Net Ionic Equations

Solutions
Tu 2022-12-20

Predict products for the following chemical reactions. Write **molecular equations** and balance them. Write **total ionic equations** and **net ionic equations.** Insoluble substances, non-electrolytes, and weak electrolytes remain in molecular form when writing ionic equations. Note especially that care must be taken in determining the ionic composition of compounds. For example, sodium phosphate (Na_3PO_4) forms ions in solution to produce three Na^+ ions and one PO_4^{3-} ion. It does not produce an ion with this formula: Na_3^+.

Acid-Base

1. $HCl + NaOH \rightarrow H_2O + NaCl$

$H^+ + OH^- \rightarrow H_2O$

2. $H_2SO_4 + 2KOH \rightarrow K_2SO_4 + 2H_2O$

$H^+ + OH^- \rightarrow H_2O$

3. $2HNO_3 + Cu(OH)_2 \rightarrow 2H_2O + Cu(NO_3)_2$ (Cu(OH)$_2$: INSOLUBLE)

$2H^+ + Cu(OH)_{2(s)} \rightarrow 2H_2O + Cu^{2+}$

4. $CH_3COOH + KOH \rightarrow KCH_3COO + H_2O$ (CH_3COOH: WEAK ACID)

$CH_3COOH + OH^- \rightarrow CH_3COO^- + H_2O$

5. $NH_3 + HCl \rightarrow NH_4Cl$ (NH_3: WEAK BASE)

$NH_3 + H^+ \rightarrow NH_4^+$

6. $2H_3PO_4 + 3Ba(OH)_2 \rightarrow 6H_2O + Ba_3(PO_4)_{2(s)}$ (H_3PO_4: WEAK ACID; $Ba_3(PO_4)_2$: INSOLUBLE)

$2H_3PO_4 + 3Ba^{2+} + 6OH^- \rightarrow 6H_2O + Ba_3(PO_4)_2$

Precipitation

1. $3CuCl_2 + 2Na_3PO_4 \rightarrow Cu_3(PO_4)_{2(s)} + 6NaCl$

$3Cu^{2+} + 2PO_4^{3-} \rightarrow Cu_3(PO_4)_{2(s)}$

2. $AgNO_3 + HCl \rightarrow AgCl + HNO_3$

$Ag^+ + Cl^- \rightarrow AgCl_{(s)}$

3. $3Na_2S + 2FeCl_3 \rightarrow Fe_2S_{3(s)} + 6NaCl$

$3S^{2-} + 2Fe^{3+} \rightarrow Fe_2S_{3(s)}$

4. $2AlBr_3 + 3Na_2CO_3 \rightarrow Al_2(CO_3)_{3(s)} + 6NaBr$

$2Al^{3+} + 3CO_3^{2-} \rightarrow Al_2(CO_3)_{3(s)}$

Single Replacement

1. $Cu + 2AgNO_3 \rightarrow Cu(NO_3)_2 + 2Ag$

$Cu + 2Ag^+ \rightarrow Cu^{2+} + 2Ag$

2. $2HCl + Fe \rightarrow H_2 + FeCl_2$

$2H^+ + Fe \rightarrow H_2 + Fe^{2+}$

3. $2Na + 2H_2O \rightarrow 2NaOH + H_2$

$2Na + 2H_2O \rightarrow 2Na^+ + 2OH^- + H_2$

4. $3CuBr_2 + 2Al \rightarrow 3Cu + 2AlBr_3$

$3Cu^{2+} + 2Al \rightarrow 3Cu + 2Al^{3+}$

Gas Formation

1. $2HClO_3 + CaCO_3 \rightarrow$ (INSOLUBLE) $H_2O + CO_{2(g)} + Ca(ClO_3)_2$

$2H^+ + CaCO_{3(s)} \rightarrow H_2O + CO_{2(g)} + Ca^{2+}$

2. $NaOH + NH_4Cl \rightarrow NH_{3(g)} + H_2O + NaCl$

$OH^- + NH_4^+ \rightarrow NH_{3(g)} + H_2O$

3. $K_2SO_3 + 2HI \rightarrow H_2O + SO_{2(g)} + 2KI$

$SO_3^{2-} + 2H^+ \rightarrow H_2O + SO_{2(g)}$

4. $MgS + 2HCl \rightarrow$ (INSOLUBLE) $H_2S_{(g)} + MgCl_2$

$MgS_{(s)} + 2H^+ \rightarrow Mg^{2+} + H_2S_{(g)}$