P G1 (pg 1 of 2) Chemical Equations – Unit G Preview

Name_____

1. We have been symbolizing chemical substances by writing chemical formulas. On the list below, circle one word from each pair listed that best describes the substance that best describes it.

a.	Water − H_2O	element or compound	ionic or molecular	atom or molecule (formula unit)
b.	Aluminum nitrate − $Al(NO_3)_3$	element or compound	ionic or molecular	atom or molecule (formula unit)
c.	Iron – Fe	element or compound	ionic nor molecular	atom or molecule (formula unit)
d.	Glucose − $C_6H_{12}O_6$	element or compound	ionic or molecular	atom or molecule (formula unit)
e.	Chlorine – Cl_2	element or compound	ionic or molecular	atom or molecule (formula unit)
f.	Ammonia − NH_3	element or compound	ionic or molecular	atom or molecule (formula unit)

2. List some indicators that you might notice that could signal that a chemical reaction is possibly occurring.

_____ _____

_____ _____

_____ _____

3. Since we use chemical formulas to represent atoms and molecules, we will chemical formulas them when we represent chemical reactions.
Write the chemical formulas for:

i. carbon _____ iii. oxygen gas _____

ii. iron _____ iv. carbon dioxide_____

- Remember that one of the postulates of Dalton's Atomic Theory states that during a chemical reaction the atoms of molecules are simply rearranged.
- Recall that the Law of Conservation of Mass states that the mass of the products of a chemical reaction will always be equal to the starting mass of the reactants. Alternatively states as "atoms are neither created not destroyed" during chemical reactions.
- These statements lead to the reason that the "symbol sentence" that is written to represent a chemical reaction is called a chemical equation. So the equation below represents the reaction of carbon with oxygen gas to produce carbon dioxide.

$$C + O_2 \rightarrow CO_2$$

4. In a chemical equation, we write the reactants on the _____ side of the arrow to represent the substances that you begin with, and the products on the _____ side of the arrow to represent the substances that you end up with.

5. The _____ in the middle (which could be thought of as an equal sign) is interpreted as meaning "yields" or "produces" or "decomposes" or "forms" or "results in."

6. Balancing equations is done to satisfy the Law of Conservation of Mass and make the number of atoms the same on both sides of an equation. You can balance only by putting coefficients in front of the formulas. You can NOT change the subscripts. Write and then balance the equations for the reactions listed below.
   a. In the box A, the _____ is a subscript, and the _____ is a coefficient.
   b. In the box B, what is the total number of magnesium chloride units (molecules) present? _____
   c. In box C, what is the total number of nitrite ions present? _____
   d. In box B, what is the total number of magnesium ions present? _____
   e. In box C, what is the total number of oxygen atoms present? _____
   f. In box C, what is the total number of nitrogen atoms present? _____

A: $3Na_2O$

B: $4MgCl_2$

C: $4Al(NO_2)_3$

7. Balancing equations is done to satisfy the Law of Conservation of Mass and make the number of atoms the same on both sides of an equation. You can balance only by putting coefficients in front of the formulas. You can NOT change the subscripts. Write and then balance the equations for the reactions listed below.
   a. hydrogen and oxygen gas react to form water:
      - $H_2 + O_2 \rightarrow H_2O$
   b. nitrogen trihydride (ammonia) decomposes into its element gases:
      - first write out the formulas in the "skeleton" equation, then balance $NH_3 \rightarrow N_2 + H_2$
   c. aluminum reacts with octahedral solid sulfur to make aluminum sulfide:
      - $Al + S_8 \rightarrow Al_2S_3$
   d. solid sodium dropped into water reacts to form sodium hydroxide and hydrogen gas:
      - $Na + H_2O \rightarrow NaOH + H_2$

ANSWERS

1. element or compound ionic or molecular atom or molecule (formula unit).
   a. Water − H_2O is a compound, a molecular compound, made of molecules
   b. Aluminum nitrate − $Al(NO_3)_3$ is a compound, an ionic compound, made of formula units
   c. Iron – Fe is an element, made of atoms, and metals have their own form of bonding - the array of inner core electrons and nucleus surrounded by a delocalized sea of electrons
   d. Glucose − $C_6H_{12}O_6$ is a compound, a molecular compound, made of molecules
   e. Chlorine – Cl_2 is an element, a molecular element, made of diatomic molecules
   f. Ammonia - NH_3 is a compound, a molecular compound, made of molecules.

2. Many indicators could signal that a chemical reaction is possibly occurring, some indicators may just be a physical change. It can be difficult to distinguish a physical change from a chemical change.

color change	odor change
formation of a gas (bubbles or foam)	formation of a solid (called a precipitate)
energy exchange (gets hot or cold)	formation of a liquid (from two solids)
presence of a flame (or explosion)	texture change

3. Since we use chemical formulas to represent atoms and molecules, we will use them when we represent chemical reactions.
   a. Write the chemical formulas for:
      i. carbon C
      ii. iron Fe
      i. oxygen gas O_2 $C + O_2 \rightarrow CO_2$
      iii. carbon dioxide CO_2

4. In a chemical equation, we write the reactants on the LEFT side to represent the substances that you begin with, and the products on the RIGHT side to represent the substances that you end up with.

5. The ARROW in the middle (which could be thought of as an equal sign) is interpreted as meaning "yields" or "produces" or "decomposes" or "forms" or "results in."

6. Just like algebra, distribute the number outside the parentheses through the entire inside. A coefficient out front refers to the entire compound as if it were in parentheses, like this: $3(Na_2O)$ or this $4(MgCl_2)$
   a. In the box A, the 2 is a subscript, and the 3 is a coefficient.
   b. In the box B, what is the total number of magnesium chloride units (molecules) present? 4
   c. In box C, what is the total number of nitrite ions present? $4 \times 3 = 12$
   d. In box B, what is the total number of magnesium ions present? 4
   e. In box C, what is the total number of oxygen atoms present? $4 \times 3 \times 2 = 24$
   f. In box C, what is the total number of nitrogen atoms present? $4 \times 3 = 12$

7. Balancing equations to satisfy the law of conservation of matter
   a. hydrogen and oxygen gas react to form water:
      - $2H_2 + O_2 \rightarrow 2H_2O$
   b. nitrogen trihydride (ammonia) decomposes into its element gases:
      - skeleton: $NH_3 \rightarrow N_2 + H_2$
      - $2NH_3 \rightarrow N_2 + 3H_2$
   c. aluminum reacts with octahedral solid sulfur to make aluminum sulfide:
      - $16Al + 3S_8 \rightarrow 8Al_2S_3$
   d. solid sodium dropped into water reacts to form sodium hydroxide and hydrogen gas:
      - skeleton: $Na + H_2O \rightarrow NaOH + H_2$
      - $2Na + 2H_2O \rightarrow 2NaOH + H_2$