

# CHEMICAL REACTIONS

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## MATERIALS NEEDED:

- 1 data grid sheet
- 1 sheet waxed paper
- 1 set of solutions in Beral pipettes:
  - 0.1 M iron(III) chloride
  - 0.1 M ammonium nitrate
  - 0.1 M barium chloride
  - concentrated ammonia
  - 0.1 M potassium thiocyanate
  - 1.0 M sodium carbonate
  - 0.1 M potassium chromate
  - 0.1 M sodium chloride
  - 1.0 M hydrochloric acid
  - 0.1 M copper(II) sulfate
- magnesium metal, ribbon, 0.5 cm length
- copper metal or foil, 0.5 cm square
- zinc, metal or foil, 0.5 cm square

## SAFETY PRECAUTIONS:

- Wear safety goggles or glasses at all times in the laboratory.
- In the event of skin contact with any chemicals, immediately rinse with cold water.
- Concentrated ammonia can be irritating to the eyes and nasal passages. Work in a well ventilated area.

## DISPOSAL:

- The unreacted pieces of metal can be reused. Rinse the metal pieces with water and place them in the appropriate containers provided.
- Pick up the waxed paper carefully, fold so all the liquid materials are inside and dispose of it in the trash.

## EXPERIMENTAL PROCEDURE:

- Obtain a data grid sheet and place a piece of waxed paper over it.
- A) Place one or two drops of iron(III) chloride solution,  $\text{FeCl}_3$ , in squares 1 and 3 on the appropriate section of the data grid. Describe the solution.  
Place one or two drops of potassium thiocyanate solution,  $\text{KSCN}$ , in square 2, next to the  $\text{FeCl}_3$ . Describe the solution.  
Add one or two drops of the  $\text{KSCN}$  solution to square 3 containing the  $\text{FeCl}_3$ . Has a chemical reaction taken place? Whether your answer is *yes* or *no*, record the evidence on which it is based.
- B) Place one or two drops of sodium chloride solution,  $\text{NaCl}$ , in squares 1 and 3 on the appropriate section of the data grid. Describe the solution.  
Place one or two drops of ammonium nitrate solution,  $\text{NH}_4\text{NO}_3$ , in square 2, next to the  $\text{NaCl}$ . Describe the solution.  
Add one or two drops of the  $\text{NH}_4\text{NO}_3$  solution to square 3 containing the  $\text{NaCl}$ . Record your observations and identify evidence that a reaction has or has not occurred.
- C) Repeat the above procedure using solutions of sodium carbonate,  $\text{Na}_2\text{CO}_3$ , and hydrochloric acid,  $\text{HCl}$ . Record your observations.
- D) Repeat the above procedure using solutions of barium chloride,  $\text{BaCl}_2$ , and potassium chromate,  $\text{K}_2\text{CrO}_4$ . Record your observations.

- E) Place one or two drops of copper(II) sulfate solution,  $\text{CuSO}_4$ , in squares 1 and 3 on the appropriate section of the data grid. Describe the solution.  
Place one or two drops of concentrated ammonia solution,  $\text{NH}_3$  (**Caution:** Strong odor) in square 2, next to the  $\text{CuSO}_4$ . Describe the solution.  
Add the concentrated  $\text{NH}_3$  solution to square 3, containing the  $\text{CuSO}_4$ , one drop at a time, until a change occurs. If no change occurs, do not add more than four drops. Record your observations.
- F) Place a small piece of magnesium metal, Mg, in square 3 on the appropriate section of the data grid.  
Describe the metal.  
Place one or two drops of hydrochloric acid, HCl, onto the magnesium metal.  
Record your observations
- G) Place a small piece of copper metal, Cu, in square 3 on the appropriate section of the data grid. Describe the metal.  
Place one or two drops of hydrochloric acid, HCl, onto the copper metal.  
Record your observations
- H) Place one or two drops of copper(II) sulfate solution,  $\text{CuSO}_4$ , in square 3 on the appropriate section of the data grid. Describe the solution.  
Place a small piece of zinc metal, Zn, into the copper(II) sulfate solution.  
Record your observations

Repeat any of the above reactions, as necessary, to verify your results.

Carefully remove any unreacted pieces of metal from the reaction paper. These can be rinsed with water and should be placed in the appropriate "used metal" containers.

Carefully pick up the waxed paper sheet, fold it so all the drops are inside it and dispose of it in the trash.

For your laboratory report, summarize your results of mixing the chemical compounds and elements, as directed in parts A) through H) of this experiment. Tell initial appearances of each solution or metal and what changes, if any, that occurred when each pair was mixed.

In your conclusions, based on your observations, tell what results indicate that a chemical reaction had taken place?

## REFERENCE:

This experiment is based on Weiner, Susan A., and Peters, Edward I, "Properties and Changes of Matter" in *Introduction to Chemical Principles: A Laboratory Approach*, 3rd Edition, Saunders College Publishing, Philadelphia, PA, 1986.

# CHEMICAL REACTIONS DATA SHEET

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<u>Exp.</u>	<u>Solutions used</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>Observations</u>
A	iron(III) chloride potassium thiocyanate	<input type="text"/>	<input type="text"/>	<input type="text"/>	
B	sodium chloride ammonium nitrate	<input type="text"/>	<input type="text"/>	<input type="text"/>	
C	sodium carbonate hydrochloric acid	<input type="text"/>	<input type="text"/>	<input type="text"/>	
D	barium chloride potassium chromate	<input type="text"/>	<input type="text"/>	<input type="text"/>	
E	copper(II) sulfate concentrated ammonia	<input type="text"/>	<input type="text"/>	<input type="text"/>	
F	magnesium hydrochloric acid			<input type="text"/>	
G	copper hydrochloric acid			<input type="text"/>	
H	copper(II) sulfate zinc			<input type="text"/>	

Based on your observations, what results indicate that a chemical reaction has taken place?