Biomolecules

(b) trihydroxy propane

FACT/DEFINITION TYPE QUESTIONS

1.	The acid used for prelimina	ry separation of biomolecule
	in a living tissue is	
	(a) trichlorobenzoic acid	(b) benzoic acid

- (a) trichlorobenzoic acid (b)
- (c) trichloroacetic acid (d) acetic acid
- 2. Biomolecules are

5.

- (a) organic compounds
- (b) inorganic compounds
- (c) volatile compounds
- (d) both (a) and (b)
- 3. Which of the following is the example of acidic amino acid?
 - (a) Lysine (b) Glutamic acid (c) Aspartic acid (d) Both (b) and (c)
- 4. All the following amino acids are aromatic, except
 - (b) phenylalanine (a) tyrosine
 - (c) tryptophan (d) valine The most basic amino acid is
 - (b) histidine (a) arginine
- glycine (c) (d) glutamine The simplest amino acid is _ 6.
 - (a) glycine (b) proline (c) leucine
 - (d) tryptophan
- 7. The charged molecule which is electrically neutral is known as
- (a) amino acid (b) zwitterion (c) amide (d) peptide 8.
 - Unsaturated fatty acids have (a) palmitic acid (b) oleic acid
 - (c) high melting point (d) one or more double
 - bonds
- 9. Which of the following is/are essential fatty acid(s)?
 - (a) Linoleic acid (b) Linolenic acid
 - (c) Arachidonic acid (d) All of these
- **10.** Phospholipids are important cell membrane constituents, because they
 - (a) contain glycerol.
 - (b) can form bilayers in water.
 - (c) combine covalently with protein.
 - (d) contain polar and non-polar portions.

- 11. Glycerol is a
 - (a) tetrahydroxy propane
- (c) trihydroxy butane (d) tetrahydroxy butane **12.** A fat has
 - (a) 3 glycerol and one fatty acid molecule.
 - (b) one glycerol and 3 fatty acid molecules.
 - (c) 3 glycerol and 3 fatty acid molecules.
 - (d) one glycerol and one fatty acid molecule.
- 13. Lecithin is a
 - (a) phospholipid (b) carbohydrate
 - (d) amino acid
- (c) protein A nucleotide is formed of 14.
 - (a) purine, pyrimidine and phosphate
 - (b) purine, sugar and phosphate
 - (c) nitrogen base, sugar and phosphate
 - (d) pyrimidine, sugar and phosphate
- 15. Building block of nucleic acid is
 - (a) nucleotide (b) nucleoside
 - (c) amino acid (d) fatty acid
- 16. Inulin is a polymer of
 - (a) glucose (b) galactose
 - (c) fructose (d) arabinose
- 17. Primary structure of protein is due to the presence of
- (a) hydrogen bonds (b) peptide bonds (c) -S-S-linkages(d) ionic bonds
- 18. Most abundant protein in human body is
 - (a) collagen (b) myosin
 - actin (d) albumin (c)
- 19. Quaternary structure is present in
 - (b) histone (a) haemoglobin
 - (c) globulin (d) elastin
- 20. The bond between phosphate and hydroxyl group of sugar in nucleic acid is _____
 - (a) glycosidic bond (b) peptide bond
 - (c) ester bond (d) none of these
- Turn over number of enzyme depends upon 21.
 - (a) size of enzyme molecule.
 - (b) number of the active sites.
 - (c) concentration of substrate molecule.
 - (d) molecular weight of as enzyme.

- **22.** The Km value of the enzyme is the value of the substrate concentration at which the reaction reaches to
 - (a) zero (b) 2Vmax
 - (c) ¹/₂Vmax (d) ¹/₄Vmax
- **23.** Ribozyme is a/an
 - (a) enzyme whose cofactor is RNA.
 - (b) RNA with enzyme activity.
 - (c) enzyme by which RNA is formed.
- (d) conjugated protein having ribose sugar.
- **24.** Feedback inhibition of enzymes is affected by
 - (a) enzyme (b) substrate
 - (c) end product (d) intermediate end
 - products
- 25. Co-enzyme is
 - (a) always a protein.
 - (b) often a metal.
 - (c) always an inorganic compound.
 - (d) often a vitamin.
- **26.** Which one of the following statements is correct, with reference to enzymes ?
 - (a) Holoenzyme = Apoenzyme + Coenzyme
 - (b) Coenzyme = Apoenzyme + Holoenzyme
 - (c) Holoenzyme = Coenzyme + Co-factor
 - (d) Apoenzyme = Holoenzyme + Coenzyme
- 27. Inorganic catalyst work efficiently at _____ temperature and _____ pressure.
 - (a) high, low (b) low, low
 - (c) low, high (d) high, high

STATEMENT TYPE QUESTIONS

- **28.** Which of the following statement is not true about amino acid?
 - (a) The amino group and carboxylic group of an amino acid are attached to both amino and carboxylic groups to alpha carbon.
 - (b) Amino acids have an N-terminus, C-terminus, and R groups.
 - (c) Amino acid can be classified by the number of peptide bond.
 - (d) Essential amino acids are not synthesized in the body, therefore have to be provided in the diet.
- **29.** Which of the following statement is incorrect ?
 - (a) Long chain molecules of fatty acids are formed by polymerization of 2 carbon compounds.
 - (b) Lipid molecules are soluble in water.
 - (c) In lipid, R group may be $-CH_3$ group, $-C_2H_5$ group or higher number of $-CH_2$ group (1 to 19 carbon).
 - (d) Oils have lower melting temperature.
- **30.** Select the incorrect statement.
 - (a) Amino acids are substituents methanes.
 - (b) Glycerol is a trihydroxy propane.
 - (c) Lysine is a neutral amino acid.
 - (d) Lecithin is a phospholipid.

- **31.** Select the incorrect statement.
 - (a) Ribozymes are nucleic acids with catalytic power.
 - (b) Proteins are homopolymer made of amino acids.
 - (c) Inulin is a polymer of fructose.
 - (d) Glycogen is stored in liver and muscles.
- **32.** Pick out the correct statement.
 - (a) Chitin is a homopolymer.
 - (b) Collagen is the most abundant protein in the whole of the biosphere.
 - (c) Proteins are linear chains of amino acids linked by peptide bonds.
 - (d) In a polysaccharide, the individual monosaccharides are linked by a phosphodiester bond.
- **33.** Which of the following statement is wrong regarding chitin?
 - (a) It is a storage of polysaccharide.
 - (b) It is a heteropolysaccharide.
 - (c) It is a constituent of arthropods and fungal cell wall.
 - (d) It is a second most abundant carbohydrate on earth.
- **34.** Which of the following statement is incorrect regarding secondary metabolites ?
 - (a) Plant tissues produce only secondary metabolities.
 - (b) Secondary metabolities have restricted distribution in the plant kingdoms.
 - (c) Abrin and ricin are secondary metabolities used as a drugs.
 - (d) Some secondary metabolites have ecological importance.
- **35.** Which of the following statements about enzymes is incorrect?
 - (a) Enzymes are denatured at high temperature but in certain exceptional organisms. They are effective even at $80^{\circ} 90^{\circ}$ C.
 - (b) Enzymes require optimum pH for maximal activity.
 - (c) Most enzymes are proteins but some are lipids.
 - (d) Enzymes are highly specific.
- 36. Which statement is incorrect about coenzyme ?
 - (a) Every coenzyme is a cofactor and every cofactor is a coenzyme.
 - (b) Every coenzyme is a cofactor and every cofactor is not a coenzyme.
 - (c) Most of the coenzymes are nucleotides and are composed of vitamins.
 - (d) Coenzymes are the active constituents of enzyme.
- **37.** Study the given statements and select the correct option.
 - (i) Nitrogen bases are open chain hydrocarbons.
 - (ii) A nucleoside differ from nucleotide in not having phosphate.
 - (iii) One turn of B-DNA has ten base pairs.
 - (iv) Length of one turn of DNA is 3.4 Å.
 - (a) Statements (i) and (ii) are correct.
 - (b) Statements (i) and (iv) are correct.
 - (c) Statements (ii) and (iii) are incorrect.
 - (d) Statements (i) and (iv) are incorrect.



Biomolecules

- **38.** Which of the following statements are correct?
 - (i) Chitin, a complex or heteropolysaccharide occuring in exoskeleton consists of NAG.
 - Glucosamine and N-acetyl glucosamine are modified sugar.
 - (iii) Cellulose shows blue colour when treated with I_2 .
 - (iv) Starch in plants and glycogen in animals are store houses of energy.
 - (v) Right end of polysaccharide is called reducing end while left end is called non-reducing end.
 - (a) (i), (ii) and (iii) (b) (iii), (iv) and (v)
 - (c) All except (iii) (d) All except (v)
- **39.** Select false statements for an enzyme promoting a chemical reaction by
 - (i) lowering the energy of activation.
 - (ii) causing the release of heat, which acts as a primer.
 - (iii) increasing molecular motion.
 - (iv) changing the free energy difference between substrate and product.
 - (a) (i) and (iv) (b) (ii) and (iii)
 - (c) (ii),(iii) and (iv) (d) (iii) and (iv)
- **40.** The steps in catalytic cycle of an enzyme action are given in random order.
 - (i) The enzyme releases the products. Now enzyme is free to bind another substrate.
 - (ii) The active sites, now in close proximity of substrate breaks the bond of substrate and forms E-P complex.
 - (iii) Binding of substrate induces the enzyme to alter its shape fitting more tightly around the substrate.
 - (iv) The substrate binds to the active site of enzyme (*i.e.*, fitting into the active site).

The correct order is

- (a) (i), (ii), (iii), (iv) (b) (iv), (iii), (ii), (i)
- (c) (i), (iii), (ii), (iv) (d) (i), (ii), (iv), (iii)
- **41.** Which of the following statement(s) is/are incorrect?
 - (i) Nearly 1/3rd of all enzymes requires the presence of metal ions for catalytic function.
 - (ii) Metal ions form coordinate bond with side chain at active site of metalloenzyme and at the same time form one or more coordinate bonds with the substrate.
 - (iii) NAD and NAD (coenzymes) contain niacin (vit. B_3)
 - (iv) Coenzymes are organic compounds but their association with the apoenzyme is only transient, usually occurring during catalysis.
 - (a) All of these (b) Only (iii) and (iv)
 - (c) Only (iv) (d) None of these
- **42.** Which of the given option is correct for the following statements ?
 - (i) The metabolic pathway in which acetic acid is converted into cholesterol is an endothermic one.
 - (ii) Anabolic pathway is endergonic while catabolic pathway is exergonic.
 - (iii) Without metabolism there can not be a living state.
 - (a) All are correct (b) All are wrong
 - (c) (i) and (ii) are correct (d) Only (iii) is correct

ASSERTION/REASON TYPE QUESTIONS

In the following questions, a statement of Assertion is followed by a statement of Reason.

- (a) If both Assertion and Reason are true and the Reason is the correct explanation of the Assertion.
- (b) If both Assertion and Reason are true but the Reason is not the correct explanation of the Assertion.
- (c) If Assertion is true but Reason is false.
- (d) If both Assertion and Reason are false.
- **43. Assertion:** A coenzymes or metal ions that is very tightly bound to enzyme protein is called prosthetic group.

Reason: A complete, catalytically active enzyme together with its bound prosthetic group is called apoenzyme.

- Assertion: Glycosidic bonds are formed by dehydration. Reason: In polysaccharides, individual monosaccharide is linked by glycosidic bond.
- **45. Assertion:** Human diet should compulsorily contain glycine, serine and tyrosine.

Reason: Essential amino acids can be synthesized in the human body.

46. Assertion : Unsaturated fats are more reactive compared with the saturated fats.

Reason : Unsaturated fats have only single bonds in their structure.

47. Assertion : In a DNA molecule, A–T rich parts melt before G–C rich parts.

Reason: In between A and T there are three H–bond, whereas in between G and C there are two H-bonds.

48. Assertion: The amino acid glycine comes under the category of nonessential amino acids.

Reason: This is due to the fact that it can not be synthesised in the body.

MATCHING TYPE QUESTIONS

49. Match column I (organic compound) with column II (examples) and choose the correct combination from the given options.

	Column-I		Column-II
(Or	ganic Compounds)		(Examples)
A.	Fatty acid	I.	Glutamic acid
B.	Phospholipid	II.	Tryptophan
C.	Aromatic amino acid	III.	Lecithin
D.	Acidic amino acid	IV.	Palmitic acid
(a)	A - I; B - II; C - III, D	-IV	
(b)	A - IV; B - III; C - II,	D - I	
(c)	A - II; B - III; C - IV,	D - I	
(d)	A - III: B - IV: C - I.I	D–II	



50. Match the biomoecules given in column I with their examples given in column II and choose the correct answer.

	Сла	inples given in colui		libbse the context answer.	
		Column I		Column II	
		(Biomolecules)		(Examples)	
	А.	Carbohydrates	I.	Trypsin	
	B.	Protein	II.	Cholesterol	
	C.	Nucleic acid	III.	Insulin	
	D.	Lipid	IV.	Adenylic acid	
	(a)	A - III; B - I; C -	IV, D – II		
	(b)	A – II; B – III; C –	IV, D–I		
	(c)	A - III; B - IV; C	– I, D – II		
	(d)	A - IV; B - I; C -	II, D – III		
51.	Ma	tch the protein giv	en in col	umn I with its function	
	give	en in column II and	l choose t	he right option.	
		Column I		Column II	
		(Proteins)		(Functions)	
	А.	Collagen	I.	Glucose transport	
	B.	Trypsin	II.	Hormone	
	C.	Insulin	III.	Intercellular ground	
				substance	
	D.	GLUT-4	IV.	Enzyme	
	(a)	A - III; B - IV; C	–II; D–I		
	(b)	A - IV; B - I; C - I	II; D–III		
	(c)	A - II; B - IV; C -	I; D–III		
	(d)	A - III; B - IV; C	–I; D–II		
52.	Match the column-I (component) with column-II (% of				
	the	total cellular mass)	and iden	tify the correct option.	
		Column-I	Co	olumn-II	
		(Component)	(%	of the total	
			cell	ular mass)	
	A.	Water	I.	3	
	B.	Proteins	II.	70-90	
	C.	Carbohydrates	III.	2	
	D.	Lipids	IV.	5-7	
	E.	Nucleic acids	V.	10-15	
	(a)	A-V; B-II; C-I	III; D–IV	∕; E − I	
	(b)	A-II; B-V; C-I	I; D - III;	E-IV	
	(c)	A-III; B-I; C-I	IV; D-V	; E – II	
	(d)	A - V; B - IV; C -	III; D–I	I; E – I	
53.	Ma	tch column I (cate	gory) wit	h column II (secondary	
	met	abolites)and choos	e the corr	rect option.	
		Column I	Co	lumn II	
		(Category)	(Secon	dary metabolites)	
	А.	Pigments	I. Co	ncanavalin A	

II.

Terpenoides

(a) A-IV; B-II; C-III; D-I

(b) A-IV; B-III; C-II; D-I(c) A-I; B-IV; C-III; D-II(d) A-I; B-III; C-II; D-IV

Alkaloids

D. Lectins

В.

С.

of

Monoterpenes, Diterpenes

IV. Carotenoids, Anthocyanin

III. Morphine, Cadeine

54. Match column I with column II and choose the correct option.

	Column-I		Column-II
А.	Cotton fibre	I.	Chitin
B.	Exoskeleton of	II.	Glycogen
	cockroach		
C.	Liver	III.	Starch
D.	Peeled potato	IV.	Cellulose
(a)	A-I; B-IV; C-III; D	-II	
(b)	A-IV; B-I; C-II; D-	III	
(c)	A-IV; B-I; C-III; D	– II	

 $(d)\quad A-I; B-IV; C-II; D-III$ 55. Match column I (function) with column II (Types of enzymes) and select the correct option.

		Column I		1	Column II	
		(Function)			(Types of enzymes)	
	A.	Enzymes catalysing		I.	Isomerases	
		breakdown without	,			
		addition of water.				
	B.	Enzyme catalyzes th	ne	II.	Oxidoreductase	
		conversion of				
		an aldose sugar to				
		a ketose sugar.				
	C.	Enzyme where		III.	Ligases	
		catalysis involves			e	
		transfer of electrons	5.			
	D.	Enzyme catalysing		IV.	Lyases	
		bonding of two				
		components with th	ne			
		help of ATP.				
	(a)	A-I; B-IV; C-III	[; D -	- II		
	(b)	A-I; B-IV; C-II;	D –	III		
	(c)	A - IV; B - I; C - II;	D –	III		
	(d)	A - IV; B - I; C - III	[; D -	- II		
56.	Wh	ich one of the followi	ngp	airs o	of nitrogenous bases of	
	nucleic acids, is wrongly matched with the category					
	me	ntioned against it ?				
	(a)	Adenine, thymine	-	Puri	ines	
	(b)	Thymine, uracil	-	Pyri	midines	
	(c)	Uracil, cytosine	-	Pyri	midines	
	(d)	Guanine, adenine	_	Puri	ines	
57.	Mark the odd pair in the followings					
	(a)	Amino acid	—	Prot	ein	
	(b)	Nucleotide	_	DN	A	
	(c)	Glycerol	_	Fatt	y acid	
	(d)	Monosaccharide	—	Cell	ulose	
58.	Which one of the following is wrongly matched?					
	(a)	Fungi	—	Chit	in	
	(b)	Phospholipid	-	Plas	ma membrane	
	(c)	Enzyme	_	Lip	opolysaccharide	
	(d)	ATP	-	Nuc	eleotide derivative	
59.	Fin	d out the wrongly ma	tche	d pai	r	
	(a)	Primary metabolite	_	F	Ribose	
	(b)	Secondary metaboli	te –	A	Anthocyanins	
	(c)	Chitin	-	F	Polysaccharide	
	(d)	Cellulose		ŀ	leteropolymer	

Biomolecules

- 60. Choose the mismatch pair
 - (a) Glutamic acid Acidic
 - (b) Lysine Basic
 - (c) Valine Charged
 - (d) Phenylalanine Aromatic
- **61.** Find out the odd one from the given pair.
 - (a) Polysaccharide Glycosidic bond
 - Peptide bond (b) Protein
 - Ester (c) Fat
- (d) Polynucleotide Hydrogen bond
- Which of the following is wrongly matched? 62.
 - (a) Ribozyme - Proteinaceous in nature.
 - (b) Apoenzyme The protein part of enzyme.
 - Loosely attached organic (c) Co-enzyme _ cofactor of haloenzyme
 - (d) Co-factors Non-protein part of haloenzyme. _
- **63.** Find out the correct match.

(c) 1 and 4

- (a) Inulin - Polymer of glucose
 - (b) Starch - Spiral secondary structure
 - Cellulose Component of cell wall (c)
 - Glycogen Monosaccharide and reserved food of (d) plants

DIAGRAM TYPE QUESTIONS

64. Which of the two groups (marked as 1, 2, 3, & 4) of following formula involved in peptide bond between different amino acids?

(a) 2 and 3(b) 1 and 3

(d)
$$2 \text{ and } 4$$

65. What kinds of the structures of proteins are shown in the given figure (A, B, C and D)?



- (a) $A = 1^{\circ}$ structure, $B = 2^{\circ}$ structure, $C = 3^{\circ}$ structure, $D = 4^{\circ}$ structure
- (b) $A = 4^{\circ}$ structure, $B = 2^{\circ}$ structure, $C = 3^{\circ}$ structure, $D = 1^{\circ}$ structure
- (c) $A = 1^{\circ}$ structure, $B = 4^{\circ}$ structure, $C = 3^{\circ}$ structure, $D = 2^{\circ}$ structure
- (d) $A = 4^{\circ}$ structure, $B = 3^{\circ}$ structure, $C = 2^{\circ}$ structure, $D = 1^{\circ}$ structure

66. Identify the following molecule.



- (a) Phospholipid (b)
- (c) Cholesterol (d) Oleic acid
- Refer the given structure of adenylc acid. In this identify 67. Α.



- (a) Glycosidic bond (b) Phosphate bond
- (c) Ester bond (d) Ionic bond
- **68**. The adjoining graph shows change in concentration of substrate on enzyme activity. Identify A, B and C.



	Α	В	С
(a)	Ki	K _m	V _{max}
(b)	$\frac{V_{max}}{2}$	K _m	Ki
(c)	V _{max}	K _m	$\frac{V_{max}}{2}$
(d)	K _m	V _{max}	$\frac{V_{max}}{2}$

69. The given structural formulas represent amino acids (labelled by as X, Y and Z)



Identify the correct name of X, Y and Z.

- (a) Alanine, serine and glycine respectively.
- (b) Tyrosine, cysteine and glutamic acid respectively.
- (c) Glycine, alanine and serine acid respectively.
- (d) Cysteine, glutamic acid and tyrosine respectively.



70. The structural formula given below belongs to

86



- (a) glucose (b) ribose
- (c) sucrose (d) deoxyribose
- **71.** The given graph shows concept of activation energy with labelled 1, 2, 3, & 4. Co-relate the statements I, II, III & IV with 1, 2, 3 & 4.



- I. Segment representing the energy of activation.
- II. Segment representing the amount of free energy released by the reaction.
- III. Transition state.
- IV. Segment would be the same regardless of whether the reaction were uncatalysed or catalysed.

	Ι	II	III	IV
(a)	1	3	2	4
(b)	1	2	3	2
(c)	1	3	2	4
(d)	1	2	4	3

72. What is denoted by X and Y in the given graph ?



Х

- (a) Activation energy without enzyme(b) Activation energy with enzyme
- (c) Substrate concentration with enzyme without enzyme
- (d) Substrate concentration without enzyme

Activation energy with enzyme Activation energy without enzyme Substrate concentration without enzyme Substrate concentration with enzyme

Y

73. Which one of the given graph shows the effect of pH on the velocity of a typical enzymatic reaction (V) ?



74. The curve given below shows enzymatic activity with relation to three conditions (pH, temperature and substrate concentration.) Identify the correct representation of two axes (x and y).



y-axis

pН

- (a) Enzymatic activity
- (b) Temperature Enzymatic activity
- (c) Substrate concentration Enzymatic activity
- (d) Enzymatic activity Temperature
- **75.** The given diagrammatic representation shows one of the categories of small molecular weight organic compounds in the living tissues. Identify the category shown and one blank component marked as "X" in it.



Guanine

NH₂

Category

(a) Cholesterol

x - axis

(b) Amino acid

(c)

Nucleotide Adenine

- (d) Nucleoside Uracil
- **76.** Which one of the following structural formulae (A & B) of two organic compounds is correctly identified along with its related function?

A. O
$$CH_2 - O - C - R$$

 $R_2 - C - O - CH$
 $CH_2 - O - C - R$
 $CH_2 - O - P - O - CH_2 - CH_2$
 OH
 $CH_3 - CH_3$



- (a) B : Adenine A nucleotide that makes up nucleic acids.
- (b) A: Triglyceride Major source of energy
- (c) B: Uracil A component of DNA
- (d) A: Lecithin A component of cell membrane
- **77.** The given graph shows the effect of substrate concentration on the rate of reaction of the enzyme greengram-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.
- **78.** Which of the following shows zwitter ionic form?

R

(a)
$$\stackrel{+}{H_3N-CH-COOH}$$
 (b) $\stackrel{+}{H_3N-CH-COO^{-1}}$

(c)
$$H_2N - CH - COO^-$$
 (d) None of these

CRITICAL THINKING TYPE QUESTIONS

79. According to weight percentage, the first three elements in human body are

(a)
$$C > H > O$$
 (b) $C > O > N$

(c)
$$O > N > C$$
 (d) $O > C > H$

- **80.** In the composition of cellular mass, arrange the components- proteins(P), carbohydrates(C), lipids(L) and nucleic acids(N) in decreasing order of mass percentage.
 - (a) C > N > P > L (b) P > N > C > L

(c) P > C > L > N (d) P > N > L > C

- **81.** If all the peptide bonds of a protein are broken down, then what would remain?
 - (a) Amino acids (b) Peptides
 - (c) Polypeptides (d) Oligopeptides

- **82.** Relation between amino acid and protein is similar to the one found between
 - (a) glucose and fructose
 - (b) thymine and uracil
 - (c) nucleosides and nucleic acid
 - (d) nucleotides and nucleic acid
- **83.** Nucleotides are building blocks of nucleic acids. Each nucleotide is a composite molecule formed by
 - (a) base-sugar-phosphate.
 - (b) base-sugar-OH.
 - (c) (base-sugar-phosphate)_n.
 - (d) sugar-phosphate.
- 84. Antiparallel strands of a DNA molecule means that
 - (a) the phosphate groups of two DNA strands, at their ends share the same position.
 - (b) the phosphate groups at the start of two DNA strands are in opposite position (pole).
 - (c) one strand turns clockwise.
 - (d) one strand turns anti-clockwise.
- 85. Which of the following is not an attribute of enzymes ?
 - (a) They are substrate specific in nature.
 - (b) They are proteinaceous in nature.
 - (c) They are used up in the reaction.
 - (d) They speed up rate of biochemical reaction.
- **86.** "All enzymes are proteins." This statement is now modified because an apparent exception to this biological truth is
 - (a) arylsulfatase (b) dehydrogenase
 - (c) ribozyme (d) nitroreductase
- **87.** Carbohydrates, the most abundant biomolecule on earth, are produced by
 - (a) some bacteria, algae and green plant cells.
 - (b) fungi, algae and green plant cells.
 - (c) all bacteria, fungi and algae.
 - (d) viruses, fungi and bacteria.
- **88.** 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.
- 89. The effectiveness of an enzyme is affected least by
 - (a) temperature.
 - (b) concentration of the substrate.
 - (c) original activation energy of the system.
 - (d) concentration of the enzyme.
- **90.** Which of the following set is correctly match to the category mentioned against them ?
 - (a) Lysine, glycine, thiamine amino acids.
 - (b) Arachidonic acid, acetic acid, palmitic acid Fatty acids
 - (c) Thymidine, uridine, cytidilic acid Nucleosides
 - (d) Cellulose, inulin, glycogen Polysaccharides



Biology

- 91. The stored form of sugar in animal is a
 - (b) heteropolysaccharide (a) homopolysaccharide
 - (d) diasaccharide (c) oligosaccharide
- 92. Select the type of enzyme involved in the following reaction.

 $S-G+S' \rightarrow S+S'-G$

- (a) Dehydrogenase (b) Transferase
- (c) Hydrolase (d) Lyase
- 93. Transition state structure of the substrate formed during an enzymatic reaction is.

(a) permanent but unstable. (b) transient and unstable.

- (c) permanent and stable. (d) transient but stable.
- 94. For a protein to have a quaternary structure, it must
 - (a) have four amino acids.
 - (b) consist of two or more polypeptide subunits.
 - (c) consist of four polypeptide subunits.
 - (d) have at least four disulphide bridges.
- 95. The quaternary structure of human haemoglobin is best described as a
 - (a) dimer of identical subunits.
 - (b) dimer of different subunits.
 - (c) tetramer of four different subunits.
 - (d) tetramer of two different subunits.
- 96. At temperature near freezing point, the enzymes are
 - (a) inactivated (b) activated
- (c) slightly activated (d) slightly inactivated
- 97. A nucleoside differs from nucleotide is not having
 - (a) sugar (b) nitrogen
 - (c) phosphate (d) phosphate and sugar
- **98.** Hexokinase (Glucose + ATP \rightarrow Glucose 6-P + ADP) belongs to the category
 - (a) transferases (b) lyases
 - (c) oxidoreductases (d) isomerases
- 99. Sugar-phosphate backbone in nucleic acid
 - (a) is hydrophilic in nature.
 - (b) is negatively charged.
 - (c) shows polarity.
 - (d) all of the above.
- 100. On hydrolysis, a nucleoside would not yield
 - (a) purine (b) pyrimidine
 - (c) pentose sugar (d) phosphoric acid
- 101. The information in a genetic nucleic acid resides in the
 - (a) number of nucleotides.
 - (b) kinds of nucleotides.
 - (c) sequence of nucleotides.
 - (d) all of the above.
- 102. Km is related to
 - (a) temperature (b) ES complex
 - (c) pH
- (d) none of these

- 103. When triglycerides are solid at ordinary room temperature, they are called
 - (a) oils (b) gases
 - (c) fats (d) none of these
- 104. Natural lipids are readily soluble in
 - (a) oil (b) water
 - (c) mercury (d) none of these
- 105. Enzyme that break nucleic acids into nucleotides belongs to which of the following class ?
 - (a) Oxidoreductases
 - (d) Lyases

(b) pH

(b) Transferases

- (c) Hydrolases **106.** Enzymes are sensitive to
 - (a) light
 - (c) temperature (d) both (b) and (c)
- 107. Primary structure of polypeptide is stabilized or secondary structure of polypeptide is maintained by
 - (a) disulphide bonds.
 - (b) ionic bonds.
 - (c) hydrogen bonds.
 - (d) hydrophobic interactions.
- 108. The catalytic efficiency of two different enzymes can be compared by the
 - (a) Km value.
 - (b) pH optimum value.
 - (c) formation of the product.
 - (d) molecular size of the enzyme.
- **109.** What will happen when the cofactor is removed from the enzyme?
 - (a) Catalytic activity of the enzyme is lost.
 - (b) Enzyme preserves in a temporarily inactive state.
 - (c) The substurate molecules are not closely related to enzymes molecules.
 - (d) Both b and c
- 110. "When glucose is degraded to lactic acid in skeletal muscles energy is liberated".

Which of the following conclusion is correctly associated with the above statement? enzyme?

- (a) It is a catabolic pathway which releases energy.
- (b) It is an anabolic pathway which releases energy.
- The energy, liberated during this degradation, is (c) trapped and stored in the form of chemical bonds (ADP).
- (d) None of the above.
- 111. Why the velocity of enzymatic reaction is not exceeded by any further rise in the concentration of the substrate?
 - (a) The enzyme molecules are equal to the substrate molecules.
 - (b) The enzyme molecules are fewer than the substrate molecules
 - (c) The substrate molecules are not closely resembled to the enzyme molecules.
 - (d) Both b and c.

88

Chapter 9 : Biomolecules

- (c) In order to study the various biomolecules found in living tissues, the living tissues are ground in trichloroacetic acid using a mortar and a pestle to form a thick soup. It is then strained to obtain two fractions : acid soluble and acid insoluble fraction. Chemicals present in both the fractions are further separated by various analytical techniques and identified.
- **2.** (a) Biomolecules are organic compounds normally present as essential components of living organisms.
- (d) Glutamic acid and aspartic acid are acidic amino acid because they bear one amino acid group and two carboxylic group. Lysine is a basic amino acid.
- (d) Aromatic amino acid possess cyclic structure with a straight side chain bearing carboxylic and amino group. Valine is a neutral amino acid. It contains equal number of amino and carboxylic groups.
- (a) Arginine, lysine and histidine are basic amino acids with two amino groups and one carboxylic group. Arginine is the most and histidine is the least basic amino acid.
- 6. (a) Glycine is the simplest amino acid with lowest molecular weight. The side chain in glycine is represented by H (Hydrogen) atom (not alkyl group). Due to 2-opposite H-atoms, this amino acid is symmetrical or achiral. All other amino acids are assymetrical or chiral, and can exist as D- and L-stereoisomers.
- 7. (b) Zwitterion is a neutral molecule with a positive and a negative electrical charge, though multiple positive and negative charges can be present. Amino acids are the best known examples of zwitterions.
- (d) Saturated fatty acids do not have any double bond while unsaturated fatty acids have one or more double bonds.
- **9.** (d) Essential fatty acid are some polyunsaturated acid which can not be synthesized in the animal body. Therefore it must be supplied with food to avoid their deficiency. Linoleic acid, linolenic acid and arachidonic acids are some examples of essential fatty acids.
- 10. (d) Phospholipids are composed of phosphate group and one or more fatty acids. They have hydrophilic (polar) phosphate group and long hydrophobic (non-polar) hydrocarbon 'tails'. The phospholipids readily form membrane like structure in water.
- (b) Glycerol is a trihydroxy propane compound and has three hydroxyl groups that are responsible for its solubility in water and its hygroscopic nature. It is a colourless, odourless, viscous liquid that is widely used in pharmaceutical formulations.

- 12. (b) Fat is a group of natural esters of glycerol and various fatty acids, which are solid at room temperature and are the main constituents of animal and vegetable fat.
- 13. (a) Lecithin is a choline containing phospholipid.
- 14. (c) A nucleotide is a compound made of a nitrogen base, a pentose sugar and phosphate all linked together by a covalent bond. Nucleosides are compounds formed from a nitrogen base and pentose sugar.
- 15. (a) DNA and RNA are made up of nucleic acids. They are the vehicles of genetic inheritance. Building blocks of nucleic acids are called nucleotides. Each nucleotide consists of three parts: a sugar (ribose for RNA and deoxyribose for DNA), a phosphate, and a nitrogenous base. These nucleotides linked together with covalent bonds to form a sugar-phosphate backbone with extended nitrogenous bases.
- 16. (c) Inulin is a heterogeneous collection of fructose polymers. It consists of glucosyl moiety and fructosyl moiety, which are linked by β (2, 1) bonds. It is a soluble dietary fibre which is a naturally occurring oligosaccharide belonging to a group of carbohydrates known as fructans. Unlike most carbohydrates, inulin is non-digestible. Inulin is naturally present in many different foods such as aspergraps, lock onions, hence, whet and

such as asparagus, leek, onions, banana, wheat and garlic. Higher concentrations exist in herbs.

- 17. (b) Proteins are polypeptide. A polypeptide is formed of a linear row of amino acids joined by peptide bonds. This constitutes the primary structure (1°).
- **18.** (a) The collagen is the most abundant protein of animal world.
- 19. (a) Quaternary structure is found only in multimeric protein. In quaternary structure, more than one polypeptide chains are involved to form a large multiunit protein. *e.g.*, haemoglobin.
- 20. (c) Glycosidic bonds are bonds established between aldose or ketose group of carbohydrate with alcoholic or nitrogen group of another organic compound. Two amino acid molecules can be covalently joined through a substituted amide linkage, termed a peptide bond.
- 21. (b) Turn over number is the number of substrate molecules which can be catalyzed by a single molecule of an enzyme in a unit time. Turnover number of enzyme is dependent on active site, rapidity of reaction and separation of end products.

- **22.** (c) The concentration of substrate at which velocity of enzymatic action reaches half of its maximum value, is called Km value or Michaelis Menten constant.
- 23. (b) A ribozyme is an RNA molecule that catalyzes a chemical reactions, similar to the action of protein enzymes.
- 24. (c) Feedback inhibition of enzymes is affected by end product. Feedback inhibition occurs when the end product of a reaction interferes with the enzyme that helped produce it. The inhibitor does this by binding to a second active binding site that's different from the one attached to the initial reactant. The enzyme then changes its shape and can't catalyze the reaction anymore. This type of inhibition is done as a regulatory mechanism to meet the metabolic needs of the cell or organisms.
- **25.** (d) Coenzyme is a non-proteinaceous organic substance that usually contains a vitamin or mineral and combines with a specific protein, the apoenzyme, to form an active enzyme system.
- 26. (a) Holoenzyme is conjugated enzyme which consists of a protein part called apoenzyme and a non-protein called cofactor. Coenzyme are also organic compounds but their association with apoenzyme is only transient and acts as cofactors.
- 27. (d) Inorganic catalyst work efficiently at high temperature and high pressure. Inorganic catalysts speed up reactions, but they do not have carbon-hydrogen atoms. An example of this is magnesium sulphate, which is a compound used to speed up some reactions in the chemistry lab.
- (c) Amino acids are the building blocks proteins. Amino acid can be classified on the basis of characteristics of their side chains.
- 29. (b) Lipid molecules are insoluble in water because lipid molecules are hydrophobic, but they are readily soluble in nonpolar organic solvents like chloroform and benzene.
- **30.** (c) Lysine is a basic amino acid.
- **31.** (b) A protein is a heteropolymer and not a homopolymer.
- **32.** (c) Options (a), (b) and (d) are incorrect.

Chitin is a structural heteropolysaccharide found in the fungal walls as fungus cellulose and as chitin in the exoskeloton of arthropods.

Collagen is the most abundant protein in animal world while RuBisCo is the most abundant protein in the whole of the biosphere.

In a polysaccharide, the individual mono-saccharides are linked by a glycosidic bond. Phosphodiester bonds help in polymerization of nucleotides to form polynucleotide.

- 33. (a) Chitin is a long-chain polymer of a N-acetylglucosamine, a derivative of glucose. It is a characteristic component of the cell walls of fungi, exoskeletons of arthropods such as crustaceans (e.g., crabs, lobsters and shrimps) and insects, the radulae of molluscs, and the beaks and internal shells of cephalopods, including squid and octopuses.
- **34.** (c) Abrin and ricin are toxin secondary metabolities. The secondary metabolities which are used as drugs are vinblastin, curcumin, etc.
- **35.** (c) Almost all enzymes are proteins. Certain RNAs have also been reported to have enzyme property. They are called ribozymes or RNA enzymes. No enzyme exists which is made up of lipid.
- 36. (a) Coenzymes are organic non-protein molecules that bind with the protein molecule (apoenzyme) to form the active enzyme (holoenzyme). They function as intermediate carriers of electrons, specific atoms or functional groups that are transferred in the overall reaction. Every coenzyme is a cofactor is not a coenzyme.
- **37.** (d) Nitrogen bases are heterocyclic compounds. Length of one turn of DNA is 34Å.
- **38.** (c) Starch can hold iodine (I_2) molecules in its helical secondary structure but cellulose being non helical, can not hold I_2 . Thus, cellulose does not shows blue colour when treated with I_2 .
- 39. (c) Enzymes are biological molecules (proteins) that act as catalysts and help complex reactions occur. Enzymes bind temporarily to one or more of the reactants the substrate(s) of the reaction they catalyze by lowering the amount of activation energy needed and thus speed up the reaction.
- **40.** (b) The correct sequence of the steps in catalytic cycle of an enzyme actions is : iv, iii, ii, i.
- 41. (d) 42. (a)
- **43.** (c) Prosthetic group is an organic substances which is dialyzable, thermostable and firmly attached to the protein or apoenzyme portion during the complete catalytic cycle. Apoenzyme is a protein that forms an active enzyme system by combination with a coenzyme and determines the specificity of this system for a substrate.
- 44. (b) In polysaccharides, individual monosaccharide is linked by glycosidic bond. This bond is formed between two carbon atoms of two adjacent monosaccharides. A glycosidic bond is a type of covalent bond that joins a carbohydrate (sugar) molecule to another group, which may or may not be another carbohydrate. Glycosidic bonds are formed by dehydration.

- **45.** (d) Essential amino acids are those which are taken from food and not synthesized in the body whereas non-essential amino acids need not be supplied in the diet and are synthesized in the body. Glycine, serine and tyrosine are non-essential amino acids.
- **46.** (c) Compound having double bond in their structure are more unstable compound in comparison to single bond holder compounds. Unsaturated fats those have double bonds in their structures are more reactive than saturated fats.
- **47.** (c) In a DNA molecule, A-T rich parts melt before G-C rich parts because there are two H-bond between A and T whereas in between G and C, there are three H-bond.
- **48.** (c) Non-essential amino acids are those amino acids which need not be supplied in the diet because they can be synthesised by the body, particularly from carbohydrate metabolites, Glycine is one such non essential amino acid. On the contrary, essential amino acids are those amino acids which can not be synthesised in the animal body and must be supplied with food in adequate amounts. Out of twenty amino acids, eight are considered essential in human diet.
- **49**. **(b)** Palmitic acid is a solid saturated fatty acid, obtained from palm oil and other vegetable and animal fats. Lecithin is a group of phospholipids. It is composed of units of choline, phosphoric acid, fatty acids, and glycerol. It occurs in animal and plant tissues and egg yolk, Phospholipids are fat derivatives in which one fatty acid has been replaced by a phosphate group and one of several nitrogen-containing molecules. Tryptophan is an example of aromatic amino acids. It is an essential amino acid which is a constituent of most proteins. It is a precursor of the neurotransmitter serotonin, melatonin, a hormone related to sleep, and the B vitamin niacin. Tryptophan is also necessary for normal growth and development of infants. Glutamic acid is a non- essential acidic amino acid. The carboxylate anions and salts of glutamic acid are known as glutamates. Glutamate is an important neurotransmitter that plays the principal role in neural activation.

50. (a) Insulin is a type of carbohydrate. Basically it is a peptide hormone produced by beta cells of pancreas. It regulates the metabolism of carbohydrates and fats by promoting the absorption of glucose from the blood to skeletal muscles and fat tissue and by causing fat to be stored rather than used for energy. Trypsin is an proteinaceous enzyme which is found in the digestive system where it hydrolyses proteins. It is produced in the pancreas as the inactive protease trypsinogen.

Adenylic acid is a nucleic acid. It is a compound consisting of an adenosine molecule bonded to one acidic phosphate group. It is present in most DNA and RNA. It typically exists in a cyclic form with the phosphate bonded to the nucleoside at two points. Cholesterol is a sterol (or modified steroid), a lipid molecule. It is biosynthesized by all animal cells because it is an essential structural component of cell membranes that is required to maintain both membrane structural integrity and fluidity. Cholesterol enables animal cells to (a) not need a cell wall (like plants & bacteria) to protect membrane integrity/cell-viability and thus be able to (b) change shape and (c) move about (unlike bacteria and plant cells which are restricted by their cell walls).

51. (a) Collagen is a class of extracellular proteins abundant in higher animals. They are specially found in the skin, bone, cartilage, tendon, and teeth, forming strong insoluble fibres. It serves as connective tissue between cells, yielding gelatin when denatured by boiling and Trypsin is an enzyme found in the digestive system of many vertebrates, where it hydrolyses proteins. It is produced in the pancreas as the inactive protease trypsinogen. Insulin is a pancreatic hormone which regulates the metabolism of carbohydrates and fats by promoting the absorption of glucose from the blood to skeletal muscles and fat tissue and by causing fat to be stored rather than used for energy. GLUT - 4, also known as glucose transporter type 4, is a protein that in humans is encoded by the GLUT4 gene. GLUT4 is the insulin-regulated glucose transporter found primarily in adipose tissues and striated muscle (skeletal and cardiac). The first evidence for this distinct glucose transport protein was provided by David James in 1988. The gene that encodes GLUT4 was cloned and mapped in 1989.

	Component		% of the total
			cellular mass
Α	Water	Π	70 - 90
В	Proteins	V	10-15
С	Carbohydrates	Ι	3
D	Lipids	Ш	2
Е	Nucleic acid	IV	5-7

52. (b) A-II, B-V, C-I, D-III, E-IV

53. (a) Carotenoids and anthocyanin are types of pigments. Carotenoids are naturally occurring pigments synthesized by plants, algae, and photosynthetic bacteria. These richly coloured molecules are the sources of the yellow, orange, and red colours of many plants. Anthocyanin is a water soluble blue, violet or red flavonoid pigment found in plants. Terpenoids are large class of organic compounds including terpenes, diterpenes, and sesquiterpenes. They have unsaturated molecules composed of linked isoprene units, generally having the formula $(C_5H_8)n$.

> Alkaloids are nitrogenous organic compounds of plant origin which have distinct physiological actions on humans. They include many drugs (morphine, quinine) and poisons (atropine, strychnine).

> Concanavalin A is member of legume lectins (carbohydrate-binding protein) family. It binds specifically to certain structures found in various sugars, glycoproteins, and glycolipids, mainly

internal and non-reducing terminal α -D-mannosyl and α -D-glucosyl groups.

- 54. **(b)** Cellulose, an insoluble substance, is the main constituent of plant cell walls and of vegetable fibres such as cotton. It is type of a polysaccharide which consists of chains of glucose monomers. Chitin is a derivative of glucose, and is a characteristic component of the cell walls of fungi, the exoskeletons of arthropods such as crustaceans (e.g., crabs, lobsters and shrimps) and insects. Glycogen is a polysaccharide which is deposited in the bodily tissues as a store of carbohydrates. It forms glucose on hydrolysis and found primarily in the liver and muscle tissue. Starch is an odourless, tasteless white substance occurring widely in plant tissue. It is obtained chiefly from cereals and potatoes and functions as a carbohydrate store and is an important constituent of the human diet.
- **55.** (c) Enzymes are generally classified on the basis of the type of reactions that they catalyse, like oxidoreductases, transferase, hydrolases, isomerases, lyases and ligases.
- 56. (a) Adenine is purine while thymine is pyrimidine.
- **57.** (c) Three molecules of fatty acid linked with one molecule of glycerol to form a simple lipid called triglycerides.
- 58. (c) Enzyme is made up of proteins. They are catalysts (biocatalysts) that speed up chemical reactions in the cell without themselves undergoing any permanent chemical change.
- **59.** (d) Cellulose is a polysaccharide and homopolymer that consists of a long unbranched chain of glucose units.
- **60.** (c) Valine is a neutral essential amino acid which contains equal number of amino and carboxylic group.
- **61.** (d) Phosphodiester bonds help in polymerization of nucleotides to form polynucleotide.
- 62. (a) Ribozymes (ribonucleic acid enzymes) are also called catalytic RNA. They are RNA molecules capable of catalysing specific biochemical reactions, similar to the act of protein enzymes. Ribozyme, discovered in 1982, demonstrated that RNA can be both genetic material (like DNA) and a biological catalyst (like protein enzymes). Examples of ribozymes include the hammerhead ribozyme, the VS ribozyme, Leadzyme and the hairpin ribozyme.
- **63.** (c) Options (a), (b) and (d) are wrong.
 - (a) Inulin is a polymer of fructose.
 - (b) Starch forms helical secondary structure.
 - (d) Glycogen is glucosan homopolysaccharide which is the major reserve food of animals, fungi and some bacteria.
- **64.** (b) The different amino acids are attached through–Co– NH bond, called peptide bond or amide bond.
- **65.** (c) The type of protein structure shown in the given figures A, B, C and D are respectively primary

structure, quaternary structure, tertiary structure and secondary structure.

66. (c) Cholesterol is a 4-ringed structure (3-cyclohexane ring and

1-cyclopentane ring) found only in animals.

67. (c) Phosphate is bound to pentose sugar by ester bond.68. (c) In the given graph which shows the change in the concentration of substrate on enzyme action

activity, letter marked as A, B and C is respectively V_{max} , K_m , and $V_{max}/2$. (V_{max}) is the maximum velocity of the enzyme which

 (V_{max}) is the maximum velocity of the enzyme which determines the maximum speed of enzymatic reaction during which the substrate concentration is increased until a constant rate of product formation is achieved. This is called maximum velocity (V_{max}) of the enzyme. K_m, the Michaelis – Menten constant is the substrate concentration at which an enzyme attains half its maximal velocity.

- **69.** (c) The correct name of the structural formula of the given amino acids X, Y and Z are respectively glycine, alanine and serine.
- 70. (a) The given structural formula represents glucose $(C_6H_{12}O_6)$.
- 71. (b) The graph shows the concept of activation energy. Activation energy is the least amount of energy required to activate atoms or molecules to a state in which they can undergo a chemical reaction. The label marked as 1, 2, 3 and 4 in the graph are respectively correlated with the statements I, II, III and IV.
- **72.** (b) In the given graph, X and Y are respectively activation energy with enzyme and activation energy without enzyme.
- 73. (c) Parabolic curve in option (c) correctly represents the effect of pH on the velocity of a typical enzymatic reaction (V). Enzyme shows its highest activity at a particular pH called the optimum pH. Activity declines both below and above the optimum value.
- 74. (b) In the given curve the relation of temperature and enzyme activity is shown.
- **75.** (d) A combination of a nitrogen base with a pentose sugar is known as nucleoside. The nitrogen base combines with the sugar molecule at its carbon atom 1' in a glycosidic bond (C N C) by one of its nitrogen atoms (usually 1 in pyrimidines and 9 in purines). Depending upon the type of pentose sugar, nucleosides are differentiated into ribonucleosides and deoxyribonucleosides.
- **76.** (d) Lecithin is a fat like substance called a phospholipid, which is a part of plasma membrane. Adenine is a nitrogenous base.
- 77. (a) This graph represents the effect of substrate concentration on the velocity of enzyme action in which the rate of engyme reaction is directly proportional to the substrate concentration.

78. (b)
$$H_{3}^{+}N \xrightarrow{H} O^{-}$$
 shows zwitter ionic form. Zwitterions

are those ions that are electrically neutral overall but contain non adjacent regions of positive and negative charges. They are sometimes referred to as dipolar ions. Free amino acid found in cells is an example of zwitterion. General structure of an amino acid exposes two parts, or groups, of the molecule that can function as an acid/base pair, the –COOH and –NH₂ groups.

- 79. (d) According to weight percentage, the first three elements in human body are O > C > H. % Weight of O (oxygen), C (carbon) and H (hydrogen) in human body are 65.0, 18.5 and 0.5.
- 80. (b) In the comparison of cellular mass, the decreasing order of the components is:
 P (Protein):10-15%>N (Nucleic acid): 5-7% > C (Carbohydrates): 3% > L (Lipid): 2%
- **81.** (a) Amino acids are building blocks of protein which are joint by peptide bond.
- 82. (d) Relation between the protein and amino acid is similar to one found in the nucleotides and nucleic acid. In the first case, proteins are polysaccharide and amino acids are the building blocks of proteins. Similarly nucleotides are the building blocks of nucleic acid.
- 83. (a) Nucleotides are the building blocks of nucleic acid.Each nucleotide consists of three parts: a sugar (ribose for RNA and deoxyribose for DNA), a phosphate, and a nitrogenous base.
- 84. (b) The two strands of DNA run in opposite directions to one another with the hydrogen bonds between them. One strand of DNA has 5'-3' direction and the other strand has 3'-5' direction. So they are antiparallel. This direction is determined by the presence of a free phosphate or OH group at the end of the strand. If the strand has phosphate group at the 5' end then a free OH group present at the 3' end.
- **85.** (c) Enzymes increase the rate of reaction without being consumed in the reaction.
- 86. (c) All enzymes are proteinaceous in nature. This statement is now modified due to exception of ribozyme. Ribozymes are RNA molecules which catalyses specific biochemical reactions.
- 87. (a) Carbohydrates are organic compounds synthesized in the chlorophyll containing cells of some bacteria, algae and green plant cells, during photosynthesis. Certain photoautotrophic bacteria, e.g. green sulphur bacteria and purple sulphur bacteria contain pigments like chlorobium chlorophyll and bacteriochlorophyll respectively that helps them in

photosynthesis. During photosynthesis carbon dioxide is reduced into carbohydrates by water and oxygen is liberated.

- **88.** (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. Adenylic acid is a nucleotide consisting of adenine, ribose or deoxyribose, and a phosphate group. It is a constituent of DNA or RNA. It is also called adenosine monophosphate. Amino acids are organic acids (with carboxylic group COOH) having amino group $(-NH_2)$ generally attached to carbon or carbon next to carboxylic group. The carbon also bears a variable alkyl group (R) or hydrogen or hydrocarbon. In alanine it is represented by methyl group.
- **89.** (c) The effectiveness of an enzyme is affected least by the original activation energy of the system. Because activation energy is the least amount of energy required to start chemical reaction.
- **90.** (d) Thiamine is nitrogen base. Acetic acid is a weak acid, Cytidylic acid is a nucleotide.
- **91.** (a) Homopolysaccharides composed of glucose which includes glycogen and starch, the storage carbohydrates of animals and plant respectively.
- **92.** (b) Transferase is a class of enzyme that catalyse the transfer of a group of atoms from one molecule to another. The given reaction shows the involvement of transferase enzyme.
- **93.** (b) Transition state structure formed during an enzymatic reaction is transient and unstable.
- 94. (b) Quaternary structure is the three-dimensional structure of a multi-subunit protein. For a protein to have a quaternary structure, it must consist of two or more polypeptide subunits.
- 95. (d) Haemoglobin consists of 4 subunits. Two of these are identical to each other. Hence, two subunits of α type and two subunits of β type together constitute the human haemoglobin (Hb).
- 96. (a) Temperature affects activity of enzyme. At very low temperature (almost near freezing point) the enzymes are inactivated whereas high temperature denatures enzymes permanently. Temperature ranges for maximum functioning of enzyme is 25-40 degree Celsius.
- 97. (c) A nucleoside consists of a nitrogenous base covalently attached to a sugar (ribose or deoxyribose) but without the phosphate group. A nucleotide consists of a nitrogenous base, a sugar (ribose or deoxyribose) and one to three phosphate groups. Nucleoside = Sugar + Base

Nucleotide = Sugar + Base + Phosphate

98. (a) Transferases catalyse reactions which involve group transfer from one molecule to another.

- 99. (d) The backbone is constructed from alternating ribose sugar and negatively charged phosphate molecules which are highly polar. Because the backbone is polar, it is hydrophilic which means that it likes to be immersed in water. The DNA is antiparallel means that the two strands of DNA have opposite chemical polarity, or stated another why their sugarphosphate backbones run in opposite directions.
- 100. (d) Nucleoside is the combination of pentose sugar with nitrogenous bases (purines or pyrimidines). So, on hydrolysis it does not yield phosphoric acid.
- 101. (c) Nucleotides are the building blocks of nucleic acid (DNA and RNA), therefore the information in a genetic nucleic acid resides in the sequences of nucleotide. The biological functions of nucleotides are: storage of data (as part of DNA/RNA); energy currency (ATP); cellular communication (cAMP; ATP allosteric regulator) and co-enzyme catalysis.
- **102. (b)** Km of an enzyme is the substrate concentration that gives half maximal velocity. Enzyme-substrate (ES) complex formation is essential in enzymatic reaction.
- 103. (c) Fats is a group of natural esters of glycerol along with various faty acids. They are generally solid at ordinary room temperature. Fats occur naturally in food and play a important role in human nutrition. Fats store energy in the body, protectbody tissues by insulating them, cushion internal organs, and transport fat-soluble vitamins in the blood. Fats are soft, low-melting solids, with a density less than that of water.
- **104. (d)** Natural lipids are readily soluble in non-polar hydrocarbons such as benzene and light petroleum.
- 105. (c) Nucleases, which belong to the class of enzymes called hydrolases, are usually specific in action. Nucleases is an enzyme that cleaves nucleic acids. Hydrolases is one of the six main classes of enzymes that catalyze a hydrolytic cleavage reaction.
- 106. (d) Enzymes are sensitive to temperature, enzyme concentration, substrate concentration, product concentration, activations, inhibitors and pH. Each enzyme shows its highest activity at a particular temperature and pH called the optimum temperature and pH respectively. Activity declines both below and above the optimum value.
- **107. (c)** Primary structure of polypeptide is stabilized or secondary structure of polypeptide is maintained by hydrogen bonds.
- **108.** (a) The catalytic efficiency of two different enzymes can be compared by the Km value. Km is the Michaelis-Menten constant. It is the substrate concentration at which an enzyme attains half its maximal velocity.

- **109. (a)** When the cofactor is removed from the enzyme, catalytic activity of the enzyme is lost. Cofactors were defined as an additional substance apart from protein and substrate that is required for enzyme activity.
- **110. (a)** The above statement shows the catabolic pathway. Catabolic pathways involve the breakdown of nutrient molecules into usable forms (building blocks). In this process, energy is either stored in energy molecules for later use, or released as heat. The energy, liberated during this degradation, is trapped and stored in the form of chemical bonds (ATP).
- **111. (a)** With the increase in substrate concentration, the velocity of the enzymatic reactions rises at first. The reaction ultimately reaches a maximum velocity which is not exceeded by any further rise in concentration of the substrate. This is because the enzyme molecules are fewer than the substrate molecules and after saturation of these molecules there are no free enzyme molecules to bind with the additional substrate molecules.