



WEST BENGAL STATE UNIVERSITY

B.Sc. Honours 2nd Semester Examination, 2020

MCBACOR03T-MICROBIOLOGY (CC3)

Time Allotted: 2 Hours

Full Marks: 40

*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.*

Answer Question No. 1 and any *four* questions from the rest

1. Answer any *four* questions from the following: 2×4 = 8
 - (a) Give the structure of linoleic acid and mention its ω series.
 - (b) What are energy rich compounds? Give two examples.
 - (c) What fraction of V_{\max} will be achieved at $[S] = 7 K_m$?
 - (d) What is adenylation reaction? Give an example.
 - (e) Explain with logic which of the following reactions would you expect to proceed in the direction shown under standard conditions, in the presence of appropriate enzymes.

$$\text{Malate} + \text{NAD}^+ \rightleftharpoons \text{Oxaloacetate} + \text{NADH} + \text{H}^+$$

[Given: E'^0 values for Oxaloacetate/Malate and NAD^+/NADH conjugate redox pairs are -0.166 V and -0.320 V respectively]
 - (f) Write the equation that relates Gibbs free energy (G), enthalpy (H), entropy (S) and absolute temperature (T) for a process.
 - (g) What is R_f value in Thin layer chromatography? What is Katal?

2. (a) Name the products of mild hydrolysis of 1-palmitoyl-2-oleyl phosphatidylcholine with dilute sodium hydroxide. 2
- (b) What is Iodine No.? Discuss its significance and application. 2
- (c) Define the phenomenon rancidity and the reasons behind it. 2
- (d) How the degree of unsaturation of lipids is related to membrane fluidity? 2

3. (a) A drop of solution containing a mixture of gly, ala, glu, lys, arg and this was placed in the center of a paper strip and dried. The paper was moistened with a buffer of pH 6.00. An electric current was applied to the ends of the strip. 3
 - (i) Which amino acid(s) moved towards the anode?
 - (ii) Which amino acid(s) moved towards cathode?
 - (iii) Which remained at or near the origin?
- (b) What will be the product when the peptide gly-lys is treated with dansylchloride? 2½
- (c) Why phenylisothiocyanate is preferred to dansylchloride for N terminal amino acid identification of a rare peptide? 2½

4. (a) What will be the molecular weight of a polypeptide containing 458 amino acids? 2
 (b) Name one peptide antibiotic. 2
 (c) Give reason why anti parallel β sheets are more stable than parallel β sheets? 2
 (d) What is 3_{10} helix? 2
5. (a) What is the relationship between equilibrium constants and standard free changes of chemical reactions? What does it tells you about the direction of chemical reaction? 1+1
 (b) Phosphocreatine + ADP \rightarrow Creatine + ATP 2
 Calculate the $\Delta G'^0$ for the above reaction. [Given: Phosphocreatine + H₂O \rightarrow Creatine + Pi²⁻ $\Delta G'^0 = -43.0$ kJ/mol].
 (c) Define the term conjugate redox pair. What are the different ways in which electrons can be transferred in a biological redox reaction? 1+1
 (d) The E'^0 values for the NAD⁺/NADH and pyruvate / lactate conjugate redox pairs are -0.32 V and -0.19 V respectively. $\frac{1}{2} + \frac{1}{2} +$
 $\frac{1}{2} + \frac{1}{2}$
 (i) Which redox pair has the greater tendency to lose electrons? Explain.
 (ii) Which pair is the stronger oxidizing agent? Explain.
 (iii) Beginning with 1 M concentrations of each reactant and product at pH 7 and 25 °C, in which direction will the following reaction proceed?
 (iv) What is the standard free-energy change ($\Delta G'^0$) for the conversion of pyruvate to lactate?
6. (a) RuBisCO is an enzyme in the Calvin cycle that fixes atmospheric carbon and has a turnover rate of 3.3 s^{-1} . How long does it take RuBisCO to fix one molecule of carbon dioxide? $2 \times 4 = 8$
 (b) Mention the composition and use of Barfoed's reagent in carbohydrate chemistry.
 (c) What are the bonds involved to make structural integrity of proteins?
 (d) What are different types of Complex lipids?
7. (a) Active site of enzyme governs its activity — Justify the statement. $2 \times 4 = 8$
 (b) For Papain the activity of enzyme is unaltered within certain pH range — why?
 (c) Define Coupled enzyme assay. What is specific activity of enzyme?
 (d) An solution initially contains a catalytic amount of an enzyme with $K_m = 1.5$ mM, 0.25 M of substrate, and no product. After 45 seconds, the solution contains 25 μ M of product. Find V_{max} and the concentration of product after 2.0 minutes.

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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