Chemical Reactions Lab name

160/1200

This is the largest lab of the year. You will do 20 experiments and write out detailed balanced chemical equations for them all. You must read the procedures for each before doing the experiments. Goggles On!!

List the five kinds of chemical reactions	1	2
3	4	5

You will be looking for evidence that a chemical reaction has taken place. There are 6 indicators that a chemical reaction has probably happened. (use the acronym — TOPIC-B). What does each letter stand for?

T

O

P

I

C

B

During several of the experiments you will produce a gas. You may make O_2, CO_2, or H_2. Since all these gases are invisible and have no smell, you will have to test the gases to determine which gas forms in any reactions. You will use a burning, or glowing hot piece of wood (a splint).

Gas	Use a	"proof"
Carbon dioxide	Flaming splint	
Oxygen	Glowing splint	
Hydrogen	Flaming splint	

Do not write on this lab report until you get home.

Only write on white paper that is 8½ x 11 inches in size. Try to make this lab report PERFECT. This is the first BIG DEAL lab report. DO not turn in frilly edged paper. Think on scrap paper, this report should have no crossing out, or arrows pointing far away. Leave space for me to write you comments.

Lab report requires	Including	points
TITLE PAGE	A serious title, an optional funny title, and a few sentences explaining what this lab experience showed you.	5
20 BALANCED EQUATIONS	All equations must be balanced, have phase symbols, and be neat.	40
LAB QUESTIONS	Done in order, neatly, and with A LOT of space for comments	25
CONCLUSION	There is NO conclusion for his lab report.	60
Lab due on	Late points will be deducted	

For each experiment you need to make OBSERVATIONS. On white paper, a maximum of 6 experiments per side, write details about the reactants, and products. You can mention colors, mass, temperatures, gas test results, the TOPIC B reaction indicators, etc. Notes about all things you learn in lab that might be helpful to remember while you are writing this lab report.

Check List - Make sure you pay attention to these.

	Did you check every single equation for correct PHASE SYMBOLS?
	Did you include your observations?
	Did you leave any blanks?
	Did you check to do all 30 lab questions, in order?
	Did you write your name and class period on the cover?

Experiments	
Reaction 1	Combustion of Butane The "clicker lighter" contains a liquid called butane. It gets sprayed through a tiny hole in the metal tube of the handheld device, where it vaporizes into a gas. Butane gas mixes with oxygen from the air. The "click" sparks it and it combusts well. The formula for butane gas is $C_4H_{10(G)}$
Reaction 2	Combustion of Candle Wax Demonstration. We will burn the candle for about 10 minutes, then blow it out. We'll note the start and end masses in our observations. There are many kinds of waxes, all with different formulas. "Wax" is a general term, not a compound name. Think about how the Law of Conservation of Matter works for this reaction. The formula we will use for wax is $C_{20}H_{42(S)}$
Reaction 3	Decomposition of Water by Electrolysis The Hoffmann Apparatus is set up for you to observe. Watch the demonstration. This machine decomposes water into its component elements. The gases fill the tubes in very different volumes, think about WHY that is. What proportion do they fill? The water has some sulfuric acid in it. Sodium chloride would help as well. Think about why acid or salt would be necessary. Acid or salt are NOT part of the equation or reaction. Test both gases in the tubes, as shown.
Reaction 4	Synthesis of Water Obtain a large test tube of hydrogen gas from the Hoffmann Apparatus. After you test it, put your pinky finger into the tube, does it feel wet? Does it look like condensation in the tube? It will only toot once.
Reaction 5	Combustion of Wood Wood is not "one thing", it is a mixture of compounds that is mostly cellulose, which is formed from a chain of sugar molecules. The chain can be almost any length, so there is not one formula for wood. Its "general" formula is $(C_6H_{10}O_5)n$ where "n" is an integer. For your balanced equation use this formula $C_{24}H_{40}O_{20(S)}$. Set your splint on fire and observe the wood burning. Think about where the other reactant from combustion comes from, and where the products go. When you blow the fire out why does the fire go out?
Reaction 6	Combination Reaction of one kind of a Copper Oxide Obtain some copper wire. Holding it with tongs, in the hottest part of the Bunsen burner flame. It gets red hot, but when it cools, you'll see the outside of the wire has changed color because the copper chemically combined with the oxygen in the air. Compare this product to the two types of copper oxide provided.

Experiments	
Reaction 7	Single Replacement with aluminum (foil) and aqueous copper (II) chloride solution. Put 75 mL solution into a medium sized test tube. Add ripped up foil bits and swirl. Let this sit for 5 minutes. Catch the precipitate in a funnel with filter paper.
Reaction 8	Single Replacement with Iron and aqueous Copper (II) Sulfate Put about 1 inch of copper (II) sulfate solution into a small test tube. Gently insert the nail into the solution. Let this sit for 5 minutes. Dump the solution and catch the nail in your hand. Observe the nail. Think about what that red stuff might be. Ask around. The product here will be the Iron (III) ion, balance accordingly.
Reaction 9	Single Replacement with Aluminum and aqueous Potassium Chloride Put about an inch of the potassium chloride solution into a small test tube. Gently insert aluminum metal into the solution, let this sit for 5 minutes. Dump the solution out in your hands and observe the metal.
Reaction 10	The Ionization of Potassium Nitrate into water Get about 40 mL of deionized water in a medium sized beaker and measure the starting temperature to the nearest 10th degree. Add a scoop of potassium nitrate. Stir carefully with the thermometer. Measure the highest or lowest temperature the solution gets to. Do not get this in your mouth, or else!
Reaction 11	Combustion of Ethanol Demo — The alcohol ethanol will burn or combust when sparked with a flame. Alcohols burn the same color as methane in the Bunsen burner. Here we will combust it on top of some $CuCl_{2(S)}$. The fire will heat the salt, and excite the electrons, which produce a fun color flame (spectra). This salt IS NOT part of this reaction. Alcohols are oxygenated hydrocarbons. Ethanol = $C_2H_5OH_{(L)}$
Reaction 12	Synthesis of Magnesium Oxide Mass a crucible empty. Curl the metal around a pencil into a small spring shape. Make sure it fits INSIDE the crucible. Mass crucible with the metal. Put the crucible onto the indestructible black lab table. Carefully light the metal on fire. Once the reaction is over, let this COOL for several minutes before you mass it one more time.
Reaction 14	Combustion of Methane Turn on your Bunsen burner (that's a capital B for Mr. Bunsen!) Methane gas burns with the oxygen in the air. The products are invisible gases, but they are really there. This is also known as complete combustion. Be aware that incomplete combustion can occur as well.

For the next set of reactions, obtain a watch glass. Make sure it is clean and dry.
You will use 3 drops of each of the two solutions to see these reactions.
Make sure that you DO NOT cross contaminate the solutions, by touching the eye droppers to each other, or to the watch glass. If you accidentally touch your eyedropper to something, just get a CLEAN one.
Soap and water and dry watch glass between each reaction.

Reaction 15	Double Replacement Put 3 drops of sodium phosphate solution into 3 drops of silver nitrate solution.
Reaction 16	Double Replacement Put 3 drops of sodium hydroxide solution into 3 drops of copper (II) sulfate solution.
Reaction 17	Double Replacement Put 3 drops of cobalt (II) nitrate solution into 3 drops of sodium hydroxide solution.
Reaction 18	Double Replacement Put 3 drops of rubidium bromide solution into 3 drops of ammonium nitrate solution.
Reaction 19	Decomposition of Copper (II) carbonate with heat Put about $^1/_4$ inch of copper (II) carbonate into a large test tube, put it into a test tube clamp as shown. Have a wood splint in your hand to set it aflame as you begin to heat the compound. Heat will decompose the compound, and it changes color. Put flaming splint partly into the tube – do not let it go! Test the gas produced twice. Have you recently seen a black powder like that? (yes)
Reaction 20	Single Replacement with Magnesium and Hydrochloric Acid Put about 1 inch of acid into a large test tube. Put the bits of metal into a second clear and dry test tube. Invert the metal into the acid, holding both tubes with one hand. When the fizzing stops, it's time to test the gas in the top tube (without tipping it sideways). Use a flaming splint.
Reaction 21	New pennies are only copper on the outside. Inside they are zinc metal. Using an emery board or file, scrape two opposite sides of the pennies. Look at the silver-colored metal inside. Put your scraped penny into about 40 mL of strong hydrochloric acid. Observe, but this takes all night. Tomorrow check on your penny.

#	Balanced Chemical Equations with Phase Symbols
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7	

#	Balanced Chemical Equations with Phase Symbols
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#	Balanced Chemical Equations with Phase Symbols
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21	

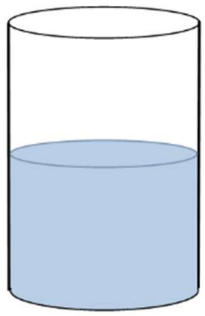
Lab Questions.
White 8½ x 11 inch paper, leave room between each question for comments, and do not run into the right side or left side margin if you can help it (you can). Use a lot of paper, and answer the questions IN ORDER, OR ELSE. Write WHOLE SENTENCES, not short answers, or fill in the blanks.

1	Acid is used in the Hoffmann Apparatus - but it is NOT part of the chemical equation. Why is acid put in the water? We could use salt, but we don't (why?) Does water conduct electricity?
2	On the first day of school your teacher blew up a hydrogen balloon, and it created a loud fireball. You reacted the hydrogen and oxygen to create water, but there was no fireball; all you got was a cute little toot. Why was there such a big difference between these identical reactions?
3	Why does a candle go out when you blow it out with your breath (chemically speaking)?
4	Why does a "glowing" splint of wood catch fire again when you put it into a test tube with oxygen gas but not if you just fan it?
5	What is another name for a combination reaction?
6	In double replacement reactions we always start with two __ __. In double replacement reactions, the products are always an __ __ and a __. Occasionally you mix together two ionic solutions and end up without a precipitate. This is NOT a double replacement reaction, instead it is just a __.
7	Write the symbols showing the ionization of sodium chloride when it dissolves in water (table I). Write the symbols showing the ionization of potassium nitrate when it dissolves in water (table I).
8	What happens to sucrose (table sugar), when it dissolves into water? It is a molecular compound; it does not form into any ions. Use symbols to show this process ($C_{12}H_{22}O_{11(S)}$)

Read this to answer questions 9 through 11. The set-up for single replacement reactions has atoms going into a single aqueous solution. There are 3 chemical paths that might happen. Most common is the cation replacement single replacement reaction. Or there can be an anion replacement SR instead. The last path is NO REACTION, like when your teacher's gold wedding band went into the acid. Table J is your guide.

9	Write a balanced equation for cation replacement single replacement reaction NOT from this lab.
10	Write a balanced equation for anion replacement single replacement reaction NOT from this lab.
11	Write a set up for a single replacement reaction that results in "no reaction" (not $Au_{(S)} + HCl_{(AQ)} \rightarrow X$)
12	If you started with a potassium nitrate solution and added a metal to it, name all the metals that would replace it in a single replacement reaction in high school chemistry.
13	Skip this one, of course!

14	If you don't have sufficient oxygen for a complete combustion reaction, name two other products you end up with in addition to CO_2 and H_2O. Check your BASICS.
15	Write a balanced equation showing two AQ solutions mixing which results in a "no reaction". Write out all formulas, even the products, with phase symbols.
16	The smallest of all hydrocarbons is methane CH_4. Hexane is a medium sized, liquid hydrocarbon with a formula of C_6H_{14}. Write out the word equation for the combustion of hexane.
17	Write out the balanced equation for the combustion of hexane, with phase symbols.
18	An oxygenated hydrocarbon has oxygen combined inside of hydrocarbon, including ethanol. You saw the combustion of ethanol in lab. Another alcohol is pentanol with formula of $C_5H_{11}OH_{(L)}$. Write the balanced equation for the combustion of pentanol with phase symbols.
19	In reaction #12 (MgO) how many grams did your crucible increase between start and end? If the Law of Conservation of Matter is in effect (it is) how do you explain a gain of mass in this chemical reaction?
20	Using table I, show the symbols showing how sodium hydroxide and how lithium bromide dissociate (ionize) in water.
21	Incomplete combustion happens when there is insufficient oxygen present to change all the carbon into carbon dioxide gas. There are several different incomplete combustion reactions. Write the balanced equations for two different ones, that produce solid carbon (soot) or carbon monoxide (poison gas). Your BASICS will help.
22	Write the word equation for the double replacement (16), including phases and names. Do not use any numbers — unless they are Roman Numerals.
23	Why doesn't the copper react in hydrochloric acid like the zinc does in reaction #21?
24	Write the word equation for reaction #20 with the magnesium metal.
25	Write the word equation for the reaction #8 with the metal and the solution.
26	Write the word equation for reaction decomposition of $CuCO_{3(S)}$.
27	There is no credit for question 27 but explain why this cartoon below is funny (what does it mean?).



An optimist sees this glass as $^1/_2$ full.

A pessimist sees this glass as $^1/_2$ empty.

A chemist would say it is full.