

Chemical Reactions Lab name: _____ 160/1200

This lab will take 4 lab periods to complete. You can ONLY do the experiments as directed by your teacher. Not all material will be out at once. You can get part credit (in minutes) if you miss some of this lab. There are FIVE basic chemical reactions in our class. During this lab you will do 12 different experiments that will cover each of these.

The five basic types of chemical reactions are:	1.
2.	3.
4.	5.

During many of these experiments different gases will be produced (oxygen, carbon dioxide, and hydrogen). Each time a gas is produced you will test it using a splint of wood that will be aflame, or glowing (flame out but it's still hot). Fill in this chart as your teacher shows you how each test works.

gas	test procedure	what happens?
carbon dioxide	flaming splint	
oxygen	glowing splint	
hydrogen	flaming splint	

We also will be looking for evidence that a chemical reaction has even taken place. List the six main indicators of chemical reactions here (topic-B):

T.
O.
P.
I.
C.
B.

For each of these reactions you will need to examine carefully WHAT HAPPENED? Keep track of your data and observations NEATLY. Clearly label our data as you go, and make sure that you use enough paper (PAPER IS CHEAP, KNOWLEDGE IS VALUABLE).

For each reaction you will need to write a WORD EQUATION as well as a BALANCED CHEMICAL EQUATION (with phase symbols). The phase symbols are: (AQ), (L), (S), and (G) for aqueous solutions, liquids, solids, and gases.

Further we will indicate WHAT KIND of reaction it was and what evidence leads you to believe that a reaction occurred at all. Put all your equations and evidence and types of reactions very neatly in the pages that follow. It would be very smart to work all of this out on loose leaf paper, then COPY IT to the lab report perfectly.

ONLY PROFESSIONAL LOOKING LAB REPORTS WILL BE ACCEPTED. No more rough edged paper, no more excessive crossing out. No more arrows. Do not squeeze your thoughts, if you want to express yourself, or if you need to, then do so properly and with ENOUGH ROOM for my comments as well.

By signing here I hereby promise to be neat, use lots of paper, and to ONLY hand in a high quality lab report:

(if you don't sign now I will have to discuss this with the powers that be)

THIS LAB REQUIRES:

1. TITLE PAGE, title, optional funny title, and a short intro
2. Each of the twelve experiments has its own section to fill in
You must take care to include phase symbols, balanced chemical reactions, and answer any questions in each section that are specific to that reaction.

There is NO CONCLUSION FOR THIS LAB

This lab is worth 60 points because it is SO LONG, and SO IMPORTANT. Part credit is available if you miss some of the experiments, you will receive a grade out of 60, but your lab minutes will get pro rated. Each balanced reaction will count for 2 points, each word equation one point, each set of questions is one point, and the phase symbols is one point. (5 x 12 = 60 points). You can also lose up to three points on page one of this handout.

1. Magnesium and oxygen form into magnesium oxide. Carefully set up crucibles with ceramic triangles as shown. Obtain a piece of Mg metal and carefully mass it IN the crucible. Heat it up until it completely reacts with the oxygen in the air. Cool down, then re-mass the crucible. Use the same scale for whole experiment. When done, cool the crucibles, dispose contents to trash, wash and turn upside down to dry out.

Word EQ: _____

Balanced Chemical EQ: _____

Your Statement: What sort of chemical reaction was this? Compare the start mass of Mg to final mass of MgO. How do you explain the change in mass? Did you test for any new gases?



2. Heated copper wire forms a type of copper oxide. Obtain a piece of copper wire, hold it with crucible tongs, plunge it into the hottest part of the Bunsen burner flame and then observe as it cools. Look at the 2 jars of "copper oxide". When done, put wire into the trash when cool.

compound name	compound formula	color
copper (I) oxide		
copper (II) oxide		

Word EQ: _____

Balanced Chemical EQ: _____

Your Statement: What sort of chemical reaction was this? What color did your copper oxide form? What would happen to the wire mass if you wiped off this oxide, and reheated the wire again and again and again?

3. Copper (II) carbonate powder is heated, new products form. Obtain about 2 cm of $\text{CuCO}_3(s)$, in a test tube. Set up your Bunsen burner with a tube clamp as shown. Heat this tube and TEST FOR A GAS using a FLAMING SPLINT. When cool, rinse down drain with plenty of water, turn tubes upside down to dry.

Word EQ: _____

Balanced Chemical EQ: _____

Your Statement: What sort of chemical reaction was this? Compare the start color to the end color (look right now at the boxes in experiment 2). Did you test for any new gases? What gas forms?



4. Methane burns in the air. We use Bunsen burners all the time in the lab. This is a cool reaction (qualitatively speaking), and a hot reaction (if you stick your finger into the flame—don't!) when methane reacts rapidly with oxygen in the air. Observe the flame as you ignite the burner. Don't dismiss such a common place thing as unimportant, it is a real chemical reaction. The formula for methane is CH_4 .

Word EQ: _____

Balanced Chemical EQ: _____

Your Statement: What sort of chemical reaction was this? The evidence for this type of reaction is hard to describe because the products are invisible. Define exothermic and endothermic reactions. Which was this? Define hydrocarbon too.

5. Demonstration of a Burning Candle. Mass a candle then light it on the scale. Let it burn for about 20 minutes. Remass the candle. The formula for this wax is: $C_{20}H_{42}$.

Word EQ: _____

Balanced Chemical EQ: _____

Your Statement: What sort of chemical reaction was this? What happened to the mass of the candle? Some wax melts (you can see that), but what does most of the wax do? Explain the change in mass, where are these products? Is there a loss of mass?



6. Demonstration of the formation of water by synthesis, then the reverse reaction using the Hoffmann Apparatus, breaking water into its component elements. This reverse reaction does not happen spontaneously, you must use both smarts + energy to "force" the reverse reaction. Put the word "ENERGY" into both of the word equations below, with the reactants or with the products, as the case may be.

Synthesis Word EQ: _____

Synthesis Balanced Chemical EQ: _____

Decomposition Word EQ: _____

Decomposition Balanced Chemical EQ: _____

Your Statement: Define spontaneous reactions, & describe how these 2 reactions are different in this "spontaneous" regard. Which of these reactions is exothermic or endothermic, and how do you know? Why is acid added to the Hoffmann Apparatus, what if there were no acid present?

7. Aluminum foil bits into **concentrated** hydrochloric acid. This is DANGEROUS stuff, do not spill it on your skin. DO NOT INHALE ANY FUMES. Put some acid into a medium clean test tube as shown. Carefully drop some shredded aluminum foil into the acid. Top with a clean dry test tube to catch the lighter than air gas that forms. This reaction is a slow starter. When done, You may wash the tube out with PLENTY of water.

Word EQ: _____

Balanced Chemical EQ: _____

Your Statement: What sort of chemical reaction was this? What gas forms, how do you know? Was this an exothermic or endothermic? What is the ΔH (say *delta H*) for this reaction? (ask, this is part of Thermochemistry - which is coming soon).



8. This reaction will take some time to occur. Set this up and put aside while you move ahead in the lab. Obtain a clean medium test tube, add 5 - 6 mL copper II sulfate solution (weak). Take an iron nail and shine it up with some steel wool. Place the pointy side of the nail carefully into the solution for at least 30 minutes. Nails to the trash when done.

Word EQ: _____

Balanced Chemical EQ: _____

Your Statement: What sort of chemical reaction was this? Why did the nail change color? What happened to the color of the blue solution? Explain that change too. *Although we can't know by just looking which type of iron sulfate solution forms, please use the Iron (III) ion for balancing.*

9. Zinc metal is added to **concentrated** hydrochloric acid. This is DANGEROUS stuff, do not spill it on your skin. DO NOT INHALE ANY FUMES. Put some acid into a clean test tube as shown. Carefully drop some zinc into the acid. Top with a clean dry test tube to catch the lighter than air gas that forms. Test with a burning splint. This reaction is FAST. When done, you may wash the tube out with PLENTY of water, put zinc in to container as shown.

Word EQ: _____

Balanced Chemical EQ: _____

Your Statement: What sort of chemical reaction was this? What gas forms, how do you know? Was this an exothermic or endothermic?



10. This is fun, safe, and messy. Into a clean beaker put some vinegar (which is really weak acetic acid $\text{HC}_2\text{H}_3\text{O}_2(\text{AQ})$). Scoop some baking soda (sodium hydrogen carbonate) into a clean and dry beaker as shown. Pour vinegar into the baking soda. Be prepared to test for a gas with a flaming splint. When done, wipe mess with clean wet towels, wash beakers out in sinks.

Word EQ: _____

Balanced Chemical EQ: _____

Your Statement: This is fun but complicated chemically. What sort of chemical reaction*** was this? What gas forms, how do you know? Copy from board the "sorta double replacement" reaction and the "sorta decomposition reaction" that occurs. Circle the REAL PRODUCTS, put boxes around the FAKE products. Explain this real and fake stuff.

11 + 12. Do these last 2 reactions at the same time. Put 2-3 drops of each chemical and watch what happens. Do each one in an watch glass.

DO NOT CONTAMINATE the jars. Do not touch the glass or the chemicals with the eye droppers! If you MISTAKENLY do this, do not replace the dropper into the chemical bottle! When done, wash thoroughly in sinks.

11. SILVER NITRATE solution plus SODIUM PHOSPHATE solution

Word EQ: _____

Balanced Chemical EQ: _____

Your Statement: What sort of chemical reaction was this? Explain how you know which product is a solid precipitate and which stays aqueous. Phases are MANDATORY with this reaction.

12. CALCIUM CHLORIDE solution plus SODIUM PHOSPHATE solution

Word EQ: _____

Balanced Chemical EQ: _____

Your Statement: What sort of chemical reaction was this? Explain why if both products are aqueous according to table F, no reaction has occurred. If no reaction occurs when 2 solutions are put together, what does happen instead? (ask) Phases are MANDATORY with this reaction too.