Odd Semester, 2020

(Held in March, 2021)

BIO-CHEMISTRY

(Honours)

(BCHEM–101)

(Biomolecules and Biophysical Techniques)

Marks : 56

Time : 3 hours

The figures in the margin indicate full marks for the questions

Answer **four** questions, taking at least **one** from each Part

PART—A

1. *(a)* Draw the structure of water molecule. 2

(b) Why is water a polar molecule? 3

(c) Define pH and pK_a. Deduce the relation between them. 2+7=9

2. *(a)* Write the structures of α-D-glucose and β-D-glucose. What type of isomerism do they represent? 3

(b) How are glycosidic bonds formed? Write the structures of lactose and sucrose. Why is sucrose called a non-reducing sugar? 2+2+3=7

(c) What is mutarotation? Explain with example. 4

3. *(a)* Why are α-amino acids so called? Explain with the help of a diagram. 3

(b) Why is rotation around the peptide bond restricted? 4

(c) Discuss the salient features of α-helix and β-pleated sheet. 7

4. *(a)* What general properties do fatty acids have? 4

(b) Explain the general structure and functions of any two of the following lipid sub-classes : 5+5=10

(i) Acylglycerol

(ii) Phosphoglyceride

(iii) Prostaglandins

5. *(a)* What is Z-DNA? How is it different from B-DNA? 3

(b) What is T_m? Describe the factors that influence T_m during the denaturation of DNA 2+4=6

(c) Mention why RNA molecules do not form extensive double helices. 2

(d) Name the different types of RNA. 3

PART—B

6. *(a)* What physical characteristics of a bio-molecule influence its rate of movement in an electrophoresis matrix? 3

(b) Draw a slab gel to show the result of native polyacrylamide gel electro-phoresis of the following mixture of proteins. Molecular weight is given for each : 4

Lysozyme (13930)

Chymotrypsin (21600)

Egg white albumin (45000)

Serum albumin (65400)

(c) Using equation define centrifugal force F and relative centrifugal force RCF. 3+2=5

(d) Define sedimentation coefficient. 2

7. *(a)* Briefly explain the partition and adsorption chromatography. 3+3=6

(b) Define the following terms : 2+2=4

(i) Absorption coefficient

(ii) Molar absorption coefficient

(c) The absorbance A of a 5×10^{-4} M solution of the amino acid tyrosine at wavelength of 280 nm is 0·75. The path length of the cuvette is 1 cm. What is the molar absorption coefficient ε? 4

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