DPP
DAILY PRACTICE PROBLEMS

Class : XIIth
Date :

Solutions

Subject : CHEMISTRY
DPP No. : 3

Topic :- Chemical Kinetics

1 **(c)**

$K_1 = 10^{16}e^{-2000/T}; K_2 = 10^{15}e^{-1000/T}$

if $K_1 = K_2$ then $10^{16}e^{-2000/T} = 10^{15}e^{-1000/T}$

or $\log 10 - \frac{2000}{T} = -\frac{1000}{T}$ or $T = \frac{1000}{2.303}\text{K}$

2 **(c)**

As we know that, rate of reaction is directly proportional to concentration of reactant and inversely proportional to the volume of vessel.

$i.e.$,concentration$\alpha \propto \frac{n}{v}$

For a given reaction,

$2NO(g) + O_2(g) \rightleftharpoons 2NO_2(g)$

Rate of reaction$=k[NO]^2[O_2]$

If volume of vessel is reduced by $\frac{1}{3}rd$ of its initial value, then concentration of compound is increase by 3 times. Hence, the rate of reaction will be increased by 27 times.

3 **(c)**

For a zero order reaction

$$k_0 = \frac{[A_0]}{2t_{1/2}}$$

Since,$[A]_0 = 2\ M, t_{1/2} = 1\ h$

So, $k_0 = 1$ and

$$k_0 = \frac{\Delta x}{t}\ or\ t = \frac{0.50 - 0.25}{1} = 0.25\ h$$

4 **(c)**

$A + B \rightarrow C + D$

Rate (r)=$k[A]^a[B]^b$ ...(i)

$2r$=$k[2A]^a[B]^b$ ... (ii)

$3r$=$k[A]^a[9B]^b$ ...(iii)

Dividing eq.(ii) by eq.(i)

$2 = 2^a$or a=1

Dividing eq (iii)by eq.(i)

$3 = 9^b\ or\ 3 = 3^{2b}\ \ or\ 2b = 1\ or\ b = 1/2$

So order of reaction $= 1 + \frac{1}{2} = \frac{3}{2}$

5 **(a)**

$$N = \frac{N_0}{2^n}$$

$$n = \frac{T}{t_{1/2}} = \frac{40}{20} = 2$$

$$\therefore \quad N = \frac{N_0}{2^2} = \frac{N_0}{4}$$

6 **(a)**

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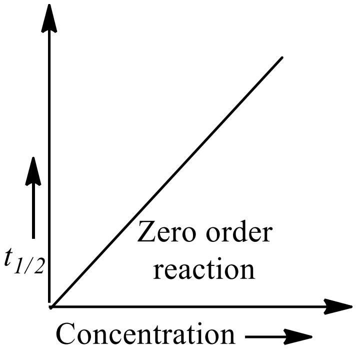
$p_1 = 80\text{ kPa}, \left(t_{1/2}\right)_1 = 350s$

$p_1 = 40\text{ kPa}, \left(t_{1/2}\right)_1 = 175s$

$$\frac{80}{40} = \frac{350}{175} = 2$$



$$\because \frac{p_1}{p_2} = \frac{\left(t_{1/2}\right)_1}{\left(t_{1/2}\right)_2} = \frac{a_1}{a_2}$$

$\left(t_{1/2}\right) \propto a(zero\ order\ reaction)$

7 **(b)**

Thermal decomposition,

$CH_3CHO \xrightarrow{\Delta} CH_4 + CO$

$$\frac{dx}{dt} = k[CH_3CHO]^{3/2}$$

8 **(b)**

For the reaction : $A \rightarrow 2B + C$

$p_1 \quad 0 \quad 0$

After 10 min $p_1 - p \quad 2p \quad p$

After long time $0 \quad 2p_1 \quad p_1$

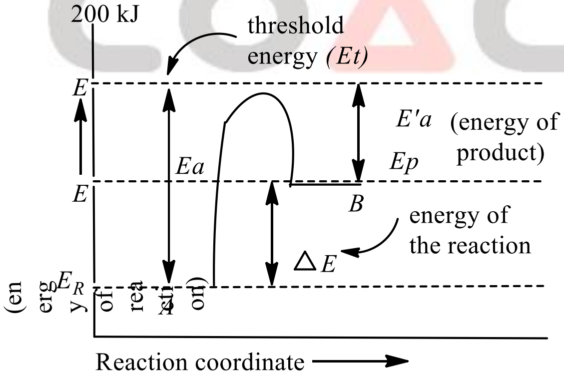
Total pressure $= (p_1 - p + 2p + p) = 176$ mm

Total pressure after long time

$= 2p_1 + p_1 = 270$ mm

Calculate the value of p from above two equation and then the difference of p_1 and p will be the pressure of A

9 **(c)**



Where,

E_a =activation energy of forward reaction

E_a''=activation energy of backward reaction
The above energy profile diagram shows that
$E_a > E_a''$
The potential energy of the product is greater than that of the reactant, so the reaction is endothermic.
$E_a = E_a'' + \Delta E$
$E_t = E_a$ or $E_t > E_a''$

10 **(d)**
Combination of $H_2$and B_{r2} to give HBr is zero order reaction as the rate of reaction is not affected by the concentration of reactants.
$H_2 + B_{r2} \overset{hv}{\rightarrow} 2\text{HBr}$

11 **(a)**
$$Rate\ of\ reaction\ = \frac{1}{4}\frac{d(NO_2)}{dt} = \frac{5.2 \times 10^{-3}}{4 \times 100}$$
$= 1.3 \times 10^{-5}\ Ms^{-1}$

12 **(d)**
$$9 = \left(\frac{3.24 \times 10^{-2}}{1.2 \times 10^{-3}}\right)^n$$
$9 = (3^3)^{2/3}$
order of the reaction is=2/3

13 **(b)**
For zero order reaction
$$k = \frac{a}{2t_{1/2}} = \frac{a}{2 \times 100} = \frac{a}{200}$$
When 80% completion take place
$$k = \frac{x}{t}$$
$$\frac{a}{200} = \frac{0.80a}{t}$$
$t = 200 \times 0.8 = 160$ min

14 **(a)**
$2A + B \rightarrow product$
[B] is doubled, half-life didn't change
Half-life is independent of change in concentration of reactant i.e., first order
First order w.r.t. to B
When [A] is doubled, rate increased by two times
$\Rightarrow$ First order w.r.t.A
Hence, net order of reaction =1+1=2
Unit for the rate constant=$conc.^{(1-n)}\ t^{-1}$
$= (mol^{-1})^{-1}.s^{-1}$
$L.mol^{-1}s^{-1}$

16 **(c)**
$\text{H}_2\text{O} + \text{O} \longrightarrow 2\text{OH};\ \Delta H = 72\text{kJ}$ at 500 K;
Given $E_a = 77\ \text{kJmol}^{-1}$
$2\text{OH} \longrightarrow \text{H}_2\text{O} + \text{O}; E_{a_{B.R.}}$
For a reaction $E_{a_{F.R}} = \Delta H + E_{a_{B.R}}$
$\therefore 77 = 22 + E_{a_{B.R}}$
$\therefore E_{a_{B.R}} = 5\text{kJ mol}^{-1}$

17 **(d)**
According to Arrhenius equation, the relationship between the activation energy and temperature is

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$k = Ae^{-E_a/RT}$

$\log k = \dfrac{-E_a}{2.303\,RT} + \log A$

∴ Activation energy decreases with rise in temperature, thereby increasing the rate of the reaction.

18 **(d)**

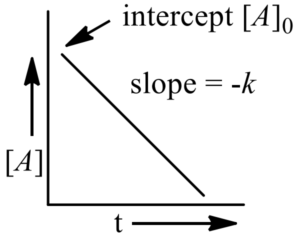
rate $= K[A]^1$

$$K = \frac{2.0 \times 10^{-5}}{0.01} = 2.0 \times 10^{-3}\text{s}^{-1}$$

$$\therefore \quad t_{1/2} = \frac{0.693}{2 \times 10^{-3}} = 347\text{s}$$

19 **(c)**

For a zero order reaction, the plot of concentration of reactant vs time is a straight line (linear) with a negative slope and non-zero intercept.



20 **(b)**

$r = K[A]^m[B]^n$;

Also, $\dfrac{r}{4} = K[A]^m[2B]^n$

$$4 = \left(\frac{1}{2}\right)^n \text{ or } 2^2 = 2^{-n}$$

$$\therefore \quad n = -2$$

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

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