DPP
DAILY PRACTICE PRACTICE PROBLEMS

Class : XIIth

Date :

Solutions

Subject : CHEMISTRY

DPP No. : 1

Topic :- Chemical Kinetics

1 **(a)**

It is the definition of molecularity.

2 **(c)**

$\left(\frac{dx}{dt}\right) = k[NO]^2[o_2]$

$= k\left(\frac{n_{NO}}{V}\right)^2\left(\frac{n_{O_2}}{V}\right)$

$\left(\frac{dx}{dt}\right) = \frac{k}{V^3}(n_{No})^2(n_{O_2})$

$\left(\frac{dx}{dt}\right) = \frac{k(n_{No})^2(n_{O_2})}{\left(\frac{V}{2}\right)^3}$

$= 8\left(\frac{dx}{dt}\right)$

3 **(c)**

No doubt order cannot be predicted by merely looking chemical reaction but this can be treated as standard example of II order reaction.

4 **(a)**

$\text{Rate} = -\left[\frac{dc}{dt}\right] = \left[-\frac{dn}{dt}\right]\frac{1}{V} \qquad \left[\because c = \frac{n}{V}\right]$

$\therefore \qquad -\left[\frac{dc}{dt}\right] = -\frac{1}{RT}\left[\frac{dP}{dt}\right]. \quad \left[c = \frac{P}{RT}\right]$

5 **(a)**

For zero order reaction

Rate $=[A]^0 = k$

$\frac{mol\ L^{-1}}{s} = k$

K$=mol\ L^{-1}\ s^{-1}$

6 **(b)**

$A \xrightarrow{k_1} B,$

$A \xrightarrow{k_2} C,$

By Arrhenius equation,

$R_1 = A'e^{-E_a 1/RT}$ and $k_2 = A'e^{-E_a 2/RT}$

(A' is Arrhenius constant) (Since, $E_{a2} = 2E_{a1}$)

$\therefore k_2 = A'e^{-2E_{a'}|RT}$

$$\frac{k_1}{k_2} = \frac{A'e^{-E_a 1|RT}}{A'e^{-2E_a|RT}} = e^{E_a 1|RT}$$

$\therefore k_1 = k_2 e^{E_a 1/RT}$

7 **(d)**

For the reaction, $2A + B \rightarrow A_2B$

According to rate laws,

Rate $\propto$ concentration of reactants

$rate = k[A]^2[B]$

Where, k=rate constant

8 **(d)**

This is activation state and orientation concept for mechanism of reactions.

9 **(b)**

Rate depends upon the slowest step. Hence, from equation

$O + O_3 \rightarrow 2O_2$

$r = k[O_3][O]$

And from equation $O_3 \rightleftharpoons O_2 + O$

$$K_{eq} = \frac{[O_2][O]}{[O_3]}$$

$$[O] = \frac{K_{eq}[O_3]}{[O_2]}$$

$$\therefore r = k[O_3]\frac{K_{eq}[O_3]}{[O_2]}$$

$$= k'[O_3]^2[O_2]^{-1}$$

10 **(a)**

Amount of A left in n_1 halves $= \frac{[A_0]}{2^{n_1}}$

Amount of B left in n_2 halves $= \frac{[B_0]}{2^{n_2}}$

Also if $\frac{[A_0]}{2^{n_1}} = \frac{[B_0]}{2^{n_2}}$ when A decays to n_1 halves and B decays to n_2 halves.

$\because \quad [A_0] = 4[B_0]$

$\therefore \quad 4 = \frac{2^{n_1}}{2^{n_2}} = (2)^{n_1 - n_2}$

or $\quad (n_1 - n_2) = 2$

$\therefore \quad n_2 = n_1 - 2$ ...(i)

Now, $T = n_1 \times t_{1/2A}$ and $T = n_2 \times t_{1/2B}$

$\therefore \quad \frac{n_1 \times t_{1/2A}}{n_2 \times t_{1/2B}} = 1$

or $\quad \frac{n_1 \times 5}{n_2 \times 15} = 1$

or $\frac{n_1}{n_2} = 3$ ...(ii)

$\therefore$ By Eqs. (i) and (ii) $n_1 = 3, n_2 = 1$

Thus, $T = 3 \times 5 = 15$ minute

11 **(c)**

$\because$ On doubling the concentration of A, the rate of reaction becomes two times.

$\therefore$ The order of reaction w.r.t. A is 1

$\because$ On doubling the concentration of B, the rate of reaction does not change.

$\therefore$ the order of reaction respect to B is 0

$\because$ on doubling the concentration of C, the rate of reaction becomes four times

$\therefore$ the order of reaction w.r.t. C is 2

$\therefore$ the overall order of reaction=1+0+2=3

12 **(c)**

For nth order; unit of rate constant may be derived by

$$K = \frac{\text{rate}}{[\text{reactant}]^n}$$

13 **(c)**

$r = K[\mathrm{N_2O_5}] = 6.2 \times 10^{-4} \times 1.25 = 7.75 \times 10^{-4}\mathrm{M/s}$

14 **(c)**

	A	$\rightarrow$ *product*
Initially	a	0
After time t	(a-x)	x
After $t_{1/4}$	$\left(a - \frac{a}{4}\right)$	$\frac{a}{4}$

For the first order kinetics ,

$$k = \frac{2.303}{t}\log\left(\frac{a}{a-x}\right)$$

$$k = \frac{2.303}{t_{1/4}} log \frac{a}{\frac{3a}{4}}$$

$$t_{1/4} = \frac{2.303 log \frac{4}{3}}{k}$$

$$= \frac{0.29}{k}$$

15 **(a)**

The order of reaction is zero. Suppose the following reaction take place .

$A + B \rightarrow product$

$\therefore rate = [A][B]^{-1}$

$\therefore$ order =1+(-1)=0

16 **(d)**

Pseudo first order reactions are those reactions which are not truly first order but show first order kinetics under specific conditions. For examples, acidic hydrolysis of an ester and hydrolysis of cane sugar.

17 **(d)**

The differential rate law for the reaction,

$4NH_3(g) + 5O_2(g) \rightarrow 4NO(g) + 6H_2O(g)$ is

$$Rate = -\frac{1}{4}\frac{d[NH_3]}{dt} = -\frac{1}{5}\frac{d[O_2]}{dt}$$

$$= +\frac{1}{4}\frac{d[NO]}{dt} = +\frac{1}{6}\frac{d[H_2O]}{dt}$$

18 **(a)**

$${}_{79}\text{Au}^{198} \xrightarrow{-B} {}_{80}\text{Hg}^{198}$$

$$k = \frac{0.693}{t_{1/2}} = \frac{0.693}{65}$$

After 260 hr,

$$k = \frac{2.303}{260}\log\frac{a}{a-x}$$

$$\frac{0.693}{65} = \frac{2.303}{260}\log\frac{a}{a-x}$$

$$\frac{a}{a-x} = 16$$

$$\frac{1}{1-x} = 16$$

$$x = \frac{15}{16}\text{ g} = 0.9375\text{ g}$$

19 **(d)**

Rate $= k[NO_2Cl]$

Hence ,rate determining step is

$NO_2CL \rightarrow NO_2 + CL$

20 **(b)**

$R\text{Cl} + \text{NaOH} \rightarrow R\text{OH} + \text{NaCl}$

Rate $= k[R\text{Cl}]$

For this reaction rate of reaction is depends upon the concentration of RCl

It means, the rate of reaction is halved by reducing the concentration of RCl by one half

ANSWER-KEY										
Q.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
A.	**A**	**C**	**C**	**A**	**A**	**B**	**D**	**D**	**B**	**A**
Q.	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
A.	**C**	**C**	**C**	**C**	**A**	**D**	**D**	**A**	**D**	**B**