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Redox Reaction

$$SO_3^{-2} + O.A \longrightarrow SO_4^{-2}$$

$$SO_3^{-2} + R.A \longrightarrow S$$

$$SO_3^{-2} + s.R.A \longrightarrow S^{-2}$$

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$SO_2 \longrightarrow SO_4^{-2}$

$SO_2 \longrightarrow S$

$SO_2 \longrightarrow S^{-2}$

Redox Reaction based on Reducing Prop. of SO_2 gas

MnO_4^- (Pink/Purple) $+ H_2S / SO_2 / NO_2^- \xrightarrow{H^+}$ Mn^{+2} (colourless/light pink) $+ SO_4^{-2} / S / NO_3^-$

$Cr_2O_7^{-2}$ (orange) $+ H_2S / SO_2 / NO_2^- \xrightarrow{H^+}$ Cr^{+3} (green) $+ SO_4^{-2} / S / NO_3^-$

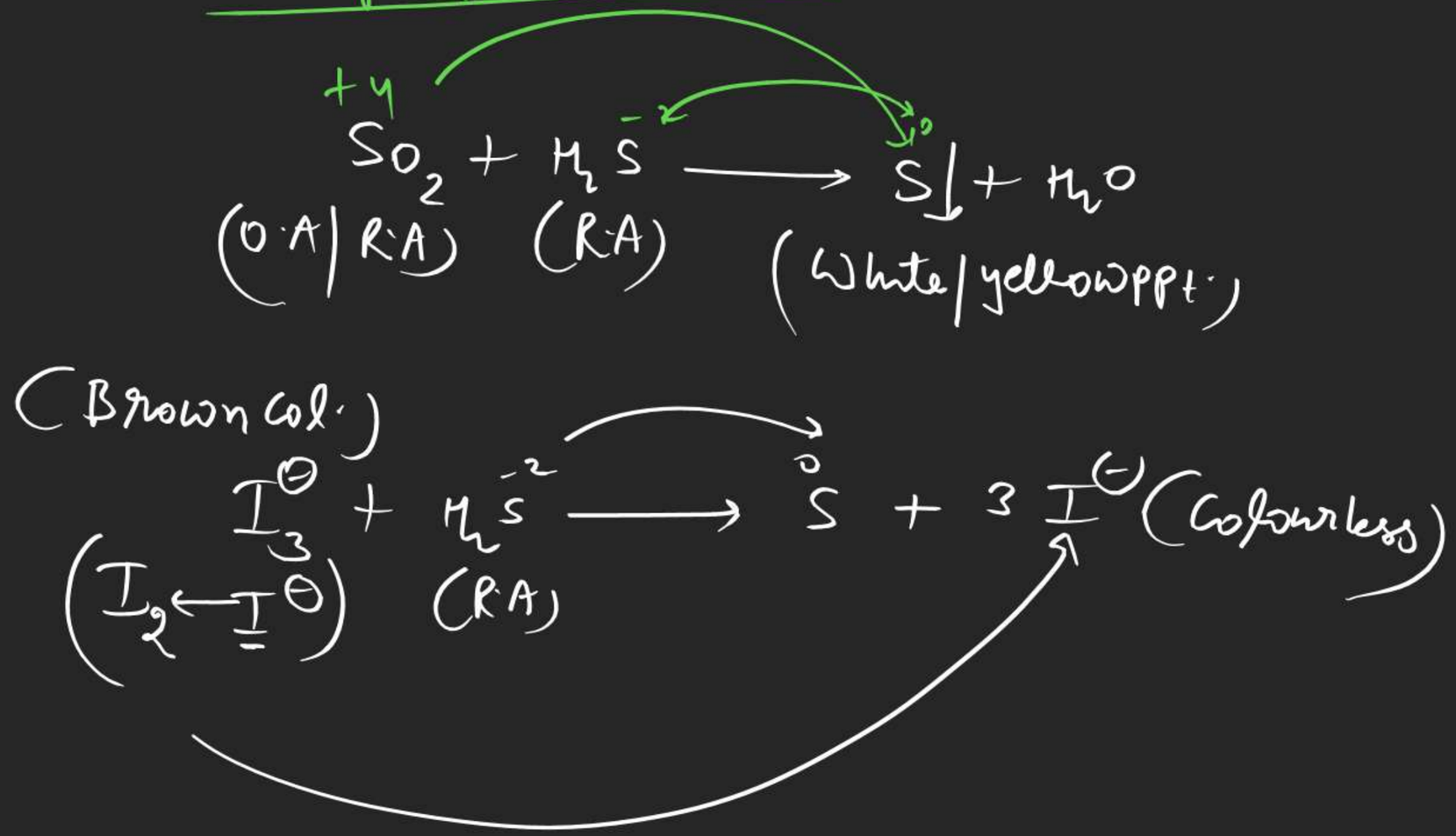
Fe^{+3} (yellow) $+ H_2S / SO_2 / NO_2^- \xrightarrow{H^+}$ Fe^{+2} (green) $+ SO_4^{-2} / S / NO_3^-$

$Br_2 + H_2O + H_2S / SO_2 \xrightarrow{H^+}$ $Br^{\ominus}$ Colourless $+ SO_4^{-2} / S$

IO_3^- (Colourless) $+ H_2S / SO_2 \xrightarrow{H^+} I_2 + SO_4^{-2} / S$

$I_2 \xrightarrow{\text{Starch}}$ Deep Blue Colour

Comproportionation Reaction



Sol

$[Pb(OH)_4]^{-2} \xrightarrow{H_2S} PbS$ (Black)

(Imperfect Complex)

Test with sodium nitroprusside

$Na_2[Fe(CN)_5(NO)] + S^{-2} \longrightarrow Na_4[Fe(CN)_5(NOS)]$

(Brownish Red Col.) (Sodium thio nitroprusside)

Purple / Violet Colouration

$Na_2[Fe(CN)_5(NO)] \xrightarrow[\text{acidic/neutral}]{H_2S} \times$

$Na_2[Fe(CN)_5(NO)] \xrightarrow[(Basic)]{H_2S}$ Purple colouration

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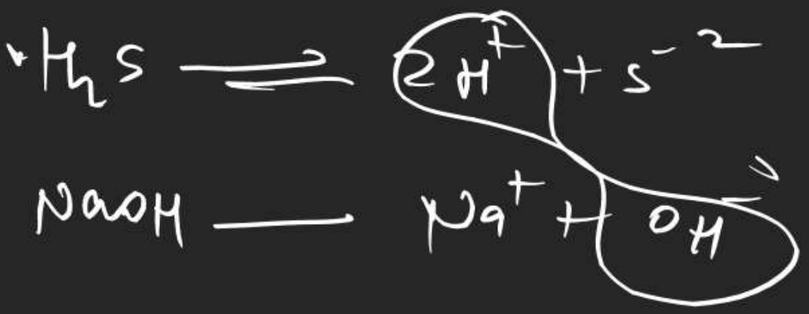

based on oxidising Prop.

$Zn + dil\,H_2SO_4 \longrightarrow ZnSO_4 + H$ (S.R.A)

$SO_3^{-2} + H \longrightarrow \underline{S}^{-2} + H^+$

H_2S

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Devarda alloy (Zn/Cu/Al) with strong alkaline solution

$Zn + NaOH \longrightarrow Na_2ZnO_2 + H$

$Al + NaOH \longrightarrow NaAlO_2 + H$

(S.R.A)

$SO_2 \xrightarrow{(Zn/NaOH)} H_2S$

$SO_3^{-2} \xrightarrow{Zn+NaOH} S^{-2}$

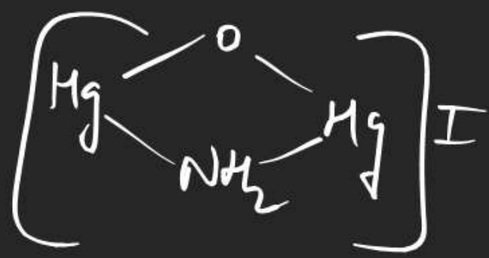
$NO_2^- \xrightarrow{Zn+NaOH} NH_3$

$NO_3^- \xrightarrow{Zn+NaOH} NH_3$

NH_3 (Pungent smell)

Basic gas

Red litmus → Blue

- HCl → NH_4Cl (White dense fumes)
- $K_2[HgI_4]/OH$ (Nessler's reagent) →  Brown ppt.

  oxy dimercuryammonium iodide

  (Iodide of millon's base)
- $CuSO_4$ → $[Cu(NH_3)_4]SO_4$ Deep Blue Glows (Switzer's Salt)
- $NiCl_2$ → $[Ni(NH_3)_6]^{+2}$ Deep Blue

Test with Zinc nitroprusside

$Na_2[Fe(CN)_5(NO)] + ZnSO_4 \longrightarrow Zn[Fe(CN)_5(NO)]$

Zinc nitroprusside

Salmon colour

(Light Pink Colour)

Note ⇒ S^{-2} and $S_2O_3^{-2}$ ion interfere they can be removed by using $MgCl_2$

$Mg^{+2} + S^{-2} \longrightarrow MgS$ (Black)

$Mg^{+2} + S_2O_3^{-2} \longrightarrow Mg_2S_2O_3 \xrightarrow{\Delta} MgS$

(White) (Black)

↓ moist SO_2 gas

Red colour compound with unknown composition.

Shiff Reagent / magenta reagent / fuchsion Reagent

When SO_2 / SO_3^{-2} solution
added in shiff reagent
then light Pink colour disappear

Note ⇒ CO_2 does not infere but NO_2 does

⇒ $S_2O_3^{-2}$ does not infere but

S^{-2}, poly sulphide and alkali metal
Interfere

HSO_3^- = all are soluble

$$HSO_3^- + H^+ \longrightarrow SO_2 \uparrow$$

Test with H_2O_2

$$SO_3^{-2} + H_2O_2 \longrightarrow SO_4^{-2} + H_2O$$

$$HSO_3^- + H_2O_2 \longrightarrow \underbrace{SO_4^{-2} + H_2O + H^+}_{\text{acidic}}$$

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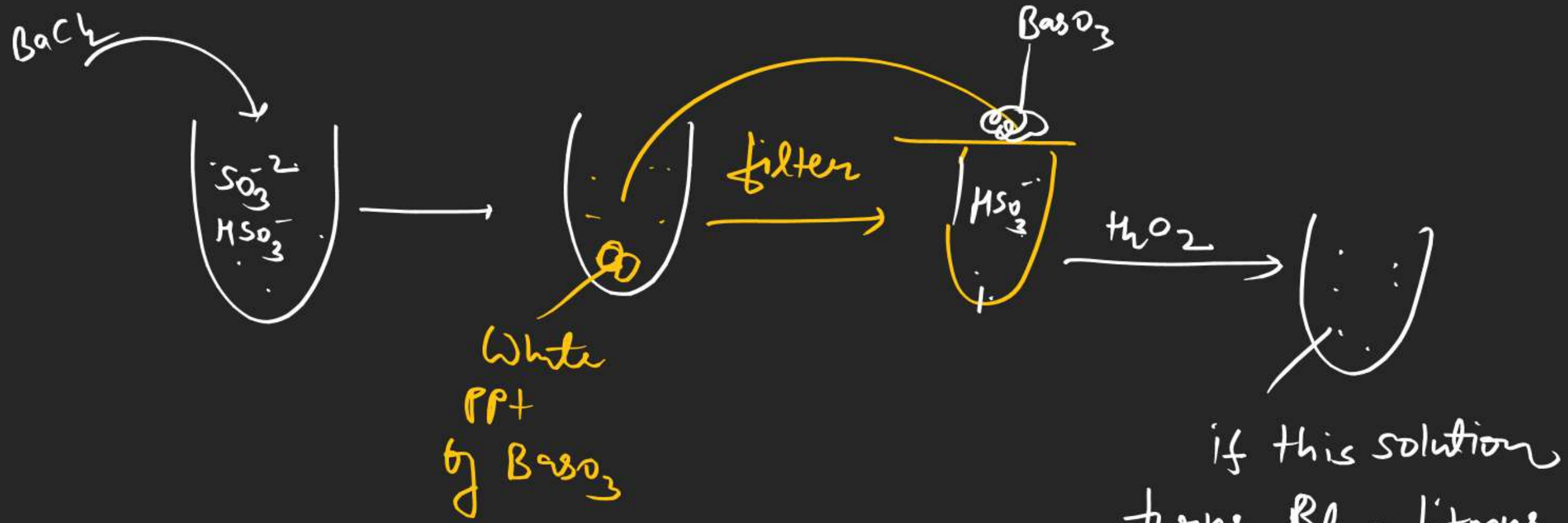
Distin. b/w SO_3^{-2} and HSO_3^-



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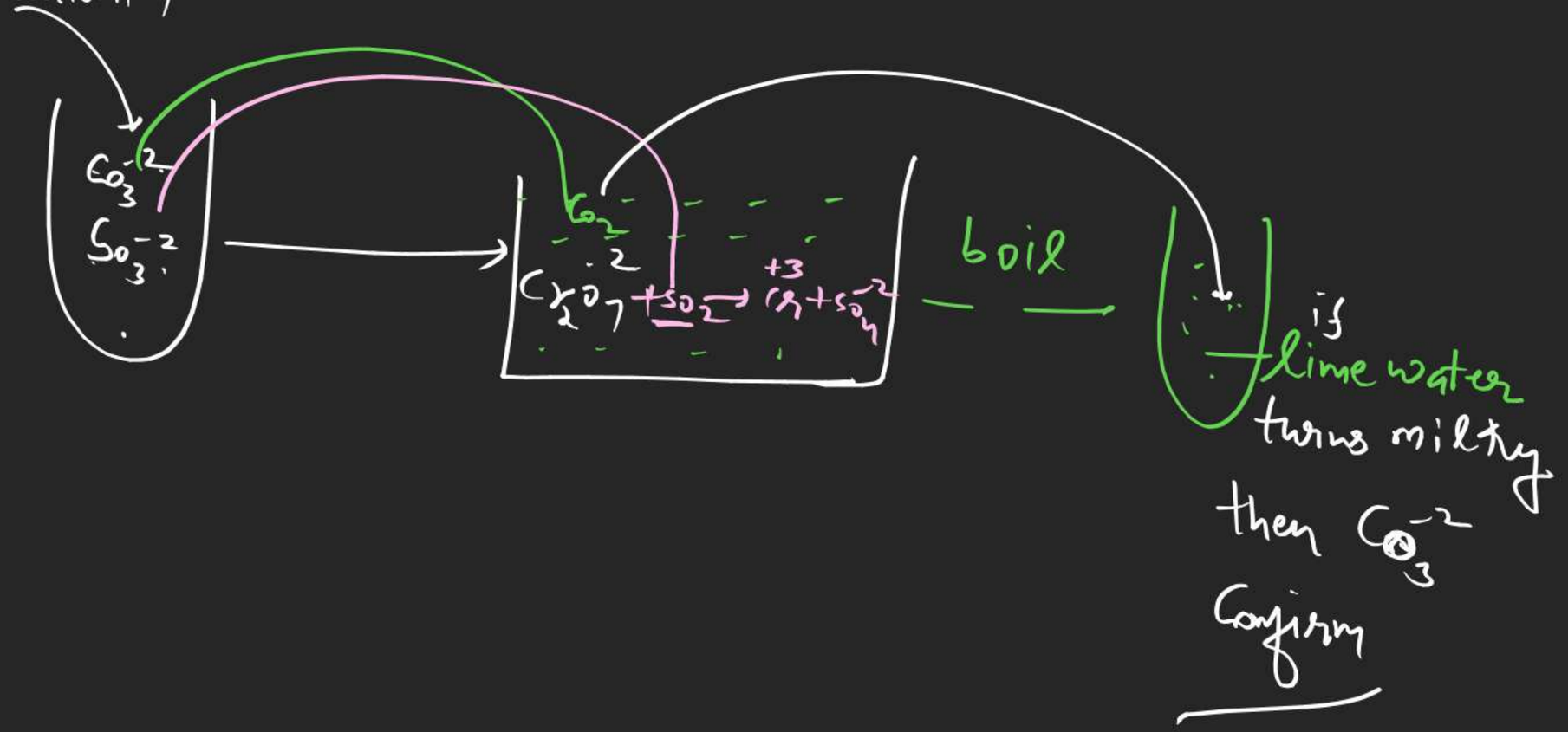
CO_3^{-2} | SO_3^{-2} distinction



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S^{-2} = all are Insoluble except IA/IIA and $(NH_4)_2S$

(1) Test with acid

$$S^{-2} + H^+ \longrightarrow H_2S$$

Rotten egg smell

$Pb(CH_3COO)_2$ paper turns PbS (Black)

$Cd(CH_3COO)_2$ Paper turns CdS (yellow)

Note ⇒ Sulphide salts of Cr^{+3} Al^{+3} and Mg^{+2} do not exist in aq. solution because they readily hydrolysed.

$$Cr^{+3} + S^{-2} \longrightarrow \overset{+}{Cr}_2\overset{-}{S}_3 \xrightarrow{H\text{-}OH} Cr(OH)_3 + H_2S\uparrow$$

$$Al^{+3} + S^{-2} \longrightarrow \overset{+}{Al}_2\overset{-}{S}_3 \xrightarrow{H\text{-}OH} Al(OH)_3 + H_2S\uparrow$$

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Test based on ppt.