

Chemical Bonds and the Chemical Reactions Study Guide

Below are the expectations for each point level for the two Chemical Bonds and Reactions objectives.

Objective 1: Students will know the different types of bonding.

1 point – (Basic)

- Know which subatomic particle allows bonding to occur.

2 points – (Developing)

Skills from the 1 point question plus:

- Know the definition of each of the types of bonds we learned about in class.

3 points – (Proficient)

Skills from the 1 and 2 point questions plus:

- When given a chemical formula, be able to identify whether a compound/molecule has ionic, covalent, or metallic bonds.

4 points – (Exemplary)

Skills from the 1, 2, and 3 point questions plus:

- When given a chemical formula (and illustration), be able to identify the type of bond and explain why it is that type of bond.

Objective 2: Students will understand The Law of Conservation of Mass and why balancing chemical equations is important.

1 point – (Basic)

- Be able to give the definition of the Law of Conservation of Mass.

2 points – (Developing)

Skills from the 1 point question plus:

- Using the Law of Conservation of Mass, be able to determine the mass of the products when the mass of the reactants are given
OR be able to determine the mass of one of the reactants when the mass of the products and other reactants are given.

3 points – (Proficient)

Skills from the 1 and 2 point questions plus:

- When given a chemical equation, be able to correctly state whether it is balanced or not. (You will need to include a t-chart showing your atoms.)

4 points – (Exemplary)

Skills from the 1, 2, and 3 point questions plus:

- When given a chemical equation, be able to correctly state whether it is balanced or not. (You will need to include a t-chart showing your atoms.)
- Be able to explain why it is necessary to balance chemical equations.

Objective 3: Students will know the evidence that a chemical reaction has occurred and will know whether it is an endothermic or exothermic reaction.

1 point – (Basic)

- Know what happens to the energy in an endothermic and exothermic reaction.
- When given a scenario, be able to identify the evidence that a chemical reaction has occurred.

2 points – (Developing)

Skills from the 1 point question plus:

- Be able to classify a chemical equation as either endothermic or exothermic.
- Be able to list out the different types of evidence of a chemical reaction.

3 points – (Proficient)

Skills from the 1 and 2 point questions plus:

- When given real life examples of chemical reactions be able to classify it as an exothermic reaction and an endothermic reaction.
- Be able to determine if a reaction has taken place in different scenarios.

4 points – (Exemplary)

Skills from the 1, 2, and 3 point questions plus:

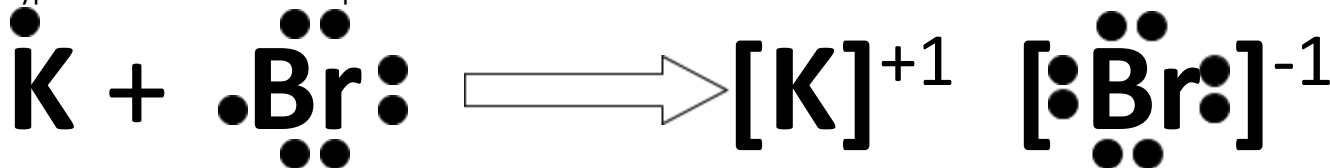
- Give an example of a situation where a chemical reaction has NOT taken place but it appears as though a chemical reaction has taken place (has one of the five indicators of chemical reaction).
- Give an example of when you are able to determine a chemical reaction has taken place based on the 5 indicators of chemical reactions.
- When given a graph showing the transfer of energy (heat) be able to identify the graph showing an endothermic reaction and exothermic reaction.
- Know what happens to the heat energy transfer in an endothermic and exothermic reaction.
- Be able to determine what happens to the temperature of the surroundings during an endothermic and exothermic reaction.

Objective 1: Students will know the different types of bonds.

1. Which subatomic particle allows chemical bonding to occur?
2. Give the definition for the following types of bonds:
 - Ionic Bond –
 - Covalent Bond –
 - Metallic Bond –
3. What are the differences between an ionic and a covalent bond?
4. What type of bonds do the following compounds have:
 - Fe_2O_3
 - CH_4
 - Mg_2
5. Identify the type of bond that HCl is (see example below). Give an explanation of how the electrons are exchanged in this type of bond and this example.

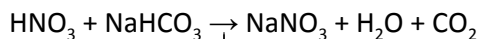
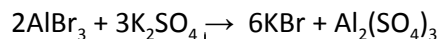
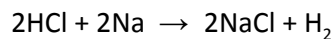
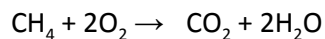


6. Identify the type of bond that KBr is (see example below). Give an explanation of how the electrons are exchanged in this type of bond and this example.



Objective 2: Students will understand The Law of Conservation of Mass and why balancing chemical equations is important.

1. The Law of Conservation of Mass states that _____
_____.
2. A student placed an unknown amount of HCl into a beaker and then added 5 g of salt. He stirred the HCl and salt until the salt dissolved and then measured the mass again. The final mass was 47g. Using the Law of Conservation of Mass explain what the mass of the HCl that was added should be and why.
3. A student has measured out 400 mL of water and placed it in a beaker on top of a Bunsen burner. The water has a mass of 400g. While waiting for the water to boil he sits down and begins working on his science questions. He becomes so caught up in his work that 30 minutes has passed. He removes the beaker from the Bunsen burner with his tongs and notices that much of the water has “disappeared”; he is confused until he remembers something his teacher told him... *Matter cannot be created or destroyed.* He begins to think – where has it gone? Help this student – where has the water gone? Explain using the law of conservation of mass.
4. Are the following chemical equation balanced or not? Show us by creating a T-chart of the number of atoms for each element in the reactants and the products.



5. Explain why it is necessary to balance chemical equations?

Objective 3: Students will know the evidence that a chemical reaction has occurred and will know whether it is an endothermic or exothermic reaction.

1. Does an endothermic reaction require or give off heat?
2. What happens to the surrounding air temperature when an endothermic reaction takes place?
3. Does an exothermic reaction require or give off heat?
4. What happens to the surrounding air temperature when an exothermic reaction takes place?
5. List the five pieces of evidence that a chemical reaction has taken place.

From the following list, state which are examples of evidence of chemical reactions and which ones are not examples of evidence of chemical reactions.

6. Burning toast in the toaster
7. Chopping up fire wood
8. Mixing red and blue paint together in order to get purple
9. Blowing bubbles through a straw in a glass of chocolate milk
10. Crystals forming when making rock candy
11. Adding ice cubes to hot chocolate so it cools down faster
12. The smell that is given off from a stink bomb
13. Using the 5 indicators of chemical reactions explain how you can determine whether a chemical reaction has taken place or not in the scenario below:
A scientist poured chemical X, which is a clear liquid into a beaker with chemical Y, which is a yellow liquid and waited approximately 15 seconds. At the end of the 15 seconds, the liquid in the beaker turned bright orange and the beaker was cool to touch. A chemical reaction had taken place.

Classify each of the following reactions as either exothermic or endothermic.

14. $2\text{CH}_3\text{COOH} + \text{Na}_2\text{CO}_3 + \text{Energy} \rightarrow 2\text{CH}_3\text{COONa} + \text{H}_2\text{O} + \text{CO}_2$
15. $\text{C}_3\text{H}_8 + 5\text{O}_2 \rightarrow 3\text{CO}_2 + 4\text{H}_2\text{O} + \text{Energy}$

Decide whether each of these reactions is exothermic or endothermic:

16. When two chemicals mix their temperature rises: _____
17. A solid burns brightly and releases heat, light and sound: _____
18. When two chemicals are mixed their temperature drops: _____
19. Plants take in light energy for photosynthesis: _____
20. Evaporation: _____
21. The combustion reaction in a car engine: _____
22. Digestion of food: _____
23. Condensation: _____
24. Draw an endothermic reaction graph. Label the reactants, products, x axis, y axis. Give a brief explanation of the exchange of heat between the chemical reaction and the surroundings.
25. Draw an exothermic reaction graph. Label the reactants, products, x axis, y axis. Give a brief explanation of the exchange of heat (is it being absorbed or released). State whether the surrounding get cooler or warmer when this type of reaction occurs.
26. Give an example of a time when there is evidence that a chemical reaction has occurred, but a chemical reaction has not actually taken place.
27. Give an actual example of when the same type of evidence is actually caused by a chemical reaction.