Exercise-1

Marked questions are recommended for Revision.

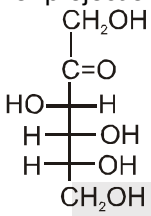
PART - I : SUBJECTIVE QUESTIONS

Section (A) : Carbohydrates

A-1. What are monosaccharides ?

A-2. Draw the Fischer projections for the open-chain structures of D-glucose and L-glucose ?

A-3. The fischer projection of D-fructose is given below, write the fischer projection of L-fructose.



D-Fructose

A-4. Write the reaction of D-glucose with HNO_3.

A-5. Give reasons as the evidence in support of cyclic structure of glucose

A-6. What is mutarotation ?

A-7. What do you understand by glycosidic linkage ?

A-8. What are reducing sugars ?

A-9. What are the hydrolysis products of sucrose ?

A-10. What is the basic structural difference between starch and cellulose ?

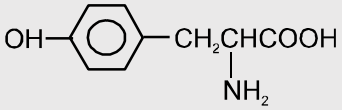
A-11. Simple six memebered ring compound (eg. Cyclohexane) are not soluble in water whereas glucose and sucrose are soluble in water. Explain why ?

Section (B) : Amino Acids & Proteins

B-1. What do you mean by the following also give example
(a) Non -essential amino acids (b) Essential amino acids

B-2. Amino acids show amphoteric behaviour. Explain why ?

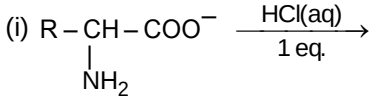
B-3. Tyrosine is an α-amino carboxylic acid shown below :

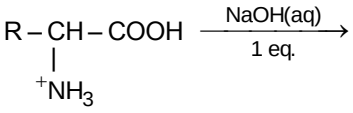


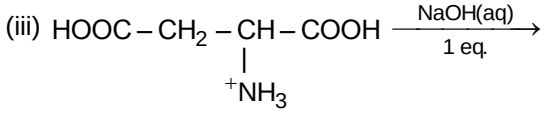
Write the most stable structural formula -
(a) In it's cationic form (b) In it's anionic form
(c) In it's dianionic form (d) In it's Zwitter ionic form

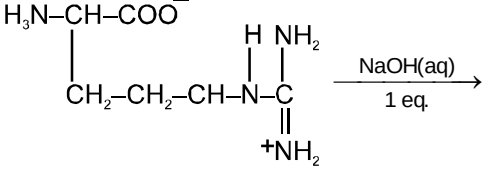
B-4. How will you identify a basic amino acid ?

B-5. Complete the following reactions :

(i) 

(ii) 

(iii) 

(iv) 

B-6. Why an amino acid is usually solid at room temperature.

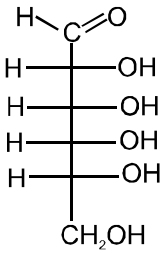
B-7. The melting point and solubility (in H_2O) of amino acids are generally high. explain why ?

B-8. What is the product obtained when glycine hydrochloride reacts with two equivalents of NaOH ? Write the chemical reactions involved.

B-9. What is the denaturation of proteins ?

PART - II : ONLY ONE OPTION CORRECT TYPE

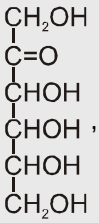
Section (A) : Carbohydrates

A-1.  Allose, given monosacharide is a/an ?

(A) Aldopentose (B) Aldohexose (C) Ketopentose (D) Aldoheptose

A-2. The letter D in D-glucose signifies

(A) dextrorotatory (B) mode of synthesis (C) its configuration (D) its diamagnetic nature

A-3. For the structure  , total possible optical isomers are

(A) 12 (B) 4 (C) 16 (D) 8

A-4. Carbohydrates have :

(A) –OH group (B) –CHO group (C) >C=O group (D) All

A-5. Which of the following monosaccharide is pentose ?

(A) Glucose (B) Fructose (C) Arabinose (D) Galactose

A-6. α-D-glucose and β-D-glucose differ from each other due to the difference in one of the carbon atoms, with respect to its

(A) Number of –OH groups (B) Configuration

(C) Conformation (D) Size of hemiacetal ring

A-7. Which of the following pairs form the same osazone ?

(A) Glucose and fructose (B) Glucose and galactose

(C) Glucose and arabinose (D) Lactose and maltose

A-8. Glucose when treated with CH_3OH in presence of dry HCl gas gives α- and β-methylglucosides because it contains

(A) an aldehydic group (B) a – CH_2OH group

(C) a cyclic structure (D) five – OH group

A-9. α-D (+) glucopyranose is example of

(A) acetal (B) ketal (C) hemiacetal (D) hemiketol

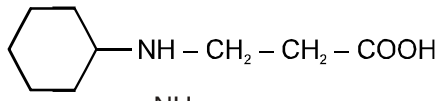
A-10. Which of the following indicates the presence of 5 –OH groups in glucose

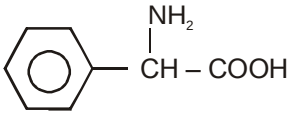
(A) Penta-acetyl derivative of glucose (B) Cyanohydrin formation of glucose

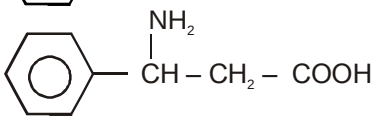
(C) Reaction with Fehling's solution (D) Reaction with Tollen's reagent

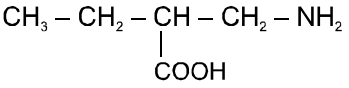
Section (B) : Amino Acids & Proteins

B-1. Which of the following is α-amino acid?

(A) 

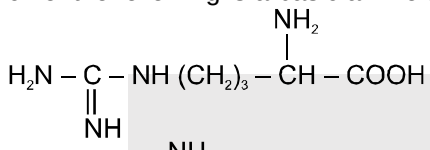
(B) 

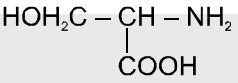
(C) 

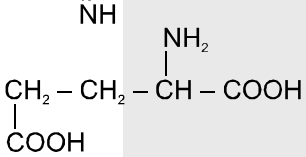
(D) 

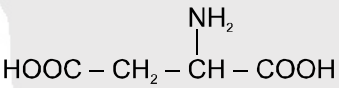
B-2. Which of the following α-amino acids is not optically active ?
(A) Alanine (B) Glycine (C) Phenylalanine (D) Cysteine

B-3. Which of the following is a basic amino acid?

(A) 

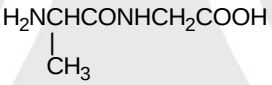
(B) 

(C) 

(D) 

B-4. The force of attraction between the neighbouring peptide chains is
(A) Vander Waal's force (B) Covalent bond
(C) Hydrogen bond (D) Peptide linkage

B-5. The name of the given dipeptide is :



(A) Gly-Gly (B) Gly-Ala (C) Ala-Ala (D) Ala-Gly

B-6. The three pK_a values of aspartic acid are 1.89, 3.65 and 9.60. The pI of the amino acid is
(A) 2.77 (B) 6.62 (C) 5.74 (D) 7.0

Section (C) : Vitamins and Nucleic Acids

C-1. Which of the following is a vitamin -
(A) Glucose (B) Keratin (C) Maltose (D) Riboflavin

C-2. Vitamin B_6 is known as
(A) Pyridoxine (B) Thiamine (C) Tocopherol (D) Riboflavin

C-3. The best source of vitamin A is -
(A) Oranges (B) Beans (C) Carrots (D) Wheat

C-4. Vitamin D is called -
(A) Ascorbic acid (B) Calciferol or ergocalciferol
(C) Thaimine (D) Riboflavin

C-5. Which of the following is found in cod-liver oil ?
(A) Vitamin C (B) Vitamin E (C) Vitamin A (D) Vitamin B_1

C-6. Vitamin E is also called :
(A) Cyanocobalamin (B) Tocopherol (C) Lactoflavin (D) Ascorbic acid

C-7. The best source of vitamin C is :
(A) Code liver oil (B) Egg yolk (C) Citrus fruits (D) Fish liver oil

C-8. Milk contains vitamins :
(A) A, D and E (B) A, B_{12} and D (C) C, D and K (D) B_1, B_6 and D

C-9. Nervousness anaemia is caused by the deficiency of vitamin
(A) B_1 (B) B_2 (C) B_6 (D) B_{12}

C-10. Deficiency of vitamin E causes
(A) Scurvy (B) Loss of appetite
(C) Loss of sexual power and reproduction (D) Beriberi

C-11. Which of the following is fat soluble vitamin ?
(A) Vitamin A (B) Pyridoxine (C) Riboflavin (D) Thiamine

C-12. Which one of the following vitamin contains a metal atom ?
(A) Vitamin A (B) Vitamin B_2 (C) Vitamin B_6 (D) Vitamin B_{12}

C-13. Identify the vitamin whose deficiency in our food decreases reproductive power :
(A) vitamin A (B) vitamin C (C) vitamin D (D) vitamin E

C-14. Beri-beri is casued due to :
(A) vitamin A (B) vitamin B (C) vitamin C (D) vitamin D

C-15. The sugar present in DNA is :
(A) Glucose (B) Deoxyribose (C) Ribose (D) Fructose

C-16. The pentose sugar in DNA and RNA has the :
(A) Open chain structure (B) Pyranose structure
(C) Furanose structure (D) None of the above

C-17. Which of the following is not a pyrimidine base ?
(A) Uracil (B) Guanine (C) Cytosine (D) Thymine

C-18. The relationship between the nucleotide triplets and the amino acids is called
(A) Translation (B) Transcription (C) Replication (D) A genetic code

C-19. Which of the following statements about DNA is not correct ?
(A) It has a double helix structure
(B) It undergoes replication
(C) The two strands in a DNA molecule are exactly similar
(D) It contains the 2-deoxyribose pentose sugar.

C-20. Which of the following statements about RNA is not correct ?
(A) It has a single strand (B) It does not undergo replication
(C) It does not contain any pyrimidine base (D) It controls the synthesis of proteins

C-21. Oils and fats are esters of higher fatty acids with :
(A) Ethanol (B) Glycol (C) Glycerol (D) Methanol

C-22. The cheif constituents of cell membranes are :
(A) Simple triglycerides (B) Waxes (C) Phospholipids (D) Proteins

C-23. The fats present in the body act as
(A) Food storage only (B) Heat insulator only
(C) Shock absorber only (D) All the three above

C-24. The most concentrated source of energy in the human body is
(A) Fats (B) Sugars (C) Proteins (D) Nuclei acids

PART - III : MATCH THE COLUMN

1. Match **Column-I** with **Column-II**.

	Column-I		**Column-II**
	(polymer)		**(monomer)**
(A)	Sucrose	(p)	Linkage and hydrolysis product D(+) glucose
(B)	Maltose	(q)	Linkage and hydrolysis product D(–) fructose
(C)	Lactose	(r)	D(+) galactose
(D)	Cellulose	(s)	$\alpha(1 \rightarrow 4)$
		(t)	$\beta(1 \rightarrow 4)$

2. Match **Column-I** with **Column-II**.

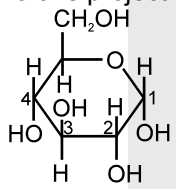
	Column-I		**Column-II**
(A)	$CH_3–\underset{\displaystyle NH_3^+}{\underset{\vert}{CH}}–COO^-$	(p)	Acidic amino acid
(B)	Arginine	(q)	Neutral amino acid
(C)	Valine	(r)	Zwitter ion
(D)	Aspartic acid	(s)	Basic amino acid

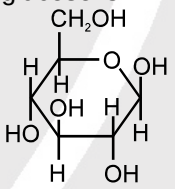
Exercise-2

Marked questions are recommended for Revision.

PART-I : ONLY ONE OPTION CORRECT TYPE

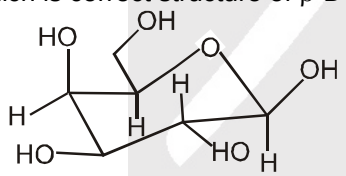
1. Haworth's projection of α-D glucose is :

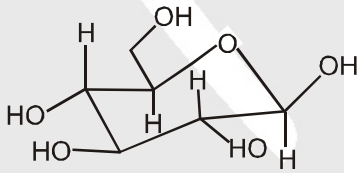
(A) 

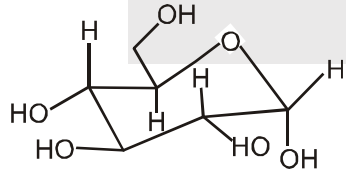
(B) 

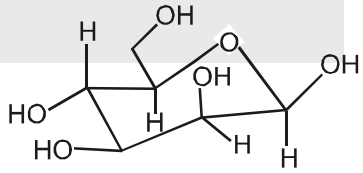
(C) both (D) none

2. Which is correct structure of β-D-glucopyranose.

(A) 

(B) 

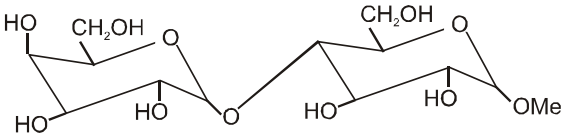
(C) 

(D) 

3. 3 molecule of phenylhydrazine is used in Osazone formation. The correct statement about the use of phenylhydrazine is :
(A) All the three molecules react in similar manner.
(B) Two molecules reacts in similar manner whereas the third reacts in different way.
(C) All the three molecules react in different way.
(D) Only two react in same manner but the third molecule remains unreacted.

4. Ketones do not reduce Tollen's reagents, but fructose with a keto group reduces it. Which one of the following is a correct statement ?
(A) Enolisation of keto group of fructose and transformation into aldehyde group in presence of OH^-, (which is present in Tollen's reagent).
(B) > CHOH group is also oxidised to keto group.
(C) Both statements are correct.
(D) None of the statement is correct.

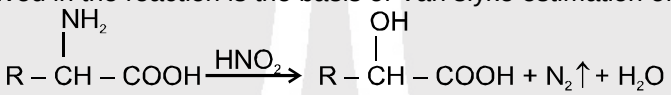
5.



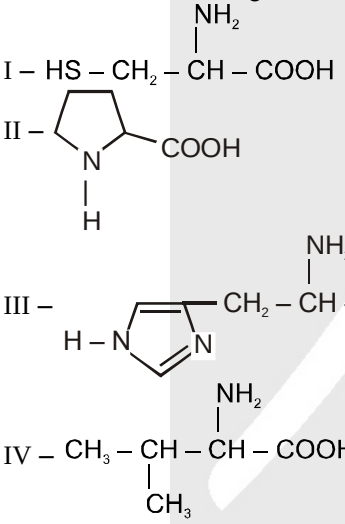
On acid hydrolysis of above disaccharide, we get
(A) Two moles of glucose (B) one mole of glucose
(C) One mole of galactose (D) one mole of glucose and one mole of galactose

6. Find the pair which is correctly matched
(A) Sucrose : monosaccharide (B) Fructose : aldose sugar
(C) Glucose : mutarotation (D) Sucrose : reducing sugar

7. Nitrous acid (HNO_2) converts amino acids into hydroxy acids with retention of configuration. Estimation of nitrogen gas evolved in the reaction is the basis of Van slyke estimation of amino acids.

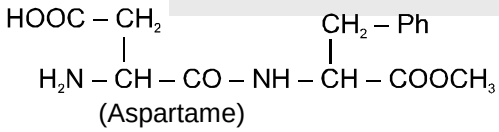


Which of the following amino acids cannot be analysed by Van slyke method?



(A) only I (B) only II (C) I and III (D) I, III, IV

8.



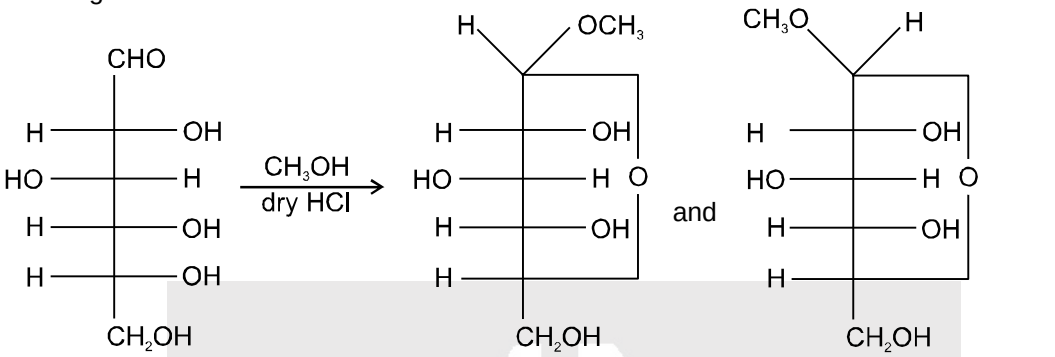
(Aspartame)

Aspartame is 160 times as sweet as sucrose and is used as a sugar substitute.
the correct statement (s) about aspartame is (are)
I – It is an ester derivative of dipeptide
II – It can be named as aspartyl phenylalanine methyl ester
III – It is a tripeptide
IV – It is having four functional groups.
(A) I, II (B) I, II, IV (C) II, III, IV (D) only II

PART - II : SINGLE AND DOUBLE VALUE INTEGER TYPE

1. Consider an amylose chain of 4000 glucose unit. At how many cleavage require to lower the average length to 400 units.

2. How many statements are correct?
D-glucose, on treating with methanol in presence of dry HCl gives methyl glucosides according to the following reaction



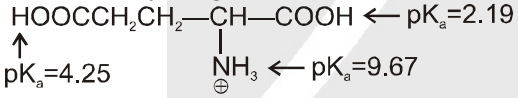
D-glucose (I) | Methyl-α-D-glucoside (II) | Methyl-β-D-glucoside (III)

(i) The glucosides do not reduce fehling's solution
(ii) The glucosides do not react with hydrogen cyanide or hydroxylamine
(iii) Behaviour of glucosides as stated in S_1 and S_2 indicates the absence of free –CHO group.
(iv) The two forms of glucosides are enantiomers.
How many statements are correct ?

3. An octapeptide (Mol. wt. = 516 g) on complete hydrolysis given glycine and alanine (Mol. mass = 89 g). Alanine contributes 41.59% to total weight of hydrolysed product. How many number of alanine unit present in octapeptide.

4. Among the following amino acids no. of essential amino acids are
Glycine, Alanine, Valine, Cysteine, Leucine, Isoleucine, Serine, Threonine.

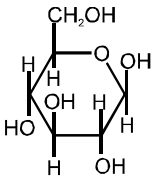
5. Calculate of pI of glutamic acid



(report answer pI×10 upto two digit)

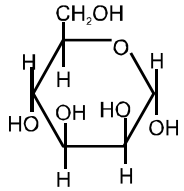
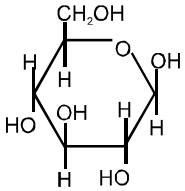
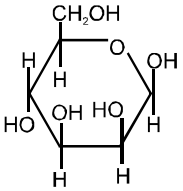
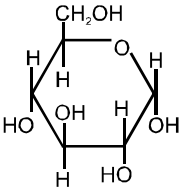
6. No of optical isomers possible for fructose $CH_2(OH)–CH(OH)–CH(OH)CH(OH)–CO–CH_2–OH$ is :

PART - III : ONE OR MORE THAN ONE OPTIONS CORRECT TYPE

1.  Glucose

The correct statements about above structure of glucose are :
(A) It is a Pyranose form
(B) It is a furanose form
(C) It is a β-anomer
(D) It is a D –sugar

2. D-Mannose differs from D-glucose in its stereochemistry at C-2. The pyranose form of D-Mannose is

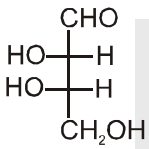
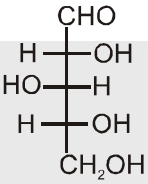
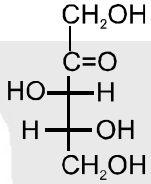
(A)  (B)  (C)  (D) 

3. Which of the following is /are reducing sugar

(A) Sucrose (B) Glucose (C) Fructose (D) methylmaltoside

4. Which of these are polysaccharides of glucose ?

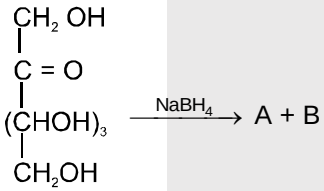
(A) Starch (B) Cellulose (C) Sucrose (D) Lactose

5. (I)  (II)  (III) 

The correct statement about the sugars given above are

(A) I and II are L-Sugars (B) II and III are D-Sugar

(C) I and III are D-sugars (D) I is L-sugar

6. 

Fructose

The product A and B in the a above reaction are

(A) Diastereomers (B) Enantiomers

(C) Anomers (D) Optically active hexahydroxy compounds

7. The correct statements about peptides are :

(A) A dipeptide has one peptide link between two amino acids.

(B) By convention N-Terminus is kept at left and C- terminus at right in the structure of a peptide

(C) If only one amino group and one carboxylic acid, group are available for reaction, then only one dipeptide can forms.

(D) A polypeptide with more than hundred amino acid residues (mol. mass > 10,000) is called a protein

8. Correct statement about peptide linkage in a protein molecule is/are correct ?

(A) It is amide linkage

(B) It has partial double bond character.

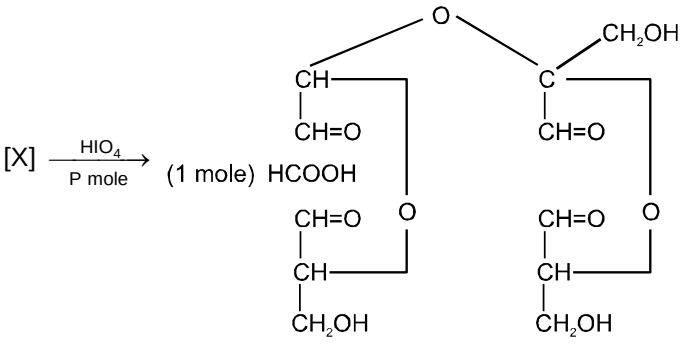
(C) It is hydrophilic in nature

(D) It connects protein molecules through H-bonds.

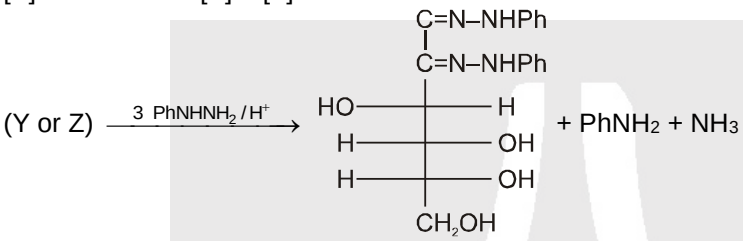
PART - IV : COMPREHENSION

Read the following passage carefully and answer the questions.

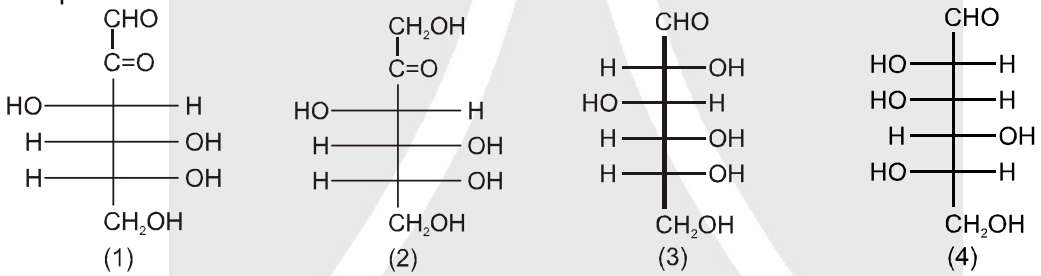
Comprehension # 1



[X] $\xrightarrow{\text{Hydrolysis}}$ [Y] + [Z]



1. Compounds Y and Z can be :



(A) 1 only (B) 2, 3 (C) 1, 4 (D) 2, 3, 4

2. Number of moles (P) of HIO_4 used per moles of compound X is :

(A) 2 (B) 3 (C) 4 (D) 5

Comprehension # 2

Answer Q.3, Q.4 and Q.5 by appropriately matching the information given in the three columns of the following table.

Observe the three columns in which column-1 represents carbohydrates, column-2 represents types of sugar while column-3 represents different type of test and nature.

Column-1		Column-2		Column-3	
(I)	Glucose	(i)	Disaccharide	(P)	Mutarotation
(II)	Sucrose	(ii)	Monosaccharide	(Q)	Reducing sugar
(III)	Starch	(iii)	Polysaccharide	(R)	Non-Reducing sugar
(IV)	Fructose	(iv)	Oligosaccharide	(S)	2,4-DNP test positive

3. Which combination is correct ?

(A) (I) (ii) (R) (B) (III) (iii) (S) (C) (II) (i) (R) (D) (IV) (i) (Q)

4. Which of the following combination gives Br_2/H_2O test ?

(A) (II) (iii) (R) (B) (I) (ii) (Q) (C) (IV) (ii) (Q) (D) (III) (iii) (S)

5. Which of the following combination is correct set for invert sugar ?

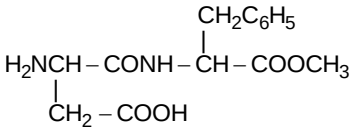
(A) (II) (i) (Q) (B) (III) (iii) (R) (C) (II) (iv) (R) (D) (II) (iii) (R)

Exercise-3

*** Marked Questions may have more than one correct option.**

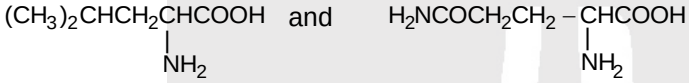
PART - I : JEE (ADVANCED) / IIT-JEE PROBLEMS (PREVIOUS YEARS)

1. Aspartame, an artificial sweetener, is a peptide and has the following structure : **[JEE-2001(M), 5/100]**



(i) Identify the four functional groups
(ii) Write the zwitter ionic structure
(iii) Write the structures of the amino acids obtained from the hydrolysis of aspartame.
(iv) Which of these two amino acids, is more hydrophobic ?

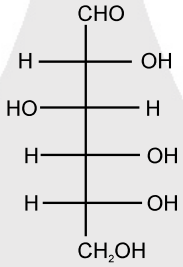
2. Following two aminoacids leusine and glutamine form dipeptide linkage. What are two possible dipeptides ?



[JEE-2003(M), 2/60]

3. Which of the following pairs give positive Tollen's Test ? **[JEE-2004(S), 3/84]**
(A) Glucose, sucrose (B) Glucose, fructose
(C) Hexanol, Acetophenone (D) Fructose ,sucrose

4. The Fischer projection formula of D-glucose is **[JEE 2004(M), 2/60)]**

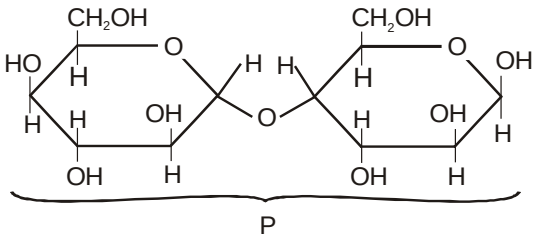


(i) Give Fischer projection formula of L-glucose.
(ii) Give the product of reaction of L-glucose with Tollen's reagent.

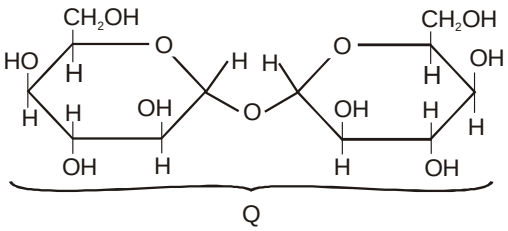
5. The two forms of D-Glucopyranose obtained from solution of D-Glucose are known as : **[JEE-2005(S), 3/84]**

(A) Epimers (B) Anomers
(C) Enantiomers (D) Geometrical Isomers

6. Which of the following disaccharide will not reduce tollen's reagent. **[JEE-2005(M), 2/60]**



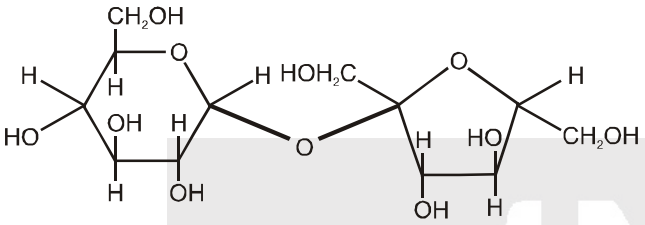
P



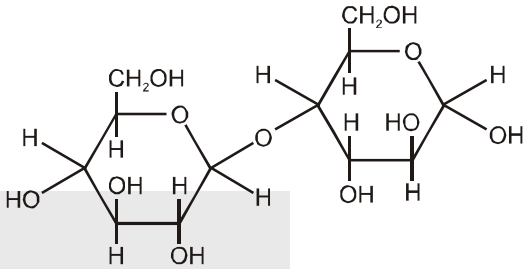
Q

7. **Statement-1 :** Glucose gives a reddish-brown precipitate with Fehling's solution. **[JEE-2007, 3/162]**
because
Statement-2 : Reaction of glucose with Fehling's solution gives CuO and gluconic acid.
(A) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.
(B) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1
(C) Statement-1 is True, Statement-2 is False
(D) Statement-1 is False, Statement-2 is True

8.* The correct statement(s) about the following sugars **X** and **Y** is(are) : **[JEE 2009, 4/160]**



X

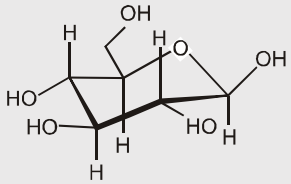


Y

(A) **X** is a reducing sugar and **Y** is a non-reducing sugar.
(B) **X** is a non-reducing sugar and **Y** is a reducing sugar.
(C) The glucosidic linkages in **X** and **Y** are α and β, respectively.
(D) The glucosidic linkages in **X** and **Y** are β and α, respectively.

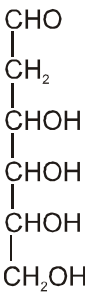
9. A decapeptide (Mol. Wt. 796) on complete hydrolysis gives glycine (Mol. Wt. 75), alanine and phenylalanine. Glycine contributes 47.0 % to the total weight of the hydrolysed products. The number of glycine units present in the decapeptide is **[JEE 2011, 4/180]**

10. The following carbohydrate is **[JEE 2011, 3/180]**

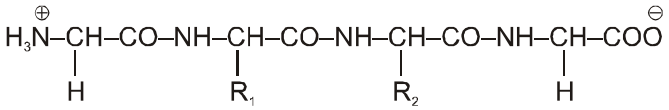


(A) a ketohexose (B) an aldohexose (C) an α-furanose (D) an α-pyranose

11. When the following aldohexose exists in its D-configuration, the total number of stereoisomers in its pyranose form is : **[JEE-2012, 4/136]**



12. The substituents R_1 and R_2 for nine peptides are listed in the table given below. How many of these peptides are positively charged at pH = 7.0 ? **[JEE-2012, 4/136]**

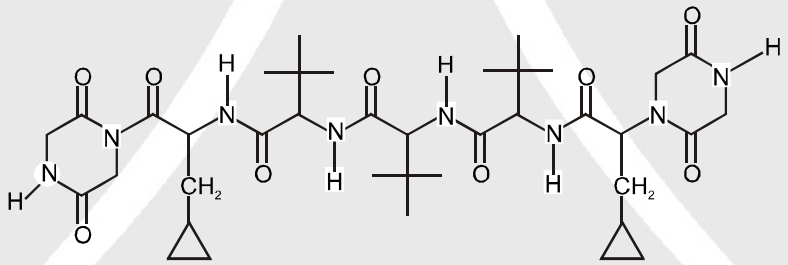


Peptide	R_1	R_2
I	H	H
II	H	CH_3
III	CH_2COOH	H
IV	CH_2CONH_2	$(CH_2)_4NH_2$
V	CH_2CONH_2	CH_2CONH_2
VI	$(CH_2)_4NH_2$	$(CH_2)_4NH_2$
VII	CH_2COOH	CH_2CONH_2
VIII	CH_2OH	$(CH_2)_4NH_2$
IX	$(CH_2)_4NH_2$	CH_3

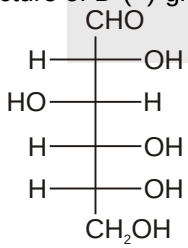
13. A tetrapeptide has – COOH group on alanine. This produces glycine (Gly), valine (Val), phenyl alanine (Phe) and alanine (Ala), on complete hydrolysis. For this tetrapeptide, the number of possible sequences (primary structures) with $-NH_2$ group attached to a chiral center is :

[JEE(Advanced)-2013, 4/120]

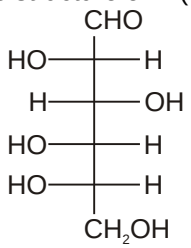
14. The total number of ***distinct naturally occurring amino acids*** obtained by complete acidic hydrolysis of the peptide shown below is : **[JEE(Advanced)-2014, 4/120]**

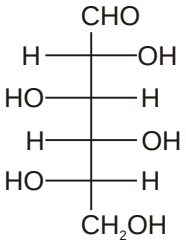


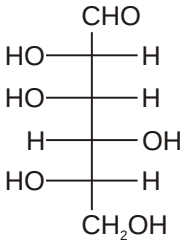
15. The structure of D-(+)-glucose is

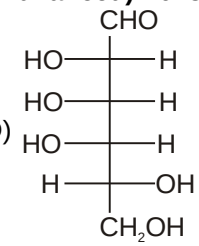


The structure of L-(–)-glucose is : **[JEE(Advanced)-2015, 4/120]**

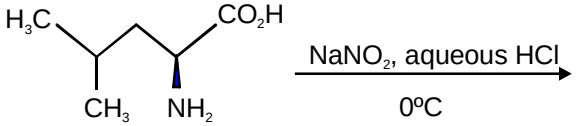
(A) 

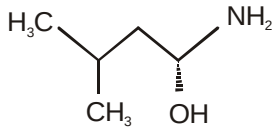
(B) 

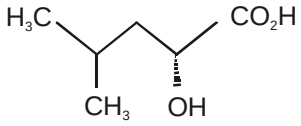
(C) 

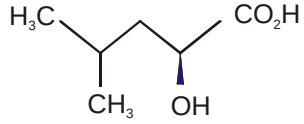
(D) 

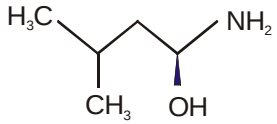
16. The major product of the reaction is : **[JEE(Advanced)-2015, 4/120]**



(A) 

(B) 

(C) 

(D) 

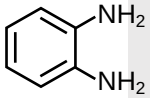
17.* For 'invert sugar', the correct statement(s) is(are) **[JEE(Advanced)-2016, 3/124]**
(Given : specific rotations of (+)-sucrose, (+)-maltose, L-(–)-glucose and L-(+)-fructose in aqueous solution are +66º, +140º, –52º and +92º, respectively)
(A) 'invert sugar' is prepared by acid catalyzed hydrolysis of maltose
(B) 'invert sugar' is an equimolar mixture of D-(+)-glucose and D-(–)-fructose
(C) specific rotation of 'invert sugar' is –20º
(D) on reaction with Br_2 water, 'invert sugar' forms saccharic acid as one of the products

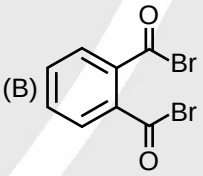
Comprehension # 2 (for 18 to 19)

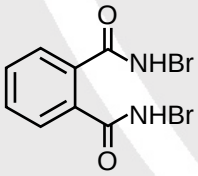
Treatment of compound **O** with $KMnO_4/H^+$ gave **P**, which on heating with ammonia gave **Q**. The compound **Q** on treatment with Br_2/NaOH produced **R**. On strong heating, **Q** gave **S**, which on further treatment with ethyl 2-bromopropanoate in the presence of KOH followed by acidification, gave a compound **T**.

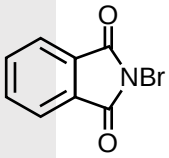
(O)

18. The compound **R** is **[JEE(Advanced)-2016, 3/124]**

(A) 

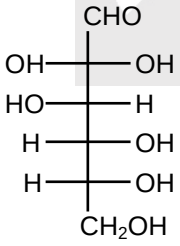
(B) 

(C) 

(D) 

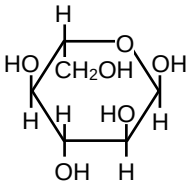
19. The compound **T** is **[JEE(Advanced)-2016, 3/124]**
(A) glycine (B) alanine (C) valine (D) serine

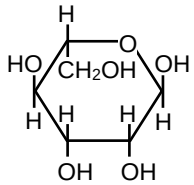
20.* The Fishcher presentation of D-glucose is given below. **[JEE(Advanced)-2018, 4/120]**

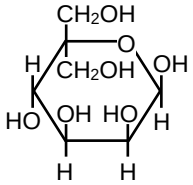


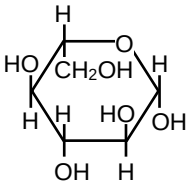
D-glucose

The correct structure(s) of β-L-glucopyranose is (are)

(A) 

(B) 

(C) 

(D) 

PART - II : JEE (MAIN) / AIEEE PROBLEMS (PREVIOUS YEARS)

JEE(MAIN) OFFLINE PROBLEMS

1. A substance forms zwitter ion. It can have functional group. **[AIEEE-2002, 3/225]**
(1) $-NH_2$, $-COOH$ (2) $-NH_2$, $-SO_3H$
(3) Both (1) and (2) (4) None of these

2. Complete hydrolysis of cellulose gives **[AIEEE-2003, 3/225]**
(1) D-fructose (2) D-ribose (3) D-glucose (4) L-glucose

3. The reason for double helical structure of DNA is: **[AIEEE-2003, 3/225]**
(1) van der Waal's forces. (2) dipole-dipole interaction.
(3) hydrogen bonding. (4) electrostatic attractions.

4. Which base is present in RNA but not in DNA? **[AIEEE-2004, 3/225]**
(1) uracil (2) cytosine (3) guanine (4) thymine

5. Insulin production and its action in human body are responsible for the level of diabetes. This compound belongs to which of the following categories? **[AIEEE-2004, 3/225]**
(1) a co- enzyme (2) a hormone (3) an enzyme (4) an antibiotic

6. In both DNA and RNA, heterocylic base and phosphate ester linkages are at : **[AIEEE 2005, 3/225]**
(1) C_5' and C_2' respectively of the sugar molecule
(2) C_2' and C_5' respectively of the sugar molecule
(3) C_1' and C_5' respectively of the sugar molecule
(4) C_5' and C_1' respectively of the sugar molecule.

7. The pyrimidine bases present in DNA are **[AIEEE-2006, 3/165]**
(1) cytosine and guanine (2) cytosine and thymine
(3) cytosine and uracil (4) cytosine and adenine

8. The term anomers of glucose refers to **[AIEEE-2006, 3/165]**
(1) a mixture of (D)–glucose and (L)–glucose
(2) enantiomers of glucose
(3) isomers of glucose that differ in configuration at carbon one (C–1)
(4) isomers of glucose that differ in configurations at carbons one and four (C–1 and C–4)

9. The secondary structure of protein refers to: **[AIEEE-2007, 3/120]**
(1) α-helical backbone. (2) hydrophobic interactions.
(3) sequence of α-amino acids. (4) fixed configuration of the polypeptide backbone.

10. α-D-(+)-glucose and β-D-(+)-glucose are **[AIEEE-2008, 3/105]**
(1) epimers (2) anomers (3) enantiomers (4) conformers

11. The two functional groups present in a typical carbohydrate are : **[AIEEE-2009, 4/144]**
(1) –CHO and –COOH (2) >C=O and –OH (3) –OH and –CHO (4) –OH and –COOH

12. The presence or absence of hydroxy group on which carbon atom of sugar differentiates RNA and DNA. **[AIEEE-2011, 4/120]**
(1) 1^{st} (2) 2^{nd} (3) 3^{rd} (4) 4^{th}

13. The change in the optical rotation of freshly prepared solution of glucose is known as: **[AIEEE-2011, 4/120]**
(1) racemisation (2) specific rotation (3) mutarotation (4) tautomerism

14. Which one of the following statements is correct? **[AIEEE-2012, 4/120]**
(1) All amino acids except lysine are optically active
(2) All amino acids are optically active
(3) All amino acids except glycine are optically active
(4) All amino acids except glutamic acids are optically active

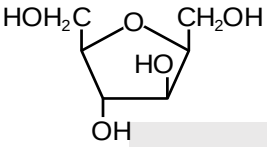
15. Synthesis of each molecule of glucose in photosynthesis involves : **[JEE-Main 2013, 4/120]**
(1) 18 molecules of ATP (2) 10 molecules of ATP
(3) 8 molecules of ATP (4) 6 molecules of ATP

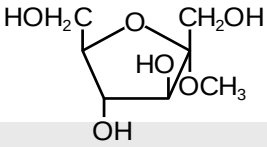
16. Which one of the following bases is not present in DNA ? **[JEE-Main 2014, 4/120]**
(1) Quinoline (2) Adenine (3) Cytosine (4) Thymine

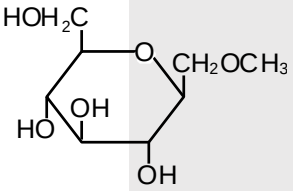
17. Which of the vitamins given below is water soluble ? **[JEE-Main 2015, 4/120]**
(1) Vitamin C (2) Vitamin D (3) Vitamin E (4) Vitamin K

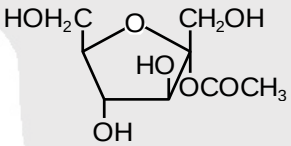
18. Thiol group is present in : **[JEE-Main 2016, 4/120]**
(1) Cystine (2) Cysteine (3) Methionine (4) Cytosine

19. Whcih of the following compounds will behave as a reducing sugar in an aqueous KOH solution? **[JEE-Main 2017, 4/120]**

(1) 

(2) 

(3) 

(4) 

20. Glucose on prolonged heating with HI gives : **[JEE-Main 2018, 4/120]**
(1) Hexanoic acid (2) 6-iodohexanal (3) n-Hexane (4) 1-Hexene

JEE(MAIN) ONLINE PROBLEMS

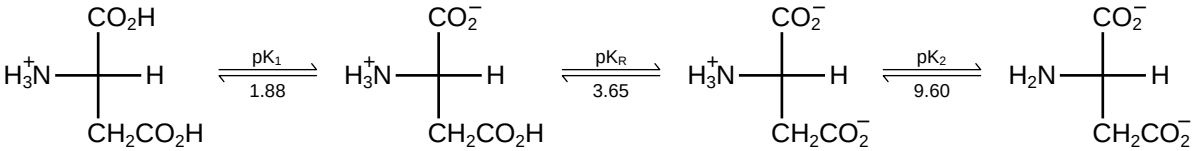
1. Which of the following will not show mutarotation? **[JEE(Main) 2014 Online (12-04-14), 4/120]**
(1) Maltose (2) Lactose (3) Glucose (4) Sucrose

2. The reason for double helical structure of DNA is the operation of : **[JEE(Main) 2014 Online (19-04-14), 4/120]**
(1) Electrostatic attractions (2) Vander Waals forces
(3) Dipole-Dipole interactions (4) Hydrogen bonding

3. Complex hydrolysis of starch gives : **[JEE(Main) 2015 Online (10-04-15), 4/120]**
(1) glucose only
(2) glucose and fructose in equimolar amounts
(3) galactose and fructose in equimolar amounts
(4) glucose and galactose in equimolar amounts

4. Accumulation of which of the following molecules in the muscles occurs as a result of vigorous exercise? **[JEE(Main) 2015 Online (11-04-15), 4/120]**
(1) Glycogen (2) Glucose (3) Pyruvic acid (4) L-lactic acid

5. Consider the following sequence for aspartic acid:



The pI (isoelectric point) of aspartic acid is: **[JEE(Main) 2016 Online (09-04-16), 4/120]**
(1) 5.74 (2) 3.65 (3) 2.77 (4) 1.88

6. Among the following, the essential amino acid is : **[JEE(Main) 2017 Online (08-04-17), 4/120]**
(1) Valine (2) Aspartic acid (3) Serine (4) Alanine

7. The **incorrect** statement among the following is : **[JEE(Main) 2017 Online (09-04-17), 4/120]**

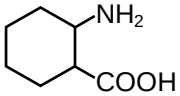
(1) α-D-glucose and β-D-glucose are anomers.

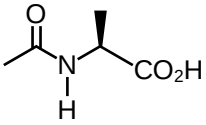
(2) The penta acetate of glucose does not react with hydroxyl amine.

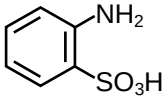
(3) Cellulose is a straight chain polysaccharide made up of only β-D-glucose units.

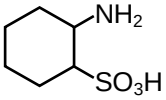
(4) α-D-glucose and β-D-glucose are enantiomers.

8. Which of the following will not exist in zwitter ionic form at pH = 7 ? **[JEE(Main) 2018 Online (15-04-18), 4/120]**

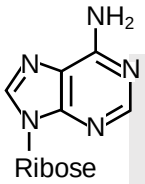
(1) 

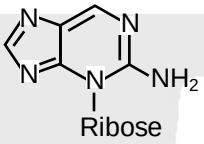
(2) 

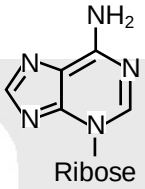
(3) 

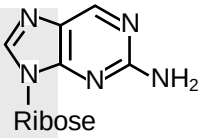
(4) 

9. Which of the following is the correct structure of Adenosine ? **[JEE(Main) 2018 Online (15-04-18), 4/120]**

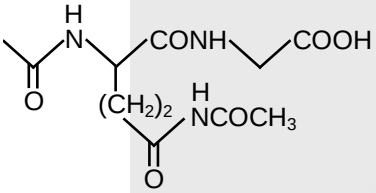
(1) 

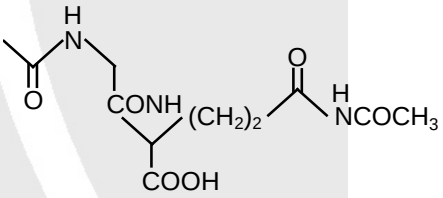
(2) 

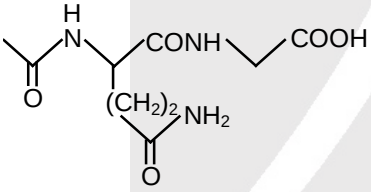
(3) 

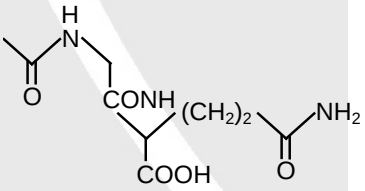
(4) 

10. The dipeptide, Gln-Gly, on treatment with CH_3COCl followed by aqueous work up gives : **[JEE(Main) 2018 Online (15-04-18), 4/120]**

(1) 

(2) 

(3) 

(4) 

11. Among the following, the **incorrect** statement is : **[JEE(Main) 2018 Online (16-04-18), 4/120]**

(1) Cellulose and amylose has 1,4-glycosidic linkage.

(2) Lactose contains β-D-galactose and β-D-glucose.

(3) Maltose and lactose has 1,4-glycosidic linkage.

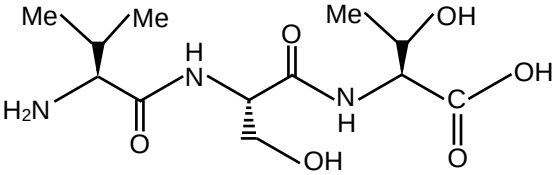
(4) Sucrose and amylose has 1,2-glycosidic linkage.

12. The increasing order of pKa of the following amino acids in aqueous solution is :
Gly, Asp, Lys, Arg **[JEE(Main) 2019 Online (09-01-19), 4/120]**

(1) Asp < Gly < Lys < Arg (2) Arg < Lys < Gly < Asp

(3) Asp < Gly < Arg < Lys (4) Gly < Asp < Arg < Lys

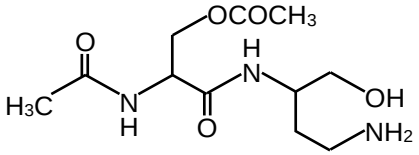
13. The correct sequence of amino acids present in the tripeptide given below is : **[JEE(Main) 2019 Online (09-01-19), 4/120]**

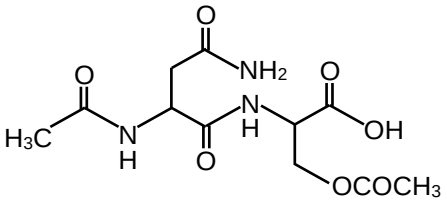


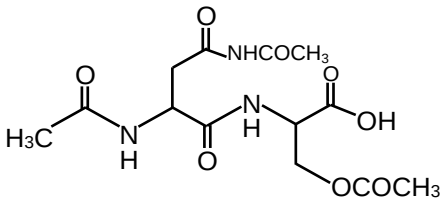
(1) Val - Ser - Thr (2) Leu - Ser - Thr (3) Thr - Ser - Leu (4) Thr - Ser - Val

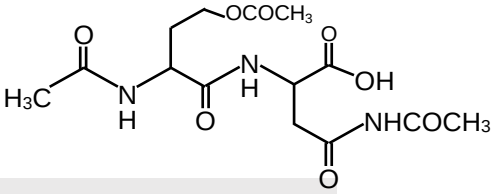
14. The correct structure of product 'P' in the following reaction is :

Asn–Ser + $\underset{\text{(Excess)}}{(CH_3CO)_2O} \xrightarrow{NEt_3} P$ **[JEE(Main) 2019 Online (10-01-19), 4/120]**

(1) 

(2) 

(3) 

(4) 

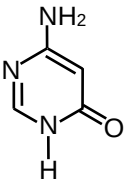
15. The correct match between item 'I' and item 'II' is: **[JEE(Main) 2019 Online (10-01-19), 4/120]**

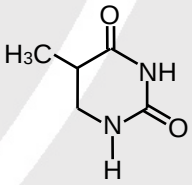
	Item 'I' (Compound)		**Item 'II' (Reagent)**
(A)	Lysine	(P)	1-Naphthol
(B)	Furfural	(Q)	Ninhydrin
(C)	Benzyl alcohol	(R)	$KMnO_4$
(D)	Styrene	(S)	Ceric ammonium nitrate

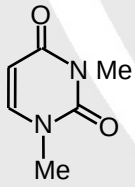
(1) (A)→(R), (B)→(P), (C)→(Q), (D)→(S)
(2) (A)→(Q), (B)→(P), (C)→(S), (D)→(R)
(3) (A)→(Q), (B)→(R), (C)→(S), (D)→(P)
(4) (A)→(Q), (B)→(P), (C)→(R), (D)→(S)

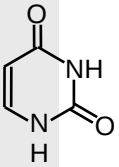
16. Among the following compounds, which one is found in RNA?

[JEE(Main) 2019 Online (11-01-19), 4/120]

(1) 

(2) 

(3) 

(4) 

17. The correct match between Item I and Item II is : **[JEE(Main) 2019 Online (11-01-19), 4/120]**

	Item I		**Item II**
(A)	Ester test	(P)	Tyr
(B)	Carbylamine test	(Q)	Asp
(C)	Phthalein dye test	(C)	Ser
		(D)	Lys

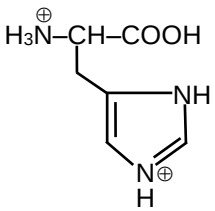
(1) (A) → (Q); (B) → (S); (C) → (R)
(2) (A) → (R); (B) → (Q); (C) → (P)
(3) (A) → (R); (B) → (S); (C) → (Q)
(4) (A) → (Q); (B) → (S); (C) → (P)

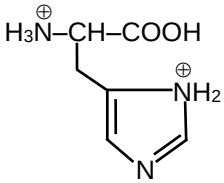
18. Among the following compounds most basic amino acid is: **[JEE(Main) 2019 Online (12-01-19), 4/120]**

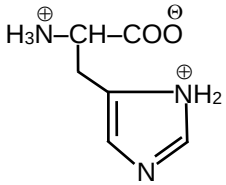
(1) Asparagine (2) Serine (3) Histidine (4) Lysine

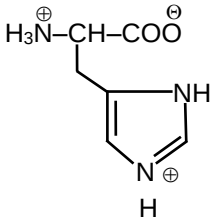
19. The correct structure of histidine in a strongly acidic solution (pH = 2) is:

[JEE(Main) 2019 Online (12-01-19), 4/120]

(1) 

(2) 

(3) 

(4) 

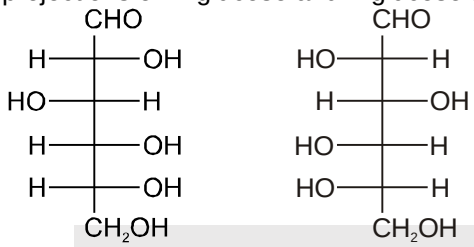
Answers

EXERCISE - 1

PART - I

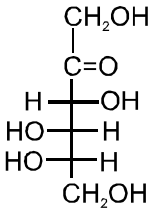
A-1. Monosaccharide is a carbohydrate that cannot be hydrolysed further to give simpler unit of polyhydroxy aldehyde or ketone.

A-2. Fischer projections of D-glucose and L-glucose are respectively



D(+)-glucose L-glucose

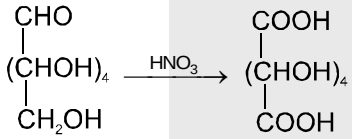
A-3.



L-Fructose

L-Fructose is enantiomer of D-Fructose.

A-4.



glucose saccharic acid

A-5. (i) Though glucose has aldehyde group, it does not give 2,4-DNP test
(ii) It does not form hydrogen sulphite addition product
(iii) The pentacetate of glucose does not react with hydroxyl amine.
Above facts indicate the absence of free –CHO group in glucose.

A-6. The spontaneous change in specific rotation of an optically active compound in solution with time, to an equilibrium value, is called mutarotation

A-7. The oxide linkage between two monosaccharides, formed by loss of a water molecule is called glycosidic linkage.

A-8. Those carbohydrates which reduce fehling's solution and tollen's reagents are called reducing sugars.

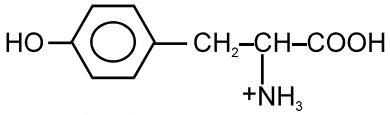
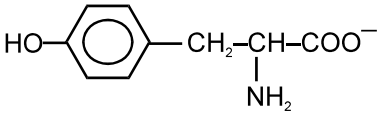
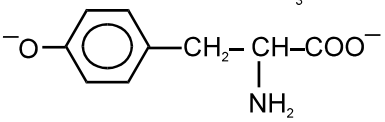
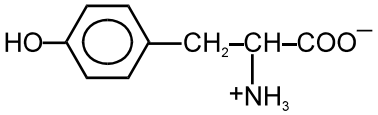
A-9. Glucose and fructose

A-10. Starch has (C_1–C_4) α glycosidic linkage between α-D glucose units, cellulose has (C_1–C_4) β glycosidic linkage between β-D glucose units.

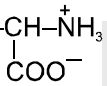
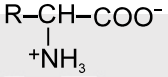
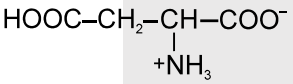
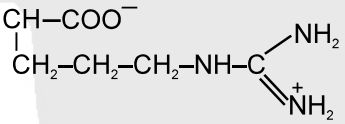
A-11. Glucose has five –OH groups and sucrose has eight –OH groups so they can form hydrogen bonding with H_2O molecules, hence soluble in water.

B-1. (a) The amino acids which can be synthesised in the body - non-essential ex. Glycine, Alanine.
(b) The amino acids which cannot be synthesised and must be obtained through diet. ex. valine, leucine.

B-2. Due to the presence of both acidic and basic groups in the same molecule. In aqueous solution –COOH group can loose a proton and $–NH_2$ group can accept a proton and forms zwitter ion. In zwitter ionic form amino acids show amphoteric behaviour.

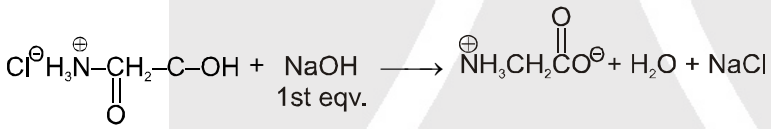
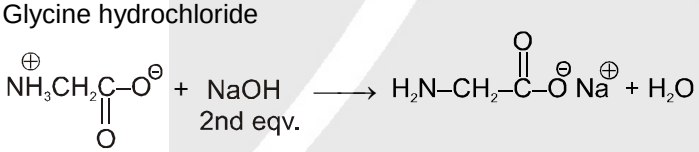
B-3. (a) 
(b) 
(c) 
(d) 

B-4. Number of amino groups is more than the number of carboxylic groups.

B-5. (i) 
(ii) 
(iii) 
(iv) 

B-6. Due to its existence in the form of zwitter ion, there exist a very strong intermolecular attraction which is responsible for high melting point of amino acid.

B-7. Amino acids contain two functional groups which can make H-bonds that is the reason why they have high m.p. and solubility in water.

B-8. 
Glycine hydrochloride


B-9. When protein in native form is subjected to a physical change like temperature or pH, the H–bonds are disturbed. As a result globules get unfold and helices get uncoiled therefore proteins loses its activity. During denaturation 2° and 3° structures get destroyed but 1° structure remain the same.
Ex: Coagulation of egg while on boiling and curdling of milk caused by bacteria present in milk.

PART – II

A-1.	(B)	**A-2.**	(C)	**A-3.**	(D)	**A-4.**	(D)	**A-5.**	(C)
A-6.	(B)	**A-7.**	(A)	**A-8.**	(C)	**A-9.**	(C)	**A-10.**	(A)
B-1.	(B)	**B-2.**	(B)	**B-3.**	(A)	**B-4.**	(C)	**B-5.**	(D)
B-6.	(A)	**C-1.**	(D)	**C-2.**	(A)	**C-3.**	(C)	**C-4.**	(B)
C-5.	(C)	**C-6.**	(B)	**C-7.**	(C)	**C-8.**	(A)	**C-9.**	(C)
C-10.	(C)	**C-11.**	(A)	**C-12.**	(D)	**C-13.**	(D)	**C-14.**	(B)
C-15.	(B)	**C-16.**	(C)	**C-17.**	(B)	**C-18.**	(D)	**C-19.**	(C)
C-20.	(C)	**C-21.**	(C)	**C-22.**	(C)	**C-23.**	(D)	**C-24.**	(A)

PART – III

1. A → (p,q) ; B → (p,s) ; C → (p,r,t) ; D → (p,t)

2. (A – q,r) ; (B – s) ; (C – q) ; (D – p)

EXERCISE - 2

PART - I

1.	(A)	**2.**	(B)	**3.**	(B)	**4.**	(A)	**5.**	(D)
6.	(C)	**7.**	(B)	**8.**	(B)				

PART - II

1.	9	**2.**	3	**3.**	3	**4.**	4	**5.**	32
6.	$2^3 = 8$								

PART - III

1.	(ACD)	**2.**	(AC)	**3.**	(BC)	**4.**	(AB)	**5.**	(BD)
6.	(AD)	**7.**	(ABCD)	**8.**	(ABCD)				

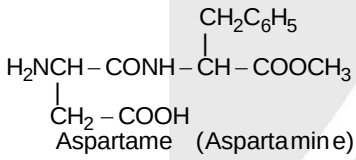
PART - IV

1.	(B)	**2.**	(B)	**3.**	(C)	**4.**	(B)	**5.**	(C)

EXERCISE - 3

PART - I

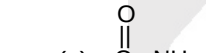
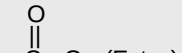
1.



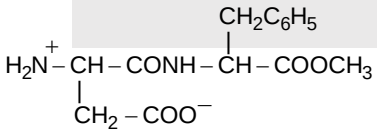
Aspartame (Aspartamine)

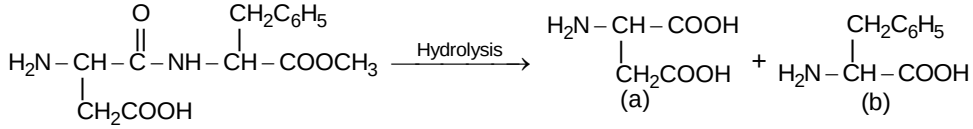
(i) In aspartame four functional groups are present which are

(a) $-NH_2$ (Amine) (b) (–COOH) (Carboxylic acid)

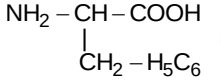
(c)  (d) 

(ii) Zwitter ion structure is givens as below :

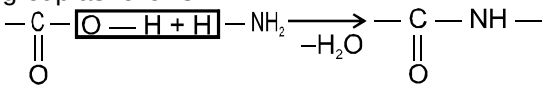


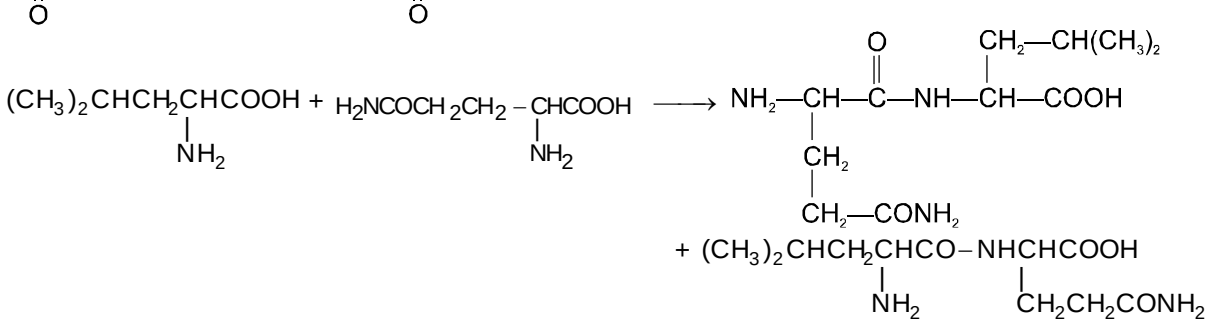
(iii) 

Hence on hydrolysis two amino acid (a) and (b) are obtained.

(iv) In above two amino acids  is more hydrophobic due to presence of non-polar $C_6H_5–CH_2–$ or benzyl group.

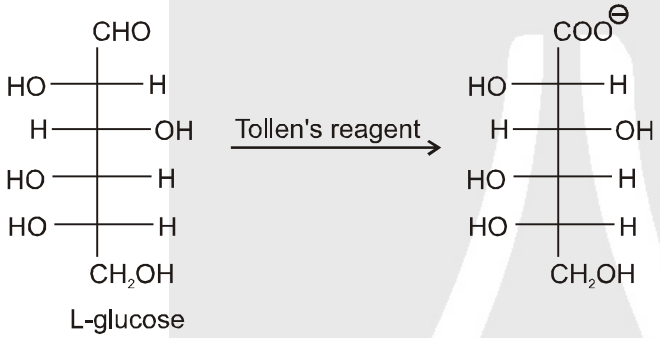
2. Peptide linkage is $-NH-\overset{O}{\overset{\|}{C}}-$ and it is formed by the condensation between $-NH_2$ group and –COOH group as follows





3. (B)

4.



5. (B)

6. P is a reducing sugar as one monosaccharide has free reducing group because glycosidic linkage is (1, 4). Whereas in Q both the reducing groups are involved in glycosidic bond formation

7.	(C)	**8.**	(BC)	**9.**	6	**10.**	(B)	**11.**	8
12.	4 [(iv) , (vi), (viii) & (ix)]			**13.**	4	**14.**	1	**15.**	(A)
16.	(C)	**17.**	(BC)	**18.**	(A)	**19.**	(B)	**20.**	(D)

PART - II

JEE(MAIN) OFFLINE PROBLEMS

1.	(3)	**2.**	(3)	**3.**	(3)	**4.**	(1)	**5.**	(2)
6.	(3)	**7.**	(2)	**8.**	(3)	**9.**	(4)	**10.**	(2)
11.	(3)	**12.**	(2)	**13.**	(3)	**14.**	(3)	**15.**	(1)
16.	(1)	**17.**	(1)	**18.**	(2)	**19.**	(4)	**20.**	(3)

JEE(MAIN) ONLINE PROBLEMS

1.	(4)	**2.**	(4)	**3.**	(1)	**4.**	(4)	**5.**	(3)
6.	(1)	**7.**	(4)	**8.**	(2)	**9.**	(1)	**10.**	(3)
11.	(4)	**12.**	(1)	**13.**	(1)	**14.**	(2)	**15.**	(2)
16.	(4)	**17.**	(4)	**18.**	(4)	**19.**	(1)		