RAMAKRISHNA MISSION VIDYAMANDIRA

(A Residential Autonomous College under University of Calcutta)

First Year, Second Semester (January – June), 2011
Mid-Semester Examination, March, 2011

MICROBIOLOGY (Honours)

Date : 9 March 2011 Full Marks : 50
Time : 11am – 1pm

(Use separate Answer Script for each group)

Group – A

1. Define microelement. Give examples of four microelements and their roles. How would you differentiate auxotroph from prototroph? Distinguish between selective media and differential media. [2+2+3+3]

OR,

How would you classify bacteria based on their nutritional requirements? Define myxotrophy. Set up an experiment to isolate bacteria based on their oxygen requirements. Show the detoxifying enzymes present in each group. [3+2+2+3]

2. Write down the structure of—
   a) γ-linolenic acid
   b) Aracidic acid [2+2]

3. a) Explain why unsaturated fatty acid has lower melting point than saturated fatty acid.
   b) What is HVZ Reaction of fatty acid? [3+3]

OR,

   a) What are soaps? How are they formed?
   b) What are syndets?
   c) Complete the reaction : $RCOOH + SOCl_2 \longrightarrow ?$ [3+2+1]

4. You are given the following data :

	X	Y
Mean	20	25
S.D	5	4

Correlation coefficient between X and Y is 0·6. Find the two regression equations and estimate—
   a) Y when x = 30 and
   b) X when Y = 28 [3+2]

OR,

   a) Define correlation
   b) What do you mean by null event and mutually exhaustive events?
   c) What do you mean by perfect positive correlation? [1+2+2]

Group – B

Answer **any one** from the following questions :

5. a) Classify carbohydrates.
   b) What happen when—
      i) glucose is treated with HCN
      ii) glucose is treated with Conc. HCl.

c) Write short notes on Osazone formation. [3+(2×2)+3]

6. a) Write short note on Mutarotation.
   b) What do you mean by Inversion of sugar?
   c) What happen when sucrose is treated with HIO_4 followed by hydrolysis?
   d) What is smith degradation? [3+2+2+3]

Answer **any two** from the following questions :

7. a) Define 'entropy'. What is its unit?
   b) Define relative activity and specific activity of a radioactive substance.
   c) Ca^{45} has a half life of 163 days. Calculate the decay constant in terms of (i) day - 1 (ii) sec - 1 (iii) what percent (%) of initial radioactivity will remain in the sample after 90 days?
   d) What is reverse Osmosis? [2+2+2½+1]

8. a) Calculate the standard-state ΔG values at (i) pH '0' and (ii) ph '5' for the dissociation of acetic acid : $HOAc \rightleftharpoons OAc^- + H^+$, $K_a = 1{\cdot}75\times10^{-5}$
   b) How does active transport differ from facilitated diffusion? Explain with proper examples.
   c) K^{40} $(t_{1/2} = 1.3\times10^9 \text{ yrs})$ constitutes 0·012% of the potassium in nature. The man body contains about 0·35% potassium by weight. Calculate the total radioactivity from K^{40} decay in a 75 kg human.
   d) Explain the clinical applications of radioisotopes. [2+2+2+1½]

9. a) Calculate the specific activity of pure C^{14} in terms of dpm/g.
   [Given, Decay constant of $C^{14} = 2{\cdot}31\times10^{-10}$ min^{-1}]
   b) How can you measure radioactivity using liquid scintillation method?
   c) Calculate the ΔG for the hydrolysis of ATP at pH 7 and 25°C under steady state conditions (such as might exist in a living cell) in which the concentrations of ATP, ADP and Pi are maintained at 10^{-3}M, 10^{-4}M and 10^{-2}, respectively.
   d) Write down the equation relating free energy, entropy and enthalpy. [2+2+2+1½]