



MAGNUS BANGLADESH

A RELIABLE SOURCE OF ECOLOGICAL TEXTILE PRINTING CHEMICALS A RELIABLE SOURCE OF ECOLOGICAL TEXTILE PRINTING CHEMICALS A RELIABLE SOURCE OF ECOLOGICAL TEXTILE PRINTING CHEMICALS

Thermochemistry

Thermochemistry is the branch of physical chemistry which deals with thermal or heat changes caused by chemical reactions.

Notes

WHEN WE DREAM IMPOSSIBLE HAPPENS WHEN WE DREAM IMPOSSIBLE HAPPENS WHEN WE DREAM IMPOSSIBLE HAPPENS WHEN WE DREAM IMPOSSIBLE HAPPENS

Thermochemistry cal eq'n :-

(1) Physical state

(2) Balanced

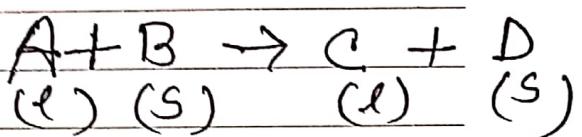
(3) Value of ΔH is given.

$$E - \Delta E$$

$$H - \Delta H$$

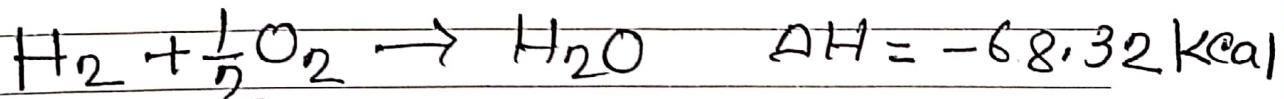
$$G - \Delta G \xrightarrow{\text{Gibb's}}$$

$$S - \Delta S$$



Notes

Example of Th: eq'n :-



Heat of Reaction \rightarrow Relationship between ΔH_n and Temp.
Different types of heat of reaction :-

- (i) Heat of formation $\rightarrow \Delta H_f$
- (ii) Standard heat of formation $\rightarrow \Delta H_f^\circ$
- (iii) Heat of Solution $\rightarrow \Delta H_s$
- (iv) Heat of Neutralization $\rightarrow \Delta H_n$
- (v) Heat of Combustion $\rightarrow \Delta H_c$

Notes.

The enthalpy of a system is defined as the sum of the internal energy and the product of its pressure and volume.

$$\text{That is, } H = E + PV$$

It is also called Heat Constant.

$$\Delta H = H_{\text{products}} - H_{\text{reactants}}$$

$$= H_p - H_r$$

Notes

* evolution of heat energy =

exothermic reactions. (- sign)

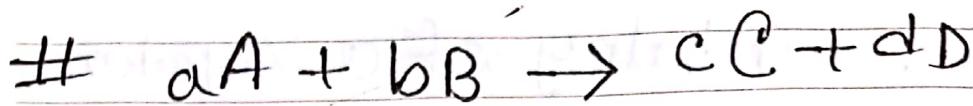
* absorption of heat = endothermic reactions. (+ sign)

** Heat of reaction varies with the change in temperature.



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Change in number of moles =

No. of moles of Products - No.
of moles of reactants

$$= (c+d) - (a+b)$$

$$= \Delta n$$

Let, $\Delta V = \Delta n \times V$

$$P \times \Delta V = P(\Delta n \times V)$$

$$P \times \Delta V = P \times \Delta n$$

$$PV = RT \quad \text{--- (1)}$$

Putting RT in place of PV in

eq'n (1) we get,

$$P \Delta V = RT \Delta n$$

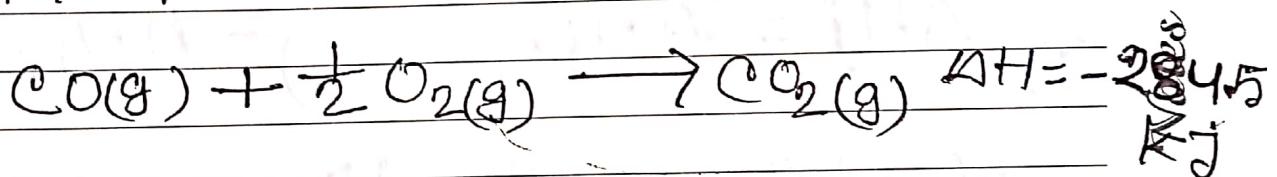
$$\Delta H = \Delta E + \Delta n RT$$



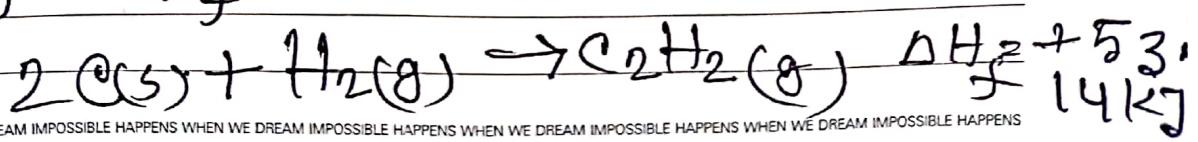
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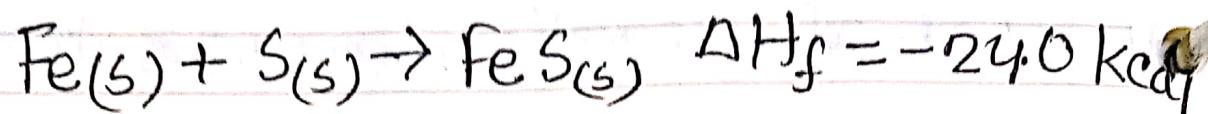
Heat of Reaction may be defined as - the amount of heat absorbed or evolved in a reaction when the number of moles of reactants as represented by balanced chemical equation change completely into the products.



(1) Heat of formation : The change in enthalpy that takes place when one mole of the compound is formed from its elements. It is denoted by ΔH_f .



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(Q) Standard heat of formation:

all substances being in their standard states [1 atm pres
sure and 298 K] it is denoted by ΔH_f° .

~~Notes~~ $\Delta H_f^\circ = \Delta H_f^\circ(\text{products}) - \Delta H_f^\circ(\text{reactants})$



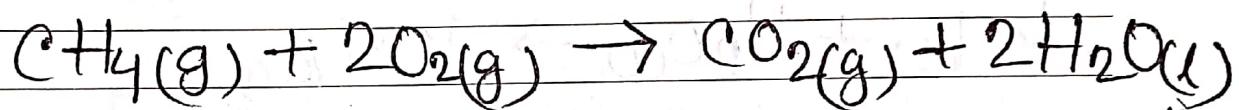
$$\Delta H_f^\circ = \Delta H_f^\circ(\text{products}) - \Delta H_f^\circ(\text{reactants})$$

$$= [c \times \Delta H_f^\circ(C) + d \times \Delta H_f^\circ(D)] -$$

$$[a \times \Delta H_f^\circ(A) + b \times \Delta H_f^\circ(B)]$$

(3) Heat of combustion $\triangle H_c$ The change in enthalpy of a system when one mole of the substance is completely burnt in excess of air or oxygen.

It is denoted by ΔH_c



$$\Delta H_c = -21.0 \text{ kcal}$$

** Heat of combustion of a substance (ΔH_c) is always negative $\boxed{\Delta H_c = -ve}$

Notes

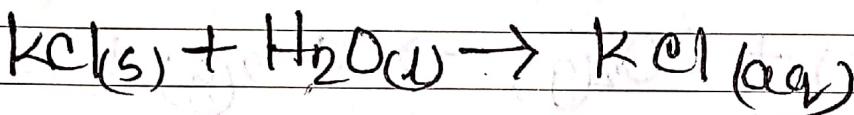
Ans for following question
Q10 - How does heat of combustion of a fuel depend on its composition?

Ans for following question
Q11 - What is the standard enthalpy of combustion of hydrogen?

Ans for following question
Q12 - What is the standard enthalpy of combustion of carbon?

(4) Heat of Solution :- The change in enthalpy when one mole of a substance is dissolved in a specified quantity of solvent at a given temp.

It is denoted by ΔH_s .



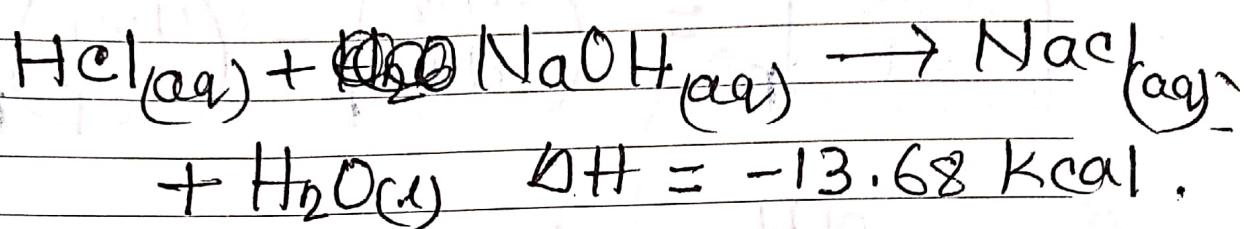
$$\Delta H = -4.4 \text{ kcal}$$

Notes

(5) Heat of Neutralisation :- The change in heat content (enthalpy) of the system when one gram equivalent of an acid is neutralised by one gram equivalent of a base.

OTG Vice Versa in dilute solution -

It is denoted by ΔH_n .



Relationship between ΔH_n & Temp.

$$\Delta E = E_2 - E_1$$

$$\left[\frac{d(\Delta E)}{dT} \right] = \left(\frac{dE_2}{dT} \right)_V - \left(\frac{dE_1}{dT} \right)_V$$

$$\left(\frac{dE}{dT} \right)_V = C_V \rightarrow \text{Heat capacity}$$

$$\frac{d(\Delta E)}{dT} = (C_V)_2 - (C_V)_1 = \Delta C_V$$

$$\Delta E_2 - \Delta E_1 = \int_{T_1}^{T_2} \Delta C_V dT$$

$$\therefore \Delta E_2 - \Delta E_1 = \Delta C_V [T_2 - T_1]$$

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Similarly, $\Delta H = H_2 - H_1$

$$\left[\frac{d(\Delta H)}{dT} \right]_p = \left(\frac{dH_2}{dT} \right)_p - \left(\frac{dH_1}{dT} \right)_p$$

$$\frac{dH}{dT} = C_p$$

$$\therefore \left[\frac{d(\Delta H)}{dT} \right]_p = (C_p)_2 - (C_p)_1$$

$$= \Delta C_p$$

$$\therefore d(\Delta H) = \Delta C_p \times dT$$

$$\Delta H_2 - \Delta H_1 = \int_{T_1}^{T_2} \Delta C_p dT$$

$$\boxed{\therefore \Delta H_2 - \Delta H_1 = \Delta C_p [T_2 - T_1]}$$

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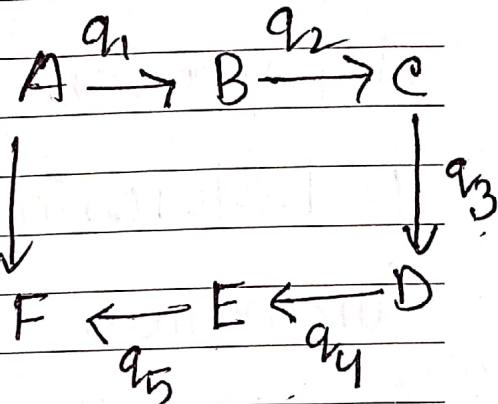
01/11/2022
Hess's Law :-

$$Q = q_1 + q_2 + q_3 + q_4 + q_5$$

① Example.

② Application.

③ Limitations.


Hess's Law :-

If a chemical change can be made to take place in two or more different ways whether in one step or two or more steps, the amount of total heat change is same no matter by which method the change is brought about.

Notes

According to Hess's Law,

$$Q_1 = Q_2$$

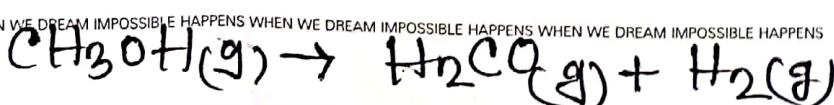
Application of Hess's Law:

① Determination of heat of formation of substances which otherwise can't be measured experimentally.

② Determination of Heat of transition.

③ Determination of heats of various reactions.

A catalyst can convert methanol to formaldehyde and Hydrogen.





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* Law of Regardless of the multiple stages or steps of a reaction, the total enthalpy change for the reaction is the sum of all changes.

* Real life example of Hess's law :-

Reactions which happen in our body when we consume food and in the industry to see how much energy the engine produces / uses.

Notes

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Solutions

A Solution is a homogeneous mixture
(সমান) of two or more substance on molecular level.

The constituent of the mixture present is a smaller amount is called the Solute. (সুল্টুটোপার্ট)

And the one present in a larger amount is called the solvent. (হাবর)

The amount of Solute present in a given amount of Solution.

is called concentration of solution
concentration = $\frac{\text{Quantity of Solute}}{\text{Volume of Solution}}$

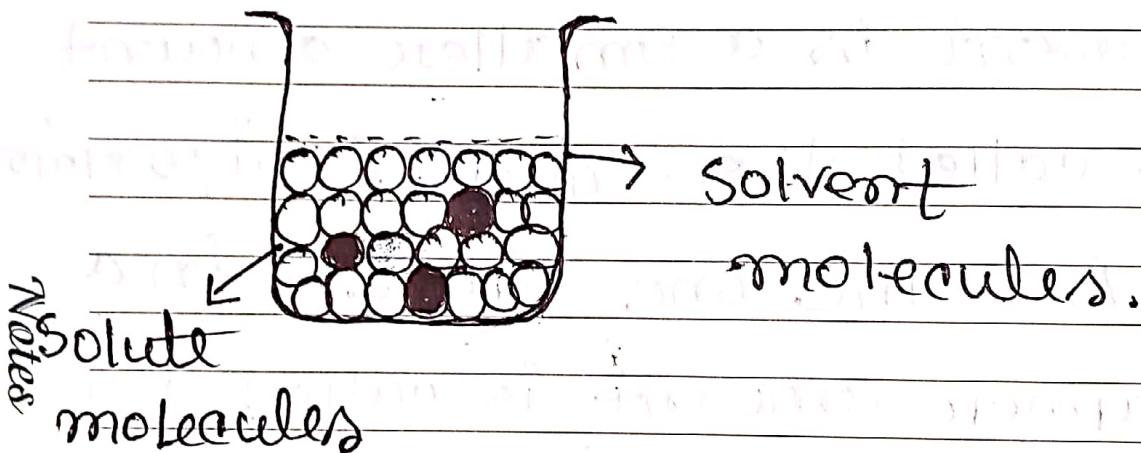
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Low concentration → Dilute

Solution.

High concentration → concen
treated Solution.



Ways of Expressing

Concentration %

(1) Percent by weight $\% \left(\frac{w}{w}, \frac{w}{v}, \frac{v}{v} \right)$

% by weight of solute =

$\frac{\text{wt. of solute}}{\text{wt. of solution}} \times 100$

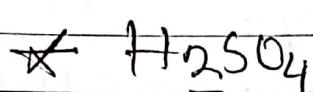
$\frac{\text{wt. of solute}}{\text{wt. of solution}} \times 100$

(2) Mole-fraction . $X_A = \frac{n_A}{n_{\text{total}}}$

M(3) Molarity (1 Mole / 1L Solution)

N(4) Normality (1gm.equiv. Wt / 1L Solution)

m(5) Molality (1 mole / 1 kg Solvent)



$$\frac{98}{2} = 49$$

↓
H₂SO₄

gm.equiv.

1m = 98 gm / 1 L Solution

0.5M
1N = 49 gm / 1 L Solution.

2N

* CO_2 বাতি পুনরুৎপন্ন করা। অবস্থার

পুরোটা জ্বর করা।

Notes

Next topic :- Liquid Solid

(01) Wt. of solute (NaCl) = 1.75 g

Wt. of solvent (H_2O) = 5.85 g

Wt. of solution = $1.75 + 5.85$

$$= 7.60 \text{ g}$$

Hence concentration of NaCl

$$\% \text{ by weight} = \frac{1.75}{7.60} \times 100 \\ = 23.0$$

(02)

The Solution contains 36 g of HCl and 64 g of H_2O

Number of Moles of HCl =

$$(36 \text{ g HCl}) \left(\frac{1 \text{ mol HCl}}{36.5 \text{ g HCl}} \right) \\ = 0.99$$

Number of Moles of H_2O =

$$(64 \text{ g H}_2\text{O}) \left(\frac{1 \text{ mol H}_2\text{O}}{18 \text{ g H}_2\text{O}} \right)$$

$$= 3.55$$


 1 molar = $\frac{1 \text{ mole solute}}{1 \text{ kg প্রাপ্তি}}$

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$$\begin{aligned}
 X_{\text{HCl}} &= \frac{\text{moles of HCl}}{\text{moles of HCl} + \text{moles of H}_2\text{O}} \\
 &= \frac{0.99}{3.55 + 0.99} \\
 &= 0.218
 \end{aligned}$$

Q3] Molarity = $\frac{\text{Moles of Solute}}{\text{Volume in litres}}$

$$(M) = \frac{n}{V} \text{ (in litre)}$$

$$\begin{aligned}
 \text{Molecular mass of KOH} &= 39.1 + \\
 &\quad 16.0 + 1.0 \\
 &= 56.1
 \end{aligned}$$

Notes

Calculation of moles of KOH.

$$\begin{aligned}
 75.5 \text{ g KOH} &\times \frac{1 \text{ mol}}{56.1 \text{ g}} \\
 &= 1.35 \text{ mol}
 \end{aligned}$$

Calculation of ~~moles~~ of litres:

$$\begin{aligned}
 540 \text{ ml} &\times \frac{1 \text{ litre}}{1000 \text{ ml}} \\
 &= 0.540 \text{ litres}
 \end{aligned}$$

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Calculation of Molarity :

$$M = \frac{n}{V} = \frac{1.35}{0.540} \\ = 2.50 M$$

[04] Molality (m) =

$$\frac{\text{Moles of Solute}}{\text{Mass of Solvent in Kg}}$$

Notes

Molarity	Molarity
Volume of Solution.	mass of Solvent.

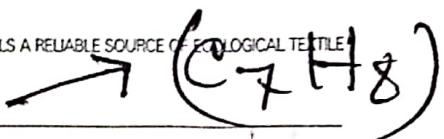
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তাৰু ওসৰ নিতোষীল,



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Molecular mass of toluene =

$$(12 \times 7) + (1 \times 8) = 92$$

No. of moles 5 g of toluene = $\frac{5}{92}$

$$= 0.0543$$

Mass of Solvent in kg =

$$\frac{225 \text{ g}}{1000} = 0.225 \text{ kg}$$

$$\begin{aligned} \text{Molality} &= \frac{0.0543}{0.225} \\ &= 0.24 \text{ m} \end{aligned}$$

[05] Normality (N) =

Equivalents of solute
Volume of solution in litres.

Notes



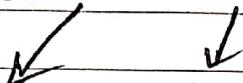
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Henry's Law

C \propto P

$$\Rightarrow C = kP \rightarrow \text{pressure}$$



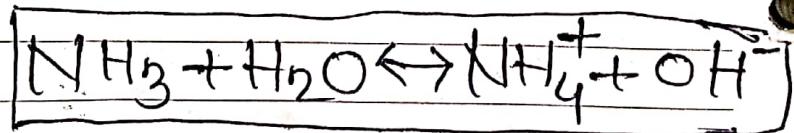
Concen
fraction. Proportionality

Henry's law limitation

(1) at moderate temperature
and Pressure.

(2) if the solubility of the
gas in the solvent is low.

(3) the gas doesn't react with
the solvent to form a new
species.



if it does

(4) the gas doesn't associate
or dissociate on dissolving

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Notes



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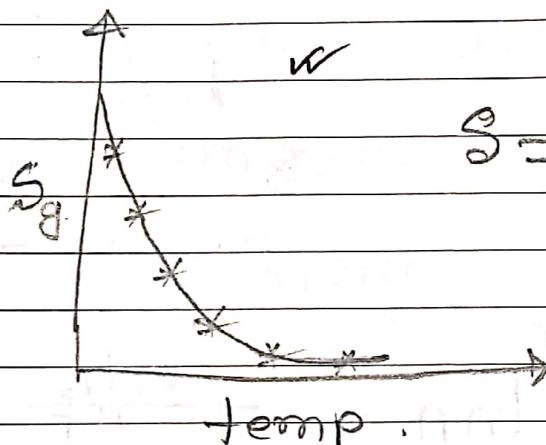
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in the Solvent.

Henry's
Law

~~Effect of Temp. On dissolution~~

of gases in liquids \Rightarrow gas-Lawide



$S = \text{Solubility of}$
 gases .

$$\frac{d \ln S_g}{dT} = -\frac{\Delta H_s}{RT^2}$$

$$\text{or, } d \ln S_g = -\frac{\Delta H_s}{R} \cdot \frac{dT}{T^2}$$

Integrate,

$$\text{or, } \int d \ln S_g = -\frac{\Delta H_s}{R} \int \frac{dT}{T^2}$$

$$\text{or, } \ln S_g = -\frac{\Delta H_s}{R} \cdot \frac{1}{T} + C'$$

$$C' = \ln A$$

Notes

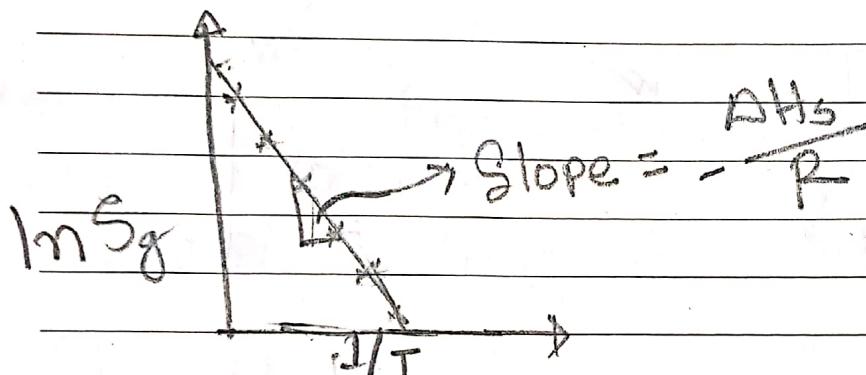


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$$\text{Or}, \ln S_g = -\frac{\Delta H_s}{R} \cdot \frac{1}{T} + \ln A$$

$$\underline{y} = m \underline{x} + c$$



$$\text{Or}, \ln S_g - \ln A = -\frac{\Delta H_s}{RT}$$

$$\text{or}, \ln \frac{S_g}{A} = -\frac{\Delta H_s}{RT}$$

$$\text{or}, \frac{S_g}{A} = e^{-\frac{\Delta H_s}{RT}}$$

$$\text{or}, S_g = A e^{-\frac{\Delta H_s}{RT}}$$

II, $\Delta H_s = -Ve$ (exothermic)

$$S_g = A e^{\frac{\Delta H_s}{RT}} \boxed{(-,-) + 2(+)}$$



* ধ্রাঘতা নিষ্ঠাবক্তৃ
প্রযোগের আয়ু ।

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* if temp. is increased,

$e^{\frac{\Delta H_s}{RT}}$ will be smaller.

$\therefore S_g$ will decrease.

* if temp. is decreased, $e^{\frac{\Delta H_s}{RT}}$ will be larger.

$\therefore S_g$ will increase.

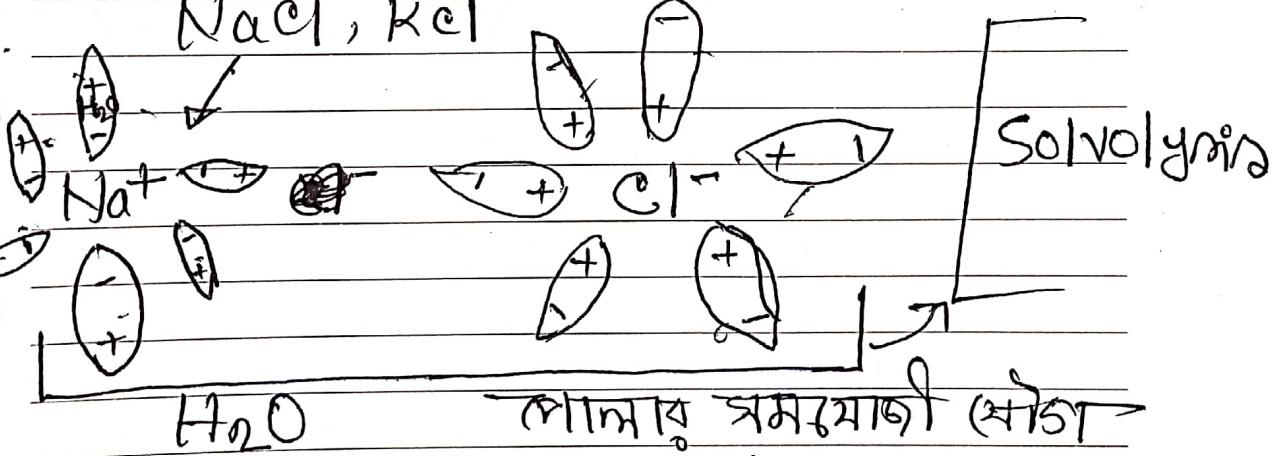
I'm

Mechanism of dissolution

Notes

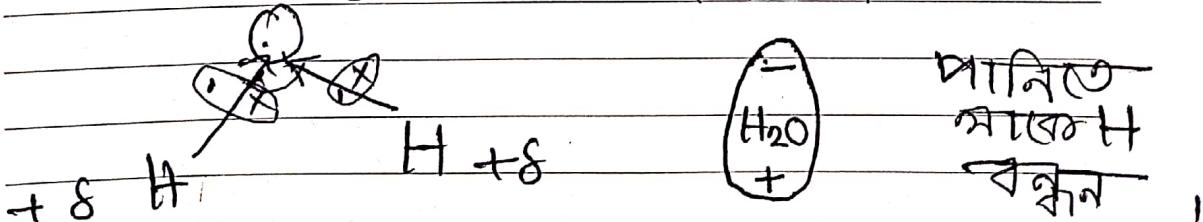
1) Ionic compounds.

NaCl, KCl



-s

H₂O





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Sugarc molecules group এবং

- কোষে OH মাঝে।

* Dissolution due to Hydrogen

Bonding

* Solubility Curves

* Describe the solubility

Notes

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Solid
Liquid

Relationship between ΔH_s V.S
Temp. $\frac{^{\circ}}{K}$

$$\frac{d \ln S}{dT} = \frac{\Delta H_s}{RT^2}$$

[Clasius
Clayperon
eqn]

$$\Rightarrow d \ln S = \frac{\Delta H_s}{R} \cdot \frac{dT}{T^2}$$

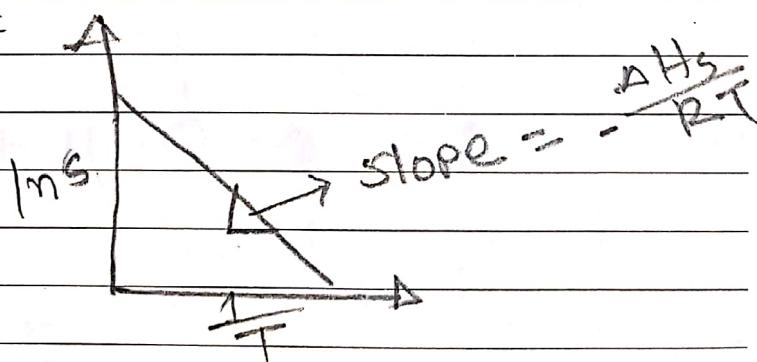
Integrate :-

$$\text{or, } \int d \ln S = \frac{\Delta H_s}{R} \int \frac{dT}{T^2}$$

$$\Rightarrow \ln S = -\frac{\Delta H_s}{R} \cdot \frac{1}{T} + C'$$

$$\Rightarrow \ln S = -\frac{\Delta H_s}{R} \cdot \frac{1}{T} + \ln A$$

$\ln S$ =



$$\Rightarrow \ln S - \ln A = -\frac{\Delta H_s}{R \cdot T}$$

$$\Rightarrow S = A e^{-\frac{\Delta H_s}{R \cdot T}}$$

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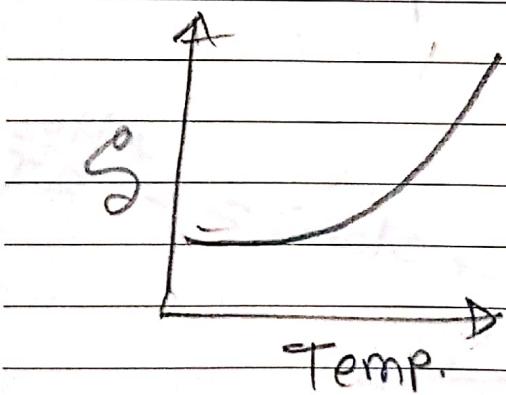
i) if $\Delta H = +ve$ [endothermic]

$$S = A e^{-\frac{\Delta H_s}{RT}}$$

$$S = \frac{A}{e^{\frac{\Delta H_s}{RT}}}$$

if temp. is increased, $e^{-\frac{\Delta H_s}{RT}}$ will small. $\therefore S$ will increase.

ii) if temp. is decreased,
 $e^{-\frac{\Delta H_s}{RT}}$ will large. $\therefore S$ will decrease

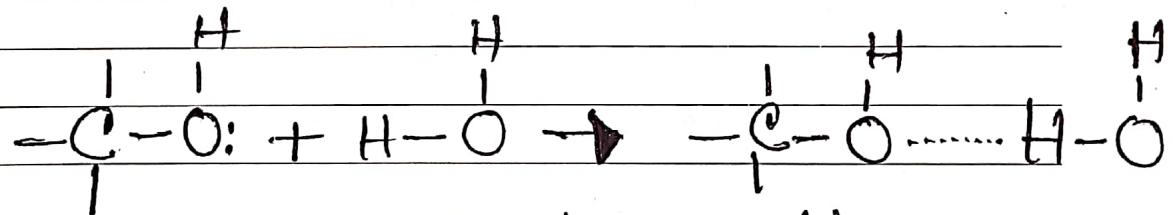


Notes

Dissolution Due to Hydrogen Bonding

Many non-ionic substance such as sugar also dissolve in water.

Hence the dissolution is due to hydrogen bonding that occurs between water and sugar molecules. The hydrogen bonding takes place through the hydroxyl group of the sugar molecule.



Sugar fragment

Water Hydrogen
bonding with
water mole
cule.

The water molecules are thus able to pull away the molecules of sugar from the crystal,



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which dissolve. In fact, every sugar molecule is surrounded by a number of water molecules and these aggregates are free to migrate through out the solution.

Notes

~~THE~~ A curve

~~COLLIGATIVE PROPERTIES~~

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মানোপর্যন = মানোপর্যন
maximum number

~~বেগ অপরিসীম প্রয়োগ ও প্রযুক্তি~~

~~বাস্তীয় টাপ সমূহ ধৈর্য~~

I) শুল্কনির্ধাৰণ \rightarrow

II) বাস্তীয় টাপ \rightarrow

Ch - 15

ত্বরণের প্রয়োগ বাস্তীয় টাপ =
লিক-লিক
সোল-লিক

) with
center.

Dilute

Theory of Dilute Solution

COLLIGATIVE PROPERTIES : A

Colligative property may be

defined as one which depends

on the number of particles ^{les} in

solution and not in any way on

the size or chemical nature of

the particles.

Dilute solutions containing non-

Volatile Solute exhibit the following
Properties :-

WHEN WE DREAM IMPOSSIBLE HAPPENS WHEN WE DREAM IMPOSSIBLE HAPPENS

Notes



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(1) Lowering of the Vapour Pressure.

(2) Elevation of the Boiling Point

(3) Depression of the Freezing Point.

(4) Osmotic Pressure.

~~Notes~~ অন্তর কোনো কানুন নেই।

(i) No heat and Volume change

(ii) বিদ্যুত কোনো কানুন নেই।

(iii) পরিমাণ হবে না।

Raoult's Law

$$\frac{P - P_s}{P} = \frac{n}{n + N} = \frac{\frac{W_s}{MW_s}}{\frac{W_s}{MW_s} + \frac{W_{soln}}{MW_{soln}}}$$



13/12/22

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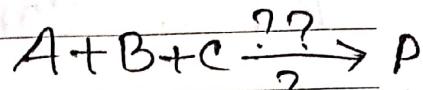
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অসম্ভব

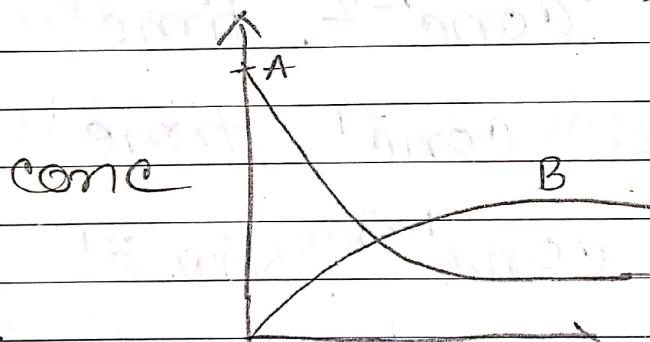
বন্ধন

Chemical Kinetics



- i) Rate (change of conc. with time)
- ii) Rate constant
- iii) Order (n) $n = 0, 1, 2, 3$ (মানিয়ে গুণ করা হবে)
- iv) Molecularity (ক্ষয়োধূমীতা) (নির্ণয়শীল)

Order = number of components /
of activity (মানিয়তা)



Notes

মানিয়ার
১ শাত ডিস্ট্রিবিউশনের মুকুট (unit) এবং
মানিয়ে । (conc. \times time $^{-1}$)



$$\text{Rate} = k [A]^x [B]^y [C]^z$$

$$= k [A]^{(x+y+z)}$$

$$n = x+y+z$$

$$\text{Rate} = k c^n \rightarrow \text{molar concentration}$$

Rate constant unit depends on Order.



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$$K = \text{conc. time}^1 / C^n$$

$$K_0 = \text{Conc}^{1-n} \cdot \text{time}^1$$

$$= \text{Conc}^{1-0} \cdot \text{time}^1$$

$$= \text{Conc. time}^1$$

$$K_1 = \text{Conc}^{1-1} \cdot \text{time}^1$$

$$= \text{time}^1$$

$$K_2 = \text{Conc}^{1-2} \cdot \text{time}^1$$

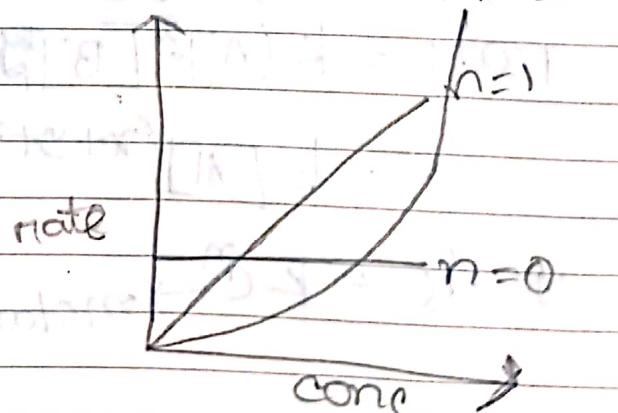
$$= \text{Conc}^1 \cdot \text{time}^1$$

$$K_3 = \text{Conc}^{1-3} \cdot \text{time}^1$$

$$= \text{Conc}^2 \cdot \text{time}^1$$

$\text{Rate} = k C^n$

$$n = 0, 1, 2, 3$$



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The branch of physical chemistry which deals with the rate of reactions is called chemical kinetics.

Included :-

- ① The rate of the reactions and rate laws.
- ② The factors as temperature, pressure, concentration, catalyst that influence the rate of a reaction.
- ③ The mechanism or the sequence of steps by which a reaction occurs.

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→ বিক্রিয়ার গাতি নির্ভুলতার পূর্বান্ত বিক্রিয়া

ঘটাবশালে মিস্টেমের চাপ, তাপমাত্রা,

(গ্যাজীয় বিক্রিয়ার ফোড়া) বিক্রিয়ার ফোড়া

অনমন্ত্র উৎপাদিত উপার্থ

→ কোনো বিক্রিয়ার বিক্রিয়ার অনমন্ত্র

একক মন্ত্রে বল্টিকু প্রাপ্ত বা পুরুষ মাধ্য

ওভে এই বিক্রিয়ার গাতি বলে,

Notes

→ বাসামানিক বিক্রিয়ার হার নিষ্ঠা

নিয়ানকস্থুলোর উপর নির্ভুলতা

I. বিক্রিয়ার অনমন্ত্র

II. চাপ

III. তাপমাত্রা

IV. মালো

V. বিক্রিয়ার প্রক্রিতির ফোড়া

VI. অনুরোধ

* বিক্রিয়ার হার ও বিক্রিয়ার বিক্রিয়া

অনমন্ত্র)

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- * ঘনজামা বৃক্ষিপাত্র মানে তরফতি নির্দিষ্ট
আয়তন বিক্রিয়ায় অঙ্গশহরকারী অনুমতি
অঙ্গশের বৃক্ষিপাত্র। ২৩৮ মণ্ডপম বৃক্ষ
সামু এবং পৰিক্রিয়ার হাব বৃক্ষিপাত্র।
- * চাপাই কুকুর পেট অনুমতি - মুকুট হচ্ছে।
- * তালমা আবাঢ়ানৈ বিক্রিয়াকের অনুমতি
অঙ্গশ মাঝে সহজে গোলি হচ্ছে। ২৩৮
কুকুর পেট সাবিনত হতে পারে।
- * আমোব ইয়েলটেনের প্রয়োবে অনুব
বন্ধন ফেজিল ফ্রি Radical প্রযুক্তি
বলুব।

Notes

03/01/23



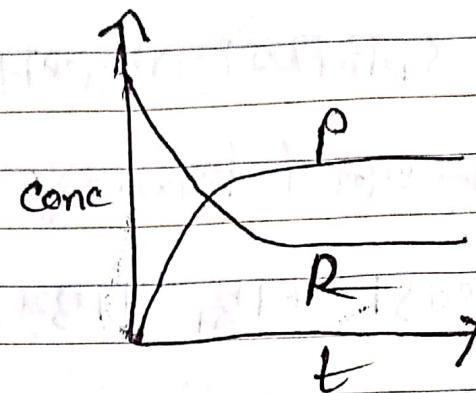
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FIRST ORDER



$t=0$ a moles 0



let "x" moles go into reaction

at any time "t"

$t=t$ $(a-x)$ moles x

Notes

$$\frac{dx}{dt} = k_1(a-x) \rightarrow \text{differentiat form}$$

$$\text{or, } \frac{dx}{(a-x)} = k_1 dt$$

Integration expression,

$$\int \frac{dx}{a-x} = \int k_1 dt$$

$$= -\ln(a-x) = k_1 t + I$$

$$I = -\ln a$$

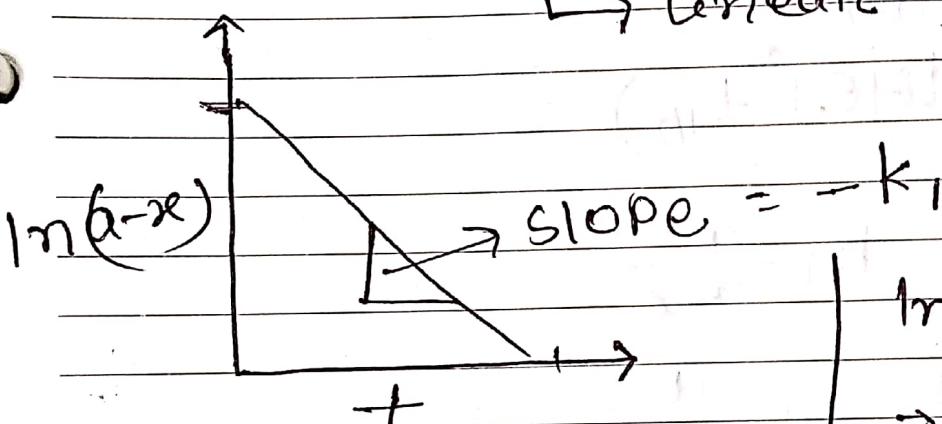
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$$\text{or, } -\ln(a-x) = k_1 t - \ln a$$

$$\text{or, } \ln(a-x) = -k_1 t + \ln a$$

$$y = -mx + c$$

linear form



$$\frac{\ln a}{a-x} = k_1 t$$

$$\Rightarrow k = \pm \ln \frac{a}{a-x}$$

$$\text{or, } \ln(a-x) - \ln a = -k_1 t$$

$$\text{or, } \ln \frac{a-x}{a} = -k_1 t$$

$$\text{or, } \frac{a-x}{a} = e^{-k_1 t}$$

$$\text{or, } (a-x) = a e^{-k_1 t}$$

Exponential form

Ans

Derive the exponential form of kinetic eq'n ??



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k_1 এর মান বিভিন্নভাবে same হবে

যখন এবে এটি first order.

৩। ইচ্ছিতা চাল negative হলে ২য়ে
first order.

Half-life ($t_{1/2}$) :

$$t = \frac{1}{k_1} \ln \frac{a}{a-x}$$

$$t_{1/2} = \frac{1}{k_1} \ln \frac{a}{a-\frac{a}{2}}$$

$$= \frac{1}{k_1} \ln 2$$

$$= \frac{\ln 2}{k_1}$$

$$\Rightarrow \boxed{\frac{0.693}{k_1}} = \text{constant}$$

\rightarrow Half life form

$t_{1/2} \propto$ constant



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

~~* 2nd order Half-life =~~

$$k_2 = \frac{1}{t} \cdot \frac{x}{a(a-x)}$$

$$\Rightarrow t = \frac{1}{k_2} \cdot \frac{x}{a(a-x)}$$

$$t_{1/2} = \frac{1}{k_2} \cdot \frac{a/2}{a(a-a/2)}$$

$$= \frac{1}{k_2} \cdot \frac{a}{2}$$

$$a \left(\frac{2a-a}{2} \right)$$

$$= \left[\frac{1}{k_2} \cdot \frac{1}{a} \right] \rightarrow \text{Half-life form}$$

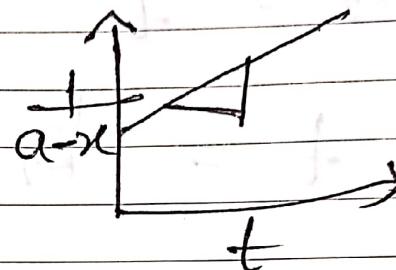
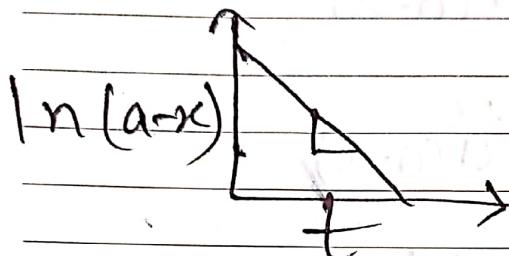
$$t_{1/2} \propto \frac{1}{a}$$

Notes

Methods to determine order

i) Integral method $k_1 = \frac{1}{t} \ln \frac{a}{a-x}$ \Rightarrow $k_1 = \frac{1}{t} \ln \frac{a}{a-x}$

ii) Graphical method



iii) Half-life method

Notes

1^{st} \rightarrow constant

2^{nd} \rightarrow ~~2 log plot~~

0 \rightarrow

iv) Isolation method

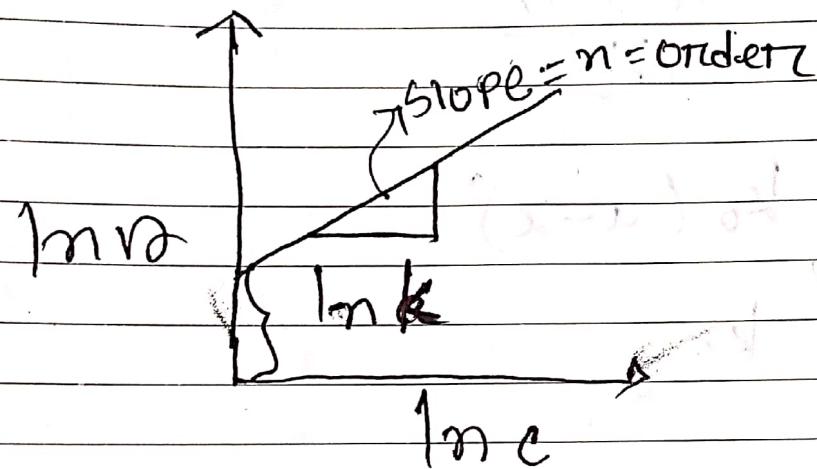
v) Differential Method

$$\text{rate} \approx k c^n$$

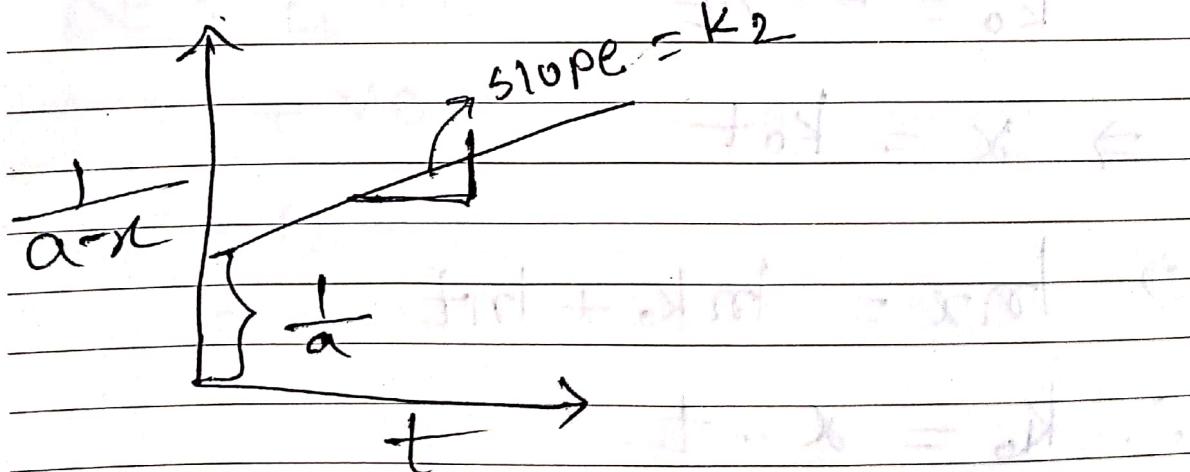
multiplying both side with 'm',

$$\text{On, } \ln n = n \ln c + \ln k$$

$$y = m x + c$$



2nd Order



Notes

Zero Order $A \rightarrow \text{Products}$

$$\frac{dx}{dt} = -\frac{d(a-x)}{dt}$$

$$= k_0 (a-x)^0$$

$$= k_0$$

$$\frac{dx}{dt} = k_0$$

Notes

By Integrating,

$$k_0 = \frac{x}{t}$$

$$\Rightarrow x = k_0 t$$

$$\Rightarrow \ln x = \ln k_0 + \ln t$$

$$\therefore k_0 = x - t$$

$$\Rightarrow t = k_0 - x$$

04/01/23



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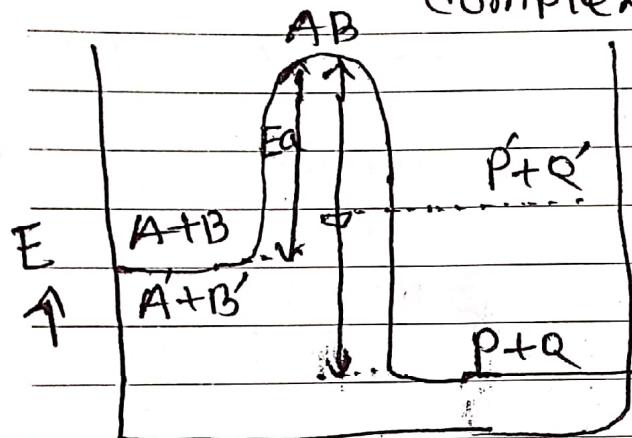
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T → শিফট হয়ে যাবে

Catalyst →



activated
complex



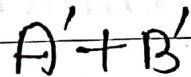
$$\Delta E = E_a - E_a'$$

$$E_a' > E_a$$

$\Delta E = -Ve$ (exothermic)

$$\Delta E' = E_a' - E_a = +Ve$$

(endothermic)



$$\Delta E'' = E_a - E_a''$$

$= +Ve$ (endothermic)

$$\Delta E''' = E_a'' - E_a$$

$= -Ve$ (exothermic)

Notes

4

Atomic Structure

Rutherford's Atomic model

Proton -

neutron -

electron -

Isotope %

Isobare % \rightarrow atomic Number

Same \rightarrow mass number

$$n = \frac{n^r h^r}{4\pi^r m e^r}$$

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Quantum Number

Quantum

The Bohr model was one-dimensional model.

Quantum numbers describe the
① Size, shape and orientation in
② (n) (l) (m)
Space of the orbitals on an atom.

→ Spring.
(s)

Principal
angular
magnetic
Spring

Notes

$$2m^2$$

Relative energies: $s < p < d < f$

$$n+1$$

$$1s < 2s < 2p < 3s < 3p < 4s < 3d < 4p$$



17/01/23

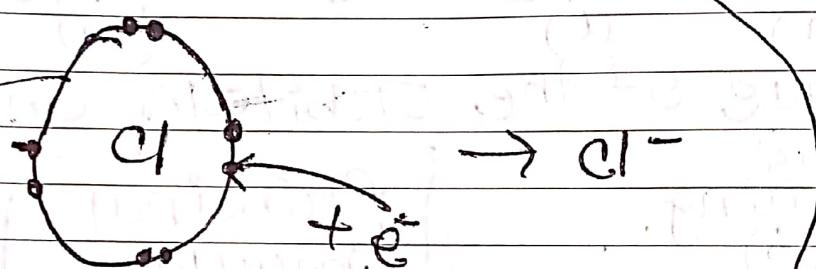
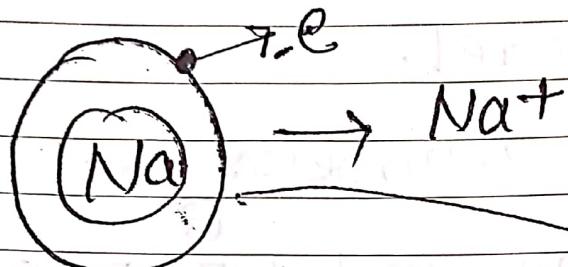


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Chemical Bond

① Ionic Bond



Notes [L]

- Ionization potential

→ Electron affinity

1. Ionic Bond

2. a) Covalent bond

b) Polar bond

3. Coordination bond

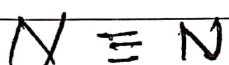
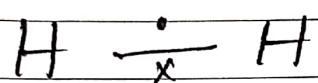
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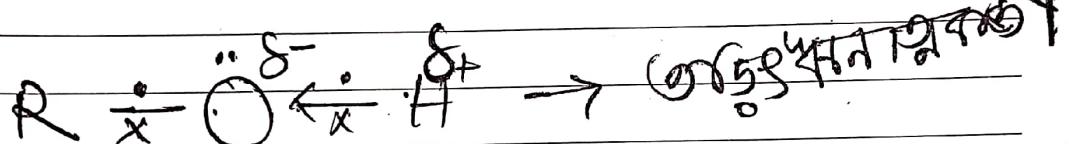
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4. Metallic bonds

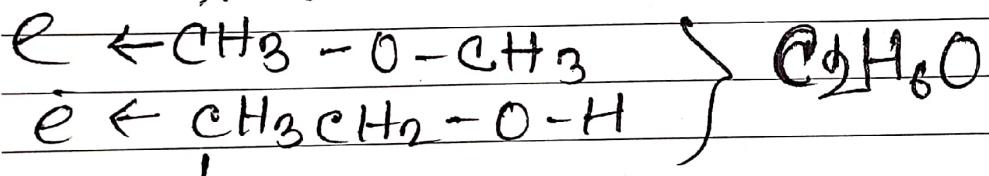
5. Hydrogen bonds.



Share ৩০%



$\approx 30^\circ$



bp 77°C

Notes