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Sub: TCH

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Q.2

VSEPR Theory:-

The Valence shell electron repulsion theory was developed by Gillespie & Nyholm to predict the shape of covalent molecules & ions based on the number of bond pairs and lone pairs in the central atom.

Postulates:-

(Naveen)

- * Shape of molecules of molecules depends on no. of electron pairs present in valence shell around central atom.

* Pairs of electron in valence shell repel each other since their electron shells around are negatively charged.

These pairs of electron tend to occupy same position if space that resist repulsion and thus maximize distance between them.

If central atom is surrounded by lone pairs as well as bond pairs then molecules will have distorted geometry.

Order of strength of repulsion is

$$(lp-lp) > (lp-bp) > (bp-bp)$$

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Structure Discussion:-

NH_3 :

Central atom N outermost $e^- = 5$

e^- participating in bond = 3

Total valence shell $e^- = 5, \text{VSEPR } 5/2 = 4$

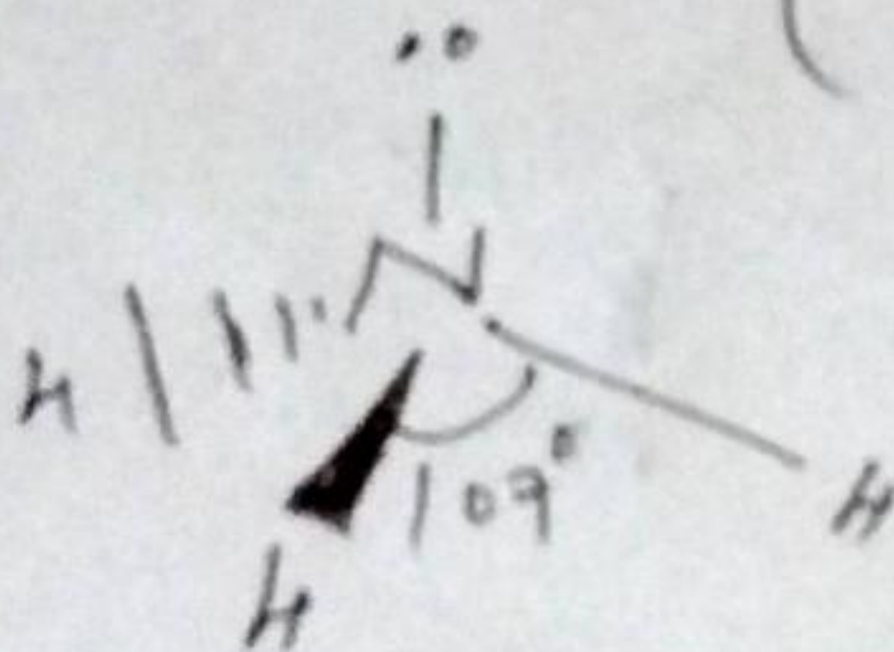
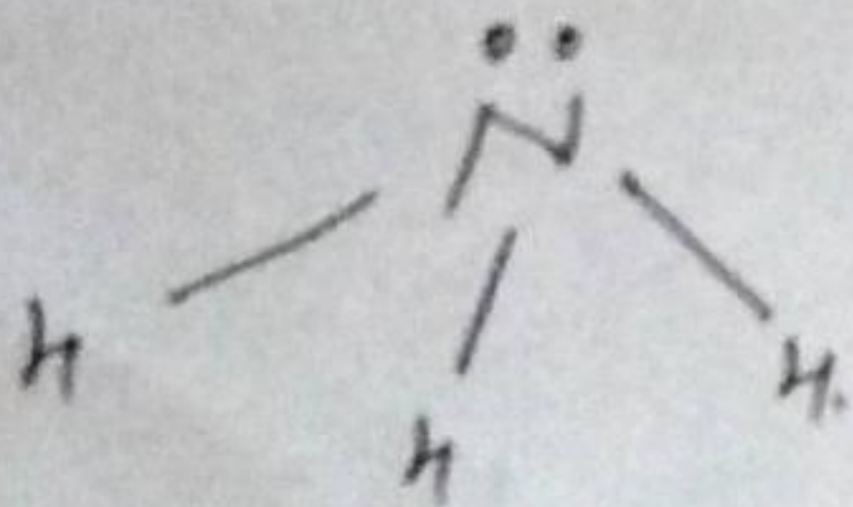
$\text{VSEPR} = 4$ predicted shape tetrahedral

having $\text{H}-\text{N}-\text{H} \angle 109.5^\circ$

$\text{lp} > \text{bp}$ Hence actual shape is

Trigonal bipyramidal having angle of 107° i.e.
less than 109.5° .

(Note)



Trigonal bipyramidal.

H₂O!-

Outermost $e^- = 6$.

bond forming $e^- = 2$.

VSE = 8

$$VSE R = 8/2 = 4$$

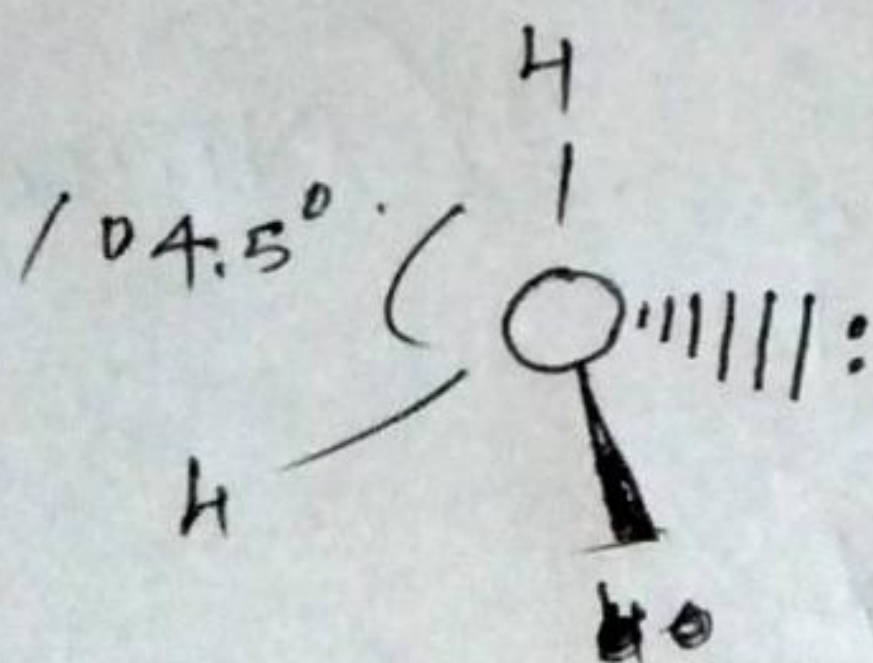
Since VSE P = 4 ,

predicted shape is tetrahedral.

lp - bp > bp - bp

Actual shape is V-shaped or bent
bond angle 104.5° .

(Narrow)



(V-shaped OR Bent)

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Q.2b.
Ans:- Bomb calorimeter is used to determine the energy change during a reaction accurately.

Construction of bomb calorimeter :-

- * It is used to determine calorific values of solid and liquid fuels. It consists of a strong steel shell known as bomb.
- * It consists of a base which supports platinum cone and is screwed to the body of the bomb. The top of the bomb carries an oxygen supply connection and a valve to release the pressure.

* The sample is placed in the platinum crucible. The iron fuse wire which surrounds the sample at coal, is connected to the lower end of the 2 electrode. coal is ignited by cooling the electronic circuit through electrodes.

* The bomb is placed inside a copper vessel which contains water (H_2O). The calorimeter is used to place in another container which acts as a heat insulator. The temp. is measured by a 'Thermometer'.

Working of Bomb Calorimeter:-

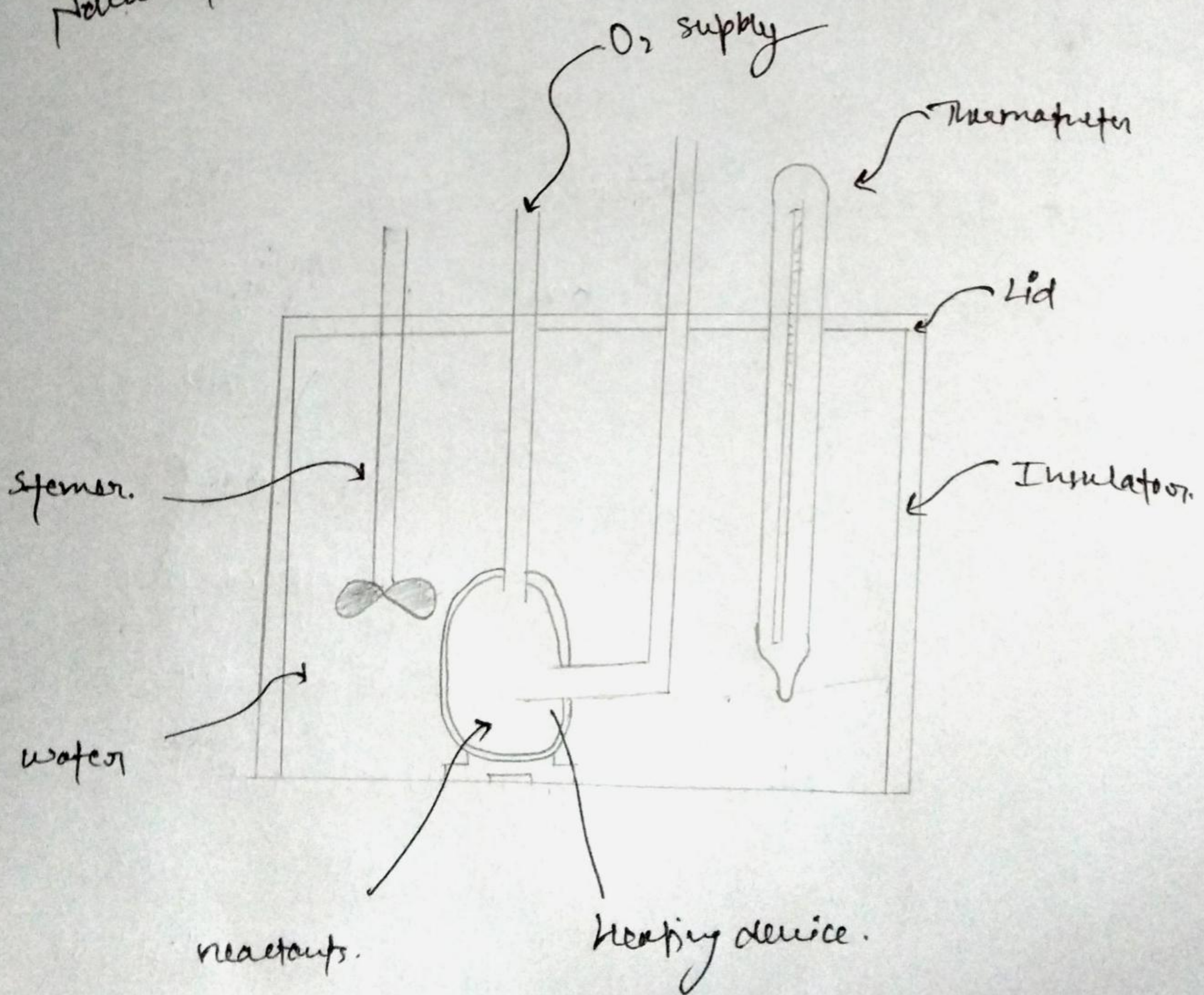
The bomb calorimeter is a type of constant volume calorimeter used to measure combustion of heat of oxygen - burnable sample

Naureen kumar

* It works on the basic principle of law of energy conservation i.e.

* Heat given by $\text{Combustion of coal} + \text{Heat given by Combustion of fuels} = \text{Heat taken by water and calorimeter}$

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Q. 3(a)

Ans $\Rightarrow$ Spectroscopy:-

NMR Spectroscopy is abbreviated as nuclear magnetic resonance spectroscopy.

NMR is the study of molecules by resonating the interaction of radio frequency (Rf) electromagnetic radiation with the nuclei of molecule placed in a strong magnetic field.

Principle:-

many nuclei have spin and all nuclei are electrically charged, according to 'NMR' spectroscopy principle.

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* All nuclei are electrically charged and many have spin

* Transfer of energy is possible from base energy to higher energy levels when an external magnetic field is applied

* Transfer of energy occurs at a wavelength that coincide with radio frequency.

* Energy is emitted at same frequency when spin comes back to base level

* Therefore, by measuring the signal while matches this transfer the processing of NMR spectrum for concerned nucleus is yield.

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Applications:-

- * NMR spectroscopy is a spectroscopy technique used by chemists and biochemists to investigate the properties of organic molecules.
- * NMR can quantitatively analyze mixture containing known compounds.
- * NMR can either be used to match against spectral libraries or to infer the structure directly for unknown compounds.
- * NMR is used to determine molecular conformation in solution as well as in studying physical properties at molecular level such as conformational exchange, diffusion.

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Q.4.

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Corrosion:-

Destruction or deterioration of a metal, caused due to direct chemical action or electrochemical reaction with its environment

Examples Rusting of iron:-

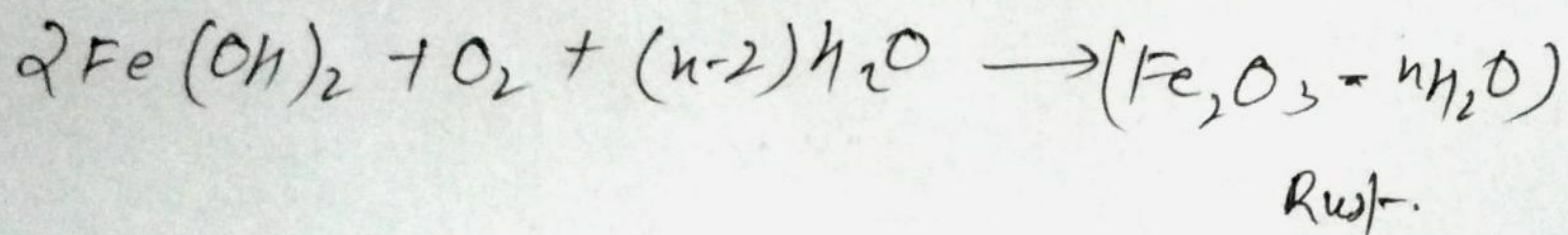
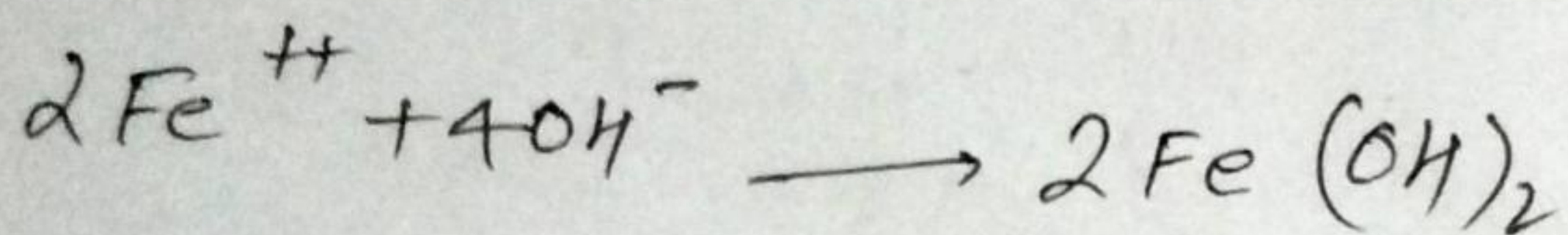
1) Dry corrosion:- Dry corrosion occurs in the absence of moisture or conducting electrolyte medium.

2) Wet corrosion:- It involves reaction in aqueous medium the corroding surface of metal undergoes and electrochemical reaction.

Formation of corrosion product

The hydroxyl ion migrate towards anode
anode react with ions (M^{n+})

and form corrosion prod. In the
case insoluble hydrated ferric oxide
known as brown rust



(Name)

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Q.5(a)

SN1 Reaction:-

SN1 reaction is a substitution nucleophilic

unimolecular reaction. It is a

2-step reaction. In the first step,

the carbon-halogen bond breaks

heterolytically with the halogen

retaining the previously shared pair of e⁻.

In the first nucleophilic step,

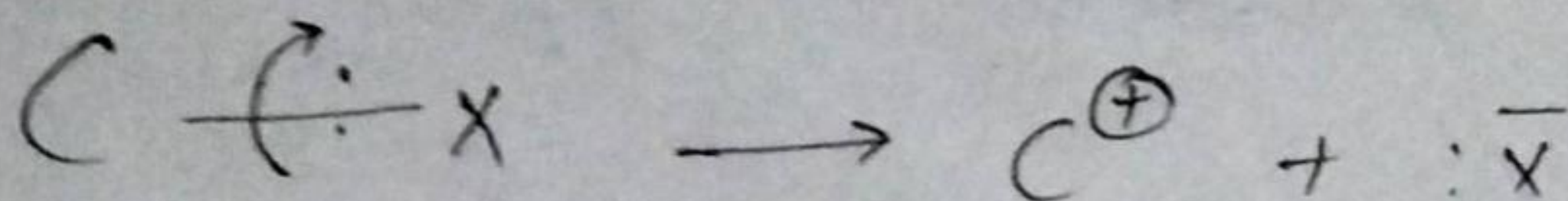
rapidly with the carbocation that

was formed in the first step.

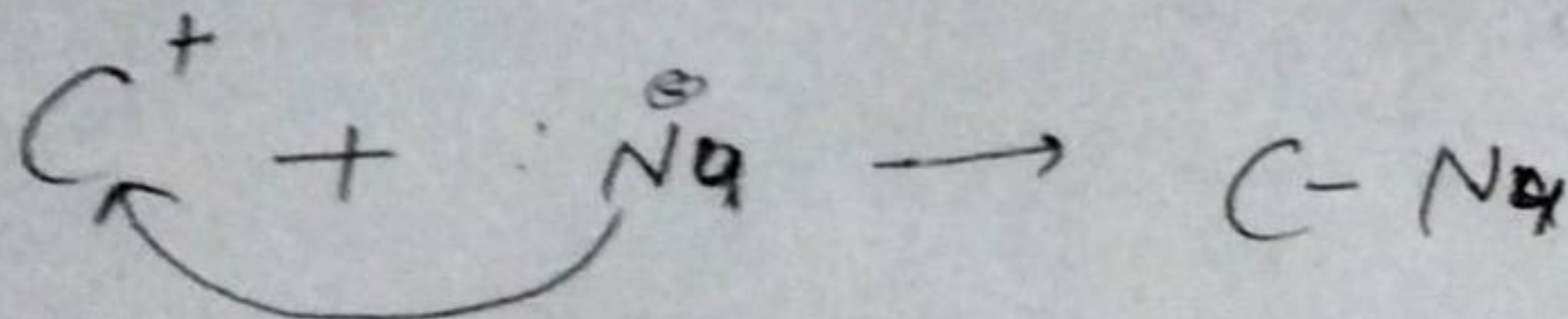
This rxn. is carried out in polar
protic solvent such as H₂O, acetic acid

This reaction follows 1st order kinetics.
Hence, it is named as substitution
nucleophilic unimolecular reaction.

(i)



(ii)



SN2 reaction:-

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This reaction follows second order kinetic.
and the rate of reaction depends upon

both haloalkane and participating nucleophile

Hence the reaction is called as substitution
nucleophilic bimolecular reaction.

It is one step reaction.

