

Synthesis and Decomposition Reactions

1. For each of the following word equations, write a balanced chemical equation.

a) magnesium + oxygen gas \longrightarrow magnesium oxide



b) hydrogen gas + oxygen gas \longrightarrow water



c) potassium + chlorine gas \longrightarrow potassium chloride



d) iron + oxygen gas \longrightarrow iron (III) oxide

4



e) sodium iodide \longrightarrow sodium + iodine



f) zinc carbonate \longrightarrow zinc oxide + carbon dioxide (zinc forms a Zn^{2+} ion)



g) iron (II) sulfide \longrightarrow iron + sulfur



2. For these questions, the product is not given to you.
Complete the word equation by naming the product, and then write a
balanced chemical equation.

a) sodium + oxygen gas \longrightarrow sodium oxide



b) aluminum + bromine gas \longrightarrow aluminum bromide

2



c) magnesium chloride \longrightarrow magnesium + chlorine



d) water \longrightarrow hydrogen + oxygen



Single Displacement and Double Displacement Reactions

1. magnesium + silver nitrate \longrightarrow silver + magnesium nitrate



2. bromine + calcium iodide \longrightarrow iodine + calcium bromide



3. copper + silver nitrate \longrightarrow silver + copper (II) nitrate



4. zinc + hydrogen chloride \longrightarrow hydrogen + zinc chloride



5. lead (II) nitrate + potassium iodide \longrightarrow lead (II) iodide + potassium nitrate



6. calcium carbonate + hydrogen chloride \longrightarrow hydrogen carbonate + calcium chloride



7. aluminum + copper (II) chloride \longrightarrow copper + aluminum chloride



8. beryllium fluoride + sodium oxide \longrightarrow beryllium oxide + sodium fluoride



9. For each of the following, predict what the products are and then balance the equation.

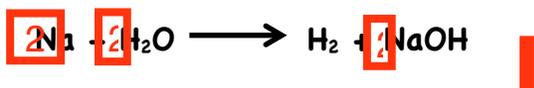
a) aluminum reacts with iron (III) oxide

(This is how iron is extracted from iron ore. It is heated at a high temperature with aluminum present. In the reaction, iron is separated from the iron ore producing a new aluminum compound.)



b) sodium reacts with water

(This reaction is dangerous. Dropping a piece of sodium in water can cause a fire.)



c) sodium chloride reacts with hydrogen sulfate (sulfuric acid)

(When this happens in the laboratory, a dangerous gas is produced.)



d) hydrogen sulfate reacts with calcium phosphate

One of the products is hydrogen phosphate. This is a very good plant fertilizer.)



Hydrocarbon Combustion Reactions

Write balanced chemical equations for the following reactions.

1. The burning of propane (C_3H_8) in a barbecue.

propane + oxygen \longrightarrow carbon dioxide + water



2. The combustion of gasoline (mainly octane C_8H_{18}) by an automobile engine.

octane + oxygen \longrightarrow carbon dioxide + water



3. The combustion of cyclopropane (C_3H_6). This was once used as an anaesthetic.

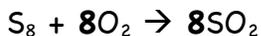
cyclopropane + oxygen \longrightarrow carbon dioxide + water



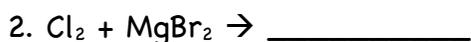
Practice: Reaction Types

For questions 1 to 10

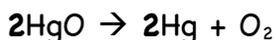
- Predict what the products are (if they are not shown)
- Balance the chemical equation
- Write the reaction type



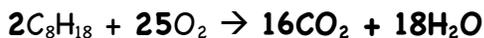
Synthesis



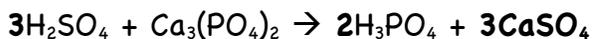
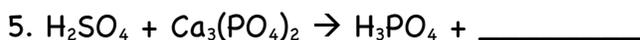
Single Displacement (or Single Replacement)



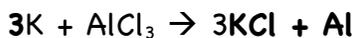
Decomposition



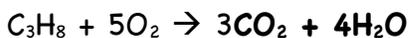
Hydrocarbon Combustion



Double Displacement (or Double Replacement)



Single Displacement



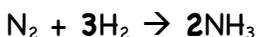
Hydrocarbon Combustion



Decomposition



Double Replacement



Synthesis

In the next few questions a description of a reaction is given. From this description,

- Write a balanced the chemical equation
- Write the reaction type

11. Methane is burned in a furnace to heat a home.



Hydrocarbon Combustion

12. A piece of aluminum foil placed in a solution of copper (II) chloride leads to a neat reaction.



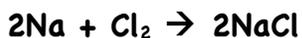
Single Replacement

13. One way to produce hydrogen gas is by running an electrical current through water.



Decomposition

14. One way to make table salt, sodium chloride, is to combine it with sodium metal and chlorine molecules.



Synthesis

15. One of the five types of chemical reactions has not been mentioned in questions 11 to 14 above. Name the missing type, and invent your own reaction of this type. Go ahead, be inventive!