B. L. D. E. Association's

S. B. ARTS & K. C. P. SCIENCE COLLEGE, VIJAYAPUR

2nd INTERNAL TEST 2023 -2024

Name / ಹೆಸರು : Aparna R. Kannur Roll No./ಸ್ಥಾನಂ : 62 Date /ದಿನಾಂಕ : 06/2024

Subject/ವಿಷಯ : Chemistry Paper-I Semester/ಸೆಮಿಸ್ಟರ್ : 6 Exam Seat No / ಪರೀಕ್ಷೆ ಸ್ಥಾನಂ : U19KN21S0299

Invigilator's Signature / ಕೊಠಡಿ ಮೇಲ್ವಿಚಾರಕರ ಸಹಿ Signature of Evaluator / ಪರೀಕ್ಷಕರ ಸಹಿ Marks obtained/ ಪಡೆದ ಅಂಕಗಳು 29/30

Q.No I.

b) Beer-Lambert's Law :- When monochromatic radiation is passed through transparent medium under frequency the rate of thickness intensity of light and ~~concentration~~ is directly proportional to the incident light. Eg concentration of the solution.

ie. $-\frac{dI}{dx} \propto I \, dc$

$\Rightarrow \frac{dI}{I} = a\,dc\,dx \Rightarrow \log\left(\frac{I}{I_0}\right) = acx$

where a → proportionality constant

c) Vitamins are vital components needed for proper functioning of physiological activities and are needed in small quantities.

Such as vitamin A deficiency leads to night blindness, Vitamin D deficiency leads to rickets.

d) Anionic Detergents :- These are the detergents having negative ion at the end of ~~ch~~ carbon chain

Eg : $CH_3-(CH_2)_{11}-O-\overset{\overset{O}{\|}}{\underset{\underset{O}{\|}}{S}}-O^- Na^+$

Sodium lauryl sulphate

Q.No 2.

a) Consequences of crystal Field Splitting on ionic radii M^{2+} ions.

For free metal ion:

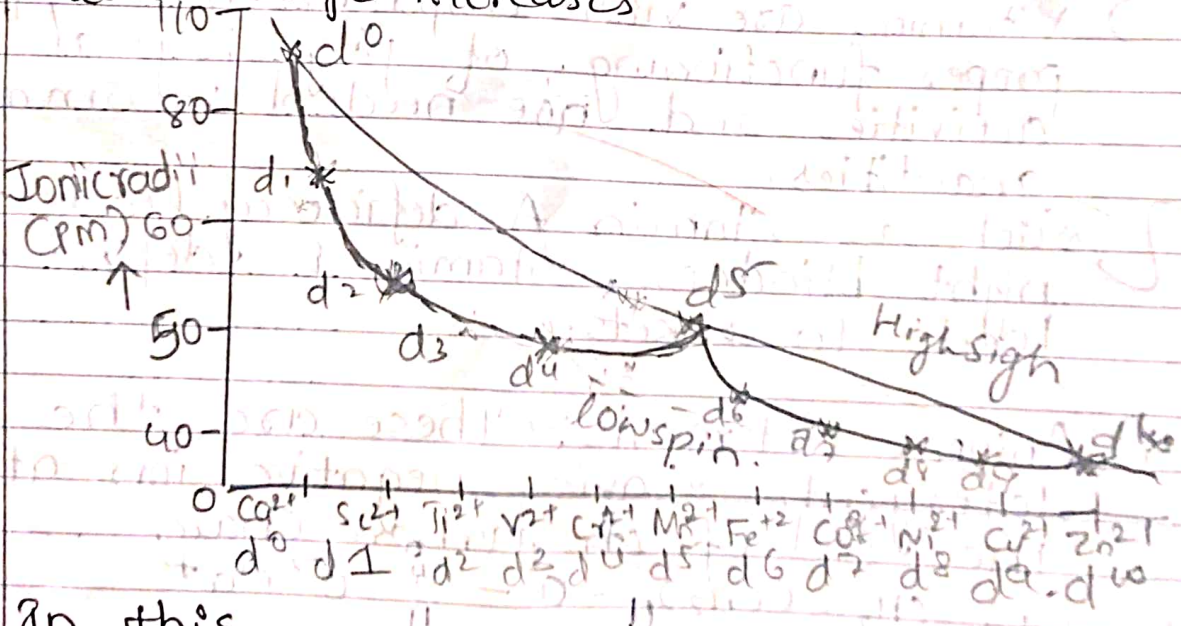
$Ca^{2+} \longrightarrow Zn^{2+}$

Let us consider the left to right in the periodic table ionic radii decreases.

* Nuclear charge increases
* Poor shielding effect of d-orbitals.

For complex

* Ionic radii decreases with size decreases when the force of interaction between metal and ligand increases.
* Nuclear charge increases



* In this

1) For d^0, d^5 & d^{10} (High spin)

$d^0 - (t_{2g})^0 (e_g)^0$

$d^5 - (t_{2g})^3 (e_g)^2 (dx^2-y^2)^1 (dz^2)^1$

$d^{10} - (t_{2g})^6 (e_g)^4 (dx^2-y^2) (dz^2)$

∴ There is symmetric distribution of d-orbitals in x, y and z axes.

2) For d^1 & d^2 and d^3 (High & low spin)

$d^1 - (t_{2g})^1 (e_g)^0$

$d^2 - (t_{2g})^2 (e_g)^0$

$d^3 - (t_{2g})^3 . (e_g)^0$

∴ There is symmetric distribution of d-orbitals in x, y & z axes.
So the ionic radii decreases.

3) For d^4 & d^5 High Spin

$d^4 \rightarrow (t_{2g})^3 (e_g)^1$

∴ There is symmetric distribution of d-orbitals.

$d^5 \rightarrow (t_{2g})^3 (e_g)^2$

There is no symmetric distribution of d-orbitals. So ionic radii decreases

4) For d^4, d^5 d^6, d^7 & d^8 (Low Spin)

$d^4 \rightarrow (t_{2g})^4 (e_g)^0$

$d^5 \rightarrow (t_{2g})^5 (e_g)^0$

$d^6 \rightarrow (t_{2g})^6 (e_g)^0$

$d^7 \rightarrow (t_{2g})^6 (e_g)^1$

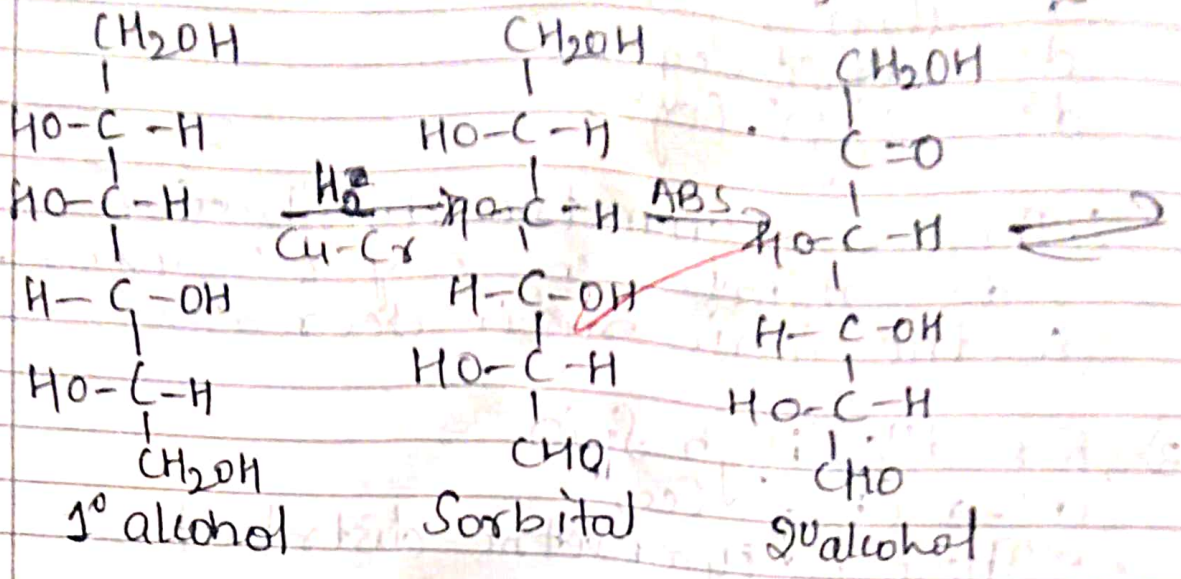
$d^8 \rightarrow (t_{2g})^6 (e_g)^2$

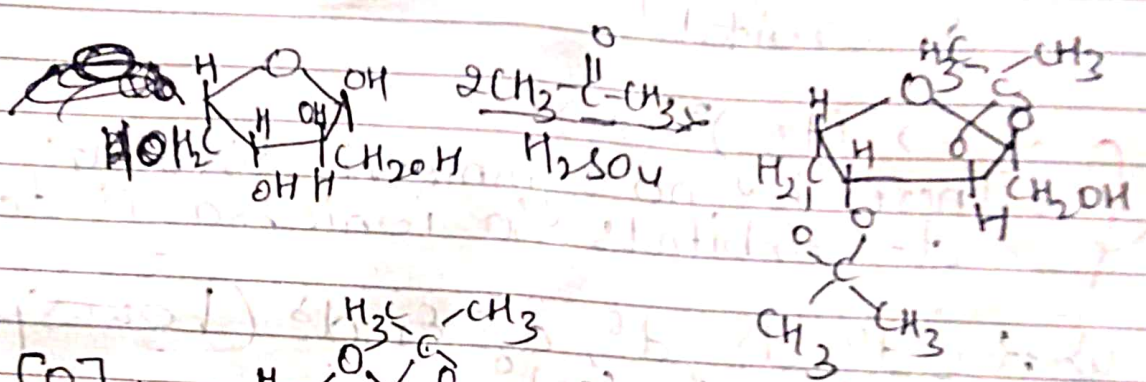
∴ In this d^4, d^5, d^6 and d^8 are not symmetrically distributed. & ionic radii decreases

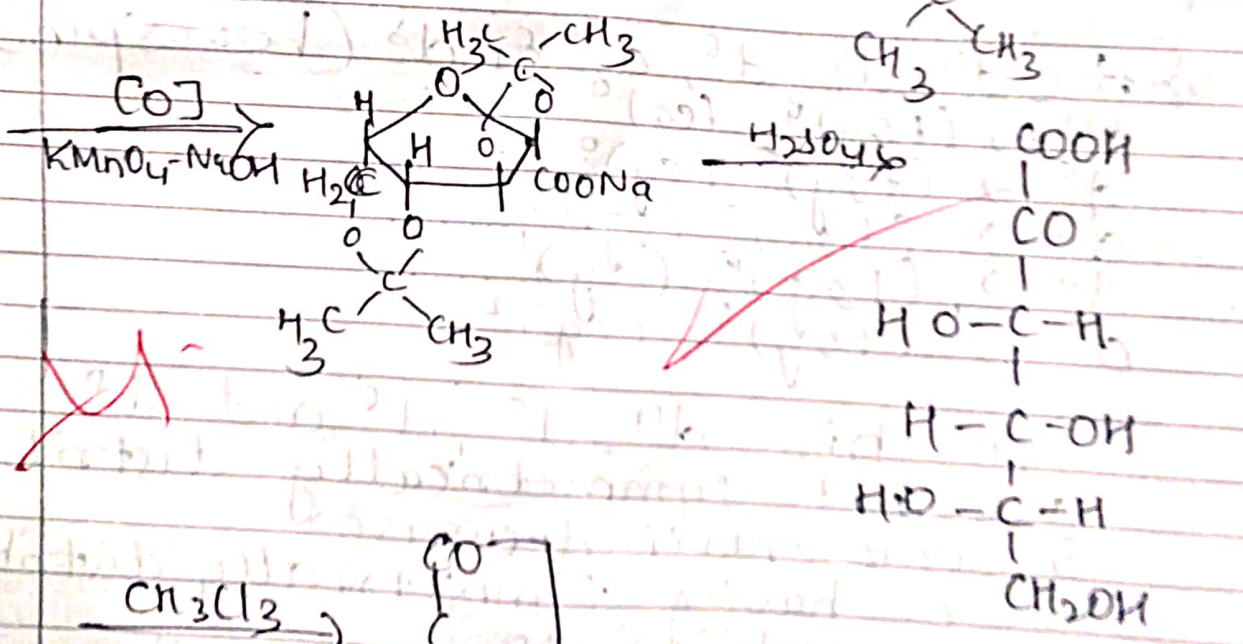
* d^7 is having symmetrically distributed ionic radii increases

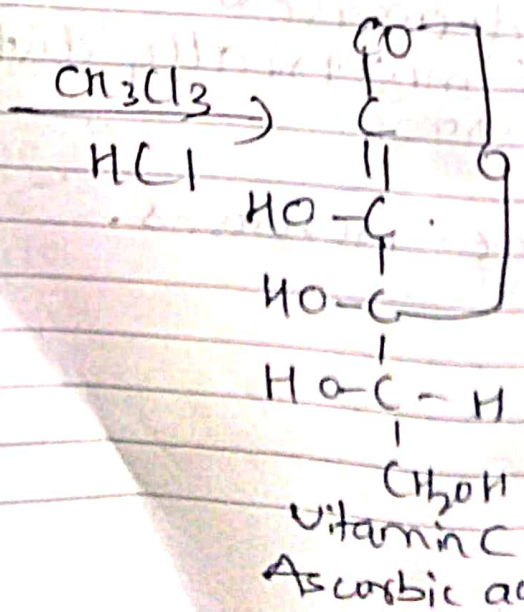
Here nuclear charge increases.

c) Synthesis of Vitamin C from D-glucose









A.B.C - Acetobacter Suboxidant

* Synthesis of Vitamin C can be done by following steps
* Aldehydic group is reduced to 1° alcohol to form sorbital
* 2° alcohol is oxidised with Ketonic group using A.B.S.
* Then it among of 5 alcoholic groups, 4 are protected using acetone & H_2SO_4 and one group is behind.
* Unprotected group is oxidised potassium p. $KMnO_4$.
* Protected groups are relased with H_2SO_4.
* On heating with chloroform with HCl to form Ascorbic Acid. i.e. Vitamin C.

d) Soaps

* Soaps are of Sodium salts of fatty acids.
* Soaps are not soluble/reacted in hard water. They do not act as cleansing soaps agent.
* Soaps are biodegradable and are not causes soil & water pollution.
* Soaps are of one type of anionic.

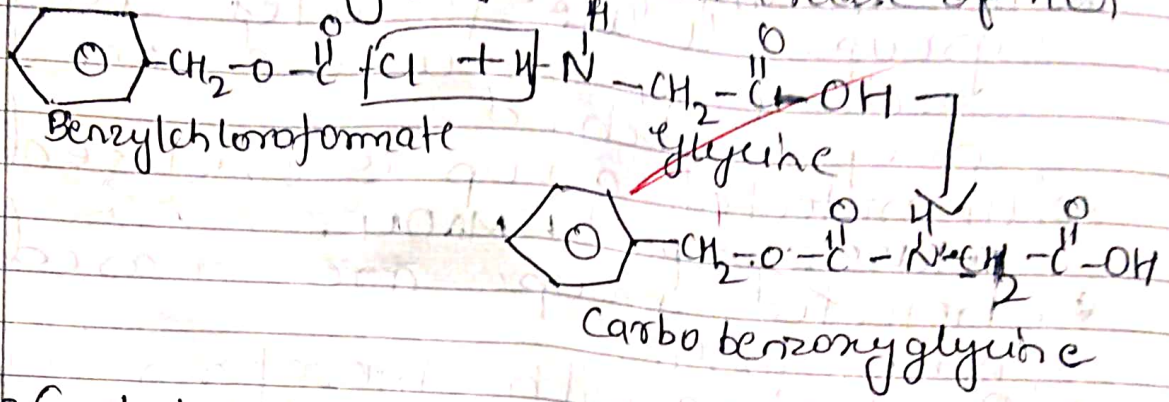
Detergents

* Detergents are not salts of fatty acids.
* Detergents reacts (solids) in hard water. They act as cleansing agent
* Detergents are non-biodegradable (alkyl benzyl sulphonates). They cause soil and water pollution
* They are anionic, cationic or non ionic.

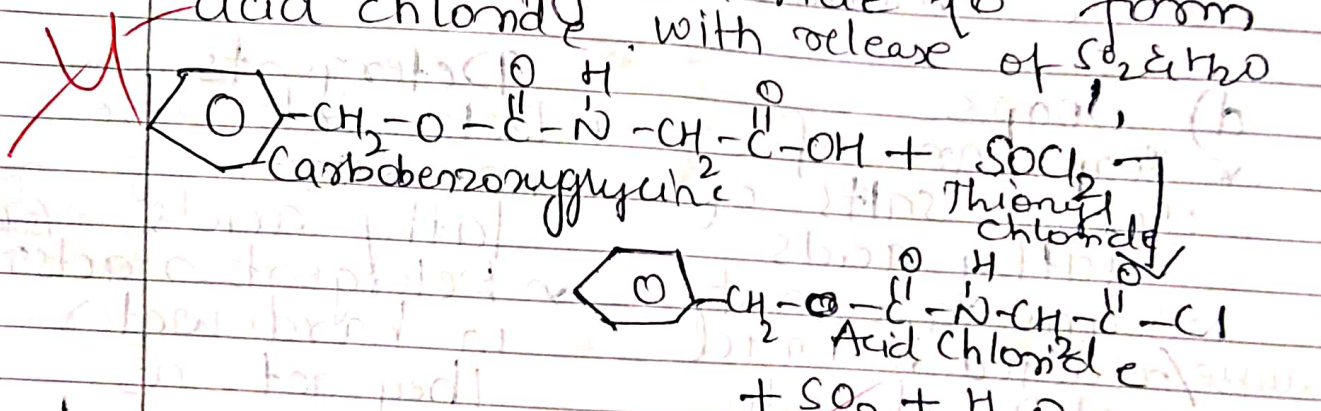
Q. No. 3

c) Synthesis of Dipeptides.

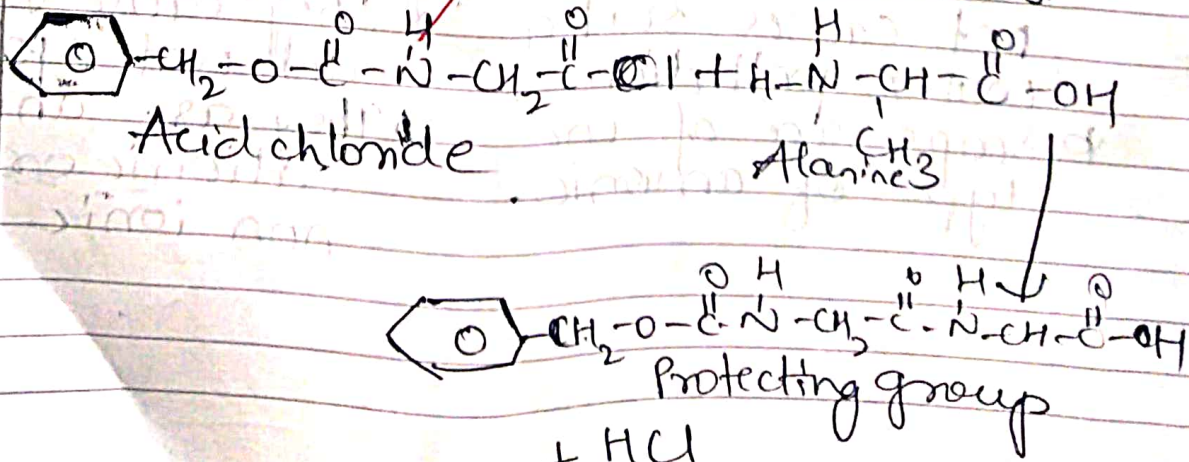
Step 1 :- Benzylchloroformate is treated with glycine to form Carbobenzoxyglycine with relase of HCl



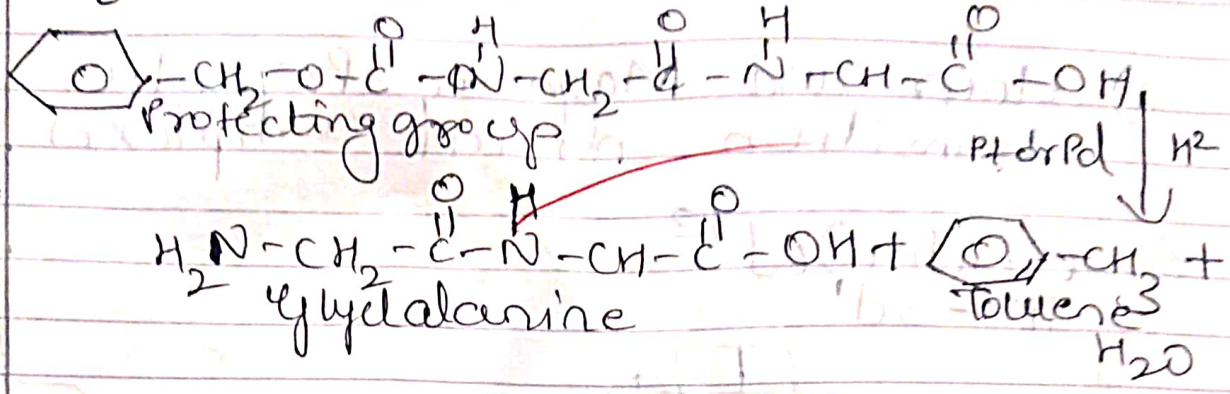
Step 2 :- Carbobenzoxyglycine is treated with thionyl chloride to form acid chloride with release of SO_2 & H_2O



Step 3 :- Acid Chloride is condensed with alanine to form protecting group.



Step 4: Protecting group is released with catalyst H_2 or Pt/Pd form glycylalanine with release of toluene



d) Manufacture of soap by Modern Process

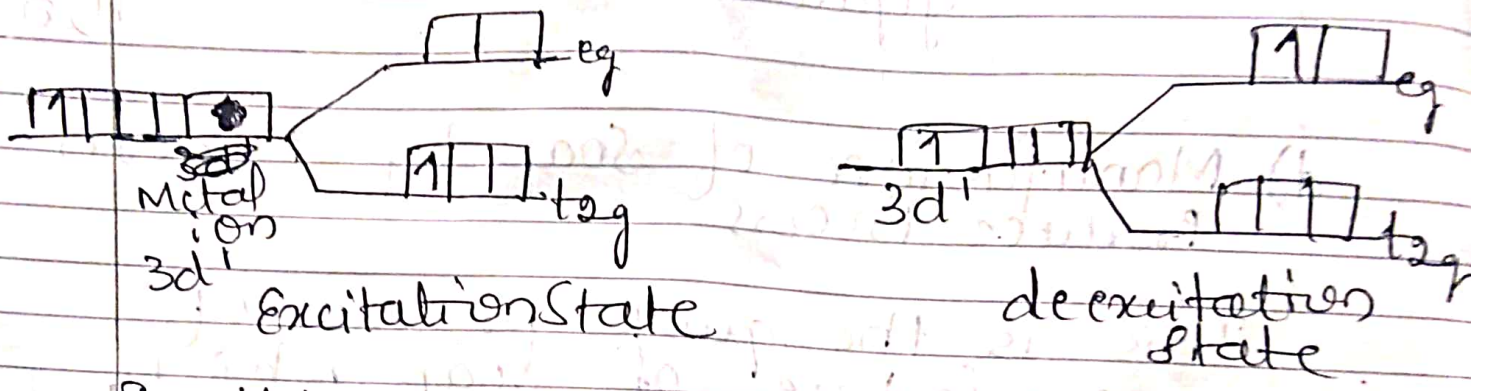
This is the quick process of manufacture of soap which takes place within 15 minutes. In this saponification reaction the fats and alkali mixture is at high temperature under pressure. During heating triglycerides to form glycerol or salts of fatty acids. After heating the mixture is cooled and separated. It washed & salted out. The separation is done by centrifugation. The separated molten soap is sprayed under vacuum chamber. Then the soap is scrapped. Then the soap is sent under the vacuum having 2 plodders. Then plodder soap is perfumed, set and it comes out as bars. And latter it is cut into shapes and is formed.

Advantages are ~~less~~ speed, economy of space, fuel etc.

a) Colour and Magnetic Properties of transition metal complexes.

Eg: $[Ti(H_2O)_6]^{+3}$

$Ti^{+3} - 3d^1$



* In this excitation of electrons from lower energy level to higher energy level and de excitation of electrons from higher energy level to lower energy level. the colour transition of metal complexes takes place.

Let us consider for high spin.

d^0 → white / colourless

d^1 → possibility of colour

d^2 → possibility of colour

d^3 → possibility of colour

d^4 → possibility of colour

d^5 → ~~white / colourless~~ possibility of colour

d^6 → possibility of colour

d^7 → possibility of colour

d^8 → possibility of colour

d^9 → possibility of colour

d^{10} → white / colourless

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For low spin
d^0 → Colourless / white
d^1 → Possibility of colour
d^2 → Possibility of colour
d^3 → Possibility of colour
d^4 → Possibility of colour
d^5 → White / colourless
d^6 → Possibility of colour
d^7 → Possibility of colour
d^8 → Possibility of colour
d^9 → Possibility of colour
d^{10} → Possibility of colour

In d^0, low spin d^5 & high spin d^{10} colour transition of metal complex is white / colourless

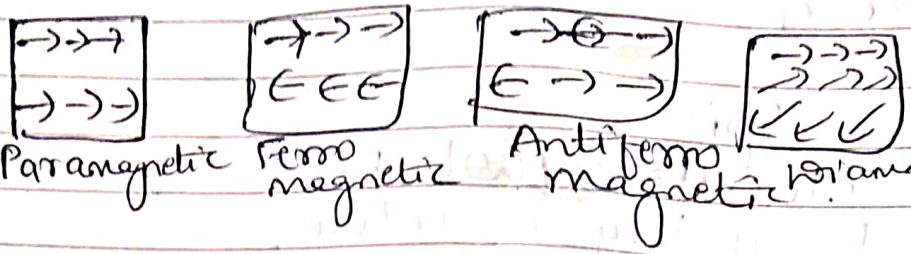
Magnetic properties of transition metal complex.

* In paramagnetic unpaired electrons are present.
* In the presence of magnetic field they get attracted to each other.
* In ferromagnetic paired electrons are present.
* In absence of magnetic field they get repelled each other.

* Magnetic moment can be calculated as

$\mu = \sqrt{n(n+2)}$ BM

n → number of electrons



* Magnetic property of metal complex is based on paramagnetic & diamagnetic property.

Q.No 1)

a) Stepwise Stability Constant

i) $M + L \underset{K_{-1}}{\overset{K_1}{\rightleftharpoons}} [ML]$ $K_1 = \frac{[ML]}{[M][L]}$

ii) $ML + L \underset{K_{-2}}{\overset{K_2}{\rightleftharpoons}} [ML_2]$ $K_2 = \frac{[ML_2]}{[ML][L]}$

For nth iii) $ML_{n-1} - L_n \underset{K_{-n}}{\overset{K_n}{\rightleftharpoons}} [ML_n]$ $K_n = \frac{[ML_n]}{[ML_{n-1}][L_n]}$

Overall Stability Constant

i) $M + L \underset{}{\overset{\beta_1}{\rightleftharpoons}} [ML]$ $\beta_1 = \frac{[ML]}{[M][L]}$

ii) $M + 2L \underset{}{\overset{\beta_2}{\rightleftharpoons}} [ML_2]$ $\beta_2 = \frac{[ML_2]}{[M][2L]}$

For nth $M_n + nL \underset{}{\overset{\beta_n}{\rightleftharpoons}} [ML_n]$ $\beta_n = \frac{[ML_n]}{[M_n][nL]}$

$\log\beta = \sum_{i=1}^{n} \log K_i$

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S. B. Arts & K.C.P. Science College, VIJAYAPUR- 586 103.

ASSIGNMENT

For B.A./ B.Sc. VI Semester

2023 - 2024

Name of the Student Vijaykumar S. Mudabhavi

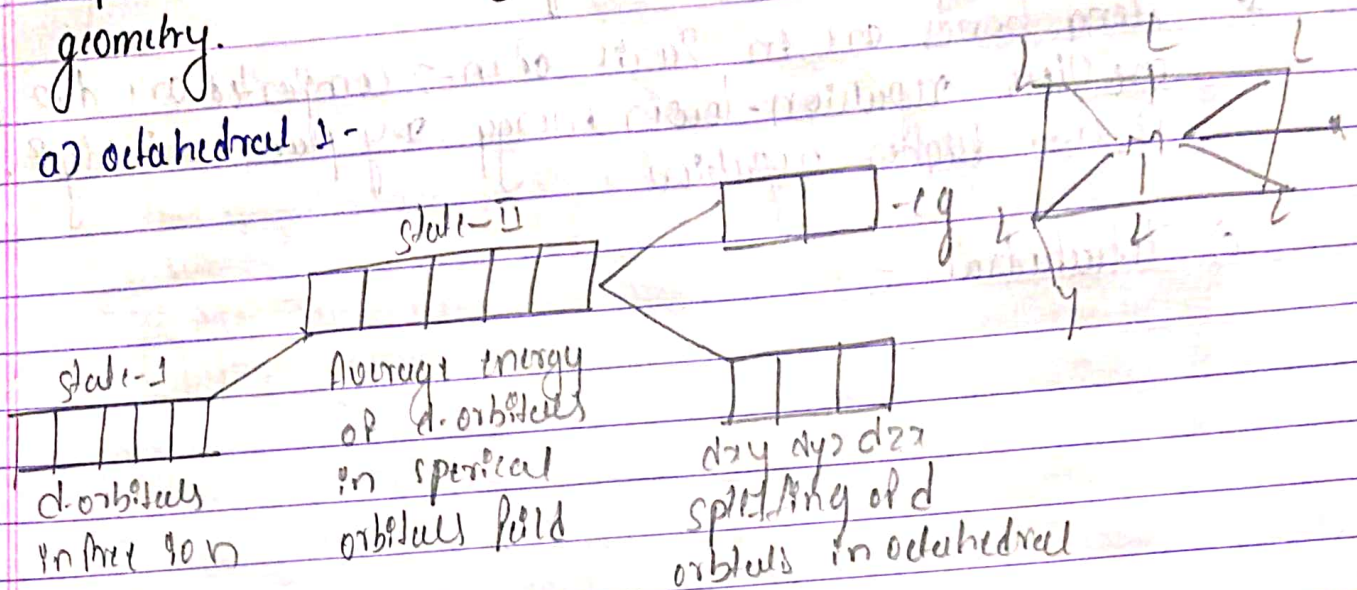
Roll No. _____ R.C.U. Seat No. VISCM21S0199

Subject Chemistry MSc - paper-I

Assignment No.	Date	Marks Assigned	Marks Obtained	Name and Signature of Teacher	Remarks
1	12/8/24	5		SV	
2					
3					
4					

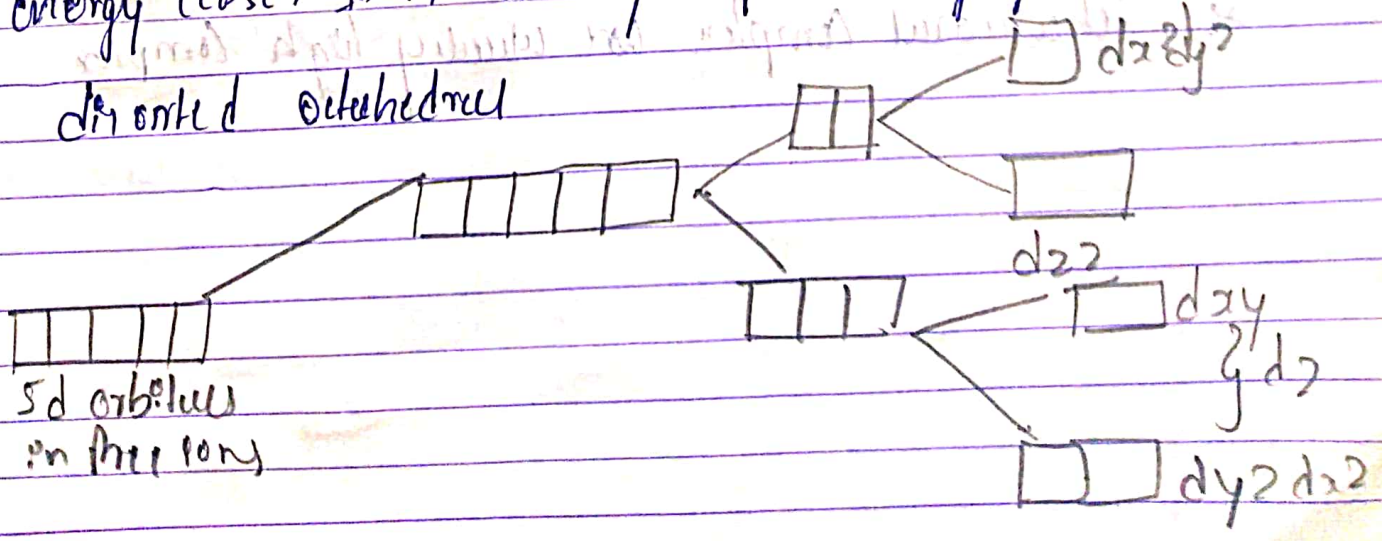
① Explain the splitting of d-orbitals in the following geometry.

→ a) octahedral :-



* the d-orbitals in octahedral split into two orbitals upper eg dx^2-y^2 and dz^2 and lower dxy, dxz and dyz energy levels
* dx^2-y^2 and dz^2 orbitals have along the principle axis where dxy, dxz, dyz between principle axis
* As a result the repulsive b/w ligands of the dx^2-y^2 and dz^2 orbitals have greater than dxy, dxz, dx^2 orbitals lower than those of dx^2y^2 and dz^2 orbitals
* The diff^e energy b/w the set of d-orbitals is called crystal field splitting energy or crystal field stabilization energy (CFSE) It is usually represent by symbol.

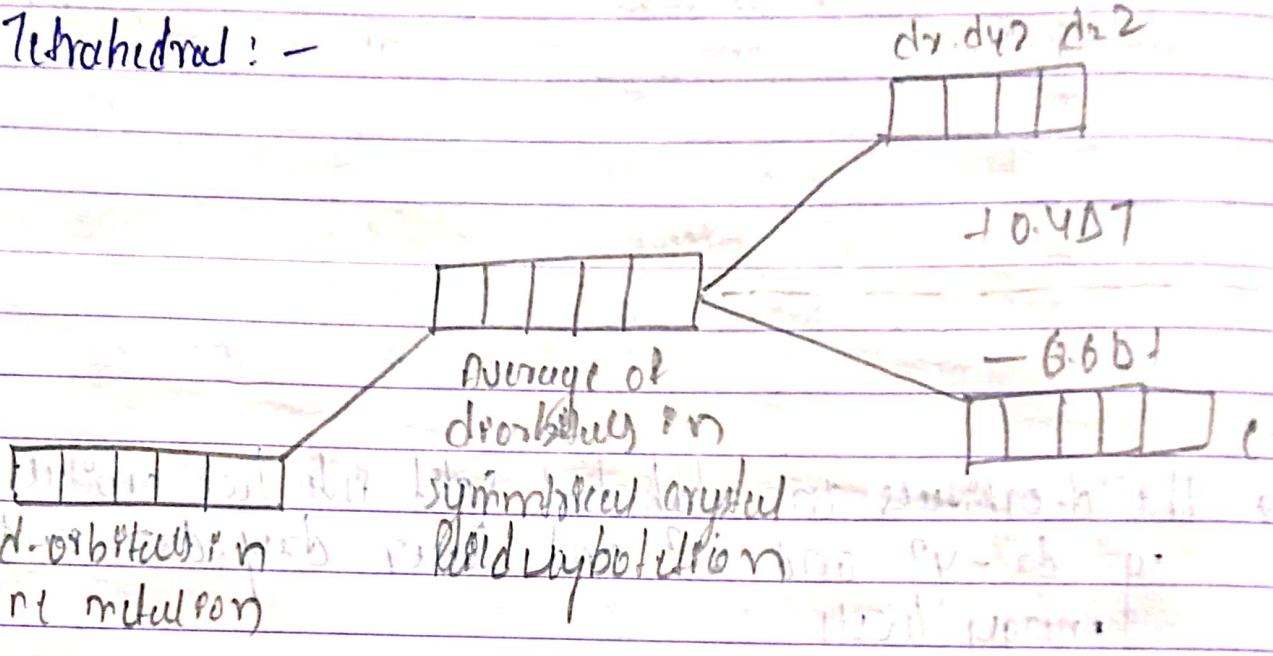
b) distorted octahedral



* In distorted octahedral → 4 long bonds and 2 short bonds

* 2 long bonds are in z axis of m-2 compared are d_{x^2} are one less repulsion - lower energy x-y plane $d_{x^2}+d_{y^2}$ - It causes higher repulsion

c) Tetrahedral :-



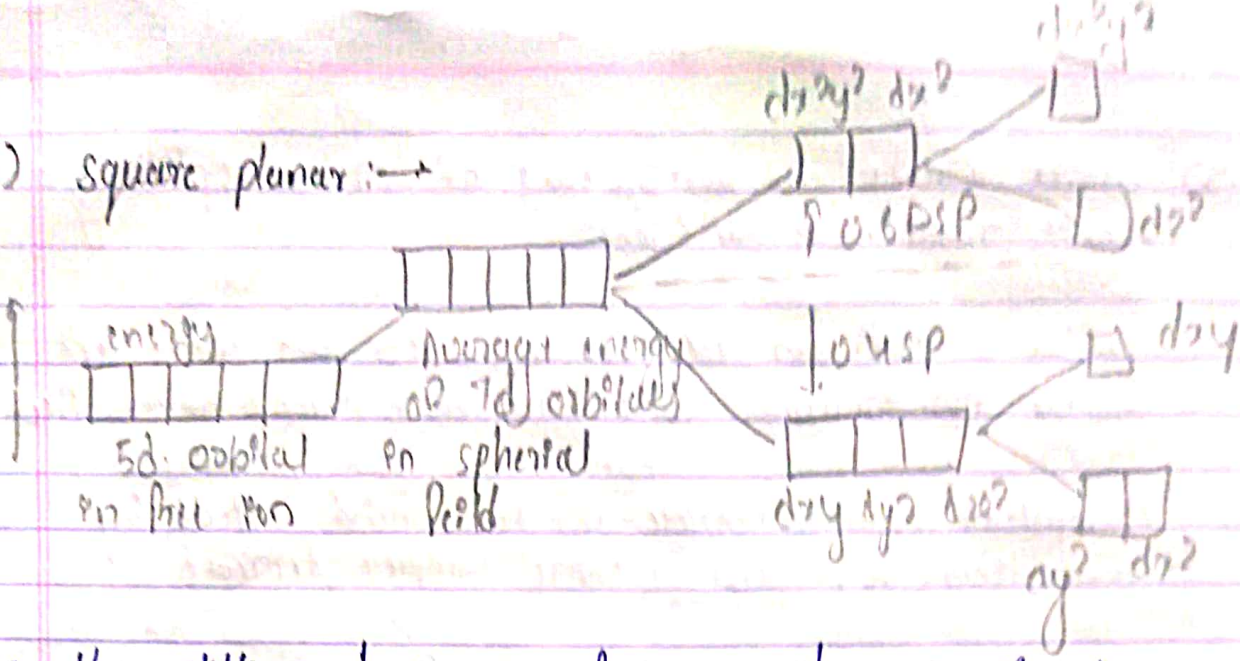
* the d-orbitals also split into two different set of energy levels

* Higher t_2 set split into three sets dxy, dyz, d_{x_2} lower set split into two sets $dx^2.y^2$ dz^2

* the tetrahedral field E_2 set has higher energy the magnitude part is considerly less than the in octahedral field.

* Tetrahedral complex are usually high complex.

d) Square planar :→

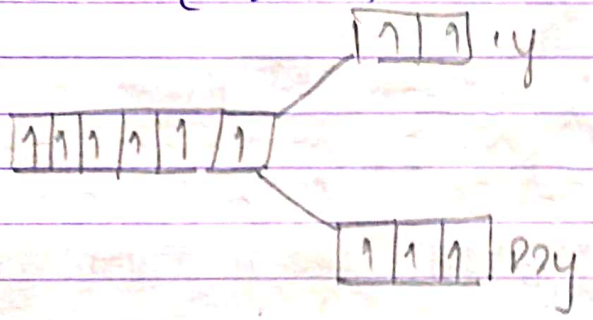


* The splitting diagram of square planar complex is obtained from splitting diagram of octahedral complex by removing two ligands which are oriented along z-axes
* Here in square planar complexes the five d-orbitals are split in this way

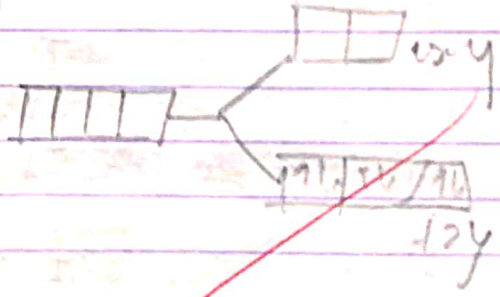
Their energy is $dx^2-y^2 > dxy > dz^2 > dxy > dzx$

2) Calculate CFSE for

a)



b)



CFSE =
$= [(0.4) \times (2) + 0.6 (y)] \Delta O$
$= [-0.4 \times 3 + 0.6 \times 2] \Delta O$
$= [-1.2 + 1.2] \Delta O$
$= 0 \Delta O$ //

CFSE
$= (-0.4) x + 0.6(y)$
$= [-0.4 \times 6 + 0.4(4)] \Delta O$
$= [-2 + 0] \Delta O$
$= -2.4 \Delta O$

3) write a note an consquence of crystal splitting on ionic radii of Mn^{+2} ions.

→ $Cu^{2+} \longrightarrow Zn^{+2}$ For free metal, when we were left tonight in periodic table the ionic radii decrease But

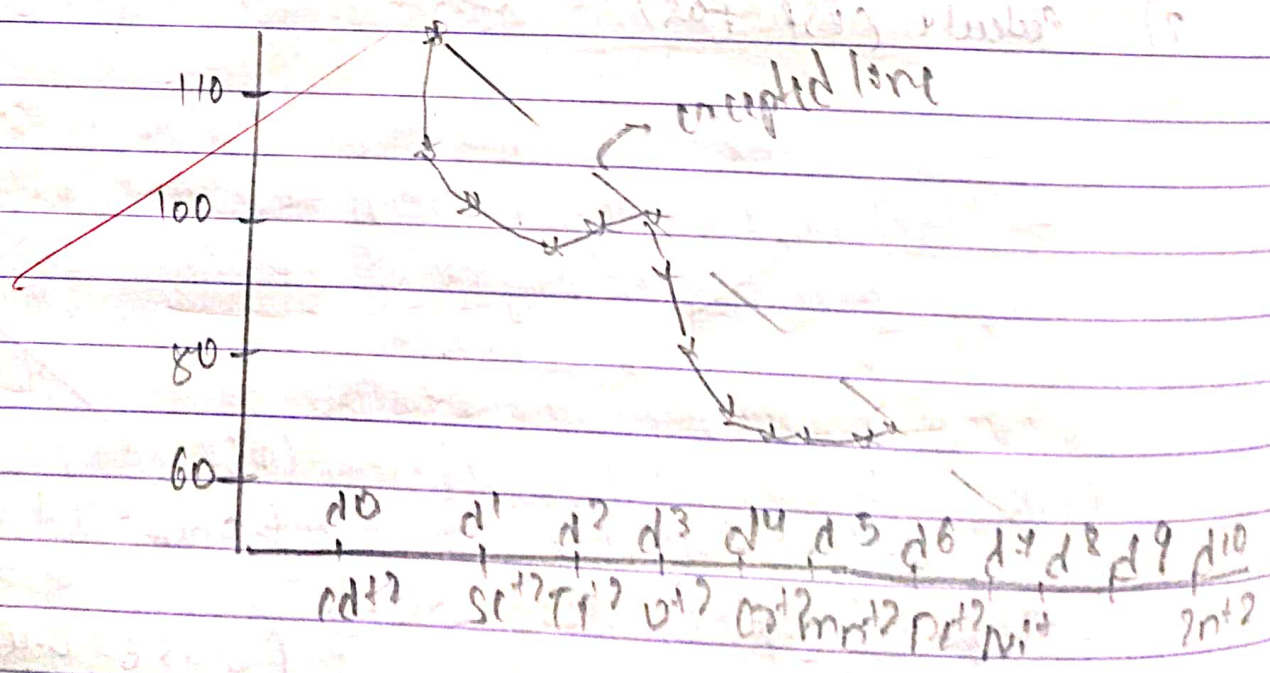
i) nuclear charge increase ii) Perr shield effects by d-es hence for them of entire complex decrease

i) Ionic radii of high spin (weak field

ii) d^1, d^2, d^3, (high spin and low spin)

iii) d^4 and d^5 (high spin)

4) If For d^4 (low spin



4) Explain the factors affecting Δo / 10Dq?

→ 1) Nature of metal.

a) Different changes on cation of same metal ion

ex:→ $[Fe(H_2O)_6]^{+3}$ $[Fe(H_2O)_6]^{+2}$

Δo = 14.000cm⁻¹ Δo = 11.00cm⁻¹

b) Same changes on cation of different metal ion

ex:→ $[Co(H_2O)]^{+2}$ → Δo = 16.000cm⁻¹

$[Ni(H_2O)_6]^{+2}$ → Δo = 21.000cm⁻¹

2) Nature of ligand

→ The magnitude of Δo depends on ligands

→ Some of the ligands are stable able to split Δo i.e more are called strong field ligand

→ Some of the ligands are able to split Δo in less power are called as weak field ligands

→ $I^- < Br < Cl < F^- < H_2O < NH_3 < NO < CN^-$

→ A square planner - ligands = 08 = Δo = 1.25 Repulsion

→ A octahedral → ligands = 06 = Δo = 1 (i.e. repulsion)

→ A tetrahedral → ligands = 04 = Δo = 0.45 (i.e. repulsion

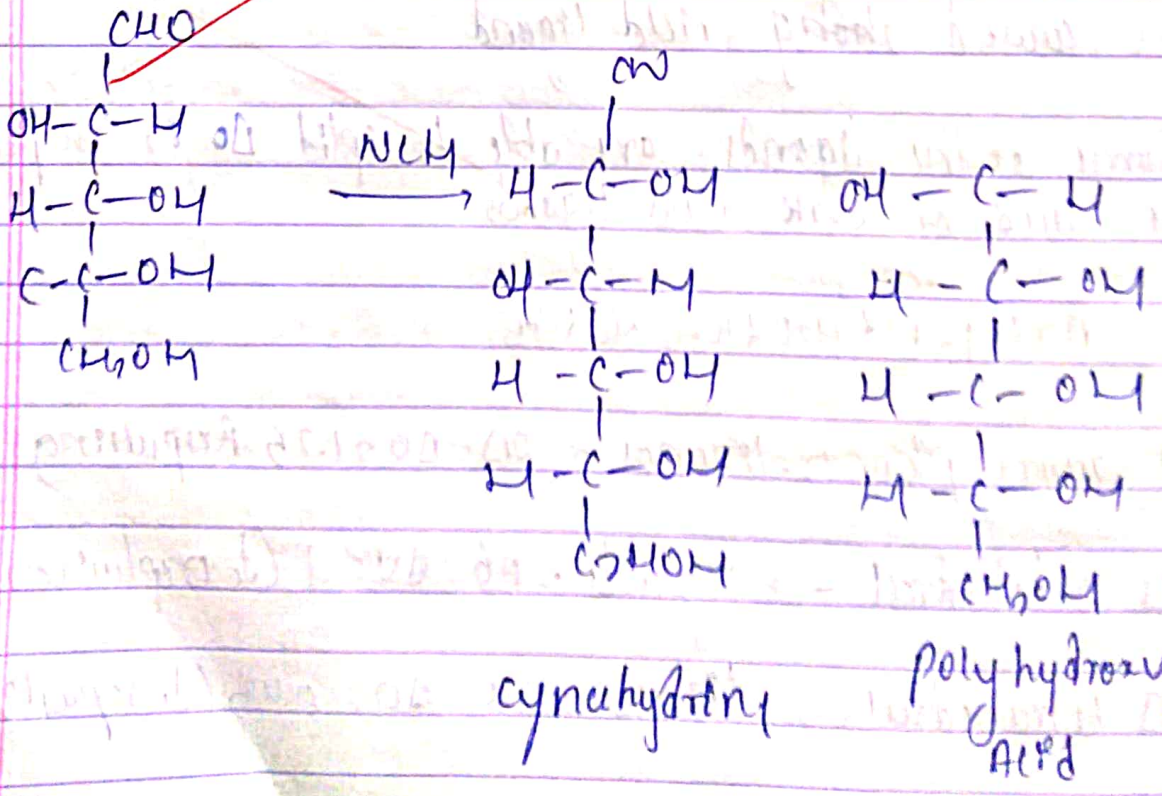
Explain the following

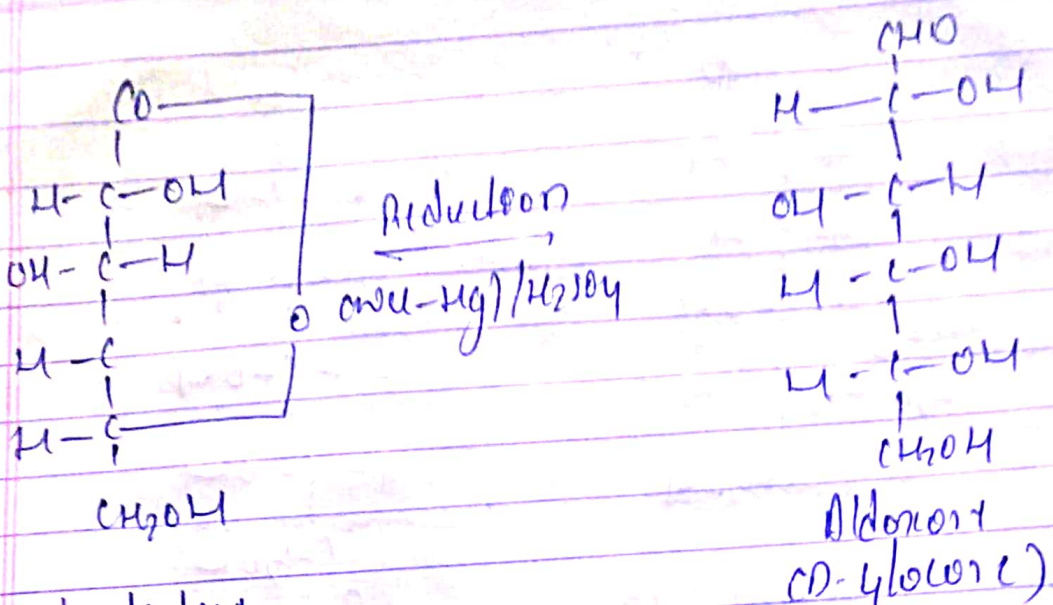
D) Kiliani's synthesis

Aldose chain may be lengthened by one carbon by the reaction sequence known as Kiliani's synthesis

ex:- Aldopentose called be converted into Aldohexose

The aldopentose is reated with hydrogen cyanide and cyanohydrin so obtained is hydrolysed with Barium. The latter contains the polyhydroxy acid the with one more carbon atom than the original sugar, they lactone of it. The is obtained the evaporating the soln to dryness and lactone is then reduced by sodium amalgam in acid soln to give the aldehyde group and next higher aldose



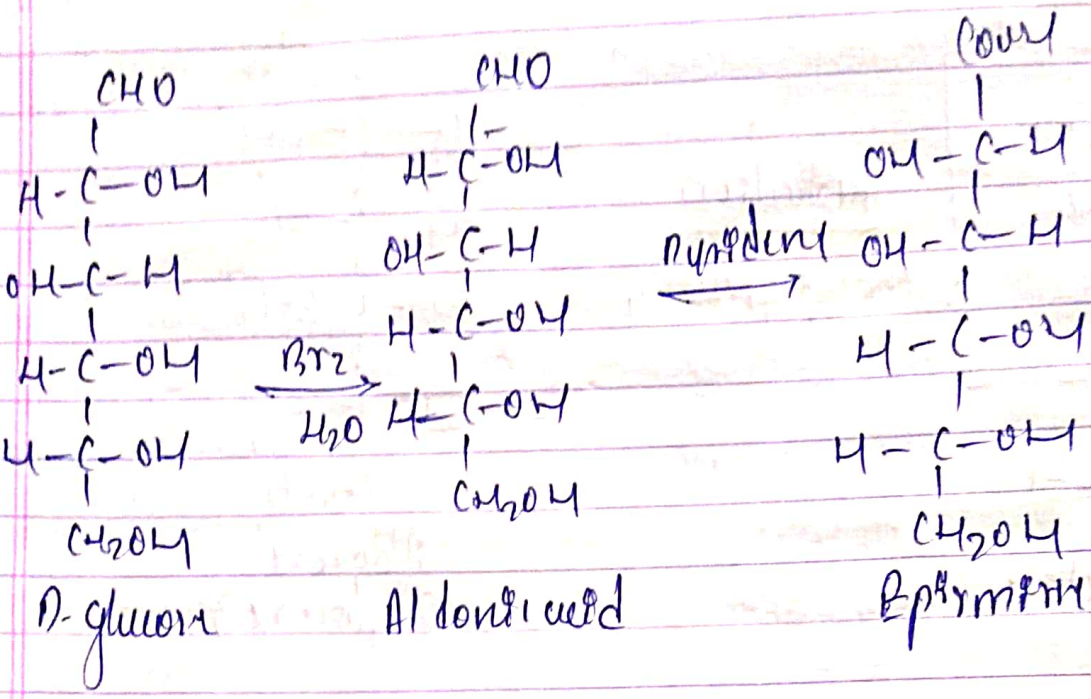


2) Epimerisation:→

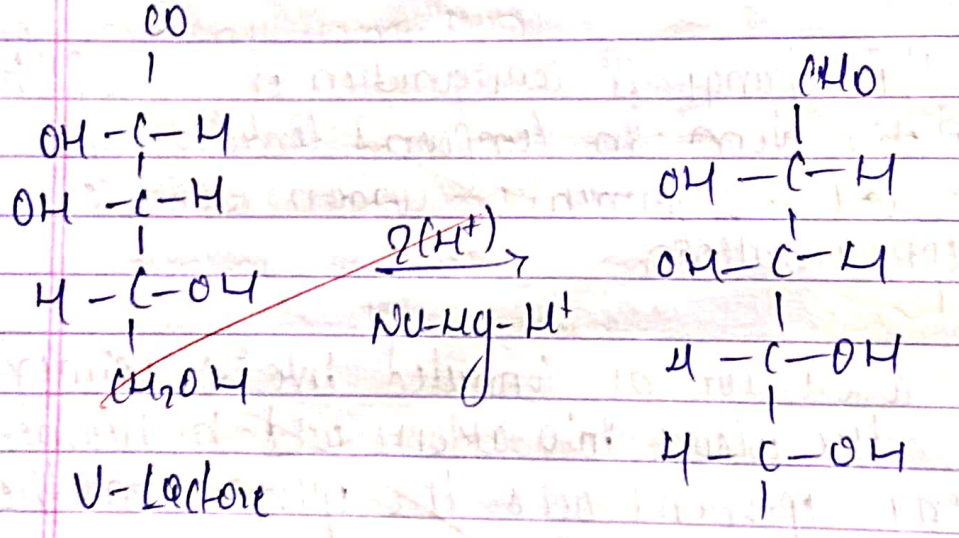
The change of configuration of one of the Asymmetric carbon atoms in Compound containing two or more asymmetric carbon atoms is known as epimerisation

An aldose can be converted into its epimer as follow oxidise the aldose into aldonic acid by treatment with pyridine epimers acid the epimer and then seprated Reduction of the epimers

For an- d-glucose may be converted for its epimer as hermon follow.



D-glucose Aldonic acid Epimeric aldonic



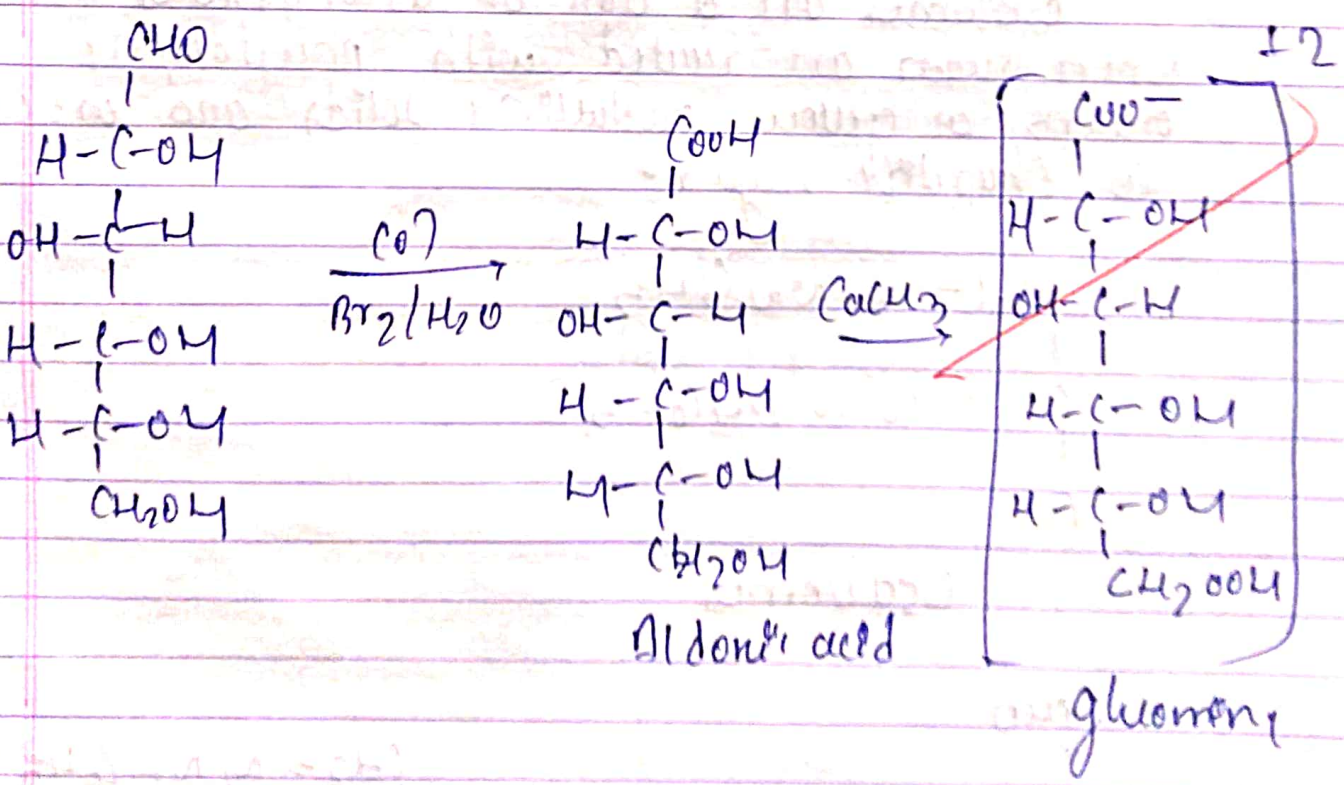
D-Lactone

D-manose

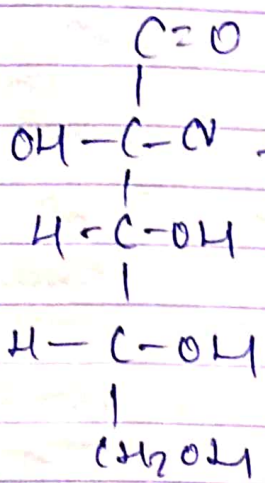
3) Ruff's Degradation →

Aldose chain may be shortened by one carbon from the aldehyde end by the reaction sequence known as Ruff's degradation

In this method the aldose is first oxidised with bromine water to give corresponding aldonic acid the aldonic acid is next treated with calcium carbonate to give the calcium salt of the give the calcium salt to the acid. the treatment of calculating salt with Fenton reagent give an aldose containing one carbon atom less than the starting aldose

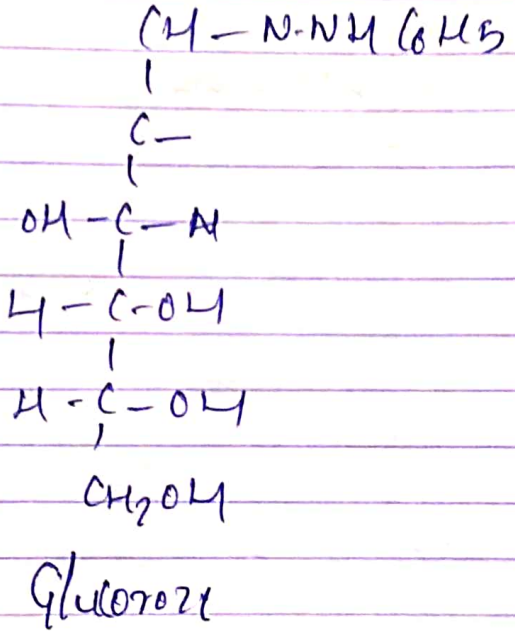


$C_6H_5NHNH_2$ ⟶



+ $C_6H_5NHNH_2$ + NH_3

$C_6H_5NHNH_2$ ⟶ $-H_2O$



Glucosazone