

Worksheet 6.2 Word Equations

1. Write the chemical equations and balance each of the following word equations.

- a) Aluminum metal reacts with iron (II) oxide powder to produce aluminum oxide solid and iron metal.

- b) Aluminum sulphate solution and calcium hydroxide solution produce a precipitate of aluminum hydroxide and solid calcium sulphate.

- c) Ammonia gas (NH_3) plus oxygen gas yields nitrogen monoxide gas plus water vapour.

- d) Calcium hydroxide solution and carbon dioxide gas yields solid calcium carbonate and liquid water.

- e) Aqueous iron (III) chloride and sodium carbonate solution yields aqueous sodium chloride and a precipitate of iron (III) carbonate.

- f) Solid iron (III) oxide and carbon monoxide gas yields iron metal and carbon dioxide gas.

- g) Magnesium carbonate solution plus aqueous hydrochloric acid (HCl) yields magnesium chloride solution plus liquid water and carbon dioxide gas.

- h) Silicon dioxide solid plus aqueous hydrofluoric acid (HF) yields solid silicon tetrafluoride plus liquid water.

- i) Aqueous sodium hydroxide and carbon dioxide gas yields sodium carbonate solution and liquid water.

2. Balance the following chemical equations.

- a) $\underline{\quad}$ Al + $\underline{\quad}$ NaOH \rightarrow $\underline{\quad}$ Na₃AlO₃ + $\underline{\quad}$ H₂
- b) $\underline{\quad}$ C₁₂H₂₂O₁₁ + $\underline{\quad}$ O₂ \rightarrow $\underline{\quad}$ CO₂ + $\underline{\quad}$ H₂O
- c) $\underline{\quad}$ Ca₃(PO₄)₂ + $\underline{\quad}$ H₂SO₄ \rightarrow $\underline{\quad}$ CaSO₄ + $\underline{\quad}$ H₃PO₄
- d) $\underline{\quad}$ FeOCr₂O₃ + $\underline{\quad}$ K₂CO₃ + $\underline{\quad}$ O₂ \rightarrow $\underline{\quad}$ K₂CrO₄ + $\underline{\quad}$ CO₂ + $\underline{\quad}$ Fe₂O₃
- e) $\underline{\quad}$ Cu + $\underline{\quad}$ HNO₃ \rightarrow $\underline{\quad}$ Cu(NO₃)₂ + $\underline{\quad}$ NO + $\underline{\quad}$ H₂O
- f) $\underline{\quad}$ SiF_{4(s)} + $\underline{\quad}$ NaOH_(aq) \rightarrow $\underline{\quad}$ Na₄SiO_{4(s)} + $\underline{\quad}$ NaF_(aq) + $\underline{\quad}$ H₂O_(l)
- g) $\underline{\quad}$ Na₂B₄O₇ + $\underline{\quad}$ HCl + $\underline{\quad}$ H₂O \rightarrow $\underline{\quad}$ NaCl + $\underline{\quad}$ H₃BO₃
- h) $\underline{\quad}$ MnO₂ + $\underline{\quad}$ K₂CO₃ + $\underline{\quad}$ O₂ \rightarrow $\underline{\quad}$ KMnO₄ + $\underline{\quad}$ CO₂
- i) $\underline{\quad}$ KMnO₄ + $\underline{\quad}$ HCl \rightarrow $\underline{\quad}$ KCl + $\underline{\quad}$ MnCl₂ + $\underline{\quad}$ H₂O + $\underline{\quad}$ Cl₂
- j) $\underline{\quad}$ Ni₂O₃ + $\underline{\quad}$ Fe + $\underline{\quad}$ H₂O \rightarrow $\underline{\quad}$ Ni(OH)₂ + $\underline{\quad}$ Fe(OH)₂
- k) $\underline{\quad}$ Si + $\underline{\quad}$ NaOH \rightarrow $\underline{\quad}$ Na₄SiO₄ + $\underline{\quad}$ H₂
- l) $\underline{\quad}$ Cu + $\underline{\quad}$ HNO₃ \rightarrow $\underline{\quad}$ Cu(NO₃)₂ + $\underline{\quad}$ NO + $\underline{\quad}$ H₂O
- m) $\underline{\quad}$ FeCl₂ + $\underline{\quad}$ KNO₃ + $\underline{\quad}$ HCl \rightarrow $\underline{\quad}$ FeCl₃ + $\underline{\quad}$ NO + $\underline{\quad}$ H₂O + $\underline{\quad}$ KCl
- n) $\underline{\quad}$ KMnO₄ + $\underline{\quad}$ HBr \rightarrow $\underline{\quad}$ MnBr₂ + $\underline{\quad}$ Br₂ + $\underline{\quad}$ KBr + $\underline{\quad}$ H₂O
- o) $\underline{\quad}$ K₂Cr₂O₇ + $\underline{\quad}$ HCl \rightarrow $\underline{\quad}$ KCl + $\underline{\quad}$ CrCl₃ + $\underline{\quad}$ H₂O + $\underline{\quad}$ Cl₂

Answers to Worksheet 6.1 Writing and Balancing Equations

1. Write the chemical equations and balance each of the following word equations.
- a) Aluminum metal reacts with iron (II) oxide powder to produce aluminum oxide solid and iron metal.
- $$2Al(s) + 3FeO(s) \rightarrow Al_2O_3(s) + 3Fe(s)$$
- b) Aluminum sulphate solution and calcium hydroxide solution produce a precipitate of aluminum hydroxide and solid calcium sulphate.
- $$Al_2(SO_4)_3(aq) + 3Ca(OH)_2(aq) \rightarrow 2Al(OH)_3(s) + 3CaSO_4(s)$$
- c) Ammonia gas (NH_3) plus oxygen gas yields nitrogen (II) oxide gas plus water vapour.
- $$4NH_3(g) + 5O_2(g) \rightarrow 4NO(g) + 6H_2O(g)$$
- d) Calcium hydroxide solution and carbon dioxide gas yields solid calcium carbonate and liquid water.
- $$Ca(OH)_2(aq) + CO_2(g) \rightarrow CaCO_3(s) + H_2O(l)$$
- e) Aqueous iron (III) chloride and sodium carbonate solution yields aqueous sodium chloride and a precipitate of iron (III) carbonate.
- $$2FeCl_3(aq) + 3Na_2CO_3(aq) \rightarrow 6NaCl(aq) + Fe_2(CO_3)_3(s)$$
- f) Solid iron (III) oxide and carbon monoxide gas yields iron metal and carbon dioxide gas.
- $$Fe_2O_3(s) + 3CO(g) \rightarrow 2Fe(s) + 3CO_2(g)$$
- g) Magnesium carbonate solution plus aqueous hydrochloric acid (HCl) yields magnesium chloride solution plus liquid water and carbon dioxide gas.
- $$MgCO_3(aq) + 2HCl(aq) \rightarrow MgCl_2(aq) + H_2O(l) + CO_2(g)$$
- h) Silicon dioxide solid plus aqueous hydrofluoric acid (HF) yields solid silicon tetrafluoride plus liquid water.
- $$SiO_2(s) + 4HF(aq) \rightarrow SiF_4(s) + 2H_2O(l)$$
- i) Aqueous sodium hydroxide and carbon dioxide gas yields sodium carbonate solution and liquid water.
- $$2NaOH(aq) + CO_2(g) \rightarrow Na_2CO_3(aq) + H_2O(l)$$

2. Balance the following chemical equations.

- a) $2 \text{Al} + 6 \text{NaOH} \rightarrow 2 \text{Na}_3\text{AlO}_3 + 3 \text{H}_2$
- b) $1 \text{C}_{12}\text{H}_{22}\text{O}_{11} + 12 \text{O}_2 \rightarrow 12 \text{CO}_2 + 11 \text{H}_2\text{O}$
- c) $1 \text{Ca}_3(\text{PO}_4)_2 + 3 \text{H}_2\text{SO}_4 \rightarrow 3 \text{CaSO}_4 + 2 \text{H}_3\text{PO}_4$
- d) $4 \text{FeOCr}_2\text{O}_3 + 8 \text{K}_2\text{CO}_3 + 7 \text{O}_2 \rightarrow 8 \text{K}_2\text{CrO}_4 + 8 \text{CO}_2 + 2 \text{Fe}_2\text{O}_3$
- e) $3 \text{Cu} + 8 \text{HNO}_3 \rightarrow 3 \text{Cu}(\text{NO}_3)_2 + 2 \text{NO} + 4 \text{H}_2\text{O}$
- f) $1 \text{SiF}_{4(s)} + 8 \text{NaOH}_{(aq)} \rightarrow 1 \text{Na}_4\text{SiO}_{4(s)} + 4 \text{NaF}_{(aq)} + 4 \text{H}_2\text{O}_{(l)}$
- g) $1 \text{Na}_2\text{B}_4\text{O}_7 + 2 \text{HCl} + 5 \text{H}_2\text{O} \rightarrow 2 \text{NaCl} + 4 \text{H}_3\text{BO}_3$
- h) $4 \text{MnO}_2 + 2 \text{K}_2\text{CO}_3 + 3 \text{O}_2 \rightarrow 4 \text{KMnO}_4 + 2 \text{CO}_2$
- i) $2 \text{KMnO}_4 + 16 \text{HCl} \rightarrow 2 \text{KCl} + 2 \text{MnCl}_2 + 8 \text{H}_2\text{O} + 5 \text{Cl}_2$
- j) $1 \text{Ni}_2\text{O}_3 + 1 \text{Fe} + 3 \text{H}_2\text{O} \rightarrow 2 \text{Ni}(\text{OH})_2 + 1 \text{Fe}(\text{OH})_2$
- k) $1 \text{Si} + 4 \text{NaOH} \rightarrow 1 \text{Na}_4\text{SiO}_4 + 2 \text{H}_2$
- l) $3 \text{Cu} + 8 \text{HNO}_3 \rightarrow 3 \text{Cu}(\text{NO}_3)_2 + 2 \text{NO} + 4 \text{H}_2\text{O}$
- m) $3 \text{FeCl}_2 + 1 \text{KNO}_3 + 4 \text{HCl} \rightarrow 3 \text{FeCl}_3 + 1 \text{NO} + 2 \text{H}_2\text{O} + 1 \text{KCl}$
- n) $2 \text{KMnO}_4 + 16 \text{HBr} \rightarrow 2 \text{MnBr}_2 + 5 \text{Br}_2 + 2 \text{KBr} + 8 \text{H}_2\text{O}$
- o) $1 \text{K}_2\text{Cr}_2\text{O}_7 + 14 \text{HCl} \rightarrow 2 \text{KCl} + 2 \text{CrCl}_3 + 7 \text{H}_2\text{O} + 3 \text{Cl}_2$