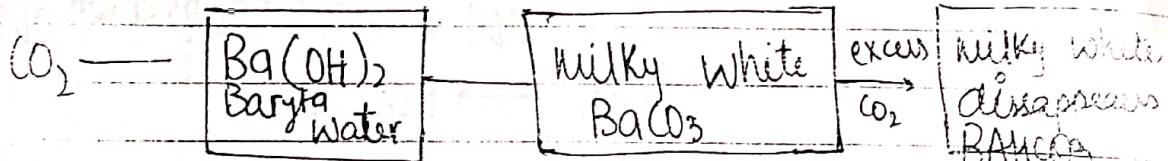
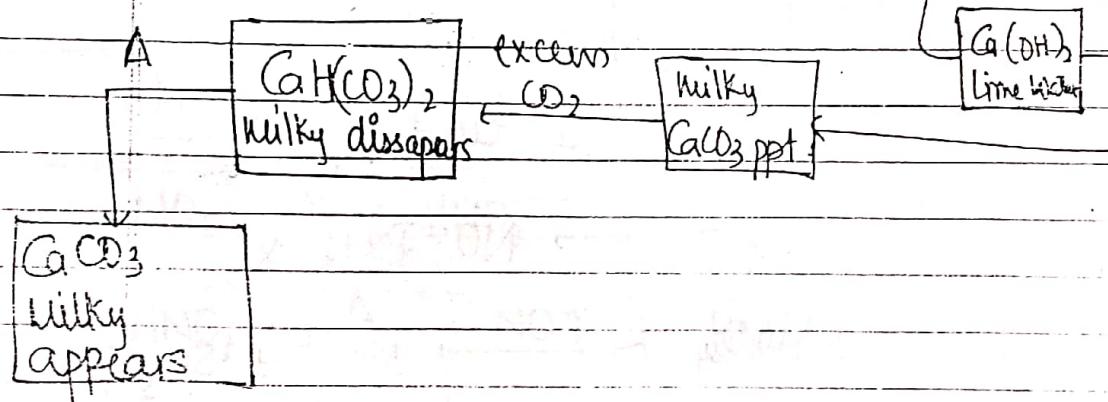
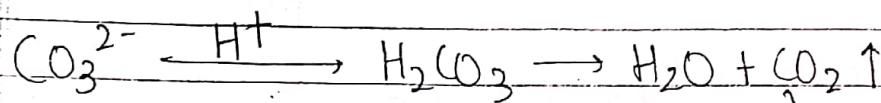


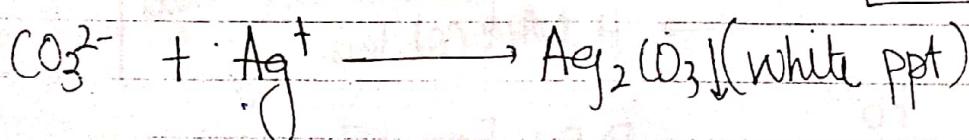
QUALITATIVE ANALYSIS

dil Acid \rightarrow gas CH_3COO^- , CO_3^{2-} , SO_3^{2-} , S^{2-} , NO_2^-

Anion (conc Acid, gas) $\times^- \left[\text{Cl}^-, \text{Br}^-, \text{I}^- \right]$, NO_3^-
individual SO_4^{2-} , PO_4^{3-}

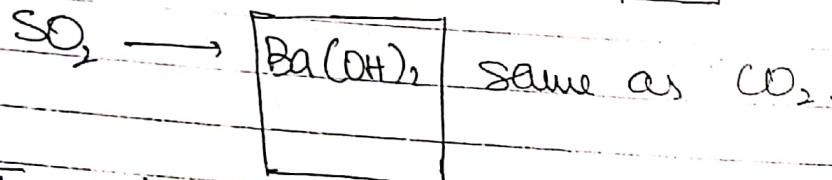
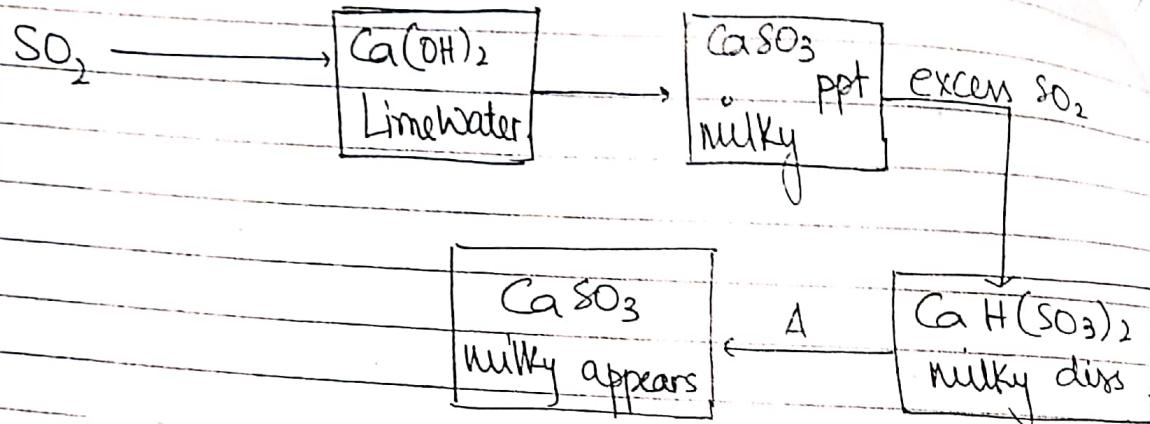
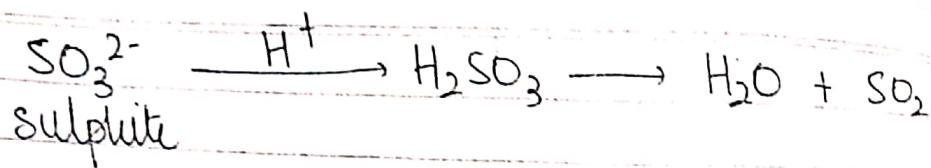


BaCO_3
white ppt

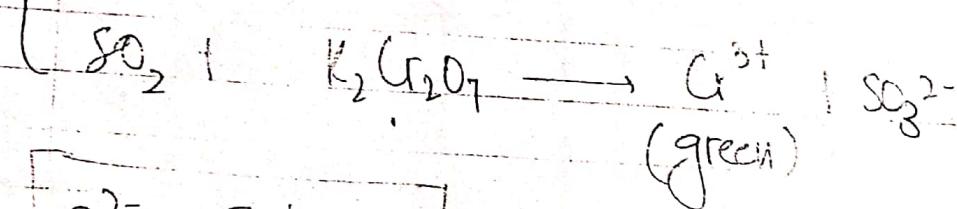
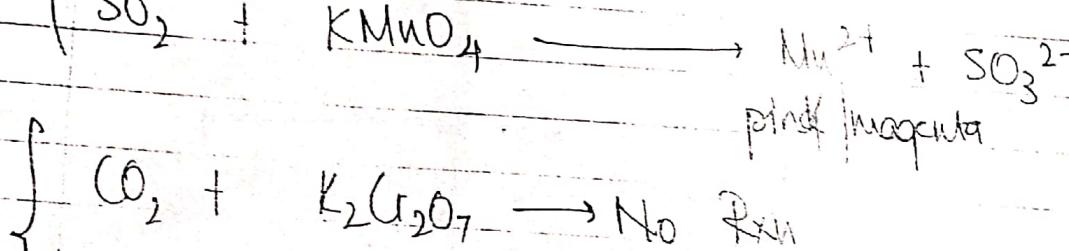
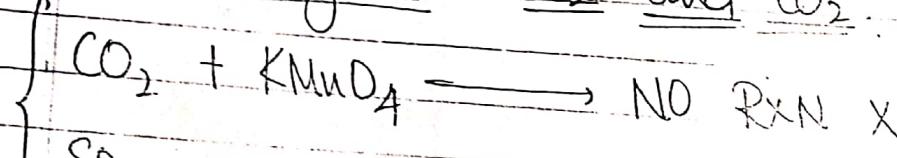


V/V Glycerin // Acetone // HgCl₂

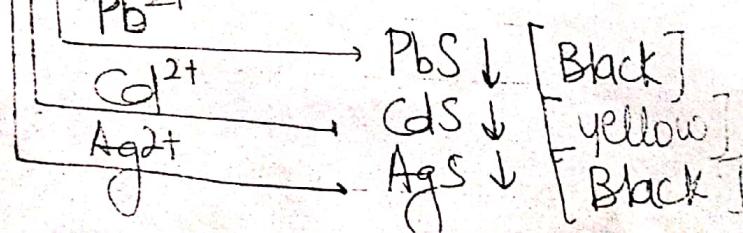
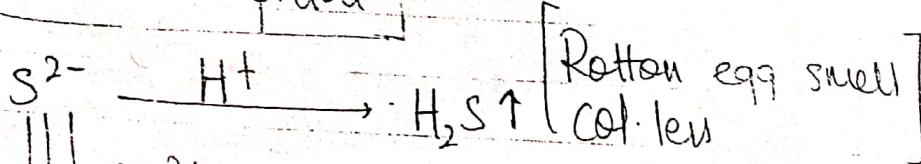
Na_2S



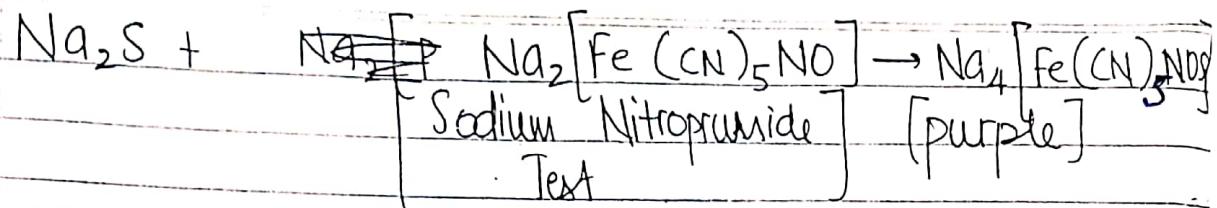
To Distinguish SO_2 and CO_2 .



S^{2-} Sulphide

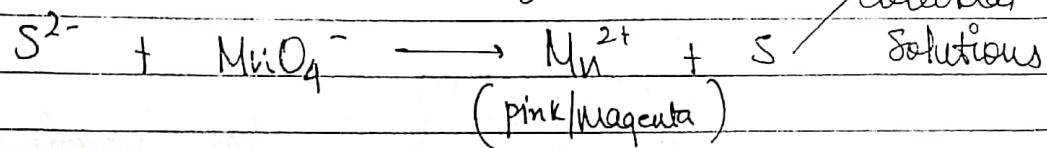
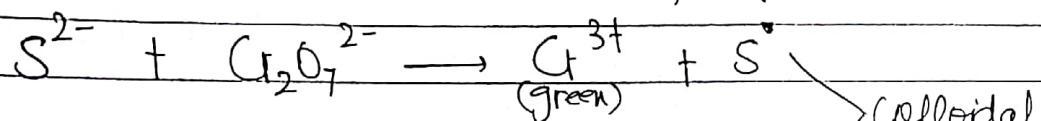


(2)

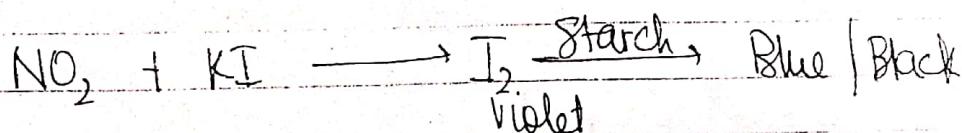
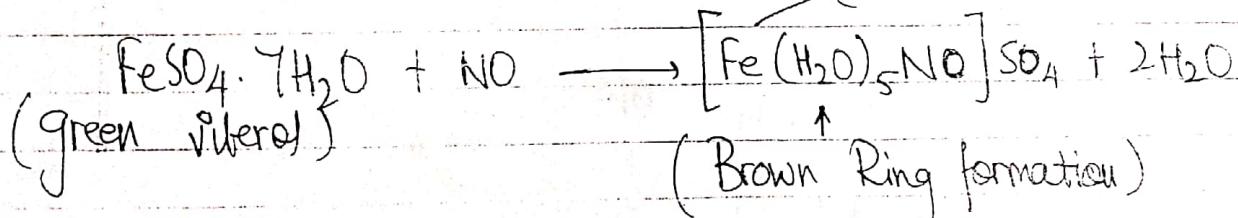
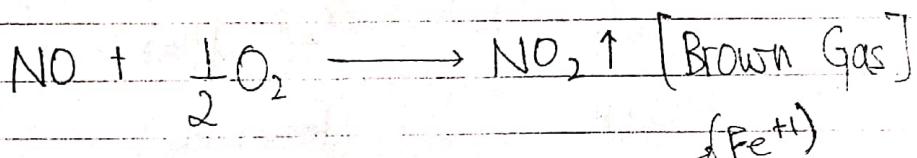
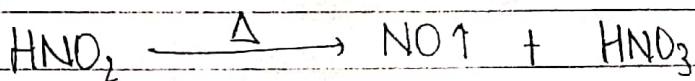
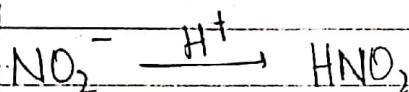


$\boxed{\text{S} \rightarrow}$ Oxidation State $\rightarrow [-2 \text{ to } 6]$

Wt S @ -2 (H_2S) \rightarrow Reducing Agent

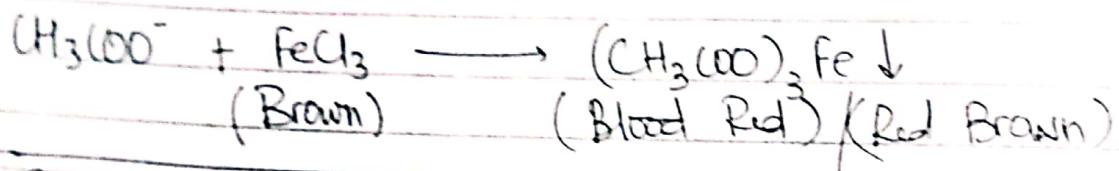
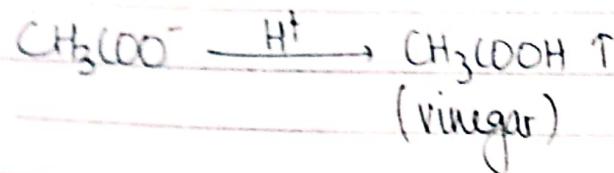
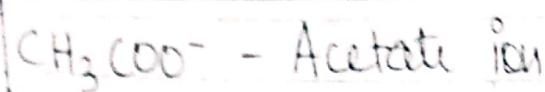


$\boxed{\text{NO}_2^-}$, Nitrite

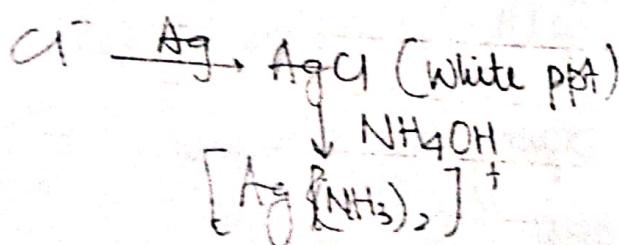
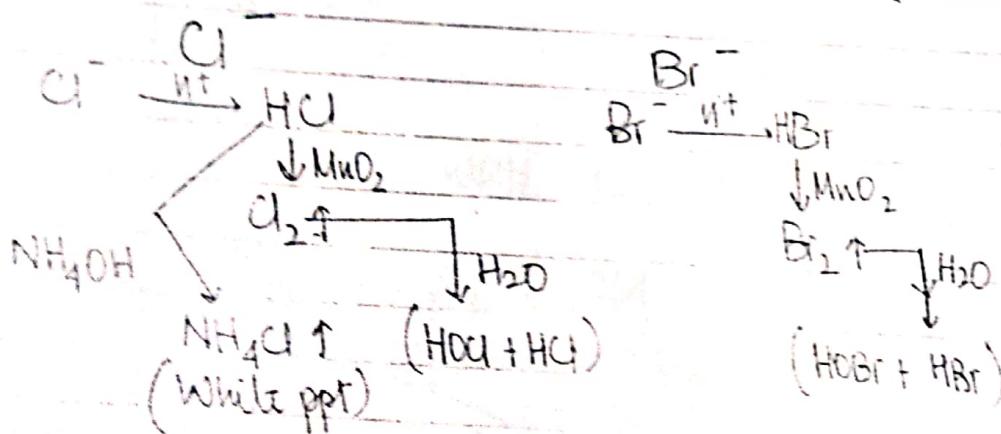
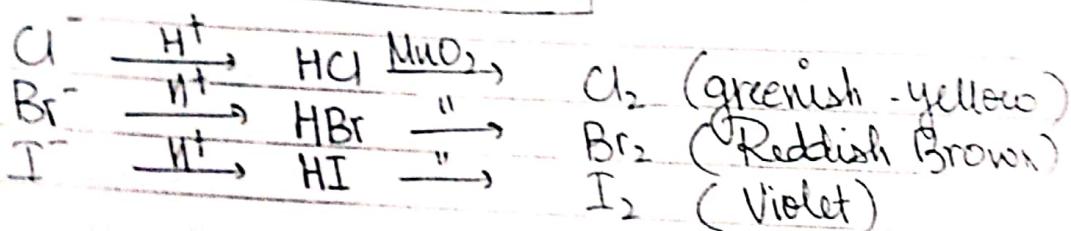


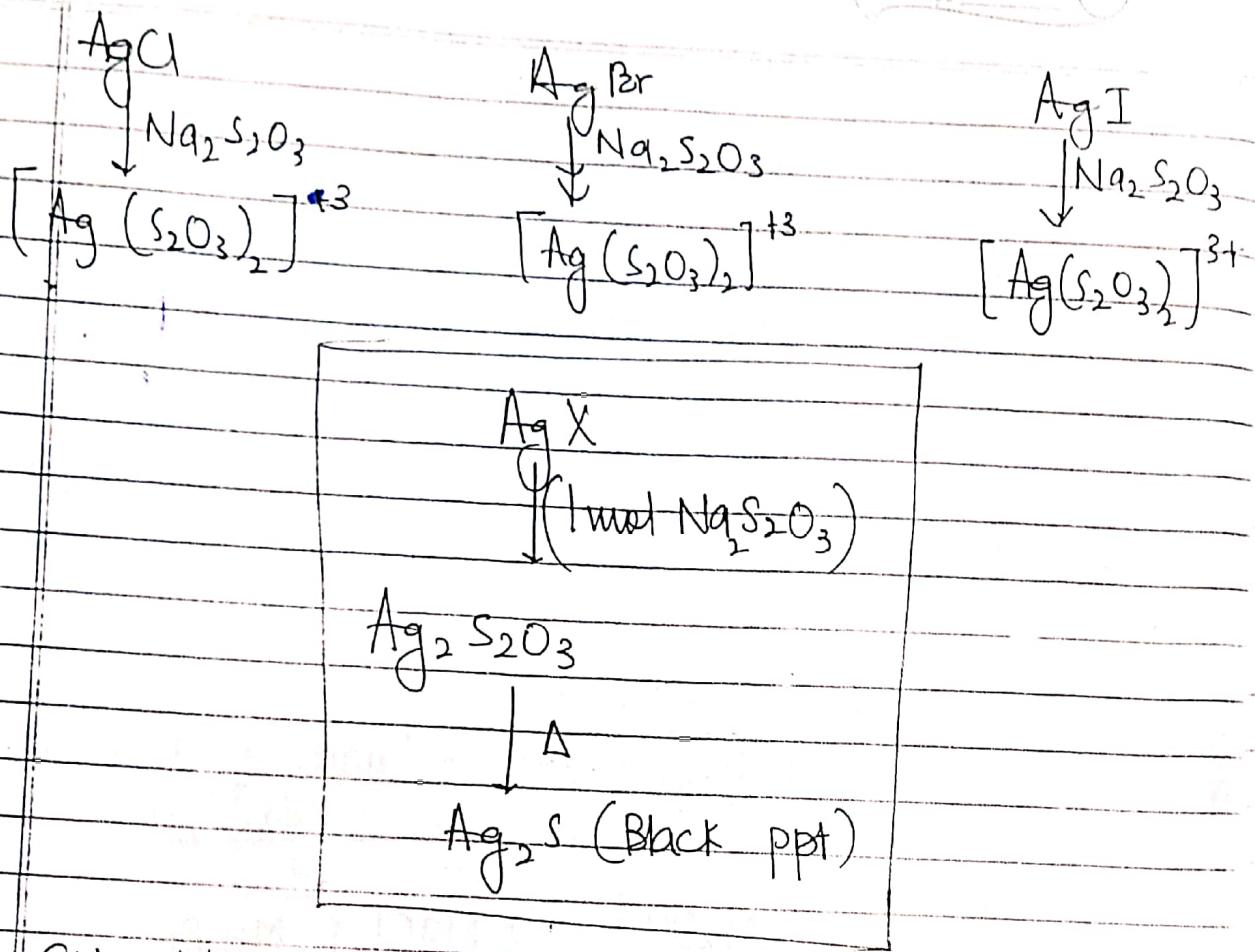
(3)

(4)

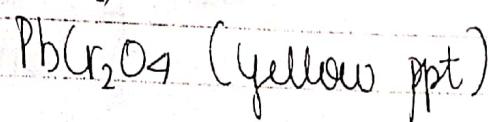
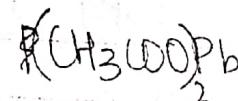
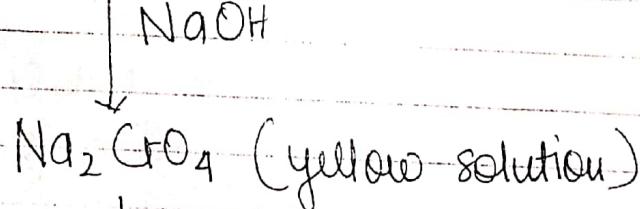
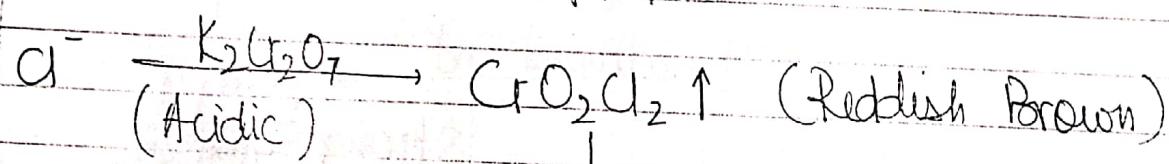


CONCENTRATED Acid





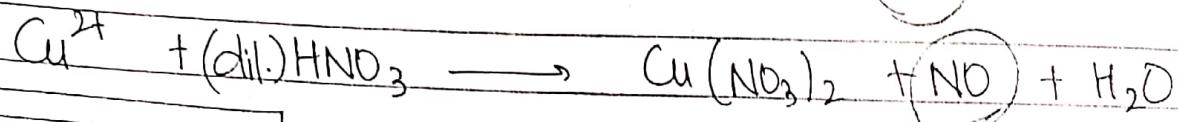
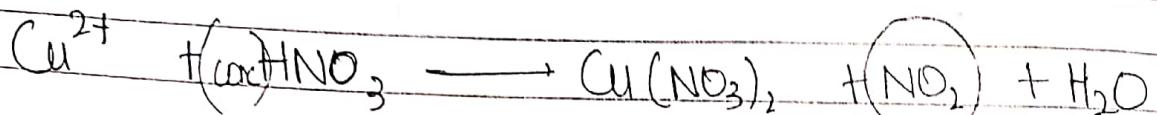
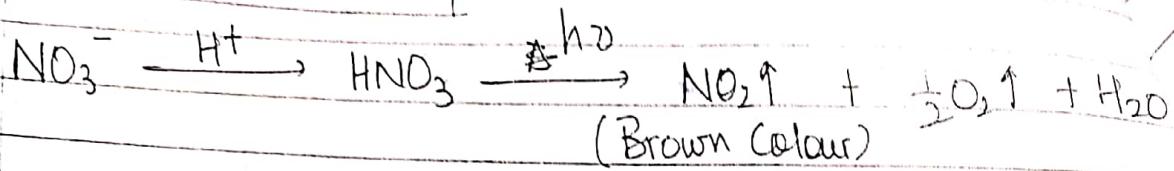
CHROMYL CHLORIDE TEST:



Chlorides of
 $(\text{Ag}, \text{Hg}, \text{Sn}, \text{Pb}, \text{Sb})$ don't show Chromyl Chloride

(5)

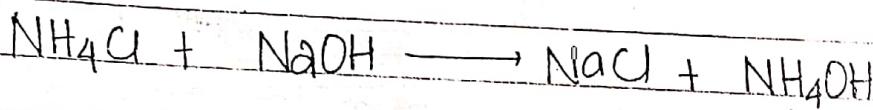
NITRATE: NO_3^-



CATIONS:

GROUP ZERO:

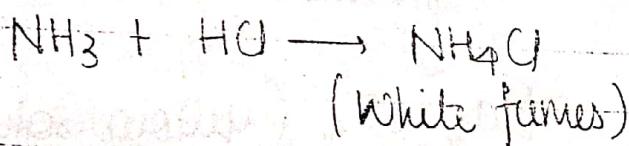
Cations: NH_4^+



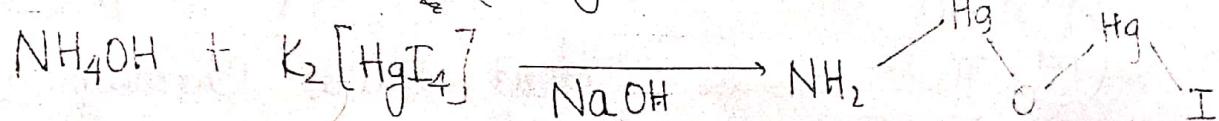
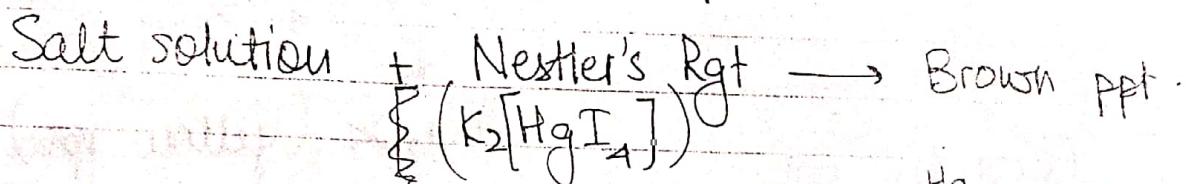
HO , dipped Rod

$\text{NH}_3 + \text{H}_2\text{O}$

Strong Ammoniacal smell

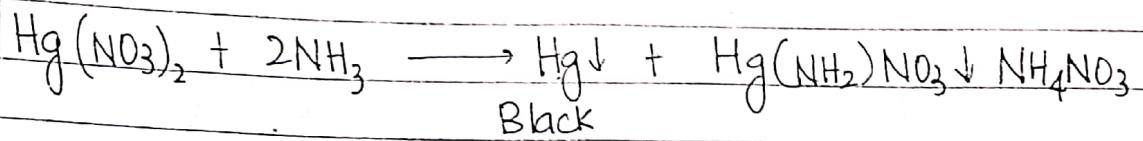
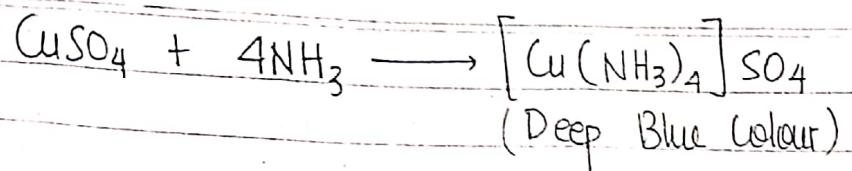


CONFIRMATORY FOR ZERO GROUP:



Iodide as Mullen Base
(Brown ppt.)

(6)



GROUP 1 : CATIONS

Cations: Ag^+ , Pb^{2+}

GROUP Reagents: dil. HCl

(Salt solution) $\xrightarrow{\text{dil HCl}}$ $\text{AgCl} \downarrow / \text{PbCl}_2 \downarrow$ (White ppt)
 $\text{Ag}^+ / \text{Pb}^{2+}$

Salt Solution

\downarrow dil HCl

$\text{AgCl} \downarrow$ (white)

$\text{PbCl}_2 \downarrow$ (white)

\downarrow Hot water

\downarrow Hot water

NH_4OH
(Ammonia
solution)

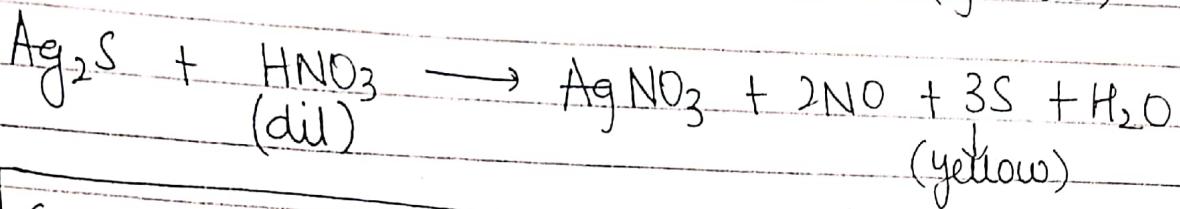
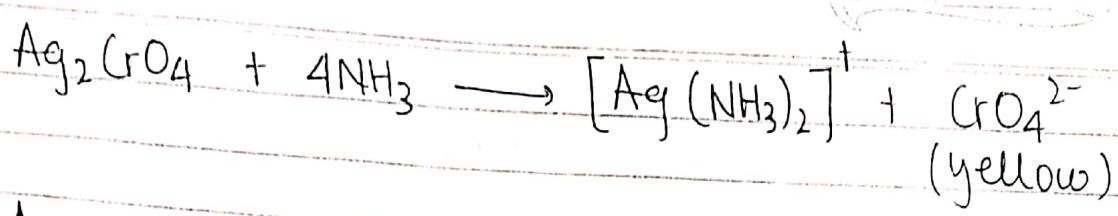
(ppt does not
dissolve)

(ppt dissolves
completely)

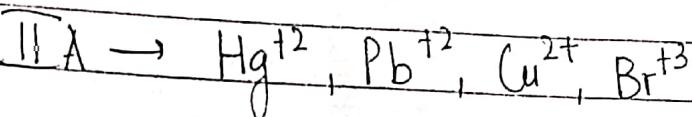
$[\text{Ag}(\text{NH}_3)_2]^+$ (ppt dissolves)

(?)

	Action of NH_3	excess NH_3	NaOH	exc Na_2O_2
Pb^{2+}	$\text{Pb}(\text{OH})_2 \downarrow$ white ppt	No change (White ppt)	$\text{Pb}(\text{OH})_2$ white ppt	$\text{Na}_2\text{Pb}(\text{OH})_2$
Ag^+	$\text{AgOH} \downarrow$ $\text{Ag}_2\text{O} \downarrow$ (brown ppt)	$(\text{Ag}[\text{NH}_3])^+$ Brown ppt dissolves	$\text{AgOH} \downarrow$ $\text{Ag}_2\text{O} \downarrow$ (brown ppt)	No change
	KI	excess KI	NaS_2O_3	NaCN
Pb^{2+}	$\text{PbI}_2 \downarrow$ yellow ppt	$\text{K}_2[\text{PbI}_4]$ ppt diss.	$\text{PbS}_2\text{O}_3 \downarrow$ (white)	$\text{Pb}(\text{N}),$ (white)
Ag^+	$\text{AgI} \downarrow$ yellow ppt	No Change	$\text{Ag}_2\text{S}_2\text{O}_3 \downarrow$ (white)	$\text{Ag}(\text{N})$ (white)
Pb^{2+}	No change	Na_2CO_3	$\text{Na}_2[\text{Pb}_2\text{O}_4]$	H_2S gas
Ag^+	$[\text{Ag}(\text{CN})_2]$	$\text{Ag}_2\text{CO}_3 \downarrow$ (yellow ppt)	$\text{Ag}_2[\text{CrO}_4]$ (Red ppt)	Ag_2S (Black)

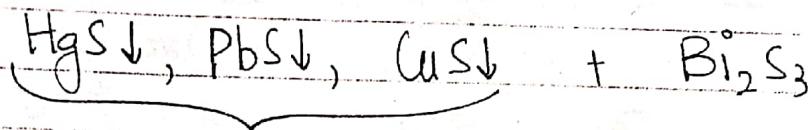
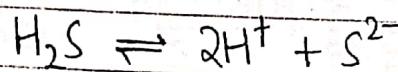


GROUP 2 : CATIONS



Pb^{+2} is kept in both groups because, PbCl_2 is partially soluble in GR 1 but fully soluble in GR 2.

GROUP REAGENT: Dil HCl + H_2S



Black ppt

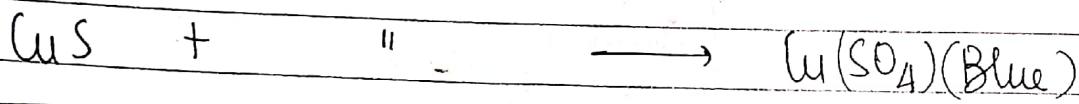
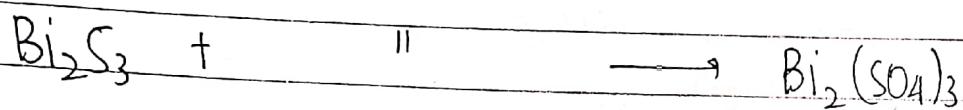
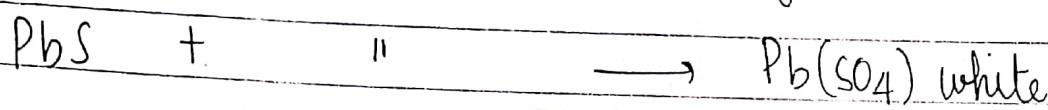
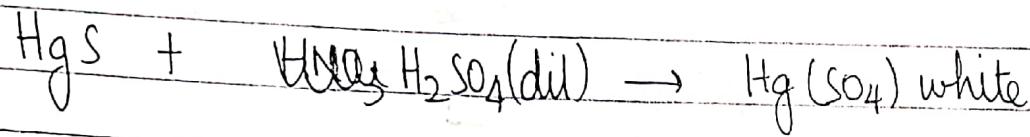
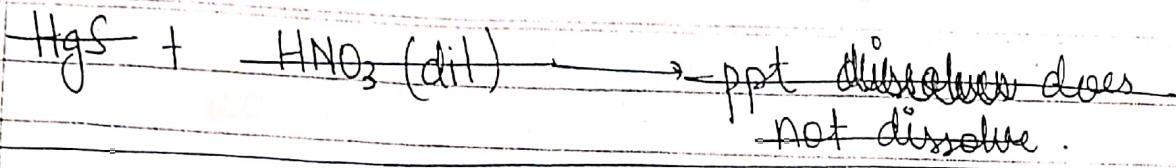
Blackish Brown ppt

K_{sp} of GR 2 sulphides is low hence $[\text{S}^{2-}]$ should be low.

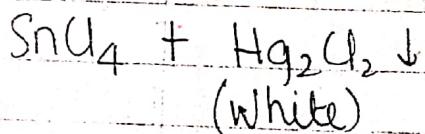
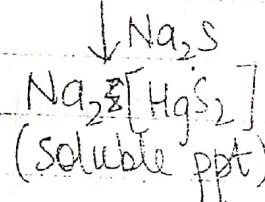
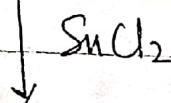
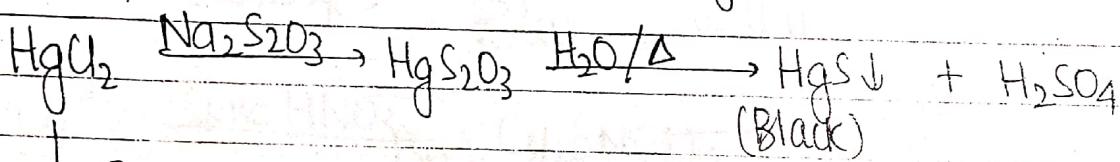
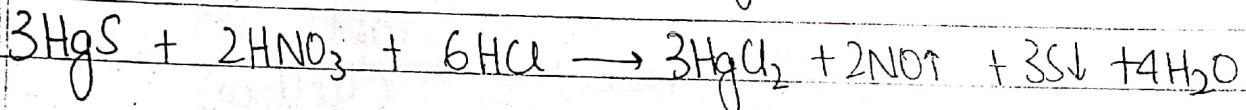
HCl is used to arrest the dissociation of H_2S due to common ion effect experienced by $[\text{H}^+]$
 $\therefore \text{S}^-$ conc obtained is low.

YAS → Yellow Ammonium Sulphide $[(\text{NH}_4)_2\text{S}_x]$
 used to distinguish II A from II B.

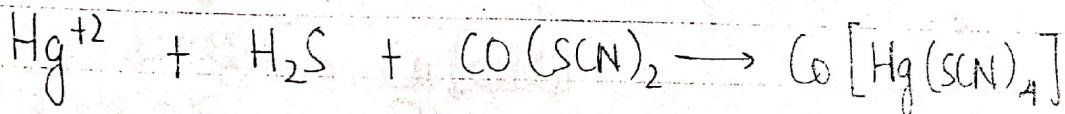
PPT of IIB dissolves divalent ions in YAS, and TIA does not.

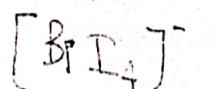
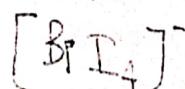
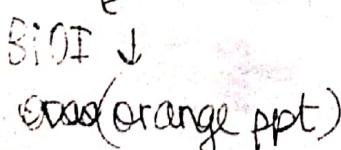
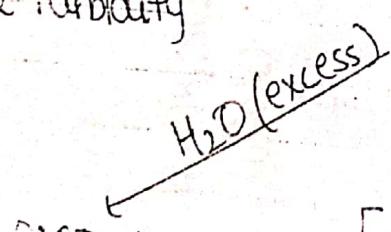
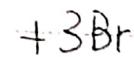
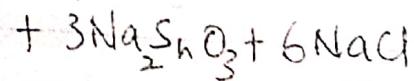
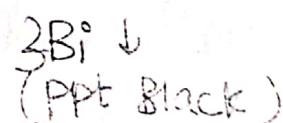
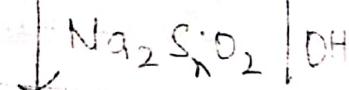
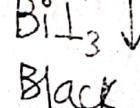
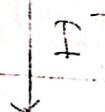
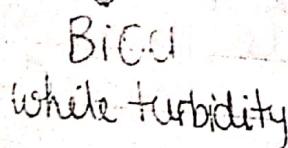
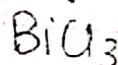
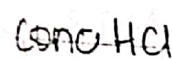
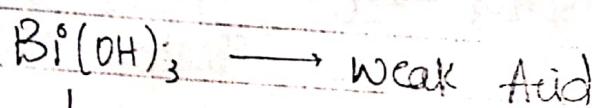
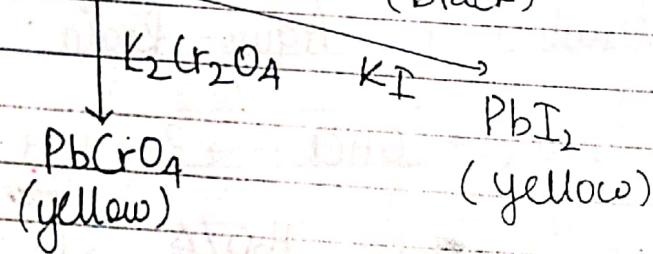
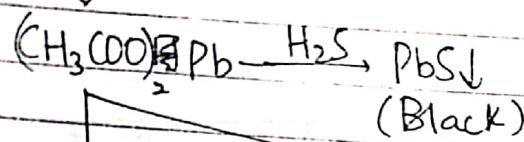
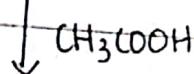
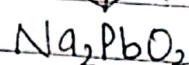
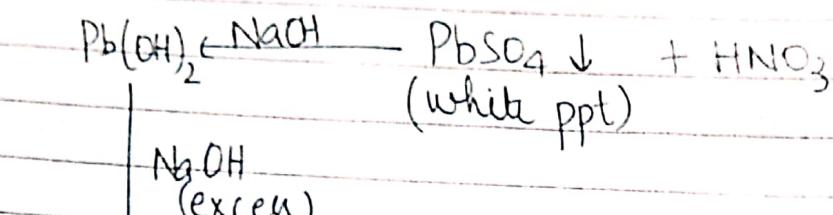
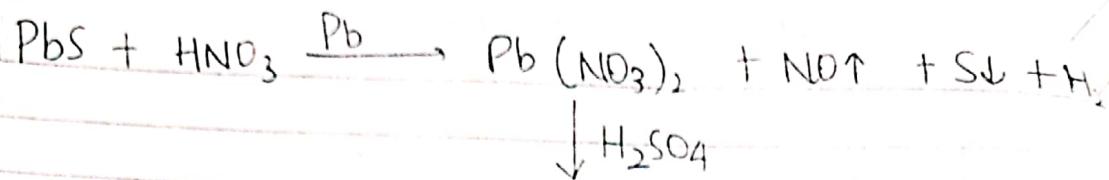


HgS dissolves in Aqua-Regia

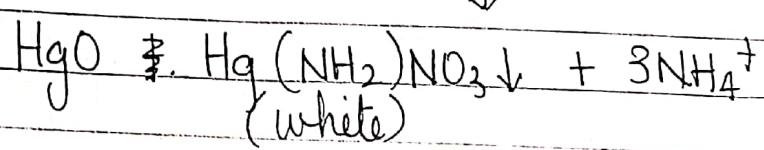
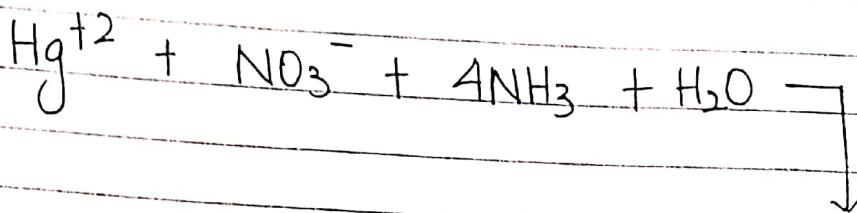
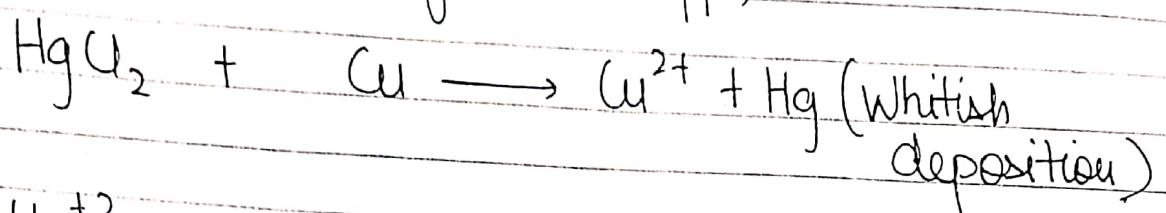
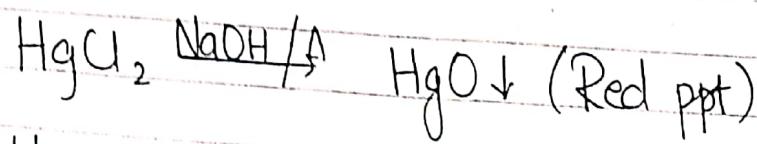


Cobalt (II) Thiocyanate test

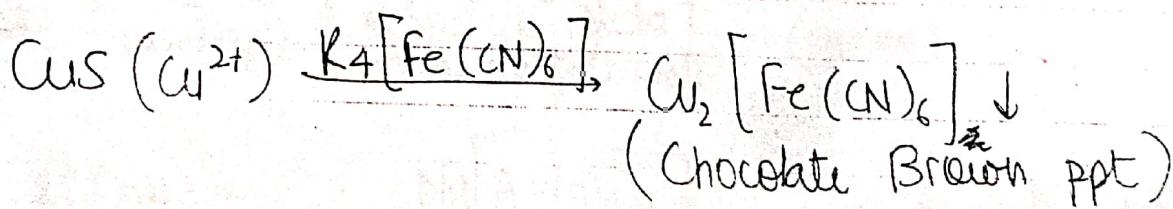
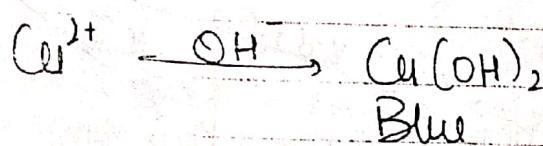
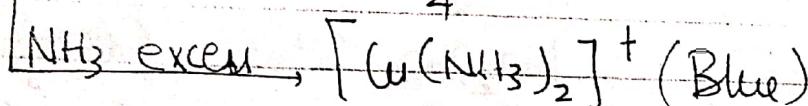
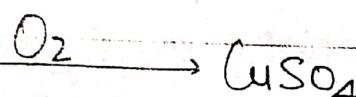
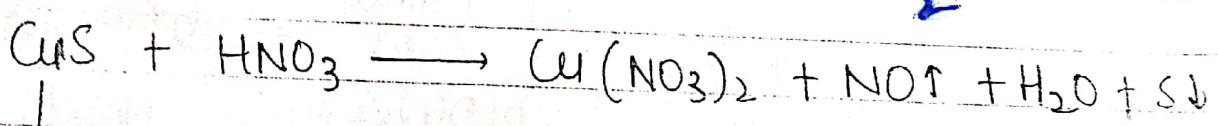
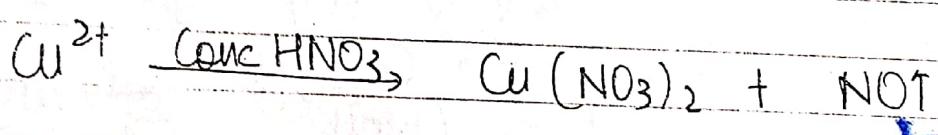
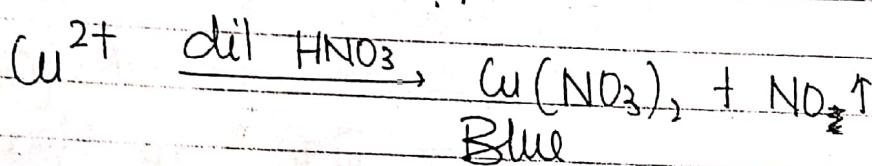


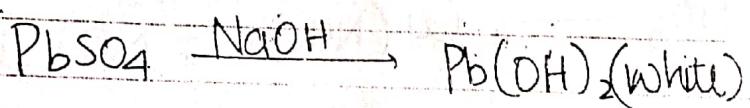
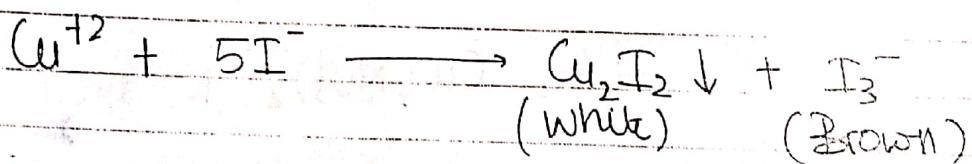
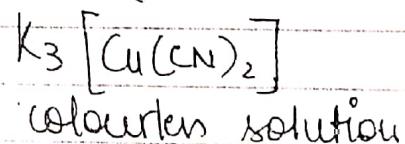
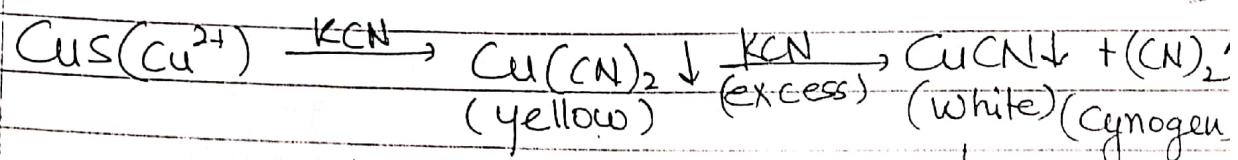
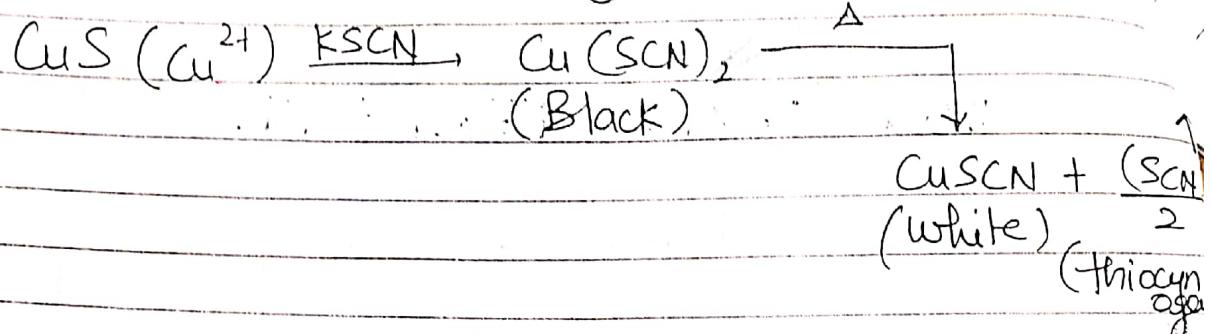
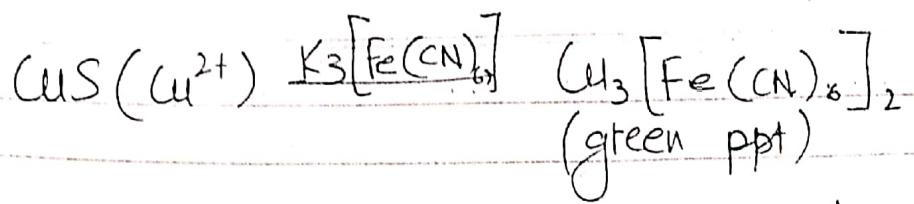


(12)

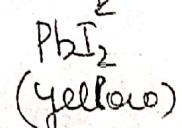
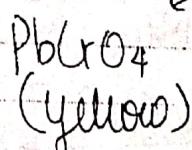
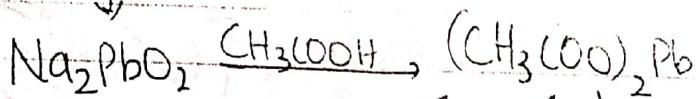


$\downarrow \text{CuS}$ (conc HNO₃) ppt dissolves



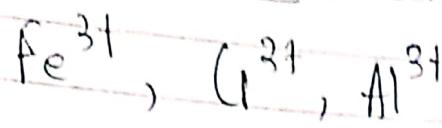


↓ NaOH excess

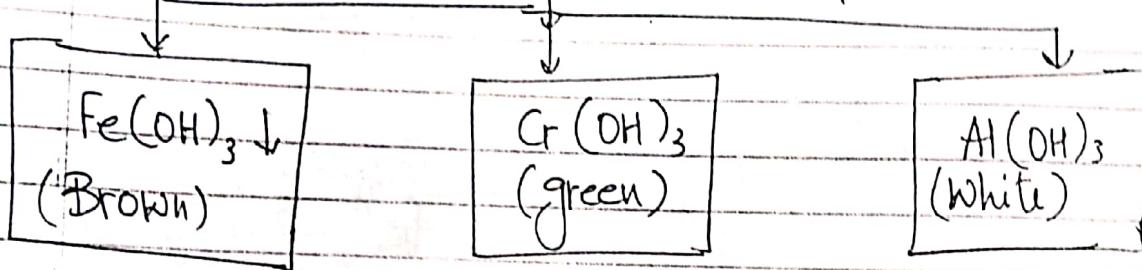
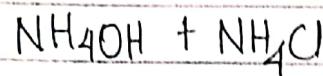
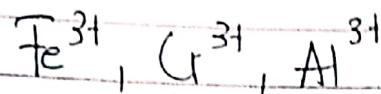


(1u)

GROUP III : CATIONS:



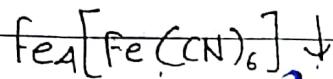
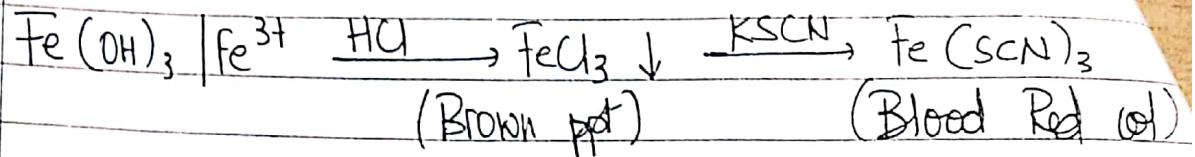
GROUP REAGENT: $\text{NH}_4\text{OH} + \text{NH}_4\text{Cl}$



K_{sp} of GR III is low

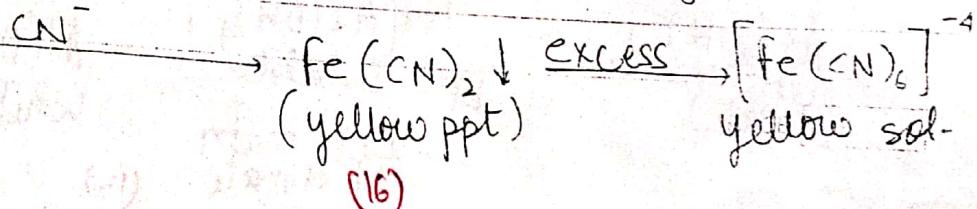
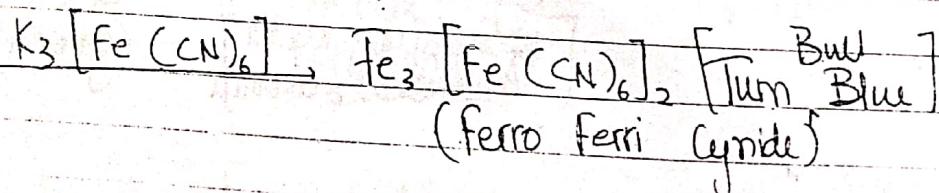
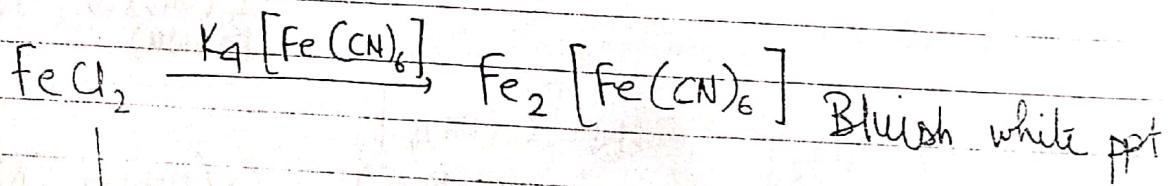
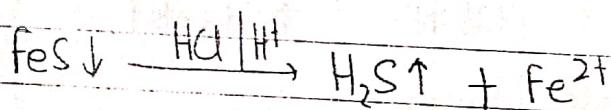
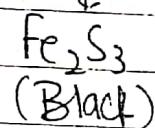
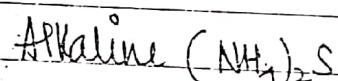
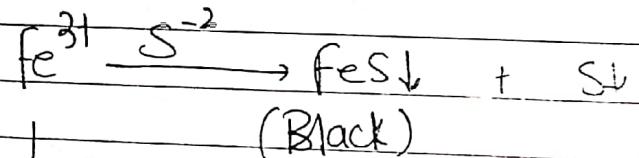
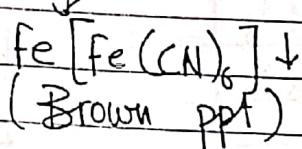
due to common ion effect of NH_4^+
 OH^- concentration is suppressed.

	NaOH	Excess NaOH	$\text{NH}_3 \text{ sol}$	Excess NH_3
Fe^{3+}	$\text{Fe(OH)}_3 \downarrow$ (Brown)	No Change	$\text{Fe(OH)}_3 \downarrow$ (Brown)	No Change
Cr^{3+}	$\text{Cr(OH)}_3 \downarrow$ (Green)	$\text{Na}[\text{Cr}(\text{OH})_4]$ (green solution) [Sodium-Meta Aluminate Chromate]	$\text{Cr(OH)}_3 \downarrow$ (green)	No Change
Al^{3+}	$\text{Al(OH)}_3 \downarrow$ (white)	$\text{Na}[\text{Al}(\text{OH})_4]$ Ppt soluble Sodium meta Aluminate	$\text{Al(OH)}_3 \downarrow$ white	No Change

REACTION OF Fe^{3+} 

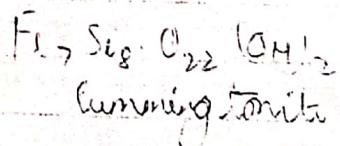
$\xrightarrow{3}$

ferri ferro cyanide
(Prussian Blue)



(16)

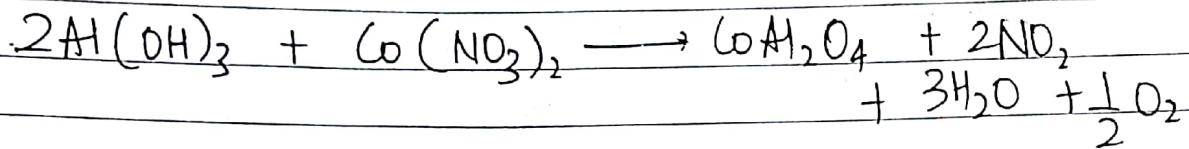
	KCN NaCN	Excess KCN	Na ₂ CO ₃	(NH ₃) ₂ S
Fe ³⁺	Fe(CN) ₃ (Reddish Brown) ppt	Na ₃ [Fe(CN) ₆] (yellow solution)	No Rxn	FeS↓ S. Black
Cr ³⁺	No change	No Rxn	Cr(OH) ₃ ↓ Water	Cr(OH) ₃ ↓
Al ³⁺	No Rxn	No Rxn	Al(OH) ₃ ↓	Al(OH) ₃
HPO ₄ ²⁻	Fe(PO ₄) ₂ ↓ + H ⁺ (yellowish white)	CH ₃ COONa + 2H ₂ O ⇌ Fe ₃ (OH) ₂ (CH ₃ COO) ₂ + CH ₃ COOH (Reddish)	NaOH + Br ₂ OH Na ₂ O ₂ / NaOH + Br ₂	
Al ³⁺	Al(PO ₄) ₂ ↓ + H ⁺ (gelatinous white)	No Rxn	No Rxn	No Rxn in cold But Boiling with excess Pgt a white ppt is formed.



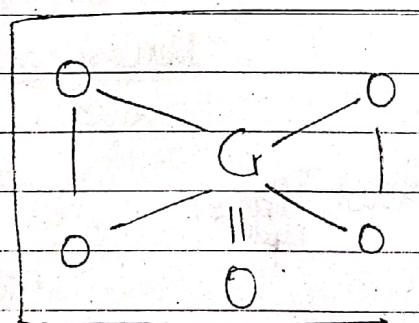
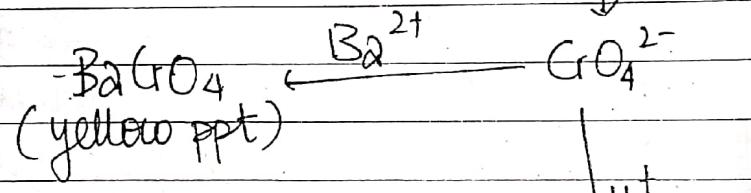
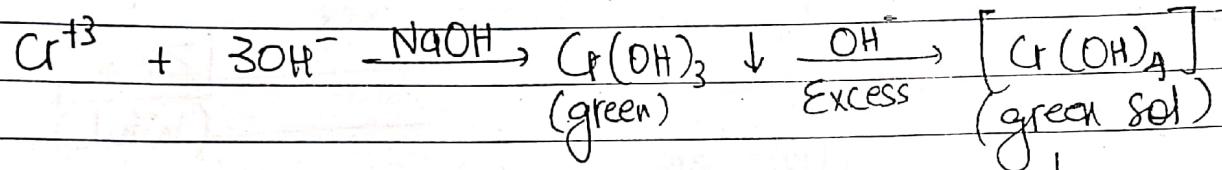
DATE

REACTION OF Al^{3+}

Naud's Blue ash test



REACTION OF Cr^{3+}

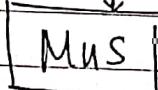
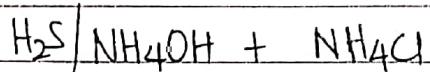
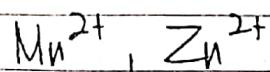


CrO_5
Blue
colour

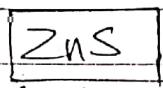
DATE

GROUP - IV

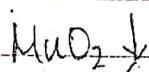
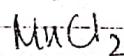
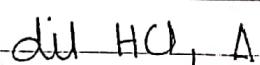
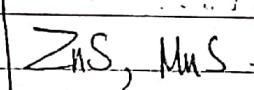
CATIONS: Mn^{2+} , Zn^{2+}



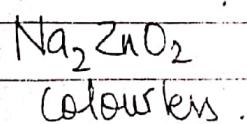
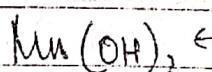
Buff ppt
(light pink)



(white)



Brash Black
ppt



Colourless

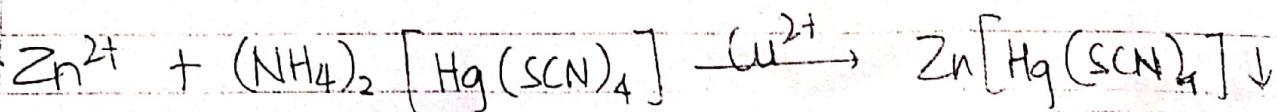
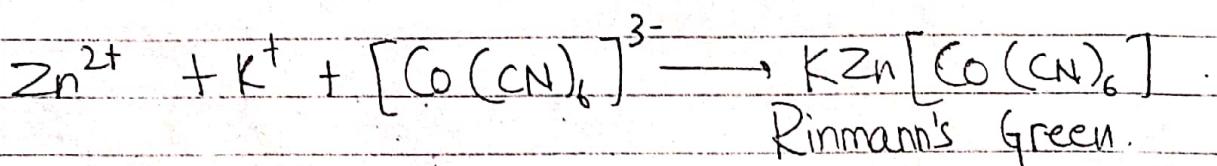
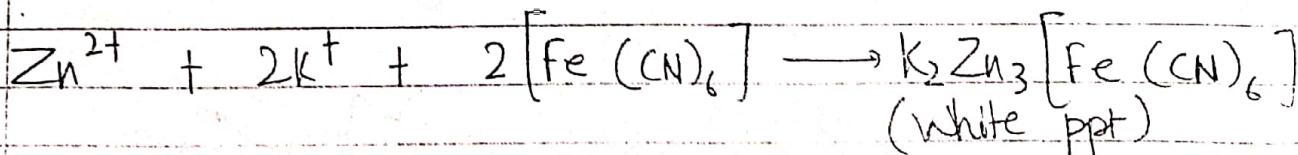
DATE []

NaOH

excess NaOH

NH₃ sol.excess NH₃Mn²⁺Mn(OH)₂↓Insoluble but
on Oxidation
Using MnO(OH)₂
Black ppt ↓Mn(OH)₂

Soluble

Zn²⁺Zn(OH)₂
(white)Na₂ZnO₂
ppt dissolvesZn(OH)₂[Zn(NH₃)₄]²⁺(NH₄)₂SNa₂HPO₄Mn²⁺MnS ↓
(Buff)Mn₃(PO₄)₂
pink pptZn²⁺ZnS ↓
(White)Zn₃(PO₄)₂(white) soluble in
mineral
Acid

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FLAME TEST:

Calcium → Brick Red

Barium → Apple Green

