

# Module 1-Understanding a Balanced Chemical Equation

Sunday, August 18, 2013

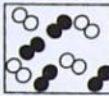
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**Understanding the Meaning of a Balanced Chemical Equation**

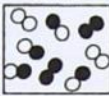
**Information A:**

We often use a variety of representations for chemical reactions. One is to use drawings or "cartoons" to represent what is happening at a molecular and atomic level.

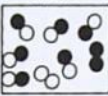
Picture 1




Picture 2



Picture 3



Picture 4



**Key**  
● = H atoms  
○ = Br atoms

1. What are the names of the substances represented in Picture 1?
2. a. What are the formulas for the substances represented in Picture 1?  
b. How did you decide on what the formulas should be?
3. What changes do you notice when you compare Pictures 1 and 2?
4. a. What formula would you use to identify the new substance formed in Picture 2?  
b. What name would you use for this substance?

**Information B:**

It would be awkward and time consuming to represent all chemical reactions with drawings. What we need is a way to notate a chemical reaction in a concise manner, which also conveys the information we need to understand about the process that happened.

5. What materials are present before any reaction happens (Picture 1)?

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6. What materials are present after the reaction begins (Picture 2)?
7. New materials that are formed from reactants are called products. What product(s) forms during this reaction?
8. What materials are present in Pictures 3 and 4?
9. Identify the reactants and products present in Pictures 1, 2, 3, and 4 using the table below.

	Reactants	Products
Picture 1		
Picture 2		
Picture 3		
Picture 4		

10. In describing chemical reactions, scientists are interested in the changes that take place during the chemical reaction. Use formulas and symbols to describe the reaction represented by the pictures. An arrow is used to indicate the change from reactants to products. (Write a chemical-reaction equation. In this step, just focus on the identities of the substances.)

#### Information C:

In addition to identifying the substances involved in a chemical reaction, a chemical equation should also indicate the relative amounts of substances involved. We know from the Law of Conservation of Matter that the number of atoms and electrons, etc., has to be the same at the beginning and end of the reaction. Look again at the pictures representing the reaction.

11. How many of each reactant molecule are present at the beginning of the reaction (Picture 1)?
12. How many of each reactant and product molecule are present in Picture 2?
13. Identify the differences in the amounts of each species in Pictures 1 and 2.
  - a. How many reactant molecules were used up?

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- b. How many product molecules were formed?
  - c. Write a chemical-reaction equation indicating the change that happened from Picture 1 to Picture 2. Your equation should indicate how many of each reactant was consumed and how many of each product was produced in going from Picture 1 to Picture 2.
14. How many molecules of each reactant and product are present in Picture 3?
15. Identify the differences in the amounts of each species in Pictures 2 and 3.
  - a. How many additional reactant molecules were used up?
  - b. How many additional product molecules were formed?
  - c. Write a chemical-reaction equation that indicates the change that happened from Picture 2 to Picture 3. Your equation should indicate how many of each reactant was consumed and how many of each product was produced in going from Picture 2 to Picture 3.

16. Compare the equation you wrote for question 13 and the equation you wrote for question 15. How are they similar? How are they different?

17. The ratio of reactant and product molecules is what is important in a chemical-reaction equation. By convention, most chemical-reaction equations are written in terms of the lowest whole number coefficients. Write the "conventional" chemical-reaction equation for the reaction represented in the drawings.

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Handout

18. Look at all three chemical-reaction equations that you wrote.

- a. What is true about the number of hydrogen atoms on each side of the reaction arrow?
- b. What is true about the number of bromine atoms on each side of the reaction arrow?
- c. As a group, write a statement using the Law of Conservation of Mass to explain why a chemical-reaction equation must contain equal numbers of atoms on each side to be "balanced."