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(No. of Questions : 10)

(No. of Printed Pages : 2)

PHM-1.2.3

PHARMACEUTICAL

CHEMISTRY-II

(PHYSICAL CHEMISTRY)

(B.Pharm., 2nd Semester, 2054)

Time : 3 Hours

Maximum Marks : 80

Note :- Section A is compulsory. Attempt any *Four* questions from Section B and any *Three* questions from Section C.

Section-A

Marks : 2 Each

1. (a) Illustrate the lowering the Gibbs free energy of activation of a reaction by a catalyst.

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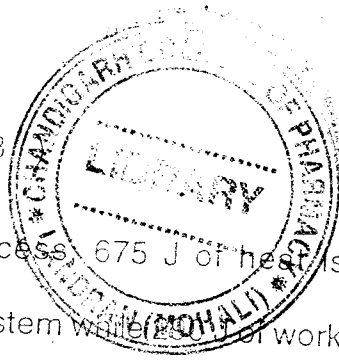
- (b) What is difference between homogeneous and heterogeneous catalysis ?
- (c) The  $t_{1/2}$  of a reaction is doubled as the initial concentration of the reactant is doubled. What is the order of the reaction ?
- (d) If the rate of a reaction is given by  $r = k[A]^2[B]^{1/2}$ . What are the units of rate constant ?
- (e) What is the maximum efficiency of a steam engine operating between  $100^\circ\text{C}$  and  $25^\circ\text{C}$  ?
- (f) State and explain the Zeroth law of thermodynamics. What is the significance of this law ?

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- (g) In a certain process, 675 J of heat is absorbed by a system while 325 J of work is done on the system. What is the change in internal energy for the process?
- (h) What is meant by Reynolds number? What is its significance?
- (i) Calculate the average translational kinetic energy of an ideal gas per molecular.  
( $K = 1.38 \times 10^{-23} \text{ JK}^{-1}$ ).
- (j) Explain the term photosensitization. Discuss the mechanism of a photosensitized reaction.
- (k) What are radiative and non-radiative transitions?

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(l) Show that :

$$[\hat{A}^2, \hat{B}] = \hat{A}[\hat{A}, \hat{B}] + [\hat{A}, \hat{B}]\hat{A}.$$

(m) Discuss any two applications of adsorption in everyday life.

(n) What is difference between Chemisorption and Physisorption ?

(o) Define :

(i) Component

(ii) Degree of freedom.

Section-B

Marks : 5 Each

2. Derive expressions for the work done in reversible isothermal expansion and reversible isothermal compression of an ideal gas. What is meant by maximum work ?

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3. State and explain the term temperature coefficient of a reaction. What is meant by energy of activation? Explain how energy of activation is determined with the help of Arrhenius equation.
4. Explain the term viscosity of a liquid. What are Newtonian and non-Newtonian liquids? Discuss the effect of temperature on the viscosity of a liquid.
5. State and explain the term quantum yield. How do you account for the fact that the quantum yield of the photochemical reaction  $\text{H}_2(\text{g}) + \text{Br}_2(\text{g}) \rightarrow 2\text{HBr}(\text{g})$  is low ( $= 0.01$ ) while that of the reaction  $\text{H}_2(\text{g}) + \text{Cl}_2(\text{g}) \rightarrow 2\text{HCl}(\text{g})$  is very large ( $= 10^5$ ).

6. Find expressions for the following operators :

(a)  $\left[ \frac{d}{dx} + x \right]^2$

(b)  $\left[ \frac{d}{dx} + x \right] \left[ \frac{d}{dx} - x \right]$

Section-C      Marks : 10 Each

7. Derive the van der Waals equations for describing the P-V-T relationship in real gases.

Illustrate how this equation satisfactorily explains the departure of real gases from ideal behaviour at different pressure and temperature.

8. Discuss the mechanism and kinetics of enzyme-catalyzed reactions.

9. State and explain Raoult's law and Henry's law.

Show that if in any solution, the solvent obeys Raoult's law, the solute obey Henry's law.

10. Discuss briefly Langmuir's unimolecular theory of adsorption. Derive an expression for Langmuir's adsorption isotherm. Show that at normal pressures, Langmuir's unimolecular adsorption isotherm becomes identical with Freundlich adsorption isotherm.

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