

## Worksheet: Writing and Balancing Chemical Reactions

1. Balance the following equations and indicate the type of reaction as formation, decomposition, single replacement, double replacement, hydrocarbon combustion, or other.

- a.  $\underline{2}$  Cu<sub>(s)</sub> +  $\underline{1}$  O<sub>2(g)</sub> →  $\underline{2}$  CuO<sub>(s)</sub>
- b.  $\underline{2}$  H<sub>2</sub>O<sub>(l)</sub> →  $\underline{2}$  H<sub>2(g)</sub> +  $\underline{1}$  O<sub>2(g)</sub>
- c.  $\underline{3}$  Fe<sub>(s)</sub> +  $\underline{4}$  H<sub>2</sub>O<sub>(g)</sub> →  $\underline{4}$  H<sub>2(g)</sub> +  $\underline{1}$  Fe<sub>3</sub>O<sub>4(s)</sub>
- d.  $\underline{2}$  AsCl<sub>3(aq)</sub> +  $\underline{3}$  H<sub>2</sub>S<sub>(aq)</sub> →  $\underline{1}$  As<sub>2</sub>S<sub>3(s)</sub> +  $\underline{6}$  HCl<sub>(aq)</sub>
- e.  $\underline{1}$  CuSO<sub>4</sub> • 5 H<sub>2</sub>O<sub>(s)</sub> →  $\underline{1}$  CuSO<sub>4(s)</sub> +  $\underline{5}$  H<sub>2</sub>O<sub>(g)</sub>
- f.  $\underline{1}$  Fe<sub>2</sub>O<sub>3(s)</sub> +  $\underline{3}$  H<sub>2(g)</sub> →  $\underline{2}$  Fe<sub>(s)</sub> +  $\underline{3}$  H<sub>2</sub>O<sub>(l)</sub>
- g.  $\underline{1}$  CaCO<sub>3(s)</sub> →  $\underline{1}$  CaO<sub>(s)</sub> +  $\underline{1}$  CO<sub>2(g)</sub>
- h.  $\underline{8}$  Fe<sub>(s)</sub> +  $\underline{1}$  S<sub>8(s)</sub> →  $\underline{8}$  FeS<sub>(s)</sub>
- i.  $\underline{1}$  H<sub>2</sub>S<sub>(aq)</sub> +  $\underline{2}$  KOH<sub>(aq)</sub> →  $\underline{2}$  H<sub>2</sub>O<sub>(l)</sub> +  $\underline{1}$  K<sub>2</sub>S<sub>(aq)</sub>
- j.  $\underline{2}$  NaCl<sub>(l)</sub> →  $\underline{2}$  Na<sub>(l)</sub> +  $\underline{1}$  Cl<sub>2(g)</sub>
- k.  $\underline{2}$  Al<sub>(s)</sub> +  $\underline{3}$  H<sub>2</sub>SO<sub>4(aq)</sub> →  $\underline{3}$  H<sub>2(g)</sub> +  $\underline{1}$  Al<sub>2</sub>(SO<sub>4</sub>)<sub>3(aq)</sub>
- l.  $\underline{1}$  H<sub>3</sub>PO<sub>4(aq)</sub> +  $\underline{3}$  NH<sub>4</sub>OH<sub>(aq)</sub> →  $\underline{3}$  H<sub>2</sub>O<sub>(l)</sub> +  $\underline{1}$  (NH<sub>4</sub>)<sub>3</sub>PO<sub>4(aq)</sub>
- m.  $\underline{1}$  C<sub>3</sub>H<sub>8(g)</sub> +  $\underline{5}$  O<sub>2(g)</sub> →  $\underline{3}$  CO<sub>2(g)</sub> +  $\underline{4}$  H<sub>2</sub>O<sub>(l)</sub>
- n.  $\underline{4}$  Al<sub>(s)</sub> +  $\underline{3}$  O<sub>2(g)</sub> →  $\underline{2}$  Al<sub>2</sub>O<sub>3(s)</sub>
- o.  $\underline{1}$  CH<sub>4(g)</sub> +  $\underline{2}$  O<sub>2(g)</sub> →  $\underline{1}$  CO<sub>2(g)</sub> +  $\underline{2}$  H<sub>2</sub>O<sub>(l)</sub>
- p.  $\underline{1}$  K<sub>2</sub>SO<sub>4(aq)</sub> +  $\underline{1}$  BaCl<sub>2(aq)</sub> →  $\underline{2}$  KCl<sub>(aq)</sub> +  $\underline{1}$  BaSO<sub>4(s)</sub>
- q.  $\underline{1}$  C<sub>5</sub>H<sub>12(l)</sub> +  $\underline{8}$  O<sub>2(g)</sub> →  $\underline{5}$  CO<sub>2(g)</sub> +  $\underline{6}$  H<sub>2</sub>O<sub>(g)</sub>
- r.  $\underline{1}$  Ca(OH)<sub>2(aq)</sub> +  $\underline{2}$  NH<sub>4</sub>Cl<sub>(aq)</sub> →  $\underline{2}$  NH<sub>4</sub>OH<sub>(aq)</sub> +  $\underline{1}$  CaCl<sub>2(aq)</sub>
- s.  $\underline{1}$  V<sub>2</sub>O<sub>5(s)</sub> +  $\underline{5}$  Ca<sub>(s)</sub> →  $\underline{5}$  CaO<sub>(s)</sub> +  $\underline{2}$  V<sub>(s)</sub>
- t.  $\underline{2}$  Na<sub>(s)</sub> +  $\underline{1}$  ZnI<sub>2(aq)</sub> →  $\underline{2}$  NaI<sub>(aq)</sub> +  $\underline{1}$  Zn<sub>(s)</sub>
- u.  $\underline{1}$  C<sub>7</sub>H<sub>6</sub>O<sub>3(l)</sub> +  $\underline{7}$  O<sub>2(g)</sub> →  $\underline{7}$  CO<sub>2(g)</sub> +  $\underline{3}$  H<sub>2</sub>O<sub>(l)</sub>
- v.  $\underline{3}$  Ca<sub>(s)</sub> +  $\underline{1}$  N<sub>2(g)</sub> →  $\underline{1}$  Ca<sub>3</sub>N<sub>2(s)</sub>
- w.  $\underline{1}$  Fe<sub>2</sub>O<sub>3(s)</sub> +  $\underline{3}$  H<sub>2(g)</sub> →  $\underline{2}$  Fe<sub>(s)</sub> +  $\underline{3}$  H<sub>2</sub>O<sub>(l)</sub>
- x.  $\underline{1}$  C<sub>15</sub>H<sub>30(l)</sub> +  $\underline{45}$  O<sub>2(g)</sub> →  $\underline{15}$  CO<sub>2(g)</sub> +  $\underline{15}$  H<sub>2</sub>O<sub>(g)</sub> or 2 - 45 - 30 - 30
- y.  $\underline{2}$  BN<sub>(s)</sub> +  $\underline{3}$  F<sub>2(g)</sub> →  $\underline{2}$  BF<sub>3(s)</sub> +  $\underline{1}$  N<sub>2(g)</sub>
- z.  $\underline{2}$  C<sub>12</sub>H<sub>26(l)</sub> +  $\underline{37}$  O<sub>2(g)</sub> →  $\underline{24}$  CO<sub>2(g)</sub> +  $\underline{26}$  H<sub>2</sub>O<sub>(g)</sub>

2. Predict the product(s) along with the states, indicate the type of reaction, and balance the following chemical reactions.

- A solution of lead (II) nitrate is mixed with a solution of sodium iodide.
- Solid zinc sulfide reacts with oxygen in the air.
- Liquid butane (C<sub>4</sub>H<sub>10(l)</sub>) is used as a fuel to ignite a lighter.
- Barium hydroxide solution is neutralized by adding hydrochloric acid (HCl<sub>(aq)</sub>).
- Copper metal is placed in a solution of silver nitrate.
- Sulfur burns in oxygen to make sulfur dioxide gas.
- A solution of aluminum sulfate is mixed with a solution of calcium hydroxide.
- Zinc metal is placed in sulfuric acid (H<sub>2</sub>SO<sub>4(aq)</sub>).
- Aluminum powder is placed in a container filled with chlorine gas.
- Sucrose undergoes cellular respiration.

