**AP Chemistry: Lab Techniques**

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Station #1: A Study of Density 20 pts**

1. You might notice that at this station there are two sodas in a container of water. In the spaces below, describe three qualitative and three quantitative observations about the sodas.
	1. Qualitative -0.5 each
		1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
		2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
		3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	2. Quantitative 0.5 each
		1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
		2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
		3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Write a hypothesis about why one can floats and the other does not. 2 pts
3. You will have the following materials to work with. 5 pts
	1. Graduated cylinder
	2. Beakers
	3. Pipettes
	4. Thermometer
	5. Extra cans of soda
	6. Sample cups
	7. Electronic balance
	8. Calculator

Use as many of these materials as needed to test your hypothesis. Write your procedures below. Be sure they are easy to follow and are numbered.

Equipment

1. Create a data table to hold your data below. 5 pts
2. Write a conclusion statement summarizing your findings below. 5 pts

**Station #2: Safety and Glassware Review 22/22 scaled for 20 pts**

At this station, you will find a set of cards and glassware. You and your partner will use the flashcards to review safety rules and the glassware present. When you are sure you have it all down, take the quiz (by yourself!) found on the last page of this packet. When you are done, get a grading guide from your teacher and grade your quiz. Record the number correct in the box provided.

**Station #3: Physical VS Chemical**

In this lab, you will work in a 24-well plate to identify physical and chemical changes. You may use any of the materials found at this station. Record your data in a table of your design, then answer the questions at the bottom of the page. Mix each solid with each liquid. Note any color changes, temperature changes, or any other indicators of a chemical reaction (You may have to observe 2-3 minutes, so be patient!). Be sure to also record the appearance of each substance both before, during and after the experiment.

Data Table 8 pts

Analysis Questions 2 pts each

1. Return to your table and highlight each data point that represented a chemical change.
2. What observations led you to believe that some of these reactions were chemical changes?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. How could you describe the four solid compounds in terms of their physical properties?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. What are the chemical formulas for the compounds used in this lab? (You may use the internet to look these up if needed and you do not have to do mineral oil)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. How many elements are the compounds in question 4 made up of? Does that seem odd to you considering what you have seen in lab? Explain your answer.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Which of the reactions gave you a solution? What is a solution and how did you know it made one?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Station #4: Separation Techniques**

In this section of the lab, you will be practicing two separation techniques: filtration and chromatography.

* Filtration 3 pts each (1-5)
	1. You will find two solutions at this station, sodium carbonate and calcium chloride. Identify each of these reactants and write a balanced equation for their reaction below.
		+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	2. You will now combine these reactants together into a 250mL beaker. You may use any volume of each reactant (between 10 and 20 mL) that you choose. Record the amount of each reactant and observations of the reaction below.
		+ Amount of sodium carbonate used \_\_\_\_\_\_\_\_\_\_\_\_\_\_
		+ Amount of calcium chloride used \_\_\_\_\_\_\_\_\_\_\_\_\_\_
		+ Reaction observations:
	3. Once combined, these reactants form a precipitate. Set up a filter in a funnel as shown to the right and filter the precipitate, so that most of the liquid is removed. Be sure to record the mass of the filter paper by itself.
		+ Mass of filter paper \_\_\_\_\_\_\_\_\_\_\_\_\_\_
	4. Place the solid precipitate and filter paper on a watch glass and place in the drying oven while you do the chromatography section of this lab.
	5. When your filter paper is dry, take the mass a second time and subtract to find the mass of the precipitate. Record it here: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	6. **BONUS!**  (5 points) If you know how, find the percent yield of this experiment. Show your work in the space below and box your answer!
* Chromatography #5-6 5 pts total
* A heinous crime has been committed and you are recruited to solve it. Someone in school wrote a terrible message about your teacher on a giant poster. Although the pen used to write the note was found, the suspect remains anonymous. However, there are only four people who would do such a thing, and a sample of writing utensils have been obtained from their bags. You must use paper chromatography to determine which writing utensil was used to write the note.
	1. Measure approximately 1cm from the outer edge of a coffee filter and mark five evenly spaced lines around the filter lightly with a pencil (do not use ink). Write the identity of the pen you will use for each mark, including the suspect pen.
	2. Place a heavy dot of the appropriate pen on each pencil line and allow to dry.
	3. Fill the dish with about 0.5 cm of water and set on a flat surface. Form a cone shape out of your filter and place it "upside down" in the dish so that your dots are close to the water.
	4. Once the chromatogram has developed and the water travels to the "top" of the coffee filter, remove the filter from the plate. Using a pencil, mark the final position of the solvent (water line).
	5. Allow the filter to air dry. Once dry, compare the sample pens to the suspect pen. Who committed the crime? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Attach your filter to this lab report (once dry).
	6. How does this separation technique work? Describe it in 2-4 sentences below.

**Station #5: Significant Figures in Measurement 1 pt each blank**

There are various pieces of equipment set up at this station. Please go in order of how they are listed on this lab sheet.

* Measure the volume, *using correct significant figures and units*, found on each of the following pieces of equipment:
	+ Beaker \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ Buret \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ Graduated cylinder \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ Volumetric pipette \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ Volumetric flask \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ List the same equipment below, in order of most accurate to least accurate for measuring volume.
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Measure the mass, *using correct significant figures and units*, of the sample given, on the following pieces of equipment:
	+ Triple beam balance \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ Electronic balance \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ Analytical balance \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ Which is the most accurate piece of equipment? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Measure the length, *using correct significant figures and units*, of the object given.
	+ Meter stick \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ Convert this to picometers, nanometers, centimeters, kilometers and megameters in the space below.
* Measure the temperature, *using correct significant figures and units*, of the sample found at this station.
	+ Thermometer \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ Temperature probe \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ Convert the reading with the most significant figures to Fahrenheit and Kelvin. Show your work below.

**Safety and Glassware Quiz**

# of Questions Correct

\_\_\_\_\_\_\_\_\_\_\_\_

1. If you spill an acid or a base on yourself, you should:
	1. rinse with acetone or another suitable solvent or neutralizing solution
	2. ask your lab partner what to do
	3. immediately wash with cool water and tell your teacher
	4. do nothing unless you feel a burn or irritation
2. You may remove your goggles while in the lab room:
3. never; goggles should always be worn in the lab
4. if no one is doing an experiment or washing glassware around you
5. if no one is doing an experiment with harmful chemicals
6. anytime
7. You can safely wear contact lenses while doing a chemistry lab:
8. if you are wearing goggles
9. if they are soft lenses
10. if you are wearing glasses
11. if your partner is the one doing the experiment
12. Broken glassware left around the lab is a hazard because:
13. if it is left on the floor, you or others might step on it and cut your foot
14. if on the lab bench, someone might lean on the bench and cut their arm
15. if in the sink, someone might try to pick it up to throw it away properly and cut themselves
16. all of the above
17. You have looked up the hazards of the chemicals you will be using in a particular lab, and found out that they are mild health hazards, requiring you to avoid skin contact and vapor inhalation. Therefore, when in lab you should:
18. wear short shorts and sandals
19. wear long pants and closed toed shoes, and even a lab coat if possible
20. keep the chemicals in the safety hood as much as possible
21. wear gloves
22. all of the above
23. b, c, and d only
24. You or your neighbor's clothing catches fire, what of the following should you *not* do?
25. drop to the floor and roll to extinguish the flames
26. alert the teacher
27. use the safety blanket to smother the flames
28. use the fire extinguisher
29. run
30. If the fire alarm sounds, you should:
31. do nothing - it is probably a false alarm
32. quickly shut down your experiment, then leave the building
33. gather your backpack, books and calculator and leave the building
34. grab a fire extinguisher and/or safety wash
35. You spilled something in your eyes because your goggles were not on. What do you do?
36. nothing
37. tell your teacher and quickly rinse with water for a few minutes using the eye wash
38. wipe your face with a paper towel and see if your eyes feel better
39. go to the restroom and rinse with water because the water is better there
40. All hazardous waste should be
	1. Placed in a special waste container
	2. Washed down the drain
	3. Placed in the wastebasket
	4. Stored in your lab drawer
41. When you have taken too much of a chemical, you should
42. Return the excess to the reagent bottle
43. Store it in your lab drawer for future use
44. Discard it using proper disposal procedures
45. Give it to your lab partner to deal with
46. Write the name of the piece of equipment in the blank provided. (When grading, each box is a question.)

|  |  |  |  |
| --- | --- | --- | --- |
| \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |