Replacement Reactions

Name _____ Date_____

In nature, elements can occur either free, meaning uncombined with other elements, or chemically combined in a compound. The tendency of a particular element to combine with other substances is a measure of the activity of that element. The more active an element is, the more likely it is to combine. In a single replacement reaction, an uncombined element replaces a less active element that is combined in a chemical compound. The less active element is then freed from the compound.

For example, in the reaction Zinc + copper sulphate → zinc sulphate + copper

Zinc replaces the less active copper, combines with sulphate, and frees the copper from the compound.

NOTE: Oxidation states: Iron (2^+), Copper (2^+), Zinc (2^+), Aluminium (3^+)

Objective: Determine the replacement reactions of various metals

Methods

Materials

- Iron
- Zinc
- Spatula
- Magnesium
- 1 M Copper sulphate
- Temperature sensor
- Copper
- Boiling tube

Procedures

1. Set up Temperature sensors
2. Fill Boiling tube with 15 mL 1 M copper sulphate.
3. Measure starting temperature. Reset Temperature sensor
4. Add a small scoop of Iron to beaker. Press Autoscale
5. Record temperature for 5 minutes.
6. Record observations in the data table.
7. Repeat procedure using iron, zinc, magnesium (2 pieces), copper (2 pieces).
8. Graph you results

Data

Metal	Rise in Temperature (C)					
	0 sec	60 sec	120 sec	180 sec	240 sec	300 sec
Zinc						
Iron						
Magnesium						
Copper						

Conclusions:

1. Why is this reaction called a displacement reaction?

1. Write and balance the single replacement reaction that has occurred between the Copper sulphate and each metal.

    a. magnesium

    b. aluminium

    c. iron

    d. copper

    e. zinc

2. Were these reactions endothermic or exothermic? _____

   Explain_____

   _____

3. Which of the metals are more active than hydrogen?_____

4. Which of the metals are less active than hydrogen?_____

5. Nonmetals can also be involved in single replacement reactions. If chlorine is more active than bromine, write the equation for the reaction between chlorine and potassium bromide.

   _____

   _____

6. Refer to your reactivity series. Which of the following mixtures would there be a temperature rise?

   Aluminium + sodium chloride
   Calcium + zinc sulphate
   Lead + zinc chloride
   Magnesium + iron chloride