Test with $Hg_2(NO_3)_2$

$$Hg_2(NO_3)_2 + CO_3^{-2} \longrightarrow Hg_2CO_3$$

Hg_2CO_3 : yellow ppt

$Hg_2CO_3 \longrightarrow Hg_2O + CO_2 \uparrow$

(Hg_2O : Black ppt)

$Hg_2O \longrightarrow \frac{1}{2}O_2 + Hg$

Hg : yellow ppt.

$Hg \longrightarrow Hg + \frac{1}{2}O_2$

★ Test with $HgCl_2$

$$CO_3^{-2} + HgCl_2 + 3H_2O \longrightarrow 3HgO \cdot HgCO_3 + 6H^+$$

(Reddish Brown)

or

$Hg_4O_3CO_3$

Note ⇒ in this reaction pH of the solution drastically change

Note ⇒ excess of CO_3^{-2} conc. acts as buffer solution

$$CO_3^{-2} + H^+ \longrightarrow CO_2\uparrow + H_2O$$

HCO_3^-

all are solubility except $NaHCO_3$ (Sparingly soluble)

① Test with acid

$$HCO_3^- + H^+ \longrightarrow CO_2 + H_2O$$

CO_2 passed in $Ca(OH)_2$ / $Ba(OH)_2$

$$CO_2 + Ca(OH)_2 \longrightarrow CaCO_3 + H_2O$$

$$CO_2 + Ba(OH)_2 \longrightarrow BaCO_3$$ — White turbidity

excess of CO_2 is passed then White ppt disappears

$$CO_2 + CaCO_3 + H_2O \longrightarrow Ca(HCO_3)_2$$

$$CO_2 + BaCO_3 + H_2O \longrightarrow Ba(HCO_3)_2$$

} Soluble

Nishant Jindal

$LiHCO_3$ is exist in solution state

White $NaHCO_3$ $KHCO_3$ $RbHCO_3$ $CsHCO_3$ exist in

* Solid state

$Be(HCO_3)_2$ $Mg(HCO_3)_2$ $Ca(HCO_3)_2$ $Sr(HCO_3)_2$ $Ba(HCO_3)_2$

exist in solution state

Note ⇒ alkali metal carbonates are more soluble than bicarbonates because bicarbonate has H-Bonding.

Test based on ppt

① Test with $BaCl_2$ / $CaCl_2$

$HCO_3^- + BaCl_2/CaCl_2 \longrightarrow$ No ppt because $Ba(HCO_3)_2$ / $Ca(HCO_3)_2$ Soluble

$HCO_3^- \xrightarrow{\text{boil}} CO_3^{-2} + CO_2\uparrow + H_2O$

$CO_3^{-2} + CaCl_2/BaCl_2 \longrightarrow CaCO_3/BaCO_3$

White ppt

Test with NH_4OH followed by $MgCl_2$

$$HCO_3^- + NH_4OH \longrightarrow NH_4^+ + H_2O + CO_3^{-2}$$

($NH_3 + H_2O$)

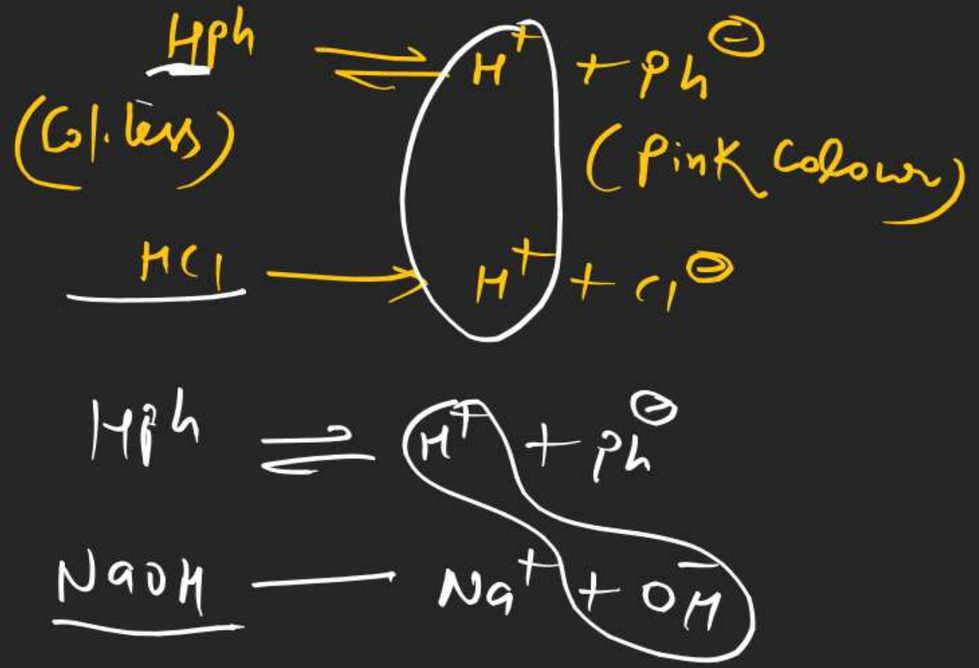
(amonia sol.)

$$CO_3^{-2} + MgCl_2 \longrightarrow MgCO_3$$

(White ppt.)

Soluble in dil HCl | dil HNO_3 | H_2SO_4 | CH_3COOH and soda water

Hph test



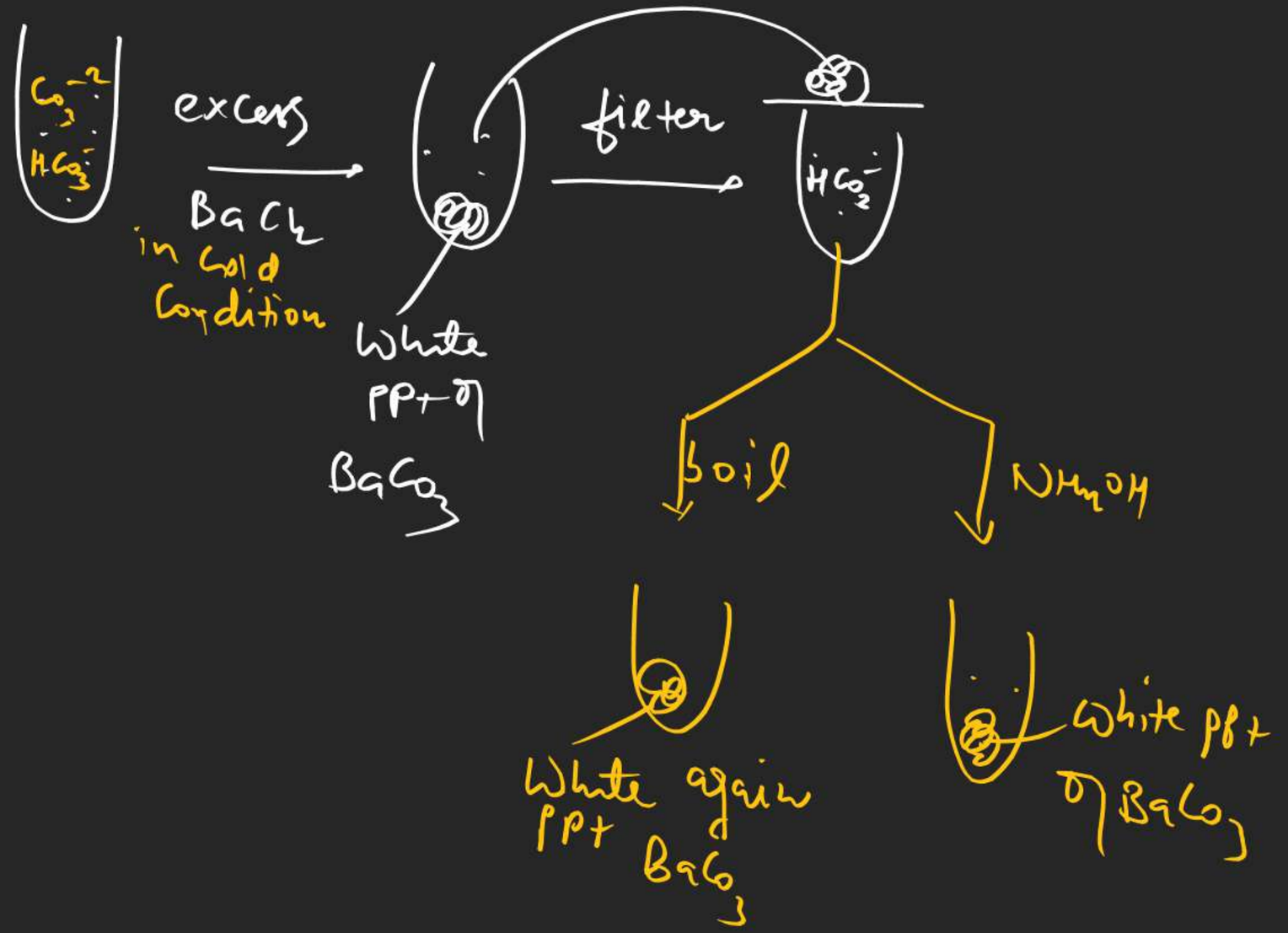
Que Salt Contain X and Y anion, both gives CO_2 gas with dil HCl aq. solution of X gives colourless solution with Hph while aq. solution of Y gives Pink Colour to Hph then identify X and Y ion

$Y = CO_3^{-2}$

$X = HCO_3^-$

Nishant Jindal

Dist. b/w HCO_3^- / CO_3^{-2}



one

$CO_2 + Ca(OH)_2 \longrightarrow CaCO_3$

$CO_2 + Ba(OH)_2 \longrightarrow BaCO_3$

White turbidity

$CO_3^{-2} + BaCl_2 \longrightarrow BaCO_3$

$+ CaCl_2 \longrightarrow CaCO_3$

White ppt.

Nishant Jindal

lime water contain low conc. of Ca^{+2} ion so turbidity obtained but $CaCl_2$ / $BaCl_2$ are salt contain high conc. of Ca^{+2} / Ba^{+2} so ppt obt.

SO_3^{-2}

all are Insoluble except IA/$(NH_4)_2SO_3$

(1) Test with acid

$$SO_3^{-2} + H^+ \longrightarrow SO_2\uparrow$$

SO_2 passed in lime water/ Baryta water

$$SO_2 + Ca(OH)_2 \longrightarrow CaSO_3$$
$$SO_2 + Ba(OH)_2 \longrightarrow BaSO_3$$

White turbidity

Excess SO_2 pass then white turbidity disappear

$$SO_2 + CaSO_3 + H_2O \longrightarrow Ca(HSO_3)_2$$
$$SO_2 + BaSO_3 + H_2O \longrightarrow Ba(HSO_3)_2$$

Soluble

Nishant Jindal

Test with $BaCl_2$/$CaCl_2$

$SO_3^{-2} + BaCl_2/CaCl_2 \longrightarrow BaSO_3/CaSO_3$

White ppt.

soluble in dil HCl

$BaSO_3 \xrightarrow[H_2O_2 \text{ / } HNO_3 \text{ (fast)}]{Br_2 \text{ water}} BaSO_4$

on standing

$\overset{+4}{BaSO_3} \xrightarrow[\text{slow}]{O_2} \overset{+6}{BaSO_4}$

White ppt → Heavy white ppt.

Insoluble in any acid and base at room temp. but soluble in hot and conc. HCl and conc. H_2SO_4

Test with $Pb(NO_3)_2$

$$SO_3^{-2} + Pb(NO_3)_2 \longrightarrow PbSO_3$$

White ppt.

(excess NaOH) and dil HNO_3)

Not

$$PbSO_3 + O_2 \xrightarrow{boil} PbSO_4$$

White — White

$$PbS_2O_3 \xrightarrow{boil} PbS + H_2SO_4$$

White — (Black)

Nishant Jindal

Test with $AgNO_3$

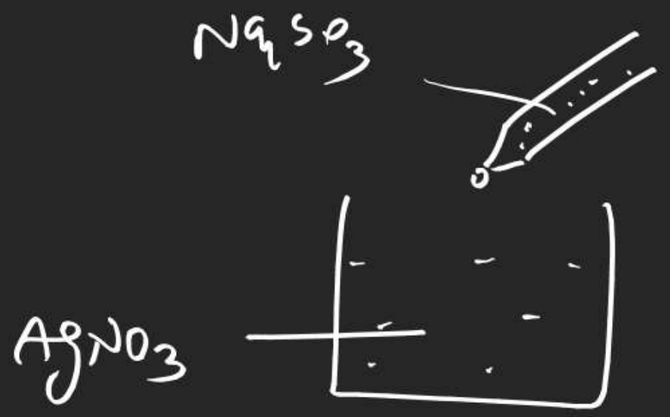
$SO_3^{-2} + AgNO_3 \longrightarrow \underset{\text{Soluble}}{[Ag(SO_3)]^{\ominus}} \xrightarrow[AgNO_3]{\text{excess}} \underset{\text{White PPt}}{Ag_2SO_3} \xrightarrow[Na_2SO_3]{\text{excess}} [Ag(SO_3)]^{\ominus}$

$Ag_2SO_3 \xrightarrow{\Delta} Ag + SO_4^{-2} + 2H^+$

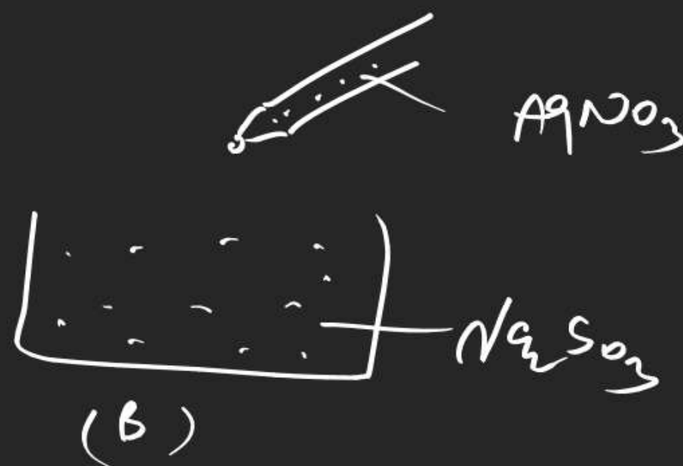
(Metallic black) PPt.

$[Ag(SO_3)]^{\ominus} \xrightarrow{\Delta} Ag + SO_4^{-2} + SO_2\uparrow$

Nishant Jindal



(A)



(B)

Which of the above diagram will produce ppt.

(A)