ChemQuest 35

Intro. to Chemical Reactions

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Hour: \_\_\_\_\_

**Formula Review**

1. Write the formulas for the following compounds:

a) dinitrogen pentoxide: \_\_\_\_\_\_\_\_\_\_\_\_\_\_ b) calcium phosphide: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

c) copper(II) phosphate: \_\_\_\_\_\_\_\_\_\_\_\_\_\_ d) lithium sulfate: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Write the names for the following compounds:

a) Ca(CN)2 : \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ b) P2O3 : \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

c) FeCO3 : \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ d) K3N : \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Chemical Reactions:** What they look like…

Here is what a chemical reaction looks like when it is written:

Cu(NO3)2 + Zn 🡪 Zn(NO3)2 + Cu

There is a sentence that you can write to describe what happens above:

*Copper(II) nitrate reacts with zinc metal and yields zinc nitrate and copper metal.*

Take a minute to notice the relationship between the sentence and the symbols in the reaction. Now, try a few yourself.

**Critical Thinking Questions**

1. Given the following reaction, write the sentence that goes along with it…

CaCl2 + AgNO3 🡪 Ca(NO3)2 + AgCl

1. Given the following sentence, use chemical symbols to write a reaction that represents it…

*Nickel(II) nitrate reacts with sodium carbonate and yields nickel(II) carbonate and sodium nitrate.*

1. Given the following reaction, write the sentence that goes along with it…

Na2CO3 + AlCl3 🡪 NaCl + Al2(CO3)3

1. Write an equation to go along with the following sentence.

*Lithium reacts with water to produce lithium hydroxide and hydrogen*

**Information**: Introduction to Reactions

During a chemical reaction, new substances are formed. Reactants are transformed into different products. Atoms are never created or destroyed, but they are rearranged. A chemical equation represents what happens during a reaction. The following is an example of a chemical equation:

Example Equation: Ca + HNO3 🡪 Ca(NO3)2 + H2

This equation describes the reaction of calcium (Ca) with nitric acid (HNO3) to produce calcium nitrate (Ca(NO3)2) and hydrogen gas (H2). You may notice that there are more total atoms on the right side than there are on the left side of the equation. If this seems strange to you, don’t worry about it now; we’ll fix this later.

Note in the above equation that hydrogen gas is written as H2 and not simply as H. There are a few elements that exist as diatomic molecules. If a substance is diatomic then the substance must always be bonded to something. A hydrogen atom is diatomic and so it must be bonded to something else like in HCl or HNO3. If nothing is available for it to bond to, it will bond to itself by forming H2. All of the diatomic substances are listed below:

Br I N Cl H O F

When by themselves these elements exist as Br2, I2, N2, Cl2, H2, O2, and F2. By the way, you can remember these by recalling a made-up name: Mr. Brinclhof.

**Critical Thinking Questions**

1. Consider the bromine atoms in this reaction: LiBr + P 🡪 Li3P + Br2.
   1. Why is bromine written as Br2 on the right side?
   2. The correct formula for lithium bromide is LiBr. Why doesn’t bromine need a “2” in the formula?
2. Name the “reactants” from the reaction in question 7.

**Information**: Single Replacement Reactions

There are several types of reactions that follow predictable patterns. The first kind is called a single replacement reaction. See if you can figure out the pattern in each of the following reactions.

Ag + KCl 🡪 K + AgCl

CaF2 + Mg 🡪 MgF2 + Ca

**Critical Thinking Questions**

1. Answer the questions that follow based on this chemical equation:

Na + MgCl2 🡪 NaCl + Mg.

1. Why can’t NaMg be produced (Hint: consider the charges of the sodium and magnesium ions)?
2. Why can’t NaCl2 be produced?
3. Given your answers to parts a and b, do you think that NaCl and Mg the only products that can be produced?
4. Given the following equation: Li + Ca3(PO4)2 🡪 Li3PO4 + Ca.
5. Why can’t CaLi2 be produced?
6. Why can’t Li3P be produced?
7. Are Li3PO4 and Ca the only substances that can be produced?
8. Write chemical equations for the following reactions.
9. Aluminum sulfate reacts with barium to produce barium sulfate and aluminum.
10. Magnesium reacts with copper(I) nitrate to produce magnesium nitrate and copper.
11. Sodium reacts with calcium phosphide to produce sodium phosphide and calcium.
12. Phosphorus reacts with sodium chloride to produce sodium phosphide and chlorine.
13. Each of the reactions you wrote in question 11 follows a similar pattern. The same pattern is followed by all of the equations in this section. Describe this pattern.
14. Complete the following reactions:
15. NaCl + Ag 🡪
16. Al2O3 + Rb 🡪
17. Li + Ca3(PO4)2 🡪