DPP - Daily Practice Problems

Chapter-wise Sheets

Date : Start Time : End Time :

CHEMISTRY CC28

SYLLABUS : Biomolecules

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

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

1. Chemically amylose is a _____ with 200–1000 α-D-(+)-glucose units held by _____ glycosidic linkage
(a) long unbranched chain, C1 – C6.
(b) branched chain, C 1 – C4.
(c) long unbranched chain, C1 – C4.
(d) branched chain, C1 – C6.

2. Which is wrongly matched?
(a) Insulin - steroid hormone
(b) Estrone - control the uterine cycle in women
(c) Oxytocin - contraction of uterus
(d) Pot. metabisulphite - food preservative

3. In nucleic acids, the sequence is
(a) phosphate - base - sugar
(b) sugar- base-phosphate
(c) base- sugar - phosphate
(d) base- phosphate - sugar

4. Read the following statements and choose the correct–option?
(i) Starch is a polymer of α – glucose.
(ii) Starch consists of amylose and amylopectin.
(iii) Amylose is insoluble in water.
(iv) Amylopectin is soluble in water.
(a) (i) (iii) and (iv) (b) (i),(ii) and(iii)
(c) (i) and (ii) (d) (iii) and (iv)

5. An acidic amino acid among the following is
(a) glycine (b) valine
(c) proline (d) histidine

6. If one strand of DNA has the sequence ATGCTTGA, the sequence in the complimentary strand would be
(a) TACGAACT (b) TCCGAACT
(c) TACGTACT (d) TACGTAGT

7. The hormone produced by pancreas
(a) Adrenaline (b) Glucogen
(c) Thyroxene (d) Cortisone

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

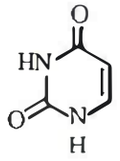
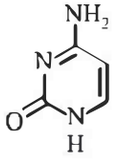
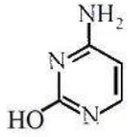
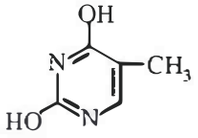
Space for Rough Work

8. Match the columns

Column - I (Enzymes)		Column - II (Reactions)
(A) Invertase	I.	Decomposition of urea into NH_3 and CO_2
(B) Maltase	II.	Conversion of glucose into ethyl alcohol
(C) Pepsin	III.	Hydrolysis of maltose into glucose
(D) Urease	IV.	Hydrolysis of cane sugar
(E) Zymase	V.	Hydrolysis of proteins into peptides

(a) A – IV; B – III; C – V; D – I; E – II
(b) A – III; B – II; C – IV; D – I; E – V
(c) A – II; B – I; C – III; D – IV; E – V
(d) A – IV; B – I; C – V; D – II; E – III

9. Which of the following structures represents thymine ?

(a) 
(b) 
(c) 
(d) 

10. Which statement is incorrect about peptide bond?
(a) C–N bond length in proteins is longer than usual C–N bond length
(b) Spectroscopic analysis shows planar structure of $-\overset{\overset{O}{\|}}{C}-NH-$ bond
(c) C–N bond length in proteins is smaller than usual C–N bond length
(d) None of these

11. The presence or absence of hydroxyl group on which carbon atom of sugar differentiates RNA and DNA?
(a) 1^{st} (b) 2^{nd}
(c) 3^{rd} (d) 4^{th}

12. Which of the following compounds can be detected by Molisch's Test ?
(a) Nitro compounds (b) Sugars
(c) Amines (d) Primaryalcohols

13. Night blindness is caused by deficiency of vitamin :
(a) Vit–B_{12} (b) Vit–A
(c) Vit–C (d) Vit–E

14. Which of the following is correct about H-bonding in nucleotide?
(a) A---A and T---T (b) G---T and A---C
(c) A---G and T---C (d) A---T and G---C

15. In an aminoacid, the carboxyl group ionises at $pK_{a_1} = 2.34$ and ammonium ion at $pK_{a_2} = 9.60$. The isoelectric point of the amino acid is at pH
(a) 5.97 (b) 2.34
(c) 9.60 (d) 6.97

16. The secondary structure of a protein refers to
(a) fixed configuration of the polypeptide backbone
(b) α–helical backbone
(c) hydrophobic interactions
(d) sequence of α–amino acids.

17. Which of the following statements regarding DNA fingerprinting is incorrect?
(a) It is used in forensic laboratories for identification of criminals.
(b) It cannot be altered by surgery.
(c) It is different for every cell and cannot be altered by any known treatment.
(d) It is used to determine paternity of an individual.

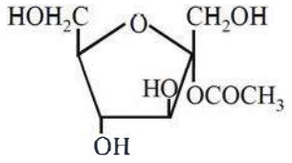
18. The artificial sweetener that has the highest sweetness value in comparison to cane sugar is :
(a) Sucralose (b) Aspartane
(c) Saccharin (d) Alitame

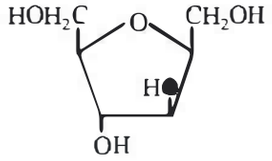
19. The term invert sugar refers to an equimolar mixture of
(a) D-glucose and D-galactose
(b) D-glucose and D-fructose
(c) D-glucose and D-mannose
(d) D-glucose and D-ribose

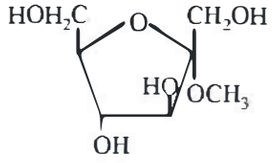
RESPONSE GRID					
	8. ⓐⓑⓒⓓ	9. ⓐⓑⓒⓓ	10. ⓐⓑⓒⓓ	11. ⓐⓑⓒⓓ	12. ⓐⓑⓒⓓ
	13. ⓐⓑⓒⓓ	14. ⓐⓑⓒⓓ	15. ⓐⓑⓒⓓ	16. ⓐⓑⓒⓓ	17. ⓐⓑⓒⓓ
	18. ⓐⓑⓒⓓ	19. ⓐⓑⓒⓓ			

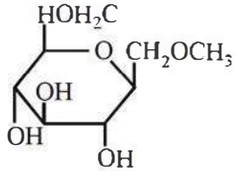
Space for Rough Work

20. Which of the following compounds will behave as a reducing sugar in an aqueous KOH solution?

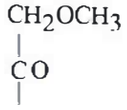
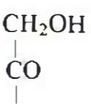
(a) 

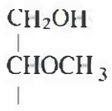
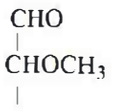
(b) 

(c) 

(d) 

21. For osazone formation, the effective structural unit necessary is

(a)  (b) 

(c)  (d) 

22. Which of the following statements about vitamin B_{12} is incorrect?

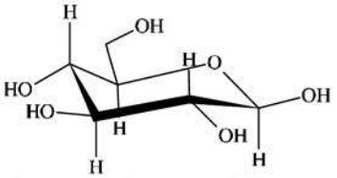
(a) It has a cobalt atom

(b) It also occurs in plants

(c) It is also present in rain water

(d) It is needed for human body in very small amounts

23. The following carbohydrate is



(a) a ketohexose (b) an aldohexose

(c) an α-furanose (d) an α-pyranose

24. The two functional groups present in a typical carbohydrate are:

(a) –CHO and –COOH (b) >C=O and –OH

(c) –OH and –CHO (d) –OH and –COOH

25. Deficiency of vitamin E causes :

(a) Beriberi (b) Scurvy

(c) Sterility (d) None

26. Which of the following terms indicates to the arrangement of different protein subunits in a multiprotein complex ?

(a) primary structure (b) secondary structure

(c) tertiary structure (d) quaternary structure

27. The term anomers of glucose refers to

(a) enantiomers of glucose

(b) isomers of glucose that differ in configuration at carbon one (C-1)

(c) isomers of glucose that differ in configurations at carbons one and four (C-1 and C-4)

(d) a mixture of (D)-glucose and (L)-glucose

28. In both DNA and RNA, heterocyclic base and phosphate ester linkages are at–

(a) C_5' and C_1' respectively of the sugar molecule

(b) C_1' and C_5' respectively of the sugar molecule

(c) C_2' and C_5' respectively of the sugar molecule

(d) C_5' and C_2' respectively of the sugar molecule

29. An amine hormone is

(a) Cortisone (b) Adrenaline

(c) Insulin (d) Estrone

30. Aminoacids generally exist in the form of Zwitter ions. This means they contain

(a) basic—NH_2 group and acidic - —COOH group

(b) the basic— $\overset{+}{N}H_3$ group and acidic - —COO^- group

(c) basic—NH_2 and acidic —H^+ group

(d) basic–COO^- group and acidic — $\overset{+}{N}H_3$ group

RESPONSE GRID					
	20. ⓐⓑⓒⓓ	**21.** ⓐⓑⓒⓓ	**22.** ⓐⓑⓒⓓ	**23.** ⓐⓑⓒⓓ	**24.** ⓐⓑⓒⓓ
	25. ⓐⓑⓒⓓ	**26.** ⓐⓑⓒⓓ	**27.** ⓐⓑⓒⓓ	**28.** ⓐⓑⓒⓓ	**29.** ⓐⓑⓒⓓ
	30. ⓐⓑⓒⓓ				

Space for Rough Work

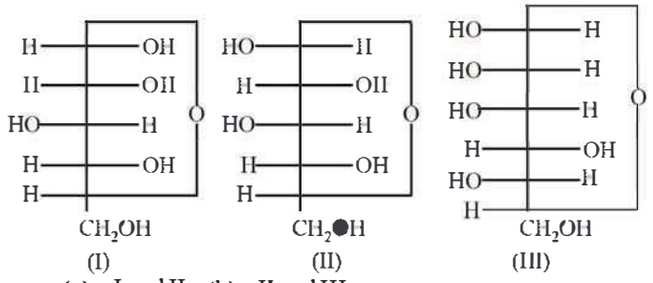
31. The change in the optical rotation (with time) of freshly prepared solution of sugar is known as
(a) Specific rotation (b) Inversion
(c) Rotatory motion (d) Mutarotation

32. Phospholipids are esters of glycerol with
(a) two carboxylic acid residues and one phosphate group
(b) one carboxylic acid residue and two phosphate groups
(c) three phosphate groups
(d) three carboxylic acid residues

33. When glucose reacts with bromine water, the main product is
(a) gluconic acid (b) glyceraldehyde
(c) saccharic acid (d) acetic acid

34. Among the following vitamins the one whose deficiency causes rickets (bone deficiency) is
(a) VitaminA (b) VitaminB
(c) VitaminD (d) VitaminC

35. Three cyclic structures of monosaccharides are given below which of these are anomers



(a) I and II (b) II and III
(c) I and III (d) III is anomer of I and II

36. Glucose molecule reacts with X number of molecules of phenylhydrazine to yield osazone. The value of X is
(a) three (b) two
(c) one (d) four

37. Which of the following indicates to 'regions of ordered structure within a protein'.
(a) Primary structure (b) Secondary structure
(c) Tertiary structure (d) Quaternary structure

38. Denaturation of proteins leads to loss of its biological activity by
(a) Formation of amino acids
(b) Loss of primary structure
(c) Loss of both primary and secondary structures
(d) Loss of both secondary and tertiary structures

39. The pair of compounds in which both the compounds give positive test with Tollen's reagent is
(a) Glucose and Sucrose
(b) Fructose and Sucrose
(c) Acetophenone and Hexanal
(d) Glucose and Fructose

40. Proteins when heated with conc. HNO_3 give a yellow colour. This is
(a) Oxidizing test (b) Xanthoproteic test
(c) Hoppe's test (d) Acid base test

41. The reason for double helical structure of DNA is operation of
(a) dipole-dipole interaction
(b) hydrogen bonding
(c) electrostatic attractions
(d) van der Waals' forces

42. Which of the statements about "Denaturation" given below are correct ?
(i) Denaturation of proteins causes loss of secondary and tertiary structures of the protein.
(ii) Denaturation leads to the conversion of double strand of DNA into single strand
(iii) Denaturation affects primary strucrture which gets distorted
(a) (ii) and (iii) (b) (i) and (iii)
(c) (i) and (ii) (d) (i), (ii) and (iii)

43. Which of the following protein destroy the antigen when it enters in body cell?
(a) Antibodies (b) Insulin
(c) Chromoprotein (d) Phosphoprotein

44. Glucose can't be classified as
(a) hexose (b) carbohydrate
(c) aldose (d) oligosaccharide

45. Hydrolysis of sucrose is called
(a) hydration (b) saponification
(c) esterification (d) inversion

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

Space for Rough Work

1. **(c)** Chemically amylose is a long unbranched chain with 200-1000 α-D-(+ -glucose units held by C1-C4 glycosidic linkage.

2. **(a)**

3. **(c)**

4. **(c)** Amylose is water soluble component which constitutes about 15-20% of strach. Amylopectin is insoluble in and constitutes about 80-85% of starch.

5. **(d)** Histidine is an acidic amino acid whereas rest are neutral amino acids.

6. **(a)** On the basis of structure of guanine and complementary bases present in them, we can say that if the sequence of bases in one strand of DNA is I, then the sequence in the second strand should be II

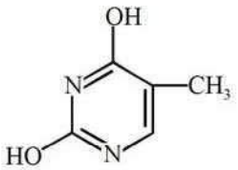
A : T : G : C : T : T : G : A I

T : A : C : G : A : A : C : T II

7. **(b)** Glucogen is produced by pancreas.

8. **(a)**

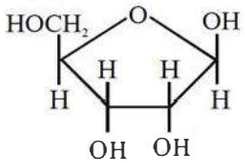
9. **(d)** The correct structure of thymine is



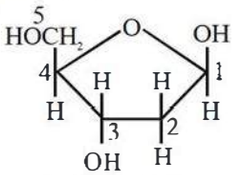
Thymine (T)

10. **(c)** Due to resonance, $-C(=O)-NH- \longleftrightarrow -C(-O^-)=NH^+-$, C – N bond in proteins acquires some double bond character, hence shorter in length.

11. **(b)** RNA has D (–) – Ribose and the DNA has 2–Deoxy D (–) – ribose as the carbohydrate unit.



ribose



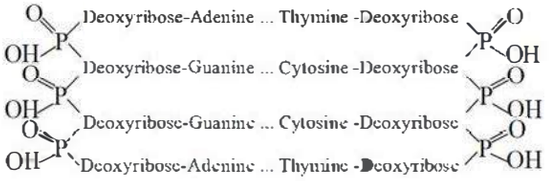
2-deoxy ribose

From the structures it is clear that 2nd carbon in DNA do not have OH group.

12. **(b)** **Molisch's Test :** This is a general test for carbohydrates. One or two drops of alcoholic solution of α-naphthol is added to 2 ml glucose solution. 1 ml of conc. H_2SO_4 solution is added carefully along the sides of the test-tube. The formation of a violet ring at the junction of two liquids confirms the presence of a carbohydrate or sugar.

13. **(b)** Night blindness is caused by deficiency of vitamin A.

14. **(d)**



The hydrogen bonds are formed between the base (shown by dotted lines). Because of size and geometrics of the bases, the only possible pairing in DNA and between G(Guanine) and C(Cytosine) through three H-bonds and between A (Adenine) and T (Thymine) through two H-bonds.

15. **(a)** Isoelectric point (pH)

$$= \frac{pK_{a_1} + pK_{a_2}}{2} = \frac{2.34 + 9.60}{2} = 5.97$$

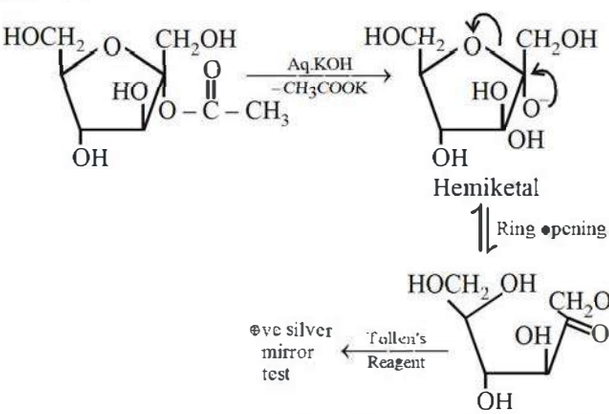
16. **(b)** The secondary structure of a protein refers to the shape in which a long peptide chain can exist. There are two different conformations of the peptide linkage present in protein, these are α-helix and β-conformation. The α-helix always bas a right handed arrangement. In β-conformation all peptide chains are stretched out to nearly maximum extension and then laid side by side and held together by intermolecular hydrogen bonds. The structure resembles the pleated folds of drapery and therefore is known as β-pleated sheet.

17. **(c)** DNA fingerprinting is same for every cell and cannot be altered by any known treatment.

18. **(d)** Alitame is an artificial sweetner that is 2,000 times as sweet as sugar.

19. **(b)** Since sucrose is dextrorotatory while hydrolysis product of sucrose, having equimolar mixture of glucose and fructose, is leovorotatory. Hence the hydrolysed product of sucrose is known as inversion.

20. **(a)**

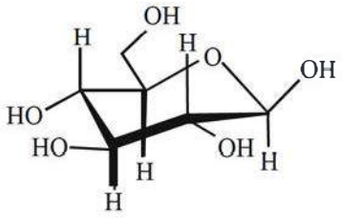


(a Reducing sugar) α-hydroxy ketone

21. (b)

22. (c) It is found in liver, egg, milk, meat, and fish. Minute amounts are probably present in all animal cells. Peculiarly, unlike other vitamins, B_{12} is found in significant amounts in green plants.

23. (b)



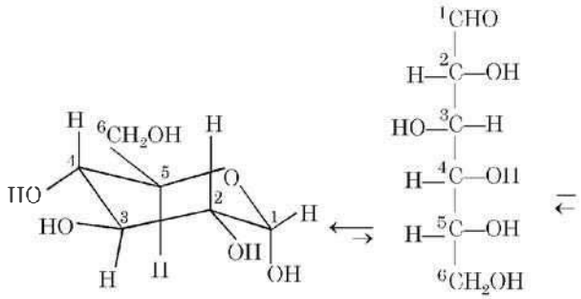
It is a β-pyranose hence it is an aldohexose.

24. (c) Glucose is considered as a typical carbohydrate which contains –CHO and –OH group.

25. (c) Vitamin E (Tocopherol) is a fat or oil soluble vitamin . It is present in ghee milk and egg yolk. Deficiency of vitamin E causes loss of sexual power of reproduction and degeneration of muscle fibres in animals.

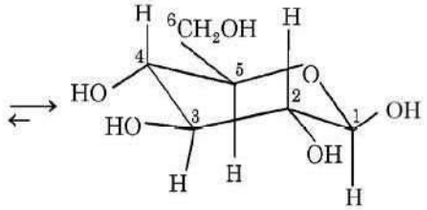
26. (d) Quaternary structure refers to the overall structure of a multiprotein complex where as primary, secondary and tertiary structure refer to the different structural levels of a single protein.

27. (b) Cyclisation of the open chain structure of D-(+)-glucose has created a new stereocenter at C_1 which explains the existence of two cyclic forms of D-(+)-glucose, namely α– and β–. These two cyclic forms are *diasteromers, such diastereomers which differ only in the configuration of chiral carbon developed on hemiacetal formation* (it is C_1 in glucose and C_2 in fructose) *are called* **anomers** and the hemiacetal carbon (C_1 or C_2) is called the **anomeric carbon.**



α–D-(+)-Glucopyranose
m.p. 146°C : $[\alpha]_D$ = + 112.2°
(36% at equilibrium)

Open chain form
of D-(+)-glucose
(negligible % at equbilibrium)



β–D-(+)-Glucopyranose
m.p. 150°C; $[\alpha]_D$ = + 18.7°
(64% at equilibrium)

28. (b) In DNA and RNA heterocyclic base and phosphate ester are at C_1' and C_5' respectively of the sugar molecule. Each corners is shared by 8 cubes and each face is shared by 2 faces

29. (b) Adrenaline is amine hormone.

30. (d) Zwitter ion contains both +ve and –ve charge. Proton of –COOH group is transferred to the $-NH_2$ group.— NH_3^+ group is acidic since it can donate a proton and —COO^- group is basic since it can accept a proton.

31. (d)

32. (a)

33. (a) Glucose contains an aldehyde group. It is oxidised into acidic group by bromine water and gluconic acid is formed

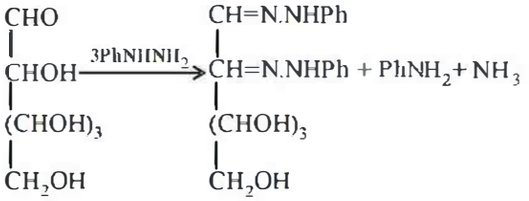
$$CH_2OH-(CHOH)_4-CHO \xrightarrow{(O)} CH_2OH-(CHOH)_4-COOH$$

$$Br_2 + H_2O \longrightarrow 2HBr + O$$

34. (c) Deficiency of vitamin D causes rickets.

35. (a)

36. (a)



37. (b)

38. (d)

39. (d) Glucose being an aldose responds to Tollen's test while fructose, although a ketose, undergoes rearrangement in presence of basic medium (provided by Tollen's reagent) to form glucose, which then responds to Tollen's test.

40. (b)

41. (b) Hydrogen bonding

42. (c) When the proteins are subjected to the action of heat, mineral acids or alkali, the watersoluble form of globular protein changes to water insoluble fibrous protein. This is called denaturation of proteins. During denaturation secondary and tertiary structures of protein destroyed but primary structures remains intact.

43. (a) When antigens enter in to the body cells and destroy them, then antibodies being proteins are synthesised in the body and combine with antigens and destroy these antigens by forming inactive complexes. Therefore antibodies protein destroy antigens.

44. (d) Glucose is aldohexose. Glucose is a monosaccharide, i.e. it can not be hydrolysed further to simple sugars. Oligosaccharides on hydrolysis give 2-10 molecules of monosaccharides.

45. (d) Since sucrose is dextrorotatory while hydrolysis product of sucrose, having equimolar mixture of glucose and fructose, is laevorotatory. Hence the hydrolysed product of sucrose is known as invert sugar and the hydrolysis of sucrose is known as inversion.