DPP - Daily Practice Problems

Chapter-wise Sheets

Date : _____ **Start Time :** _____ **End Time :** _____

BIOLOGY CB09

SYLLABUS : Biomolecules

Max. Marks : 180 **Marking Scheme :** + 4 for correct & (–1) for incorrect **Time : 60 min.**

INSTRUCTIONS : This Daily Practice Problem Sheet contains 45 MCQs. For each question only one option is correct. Darken the correct circle/ bubble in the Response Grid provided on each page.

1. A nucleotide is formed of
(a) Purine, pyrimidine and phosphate
(b) Purine, sugar and phosphate
(c) Nitrogen base, sugar and phosphate
(d) Pyrimidine, sugar and phosphate

2. Glycogen is a polymer of
(a) galactose (b) glucose
(c) fructose (d) sucrose

3. Most abundant organic compound on earth is
(a) Protein (b) Cellulose
(c) Lipids (d) Steroids

4. Protein synthesis in a cell takes place
(a) only in the cytoplasm
(b) in the nucleolus as well as in cytoplasm
(c) in cytoplasm as well as in mitochondria
(d) only on ribosomes attached to the nuclear envelope

5. In RNA, thymine is replaced by
(a) Adenine (b) Guanine
(c) Cytosine (d) Uracil

6. Which of the following is a reducing sugar?
(a) Galactose (b) Gluconic acid
(c) β-methyl galactoside (d) Sucrose

7. An enzyme that can stimulate germination of barley seeds is
(a) lipase (b) protease
(c) invertase (d) α-amylase

8. Carrier ions like Na^+ facilitate the absorption of substances like:
(a) amino acids and glucose
(b) glucose and fatty acids
(c) fatty acids and glycerol
(d) fructose and some amino acids

RESPONSE GRID					
1. ⓐⓑⓒⓓ	2. ⓐⓑⓒⓓ	3. ⓐⓑⓒⓓ	4. ⓐⓑⓒⓓ	5. ⓐⓑⓒⓓ
6. ⓐⓑⓒⓓ	7. ⓐⓑⓒⓓ	8. ⓐⓑⓒⓓ		

Space for Rough Work

9. An enzyme brings about
(a) decrease in reaction time
(b) increase in reaction time
(c) increase in activation energy
(d) reduction in activation energy

10. The enzymes hexokinase which catalyses glucose to glucose-6-phosphate in glycolysis is inhibited by glucose-6-phosphate. This is an example of
(a) competitive inhibition
(b) non-competitive inhibition
(c) feedback allosteric inhibition
(d) positive feedback

11. The enormous diversity of protein molecules is due mainly to the diversity of
(a) amino groups on the amino acids
(b) R groups on the amino acids
(c) amino acid sequences within the protein molecule
(d) peptide bonds

12. Length of one turn of the helix in a B-form DNA is approximately
(a) 3.4 nm (b) 2 nm
(c) 0.34 nm (d) 20 nm

13. The catalytic efficiency of two different enzymes can be compared by the
(a) formation of the product
(b) pH optimum value
(c) K_m value
(d) molecular size of the enzyme

14. Which of the following sets contains polysaccharides?
(a) Glucose, fructose, lactose
(b) Starch, glycogen, cellulose
(c) Sucrose, maltose, cellulose
(d) Galactose, starch, sucrose

15. Sigmoid growth curve is represented by
(a) $dN/dt = rN$
(b) $dN/dt = rN (1 – N/K)$
(c) $Nt = N_0 + B + I – D – E$
(d) $dN/dt = 1 – N/K$

16. A coenzyme is
(a) Same enzyme that occurs in different tissues such as heart and muscle
(b) One that shares the function of other enzyme
(c) Organic or inorganic in nature and helps activate metabolic enzymes
(d) Organic non-protein in nature and helps to activate metabolic enzymes

17. The most basic amino acid is
(a) Arginine (b) Histidine
(c) Glycine (d) Glutamine

18. Which of the following is not an aromatic amino acid?
(a) Valine (b) Tyrosine
(c) Phenylalanine (d) Tryptophan

19. The class of enzymes that catalyze the removal of a group from a substrate without addition of water, leaving double bonds, is
(a) Transferases (b) Dehydrogenases
(c) Hydrolases (d) Lyases

20. Which of the following is a component of vitamin (thiamine, biotin), Acetyl CoA, cysteine, methionine and ferredoxin?
(a) Fe (b) S
(c) Co (d) K

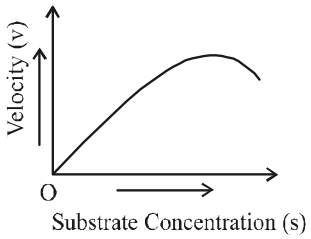
21. The helical structure of protein is stabilized by
(a) Ester (b) Peptide bonds
(c) Disulphide bonds (d) Hydrogen bonds

22. Cellulose is a polymer of
(a) α-glucose (b) α-D-glucose
(c) β-D-glucose (d) β-L-glucose

RESPONSE GRID					
9. ⓐⓑⓒⓓ	10. ⓐⓑⓒⓓ	11. ⓐⓑⓒⓓ	12. ⓐⓑⓒⓓ	13. ⓐⓑⓒⓓ
14. ⓐⓑⓒⓓ	15. ⓐⓑⓒⓓ	16. ⓐⓑⓒⓓ	17. ⓐⓑⓒⓓ	18. ⓐⓑⓒⓓ
19. ⓐⓑⓒⓓ	20. ⓐⓑⓒⓓ	21. ⓐⓑⓒⓓ	22. ⓐⓑⓒⓓ	

Space for Rough Work

23. The given graph shows the effect of substrate concentration on the rate of reaction of the enzyme green -gram - phosphatase. What does the graph indicate ?

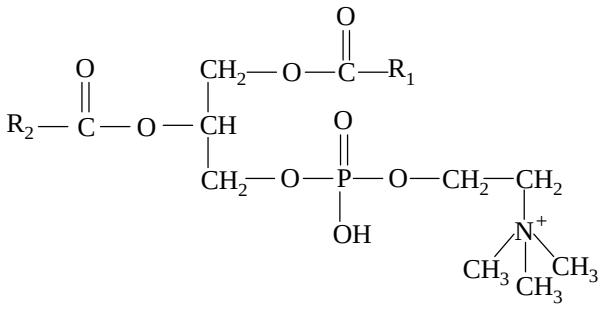


(a) The rate of enzyme reaction is directly proportional to the substrate concentration
(b) Presence of an enzyme inhibitor in the reaction mixture
(c) Formation of an enzyme-substrate complex
(d) At higher substrate-concentration the pH increases.

24. The Km value of the enzyme is the value of the substrate concentration at which the reaction reaches to
(a) Zero (b) 2 Vmax
(c) ½ Vmax (d) ¼ Vmax

25. Which group contains biocatalysts?
(a) Myosin, oxytocin, adrenalin
(b) Peptidase, amylase, rennin
(c) Glucose, amino acids, fatty acids
(d) Rhodopsin, pepsin, steapsin

26.



Given structural formula is correctly identified alongwith its related function by which of the following options?
(a) Cholesterol – A component of animal cell membrane
(b) Lecithin – A component of cell membrane
(c) Triglyceride – An energy source
(d) Adenosine – A component of nucleic acids

27. Select the option that correctly identifies the chemical bonds present in the given biomolecules.
Polysaccharides – A, Proteins – B, Fats – C, Water – D

	A	B	C	D
(a)	Ester	Peptide	Glycosidic	Hydrogen
(b)	Glycosidic	Peptide	Ester	Hydrogen
(c)	Glycosidic	Peptide	Hydrogen	Ester
(d)	Hydrogen	Ester	Peptide	Glycosidic

28. Which of the following statements is not correct regarding chitin?
(a) It is a storage polysaccharide
(b) It is a homopolysccharide
(c) It is a constituent of arthropod exoskeleton and fungal cell wall
(d) It is the second most abundant carbohydrate on earth

29. Which of the following secondary metabolites are used as drugs?
(a) Abrin and ricin
(b) Vinblastin and curcumin
(c) Anthocyanins
(d) Gums and cellulose

30. Enzymes that catalyse removal of groups from substrates by mechanisms other than hydrolysis, and addition of groups to double bonds, are called
(a) ligases (b) lyases
(c) hydrolases (d) dehydrogenases

31. Which of the following statement is incorrect w.r.t. starch?
(a) Starch consists of unbranched amylose and branched amylopectin
(b) It is a polymer of α-D-glucose
(c) Successive glucose units are linked together by α 1 → 6 linkage and at branching α 1 → 4 linkage is found
(d) Starch turns black with iodine

RESPONSE GRID					
	23. (a)(b)(c)(d)	**24.** (a)(b)(c)(d)	**25.** (a)(b)(c)(d)	**26.** (a)(b)(c)(d)	**27.** (a)(b)(c)(d)
	28. (a)(b)(c)(d)	**29.** (a)(b)(c)(d)	**30.** (a)(b)(c)(d)	**31.** (a)(b)(c)(d)	

Space for Rough Work

32. Cellulose differs from chitin in
(a) Branching
(b) Type of glycosidic bond
(c) Type of monomer unit
(d) Abundancy in biosphere

33. Oils are rich in
(a) Glycerol that possesses three hydroxyl groups
(b) Saturated fatty acids
(c) Fats that are generally liquid at room temperature
(d) Esters of fatty acids

34. Bonds that do not exist in tertiary structure of proteins
(a) Covalent bonds
(b) Phosphodiester bonds
(c) Hydrophobic etnractions
(d) Ionic bonds

35. Cleavage of specific covalent bonds and removal of groups without hydrolysis is the property of
(a) Isomerases (b) Lyases
(c) Hydrolases (d) Transferases

36. The catalytic efficiency of two different enzymes can be compared by the
(a) K_m value
(b) pH value
(c) Formation of the product
(d) Molecular size of the enzyme

37. Which of the following is an example of isozyme?
(a) α-Amylase
(b) Glucokinase
(c) Lactate dehydrogenase
(d) All of these

38. Essential amino acids include
(a) leucine (b) valine
(c) tryptophan (d) all of these

39. Acidic amino acids have two –COOH groups and one – NH_2 group per molecule. Select the pair that consists of acidic amino acids.
(a) Aspartic acid, glutamic acid
(b) Lysine, arginine
(c) Glycine, alanine
(d) Both (a) and (b)

40. The structure of glucose and galactose are same except with regard to
(a) First carbon atom
(b) Second carbon atom
(c) Third carbon atom
(d) Fourth carbon atom

41. All the following statements are true with regard to glucose, except :
(a) It is an aldohexose
(b) It is a reducing sugar
(c) It is present in starch and cellulose
(d) It is an epimer of fructose

42. Guanylic acid is a
(a) Nucleoside of purine
(b) Nucleoside of pyrimidine
(c) Nucleotide of purine
(d) Nucleotide of pyrimidine

43. Long chain molecules of fatty acids are formed by
(a) Polymerisation of 2 carbon compounds
(b) Decomposition of fats
(c) Polymerisation of glycogen
(d) Conversion of glycogen

44. Read the following four statements (A to D) and mark the option that has both correct statements
A. Blood conc. of glucose in a normal healthy man is 4.5 to 5.0 mM
B. In proteins only left handed helices are observed
C. The pitch of B- DNA is 3.4 Angstrom
D. At each step of ascent the strand of DNA turns 36 degree
(a) A, B (b) B, C (c) C, D (d) A, D

45. Which one of the following biomolecules is correctly characterized?
(a) Lecithin - A phosphorylated glyceride found in cell membrane.
(b) Palmitic acid - An unsaturated fatty acid with 18 carbon atoms.
(c) Adenylic acid - Adenosine with a glucose phosphate molecule.
(d) Alanine amino acid - Contains an amino group and an acidic group anywhere in the molecule.

RESPONSE GRID					
	32. ⓐⓑⓒⓓ	**33.** ⓐⓑⓒⓓ	**34.** ⓐⓑⓒⓓ	**35.** ⓐⓑⓒⓓ	**36.** ⓐⓑⓒⓓ
	37. ⓐⓑⓒⓓ	**38.** ⓐⓑⓒⓓ	**39.** ⓐⓑⓒⓓ	**40.** ⓐⓑⓒⓓ	**41.** ⓐⓑⓒⓓ
	42. ⓐⓑⓒⓓ	**43.** ⓐⓑⓒⓓ	**44.** ⓐⓑⓒⓓ	**45.** ⓐⓑⓒⓓ	

Space for Rough Work

DAILY PRACTICE PROBLEM DPP CHAPTERWISE 9 - BIOLOGY			
Total Questions	45	Total Marks	180
Attempted		Correct	
Incorrect		Net Score	
Cut-off Score	45	Qualifying Score	55
Success Gap = Net Score – Qualifying Score			
Net Score = (Correct × 4) – (Incorrect × 1)			

HINTS & SOLUTIONS

DPP /CB09

1. (c) The nucleic acid (DNA and RNA) are repeating units of nucleotides i.e. polynucleotides. Each nucleotide comprises of nitrogenous heterocyclic bases viz. purines or pyrimidines, pentose sugar and phosphoric acid.

2. (b) Glycogen is an animal starch, stored in the liver and is polysaccharide of α – Glucose. About 30,000 glucose molecules joined by 1-4 α -glycosidic bonds and its branches by 1-6 glycosidic bonds. It gives red colour with iodine solution.

- Galactose is a monosaccharide from milk.
- Fructose is a monosaccharide from fruit.
- Sucrose is a disaccharide (Glucose + Fructose).

3. (b) Cellulose is the most abundant organic compound, most abundant polysaccharide and most abundant biopolymer found on earth.

4. (c) In the cytoplasm, protein synthesis is restricted to the ribosomes. Mitochondria being a semiautonomous organelle, has its own genetic machinery to synthesize its proteins.

5. (d) RNA is a single chain of ribonucleotides. Each ribonucleotide consists of nitrogenous bases (adenine, guanine, cytosine and uracil), ribose sugar and phosphoric acid.

6. (a) Reducing sugar is any sugar that has an aldehyde group or is capable of forming one in solution through isomerisation. Reducing monosaccharides include glucose, fructose, glyceraldehyde and galactose. Many disaccharides, like lactose and maltose also have a reducing form, as one of the two units may have an open- chain form with an aldehyde group.
However, sucrose and trihalose in which the anomeric carbons of the two units are linked together, are non reducing disaccharides since neither of the rings is capable of opening.

7. (d) α-amylase enzyme stimulates the germination of barley seed.

8. (a) Massive ions like Na^+ facilitate the absorption of substances like amino acid and glucose through cotransport.

9. (d) Enzymes accelerate chemical reaction by lowering the activation energy.

10. (c) Competitive inhibition is the reversible inhibition of enzyme activity due to presence of substrate analogues. Non competitive inhibition is the reduction of enzyme activity by a factor that has no real structural similarity with the substrate. Allosteric inhibition is reversible non-competitive inhibition occurring in case of allosteric enzymes . Herein, the inhibitors are the products or intermediates of reactions catalyzed by the enzymes. Hence, it is also called end product inhibition or feedback inhibition.

11. (c) There are only 20 amino acids . These can be arranged in different order in the polypeptide chain to form a diverse array of proteins.

12. (a) Length of one turn of DNA helix is 34Å.
$1Å = 10^{-1}$ nm

13. (c) K_m (Michealis Menten constant) is defined as that substrate concentration at which under optimum conditions the rate of an enzyme catalysed reaction reaches half the maximum rate. K_m is inversely proportional to affinity of enzyme for its substrate.

14. (b) **15. (a)** **16. (d)** **17. (a)** **18. (a)**
19. (d) **20. (b)** **21. (d)** **22. (c)** **23. (b)**
24. (c) **25. (b)**

26. (b) Phospholipids are triglyceride lipids, in which one fatty acid is replaced by phosphoric acid residue often linked to additional nitrogenous groups like choline (in lecithin), ethanolamine (in cephalin) etc.

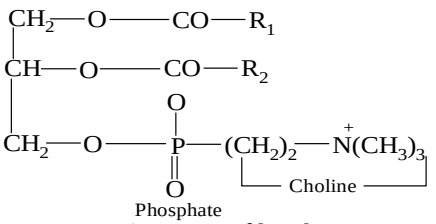


Fig. : Structure of lecithin.

27. (b) Polysaccharides, monosaccharides are linked together by glycosidic bond (C–O–C). Water has hydrogen bonding. Proteins and polymers of different amino acids, which are linked by peptide (CONH) bond formed by dehydration (polymerisation) between COOH group of one amino acid and NH_2 group of next amino acid with the removal of H_2O. The three hydroxyl groups of a glycerol molecule join with the the carboxyl groups of three fatty acid molecules to form a fat or triglyceride molecule. The chemical linkage between the glycerol and fatty acids is called the ester bond.

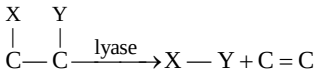
28. (a) Chitin is the second most abundant polysaccharide (after cellulose). Chitin is not a storage polysaccharide rather it is a structural homopolysaccharide, formed of N-acetylglucosamine (NAG) monomers joined together by β-1, 4 linkages. Also, it forms the structural component of fungal walls and exoskeleton of arthropods.

29. (b)

Some Secondary Metabolites	
Pigments	Carotenoids, anthocyanins, etc.
Alkaloids	Morphine, Codeine, etc.
Terpenoids	Monoterpenes, Diterpenes, etc.
Essential oils	Lemon grass oil, etc.
Toxins	Abrin, Ricin
Lectins	Concanavalin A
Drugs	Vinblastin, Curcumin, etc.
Polymeric substances	Rubber, Gums, Cellulose.

Vinblastin is used as an anticancer drug, whereas curcumin is a component of turmeric and also used as drug.

30. **(b)** Lyases enzyme catalyze the breakage of specific covalent bonds and removal of groups without hydrolysis producing double bonds or removal of double bonds by adding groups e.g., histidine decarboxylase that splits C–C bond of histidine, forming CO_2 and histamine.



Fructose-1, 6 diphosphate $\xrightarrow{\text{Aldolase}}$ Dihydroxyacetone-3-phosphate + Glyceraldehyde-3-phosphate.

31. **(c)** Successive glucose units are linked together by α 1 $\rightarrow$ 4 linkage and at branchings α 1 $\rightarrow$ 6 linkage is present.

32. **(c)** **33.** **(c)**

34. **(b)** Tertiary structure of proteius is devoid of phosphodiester bonds. There bonds are present in nudeic acids.

35. **(b)**

36. **(a)** A high k_m indicates low affinity of an enzyme for its substrate.

37. **(d)** The multiple molecular forms of an enzyme occuring in the same organisms and having a similar substrate activity are called isoenzymes or isozymes. They have similar properties but different molecular weights and location. Over 100 enzymes are known to have isoenzymes. α-amylase of wheat endosperm has 16 isozymes, lactate dehydrogenase has 5 isozymes.

38. **(d)** Essential amino acids are the amino acids which cannot be synthesized by organisms in the body and are obtained from plants e.g., valine, leucine, isoleucine, phenylalanine, threonin, lysine, tryptophan, methionine.
Non-essential amino acids can be synthesized by the organism and may not be the requisite components of diet e.g., serine, tryosine, aspartate, cysteine, glutamate, proline, glycrine, alanine, asparagine, glutamine and tyrosine.

39. **(a)** Acidic amino acids have an extra carboxylic group (mono-amino dicarboxylic), e.g., glutamate (glutamic acid, Glu), asparate (aspartic acid, Asp).
Basic amino acids have an additional amino group without forming amides (diamino monocarboxylic), e.g., arginine (Arg), lysine (Lys).
Neutral amino acids have one amino group and one carboxylic group (mono-amino mnocarboxylic) with noncyclic hydrocarbon chain, e.g., glycine (Gly), alanine (Ala), valine (Val), Leucine (Leu), isoleucine (lle). Essential amino acids are the amino acids which cannot be synthesized by organisms in the body and are obtained from plants e.g., valine, leucine, isoleucine, phenylalanine, threonin, lysine, tryptophan, methionine.
Non-essential amino acids can be synthesized by the organism and may not be the requisite components of diet e.g., serine, tryosine, aspartate, cysteine, glutamate, proline, glycrine, alanine, asparagine, glutamine and tyrosine.

40. **(d)**

41. **(b)** Trehalose is a non-reducing sugar. It is made up to 2 molecules of glucose

42. **(c)** **43.** **(a)** **44.** **(d)**

45. **(a)** Palmitic acid is one of the most common saturated fatty acids found in animals and plants. It has 16 carbons including the carboxyl carbon.