following is responsible for specification of the limb field?
(A) TGF-B (B) Retinoic acid
(C) Hox (D) FGF

[MH-2023]

54. In chick, gastrulation involves inward movement of cells through the:
(A) Blastoderm (B) Yolk
(C) Cleavage furrow (D) Primitive streak

[RJ-2023]

55. Embryonic development in Drosophila is an orderly sequence of change and is controlled by the differential expression of genes. Which one of the following genes are egg polarity gene in development of Drosophila?
(A) Hox
(B) caudal and hunchback
(C) Gap gene
(D) hedgehog and wingless

[RJ-2023]

56. Which of the following is the homologue of β-catenin in Drosophila?
(A) Armadillo (B) Engrailed
(C) Fushi tarazu (D) Cubitus interruptus

[RJ-2023]

57. Which one of the following is the primary organizer in case of chick development?
(A) Brachet's cleft
(B) Spemann's organizer
(C) Nieuwkoop centre
(D) Hensen's node

[RJ-2023]

58. You are doing research on fruit flies and if there would be a mutation occurring in a homeotic gene, which of the following developmental abnormalities would be observed by you?
1. A fly with the correct number of segments has two additional thoracic segments and two less abdominal segments.
2. One abdominal segment has legs.
3. Four abdominal segments will be, missing
(A) 1 and 3 (B) 2 and 3
(C) 1 and 2 (D) only 3

[WB-2023]

59. A researcher obtained one Drosophila specimen with four wings. He exclaimed this as a bizarre phenotype, as Drosophila is a dipteran insect. He screened out the gene responsible for this mutation. What gene he could identity for this bizarre phenotype?
(A) Exuperantia (exu) (B) Krüppel (kr)
(C) Torso (tor) (D) Ultrabithorax (ubx)

[WB-2023]

60. A researcher injected exogenous ß-catenin at the future ventral side of a Xenopus gastrula. What result did he obtain?
(A) No change in embryonic development.
(B) The embryo failed to form its anterior-posterior axis.
(C) A secondary body axis developed at the injected side.
(D) Dorsal lip of the blastopore degenerated.

[MP-2023]

61. Face of cisternae forming Dictyosome is having:
(A) Proximal face generally convex
(B) Distal face generally concave
(C) Proximal face generally concave
(D) Distal face generally convex

[MP-2023]

62. The best known cell line obtained from Human Carcinoma is:
(A) BHK cells (B) CHO cells
(C) L and 3T3 cells (D) HeLa cells

[MH-2024]

63. Which of the following signalling molecules plays a key role in the patterning of neural tube along its anterior-posterior axis?
(A) Wnt4 (B) BMP4
(C) FGF4 (D) Retinoic acid.

[MH-2024]

64. Which one of the following extra embryonic membrane found as unique feature in terrestrial vertebrates only?
(A) Yolk sac (B) Chorion
(C) Allantois (D) Amnion

(NE-SLET-2024)

65. Match the items of Column-I with those of Column-II and select the correct match by using the codes given below:

Column-I (Structures)	Column-II (Originated from)
(a) Retina	1. Endodermal cells
(b) Nephric tubules.	2. Ectodermal cells
(c) Pigment pattern of skin	3. Neural crest cells
(d) Allantois	4. Mesodermal cells

Codes:

	(a)	(b)	(c)	(d)
(A)	4	2	1	3
(B)	2	4	3	1
(C)	2	3	1	4
(D)	1	3	4	2

(NE-SLET-2024)

66. Select the correct answer from the following statements using codes:
(i) Homeobox is a part of the promoter in eukaryotic genes that code for proteins involved in segmentation.
(ii) DNA triple helix formation requires Hydrogen bonding and Hoogstien bonding.
(iii) cl gene of phage lambda encodes the lambda repressor which represses the lytic cycle.
(iv) Homeobox is a conserved DNA sequence found in genes that code for proteins that regulate development.

Codes:

	(i)	(ii)	(iii)	(iv)
(A)	True	True	False	False
(B)	False	False	True	True
(C)	False	True	True	True
(D)	True	False	False	True

[CG-2024]

67. Match the following-

Column (A)	Column (B)
(I) Invagination	(a) Involution
(II) Delamination	(b) Chordamesoderm
(III) Inward rotation of cell	(c) Insinking
(IV) Primary organizer	(d) Mass separation

Code:
(A) I-a, II-b, III-c, IV-d (B) I-d, II-c, III-b, IV-a
(C) I-c, II-d, III-a, IV-b (D) I-a, II-d, III-c, IV-b

[CG-2024]

68. In meridional plane of cleavage, the cleavage furrow-
(A) Passes through Animal-Vegetal Axis
(B) Passes through Horizontal axis
(C) Passes Above the equator
(D) Passes Below the equator

[WB-2024]

69. In Drosophila, bicoid (bcd) gene controls embryonic gene expression by transcriptional activation and translational repression. If bcd mRNA is injected at the middle of a bicoid mutant (bcd) Drosophila embryo, what would be the expected phenotype?
(A) Normal body segmentation will occur
(B) Formation of acron at both the termini
(C) Formation of telson at both the termini and head at the middle
(D) Absence of telson and abdomen

[WB-2024]

70. A decrease in Bcl-2/Bax ratio will impact a cell by
    (A) preventing apoptosis
    (B) inducing apoptosis
    (C) inducing metastasis
    (D) inducing growth

[WB-2024]

71. A researcher was observing tail regeneration of Planeria injecting with RNAi for β-catenin mRNA into the blastema. What would be the expected result of his experiment?
    (A) Planeria with an extended tail
    (B) Planeria with two tails
    (C) Planeria with heads at both ends
    (D) Planeria with regeneration of a normal tail

[MP-2024]

72. The portion of the Drosophila body plan which will produce the wings is called:
    (A) Telson (B) Dorsal
    (C) Abdomen (D) Thorax

[MP-2024]

73. Neural crest cells taking the dorsolateral route will become:
    (A) Dorsolateral route ganglion
    (B) Sympathetic ganglion
    (C) Adrenal Medulla
    (D) Melanocytes

[GJ-2024]

74. What is the primary factor responsible for proliferation of blastemal cells during limb regeneration in salamanders?
    (A) Fgf8 from neurons only
    (B) Fgf8 from AEC and newt Anterior Gradient protein from neurons
    (C) newt Anterior Gradient protein from AEC and Fgf8 from neurons
    (D) newt Anterior Gradient protein from neurons only

[GJ-2024]

75. Which of the following morphogenetic movements can be defined as the splitting of one cellular sheet into two sheets?
    (A) Involution (B) Ingression
    (C) Epiboly (D) Delamination

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

Unit-5.4:- Morphogenesis and Organogenesis in Plants:

Organization of Shoot and Root Apical Meristem; Shoot and Root Development; Leaf Development and Phyllotaxy; Transition to Flowering, Floral Meristems and Floral Development in Arabidopsis and Antirrhinum

[KA-2015]

1. The term homeobox refers to
   (A) A specific nucleotide sequence of some genes that regulate development
   (B) A group of genes that determine polarity during development
   (C) Glycoproteins that assist cells during morphogenetic movements
   (D) Peptide sequence of aminoacids that turn other genes on or off

[GJ-2016]

2. Male gametophyte in Angiosperms possesses:
   (A) One vegetative cell and two male gametes
   (B) One vegetative cell and one male gamete
   (C) Two vegetative cells and two male gametes
   (D) Two vegetative cells and one male gamete

[KA-2016]

3. Petals are formed in the 2nd Whorl due to
   (A) Class A genes (B) Class A+B genes
   (C) Class B+C genes (D) Class C genes

[AP-2017]

4. If a leaf cell of an angiosperm plant had 24 chromosomes, then its stigma cell, antipodal cell and endosperm nucleus would contain:

(A) 12, 24 and 36 chromosomes respectively
(B) 24, 12 and 24 chromosomes respectively
(C) 12, 36 and 24 chromosomes respectively
(D) 24, 12 and 36 chromosomes respectively

[MH-2017]

5. Polyembryony is reported in the:
(A) Mango (B) Wheat
(C) Jowar (D) Ragi

[GJ-2017]

6. The chief component of exine of a mature pollen grain is:
(A) Cellulose (B) Lipid
(C) Suberin (D) Sporopollenin

[GJ-2017]

7. In sporophytic self-incompatibility, rejection of male gametophyte occurs at the level of:
(A) Stigma surface (B) Ovary
(C) Stylar canal (D) Micropyle

[KA-2017]

8. The hormone responsible for moulting in insects is
(A) Brain hormone (B) Diapause hormone
(C) Ecdysone (D) Juvenile hormone

[MH-2017]

9. Somatic embryos obtained from cotyledonary explant of a diploid plant will be:
(A) Diploid (B) Haploid
(C) Triploid (D) Tetraploid

[MH-2017]

10. In mature coconuts the liquid endosperm becomes milky and
(A) it does not contain free nucleior cells
(B) it contains free nuclei only
(C) it contains cells only
(D) it contains free nuclei or cells.

[MH-2017]

11. Regeneration of plants avoiding fertilization is known as:
(A) Apogamy (B) Apospory
(C) Diplospory (D) Syngamy

[MH-2017]

12. A pentacarpellary, pentalocular ovary has 2 ovules per locule. It develops into parthenocarpic fruit. The number of seeds in the fruit will be:
(A) 20 (B) 10
(C) 40 (D) 00

[WB-2017]

13. Floral organ is controlled by overlapping expression of 'A' class, 'B' class and 'C' class genes in different whorls. In an Arabidopsis mutant, the flowers had sepals, sepals, carpels and carpels in four whorls. Mutation in which one of the following is the cause of such mutant phenotype?
(A) A class gene alone (B) B class gene alone
(C) A and B class genes (D) C class gene alone

[TN-2017]

14. Studying the following events, prescribe the correct sequence of events for fertilization in plants
(i) anthesis of flower
(ii) pollen-pistil interactions
(iii) dehiscence of anther
(iv) degeneration of synergids
(A) i->ii->iii->iv->v (B) i->ii->iv->iii->v
(C) i->iv->ii->iii->v (D) i->iii->ii->iv->v

[TN-2017]

15. If a loss of function mutation occurs in B-type genes of Arabidopsis, what will be the composition of the floral whorl
(A) Sepal-Petal-Stamens- Carpel
(B) Sepal-Sepal- Stamen-Carpel
(C) Sepal-Sepal-Carpel-Carpel
(D) Petal –Petal- Stamen- Stamen

[TN-2017]

16. Study the statements on plant reproduction and match terms in List I with those in List II:

List I		List II	
I.	Filiform apparatus	(i)	Transfer of pollen nucleus to the stigma
II.	Triple fusion	(ii)	Seedless fruit formation
III.	Pollination	(iii	Transfer of pollen nucleus into egg
IV	Parthenocarpy	(iv	Fusion of polars with male gamete

Code:
(A) I –ii; II – ii; III – iii; IV – iv
(B) I – iii; II – iv; III – i; IV – ii
(C) I – iv; II – iii; III – i; IV – ii
(D) I – iii; II – i; III – ii; IV – iv

[KA-2018]

17. What is meant by the word "Whorl" in discussing floral meristem?
(A) When leaf primordia first arise, they arise in a pattern described as "Whorl"
(B) Flowers consist of four different types of organs which occur in concentric rings called "Whorl"
(C) The floral meristem has to spin around during flower formation; the process is named "Whorl"
(D) The six stamens in a dicot flower like that of Arabidopsis form a ring that is called the flower's "Whorl"

[AP-2018]

18. Which of the following pairs is not correctly matched?

(A) Release of more than 2 sperms in an embryo sac is called polyspermy
(B) Polysiphonous pollen grains are present in HaWa neglecta
(C) Nucellar adventive embryony is common in Mangifera
(D) Endothelium is helpful in the dehiscence of anther at maturity

[AP-2018]

19. In Plumbago zeylanica, the pollen is 3-celled and the two sperms and the vegetative nucleus occur in intimate association.
Find out the correct sequence of their association.
I. Smaller sperm
II. Vegetative nucleus
III. Larger sperm
(A) I, II and III (B) III, II and I
(C) II, III and I (D) III, I and II

[WB-2018]

20. Which of the following genes is a floral repressor?
(A) CONSTANS (CO)
(B) FLOWERING D (F(D)
(C) SUPPRESSION OF OVEREXPRESSION OF CONSTANS 1 (SOC I)
(D) FLOWERING LOCUS (FL(C)

[AP-2019]

21. Match the following:

List I	List II
1. Pig	a. Cotyledenary
2. Monkey	b. diffuse
3. Dog	c. Bidiscoidal
4. Cattle	d. Zonary

(A) 1-c, 2-a, 3-d, 4-b (B) 1-d, 2-a, 3-b, 4-c
(C) 1-b, 2-c, 3-d, 4-a (D) 1-d, 2-c, 3-a, 4-b

[MH-2019]

22. With reference to plants, micropropagation in vitro means:
(A) Propagation of tiny plants
(B) Production of a large number of progeny plants
(C) Production of plants at microlevel
(D) Production of plants from microspores

[GJ-2019]

23. Major distinction in the growth and development of plants and animals is :
(A) Animals follow fixed pattern and plants follow modular pattern
(B) Animals follow modular pattern and plants follow fixed pattern
(C) Plants follow fixed pattern and animals follow infinite pattern
(D) Animals follow inconsistent pattern and plants follow fixed pattern

[CG-2019]

24. During which one of the following stages of Arabidopsis embryogenesis, cell elongation throughout the embryonic axis and further development of the cotyledon occur?
(A) Torpedo stage (B) Heart stage
(C) Globular stage (D) Mature stage

[CH-2019]

25. Choose correct statement.
(a) The embryo sac of Allium is regarded as bisporic.
(b) The formation of embryo sac of Allium take place by participation of two nuclei derived from meiosis
(A) Both (a) and (b) are correct.
(B) (a) is correct, but (b) is incorrect.
(C) (a) is incorrect, but (b) is correct.
(D) Both (a) and (b) are incorrect.

[CH-2019]

26. Out of the following options, are the functions of MADS box-containing genes in plants correct?
(a) Floral organ identity
(b) Development of root, seed and flower
(c) Development of stomata
(d) Development of chromatin
(A) (a) and (b) (B) (b) and (c)
(C) (c) and (d) (D) (d) and (a)

[MH-2019]

27. The term anthesis refers to:
(A) Formation of an anther (B) Opening of a flower
(C) Development of flower (D) Dehiscence of anther

[AP-2019]

28. During the development of a dorsiventral leaf, the following layers are present. Arrange them in the correct sequence from adaxial side to abaxial side.
(i) Inner layers of spongy parenchyma
(ii) Outer layers of palisade parenchyma
(iii) Outer layers of spongy parenchyma
(iv) Inner layers of palisade parenchyma
(v) Vascular bundle
(A) (iv), (ii), (v), (i) and (iii)
(B) (ii), (iv), (v), (i) and (iii)
(C) (ii), (iv), (v), (iii) and (i)
(D) (iv), (ii), (v), (iii) and (i)

[KA-2020]

29. During microsporogenesis the tapetum is formed from
(A) Sporogenous cells (B) Parietal cells
(C) Epithelial cells (D) Endogenous cells

[KA-2020]

30. Floral development in Arabidopsis and Antirrhinium is under genetic control of genes.
(A) Gurke (B) Homeotic
(C) Hobbit (D) Fackel

[MH-2020]

31. Androgenesis in plants refers to:
(A) development of androecium
(B) development of anthers
(C) development of haploid embryo from microspores of pollen in vitro
(D) Initiation of androecium

[MH-2020]

32. Arabidopsis plants have 10 chromosomes (5 pairs) in their somatic cells. How many chromosomes are present in each of the following?
(i) egg cell nucleus in the female gametophyte
(ii) generative cell nucleus in a pollen grain
(iii) endosperm nucleus
(iv) fertilized egg nucleus
(A) 5, 5, 15, 10 (B) 5, 5, 10, 15
(C) 15, 10, 5, 5 (D) 10, 15, 5, 5

[GJ-2021]

33. Formation of seed without fertilization is called
(A) Apomixis (B) Parthenocarpy
(C) Vegetative reproduction (D) Sexual reproduction

[GJ-2021]

34. AGAMOUS gene is involved in the development of
(A) Leaf development (B) Shoot development
(C) Carpel development (D) Root development

[GJ-2021]

35. Following are the various events that occur during the development of embryo Sac in plants. Identify the correct order
1. PCD of haploid megaspores
2. MMC formation
3. Movement of the polar nuclei towards the centre
4. Cellularization of the embryo sac
5. Functional Megaspore (FM) formation
6. Egg cell formation
(A) 2.1.5,3,4,6 (B) 2,1,3,6,45
(C) 1,3,5,4,6,2 (D) 5,4,3,6,2,1

[GJ-2021]

36. CLAVATA (CLV) genes are expressed in
(A) Sieve elements
(B) Tracheary elements
(C) Wood parenchyma
(D) Shoot apical meristem
(E) Golgi body

[GJ-2021]

37. According to ABC mode of flower development, what will be the flower organization
A class of gene is mutated
(A) sepal-sepal-carpel-carpel
(B) sepal-petal-carpel-carpel
(C) sepal-petal-stamen-carpel
(D) carpel-stamen-stamen-carpel

[GJ-2021]

38. During leaf primordium development, transition of stem cells into actively dividing cells by the activity of
(A) WUSCHEL and CLAVATA expression in the rib zone and central zone of the shoot apical meristem respectively
(B) KNOT gene expression in the shoot apical meristem
(C) Auxin accumulation in the shoot apical meristem
(D) KNOX gene expression in the shoot apical meristem

[KA-2021]

39. In ABC model of flower development in Arabidopsis thaliana, B+C determines the development of
(A) Sepals (B) Petals
(C) Carpels (D) Stamens

[KA-2021]

40. Embryo sac in plants represents
(A) Megasporangium
(B) Megaspore
(C) Male gamete
(D) Female gametophyte

[MH-2021]

41. Which of the following statements about LEAFY (LFY), a regulatory gene in Arabidopsis thaliana, is correct?
(A) LFY is involved in floral meristem identity
(B) LFY is involved in leaf expansion
(C) LFY is involved in root meristem identity
(D) LFY is involved inshoot differentiation

[GJ-2022]

42. Following are the various events that occur during the development of embryo sac in plants. Identify the correct order.
1. PCD of haploid megaspores
2. MMC formation
3. Movement of the polar nuclei towards the centre
4. Cellularization of the embryo sac
5. Functional Megaspore (FM) formation
6. Egg cell formation.
(A) 2, 1, 5, 3, 4, 6 (B) 2, 1, 3, 6, 4, 5
(C) 1, 3, 5, 4, 6, 2 (D) 5, 4, 3, 6, 2, 1

[GJ-2022]

43. Embryo sac of angiosperm is
(A) 6-celled 8-nucleate
(B) 7-celled 8-nucleate
(C) 8-celled 7-nucleate
(D) 7-celled 7-nucleate

[WB-2022]

44. Which of the following statements is not correct for the tapetum, the innermost layer of the anther wall?

(A) It is composed of a single layer of cells characterized by dense cytoplasm and prominent nucleus.
(B) It draws nutrients from the developing microspores
(C) It synthesizes enzymes that degrade the callose wall for the release of microspores.
(D) It plays an important role in the pollen wall formation.

[JK-2022]

45. CLAVATA-WUSCHEL genes are expressed in
(A) Sieve elements
(B) Tracheary elements
(C) Wood parenchyma
(D) Shoot apical meristem

[RJ-2023]

46. A mutation in a representative dicot plant resulted into having floral organs as sepal, petal, petal sepal. According to ABC model of flowering which class mutation is responsible for such class gene of alteration?
(A) Mutation in B gene
(B) Mutation in A gene
(C) Mutation in A and B.
(D) Mutation in C gene

[MH-2023]

47. Which of the following statements about embryo sac development in plants is NOT CORRECT?
(A) Embryo sac is mostly a 7-celled structure
(B) Plumbago type of embryo sac is derived from four megaspore nuclei
(C) Synergids are elongated cells present at the micropylar end of the embryo sac
(D) Polygonum type of embryo sac is derived from the micropylar megaspore of the tetrad and is eight nucleate

[WB-2023]

48. During fertilization, which part of the female gametophyte is responsible for pollen tube growth arrest—a task that plays a significant role in zygote formation?
(A) Central cell (B) Synergids
(C) Antipodals (D) Egg cell

[WB-2023]

49. Which of the following class of genes maintains the boundary of floral organ development?
(A) Meristem identity genes
(B) Cadastral genes
(C) Organ identity genes
(D) Lateral primordium identity genes

[GJ-2019]

50. WUSCHEL expression is associated with:
(A) Tracheary elements
(B) Shoot apical meristem
(C) Sieve elements
(D) Root apical meristem'

[MH-2024]

51. In watermelons, to induce seedlessness in triploid population, which of the following strategies is useful?
(A) Self-pollinate resistant triploids
(B) Cross unrelated triploids
(C) Select for unreduced gametes in triploids
(D) Cross tetraploids with diploids to produce triploids

[WB-2024]

52. In Arabidopsis, apico-basal polarity during embryogenesis is established by which of the following genes?
(A) FACKEL (B) SHORT ROOT
(C) GNOM (D) GURKE

[WB-2024]

53. Which of the following embryo sacs comprises of an egg apparatus of three haploid cells, three diploid antipodal cells and a central cell with two polar nuclei of which one is haploid and the other is triploid?
(A) Adoxa type (B) Allium type
(C) Polygonum type (D) Fritillaria type

[MP-2024]

54. In plant tissue culture, what does the term organogenesis mean?
(A) Formation of callus culture
(B) Formation of root and shoot from callus culture
(C) Genesis of plants
(D) None of the above

[GJ-2024]

55. In which of the following zones do we find stem cells in Arabidopsis root?
(A) Transition zone
(B) Meristematic zone
(C) Elongation zone
(D) Differentiation zone

[GJ-2024]

56. Through which receptor do follicle cells receive the Gurken signal in Drosophila?
(A) Toll (B) Brat
(C) Torpedo (D) Pumilio

Answer Key									
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
A	A	B	D	A	B	A	C	A	C
11	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
A	D	B	D	C	B	B	B	C	D
21	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
C	B	A	A	C	A	B	B	B	B
31	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**
C	A	A	C	A	D	D	D	D	D
41	**42**	**43**	**44**	**45**	**46**	**47**	**48**	**49**	**50**
A	A	B	B	D	B	D	B	B	B
51	**52**	**53**	**54**	**55**	**56**				
D	C	D	B	B	C				

Unit-5.5: Programmed Cell Death, Aging and Aenescence

[JK-2016]

1. Which one of the cellular organelle is the most sensitive indicator of cellular injury?
   (A) Peroxisomes (B) Mitochondria
   (C) Lysosomes (D) Ribosomes

[KA-2016]

2. Caspase 3 helps in
   (A) Activation of cells (B) Inhibition of cells
   (C) Apoptosis of cells (D) Division of cells

[MH-2016]

3. Caspases are the effectors of apoptosis belonging to the family of:
   (A) Lipases (B) Proteases
   (C) Kinases (D) Phosphatases

[MH-2016]

4. The terminal caspase of intrinsic pathway is:
   (A) Caspase 9 (B) APAF-1
   (C) Caspase 3 (D) Caspase 8

[MH-2017]

5. Hallmark of Apoptosis is:
   (A) DNA synthesis
   (B) Nuclear fragmentation
   (C) Nuclear division
   (D) Fat deposition

[AP-2017]

6. Identify the pro-apoptotic protein from the following:
   (a) Bax
   (b) Bad
   (c) Bcl-2
   (d) Bcl-xl
   (A) (a) and (b) (B) (b) and (c)
   (C) (c) and (d) (D) (a) and (d)

[CG-2017]

7. Caspases, the enzymes of cell death are:
   (A) Cysteine protease (B) Serine proteases
   (C) Endoproteases (D) Exoproteases

[CG-2017]

8. The steps of apoptosis can be summarized as follows:
   (a) Activation of the cysteine protease ced-3 by oligomerization with ced-4
   (b) apoptosis inhibitor ced - 9 and the apoptosis inducer egl - 1 regulate the activity of ced - 3 ced - 4 complex.
   (c) ced - 4 counterpart in the mammalian apoptosis is apoptotic protease activating factor 1, Apaf-1
   (d) ced - 3 is the single member of cysteine proteases family in (C)elegans
   (e) *egl* - 1 and ced - 9 are members of the Bcl-2 family of pro-or antiapoptotic proteins
   Choose the correct answer:
   (A) (a) → (b) → (c) → (d) → (e)
   (B) (b) → (c) → (d) → (e) → (a)
   (C) (c) → (d) → (e) → (a) → (b)
   (D) (d) → (e) → (a) → (b) → (c)

[GJ-2019]

9. Which cellular organelle is most active in apoptosis?
   (A) Mitochondria (B) Golgi body
   (C) Nucleus (D) Ribosome

[KA-2017]

10. Identify the correct statement with reference to "Apoptosis".
    (A) It does not lead to the elimination of cells
    (B) It's a process of programmed cell death that occurs in multicellular organisms
    (C) The process of apoptosis is not blocked in cancer cells
    (D) It occurs only in animal cells

[KA-2018]

11. Apoptosis, a process of cell death in living organism occurs
    (A) In HIV infected cells
    (B) Naturally as a part of normal cellular development
    (C) In carcinogenic cells
    (D) Due to malnutrition

[CG-2018]

12. Apoptosis is due to
    (A) PCR (B) PCD
    (C) PGR (D) PGD

[KA-2020]

13. Caspases are involved in the process of
    (A) DNA replication
    (B) Recombination
    (C) Apoptosis
    (D) Antibody synthesis

[GJ-2021]

14. Which cellular organelle is most active in apoptosis?
    (A) Nucleus (B) Ribosome
    (C) Chloroplast (D) Mitochondria

[KA-2021]

15. Which cellular organelles are involved in the initiation of the intrinsic pathway of apoptosis?
    (A) Endoplasmic reticulum
    (B) Lysosomes
    (C) Mitochondria
    (D) Peroxisomes

[AS-2021]

16. Choose the correct answer from the following, which is TRUE about the apoptotic process using codes:
    (a) Anti-apoptotic protein Bcl-2 is located in the mitochondrial inner membrane.
    (b) Apoptotic protein BAX resides in cytosol and translocates into mitochondria in response to death stimuli.
    (c) During apoptosis, there is an increase in osmotic pressure inside the cell causing the cell to swell and burst and result in cell-death.
    (d) Cytochrome c is released from lysosome into cytosol to kill the cell.

    Codes:
    (A) a-False, b-True, c-False, d-False
    (B) a-True, b-True, c-False, d-False
    (C) a-False, b-True, c-True, d-True
    (D) a-False, b-False, c-True, d-False

Answer Key									
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
B	C	B	C	B	A	A	A	A	B
11	**12**	**13**	**14**	**15**	**16**				
B	B	C	D	C	B				