

# NOMENCLATURE PACKET

## Worksheet I: Binary Ionic Compounds

1. Name the following ionic compounds:

- a.  $\text{Al}_2\text{O}_3$  aluminum oxide  
 b.  $\text{Cs}_2\text{O}$  cesium oxide  
 c.  $\text{Rb}_3\text{N}$  rubidium nitride  
 d.  $\text{Ca}_3\text{N}_2$  calcium nitride  
 e.  $\text{SrSe}$  strontium selenide  
 f.  $\text{Cs}_2\text{S}$  cesium sulfide  
 g.  $\text{Al}_2\text{S}_3$  aluminum sulfide  
 h.  $\text{LiBr}$  lithium bromide  
 i.  $\text{Mg}_3\text{N}_2$  magnesium nitride  
 j.  $\text{CaF}_2$  calcium fluoride

2. Write the chemical formula for the following ionic compounds:

- a. barium nitride  $\text{Ba}^{2+} \text{N}^{3-}$   $\text{Ba}_3\text{N}_2$   
 b. indium fluoride  $\text{In}^{3+} \text{F}^-$   $\text{InF}_3$   
 c. calcium oxide  $\text{Ca}^{2+} \text{O}^{2-}$   $\text{CaO}$   
 d. sodium nitride  $\text{Na}^+ \text{N}^{3-}$   $\text{Na}_3\text{N}$   
 e. magnesium chloride  $\text{Mg}^{2+} \text{Cl}^-$   $\text{MgCl}_2$   
 f. potassium oxide  $\text{K}^+ \text{O}^{2-}$   $\text{K}_2\text{O}$   
 g. magnesium oxide  $\text{Mg}^{2+} \text{O}^{2-}$   $\text{MgO}$   
 h. potassium sulfide  $\text{K}^+ \text{S}^{2-}$   $\text{K}_2\text{S}$   
 i. lithium nitride  $\text{Li}^+ \text{N}^{3-}$   $\text{Li}_3\text{N}$   
 j. strontium fluoride  $\text{Sr}^{2+} \text{F}^-$   $\text{SrF}_2$   
 k. aluminum sulfide  $\text{Al}^{3+} \text{S}^{2-}$   $\text{Al}_2\text{S}_3$   
 l. calcium oxide  $\text{Ca}^{2+} \text{O}^{2-}$   $\text{CaO}$

Worksheet 2: Ionic Compounds with Polyatomic Ions

1. Name the following ionic compounds:

- a.  $\text{Co}(\text{NO}_3)_2$  cobalt (II) nitrate
- b.  $\text{NaNO}_2$  sodium nitrite
- c.  $\text{Cu}_3(\text{PO}_3)_2$  copper (II) phosphate
- d.  $\text{Ba}(\text{CN})_2$  barium cyanide
- e.  $\text{Al}_2(\text{SO}_4)_3$  aluminum sulfate
- f.  $\text{KClO}_3$  potassium chlorate
- g.  $\text{CuC}_2\text{H}_3\text{O}_2$  copper (I) acetate
- h.  $\text{Fr}_2\text{C}_2\text{O}_4$  francium oxalate
- i.  $\text{NH}_4\text{Cl}$  ammonium chloride
- j.  $\text{PbPO}_4$  lead (III) phosphate
- k.  $\text{Ba}(\text{OH})_2$  barium hydroxide
- \* l.  $\text{KClO}$  potassium hypochlorite

2. Write the formula for the following ionic compounds:

- \* a. rhodium (II) chromate  $\text{Rh}^{2+} (\text{CrO}_4)^{2-}$   $\text{RhCrO}_4$
- b. lithium hydroxide  $\text{Li}^+ (\text{OH})^-$   $\text{LiOH}$
- c. sodium permanganate  $\text{Na}^+ (\text{MnO}_4)^-$   $\text{NaMnO}_4$
- d. manganese (III) nitrate  $\text{Mn}^{3+} (\text{NO}_3)^-$   $\text{Mn}(\text{NO}_3)_3$
- e. barium nitrite  $\text{Ba}^{2+} (\text{NO}_2)^-$   $\text{Ba}(\text{NO}_2)_2$
- \* f. aluminum hypochlorite  $\text{Al}^{3+} (\text{ClO})^-$   $\text{Al}(\text{ClO})_3$
- g. potassium phosphate  $\text{K}^+ (\text{PO}_4)^{3-}$   $\text{K}_3\text{PO}_4$
- h. copper (I) acetate  $\text{Cu}^{+1} (\text{CH}_3\text{COO})^-$   $\text{Cu}(\text{CH}_3\text{COO})$
- i. ammonium bromide  $(\text{NH}_4)^+ \text{Br}^-$   $\text{NH}_4\text{Br}$
- j. sodium carbonate  $\text{Na}^+ (\text{CO}_3)^{2-}$   $\text{Na}_2\text{CO}_3$
- k. lithium chlorite  $\text{Li}^+ (\text{ClO}_2)^-$   $\text{LiClO}_2$

Worksheet 3: Binary Ionic Compounds with Multivalent Metals

1. Name the following ionic compounds:

- a.  $\overset{+2}{\text{Sn}}\overset{-2}{\text{O}_2}$  tin (IV) oxide
- \* b.  $\text{Mn}_2\text{O}_7$  manganese (VII) oxide
- c.  $\text{FeN}$  iron (III) nitride
- d.  $\text{Cu}_3\text{N}_2$  copper (II) nitride
- e.  $\text{TiF}_3$  titanium (III) fluoride
- f.  $\overset{+1}{\text{Cu}}_2\overset{-2}{\text{S}}$  copper (I) sulfide
- g.  $\overset{+3}{\text{Fe}}_2\overset{-3}{\text{S}_3}$  iron (III) sulfide
- h.  $\text{CuBr}$  copper (I) bromide
- i.  $\text{Co}_3\text{N}_2$  cobalt (II) nitride
- j.  $\overset{+2}{\text{Co}}\overset{-1}{\text{F}_2}$  cobalt (II) fluoride

2. Write the formula for the following ionic compounds:

- a. copper (I) nitride  $\text{Cu}^+ \text{N}^{3-}$   $\text{Cu}_3\text{N}$
- b. cobalt (I) fluoride  $\text{Co}^+ \text{F}^-$   $\text{CoF}$
- c. titanium (IV) oxide  $\text{Ti}^{+4} \text{O}^{2-}$   $\text{TiO}_2$
- d. iron (II) nitride  $\text{Fe}^{2+} \text{N}^{3-}$   $\text{Fe}_3\text{N}_2$
- e. iron (III) chloride  $\text{Fe}^{3+} \text{Cl}^-$   $\text{FeCl}_3$
- f. copper (II) oxide  $\text{Cu}^{2+} \text{O}^{2-}$   $\text{CuO}$
- \* g. rhodium (II) oxide  $\text{Rh}^{2+} \text{O}^{2-}$   $\text{RhO}$
- h. tin (IV) sulfide  $\text{Sn}^{+4} \text{S}^{2-}$   $\text{SnS}_2$
- i. manganese (IV) nitride  $\text{Mn}^{+4} \text{N}^{3-}$   $\text{Mn}_3\text{N}_4$
- j. copper (I) fluoride  $\text{Cu}^+ \text{F}^-$   $\text{CuF}$
- k. cobalt (II) sulfide  $\text{Co}^{2+} \text{S}^{2-}$   $\text{CoS}$
- l. iron (III) oxide  $\text{Fe}^{3+} \text{O}^{2-}$   $\text{Fe}_2\text{O}_3$

## Extra Practice: Binary Covalent Compounds

1. Name the following covalent compounds:

- a. CO carbon monoxide
- b. CO<sub>2</sub> carbon dioxide
- c. NO nitrogen monoxide
- d. NO<sub>2</sub> nitrogen dioxide
- e. SF<sub>6</sub> sulfur hexafluoride
- f. SiF<sub>4</sub> silicon tetrafluoride
- g. N<sub>2</sub>S<sub>3</sub> dinitrogen trisulfide
- h. B<sub>2</sub>H<sub>6</sub> diboron hexahydride
- i. SO<sub>2</sub> sulfur dioxide
- j. CH<sub>4</sub> carbon tetrahydride

2. Write the formula for the following covalent compounds:

- a. boron trichloride BCl<sub>3</sub>
- b. nitrogen monoxide NO
- c. dinitrogen monoxide N<sub>2</sub>O
- d. dinitrogen pentoxide N<sub>2</sub>O<sub>5</sub>
- e. sulfur hexachloride SCl<sub>6</sub>
- f. carbon monoxide CO
- g. carbon disulfide CS<sub>2</sub>
- h. oxygen difluoride OF<sub>2</sub>
- i. dinitrogen tetrahydride N<sub>2</sub>H<sub>4</sub>
- j. silicon tetrahydride SiH<sub>4</sub>

Worksheet 5: Mixing up Binary Compounds

1. Name the following binary compounds:

- a.  $\overset{+2}{\text{Cu}}\overset{-2}{\text{O}}$  copper (II) oxide
- b.  $\overset{+2}{\text{Sr}}\overset{-2}{\text{O}}$  strontium oxide
- c.  $\text{B}_2\text{O}_3$  diboron trioxide
- d.  $\text{TiCl}_4$  titanium (IV) chloride
- e.  $\text{K}_2\text{S}$  potassium sulfide
- f.  $\text{OF}_2$  oxygen difluoride
- g.  $\text{NH}_3$  nitrogen trihydride
- h.  $\text{VF}_5$  vanadium (V) fluoride
- i.  $\text{CuCl}$  copper (I) chloride
- j.  $\overset{+4}{\text{Mn}}\overset{-2}{\text{O}_2}$  manganese (IV) oxide
- k.  $\text{MgO}$  magnesium oxide
- l.  $\text{B}_2\text{H}_6$  diboron hexahydride

2. Write the formula for the following binary compounds:

- a. phosphorous trichloride  $\text{PCl}_3$
- b. chlorine monofluoride  $\text{ClF}$
- c. copper (II) chloride  $\text{Cu}^{2+}\text{Cl}^-$   $\text{CuCl}_2$
- d. copper (I) sulfide  $\text{Cu}^+\text{S}^{2-}$   $\text{Cu}_2\text{S}$
- e. calcium nitride  $\text{Ca}^{2+}\text{N}^{3-}$   $\text{Ca}_3\text{N}_2$
- f. carbon tetrabromide  $\text{CBr}_4$
- g. lithium oxide  $\text{Li}^+\text{O}^{2-}$   $\text{Li}_2\text{O}$
- h. potassium chloride  $\text{K}^+\text{Cl}^-$   $\text{KCl}$
- i. titanium (IV) bromide  $\text{Ti}^{4+}\text{Br}^-$   $\text{TiBr}_4$
- j. magnesium sulfide  $\text{Mg}^{2+}\text{S}^{2-}$   $\text{MgS}$
- k. manganese (II) nitride  $\text{Mn}^{(2+)}\text{N}^{3-}$   $\text{Mn}_3\text{N}_2$

Worksheet 6: Putting it All Together

1. Name the following compounds:

- a.  $\text{Fe}(\text{NO}_3)_3$  iron (III) nitrate
- b.  $\text{CaSO}_4$  calcium sulfate
- c.  $\text{NaCl}$  sodium chloride
- d.  $\text{K}_2\text{SO}_4$  potassium sulfate
- e.  $\text{CO}_2$  carbon dioxide
- f.  $\text{SF}_6$  sulfur hexafluoride
- \* g.  $\text{KClO}$  potassium hypochlorite
- h.  $\text{N}_2\text{O}_5$  dinitrogen pentoxide
- i.  $\text{IF}_5$  iodine pentafluoride
- j.  $\text{Co}(\text{MnO}_4)_2$  cobalt (II) permanganate
- k.  $\text{Sn}(\text{SO}_4)_2$  tin (IV) sulfate
- l.  $\text{FrCl}$  francium chloride

2. Write the formula for the following compounds:

- a. trinitrogen dioxide  $\text{N}_3\text{O}_2$
- b. lithium phosphate  $\text{Li}^+ (\text{PO}_4)^{3-}$   $\text{Li}_3\text{PO}_4$
- c. ammonium chloride  $(\text{NH}_4)^+ \text{Cl}^-$   $\text{NH}_4\text{Cl}$
- d. copper (II) chlorite  $\text{Cu}^{2+} (\text{ClO}_2)^-$   $\text{Cu}(\text{ClO}_2)_2$
- e. nitrogen monoxide  $\text{NO}$
- f. iron (II) iodide  $\text{Fe}^{2+} \text{I}^-$   ~~$\text{FeI}_3$~~   $\text{FeI}_2$
- g. calcium phosphate  $\text{Ca}^{2+} (\text{PO}_4)^{3-}$   $\text{Ca}_3(\text{PO}_4)_2$
- h. dinitrogen dioxide  $\text{N}_2\text{O}_2$
- i. magnesium oxide  $\text{Mg}^{2+} \text{O}^{2-}$   $\text{MgO}$
- j. iron (III) chromate ~~iron~~  $\text{Fe}^{3+} (\text{CrO}_4)^{2-}$   $\text{Fe}_2(\text{CrO}_4)_3$
- k. sulfur dioxide  $\text{SO}_2$

Use with textbook pages 206-211.

**Balancing equations**

Starting with the skeleton equations, balance the following equations by adding coefficients where appropriate.

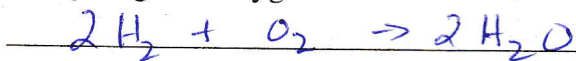
1.  $\text{H}_2 + \text{F}_2 \rightarrow 2\text{HF}$   $\text{H}_2 + \text{F}_2 \rightarrow 2\text{HF}$
2.  $2\text{Sn} + \text{O}_2 \rightarrow 2\text{SnO}$   $2\text{Sn} + \text{O}_2 \rightarrow 2\text{SnO}$
3.  $\text{MgCl}_2 \rightarrow \text{Mg} + \text{Cl}_2$   $\text{MgCl}_2 \rightarrow \text{Mg} + \text{Cl}_2$
4.  $2\text{KNO}_3 \rightarrow 2\text{KNO}_2 + \text{O}_2$   $2\text{KNO}_3 \rightarrow 2\text{KNO}_2 + \text{O}_2$
5.  $2\text{BN} + 3\text{F}_2 \rightarrow 2\text{BF}_3 + \text{N}_2$   $2\text{BN} + 3\text{F}_2 \rightarrow 2\text{BF}_3 + \text{N}_2$
6.  $\text{CuI}_2 + \text{Fe} \rightarrow \text{FeI}_2 + \text{Cu}$   $\text{CuI}_2 + \text{Fe} \rightarrow \text{FeI}_2 + \text{Cu}$
7.  $2\text{Li} + 2\text{H}_2\text{O} \rightarrow 2\text{LiOH} + \text{H}_2$   $2\text{Li} + 2\text{H}_2\text{O} \rightarrow 2\text{LiOH} + \text{H}_2$
8.  $4\text{NH}_3 + 3\text{O}_2 \rightarrow 2\text{N}_2 + 6\text{H}_2\text{O}$   $4\text{NH}_3 + 3\text{O}_2 \rightarrow 2\text{N}_2 + 6\text{H}_2\text{O}$
9.  $\text{V}_2\text{O}_5 + 5\text{Ca} \rightarrow 5\text{CaO} + 2\text{V}$   $\text{V}_2\text{O}_5 + 5\text{Ca} \rightarrow 5\text{CaO} + 2\text{V}$
10.  $2\text{C}_9\text{H}_6\text{O}_4 + 17\text{O}_2 \rightarrow 18\text{CO}_2 + 6\text{H}_2\text{O}$   $2\text{C}_9\text{H}_6\text{O}_4 + 17\text{O}_2 \rightarrow 18\text{CO}_2 + 6\text{H}_2\text{O}$
11.  $\text{H}_2\text{S} + \text{PbCl}_2 \rightarrow \text{PbS} + 2\text{HCl}$   $\text{H}_2\text{S} + \text{PbCl}_2 \rightarrow \text{PbS} + 2\text{HCl}$
12.  $2\text{C}_3\text{H}_7\text{OH} + 9\text{O}_2 \rightarrow 6\text{CO}_2 + 8\text{H}_2\text{O}$   $2\text{C}_3\text{H}_7\text{OH} + 9\text{O}_2 \rightarrow 6\text{CO}_2 + 8\text{H}_2\text{O}$
13.  $\text{Zn} + \text{CuSO}_4 \rightarrow \text{Cu} + \text{ZnSO}_4$   $\text{Zn} + \text{CuSO}_4 \rightarrow \text{Cu} + \text{ZnSO}_4$
14.  $\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 \rightarrow 6\text{CO}_2 + 6\text{H}_2\text{O}$   $\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 \rightarrow 6\text{CO}_2 + 6\text{H}_2\text{O}$
15.  $\text{C}_2\text{H}_5\text{OH} + 3\text{O}_2 \rightarrow 2\text{CO}_2 + 3\text{H}_2\text{O}$   $\text{C}_2\text{H}_5\text{OH} + 3\text{O}_2 \rightarrow 2\text{CO}_2 + 3\text{H}_2\text{O}$
16.  $2\text{Al} + 3\text{H}_2\text{SO}_4 \rightarrow 3\text{H}_2 + \text{Al}_2(\text{SO}_4)_3$   $2\text{Al} + 3\text{H}_2\text{SO}_4 \rightarrow 3\text{H}_2 + \text{Al}_2(\text{SO}_4)_3$
17.  $2\text{FeCl}_3 + 3\text{Ca}(\text{OH})_2 \rightarrow 2\text{Fe}(\text{OH})_3 + 3\text{CaCl}_2$   $2\text{FeCl}_3 + 3\text{Ca}(\text{OH})_2 \rightarrow 2\text{Fe}(\text{OH})_3 + 3\text{CaCl}_2$
18.  $\text{Pb}(\text{NO}_3)_2 + \text{K}_2\text{CrO}_4 \rightarrow \text{PbCrO}_4 + 2\text{KNO}_3$   $\text{Pb}(\text{NO}_3)_2 + \text{K}_2\text{CrO}_4 \rightarrow \text{PbCrO}_4 + 2\text{KNO}_3$
19.  $\text{Cd}(\text{NO}_3)_2 + (\text{NH}_4)_2\text{S} \rightarrow \text{CdS} + 2\text{NH}_4\text{NO}_3$   $\text{Cd}(\text{NO}_3)_2 + (\text{NH}_4)_2\text{S} \rightarrow \text{CdS} + 2\text{NH}_4\text{NO}_3$
20.  $\text{Ca}(\text{OH})_2 + 2\text{NH}_4\text{Cl} \rightarrow 2\text{NH}_3 + \text{CaCl}_2 + 2\text{H}_2\text{O}$   $\text{Ca}(\text{OH})_2 + 2\text{NH}_4\text{Cl} \rightarrow 2\text{NH}_3 + \text{CaCl}_2 + 2\text{H}_2\text{O}$

Use with textbook pages 202-211.

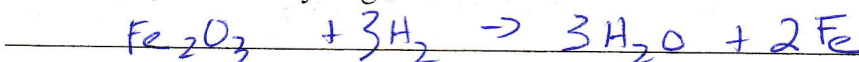
**Word equations**

Write the skeleton equation for each of the following reactions. Then balance each of the following chemical equations.

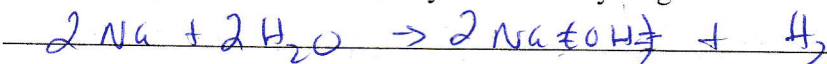
1. hydrogen + oxygen → water



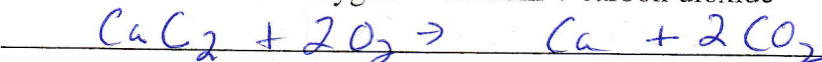
2. iron(III) oxide + hydrogen → water + iron



3. sodium + water → sodium hydroxide + hydrogen



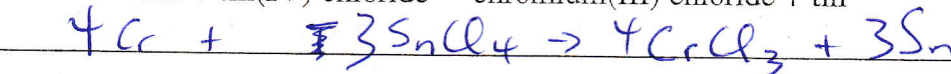
- \* 4. calcium carbide + oxygen → calcium + carbon dioxide

\*carbide  $\text{C}^-$ 

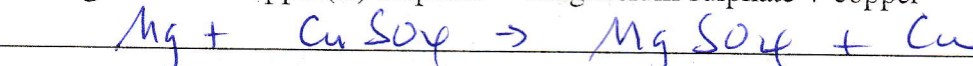
5. potassium iodide + chlorine → potassium chloride + iodine



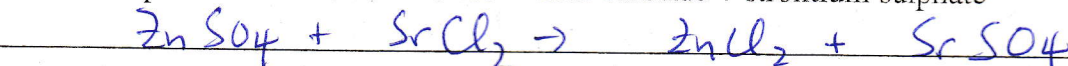
6. chromium + tin(IV) chloride → chromium(III) chloride + tin



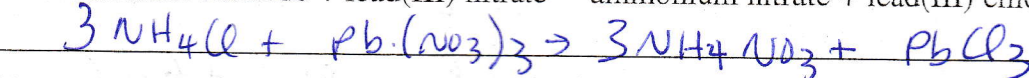
7. magnesium + copper(II) sulphate → magnesium sulphate + copper



8. zinc sulphate + strontium chloride → zinc chloride + strontium sulphate



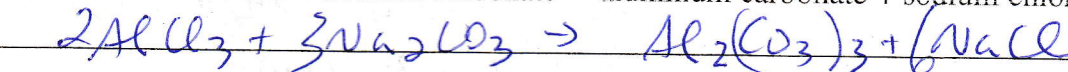
9. ammonium chloride + lead(III) nitrate → ammonium nitrate + lead(III) chloride



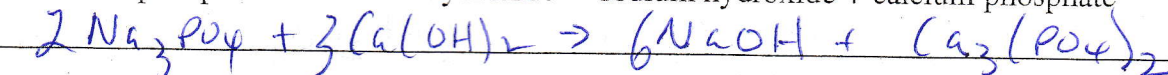
10. iron(III) nitrate + magnesium sulphide → iron(III) sulphide + magnesium nitrate



11. aluminum chloride + sodium carbonate → aluminum carbonate + sodium chloride



12. sodium phosphate + calcium hydroxide → sodium hydroxide + calcium phosphate





Use with textbook pages 202-203, 206-211.

## Chemical reactions and chemical equations

Rewrite the following sentences as chemical word equations. Then write the skeleton equation and balance the equation.

1. Iron combines with oxygen to form rust, which is also known as iron(II) oxide.

Word equation: iron + oxygen  $\rightarrow$  iron(II) oxide

Balanced equation:  $2\text{Fe} + \text{O}_2 \rightarrow 2\text{FeO}$

2. A solution of hydrogen chloride reacts with sodium carbonate to produce carbon dioxide, sodium chloride, and water.

Word equation: hydrogen chloride + sodium carbonate  $\rightarrow$  carbon dioxide + sodium chloride + water

Balanced equation:  $2\text{HCl} + \text{Na}_2\text{CO}_3 \rightarrow \text{CO}_2 + 2\text{NaCl} + \text{H}_2\text{O}$

3. When aluminum metal is exposed to oxygen, a metal oxide called aluminum oxide is formed.

Word equation: aluminum + oxygen  $\rightarrow$  aluminum oxide

Balanced equation:  $4\text{Al} + 3\text{O}_2 \rightarrow 2\text{Al}_2\text{O}_3$

4. Water reacts with powdered sodium oxide to produce a solution of sodium hydroxide.

Word equation: water + sodium oxide  $\rightarrow$  sodium hydroxide

Balanced equation:  $\text{H}_2\text{O} + \text{Na}_2\text{O} \rightarrow 2\text{NaOH}$

5. Hydrogen gas reacts with nitrogen trifluoride gas to form nitrogen gas and hydrogen fluoride.

Word equation: hydrogen + nitrogen trifluoride  $\rightarrow$  nitrogen + hydrogen fluoride

Balanced equation:  $3\text{H}_2 + 2\text{NF}_3 \rightarrow \text{N}_2 + 6\text{HF}$

6. Chromium(III) sulphate reacts with potassium carbonate to form chromium(III) carbonate and potassium sulphate.

Word equation: chromium(III) sulfate + potassium carbonate  $\rightarrow$  chromium(III) carbonate + potassium sulfate

Balanced equation:  $\text{Cr}_2(\text{SO}_4)_3 + 3\text{K}_2\text{CO}_3 \rightarrow \text{Cr}_2(\text{CO}_3)_3 + 3\text{K}_2\text{SO}_4$

7. Potassium chlorate when heated becomes oxygen gas and potassium chloride.

Word equation: potassium chlorate  $\rightarrow$  oxygen + potassium chloride

Balanced equation:  $2\text{KClO}_3 \rightarrow 3\text{O}_2 + 2\text{KCl}$

8. A piece of metallic zinc is placed in a blue solution of copper(II) sulphate. A reddish brown layer of metallic copper forms in a clear solution of zinc sulphate.

Word equation: zinc + copper(II) sulfate  $\rightarrow$  copper + zinc sulfate

Balanced equation:  $\text{Zn} + \text{CuSO}_4 \rightarrow \text{Cu} + \text{ZnSO}_4$