REVISION ASSIGNMENT # 03

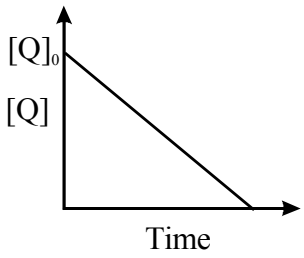
CHEMISTRY

SECTION–I : (i) Only One option correct Type

This section contains **12 multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONLY ONE** is correct. **3(–1)**

1. In the reaction : **[JEE 2013]**

$P + Q \longrightarrow R + S$



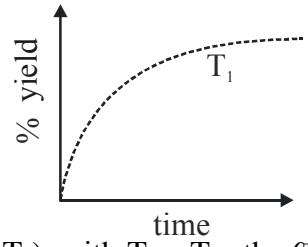
the time taken for 75% reaction of P is twice the time taken for 50% reaction of P. The concentration of Q varies with reaction time as shown in the figure. The overall order of the reaction is -

(A) 2 (B) 3 (C) 0 (D) 1

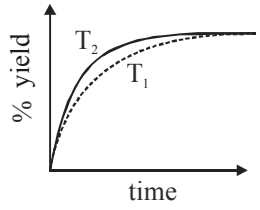
2. The % yield of ammonia as a function of time in the reaction **[JEE 2015]**

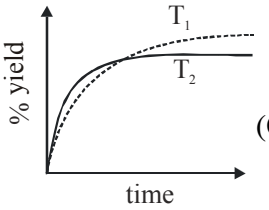
$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$, $\Delta H < 0$

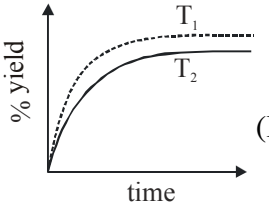
at (P , T_1) is given below -

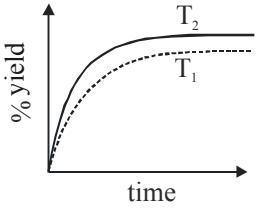


If this reaction is conducted at (P ,T_2), with $T_2 > T_1$, the % yield of ammonia as a function of time is represented by -

(A) 

(B) 

(C) 

(D) 

3. A reactant (A) forms two products : **[AIEEE-2011]**

$A \xrightarrow{k_1} B$, Activation Energy Ea_1

$A \xrightarrow{k_2} C$, Activation Energy Ea_2

If $Ea_2 = 2\ Ea_1$, then k_1 and k_2 are related as :-

(A) $k_1 = 2k_2e^{Ea_2/RT}$ (B) $k_1 = k_2e^{Ea_1/RT}$ (C) $k_2 = k_1e^{Ea_2/RT}$ (D) $k_1 = [A]\,k_2e^{Ea_1/RT}$

4. For the non-stoichiometric reaction $2A + B \rightarrow C + D$, the following kinetic data were obtained in three separate experiments, all at 298 K. **[J-MAIN 2014]**

Initial Concentration (A)	Initial Concentration (B)	Initial rate of formation of C (mol $L^{-}S^{-}$)
0.1M	0.1M	1.2×10^{-3}
0.1M	0.2M	1.2×10^{-3}
0.2M	0.1M	2.4×10^{-3}

(A) $\frac{dc}{dt} = k[A][B]^2$ (B) $\frac{dc}{dt} = k[A]$ (C) $\frac{dc}{dt} = k[A][B]$ (D) $\frac{dc}{dt} = k[A]^2[B]$

5. The reaction : $2N_2O_5(g) \rightarrow 4NO_2(g) + O_2(g)$, follows first order kinetics. The pressure of a vessel containing only N_2O_5 was found to increase from 50 mm Hg to 87.5 mm Hg in 30 min. The pressure exerted by the gases after 60 min. will be (Assume temperature remains constant)

(A) 106.25 nm Hg (B) 116.25 nm Hg **[JEE-MAIN-(Online)2015]**

(C) 125 mm Hg (D) 150 mm Hg

6. Decomposition of H_2O_2 follows a first order reaction. In fifty minutes the concentration of H_2O_2 decreases from 0.5 to 0.125 M in one such decomposition. When the concentration of H_2O_2 reaches 0.05 M, the rate of formation of O_2 will be :- **[JEE-MAIN-(Offline)2016]**

(A) 1.34×10^{-2} mol min^{-1} (B) 6.93×10^{-2} mol min^{-1}

(C) 6.93×10^{-4} mol min^{-1} (D) 2.66 L min^{-1} at STP

7. The rate of a reaction A doubles on increasing the temperature from 300 to 310 K. By how much, the temperature of reaction B should be increased from 300 K so that rate doubles if activation energy of the reaction B is twice to that of reaction A : **[MAINS-2017(online)]**

(A) 2.45 K (B) 4.92 K (C) 9.84 K (D) 19.67 K

8. For the reaction, $2A + B \rightarrow$ products, when the concentrations of A and B both wrere doubled, the rate of the reaction increased from 0.3 mol $L^{-1}s^{-1}$ to 2.4 mol L^{-1} s^{-1}. When the concentration of A alone is doubled, the rate increased from 0.3 mol $L^{-1}s^{-1}$ to0.6 mol $L^{-1}s^{-1}$ **[MAINS-2019(online)]**

Which one of the following statements is correct ?

(A) Order of the reaction with respect to B is 2

(B) Order of the reaction with respect to A is 2

(C) Total order of the reaction is 4

(D) Order of the reaction with respect to B is 1

9. The reaction $2X \rightarrow B$ is a zeroth order reaction. If the initial concentration of X is 0.2 M, the half-life is 6 h. When the initial concentration of X is 0.5 M, the time required to reach its final concentration of 0.2 M will be :-

(A) 18.0 h (B) 7.2 h (C) 9.0 h (D) 12.0 h

10. If a reaction follows the Arrhenius equation, the plot lnk vs $\frac{1}{(RT)}$ gives straight line with a gradient (–y) unit. The energy required to activate the reactant is : **[MAINS-2019(online)]**

(A) y unit (B) –y unit (C) yR unit (D) y/R unit

11. Which of the following is **INCORRECT** for first order reaction ?

(A) On introducing catalyst, both rate constant and rate of reaction increases.

(B) On increasing temperature both rate constant & rate of reaction increases.

(C) On decreasing volume both rate constant & rate of gaseous reaction increases.

(D) On increasing concentration of gaseous reactant at constant volume & constant temperature both total pressure and rate of the reaction increases.

12. **Statement-1** : A fractional order reaction must be a complex reaction.

Statement-2 : Fractional order of RDS equals to overall order of a complex reaction.

(A) Statement-1 is true, statement-2 is true and statement-2 is correct explanation for statement-1.

(B) Statement-1 is true, statement-2 is true and statement-2 is NOT the correct explanation for statement-1.

(C) Statement-1 is true, statement-2 is false.

(D) Statement-1 is false, statement-2 is true.

(ii) One or more options correct Type

This section contains **4 multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONE or MORE** are correct. **4(–1)**

13. According to the Arrhenius equation, **[JEE 2016]**

(A) A high activation energy usually implies a fast reaction

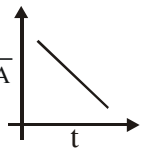
(B) Rate constant increase with increase in temperature. This is due to a greater number of collisions whose energy exceeds the activation energy

(C) Higher the magnitude of activation energy, stronger is the temperature dependence of the rate constant

(D) The pre-exponential factor is a measure of the rate at which collisions occur, irrespective of their energy.

14. For the reaction $A \rightarrow B$, the rate law expression is $-\frac{d[A]}{dt} = k\,[A]^{1/2}$. If initial concentration of [A] is $[A]_0$, then

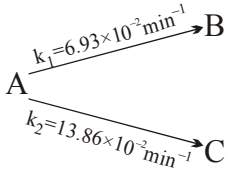
(A) The integerated rate expression is $k = \frac{2}{t}(A_0^{1/2} - A^{1/2})$

(B) The graph of $\sqrt{A}$ vs t will be 

(C) The half life period, $t_{1/2} = \frac{K}{2[A]_0^{1/2}}$

(D) The time taken for 75% completion of reaction $t_{3/4} = \frac{\sqrt{[A]_0}}{k}$

15. Consider the reaction,



A, B and C all are optically active compound . If optical rotation per unit concentration of A, B and C are 60°, –72°, 42° and initial concentration of A is 2 M then select correct statement(s).

(A) Solution will be optically active and dextrorotatory after very long time

(B) Solution will be optically active and levorotatory after very long time

(C) Half life of reaction is 15 min

(D) After 75% conversion of A into B and C angle of rotation of solution will be 36°.

16. For the gas phase reaction : $R - H + X_2 \rightarrow R - X + HX$, following mechanism has been proposed

(i) $X_2 \underset{k_2}{\overset{k_1}{\rightleftharpoons}} 2X^{\bullet}$

(ii) $X^{\bullet} + R - H \xrightarrow{k_3} R^{\bullet} + H-X$ (slowest)

(iii) $R^{\bullet} + X_2 \xrightarrow{k_4} R - X + X^{\bullet}$

Based on this, select the correct option (s)

(A) Effective rate constant for the formation of RX is $k_3k_4\sqrt{\frac{k_1}{k_2}}$

(B) $\frac{d[RX]}{dt} \propto [X_2]$

(C) Overall order of the reaction is 3/2

(D) $\frac{d[RX]}{dt} \propto [RH]^1$

(iii) Paragraph Type

This section contains **1 paragraphs** , describing theory, experiment, data etc. **2 questions** relate to one paragraphs with two questions. Each question of a paragraph has **only one correct answer** among the four choices (A), (B), (C) and (D). **3(0)**

Paragraph for Question Nos. 17 & 18

A reaction is said to be first order if it's rate is proportional to the concentration of reactant. Let us consider a reaction

	A(g)	⟶	B(g)	+ C(g)
At t = 0	a		0	0
At time t	a – x		x	x

The rate of reaction is given by the expression $\frac{dx}{dt} = k(a - x)$ and integrated rate equation for a given reaction is represented as $k = \frac{1}{t} ln\left(\frac{a}{a-x}\right)$ where a = initial concentration and (a – x) = concentration of A after time t.

17. Thermal decomposition of compound X is a first order reaction. If 75% of X is decomposed in 100 min. How long will it take for 90% of the compound to decompose?

Given : log 2 = 0.30

(A) 190 min (B) 176.66 min (C) 166.66 min (D) 156.66 min

18. Consider a reaction $A(g) \longrightarrow 3B(g) + 2C(g)$ with rate constant 1.386×10^{-2} min^{-1}. Starting with 2 moles of A in 12.5 litre a closed vessel initially, if reaction is allowed to takes place at constant pressure & at 298K then find the concentration of B after 100 min.

(A) 0.04 M (B) 0.36 M (C) 0.09 M (D) None of these