19.02.19
1st - B-Day

Environmental chemistry

Environment: Environment creates sweetable / favourable conditions for the survival and development of the living organism.
Sweetable condition comes from two way. (Nature and manmade).

- Aminity of environment →
  - Lithosphere
  - Atmosphere.
  - Hydrosphere.
  - Biosphere.

Classification of environment:

1. Natural environment. (soil, water, air, foods)
2. Manmade environment.

1. Natural environment system operates through homostatic mechanism, that is any change brought about in any component of the environment (by human activities) is counter

balanced by the change in other components in the environment.

1. Aminity - (air, water, soil)
2. Climate - (radiation, sunlight, tem. etc).

2. Manmade environment:

Man is the most powerful environmental agent capable of creating or modifying favourable condition using modern technology. Housing, inst, hospitals, road, airways, bridge etc are manmade environmental component.

Environmental pollution:

Environmental pollution is the deveation or change from pure condition of the aminities due to human activities that may cause harmful effect on the living organism immidiately or after a long time

⊛ Pollution → 6 types.

1. Air pollution
2. Water pollution.
3. Soil pollution:
4. Thermal pollution.
5. Sound pollution.
6. Radio active pollution.

Pollutant: Those are the god gifted chemical species in the environment.

~~Those~~ chemical species ~~that~~ which naturally exists in the environment but exceeds their natural abanderts by human activity and show harmful effect on the living organism.

Contaminant: ~~Tos~~ Those chemical species which are naturally absent in the environment. when contaminants show harmful effects or exert toxicity then said pollutant.

20.08.19
1st - C - Day

Path way: the mechanism by which a chemical species is introduced into living body from it source.

Pathway of led:

Petroleum →

$$\text{Petroleum} + (C_2H_5)_4Pb + \begin{cases} Cl-CH_2-CH_2Cl \\ Br-CH_2-CH_2Br \end{cases} + O_2 \longrightarrow$$

$$CO_2 + H_2O + CO + \underbrace{PbCl_2 + PbBr_2 + PbClBr}_{\downarrow}$$

Soil

Solid → Plant + Animal → Human body.

This is the pathway of Led (Pd).

0.3 ppb →

Animia → (>0.8 ppb).

Permisible level (PL) / Tolerance limit (TL):

The minimum concentration of a pollutant in water which doesn't create any health problem during / due to use.

Threshold limiting value (TLV):

The minimum concentration of any chemical species in any working place where a healthy workers will perform his daily work 8 hours a day without any harmful effect. In air

Two types of water:

① Potable water:- The water that is fit for domestic and industrial use is called potable water.

② waste water.

* (suspended solid, selelable solid, dissolve solid).

Property of water:

1. Physical property: pH, colour, ordour, permidity.

2. chemical property: COD, salinity, hardness, corrosive property, metal ion content, anion content, cation content.

3. Bio-chemical property: BOD, presence of Bacteria, protozoa, fungus.

Sign and symptoms of pollute water:

1. offensive foul odour coming out from the water body.

2. Decrease ~~of~~ in the number of fish and aquatic communitity.

3. Uncontrolled growth of aquatic plants.

4. oils and grease floating ~~in~~ on the water surface.

i) Dissolved oxygen (DO).
ii) Chemical oxygen demand (COD).
iii) Bio-chemical oxygen demand (BOD).

Dissolved oxygen (DO):

at 12° cold water max oxygen → 15 ppm.
at 20° max oxygen → 17 ppm.
at 25° max oxygen → 5-6 ppm.

Environmental significance of DO:

1. DO is essential for the respiration of fish and other aquatic animals.
2. DO is also essential for self purification for water body.

Measurement of DO:

① Winkler method: Winkler (1888) $O_2 \rightarrow O_2^{-2+}$ $MnO(OH)_2$

Principle of Analysis:

The chemical determination of oxygen dissolved in water is based on the method first proposed by winkler (1888) and modified by Strickland and Parsons (1968). Oxygen in the water is allowed to react with I^- to form I_2 which is then titrated with standard $Na_2S_2O_3$

At the time of sampling, dissolved oxygen is fixed by the addition of Mn(II) resulting in a brown precipitate, $Mn(OH)_3$.

Prior to analysis, the sample is acidified to pH 1.0-2.5 by addition of H_2SO_4 / H_3PO_4. If Fe present in the water then must use H_3PO_4. This cause the precipitated

$Mn(OH)_3$ to dissolve. Mn(III) ions oxidize previously added iodide ions to iodine. This Iodine is titrated with thiosulfate solution.

1. $MnSO_4 \xrightarrow{H_2O} Mn^{2+} + SO_4^{2-}$

Alkaline iodide-azide solution (KI + KOH).

2. $Mn^{2+} + OH^- \longrightarrow Mn(OH)_2$.

3. $4Mn(OH)_2 + O_2 + 2H_2O \longrightarrow 4Mn(OH)_3$

Brown precipitate

(*) Acidify the solution with H_2SO_4 / H_3PO_4 :

If Fe is present in the water then must use H_3PO_4

~~$4Mn(OH)_3 \longrightarrow 4I^-$~~

$4Mn(OH)_3 + 4I^- + 12H^+ \longrightarrow 4Mn^{2+} + 2I_2 + 12H_2O$

brown liquid

(*) Titration of liberated I_2:

$$4S_2O_3^{2-} + 2I_2 \longrightarrow 2S_4O_6^{2-} + 4I^-$$

4 mole $S_2O_3^{2-} \equiv$ 1 mole DO

32 g.

1 mole $= \frac{32}{4}$ g = 8 g DO.

1 L 1 M $S_2O_3^{2-} \equiv$ 8 g DO.

1 ml 1M $S_2O_3^{2-} \equiv$ 8 mg DO.

1 ml $\frac{M}{80}$ $S_2O_3^{2-} = 0.1$ mg.

∴ DO in mg per liter = ~~ml of $S_2O_3^{2-}$ soln in~~

$$\frac{\text{ml of } S_2O_3^{2-} \text{ soln in burette} \times 0.1}{\text{volume of sample}} \times 1000$$

(iv) Disadvantage of DO: DO is not properly bonding with the water. They stay on the free space in the water.

II. To avoid the oxidation and Reduction of DO.

2) When the reagent is added, they should be taken in a pipette and the pippett get inside the sample then the reagent ~~may~~ may be relese.

Procedure:

1) Sample collection

2) 1 ml $MnSO_4 . 5H_2O$ (50%) soln + 1 ml alkaline iodide soln.

3) Stopper the R.B and shake upside-down for about 15 min. → Brown precipitate

4) ~~Along~~ Allow to settle down until a bilayer is obtained.

5) Add H_2SO_4 and shake again until the ppt dissolved → Brown liquid (I_2).

6) Titrate the liberated I_2 with $M/80$ Std $S_2O_3^{2-}$ Soln.

If For waste water containing NO_2^- ion. azide - modification method's

$$NaN_3 + H_2SO_4 \longrightarrow HN_3 + NaHSO_4.$$

$$HNO_2 + HN_3 \longrightarrow N_2 + N_2O + H_2O.$$

COD (chemical oxygen demand):

Definition: mg of oxygen required to oxidize organic and inorganic compounds in waste water. (ppm)

$$C + O_2 \longrightarrow CO_2$$

1 mg

12 g 32 g

$$1 \text{ mg} \equiv \frac{32}{12} = 2.67 \text{ mg}.$$

This method is done by $K_2Cr_2O_7$.

Environmental significiance :

1. This method gives information about amenability of waste water treatment process by chemical decomposition method.

2. $\frac{BOD}{COD} = 0.8$ or > 0.8.

* COD is greater than BOD because COD required for oxidization the inorganic and organic and also bio-digradable and non bio-digradable compounds. COD always oxidize a biologicaly active and inactive compounds.

Principle of measurement of (COD) of waste water:

1. sample collection.

2. Decomposition of organic and inorganic compounds of waste water by using excess Std. soln of $K_2Cr_2O_7$. (In acidic medium and in present of catalyste.)

3. Titration of unreacted $K_2Cr_2O_7$ by using Std. mohr salt solution. $(NH_4)_2Fe(SO_4)_2 \cdot 6H_2O$.

4. conduction of back titration of blank titration.

[Back titration: conduction of the exprement using same way with ~~distelled~~ distilled water].

To avoid the decomposition of organic compounds

To avoid the conjugation of O_2 present in distilled water distilled.

26.08.19
B 2nd B Day

* The volume of mohr salt required for back titration is more than the main titration (COD measurement).

Let the volume of mohr salt solution required to reduce unreacted $K_2Cr_2O_7$ remaining after sample digestion A ml. and the volume of mohr salt solution required to reduce $K_2Cr_2O_7$ for used up in back titration B ml.

∴ A − B = The volume of $K_2Cr_2O_7$ required to oxidize the organic and inorganic materials present in waste water = volume of mohr salt solution.

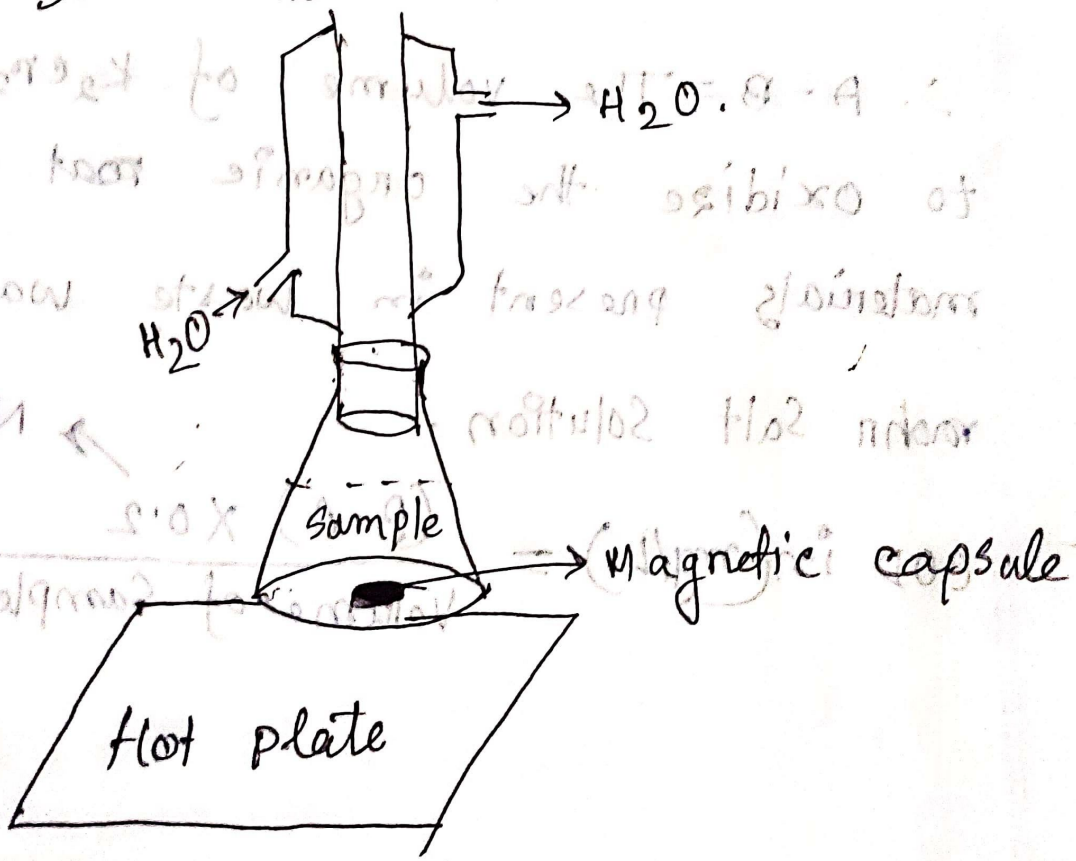
$$\text{COD in (mg/L)} = \frac{(B-A) \times 0.2}{\text{Volume of Sample in mL}} \times 1000.$$

→ N×8.

Procedure:

1. Sample collection: same as DO measurement.
2. Sample digestion:

Sample (50 ml) + $K_2Cr_2O_7$ (Excess) + Ag_2SO_4 (solution in acid medium) + $HgSO_4$ + Reflux for about 15 min ~~to~~ to 6 hr.



3. Cooling of reaction mixture under tap water.

4. Titration with standard mohr salt solution and measurement of burette reading.

5. Conduction of back titration in the same manner and measurement of burette reading

* Indicator - Phenolpthalein

Phenolpthaline

BOD (Bio-chemical oxygen demand):

→ Amount of oxygen required to decompose the biologically active compounds and organic compounds in the present of micro-organism at a perticular tem (20°c) ~~20°c is appropriate tem. for~~ and over a time. [5 ~~day~~ days].

(mg/L or ppm).

⊛ Two methods.

1. Instrumental.
2. Chemical.

27.02.19
2nd C. Day 1

(v) Measurement of BOD: (Form A.K.DE.):

$$^{c}BOD_5 = \frac{(D_0 - D_5) - (B_0 - B_5)f}{P}$$

c = Carbonacious

D_0 = Dissolve oxygen of dilution water after preparation.

D_5 = DO of dilution water after 5 days of incubation.

B_0 = DO of sample after preparation.

B_5 = DO of sample after 5 days of incubation.

P = decimal dilution factor = $\frac{\text{Volume of sample in the 300 ml R.B}}{\text{Volume of R.B}}$

f = ratio $\frac{\text{Volume of seed in sample}}{\text{Volume of seed in control}}$.

GGA → 198 ± 30 mg/L

Glucose glutamic acid.

Basic reaction of BOD measurement:

$$(CH_2O)_x + O_2 \xrightarrow{\text{micro-organism}} CO_2 + H_2O + \Delta H.$$

Sources of water pollution:

1. Domestic sewage. (contribution 75%).
2. Industrial effluent.
3. Soap and detergent.
4. Toxic metals.
5. Agricultural discharge.
6. Siltration.
7. Thermal and radioactive pollutants.

H.

Sewage: Dilute aqueous solution of organic matter and minerals in water.

Components of Sewage:

1. Organic Components: (Fat, oil, carbonecies)
2. Inorganic components. [metal ions, Fe, Cu, Pb ions, anion (fosfate; sulfate)]
3. Pathogenic bacteria [1. salmonella typhosa, 2. shigella dysentaria, 3. vibrio cholerae] E.coli
4. Saprophytic bacteria. (useful bacteria).

Environmental and health ~~of~~ effect of Domestic Sewage:

1. water containing domestic Sewage can cause pathogenic ~~dises~~ diseases.
2. DO is gradually decrease, if DO is less then 4 ppm then water is unfit for fish comm. community. And if DO is 0 then some anaerobic ~~anaetic~~ bactaria increase and they release H_2S, SO_2 etc

And solid metal under the water is floating over the water body. Offensive foul odour coming out from water body. Some anaerobic bacterial genera include Actinomyces, colostridum, Peptostreptococcus.

(*) Eutrophication: Eutrophication means, ~~increas~~ enrichment of water body with respect to nutrients may take place because of natural sources or by anthropogenic sources.

(a) Decrease in hight of water column in a water body and convertion into a dry land. by the effect of: sewage.

The water that inter into the treatment plant, called influent water.

The water that release from the treatment plant effluent water.

Turbidity
Hardness

Industrial effluent: (S.S. Dara). (B.K. Sharma)

* Anaerobic bacteria: Aerobic means involving oxgen, so anaerobic bacteria can survive without oxygen. They may be ~~neg~~ react negatively or even die if free oxygen is present.

.03.19
6th_ c Day

Chemical Toxicology.

(A) source,

(A) Toxic chemical.

(A)

(A) C.T. is a science of study of toxic chemicals Theres source, health effect, environmental effect, mechanism, of action, mitigation process

(A) 13 element / metal are toxicable anyway, Pb, Si, Hg, Al,

100- 1000 ppb alum use for hemodayalysis.

Element → (i) Trace element / Essential element.

(ii) Deficient .n

(iii) Toxic element.

(I) Trace element: Trace elements are those element which are essential for the sustenance of living organism at trace level.

(II) Deficient element: When an element is present in living body lower then trace level causing adverse effect.

(III) Toxic element: when an element is present in living body is grater than trace level causing metabolic disorders. (Pb, Cd, Hg, As, Fe).

As → use for growth, medical use.

As

As:

State: +5, +4, +3, +2, +1, -1, -2, -3.

As(V) , As(III)

* Solution pressure Reacig :

(*) As in Agricultural uses:

(I) insectisite.

(II) ~~Har~~ Harvesite

(III) Prestisite

Calcium Arsenat,

$$3Ca^{2+} \left[O \underset{O^-}{\overset{O^-}{\diagdown \diagup}} As - O^- \right]_2$$

Prastisite

* $PbHAsO_3$ → use as pigment.

Compounds of As.

Inorganic.

Oxide: AsO_3, As_2O_5

Sulfide: As_2O_4, As_4S_4

Hydride: AsH_3

Arsenate: calcium arsenate, $PbHAsO_3$.

(IV) Roxarsol

organic As

(I) methyle arsonic acid

(II) Dimethyle arsinic acid

(III) Disodium dimethyl arsenate.

(V) 4-hydroxy-3-nitro-Phenylarsonic acid

(I) $CH_3-As(OH)(=O)-OH$

(II) $CH_3-As(OH)(CH_3)=O$

(III) $CH_3-As(ONa)-ONa$

Ⓜ organic compounds are less harmful.

Inorganic, oxide,

$AsO_3 \xrightarrow{H_2O} H_3AsO_4$, Ⓐ

Ⓐ $H_3AsO_3 \longrightarrow As(OH)_3 \rightarrow$ Naturally base
look like acid

H_2AsO_3

H_3AsO_4
$H_2AsO_4^-$
$HAsO_4^{2-}$
} pentavalence.

H_3AsO_3
$H_2AsO_3^-$
$HAsO_3^{2-}$
AsO_3^{3-}
} 3

Ⓢ Arsenic Ⓢ is less toxic.

Detect of As:

$$As \xrightarrow[heat]{O_2} As_2O_5, As_2O_4.$$

বস্তুনের গন্ধ পাওয়া যায়।

Reactions of As in acid:

$As + \text{conc. } HNO_3 \longrightarrow H_3AsO_4$ (আর্সেনিক এসিড).

$As + \text{dil. } HNO_3 \longrightarrow H_3AsO_3$ (আর্সেনিয়াস এসিড)

$As + H_2SO_4 \text{ (conc.)} \longrightarrow As_2O_3$

$As + HCl \longrightarrow$ No reaction.

* Arsenic does not react with base.

Application:

(I) Industry: Battery (
(II) Semiconductor.
(III) Preservative
(IV) Insecticides.
(V) ~~Pest~~ plant and animal growth.
(V) ~~Prostisite~~ pesticide.
(VI) ~~Harvisite~~. Herbicides

Source:

(I) Air.
(II) water.
(III) Agricultural source.

Contamination of As in water by 3 ways:

Permisible level:

B.D = 0.05 ppm : 20 million people

WHO = 0.01 PPM: 36 million people } Affect

Consuming of As.

① Food.

② Drinking water.

③ Inhebation.

Health effect: long-time low level exposure ① decrease in production of RBC and WBC.

② ~~darkening of skin~~ loss of sensation of pins and needles.

High level intake: ① appearance of small corns and warts in sole, palm and body.

② darkening of skin.

Acute consumption can cause skin cancer and lung cancer.

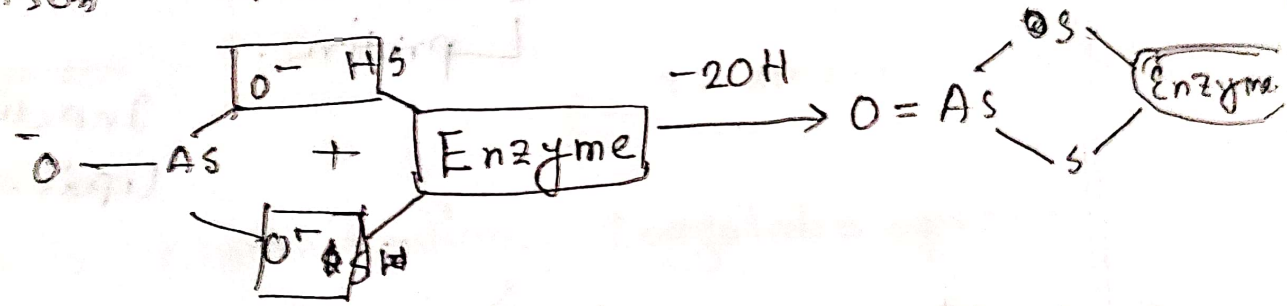
⑧ Any toxicical element is effective for child (under 6 years old) and elderly people (above 50 years old).

As soft base ~~of~~

mode of action / Biochemical effect of arsenic:

Mechanism of action of As in human body.

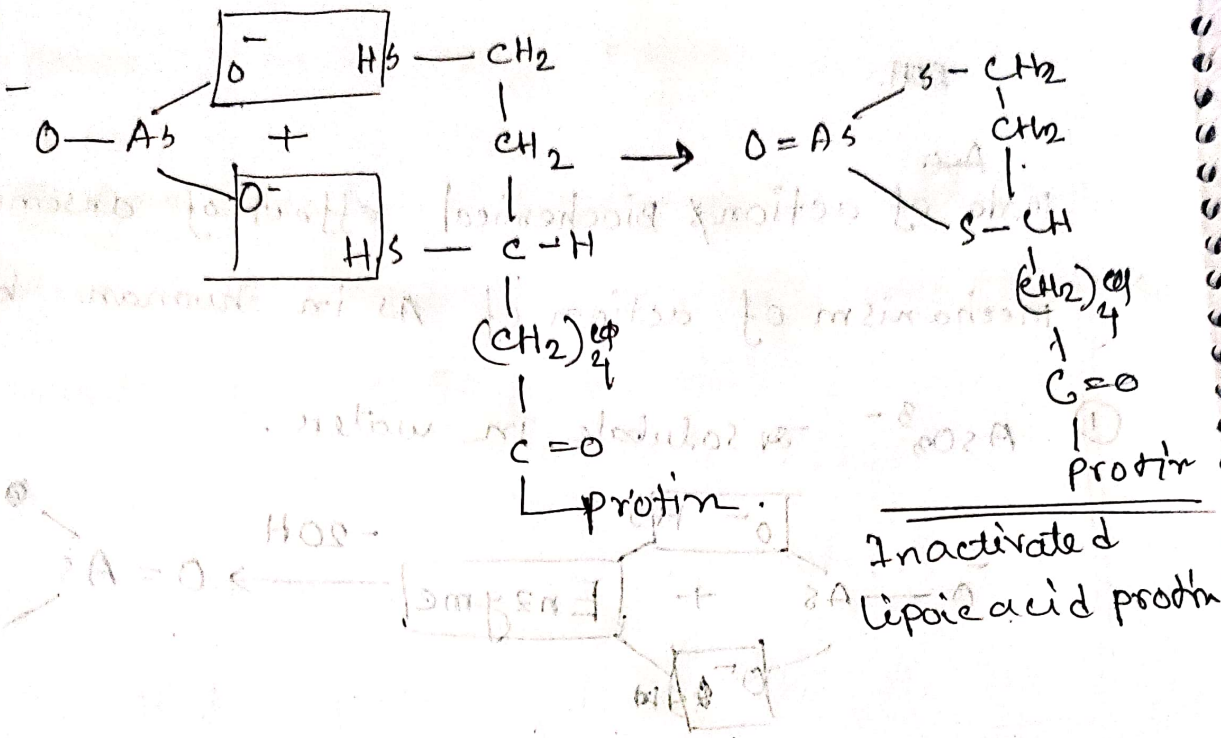
① AsO_3^{3-} → solubale in water.



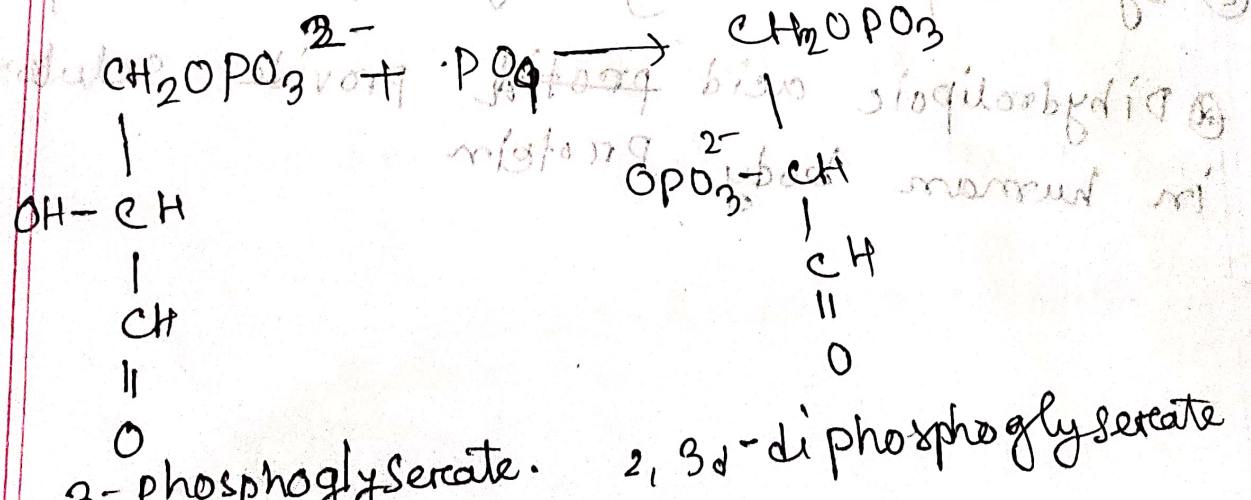
Arsenic attach the thio group of enzyme.

② By complexation of dihydrolipoic acid protein-

Dihydrolipoic acid ~~protein~~ provide solubse in human body. Protein



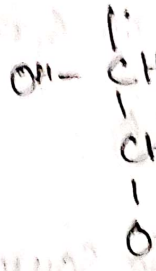
2. Inhibits the production of key energy yielding Substance ~~DNA~~ ATP.



2,3-diphosphoglycerate $\xrightarrow{\text{phosphorylation}}$ DNA

In presence of AsO_3^{2-} →

3-phosphoglycerate + AsO_3^{2-} ⟶

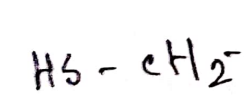


1-arseno, 3-phosphoglycerate

4. As in concentration coagulates protins.

Remedy of As poisoning:

The affected person should be treated with antidotes containing thio groups:



2,3-dimercapto propanol (BAL).

British anylewisite.

Cd.

Source:

Natural: (i) Soil. (ii) Green leafy vegetables, especially tobacco.

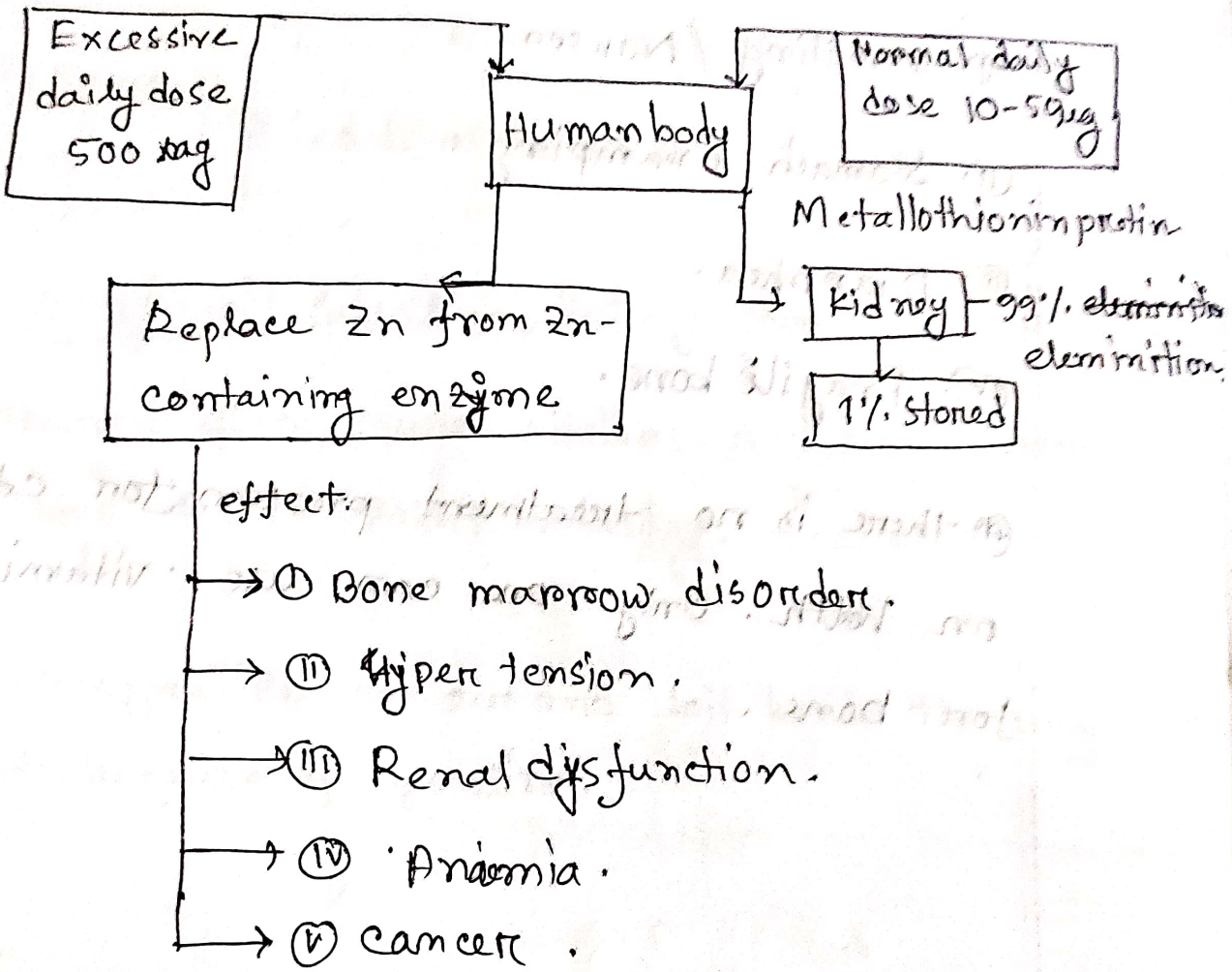
Man made source:

(i) Battery industry.

(ii) Electroplating industry.

Max - 50 mg

Daily cd intake and its effects on health.



(*) partial / permanent damage of important organ like lung, lever, kidney.

(**) To find cd hair and nail are examin.

Health

Symptomps of cd poisoning:

(I) Vomiting / Nausea.

(II) Stomach cramping.

(III) Diarrhea.

(IV) Fragile bone.

There is no treatment process for cd. on health. Only one can use vitamin D for bone.

9

Pb.

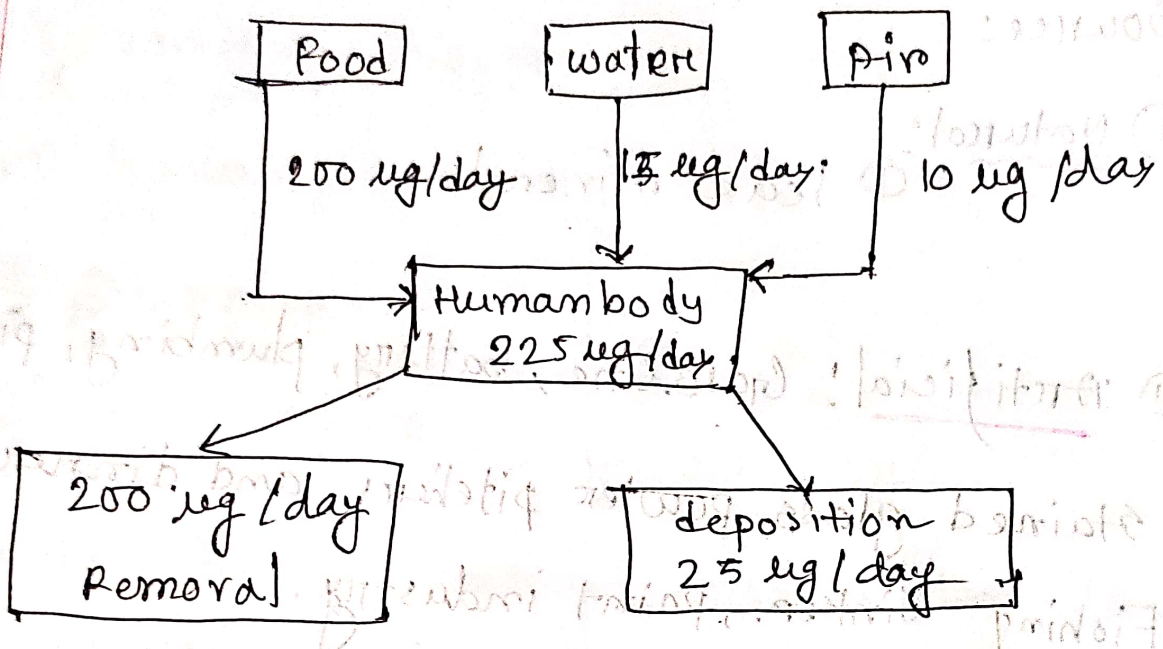
Source:

(i) Natural:
   (i) lead minerals.

(ii) Artificial: Gasoline, battery, plumbing, pipe, faucet. Stained glass, pewter pitchers and dinnerware. Fishing sinker., paint industry.

* 100-1000ppm Pb on air and soil beside the busy roads. because of gasoline.

Daily lead balance of a typical city dweller.



02.08.10.19
7th. D

Weller.

Health effect :

1. lower level intake : (i) Brain damage. and lower intelegence.
2. learning problems.
3. Hyper activety
4. Imperced sphee speech and language.
5. Slow growth.
6. Kidney and lover damage.
7. Hearing damage.

Highly effect:

(i) coma,

(ii) & Death,

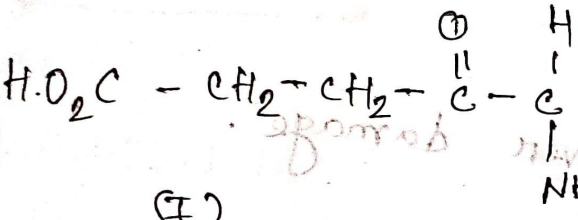
(iii) Seizures

Bio-chemistry of Pb:

Pb interferes to the production of hemoglobin. For lower production the energy transfer will hamper.

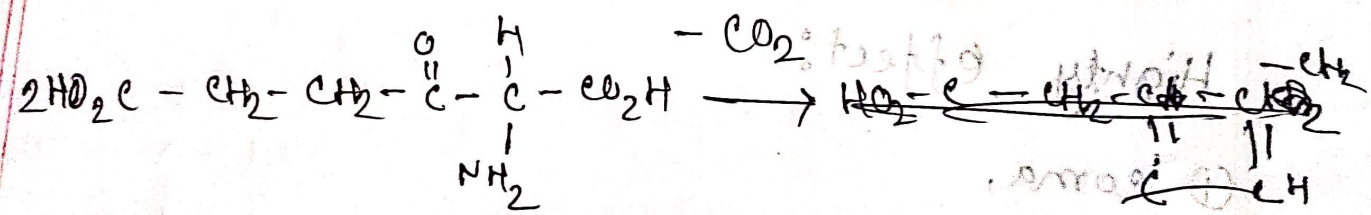
~~Main way of sin~~

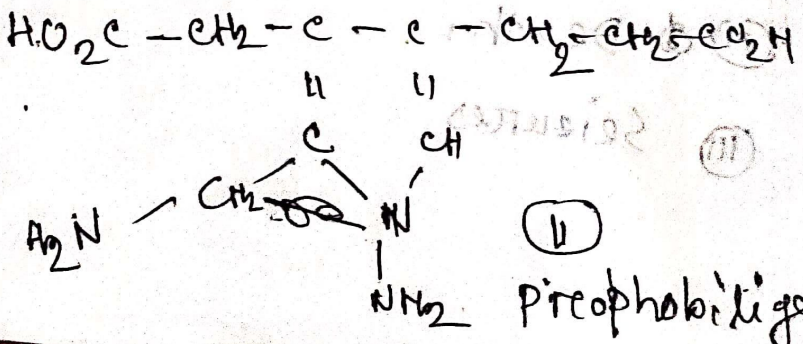
Routes of synthesis of haemoglobin in blood:



(I)

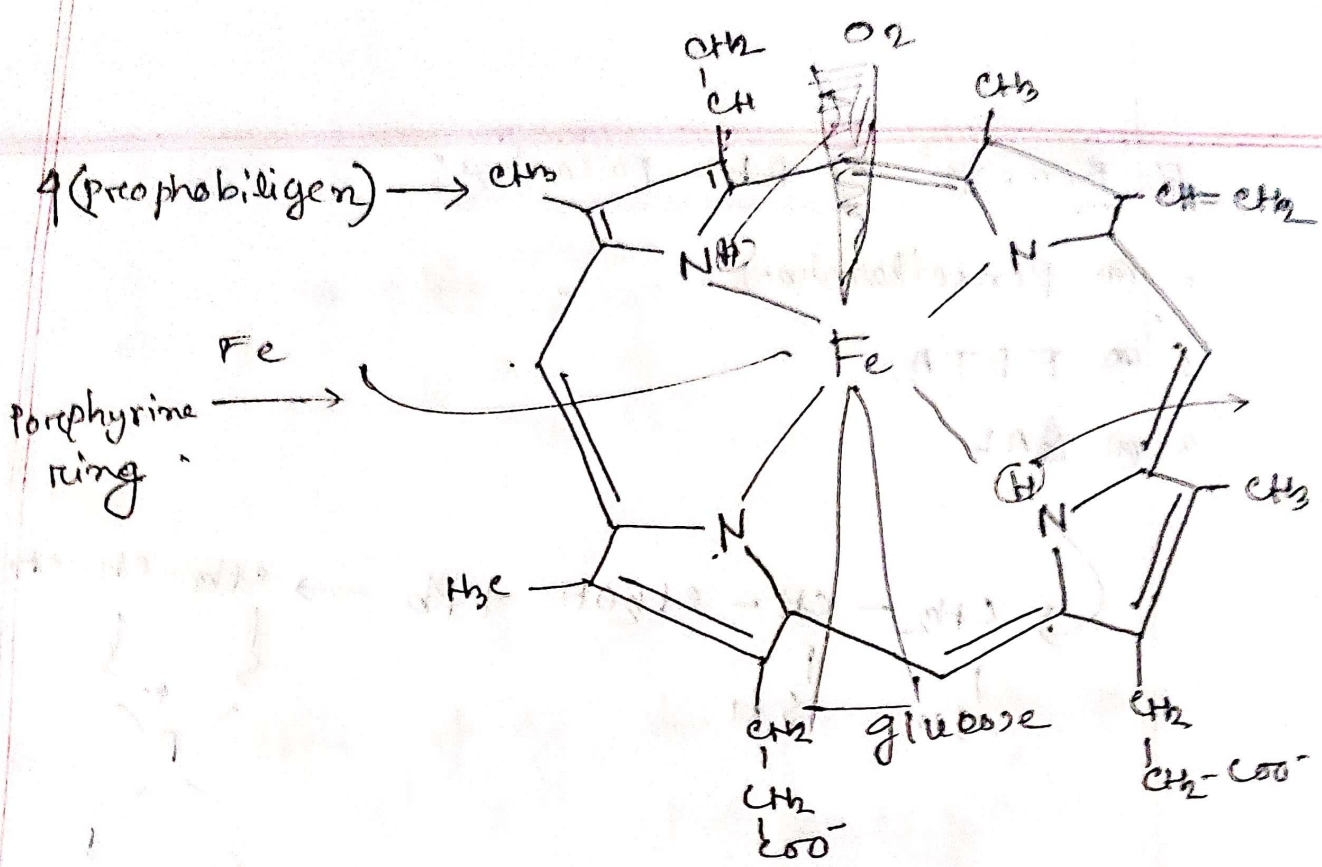
δ- amino levulinic acid.





(II)

Prophobilinogen

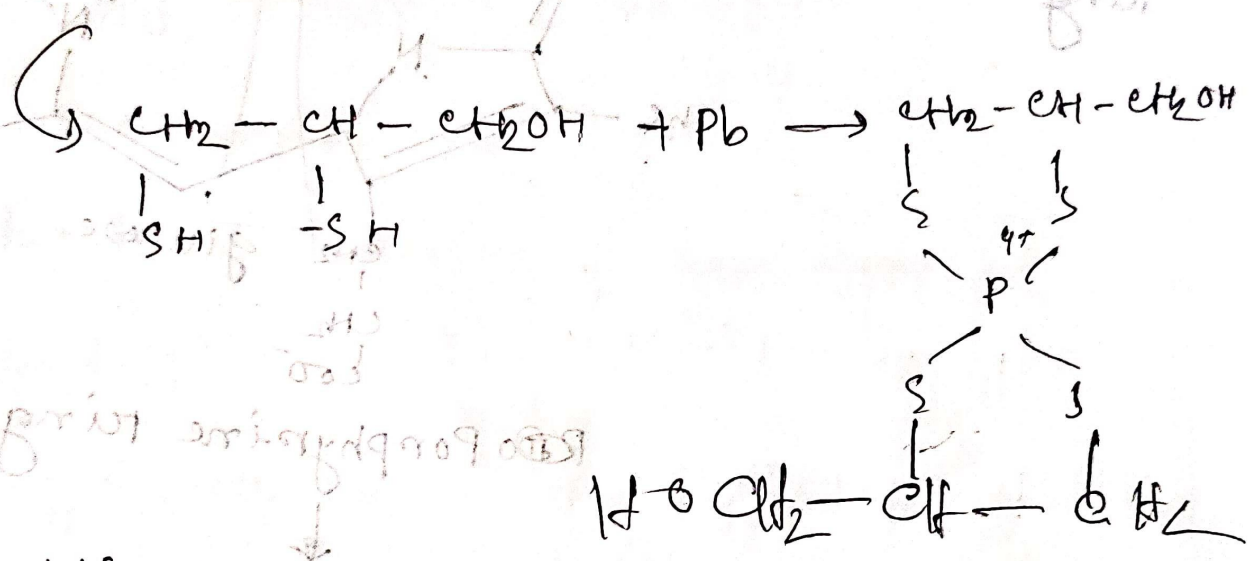


1.5 - 0.8ppm → Then difficulty in energy transfer

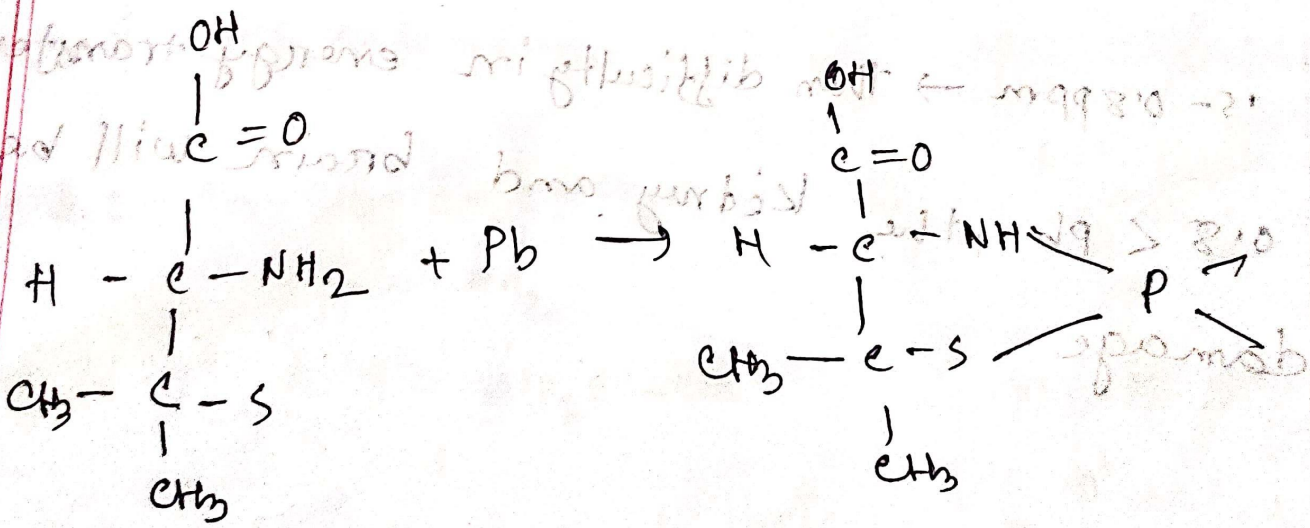
0.8 < Pb, the kidney and brain will be damage.

Remedy of Pb poisoning:

1. Penicilamin-D.
2. EDTA.
3. BAL

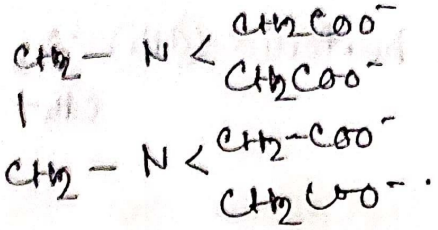


Penicilamin-D.



d-Periclamine.

EDTA:



Hg:

List of species of Hg and there relative toxicity:

Species	Toxicity
$Hg(l)$	non-toxic., but as vapour it is toxic
Hg_2^{2+}	insoluble, so less toxic
Hg^{2+}	soluble, less toxic, but it can easily pass membrane.
Toxic { $R-Hg^{+}$	toxic, easily pass the membrane
Toxic { $R-Hg^{2+}-R$	less toxic, but in acidic medium it conversion in $R-Hg^{+}$
HgS.	insoluble in water. totally non-toxic.

Water, →

Hg^+
Hg^{2+} + Anaerobic bacteria $(CH_3) \rightarrow$ $Hg^+ - CH_3$
$CH_3 + Hg - CH_3$

inorganic Hg

organic Hg

↓

Fish body

Health effect, it

Cerebellar palsi - Brain disorder.

Permanent or vertical paralysis.

29.10.19
2nd e

Domestic wastes.

Industrial effluent pre-treatment process.

1. Suspended solid
2. COD, DO, BOD value

Objectives of water treatment process.

① primary W.T.P - Stabilization.

② To protect the water body form further contamination.

Treatment by four treatment.

① Preliminary — Involves the removal of gross solid (wood, paper, metal). By screening process. Before treatment BOD - 200 ppm. ammonium - 25ppm phosphate - 30ppm

② Primary treatment → removal of suspended solid. Method - sedimentation.

Primary sludge → suspended particles.

A.E. Dec. 256

③ secondary treatment → aerobic treatment.

From aerobic treatment → suspended particles are toxic. Do not use as fertilizer.

aerobic treatment → ~~cover~~ activated sludge

→ concentrated solution of bacteria.

→ consume soluble molecular particles from water.

→ continue for atleast 5 days.

→ Preserve the water in clarifier.

BOD - 25 ppm, phosphate - 25, amonium - 20.

④ Tertiary treatment:

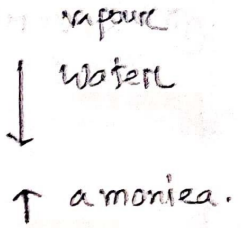
BOD → 1 ppm,

(or) Explain the function of bacteria during secondary treatment.

1. Flocculation tank → mixing $Ca(OH)_2$.
$Ca(OH)_2 + PO_4$ मिलकर →

$Ca_5[PO_4]_3OH$.

2. Amoniea striping tower.



3. clorination tank.

4. Activated carbon filter → to reduce 1 ppm BOD.

✱ Desalination :

→ ion exchange column.

→ exchange the soluble ions from water.

Na exchange the ions.

C.T → chemical Toxicology.

Industrial water treatment:

(i) Activated carbon filter.

(ii) Reverse osmosis.

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Spectrophotometry analysis:

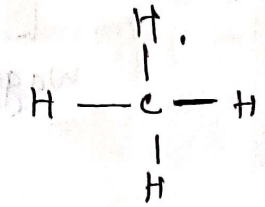
Different types of internal energy associate with a molecule.

Total energy = kinetic energy + potential energy.

= Translational energy + vibration energy + electronic energy + rotational energy.

$= E_{Tr} + (E_{vib} + E_{Elec} + E_{Rot})$

Potential energy used in chemical analysis.

$CH_4 \rightarrow$ 

* Vibration → ① Stretching vibration.
② Bending vibration.

* Spectroscopy - তে দেখার জন্য molecule - কে নাড়ার হত হবে।

Models of vibrational energy:

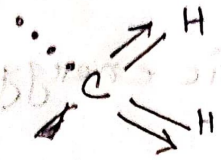
1. Stretching vibration –

$-CH_2$.

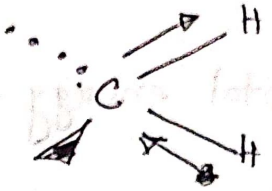
C – X

(i) Symmetric

(ii) Asymmetric

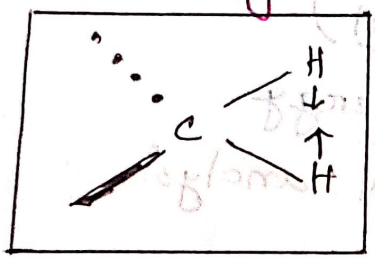


Symmetric Bonding energy কম (2850 cm^{-1})



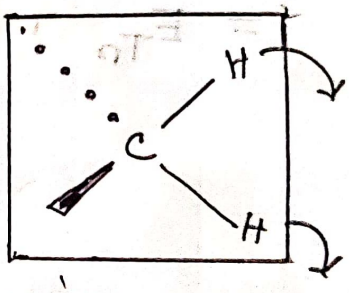
Asymmetric Bonding energy বেশি (2926 cm^{-1})

2. Bending :–

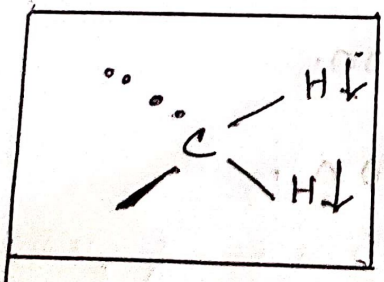


Scissoring.

energy = 1450 cm^{-1}



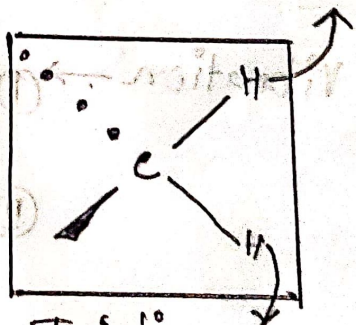
Wagging, energy 1250 cm^{-1}



Rocking

energy = 750 cm^{-1}

In plane.



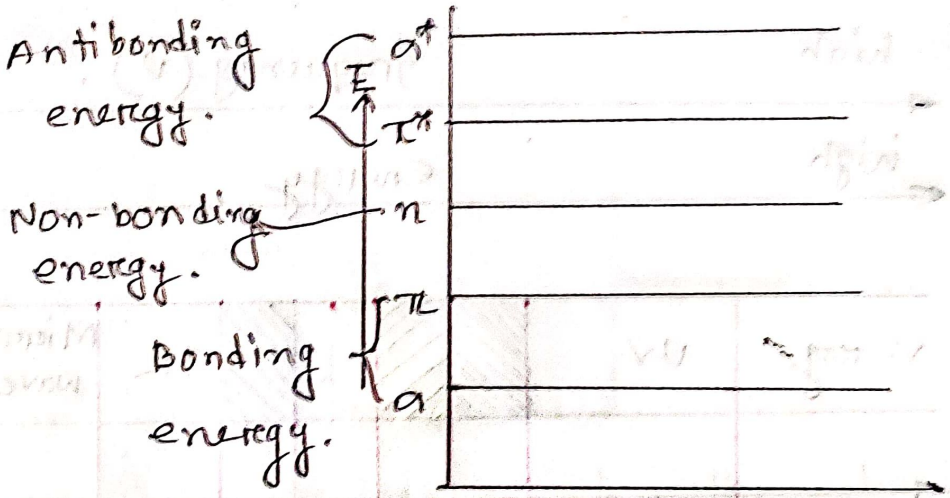
Twisting

energy 1250 cm^{-1}

Out of plane.

④ IR প্রয়োগের ফলে নির্দিষ্ট অণুর IR শোষণ করে Vibration বৃদ্ধি পাবে ফলে বর্ণালীতে দেখা যাবে।

⊞ Electronic Energy : (Use UV-Visible spectroscopy).



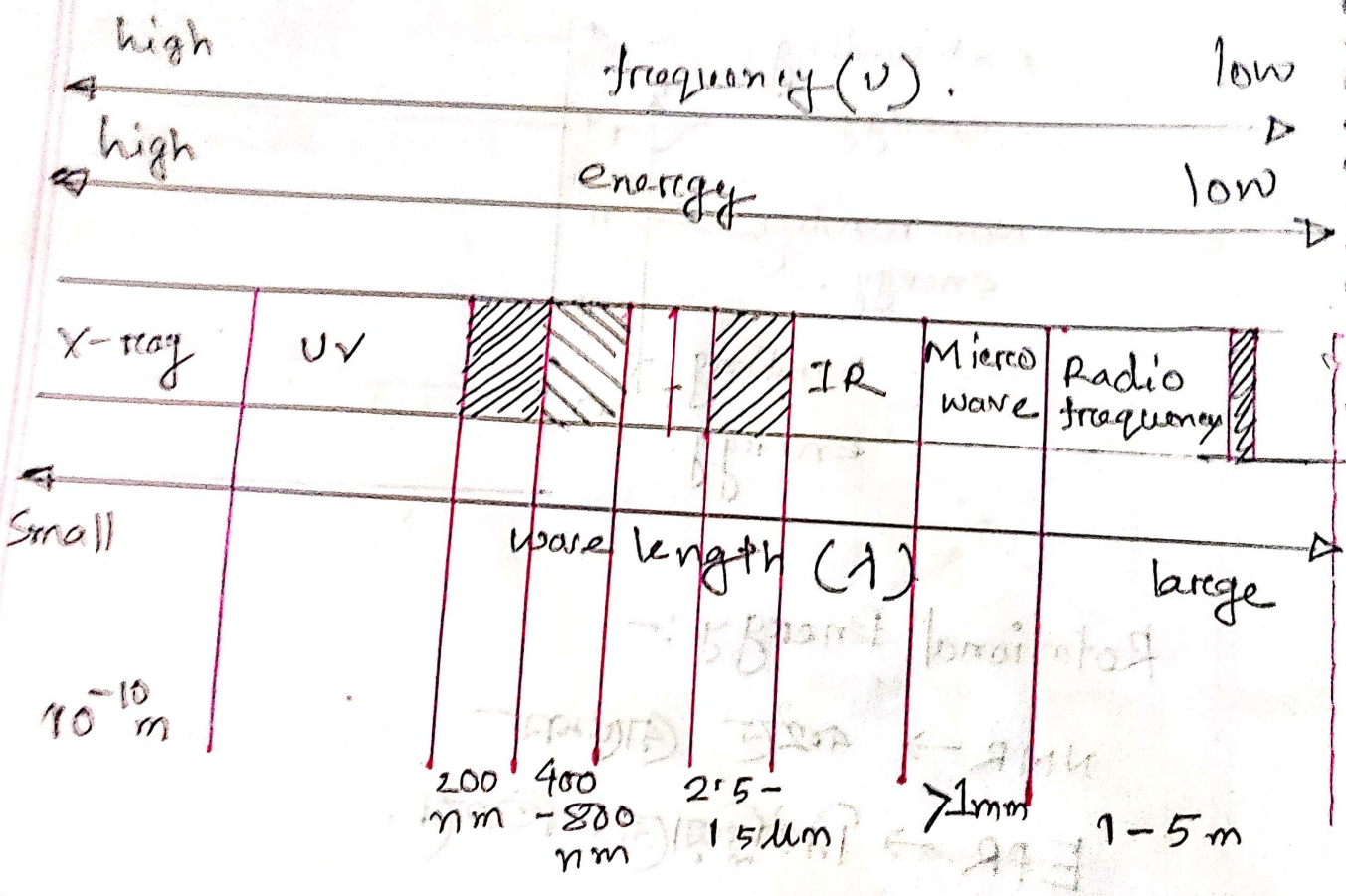
Rotational Energy :-

NMR → বর্ণালী রোটেশন

EPR → নিউক্লিয়াসের স্পিনে।

Electromagnetic Radiation:

Spectroscopy is a science in which light is resolved into its corresponding



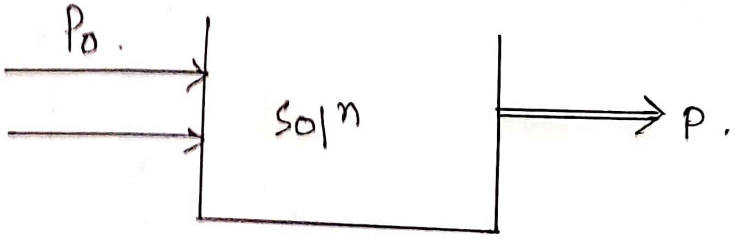
Electromagnetic radiatio is nothing but the energy which can pass with the velocity of light.

Particle concept considered.

$M \xrightarrow{h\nu} M^*$ (Excitation).

$M^* \longrightarrow M + heat$ (Relaxation).

Time difference between excitation and relaxation is 10^{-9} s.



Absorption is a process of attenuation of a beam of electromagnetic

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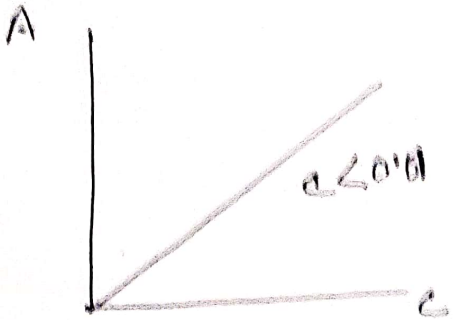
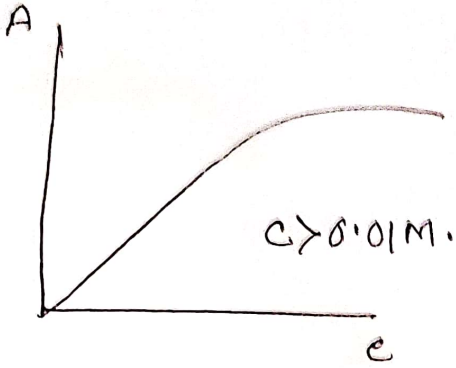
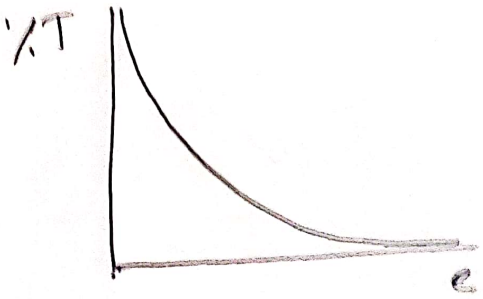
$A = \epsilon bc$.

$A \propto b$

$A \propto c$.







Limitations :

① Real limitations. when ① $c > 0{\cdot}01M$. ⑪ Presence
② chemical deviation. ⑪ $c < 10^{-5}M$. of electrolyte
③ Instrumental deviation.

When $c > 0{\cdot}01M$., there is less distance between molecules so they polarized or make H-bond.

④ chemical deviation: Due to ~~acco~~ association, dissociation, polimarization and temperature effect. Due to interaction between the solvent and analyte or due to interaction between solvents.

Association and polimarization:

$$4\ C_6H_5CH_2OH \longrightarrow (C_6H_5CH_2OH)_4.$$

Dissociation;

$$Cr_2O_7^{2-} + H_2O \rightleftharpoons CrO_4^{2-} + 2H^+$$

Orange — Yellow.

$\lambda = 375\ nm$ — $\lambda = 450\ nm$.

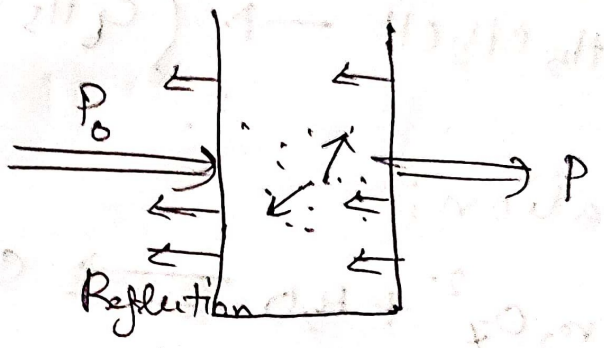
Temperature effect;

$$Fe^{3+} \rightleftharpoons Fe^{2+}$$

λ_1 — λ_2 — $\lambda_1 \neq \lambda_2$.

(13) Instrumental deviation :

(1) Due to polychromatic radiation.
(2) Stray radiation.
(3) Mismatched cell
(4) Instrumental noise.



If the solution is colloidal solution they show tyndall effect. For this effect there is error in absorption calculation

$$A = \log \frac{P \text{ solvent}}{P \text{ solution}} = \log \frac{P_0}{\phi}$$

~~Process of~~ co

(*) Why absorbance and transmitted can not measure

Application

(I) Qualitative

(II) Quantitive.

(I) Qualitative: By measuring the λ, $\pi \rightarrow \pi^*$, $\sigma - \pi$ bond we can consider it with chart and find the atoms in the molecules, like, OH, SH,

(II) Quantitive: knowing the concentration of the solution.

12, 13, 14, 15 Assignment.

12.

$c = 4.48$ ppm. $= 4.48$ mg/L.

$T = 0.309$ $= \frac{4.48 \times 10^{-3}\ g/L}{149}$

$A = \epsilon b c$. $= 3 \times 10^{-5}$ mol/L.

∴ We know,

$A = 2 - \log(\%T)$. / $A = -\log T$.

$A = 0.5$

$\epsilon = \frac{A}{bc}$. $= \frac{0.5}{1 \times 3 \times 10^{-5}}$.

=