



WEST BENGAL STATE UNIVERSITY

B.Sc. Honours Part-I Examination, 2020

MICROBIOLOGY

PAPER-MCBA-I

Time Allotted: 2 Hours

Full Marks: 50

*The figures in the margin indicate full marks.
Candidates should answer in their own words and adhere to the word limit as practicable.
All symbols are of usual significance.*

GROUP-A

Question No. 1 is compulsory and answer any two questions from the rest

1. Answer any *five* questions from the following: 1×5 = 5
 - (a) Write the R-S nomenclature of L-threonine.
 - (b) Define isoelectric pH of an amino acid.
 - (c) Hydrogenation of unsaturated Fats elevates their melting temperature — Justify the statement.
 - (d) Why table sugar is non-reducing and milk sugar is reducing?
 - (e) Draw the peptide bond between Ile-Met residues indicating both side chains.
 - (f) Why do some people have curly hair while in another hair grows straight?
 - (g) Explain why RNA is hyperchromic compared to DNA.

2.
 - (a) How many amino acids residues are there in a protein of MW 55,000? 1
 - (b) Write the name and structures of amino acids: (i) having 'R' group with $pK' \approx 12$, making it positively charged at all physiological pH and (ii) having 'R' group which is negatively charged at pH = 7. $2\frac{1}{2}$
 - (c) Describe the principle of Biuret reaction. $2\frac{1}{2}$
 - (d) Compare alpha helix and beta pleated sheets. 2
 - (e) Why is haemoglobin considered as an allosteric protein? 2

3.
 - (a) What do you mean by the following? (i) Symmetry element (ii) Alternating axis of Symmetry. Explain with examples. 3
 - (b) What are the main biological functions of the polysaccharides? 2
 - (c) How can you ascertain a molecule to be asymmetric or dissymmetric? 2
 - (d) "Although meso-tartaric acid has two asymmetric carbon atoms but it is optically inactive" — Explain. 3

4. (a) Why Thin-Layer Chromatography is better suited than Paper Chromatography in separation of biomolecules? 2
- (b) Write the structure of Phosphatidylcholine. 1
- (c) Calculate the Saponification number of Palmitodisterain. 2
- (d) Explain why soaps in aqueous solution assemble into micellar structures. 2
- (e) Arrange the following fatty acids in order from lowest melting point to highest: myristic acid, linolenic acid, stearic acid, oleic acid — Explain. 3
5. (a) A sample of DNA purified from *E. coli* contains 15.1% adenine on a molar bases. What are the percentages of the other bases present? 2
- (b) How does the absorbance of dsDNA at 260 nm change with increasing temperature and why? 2
- (c) Write the sequence of the mRNA molecule synthesized from a DNA template strand having the sequence: 5'-ATCGTACCGTTA-3' 2
- (d) Why is RNA more labile under alkaline condition compared to DNA? 2
- (e) State the differences among the RNAs. (two points) 2

GROUP-B

Question No. 6 is compulsory and answer any two questions from the rest

6. Answer any *five* questions from the following: 1×5 = 5
- (a) What is Enthalpy? What is its relation with Entropy?
- (b) What is pH? What are the pH values of Blood and Saliva?
- (c) What is blue shift?
- (d) What is resolution? How is it related to numerical aperture?
- (e) Define isotonic and hypertonic solutions.
- (f) What are fluorescence quenchers? Give example.
- (g) Define half life of a radioisotope. Write its expression.
7. (a) Draw a schematic diagram of a spectrophotometer with proper labeling. 3
- (b) What is the basis of generation of infrared spectra in molecules? 2
- (c) What amount of solid sodium nitrate is needed to prepare a buffer of pH=5.00 from 1 Litre of 0.1 M acetic acid? [pKa of acetic acid = 4.75. Molecular weight of sodium acetate = 82.0 gram] 3
- (d) What is chromatic aberration and how can it be removed? 2
8. (a) State Lambert-Beer Law. Define molar extinction coefficient and state its significance. 2+1
- (b) Dialysis is molecular filtration — Comment. What are the factors that affect rate of dialysis? 2+1

- (c) Why ATP acts as energy yielding molecule? 2
- (d) Define membrane potential. 2
9. (a) Discuss the principle of fluorescence with the help of a Jablonski diagram. 3
- (b) Differentiate between fluorophore and chromophore. 2
- (c) What are the differences between fluorescence and phosphorescence? 2
- (d) What is quenching? Mention different types of quenching. 2+1
- 10.(a) Elucidate the working principle of Ostwald viscometer. 3
- (b) An ultracentrifuge operates a 58000 rpm. Calculate (i) angular momentum in radians (ii) the radiative centrifugal force at a point 6.2 cm from the centre of rotation. $1\frac{1}{2}+1\frac{1}{2}$
- (c) Describe the circumstance when Beer-Lambert law is no more valid. 2
- (d) Differentiate between state and path functions. 2

N.B. : *Students have to complete submission of their Answer Scripts through E-mail / Whatsapp to their own respective colleges on the same day / date of examination within 1 hour after end of exam. University / College authorities will not be held responsible for wrong submission (at in proper address). Students are strongly advised not to submit multiple copies of the same answer script.*

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