This question paper contains **8** printed pages]

Roll No. | | | | | | | | | | | |

S. No. of Question Paper : **7766**

Unique Paper Code : **2491101** **F-1**

Name of the Paper : **Molecules of Life (DC 1.1)**

Name of the Course : **B.Sc. (Hons.)/Bio-Chemistry**

Semester : **I**

Duration : **3 Hours** Maximum Marks : **75**

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt *Five* questions in all.

Question No. **1** is compulsory.

Use of scientific calculator/Log tables may be allowed.

1. (A) Fill in the blanks :

(*i*) The active co-enzymatic form of folate is..... .

(*ii*) A molecule with *n* chiral centers can have ..... .stereoisomers.

(*iii*) .....and.....are essential fatty acids in humans.

(*iv*) Nucleic acids absorb maximally at.....nm.

(*v*) .....is an omega (ω)-3 series of fatty acid.

(*vi*) .....is an optically inactive amino acid found in proteins. 6

P.T.O.

(B) Give an example of any *ten* of the following :

(*i*) A lipid with signal transducing activity.

(*ii*) A methyl donor in biological reactions.

(*iii*) An amino acid with two asymmetric carbon atoms.

(*iv*) A deoxy hexose.

(*v*) A nucleotide containing co-enzyme.

(*vi*) A complex glycosphingolipid.

(*vii*) A plant sterol.

(*viii*) An exoskeletal polysaccharide.

(*ix*) Mirror image of α-D glucose.

(*x*) A standard amino acid that links the polypeptide chains covalently.

(*xi*) Provitamin A.

(*xii*) Most abundant polysaccharide in the biosphere. 5

(C) Indicate whether each of the following statement is true *or* false :

(*i*) Cholesterol is exclusively found in bacterial cell membrane.

(*ii*) All linear polymers of D-glucose can be digested by humans.

(*iii*) The sweetness of honey gradually decreases at high temperature.

(*iv*) Nucleosides are more soluble in water than the corresponding bases.

(*v*) Z-DNA is a right handed helix. 5

(D) (*a*) Indicate whether the following pairs of sugars are enantiomers, epimers, diastereomers *or* anomers :

(*i*) α-D glucose and β-D glucose

(*ii*) D-glucose and D-talose

(*iii*) D-galactose and D-mannose

(*iv*) L-fructose and D-fructose

(*b*) Which of the following are membrane lipids ?

(*i*) Cholesterol

(*ii*) Choline

(*iii*) Cerebrosides

(*iv*) Glycerol

(*v*) Phosphoglycerides 3

2. (A) Compare the following pairs :

(*i*) t-RNA and m-RNA

(*ii*) Chitin and cellulose

(*iii*) Plant and animal sterols

(*iv*) Configuration and conformation

(*v*) Phospholipid and neutral fat 10

(B) Define the following :

(*i*) Zwitterion

(*ii*) Homoglycans

(*iii*) pKa

(*iv*) Hydrogen bond 4

3. Provide a logical explanation for each of the following observations :

(*i*) Oleic acid has a lower melting point than Elaidic acid.

(*ii*) Fructose on reduction gives a mixture of mannitol and sorbitol.

(*iii*) pKa_1 of glycine is lower than the pKa of acetic acid.

(*iv*) Alkali denaturation of DNA is preferred over acid denaturation.

(*v*) Arachidonic acid is not considered as an essential fatty acid in animals.

(*vi*) DNA exhibits hyperchromicity upon denaturation.

(*vii*) Glucose is not stored in a monomeric form. 14

4. Draw the structures of (any 14) :

(*i*) Phosphatidyl choline (PC)

(*ii*) Aspartic acid at pH 11.0

(*iii*) Trehalose

(*iv*) Cyclic AMP

(*v*) 4-Thiouridine

(*vi*) Cholesterol

(*vii*) Lactose

(*viii*) Sialic acid

(*ix*) Tyrosine

(*x*) G-C base pair

(*xi*) Histamine

(*xii*) Platelet Activating Factor (PAF)

(*xiii*) L-ascorbic acid (vitamin C))

(*xiv*) Glucuronic acid

(*xv*) Retinol

(*xvi*) Ornithine

(*xvii*) α-methyl D fructofuranoside

(*xviii*) N acetyl glucosamine 14

5. (A) Write short notes on any *three* of the following :

(*i*) Role of vitamin C in humans

(*ii*) Storage polysaccharides

(*iii*) Proteoglycans

(*iv*) Waxes 12

(B) Name *two* non-protein amino acids. 2

6. (A) (*i*) What is buffer ?

(*ii*) Calculate the pH of a dilute solution that contains molar ratio of acetate to acetic acid of :

(*a*) 2 : 1 and

(*b*) 1 : 3 (pKa = 4.76).

(*iii*) Which of these compounds would be the best buffer at pH 5 and why ?

(*a*) Formic acid (pKa = 3.8)

(*b*) Acetic acid (pKa = 4.76)

(*c*) Ethyl amine (pKa = 9.0) 5

(B) An equilibrium mixture of α-and β-D galactose has a specific rotation of +80.2°. The specific rotation of pure α-D galactose is +150.7° and that of pure β-D galactose is +52.8°. Calculate the proportion of α and β-D galactose in the equilibrium mixture. 3

(C) Describe the role of either eicosanoids or carbohydrates as informational molecules. 6

7. (A) Water is a reactant in many biochemical reactions. Defend this statement with suitable examples. 4

(B) What happens when ?

(*i*) Tristearin is treated with NaOH in the presence of alcohol.

(*ii*) Cytosine is treated with nitrous acid

(*iii*) RNA is treated with alkali. 6

(C) Which of the following sugars will mutarotate and why ?

(*i*) Rhamnose

(*ii*) Glucitol

(*iii*) Glucosamine

(*iv*) Fructose

(*v*) Xylose

(*vi*) Gluconic acid

(*vii*) β-methyl galactoside

(*viii*) Mannose

(*ix*) Allose 4

8. (A) Indicate the symptoms associated with vitamin A deficiency and hypervitaminosis. 4

(B) Give the systematic and common name of the following fatty acids : 3

(*i*) $18 : 3^{\Delta 6, 9, 12}$

(*ii*) 20 : 0

(*iii*) $16 : 1^{\Delta 9}$

(C) Highlight the salient features of the Watson Crick model of DNA. 5

(D) Give *one* significant contribution of the following investigators : 2

(*i*) James Lind

(*ii*) Haworth