RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

B.A./B.Sc. SECOND SEMESTER EXAMINATION, JUNE 2022

FIRST YEAR [BATCH 2021-24]

Date : 20/06/2022

MICROBIOLOGY (HONOURS)

Time : 11 am – 1 pm

Paper : III [CC3]

Full Marks : 50

Answer **any ten** of the following questions: [10×2]

1. a) What do you mean by polenske number?
   b) Write down the structure and IUPAC name of palmitoleic acid.
   c) What are plasmalogens?
   d) What do you mean by glycerides?
   e) Define 'true acidity' and 'titrable acidity'.
   f) What are polyprotic acids? Give examples.
   g) What is the concentration of HNO_3 in a solution that has a pH of 3.4?
   h) What is isoelectric point?
   i) What do you mean by zwitterion?
   j) Name two acidic and two basic amino acids.
   k) Define non-standard amino acids with examples.
   l) Differentiate glycogen from starch.
   m) Convert D(+) Glucose to D(+) Fructose.
   n) What are the main biological functions of polysaccharides?
   o) Amylose gives blue-black colour with iodine but the colour disappears on heating the solution and reappears on cooling. Explain the findings.

Answer **any three** questions of the following: [3×10]

2. a) How come polar bears are able to survive in the arctic whereas humans need warm clothing to survive?
   b) Write down the structure and IUPAC name of the following:
      i) behenic acid
      ii) cholesterol
   c) Why are *cis* unsaturated fatty acids having a lower melting point than same carbon *trans* unsaturated fatty acids? Give examples. [3+(2+2)+3]

3. a) Define buffer. What are different types of buffer? Explain each type with proper example.
   b) How many milliliters of 0.05 N HCl are required to neutralize exactly 8.0 g of NaOH?
   c) What are the concentrations of HOAc and OAc^- in a 0.2 M "acetate" buffer, pH 5.0? The K_a for acetic acid is 1.70×10^{-5}? [(1+1+3)+2+3]

4. a) What do you mean by essential and non-essential amino acids?
   b) Proline is an imino acid – Justify.
   c) Name different types of torsional angles in a protein structure.
   d) What do you mean by primary, secondary and tertiary structures of protein? (2+2+2+4)

5. a) What do mean by saponification number?

   b) Differentiate alpha helix and beta sheet structure.

   c) What is meant by chirality? Name an amino acid which is achiral.

   d) Write short note on mutarotation. (3+2+2+3)

6. a) Exactly 81 mg of glycogen were exhaustively methylated and then acid hydrolyzed. The methylated products were separated and identified by thin layer chromatography. Exactly 62.5 μmoles of 2,3-dimethylglucose were obtained. What percent of the total glucose residues are branch points?

   b) Prove that work done in reversible process is greater than that of work done in irreversible process.

   c) Glucose-6-phosphate was hydrolysed enzymatically (at pH 7 and 25°C) to glucose and inorganic phosphate. The concentration of glucose-6-phosphate was 0.1 M at start. At equilibrium, only 0.05% of the original glucose-6-phosphate remained. Calculate K'eq for the hydrolysis of glucose-6-phosphate and ΔG' for the hydrolysis reaction.

   d) The combustion of heptane in a constant volume calorimeter gave the value of qv = -4793 kJ at 25°C. What will be the enthalpy change of process at 25°C?

   e) The ΔG' of hydrolysis of ATP at pH 7 and 25°C is -7700 cal/mole (Keq = 4.42 X 105). The ΔG' of hydrolysis of glucose-6-phosphate at pH 7 and 25°C is -3138 cal/mole (Keq = 5 X 10-3). From this information, calculate the ΔG' and K'eq for the reaction between glucose and ATP catalyzed by hexokinase. (2+2+2+2+2)

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