M.Sc. – Ph.D. Biomedical Sc. / I Sem.   J

Paper – RC–1 : Biochemistry – I

(Admissions of 2008 and before)

Time : 3 hours   *Maximum Marks* : 75

(Write your Roll No on the top immediately
on receipt of this question paper)

Attempt all questions.
Marks are indicated against each question.

Section A

1. (*a*) Define Beer Lambert Law. How do you derive absorbance scale?

   Non-saponified fraction of an oil was extracted in 25 ml of chloroform, the absorbance of chloroform solution in 1 cm cuvette was 0·48 at 458 nm, calculate the concentration of the fraction in chloroform, the ε (extinction coefficient) is 2200.

   (*b*) Determine whether the following statements are true or false, and explain the reason:

   (*i*) In a reaction under standard conditions only the reactants are fixed at 1 m concentrations.

                                        P. T. O.

(*ii*) When $\Delta G^{o\prime}$ is positive, $K_{eq} > 1$

(*iii*) The value of $\Delta G^{o\prime}$ depends on pH of solution.

(*iv*) ΔG and $\Delta G^{o\prime}$ mean the same thing.

(*v*) When $\Delta G^{o\prime} = 1 \cdot 0$ kcal/mol, the equilibrium constant equals 1 0.

(*c*) How do you calculate IR frequency using Hooke's Law? Give *two* examples. What are internal and external standard in NMR? Show the nmr spectra (tentative) of p-methyl benzaldehyde

CHO
CH₃
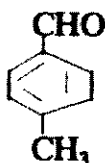
(*d*) Explain the phenomena of ellipticity. How can it be used to determine the percentage of α-helical, β-sheet and random coil structure? Give the λ_{max} for each kind of structure.   **12**

2. Attempt any *three* of the following:

(*a*) For the reaction below calculate the order of reaction for NO and O_2. What is the overall order of reaction?

$$2NO(g) + O_2(g) \rightarrow 2NO_2(g)$$
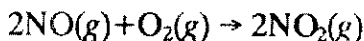
	Rate, Ms^{-1}	Initial concentrations, (M)	
		[NO]	[O_2]
Trial 1	$1 \cdot 2 \times 10^{-8}$	0·10	0·10
Trial 2	$2 \cdot 4 \times 10^{-8}$	0·10	0·20
Trial 3	$1 \cdot 08 \times 10^{-7}$	0·30	0·10

(b) What are the properties of colloidal solution? Explain Tyndall effect with example, and cleaning action of soap

(c) Define Raoult's Law Explain the colligative properties of solutions. Discuss the factors affecting the colligative properties of solution. Show graphs.

(d) The rate of a reaction at 25°C is $1 \cdot 55 \times 10^{-4} \ s^{-1}$. At 50°C, the rate of reaction is $3 \cdot 88 \times 10^{-4} \ s^{-1}$. Based on this data, what is the energy of activation for the chemical process expressed in J/mol? Calculate the first order rate constant for an enzyme preparation with V_{max} of 4·6 moles × litre × min^{-1}, $K_m = 2 \times 10^{-6}$ M.   15

3 Comment on any *two* of the following.

(i) What consequences does the restriction on flip-flop of lipids have for the structure of membrane?

P. T. O.

Or

(*ii*) Membranes contain glycolipids and glyco-proteins.

(*iii*) What is the mechanism of coupling in oxidative phosphorylation? How are respiratory inhibitors used to study electron transport?
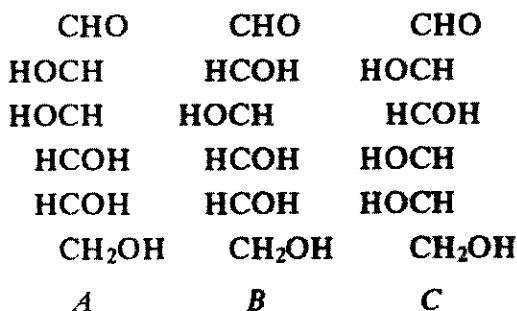
Or

(*iv*) Write the equation for pyruvate/lactate and $NAD^+/NADH$ redox couple, discuss the standard free energy change for the reaction at 25°C. Which redox pair is stronger oxidizing agent and has more tendency to lose electrons?

The redox potential (standard) of $NAD^+/NADH$ and pyruvate/lactate redox pair is -0.32 and $-0\ 184$ V.   10

SECTION B

4. (*i*) Write the Haworth structure of following carbohydrates:

CHO	CHO	CHO
HOCH	HCOH	HOCH
HOCH	HOCH	HCOH
HCOH	HCOH	HOCH
HCOH	HCOH	HOCH
CH₂OH	CH₂OH	CH₂OH
A	*B*	*C*

(*ii*) What kind of isomers are *A* and *B*? What kind of isomers are *A* and *C*? What kind of isomers are B and *C*?

(*a*) anomers, epimers, enanantiomers

(*b*) enantiomers, anomers, diastereoisomers

(*c*) diastereoisomers, enantiomers, epimers

(*d*) epimers, diastereoisomers, enantiomers

(*e*) enantiomers, epimers, anomers.

(*iii*) Show the mechanism of mutarotation in glucose.

8

5. Write short notes on any *three* of the following:

(*i*) Pentose phosphate pathway

(*ii*) Anaploretic reactions

(*iii*) Galactosemia

(*iv*) Transportation of $NAD^+/NADH^+$ by shuttles and release of ATP   15

6. Discuss any *two* of the following.

(*i*) Oxidation odd chain fatty acids is different from even chain fatty acid oxidation of unsaturated fatty acids requires exactly the same group of enzymes as the oxidation of saturated fatty acids, comment

(ii) How is cholesterol produced? Describe briefly the differences between synthesis of phosphatidylethanolamine in prokaryotes and eukaryotes.

(iii) What are the steps involved in the biosynthesis of malonyl-CoA from acetyl CoA? Discuss the metabolic significance of malonyl-CoA. 15