Student Learning Map

Unit Topic:

Key Learning(s):
Conservation of Mass

Unit Essential Question:
How does conservation of effect the way chemical equations are written?

Instructional Tools
Labs 13.1, 13.2, 13.3, 13.4, 13.5, 13.6
WS 13-A, 13-B

Concept:	Concept:	Concept:	Concept:
Conservation of Mass	Types of Equations	Chemical Family	
Lesson EQ: 1. What is meant by conservation of mass? 2. What is a closed system? 3 What is an open system?	**Lesson EQ:** 1. What are synthesis, decomposition, and single replacement equations? 2. What is a balanced chemical eqn? 3. What are the rules for balancing eqn?	**Lesson EQ:** 1. What is a chemical family? 2. How do the reactivities of elements in the same chemical family compare?	**Lesson EQ:**
Vocabulary: closed system open system	**Vocabulary:** cation anion polyatomic ion	**Vocabulary:** chemical family	**Vocabulary:**

Name:	Partner's Name:
Date of lab:	If absent, data obtained from:

Lab 13.1 - Conservation of Mass

Objective: In a normal chemical reaction, mass can never be created or destroyed. Mass is always conserved. What does this mean ?

Procedure	Observations

Make complete and accurate observations during the lab.
Observations include: 1) what is happening,
2) the color, appearance, and phase (solid, liquid, gas) of all chemicals,
3) any other observations requested (odor, temperature, etc.).

Part A - Closed System Chemical Reaction

_____1. Obtain about 10 mL of barium chloride, $BaCl_2$, solution in a clean 50 mL beaker.

_____2. Pour the barium chloride, $BaCl_2$, solution into a 250 mL Erlenmeyer flask (triangular shaped).

_____3. Obtain about 10 mL of sodium carbonate, Na_2CO_3, solution in another clean 50 mL beaker.

_____4. Pour this sodium carbonate, Na_2CO_3, solution into a small test tub. **Note:** The test tube must be able to fit **totally into** the Erlenmeyer flask !

_____5. Place the test tube into the flask.

_____6. Stopper the flask tightly.

_____7. Mass the flask and contents: _____

_____8. Holding the stopper in place, tip the flask over so that the test tube's contents spill into the flask.

Observe: _____

_____9. Mass the flask and contents again: _____

_____10. Rinse the flask and test tubes **well**.

Part B - Open System Chemical Reaction

_____11. Obtain a 250 mL beaker, and any clean test tube which will rest in the beaker easily.

_____12. Place about 6 marble chips (calcium carbonate, $CaCO_3$) in the 250 mL beaker.

_____13. Fill the **test tube** about 3/4 full with 3.0 **M** hydrochloric acid, HCl.

_____14. Place the test tube in the beaker with the marble chips.

_____15. Mass the beaker, marble chips, and hydrochloric acid, HCl: _____

_____16. Pour the hydrochloric acid, HCl, into the beaker with the marble chips. Observe: _____

_____

_____17. Place the empty test tube back into the beaker while the reaction is happening.

_____18. After 5-10 minutes (the longer the better), mass the beaker, empty test tube, marble chips, and solution: _____

_____19. Rinse the beaker and test tube well. Wipe down your counter area, wash your hands with soap, then take off your safety goggles and have a seat.

Questions: Part A - Closed System Chemical Reaction

1. Did a change take place in **Procedure 8** ? _____

2. **A chemical reaction is noticed by :**
   1) a color change,
   2) formation of a precipitate,
   3) gas formation,
   4) becoming hot or cold

   2.a. Was **Procedure 8** a chemical reaction ? _____

   Explain why or why not: _____

3. Did the mass change from **Procedure 7** to **Procedure 9** ? _____

   3.a. Did it increase, decrease, or stay the same ? _____

4. **Mass is conserved when the mass does not change from one time to another.** Was mass conserved during **Part A** ? _____

Questions: Part B - Open System Chemical Reaction

5. Did a change take place in **Procedure 16** ? _____

6. Was this a chemical reaction ? _____ Explain why or why not: _____

_____

7. Did the mass change from **Procedure 15** to **Procedure 18** ? _____

7.a. Did it increase or decrease or stay the same ? _____

8. Does it appear that mass was conserved during **Part B** ? _____

9. **The mass you start with in an ordinary chemical reaction must equal the mass you end up with. This is called the Law of Conservation of Mass.**

Hopefully the mass decreased in **Part B** from **Procedure 15** to **Procedure 18.**

Where did the mass go during **Part B** ? _____

10. How could you have trapped the mass that was lost ? (Be logical) _____

_____

11. If you had trapped the gas, what would the relationship have been between the mass in **Procedure 15** and the mass in **Procedure 18** ? _____

12. In words, write the reaction which you performed in **Part B**:

_____ + _____ ----->

_____ + _____ + _____

11.a. Write the chemical formulas for each of the reactants (things on the left) and each of the products (the things on the right).

_____ + _____ ----------> _____ + _____ + _____

12. Consequently, what were the bubbles that were produced during Part B 's reaction ? _____

Name:	Partner's Name:
Date of lab:	If absent, data obtained from:

Lab 13.2 - Synthesis and Decomposition Reactions

Objective: What are synthesis and decomposition reactions ?

Procedure	Observations

'Make complete and accurate observations during the lab.'
Observations include: 1) what is happening,
2) the color, appearance, and phase (solid, liquid, gas) of all chemicals,
3) any other observations requested (odor, temperature, etc.).

Part A - A Synthesis Reaction

_____1. Obtain a piece of copper sheet metal. Appearance: _____

_____2. Sandpaper one side until it is shiny.

_____3. Bend it a few times. Is it easy or difficult to bend ? _____

_____4. Hold the piece of copper sheet metal with a pair of tongs, shiny side down, at the **top** of the flame of a burner for 2 minutes. **Do NOT hold it in the middle of the flame; it must be at the top !**

_____5. Place the copper on the counter to cool.

Observe: _____

_____6. Again, hold the piece of copper sheet metal with a pair of tongs, shiny side down, at the **top** of the flame of a burner for 2 minutes. **Do NOT hold it in the middle of the flame; it must be at the top !**

_____7. Again, place the copper on the counter to cool.

Observe: _____

_____8. For the last time, hold the piece of copper sheet metal with a pair of tongs, shiny side down, at the **top** of the flame of a burner for 2 minutes. **Do NOT hold it in the middle of the flame; it must be at the top !**

_____9. For the last time, place the copper on the counter to cool.

Observe: _____

_____10. Now bend the copper back and forth. How does the bending of the copper compare to the first bending of the copper (Procedure # 3) ? _____

Part B - Decomposition Reactions

_____11. Place a scoop of copper (II) carbonate, $CuCO_3$, in a test tube. Appearance: _____

_____12. Place a "90 º glass bend with stopper" in the test tube.

_____13. Clamp the test tube at a steep angle, with the glass bend pointing down.

_____14. Obtain limewater in another test tube. Appearance : _____

_____15. Hold the limewater test tube so that the glass bend dips below the surface of the limewater.

_____16. Heat the copper (II) carbonate, $CuCO_3$, test tube.

_____17. While heating, observe the copper (II) carbonate, $CuCO_3$: _____

_____18. While heating, observe the limewater: _____

_____19. Once the limewater changes, remove the limewater test tube, but continue heating the copper (II) carbonate, $CuCO_3$, test tube.

_____20. After most of the copper (II) carbonate, $CuCO_3$, has changed color, continue heating for another 2 minutes.

_____21. Once the test tube is cool, look closely at the bottom of the test tube: _____

_____

_____22. Dump the test tube out in a container designated by your teacher.

_____23. Wash the glassware well. Please use a test tube brush and run water through the 90 º bend.

_____24. Wipe down your counter area, wash your hands with soap, then take off your goggles and have a seat.

Questions

Part A - A Synthesis Reaction

1. What evidence did you have that the copper sheet metal reacted with oxygen in the air ? _____

_____

2. If the copper reacted with oxygen, what is the likely product ? _____

3. Write the **word** equation for this reaction:

_____ + _____ ----------> _____

4. Now write, and balance, the **formula** equation for the reaction:

_____ + _____ ----------> _____

5. Why is this reaction called a **synthesis** reaction ? _____

_____

_____

Part B - Decomposition Reactions

6. What evidence did you have that the copper (II) carbonate, $CuCO_3$, reacted ? _____

_____

7. **Limewater turns cloudy in the presence of carbon dioxide gas, CO_2.** What gas was produced during the decomposition of copper (II) carbonate, $CuCO_3$? _____

8. Along with the gas produced (Question 7), the other product was copper (II) oxide, CuO. Write the **word** equation for the reaction:

_____ ----------> _____ + _____

green powder black powder clear gas

9. Now write, and balance, the **formula** equation for the reaction:

_____ ----------> _____ + _____

green powder black powder clear gas

10. A second reaction hopefully occurred in **Part B**. The black powder hopefully decomposed into its 2 elements. The one element was the material in the bottom of the test tube after heating for the last few minutes. Describe what you noticed in the bottom of the test tube in Procedure 21:

_____

10. a. The other element was a gas which keeps us alive. Write the **word** equation for the reaction:

_____ ----------> _____ + _____

black powder solid material in test tube gas

11. Now write, and balance, the **formula** equation for the reaction:

_____ ----------> _____ + _____

black powder solid material in test tube gas

12. Why are these reactions considered **decomposition** reactions ? _____

_____

Review Questions

13. Name the 4 indicators of a chemical reaction: 1) _____, 2) _____,

3) _____, 4) _____.

14. The mass of all the products is always _____ the mass of all the reactants.

Name:_____

Exercise 13-A: Balancing Equations

Balance the following equations:

Rules for Balancing Equations

1.

2.

3.

4.

Part A

1)	Mg	+	S	----->	MgS
2)	Zn	+	Cl_2	----->	$ZnCl_2$
3)	Al	+	S	----->	Al_2S_3
4)	Zn	+	S_8	----->	ZnS
5)	Pb	+	O_2	----->	PbO
6)	Ag	+	S_8	----->	Ag_2S
7)	Zn	+	O_2	----->	ZnO
8)	K	+	S_8	----->	K_2S
9)	Mg	+	Cl_2	----->	$MgCl_2$
10)	P	+	O_2	----->	P_4O_{10}
11)	Bi	+	Cl_2	----->	$BiCl_3$
12)	N_2	+	H_2	----->	NH_3
13)	Cu	+	O_2	----->	Cu_2O
14)	Sn	+	Cl_2	----->	$SnCl_4$
15)	Na	+	S_8	----->	Na_2S
16)	Ag	+	I_2	----->	AgI_2
17)	Al	+	Br_2	----->	$AlBr_3$
18)	Sn	+	O_2	----->	SnO

19) $Sb + S \longrightarrow Sb_2S_5$

20) $Ca + O_2 \longrightarrow CaO$

21) $Mg + P \longrightarrow Mg_3P_2$

22) $K + N_2 \longrightarrow K_3N$

23) $Fe + F_2 \longrightarrow FeF_3$

24) $HgO \longrightarrow Hg + O_2$

25) $NH_3 + HCl \longrightarrow NH_4Cl$

26) $Fe + Cl_2 \longrightarrow FeCl_3$

27) $Al + O_2 \longrightarrow Al_2O_3$

28) $Zn + HCl \longrightarrow ZnCl_2 + H_2$

29) $Ca + Pb(NO_3)_2 \longrightarrow Ca(NO_3)_2 + Pb$

30) $Mg + H_3PO_4 \longrightarrow Mg_3(PO_4)_2 + H_2$

31) $Cu + AgNO_3 \longrightarrow Cu(NO_3)_2 + Ag$

32) $Al + Pb(NO_3)_2 \longrightarrow Pb + Al(NO_3)_3$

33) $Zn + Sn(NO_3)_4 \longrightarrow Sn(NO_3)_2 + Sn$

34) $Cl_2 + AlI_3 \longrightarrow AlCl_3 + I_2$

35) $Br_2 + CuI \longrightarrow CuBr + I_2$

36) $NH_4OH + FeCl_3 \longrightarrow NH_4Cl + Fe(OH)_3$

37) $Ba(OH)_2 + H_2SO_4 \longrightarrow BaSO_4 + HOH$

38) $AlCl_3 + H_2SO_4 \longrightarrow Al_2(SO_4)_3 + HCl$

39) $Al_2(SO_4)_3$ + $BaCl_2$ -----> $BaSO_4$ + $AlCl_3$

40) Na_2CO_3 + $CaCl_2$ -----> $CaCO_3$ + NaCl

41) H_2SO_4 + $AlBr_3$ -----> HBr + $Al_2(SO_4)_3$

42) H_2SO_4 + $Mg(OH)_2$ -----> $MgSO_4$ + HOH

43) K_3PO_4 + $MgSO_4$ -----> $Mg_3(PO_4)_2$ + K_2SO_4

44) Al + HCl -----> $AlCl_3$ + H_2

Part B

Balance the following equations, then write the word equation under each. Refer to a periodic table for the names of the elements, and here are the names of some of the groups:

OH = hydroxide SO_4 = sulfate PO_4 = phosphate

NO_3 = nitrate CO_3 = carbonate

45) NaOH + $CuSO_4$ -----> $Cu(OH)_2$ + Na_2SO_4

---

46) Na_3PO_4 + $BaCl_2$ -----> $Ba_3(PO_4)_2$ + NaCl

---

47) KOH + $FeCl_3$ -----> $Fe(OH)_3$ + KCl

---

48) $Pb(NO_3)_2$ + Na_2SO_4 -----> $PbSO_4$ + $NaNO_3$

---

49) KBr + $Pb(NO_3)_2$ -----> KNO_3 + $PbBr_2$

---

50) $Ca(NO_3)_2$ + K_2CO_3 -----> $CaCO_3$ + KNO_3

---

over →

Write and balance the following equations

51. copper wire placed in silver nitrate forms copper (II) nitrate and silver.

52. Iron in a solution of copper (II) chloride produces iron (II) chloride and copper.

53. zinc mixed with hydrochloric acid forms zinc chloride and hydrogen gas

Name:	Partner's Name:
Date of lab:	If absent, data obtained from:

Lab 13.3 - Chemical Families

Objective: What are chemical families, and, how are their properties related ?

Procedure	Observations

Make complete and accurate observations during the lab.
Observations include: 1) what is happening,
2) the color, appearance, and phase (solid, liquid, gas) of all chemicals,
3) any other observations requested (odor, temperature, etc.).

Part A - Family # 17

_____1. Obtain 3 clean test tubes which are all the same size.

_____2. Obtain about 1/2 a test tube of each of the following:

Test tube # 1 - 0.2 **M** sodium chloride, NaCl Appearance: _____

Test tube # 2 - 0.2 **M** sodium bromide, NaBr Appearance: _____

Test tube # 3 - 0.2 **M** sodium iodide, NaI Appearance: _____

_____3. Obtain a clean 50 mL beaker.

_____4. Obtain about 20 mL of 0.1 **M** silver nitrate, $AgNO_3$ in the 50 mL beaker.

_____5. Add equal amounts of the 0.1 **M** silver nitrate, $AgNO_3$ from the 50 mL beaker to each test tube.

Observe: Test tube # 1: _____

Test tube # 2: _____

Test tube # 3: _____

_____6. **Pour all of the test tubes contents into the waste beaker** indicated by your teacher.

_____7. Rinse your test tubes and beaker well.

Part B - Family # 2

_____1. Obtain 4 clean test tubes which are all the same size.

_____2. Obtain about 1/2 a test tube of each of the following:

Test tube # 1 - 0.5 **M** magnesium nitrate, $Mg(NO_3)_2$ Appearance: _____

Test tube # 2 - 0.5 **M** calcium nitrate, $Ca(NO_3)_2$ Appearance: _____

_____3. Obtain a clean 50 mL beaker.

_____4. Obtain about 25 mL of 0.5 **M** sodium carbonate, Na_2CO_3, in the 50 mL beaker.

_____5. Add equal amounts of the 0.5 **M** sodium carbonate, Na_2CO_3, from the 50 mL beaker to each test tube.

Observe: Test tube # 1: _____

Test tube # 2: _____

_____6. **Pour all of the test tubes contents into the waste beaker** indicated by your teacher.

_____7. Rinse your test tubes and beaker well, , wipe down your counter area, wash your hands with soap, then take off your safety goggles and have a seat.

Questions
Part A - Family # 17

1. Write the word and balanced formula equations for each of the reactions in the test tubes. Each reaction is a double displacement reaction. Circle each precipitate (solid which formed). Begin each equation with silver nitrate, $AgNO_3$.

Test tube # 1: Word equation =

_____ + _____ -----> _____ + _____

Formula equation =

_____ + _____ -----> _____ + _____

Test tube # 2: Word equation =

_____ + _____ -----> _____ + _____

Formula equation =

_____ + _____ -----> _____ + _____

Test tube # 3: Word equation =

_____ + _____ -----> _____ + _____

Formula equation =

_____ + _____ -----> _____ + _____

2. In a general sense, what was similar about each reaction ?

_____

3. The 3 solutions each contained a family # 17 element:

Test tube # 1 contained **chlorine** as sodium chloride, Na**Cl**
Test tube # 2 contained **bromine** as sodium bromide, Na**Br**
Test tube # 3 contained **iodine** as sodium iodide, Na**I**

3. a. Where are these elements found in the periodic table ? _____

3. b. If you were given a clear solution, what would you add to it to determine if it contained a family # 17 element ? What would the reaction look like ?

_____

Part B - Family # 2

4. Write the word and balanced formula equations for each of the reactions in the test tubes. Each reaction is a double displacement reaction. Circle each precipitate (solid which formed). Begin each equation with sodium carbonate, Na_2CO_3

Test tube # 1: Word equation =

_____ + _____ -----> _____ + _____

Formula equation =

_____ + _____ -----> _____ + _____

Test tube # 2: Word equation =

_____ + _____ -----> _____ + _____

Formula equation =

_____ + _____ -----> _____ + _____

5. In a general sense, what was similar about each reaction ?

_____

6. The 2 solutions each contained a family # 2 element:

Test tube # 1 contained **magnesium** as magnesium nitrate, **Mg**$(NO_3)_2$
Test tube # 2 contained **calcium** as calcium nitrate, **Ca**$(NO_3)_2$

6. a. Where are these elements found in the periodic table ? _____

6. b. Consequently, a chemical family is **vertical column** or a **horizontal row** of elements ? (circle one)

6. c. If you were given a clear solution, what would you add to it to determine if it contained a family # 17 element ? What would the reaction look like ?

_____

_____

Review Questions

7. What is a synthesis reaction ? _____

8. What is a decomposition reaction ? _____

9. Copper (II) carbonate, $CuCO_3$, is a green powder. When you heated it, what happened to the powder ?

_____

10. When you heated copper (II) carbonate, $CuCO_3$, it also gave off a gas which will turn limewater cloudy. What gas turns limewater cloudy ?
Indicate both the name and formula please. _____

11. Copper (II) oxide, CuO, is a black powder. When heated it breaks down into 2 elements. What are the 2 elements, what are their formulas and what do they look like ?

1) _____, and

2) _____

12. What are the 4 indicators that a chemical reaction probably took place ?

1) _____, 2) _____,

3) _____, 4) _____,

13. In a normal chemical reaction mass can never be _____ or _____.

14. What does "mass is conserved" mean ? _____

Name:	Partner's Name:
Date of lab:	If absent, data obtained from:

Lab 13.4 - Making Toothpaste Chalk

Objective: To make toothpaste chalk from calcium chloride and sodium carbonate.

Procedure	Observations

Make complete and accurate observations during the lab.
Observations include: 1) what is happening,
2) the color, appearance, and phase (solid, liquid, gas) of all chemicals,
3) any other observations requested (odor, temperature, etc.).
Check off the Procedure steps as you do them

Day # 1

_____1. Obtain a clean 100 mL beaker.

_____2. Obtain a piece of filter paper.

_____3. Fold the filter paper for filtering (in half, and then in half again).

_____4. Place the filter paper gently in the 100 mL beaker.

_____5. Mass the filter paper and the beaker to 2 decimal places : _____

_____6. Set up a funnel for filtering.

_____7. Place the filter paper into the funnel and dampen it with distilled water to keep it in place. Be careful and do **not** tear the filter paper.

_____8. Place about 20 mL of 2.0 **M** calcium chloride, $CaCl_2$, solution into the 100 mL beaker.

_____9. Obtain a clean 50 mL beaker.

_____10. Mass the 50 mL beaker to 2 decimal places : _____

_____11. With the beaker still on the scale, make the balance read 2.50 g heavier than the 50 mL beaker.

Mass 50 mL beaker =

\+ 2.50 g

_____12. Obtain a small dish of sodium carbonate, Na_2CO_3, from your teacher.

_____13. Place just enough sodium carbonate, Na_2CO_3, in the 50 mL beaker on the balance so that the scale is balanced.

_____14. Take the 50 mL beaker with the sodium carbonate, Na_2CO_3, in it off the balance and add about 20 mL of distilled water.

_____15. Stir the 50 mL beaker until all the sodium carbonate, Na_2CO_3, dissolves.

_____16. Pour the 50 mL beaker (with the 20 mL of sodium carbonate, Na_2CO_3, solution) into the 100 mL beaker (with the 20 mL of calcium chloride, $CaCl_2$, solution) . Gently swirl the contents.

_____17. Observe: _____

_____18. Place an empty 250 mL beaker under the funnel stem.

_____19. Slowly pour the contents of the 100 mL beaker into the filter paper.

_____20. Rinse the 100 mL beaker with a wash bottle to get as much of the residue out. Pour this into the filter paper. **Do NOT wash** the 100 mL beaker.

_____21. Once the filter paper has drained, rinse the residue in the filter paper with the wash bottle.

_____22. Gently take the filter paper out, and place it in the unwashed 100 mL beaker.

_____23. Place the 100 mL beaker and the filter paper in a location to dry overnight.

Day # 2

_____24. Obtain your beaker and filter paper.

_____25. Mass the beaker, filter paper, and contents to 2 decimal places : _____

_____26. Throw the filter paper and residue away, wash the beaker, wipe down your counter area, wash your hands with soap, then take off your safety goggles and have a seat.

Questions

1. Calculate the mass of the product:

Mass of the 100 mL beaker, filter paper, contents (product) =

- Mass of the 100 mL beaker and filter paper =

_____

Mass of product =

2. Write the **word equation** for the reaction (circle the precipitate):

_____ + _____ -----> _____ + _____

3. Write the **balanced formula equation** for the reaction (circle the precipitate):

_____ + _____ -----> _____ + _____

4. The precipitate was chalk. It comes in many forms, blackboard chalk, limestone rock, and the form you made which is used in toothpaste to scour the teeth.

4. a. What is the chemical name and formula for the chalk you made:

Chemical name: _____, Formula: _____

_____

Review Questions

5. What is a chemical family ? _____

6. Chemical families have similar _____.

7. If you mix a solution of sodium chloride, NaCl, with silver nitrate, $AgNO_3$, and you get a white precipitate, what will happen if you mix a solution of sodium bromide, NaBr,

with silver nitrate, $AgNO_3$? _____

8. Name the elements in family # 2: _____

_____

9. In a decomposition equation, how many compounds are to the left of the arrow ? _____

10. In a synthesis equation, how many compounds are to the right of the arrow ? _____

11. What color powder is copper (II) carbonate, $CuCO_3$? _____

12. At the beginning of a lab, the mass of all the reactants was 30.5 g. At the end of the lab, the mass of all products was 33.8 g. Using one complete sentence (with correct spelling and punctuation), explain why this is not possible.

_____

_____

Name:	Partner's Name:
Date of lab:	If absent, data obtained from:

Lab 13.5: Producing Hydrogen Gas from Magnesium and Hydrochloric Acid

Objective: **1) To be able to write the balanced equation for the reaction of magnesium with hydrochloric acid.**
2) To be able to determine the volume of hydrogen gas which will be produced from a length of magnesium ribbon.

Procedure	Observations

Make complete and accurate observations during the lab.
Observations include: 1) what is happening,
2) the color, appearance, and phase (solid, liquid, gas) of all chemicals,
3) any other observations requested (odor, temperature, etc.).
Check off the Procedure steps as you do them

Part A

_____1. Obtain a piece of magnesium (Mg) ribbon 1.0 cm long. Appearance: _____

_____2. Obtain a 1000 mL beaker.

_____3. Fill the 1000 mL beaker about 3/4 full of water.

_____4. Obtain 10 to 15 mL of 6.0 **M** hydrochloric acid (HCl) in a small beaker:_____

_____5. Pour the hydrochloric acid (HCl) into a gas collection tube (be careful, the gas collection tubes are expensive.

_____6. Slowly, without disturbing the acid, pour water into the gas collection tube all the way to the top.

_____7. Gently tap the tube on the counter top to get all the air bubbles out.

_____8. Place the 1.0 cm piece of magnesium (Mg) into the gas collection tube with the one end bent over the lip of the tube.

_____9. Securely place your finger over the tube, making sure there is no air in the tube near your finger.

_____10. Holding your finger on the tube, turn the tube over and place your hand into the 1000 mL beaker. Let go of the tube once the tube opening is below the surface of the water in the beaker.

_____11. Hold the tube upright making sure the magnesium is in the tube.

_____12. Observe until the reaction is complete:_____

_____

_____13. Gently tap the tube until all the bubbles rise to the top.

_____14. Carefully and exactly record the volume of gas produced to one decimal place:_____

_____15. Pour the contents of the 1000 mL beaker and the gas collection tube down the drain.

Part B (the procedure is the same as Part A, except that the Mg ribbon is 2.0 cm)

_____16. Obtain a piece of magnesium (Mg) ribbon 2.0 cm long.

_____17. Obtain a 1000 mL beaker.

_____18. Fill the 1000 mL beaker about 3/4 full of water.

_____19. Obtain 10 to 15 mL of 6 **M** hydrochloric acid (HCl) in a small beaker:_____

_____20. Pour the hydrochloric acid (HCl) into a gas collection tube (be careful, the gas collection tubes are expensive.

_____21. Slowly, without disturbing the acid, pour water into the gas collection tube all the way to the top.

_____22. Place the 2.0 cm piece of magnesium (Mg) into the gas collection tube with the one end bent over the lip of the tube.

_____23. Securely place your finger over the tube, making sure there is no air in the tube near your finger.

_____24. Holding your finger on the tube, turn the tube over and place your hand into the 1000 mL beaker. Let go of the tube once the tube opening is below the surface of the water in the beaker.

_____25. Clamp the tube into position making sure the magnesium is in the tube.

_____26. Observe until the reaction is complete.

_____27. Record the volume of gas produced to the nearest 0.1 mL:_____

_____28. Pour the contents of the 1000 mL beaker and the gas collection tube down the drain.

Questions

1. This is a reaction of a metal with an acid. The gas produced will explode if ignited.

   What gas was produced ? _____

2. Write the **word equation** for the reaction that occurred:

   _____

3. Write the **balanced formula equation** for the reaction that occurred:

_____

4. Volume of gas with 1.0 cm Mg: _____ Volume of gas with 2.0 cm Mg: _____
You doubled the size of the piece of magnesium. Did the amount of gas double approximately ? _____

5. Show your calculations: How much would you expect to obtain

with 6.0 cm Mg ? _____
with 8.0 cm Mg ? _____

_____

Review Questions

6. Complete the equation:
magnesium chloride + sodium carbonate ----------->

_____ + _____

7. Circle the product in Question 6 which is chalk.

8. Name the elements in Family # 17: _____

_____

9. Explain why, using a complete sentence (with correct punctuation and spelling), that if a barium solution will form a precipitate with a carbonate solution, then a magnesium solution will also form a precipitate with a carbonate solution.

_____

_____

10. What type of reaction is it when copper is heated in a flame and it reacts with oxygen gas to form copper (II) oxide:

_____

11. Carbon dioxide gas turns limewater _____.

12. What is the Law of Conservation of Mass ? _____

_____

Name:	Partner's Name:
Date of lab:	If absent, data obtained from:

Lab 13.6 - Gold Pennies

Objective: To amaze and astound yourself, your family, and friends.

Procedure	Observations

'Make complete and accurate observations during the lab.'
Observations include: 1) what is happening,
2) the color, appearance, and phase (solid, liquid, gas) of all chemicals,
3) any other observations requested (odor, temperature, etc.).
'Check off the Procedure steps as you do them'

_____1. Obtain 2 pennies from your teacher which has been soaking in 6 **M** hydrochloric acid for 30-60 minutes. Handle the penny on the edges only, since the oil from your skin can alter the results. Each partner has their own penny.

_____2. Using sandpaper, **very lightly** rough the surfaces of the penny.

_____3. Rinse and dry the clean penny thoroughly.

_____4. Mass a clean, dry evaporating dish.

_____5. Mass approximately 2 to 3 grams of zinc pieces into the dish.

_____6. Pour approximately 20 mL of 6 **M** sodium hydroxide, NaOH, into the dish with the zinc.

_____7. Heat the mixture gently (high up in the flame) until it is steaming **but not boiling.**

_____8. Using tongs, drop the clean pennies into the steaming mixture.

_____9. Maintain the proper heating for at least 3 minutes.

_____10. **Turn the penny over occasionally, place the solid zinc pieces on the coin, and stir frequently all 3 minutes.**

_____11. Fill a 50 mL beaker half full with distilled water.

_____12. Remove the coins from the steaming evaporating dish with tongs.

_____13. Dunk the penny in the distilled water and place it on a paper towel to dry.

_____14. Once dry, waft the penny in the blue part of a bunsen burner flame for 10 or 20 seconds. **DO NOT OVERHEAT** !!!!

_____15. Place your coin on the counter and compare it to a regular penny, as well as everyone else's penny.

_____16. You may keep the penny !!!! Am I a generous guy or what ?

_____17. Clean your glassware, wipe your counter area, wash your hands, then take off your goggles and have a seat.

The End !

Name:_____

Exercise 13 - B: Chapter Review

1. What does the term "closed system" mean ? _____

_____

2. In a closed system, should the mass of the reactants be (greater than, equal to, or less than) the mass of the products ?

3. What does "mass is conserved" mean ? _____

_____

4. What does the term "open system" mean ? _____

_____

5. You performed the open system chemical reaction: hydrochloric acid poured on calcium carbonate chips.

   a) Was the mass of the reactants supposed to be (greater than, equal to, or less than) the mass of the products ?

   b) What product was produced which bubbled away ? _____

   c) How could you have captured the mass ? _____

6. When you heat copper sheet metal in air, what color does the copper turn ? _____

   a) What gas combined with the copper ? _____

   b) What product was formed ? _____

7. What is a synthesis reaction ? _____

8. What is a decomposition reaction ? _____

9. Describe the appearance of copper (II) carbonate: _____

10. What happens to the appearance of copper (II) carbonate when it is heated in a test tube ?

_____

   a) What gas is given off ? _____

11. Describe the appearance of copper (II) oxide: _____

12. What 2 products are formed when copper (II) oxide is heated ?

_____ + _____

13. What is a chemical family ? _____

14. magnesium nitrate + sodium carbonate ----->

_____ + _____

a) Circle the precipitate in the equation above.

b) What does the precipitate look like ? _____

c) What would the precipitate look like if strontium nitrate were used instead of magnesium nitrate ? _____

15. Name the elements in family # 2: _____

_____

16. What is the **formula** for toothpaste chalk ? _____

17. What is the **name** for toothpaste chalk ? _____

18. Write the word equation for making toothpaste chalk:

_____

19. Describe the appearance of magnesium ribbon: _____

20. Describe what you observe when magnesium is dropped into hydrochloric acid (be complete) ?

_____

a) Write the word equation for the reaction:

_____

b) What gas is produced ? _____

c) If you obtain 22 mL of gas for a 1.0 cm piece of magnesium, how much gas would you obtain from a 4.0 cm piece ? Please show your work.

****Even though there were no equations to balance in this review sheet, there are several in the test****