

Name: _____

Chemistry 117 Laboratory
University of Massachusetts Boston

FIVE UNLABELED BOTTLES

PRELAB ASSIGNMENT

1. Fill in the sections labeled "Prelab Assignment" on the attached data sheets (pages 3 and 5):
 - a. Name the ionic compounds.
 - b. Write formulas for the cation and anion in each compound.
 - c. Consider mixing solutions of each pair of compounds. There are ten pairs on each data sheet. If you expect a reaction, draw a line connecting the reacting ions. One example is shown.
 - d. Count the number of each type of reaction and total the number of expected reactions.
2. Write a balanced net ionic equation for a reaction (if one occurs) when mixing aqueous solutions of the following compounds. Write only net ionic equations here. Do scratch work elsewhere.

AgNO₃ and CuCl₂

Ba(NO₃)₂ and CuSO₄

KCl and Ba(NO₃)₂

ZnCl₂ and NaOH

HCl and Na₂CO₃

ZnCl₂ and Na₂CO₃

HCl and NaOH

Five unlabeled bottles.

In the experiment you are confronted with a set of reagent bottles without labels, each bottle containing an aqueous solution of a single ionic compound. Although we do not know the contents of any particular bottle, we do remember the list of five compounds. You are asked to identify the compound in each bottle. You must gather clues by mixing small samples from pairs of bottles and examining the mixture for evidence of chemical reaction. Most of the chemical reactions will either form a precipitate or evolve gas. The colors of the solution also provide clues.

The following properties may be useful:

- All compounds containing Group IA and ammonium cations are soluble.
- All nitrates and acetates are soluble.
- Hydroxides are mostly insoluble.
Soluble hydroxides contain Group IA cations and Group IIA cations heavier than magnesium.
- Halides are soluble except those of silver, lead (II) and mercury(I).
- Sulfates are soluble except those of lead (II) and Group IIA cations heavier than magnesium.
- Carbonates are insoluble except for those containing Group IA and ammonium cations.
- Gases are evolved when acids react with carbonates, sulfides and sulfites.

IN THE LABORATORY

You are asked to solve the puzzle of the five unlabeled bottles twice, for two separate sets which are denoted I and II. Each such set is a separate experiment and separate data sheets are provided. Do not mix any solution from Set I with one from Set II. The list of five compounds is given on the data sheet. Before beginning the experiment, check with your instructor that your Prelab Assignment 1 results are correct.

Within each set the bottles are identified A, B, C, D and E. The data sheet has spaces in which you can write your observations of the color of each solution and any evidence of chemical reaction that you see when mixing samples from a pair of bottles. Rinse a test tube with water and then mix a few drops of solution from a pair of bottles. Swirl the contents, wait a few seconds for the reaction to occur and note your observation on the data sheet. If you observe no evidence of a reaction, write “see nothing” in the box.

After finishing all ten pairs from one set, compare your observations with your predictions of expected reactions and solve the puzzle of naming the compounds, in A, B, C, D and E. Write your answers at the bottom of the sheet. Then go back and write a net ionic equation in each box in which a chemical reaction occurs. Understand that there may be pairs of compounds which react without forming a precipitate or gaseous product. You must write the net ionic reactions for these also.

Your report for this experiment consists of the two data sheets with all the blanks filled in.

Five unlabeled bottles.

Name _____ Lab Section _____

Five Unlabeled Bottles
Set I

PRELAB ASSIGNMENT 1

compound	compound name	cation formula	connect reacting ions	anion formula
CuSO₄				
Ba(NO₃)₂				
CuCl₂				→ Cl ⁻
AgNO₃		Ag ⁺		
KCl				

Summarize what you expect to see after mixing all ten possible pairs.

How many precipitates?

How many evolve gas?

How many other reactions

How many reactions total?

OBSERVATIONS

Record the observations in each box. If there is a chemical reaction, write the net ionic equation.

A,B			
A,C	B,C		
A,D	B,D	C,D	
A,E	B,E	C,E	D,E

Five unlabeled bottles.

Name _____ Lab Section _____

Record the color of the solutions, either colorless or blue:

A _____ B _____ C _____ D _____ E _____

Identify the compounds:

A _____ B _____ C _____ D _____ E _____

Five unlabeled bottles.

Name _____ Lab Section _____

Five Unlabeled Bottles
Set II

PRELAB ASSIGNMENT 1

compound	compound name	cation formula	connect reacting ions	anion formula
ZnCl₂				
KOH				
HCl				
Na₂CO₃				
LiBr				

Summarize what you expect to see after mixing all ten possible pairs.

How many precipitates?

How many evolve gas?

How many other reactions

How many reactions total?

OBSERVATIONS

Record the observations in each box. If there is a chemical reaction, write the net ionic equation.

A,B			
A,C	B,C		
A,D	B,D	C,D	
A,E	B,E	C,E	D,E

Five unlabeled bottles.

Name _____ Lab Section _____

Record the color of the solutions, either colorless or blue:

A _____ B _____ C _____ D _____ E _____

Identify the compounds:

A _____ B _____ C _____ D _____ E _____