Warm-Up

1) \_\_\_\_ N2 + \_\_\_\_ F2 🡪 \_\_\_\_ NF3

2) \_\_\_\_ KClO3 🡪 \_\_\_\_ KCl + \_\_\_\_ O2

3) \_\_\_\_ C12H22O11 + \_\_\_\_ O2 🡪 \_\_\_\_ CO2 + \_\_\_\_ H2O

4) \_\_\_\_ CuSO4 + \_\_\_\_ Fe 🡪 \_\_\_\_ Fe2(SO4)3 + \_\_\_\_ Cu

5) \_\_\_\_ MgF2 + \_\_\_\_ Li2CO3 🡪 \_\_\_\_ MgCO3 + \_\_\_\_ LiF

6) \_\_\_\_ H3PO4 + \_\_\_\_ NH4OH 🡪 \_\_\_\_ H2O + \_\_\_\_(NH4)3PO4

Synthesis and Decomposition

Synthesis reactions are chemical reactions in which two or more substances react to form a new product.  The general form of a synthesis reaction is written as:     A  +  B  🡪  AB

Decomposition reactions are chemical reactions in which a reactant breaks down into two or more products.  The general form of a decomposition reaction is written as:     AB  🡪  A  +  B

*Balance the following reactions and identify whether the reactions are synthesis or decomposition reactions.*

|  |  |  |
| --- | --- | --- |
|  | Balance the Reactions | Synthesis or Decomposition? |
| 1. | \_\_\_H2SO4  🡪  \_\_\_H2O  +  \_\_\_SO3          |  |
| 2. | \_\_\_Cu  +  \_\_\_S8  🡪  \_\_\_Cu2S |  |
| 3. | \_\_\_Zn(OH)2  🡪 \_\_\_ZnO  +  \_\_\_H2O  |  |

*Identify the following reaction types and predict the products. Then, balance the equations.*

|  |  |  |
| --- | --- | --- |
|  | Predict and Balance the Reactions | Synthesis or Decomposition? |
| 4. | \_\_\_Na  +  \_\_\_I2  🡪  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_               |  |
| 5. | hydrogen + chlorine \_\_\_\_\_ + \_\_\_\_\_\_🡪 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |  |
| 6. | \_\_\_Ag2O  🡪  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |  |

Single and Double Replacement

Single replacement reactions are chemical reactions in which a metal or non-metal element replaces the corresponding metal or non-metal in an ionic compound. The general form of a single replacement reaction is written as A + BC 🡪 AC + B (A is a metal) or A + BC 🡪 C + BA (A is a non-metal).

Double replacement reactions are chemical reactions in which the positive ions in two ionic compounds ‘switch places’ to form two new ionic compounds. The general form of a double replacement reaction is written as AB + CD 🡪 AD + CB.

*Balance the following reactions and identify whether they are single replacement or double replacement.*

|  |  |  |
| --- | --- | --- |
|  | Balance the Reactions | Single or Double Replacement?  |
| 7. | \_\_\_KI + \_\_\_Br2  🡪  \_\_\_KBr  +  \_\_\_I2 |  |
| 8. | \_\_\_BaCl2 + Al2(SO4)3  🡪 \_\_\_BaSO4  +  \_\_\_AlCl3 |  |
| 9. | \_\_\_AgNO3 + Cu 🡪 \_\_\_Cu(NO3)2 + \_\_\_Ag |  |

*Identify the following reaction types and predict the products. Then, balance the equations.*

|  |  |  |
| --- | --- | --- |
|  | Predict and Balance the Reactions | Single or Double Replacement? |
| 10. |  \_\_\_CuCl2  +  \_\_\_F2  🡪  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |  |
| 11. | \_\_\_K2CO3 + \_\_\_BaCl2 🡪 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |  |
| 12.  | calcium + aluminum nitride\_\_\_\_\_ + \_\_\_\_\_\_\_\_\_\_\_🡪 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |  |

Neutralisation

Neutralisation is a special example of a double replacement reaction where an acid and base react to form water and a salt. The general form of a neutralisation is HA + BOH 🡪 H2O + BA.

*Identify the following reaction types and predict the products. Then, balance the equations.*

|  |  |
| --- | --- |
|  | Predict and Balance the Reactions |
| 13. | \_\_\_HCl  +  \_\_\_Ba(OH)2  🡪  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| 14. | \_\_\_NaOH + \_\_\_CH3COOH 🡪 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| 15. | \_\_\_Ca(OH)2 + \_\_\_H3PO4 🡪 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

Combustion

Combustion is a reaction of an element or compound (often a hydrocarbon or alcohol) with oxygen to produce carbon dioxide and water. The general form of a hydrocarbon combustion reaction is CxHy + O2 🡪 CO2 + H2O. Alcohol combustion leads to the same products (carbon dioxide and water).

(Note: Both neutralisation and combustion reactions produce water as a product.)

*Predict the products of the following combustion reactions. Then, balance the equations.*

|  |  |
| --- | --- |
|  | Predict and Balance the Reactions |
| 16. |  \_\_\_C2H6  +  \_\_\_O2 🡪  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| 17. | \_\_\_C8H18  +  \_\_\_O2 🡪  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

6.1 Important Vocabulary

**Combustion**: the rapid reaction of an element or compound (usually a hydrocarbon or alcohol) with oxygen to form an oxide and to produce heat

**Decomposition**: the breaking down of a compound into smaller compounds or separate elements

**Double Replacement**: when two ionic solutions react to produce two other ionic compounds, one of which can be a precipitate

**Neutralisation:** an example of a double replacement reaction where an acid and base react to form water and a salt

**Precipitate:** an insoluble (does not dissolve) solid ionic compound that often forms in double replacement reactions

**Single Replacement**: when a reactive element (metal or non-metal) and compound react to produce another element and another compound

**Synthesis (Combination)**: where two or more reactants combine to produce a single product

It may help you to review:

* Ionic bonding (Ch. 4.1)
* Diatomic molecules (Ch. 4.1)
* Naming Compounds (Ch. 4.2)
* Balancing Equations (Ch. 4.3)
* Acid-Base Neutralization (Pg. 236 in textbook)