DELHI PUBLIC SCHOOL JAMMU

CLASS-XI SESSION-2024-2025 Assignment

CHEMISTRY

Class 12 - Chemistry

Time Allowed: 1 hour   **Maximum Marks: 30**

Section A

1. The slope in the log k vs. $\frac{1}{T}$ curve is 5.42×10^3. The value of the activation energy is approximately **[1]**

      a) 106 J/mol   b) 102 J/mol

      c) 104 kJ/mol   d) 108 J/mol

2. For the reaction $A \leftrightarrow B,\ \triangle H = +40 kJ/mol$. IF E_a for the forward reaction is 60 kJ/mol. E_a for the backward **[1]** reaction is

      a) 20 kJ/mol   b) 80 kJ/mol

      c) 140 kJ/mol   d) 100 kJ/mol

3. The slope of the line in the plot of concentration [A] Vs. time (s) indicate **[1]**

      a) +k   b) -k

      c) $\frac{+k}{2.303}$ d) $\frac{-k}{2.303}$

4. **Assertion (A):** The molecularity of the reaction is $H_2 + Br_2 = 2HBr$ is two. **[1]**

   Reason (R): The order of this reaction is $\frac{3}{2}$.

      a) Both A and R are true and R is the correct explanation of A.   b) Both A and R are true but R is not the correct explanation of A.

      c) A is true but R is false.   d) A is false but R is true.

5. **Assertion (A):** According to transition state theory, for the formation of an activated complex, one of the **[1]** vibrational degrees of freedom is converted into a translational degree of freedom.

   Reason (R): The energy of the activated complex is higher than the energy of reactant molecules.

      a) Both A and R are true and R is the correct explanation of A.   b) Both A and R are true but R is not the correct explanation of A.

      c) A is true but R is false.   d) A is false but R is true.
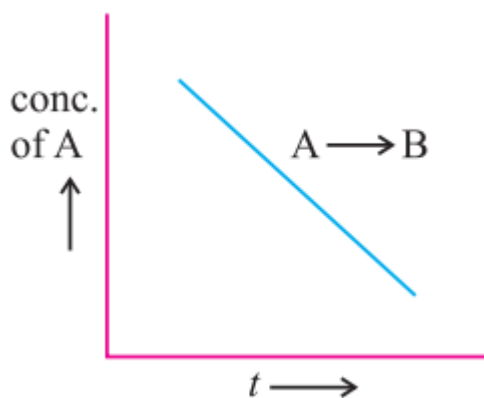
Section B

[2]

6.

  i. What is the order of the reaction?

  ii. What is the slope of the curve?

7. Rate constant 'k' of a reaction varies with temperature 'T' according to the equation **[2]**

$\log k = \log A - \frac{E_a}{2.303R}\left(\frac{1}{T}\right)$

where E_a is the activation energy. When a graph is plotted for log k vs $\frac{1}{T}$, a straight line with a slope of -4250 K

is obtained. Calculate 'E_a' for the reaction.

(R = 8.314 JK^{-1}mol^{-1})

Section C

8. The rate of a reaction quadruples when the temperature changes from 293 K to 313 K. Calculate the energy of **[3]** activation of the reaction assuming that it does not change with temperature.
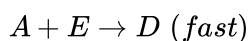
9. Consider the reaction: **[3]**

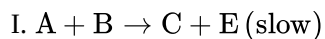2A + B → C + D
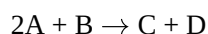
Following results were obtained in experiments designed to study the rate of reaction:

Exp. No.	Initial concentration (mol L^{-1}) [A]	[B]	Initial rate of formation [D] (m/min)
1.	0.10	0.10	1.5×10^{-3}
2.	0.20	0.20	3.0×10^{-3}
3.	0.20	0.40	6.0×10^{-3}

  i. Write the rate law for the reaction.

  ii. Calculate the value of rate constant for the reaction.

  iii. Which of the following possible reaction mechanism is consistent with the rate law?

    I. $A + B \to C + E \, (slow)$

      $A + E \to D \, (fast)$

   II. $B \to C + E \, (slow)$

      $A + E \to F \, (fast)$

      $A + F \to D \, (fast)$
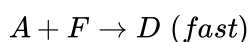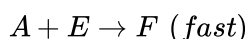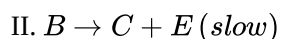
Section D

10. **Read the given passage and answer the questions that follow:** **[5]**

The rate or velocity of a chemical reaction can be defined as the rate of appearance of one or more of its products or as the rate of disappearance of one or more of its reactants in unit time. When chemical reactions occur, the concentrations of reactants decrease as they are used up, while the concentrations of the products increase as they are formed. The rate of reaction can be measured as the rate of disappearance of reactant A or rate of formation of the component. The rate at which a reactant is being consumed at any particular moment is

called the instantaneous rate. Factors affecting the rate of reactions are temperature, nature of reactants, catalysts & concentration of reaction species.

   a. The unit of rate of a reaction involving gaseous species is _____.
   b. How is the rate of reaction represented as for this reaction $2A + 3B \longrightarrow 4C$?
   c. How does the surface area of the reactant affect the rate of reaction?
   d. In the formation of sulphur trioxide by the Contact process, $2SO_2 + O_2 \longrightarrow 2SO_3$, the rate of reaction was measured as $3.0 \times 10^{-4} \mathrm{molL}^{-1}\mathrm{s}^{-1}$ in terms o oxygen. What is the rate of reaction expressed in terms of sulphur trioxide?

   OR

   e. In the rate equation, when the concentration of reactants is unity then the rate is equal to _____.

Section E

11. i. For the reaction $A \rightarrow B$, the rate of reaction becomes twenty seven times when the concentration of A is increased three times. What is the order of the reaction?   **[5]**

   ii. The activation energy of a reaction is 75.2 kJ mol^{-1} in the absence of a catalyst and it lowers to 50.14 kJ mol^{-1} with a catalyst. How many times will the rate of reaction grow in the presence of a catalyst if the reaction proceeds at 25°C?

12. i. Write the rate law for a first order reaction. Justify the statement that half life for a first order reaction is independent of the initial concentration of the reactant.   **[5]**

   ii. For a first order reaction, show that the time required for 99% completion of a first order reaction is twice the time required for the completion of 90%.