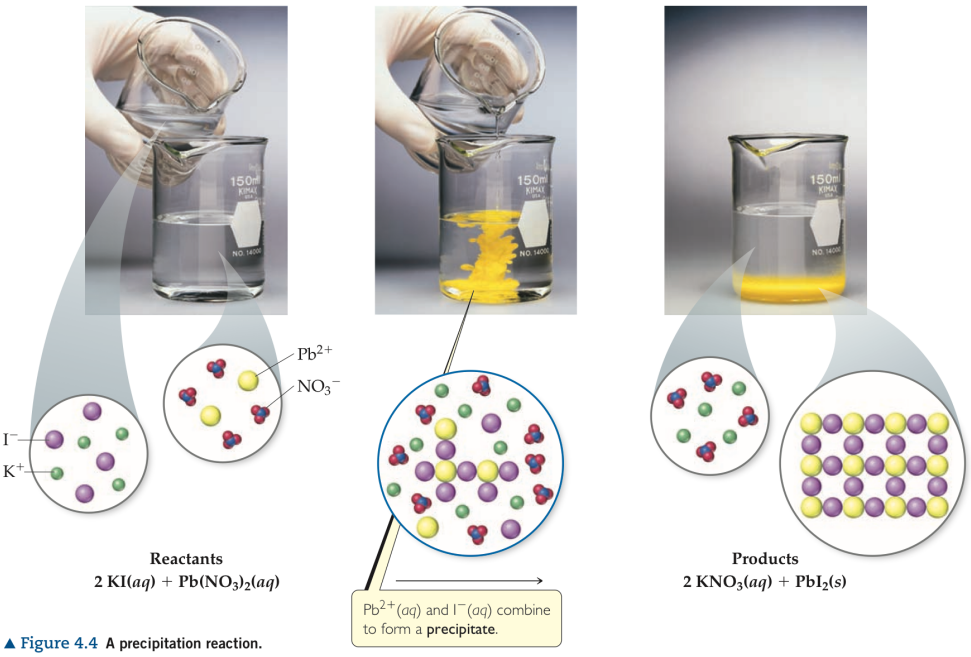
## Precipitate Definition:

GO FIGURE

Which ions remain in solution after $PbI_2$ precipitation is complete?




▲ Figure 4.4 A precipitation reaction.

## Solubility Rules

Table 4.1 Solubility Guidelines for Common Ionic Compounds in Water

| Soluble Ionic Compounds | | Important Exceptions |
|---|---|---|
| Compounds containing | $NO_3^-$ | None |
| | $CH_3COO^-$ | None |
| | $Cl^-$ | Compounds of $Ag^+$, $Hg_2^{2+}$, and $Pb^{2+}$ |
| | $Br^-$ | Compounds of $Ag^+$, $Hg_2^{2+}$, and $Pb^{2+}$ |
| | $I^-$ | Compounds of $Ag^+$, $Hg_2^{2+}$, and $Pb^{2+}$ |
| | $SO_4^{2-}$ | Compounds of $Sr^{2+}$, $Ba^{2+}$, $Hg_2^{2+}$, and $Pb^{2+}$ |
| **Insoluble Ionic Compounds** | | **Important Exceptions** |
| Compounds containing | $S^{2-}$ | Compounds of $NH_4^+$, the alkali metal cations, $Ca^{2+}$, $Sr^{2+}$, and $Ba^{2+}$ |
| | $CO_3^{2-}$ | Compounds of $NH_4^+$ and the alkali metal cations |
| | $PO_4^{3-}$ | Compounds of $NH_4^+$ and the alkali metal cations |
| | $OH^-$ | Compounds of $NH_4^+$, the alkali metal cations, $Ca^{2+}$, $Sr^{2+}$, and $Ba^{2+}$ |

**Classify these ionic compounds as soluble or insoluble in water**

**(a)** **$Na_2CO_3$**

**(b) $PbSO_4$**

**Sample Problem**
Writing a **double replacement reaction or molecular equation for a reaction** (also called a **metathesis** reaction)

(s)
(aq)

**Sample Problem**
Predict the identity of the precipitate that forms when aqueous solutions of BaCl2 and K2SO4 are mixed (b) Write the balanced chemical equation for the reaction

**Complete Ionic Equations, Spectator Ions, and Net Ionic Equations**

$Pb(NO_3)_2$ (aq) + 2KI (aq) ➔ $PBI_2$ (s) + $2KNO_3$ (aq)

If every ion in a complete ionic reaction is a spectator, then no reaction occurs.