

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

Lab 3.0 - Temperature of Flames

*Make complete and accurate observations during the lab. Observations include such things as...what is happening; for any chemicals, the color, appearance, phase (solid, liquid, gas), and odor (but **NEVER** taste) ; temperature if requested; etc.*

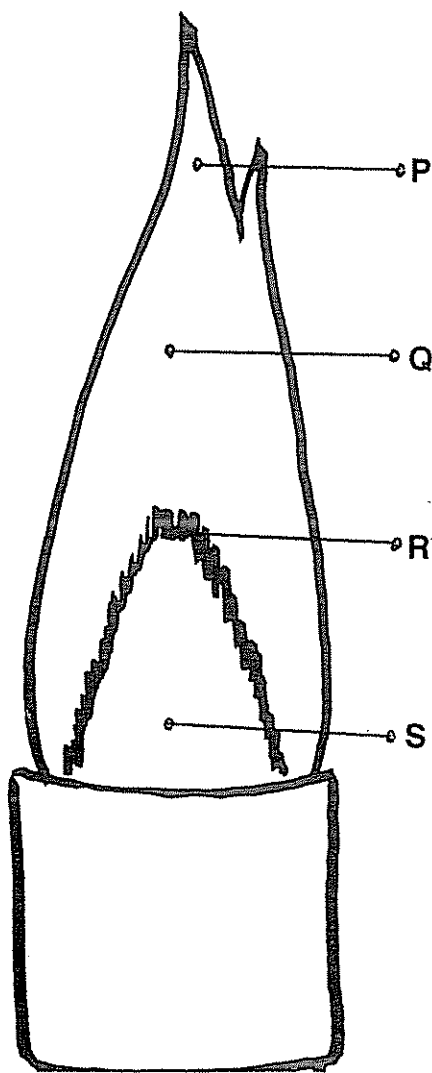
Procedure	Observations
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____ 1. Obtain 4 pieces of heavy copper wire (16 gauge) which are 15 cm or greater .

____ 2. Sandpaper one end of each wire until each is bright and shiny.

____ 3. One partner will do step 3.a. while the other partner is timing.

____ 3.a. Using a burner and tongs, hold the tip of one wire at each of the 4 positions shown in the diagram (P, Q, R, S) until it becomes bright orange. Do this one position at a time. Indicate the number of seconds for each position on the diagram. If it takes longer than 60 seconds, indicate "over 60". Also indicate the colors each wire changed during the heatings.



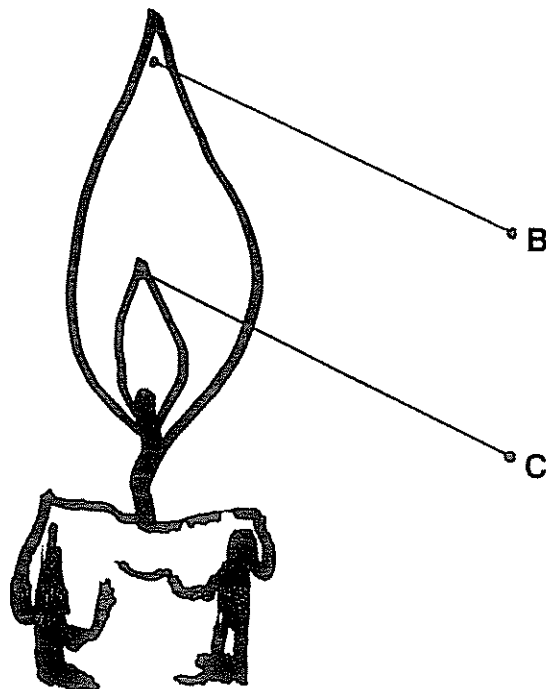
Number of Seconds

Colors during Heating

_____	_____
_____	_____
_____	_____
_____	_____

Part B - Candle Flame

- ____ 4. Sandpaper the ends of 2 new pieces of wire.
- ____ 5. Hold the tip of one wire at each of the 2 positions shown in the diagram (B, C) for 2 minutes. Do this one position at a time.
- ____ 6. Indicate the color that the wire turns in each section of the flame after the 2 minute time.



Color of Wire after 2 Minutes

Color of Wire after 2 Minutes

Questions

- Which flame was hotter, the burner or the candle ? _____
- Which part of each flame was the hottest ?
 - Burner flame (P, Q, R, S) _____
 - Candle flame (B, C) _____
- Combustion** is the chemical reaction of burning (combining with oxygen gas). The gas in the burner was probably methane, CH_4 . The candle was paraffin, $\text{C}_{25}\text{H}_{52}$. The products of complete combustion are carbon dioxide and water vapor.
 - Write the word equation for the combustion of methane:
methane + _____ -----> _____ + _____
 - Write the equation for the combustion of methane:
 CH_4 + _____ -----> _____ + _____

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Lab 3.1: The Phases of Water

*Make complete and accurate observations during the lab. Observations include such things as...what is happening; for any chemicals, the color, appearance, phase (solid, liquid, gas), and odor (but **NEVER** taste) ; temperature if requested; etc.*

Procedure	Observations
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1. Obtain and assemble the apparatus (including the crushed ice) as shown in the illustration.
2. Slowly heat the beaker containing the ice. Continue to heat the beaker for 10 minutes after all the ice has melted in the **evaporating dish**. Make observations:

Contents of the beaker: _____

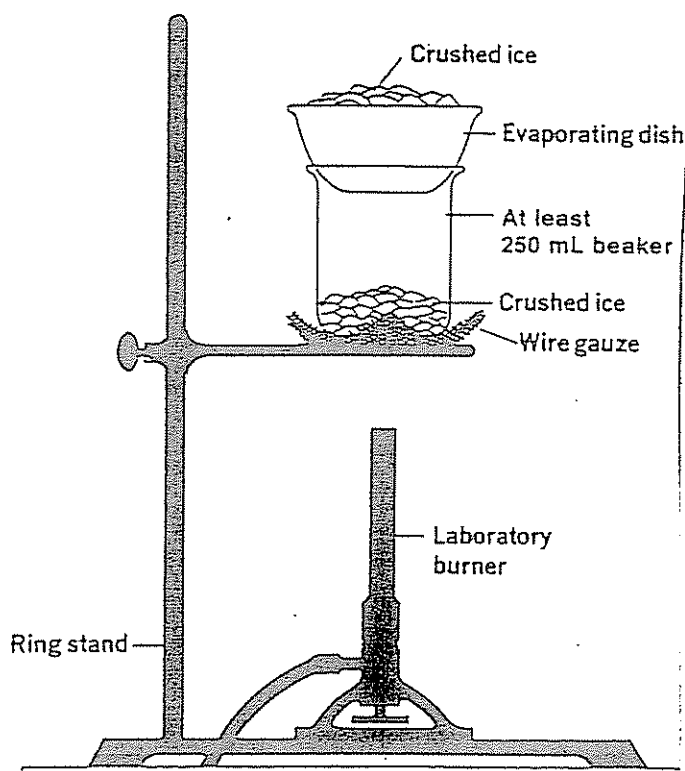
Bottom of the evaporating dish: _____

Ice in the evaporating dish: _____

3. Take the temperature of the melted water in the evaporating dish: _____

Questions

1. Name the 3 common phases of matter. _____



2. What is the name of each phase of water called ? Solid = _____;

liquid = _____; gas = _____

3. What phase changes did you observe in the lab ? _____

4. Generally, the higher the temperature of a substance, the faster the molecules are moving, and, the lower the temperature of a substance, the slower the molecules are moving.

Using complete sentences (with correct punctuation and spelling), please explain why ice lowers the temperature of matter that comes in contact with it ? _____

5. Heat always travels from an area of higher temperature to an area of lower temperature.

Please indicate what types of things would **not** be lowered in temperature when they come in contact with ice ? _____

6. Using complete sentences (with correct punctuation and spelling), why does heat applied to a substance increase its temperature (or change its phase) ? _____

7. What is the opposite of freezing ? _____

8. What is the opposite of boiling ? _____

9. How are boiling and evaporation alike and different ? _____

10. As atmospheric pressure is decreased (as you go higher in elevation (ie. to the top of a mountain)) the boiling temperature is lower due to decreased pressure on the liquid. As pressure is increased (as in pressure cookers), the boiling temperature increases due to the increased pressure on the liquid.

Why does it take longer to boil food when one is living in an area of high elevation ? _____

Why do pressure cookers cook food faster ? _____

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

Lab ^{3,2} "Water-4 (Agua-4)": The Liquid to Solid Phase Change

Objective: To observe and graph what happens to the temperature of water as it turns from a liquid into a solid.

Procedure	Observations
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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. Measure 10 mL of **warm** (about 30 to 40°C) water in a graduated cylinder. Obtain the warm water from your teacher.

____ 2. Pour this 10 mL of water into a test tube (20 x 150).

____ 3. Place a thermometer into the water in the test tube.

____ 4. In a ⁴⁰⁰600 mL beaker or larger, mix a full 250 mL beaker of **crushed** ice with at least 50 mL of calcium chloride (CaCl₂) pellets, or crushed rock salt (sodium chloride, NaCl).

____ 4.a. With your hand on top, shake the ice/salt beaker briefly.

____ 5. Pour about 3-4 cm of this ice / salt slush into the bottom of the ^{600 mL}small cup of a calorimeter.

____ 6. Take the initial temperature of the water in the test tube: _____. This is Time "0" on line 1 of your Data Table. Leave the thermometer in the test tube.

____ 7. Within the next 0.5 minutes (30 seconds), lower the test tube into the smaller cup of the calorimeter so it touches or almost touches the layer of ice / salt slush. Pour the rest of the ice / salt slush around the test tube nearly filling the cup. At the 0.5 minute mark (from the initial temperature in # 6) record the temperature of the water in the test tube.

____ 8. Record the temperature every 0.5 minutes (**do not lift the thermometer out**, but turn it slightly each time to avoid supercooling) until your instructor indicates to stop. **Indicate when you think it began to freeze.** Put these temperatures and your observations on the Data Table on the next page.

____ 9. Clean all equipment; wipe down your lab area; wash your hands; then take off your safety goggles and have

a seal.

Time (minutes)	Temperature (C)	Observations
0		
0.5		
1		
1.5		
2		
2.5		
3		
3.5		
4		
4.5		
5		
5.5		
6		
6.5		
7		
7.5		
8		
8.5		
9		
9.5		
10		
10.5		
11		
11.5		
12		
12.5		
13		
13.5		
14		
14.5		
15		

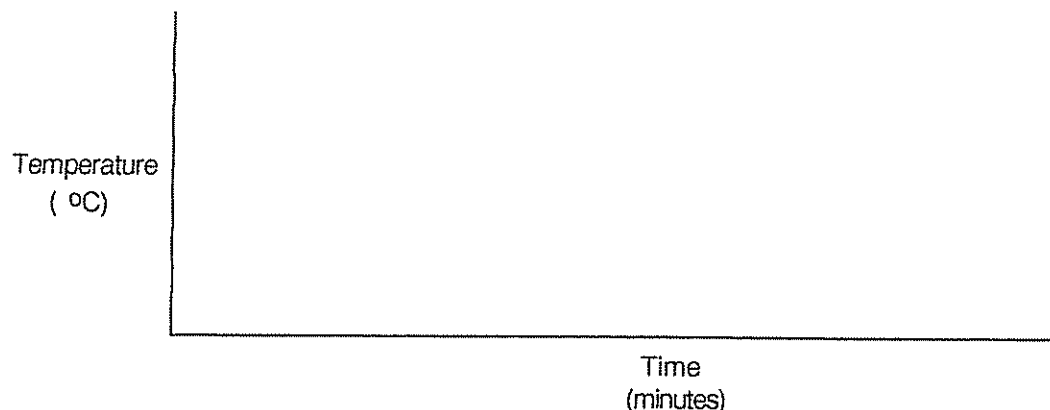
A Little Background and some Questions...

Contrary to what most people believe, when a substance changes phases, the temperature stays the same until the phase change is complete.

1. Graph your Time vs. Temp data on the attached **Cooling Curve for Water**. Be as accurate as possible.
2. What are the 3 common phases of matter ? _____

3. What phases of water did you observe in the test tube in the calorimeter cup in this lab ?

4. Your graph should have lowered in temperature initially, leveled off for a time, and then dropped slightly (similar to the following):



a) Did you have a plateau, a level portion (3 or more temperatures in a row which are the same)

on your graph ? _____

b) If so, at what temperature did it occur ? _____

c) At what ideal temperature should this plateau have happened ? _____

d) What phase change should have been happening at the plateau ? _____

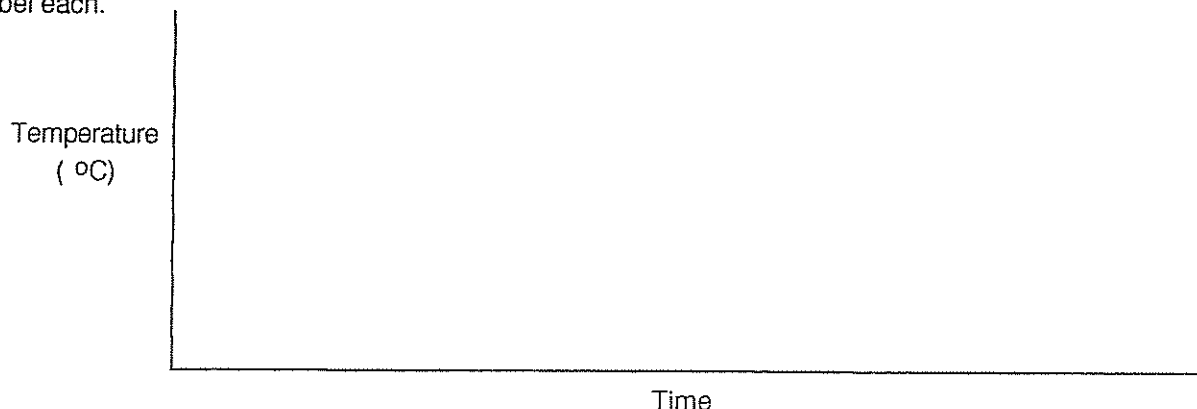
5. If the experiment had started with vapor, there would have been 2 plateaus on the graph; one at 100 °C, and one at 0 °C.

a) What phase change would have been happening at the top plateau

at 100 °C ? _____

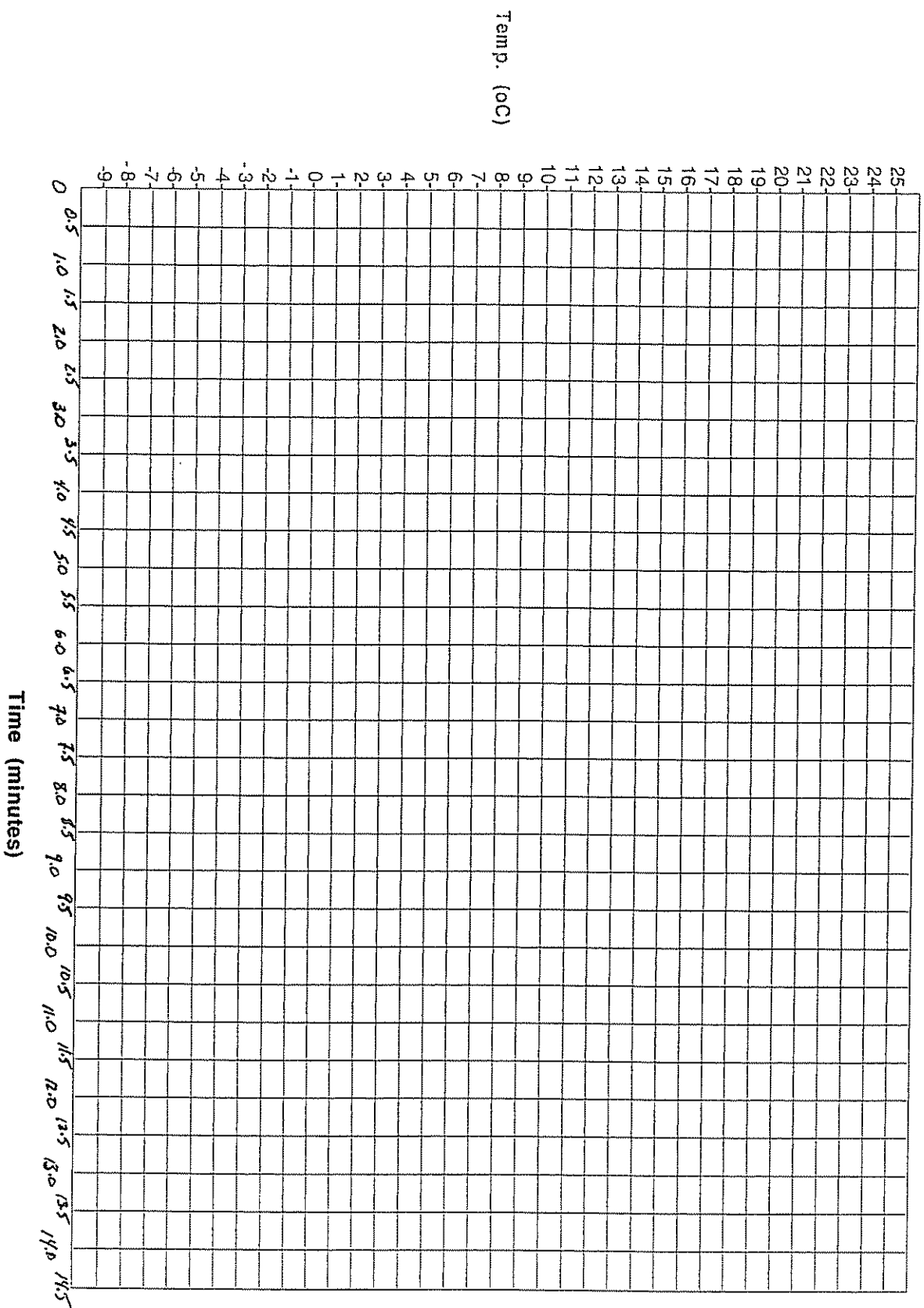
6. Knowing that the phase change plateaus will happen at the same temperatures no matter if it is a cooling curve graph, or a heating curve graph...

draw the general shape of a heating curve graph starting with ice at -20 °C, and going to steam at 120 °C. Label the temperatures of the plateaus; bracket the phases and label each; bracket the phase changes and label each.



Graphing: Graph your data from your Data Table. Connect the points.

Cooling Curve for Water



7. At what temperature does water freeze ? _____
8. At what temperature does ice melt ? _____
9. At what temperature does water boil ? _____
10. At what temperature does vapor condense ? _____
11. What is the opposite of melting ? _____
12. What is the opposite of condensation ? _____

=====

Review Questions

R-1. What is the electrolysis of water ? _____

R-2. Write the **word equation** for the electrolysis of water.

R-3. What gas is produced in the greater quantity as water is decomposed (name and formula) ?

R-4. Since hotter water increases the rate of diffusion, what can be said about the motion of the molecules in hotter water ? _____

R-5. What is the density of water ? _____

R-6. Most dense form of water = _____

Middle dense form of water = _____

Least dense form of water = _____

R-7. Remembering the balloon on the flask portion of lab, how do food manufacturers get the tops of jars to dimple in (which pop out when we open the jar) ? _____

R-8. Heat always travels from _____

R-9. What happens to the molecules as you heat something ? _____

Name: _____

Exercise : 3-A

Elements, &, More Density Problems

Part I - Use the Properties of Some Elements Data Table

1. Generally, it is recognized by a bright yellow color. it is brittle, and has a boiling point of 444.6 °C. _____
2. A dull surface hides the luster of this solid, which has a density of 11.34 g/cm³. The great density of this solid makes it possible for it to hold a fish line under fresh water. _____
3. You can not see this colorless gas, which is twice as dense as hydrogen. It is used to fill balloons. _____
4. This yellow, malleable substance is used to make rings. Its density is approximately 19 g/cm³. _____
5. Sometimes you find this substance as gray crystals. At higher temperatures you can see it as a violet gas. It is often used in making an antiseptic to treat cuts. _____
6. There is a rosy luster to this electrical conductor's appearance. It melts at approximately 272 °C. _____
7. Scientist X has discovered a silvery white solid that is lighter in density than aluminum. It is either _____ or _____.
8. This material is a dark red liquid at room temperature. It does not conduct electricity. _____
9. What phase is zinc at 400 °C ? _____
10. Of the elements which are solids at room temperature, which has the smallest density ? _____
11. What is the boiling point of silver ? _____
12. It is a gas with a greenish-yellow color: _____
13. Of the colorless gases, it has the greatest density: _____
14. Of the colorless gases, it has the highest boiling point: _____
15. It is the element most commonly associated with rust: _____
16. It is the least dense gas: _____
17. The 3 metals with very similar densities (2 are silvery, one is not): _____, _____, and _____.

Part II - Calculate the Density

- Remember Density = mass (g) / volume (L or mL)
- Use the Properties of Some Elements Data Table

1. A gas occupies 20 L at standard conditions and has a mass of 1,80 g.

Calculate the density, showing all work. _____

What may this gas be ? _____

What is its normal boiling point ? _____

2. A 2.0 mL sample of a liquid has a mass of 27.10 g.

Calculate the density, showing all work. _____

What is the liquid apt to be ? _____

What phase will it be at 100 °C ? _____

3. A student obtains the following laboratory data:

- Mass of the sample = 579.6 g
- Water level in the graduated cylinder = 60.0 mL
- Water level in the graduated cylinder after the sample is immersed = 90.0 mL
- Appearance of sample is yellow

What is the volume of the sample ? (Show all calculations) _____

Calculate the density, showing all work. _____

Is the sample gold, sulfur, or phosphorus ? _____

4. Use the data below:

- Length of sample = 10.0 cm
- Width of the sample = 5.0 cm
- Height of the sample = 20.0 cm
- Mass of the sample = 8960 g

Calculate the volume of the sample (show all work).

Calculate the density, showing all work. _____

What is the element ? _____

5. The following data was obtained in lab:

	Sample A	Sample B	Sample C	Sample D	Sample E
Conducts electricity ?	No	Yes	Yes	Yes	No
Mass	9.86 g	89.0 g	39.4 g	5.46 g	26.0 g
Volume	2.0 cm ³	10.0 cm ³	5.0 cm ³	3.0 cm ³	130.0 cm ³
Density					

Calculate the density for each sample, indicating it in the table above.

Which of the above samples is/are a metal ? _____

Which of the above samples is/are a nonmetal ? _____

Which sample has the smallest density ? _____

Which sample has the greatest density ? _____

Water has a density of 1.0 g/cm³. Which sample(s) will float on water ? _____

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

Lab 3.3 - Electrical Conductors vs. Nonconductors

*Make complete and accurate observations during the lab. Observations include such things as...what is happening; for any chemicals, the color, appearance, phase (solid, liquid, gas), and odor (but **NEVER** taste) ; temperature if requested; etc.*

Procedure	Observations
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____ 1. Obtain an apparatus which will indicate if a material conducts electricity.

____ 2. Complete the **Data Table** below for 15 different items, indicating the appearance of the material and if it conducts electricity.

Data Table

	Item	Description (color, shape, phase...)	Does it conduct electricity ?
1	Copper		
2	Lead		
3	Carbon - Charcoal		
4	Carbon - Graphite		
5	Sulfur		
6	Silver		
7	Aluminum		
8	Silicon		
9	Tin		
10	Nickel		
11	Zinc		
12			
13	Distilled water		
14	Tap water		
15	Salt water		

Questions

1. What types of things conduct electricity ? _____
2. Does distilled water conduct electricity ? _____
3. Does tap water conduct electricity ? _____
4. What is the difference between distilled water and tap water ? _____

5. Why is it not a good idea to swim in the ocean or in a pool during a thunder and lightning storm ? _____

6. What material is in the ocean which allows the water to conduct electricity ? _____
7. What material is in a pool which allows the water to conduct electricity ? _____

Review Questions

1. Which part of a burner flame is the hottest ? _____
2. Which is hotter, a burner flame or a candle flame ? _____
3. What is chemical combustion ? _____
4. What are the 3 common phases of matter ? _____
5. When you heat a substance, what is happening to the atoms and molecules of that substance ?

6. When substances are touching each other, heat always travels from _____

7. At what temperature does ice melt ? _____
8. At what temperature does water freeze ? _____
9. At what temperature does water boil ? _____
10. At what temperature does steam condense ? _____
11. What happens to the temperature of a substance as it is being heated ? _____
12. **During a phase change**, what happens to the temperature of a substance as it is being heated ?

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

Lab 3.4 - Solubilities of Chemicals

*Make complete and accurate observations during the lab. Observations include such things as...what is happening; for any chemicals, the color, appearance, phase (solid, liquid, gas), and odor (but **NEVER** taste) ; temperature if requested; etc.*

Procedure	Observations
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- ____ 1. Line up 4 clean, dry, test tubes which are all the same size.
- ____ 2. Put no more than one third of a test tube of the chemicals listed in the Data Table in the test tubes. One chemical per test tube. Keep them in order.
- ____ 3. Record the appearance of each chemical in the Data Table.
- ____ 4. Gently tap each test tube on the lab table so that the chemical settles to the bottom of the test tube.
- ____ 5. Measure the height of the dry chemicals in centimeters to one decimal place.
- ____ 6. Record the heights in the Data Table.
- ____ 7. Add water to each test tube until it is about 3/4 full.
- ____ 8. Stopper and shake each test tube vigorously for 1 minute.
- ____ 9. Let the test tubes settle for at least 3 minutes.
- ____ 10. Measure the height of any undissolved chemical in each test tube.
- ____ 11. Record the heights of the undissolved chemicals in the Data Table.
- ____ 12. Record the color of the water in each test tube.
- ____ 13. When you are finished all the test tubes, pour 1,2, and 3 down the sink; take 4 to your teacher.

Data Table

Chemical	Color of Dry Chemical	Height of Dry Chemical	Height of Undissolved Chemical	Color of Water after Shaking
Sugar				
Table salt				
Iron sulfate				
Silicon Dioxide				

Questions

1. **Soluble** means that the substance dissolves. **Insoluble** means that the substance does not dissolve. **Slightly soluble** means that the substance only partially dissolves.

- a) Which of the chemicals was soluble ? _____
- b) Which of the chemicals was insoluble ? _____
- c) Which of the chemicals was slightly soluble ? _____

2. A **solute** is the substance that is dissolved. A **solvent** is the substance which is doing the dissolving.

- a) In the sugar and water solution, which substance was the solute ? _____

Which was the solvent ? _____

- b) In the table salt and water solution, which substance was the solute ? _____

Which was the solvent ? _____

3. A **solution** is a mixture of 2 or more substances which is alike throughout (usually something dissolved in water).

Which of the chemicals formed solutions ? _____

4. Refer to the **Table of Solubilities in Water**:

- a) Is aluminum chloride soluble ? _____ Does it dissolve in water ? _____
- b) Is silver carbonate soluble ? _____ Does it dissolve in water ? _____
- c) Is lead iodide soluble ? _____ Does it dissolve in water ? _____
- d) Are the "acetate" compounds mostly soluble or insoluble ? _____
- e) Are the "mercury (I)" compounds mostly soluble or insoluble ? _____
- f) Looking at the classes of compounds across the top of the table, which are mostly insoluble ?

- g) Looking at the classes of compounds down the left side of the table, which are mostly soluble ?

Review Questions

1. What is the phase of water at -20°C ? _____ at 30°C ? _____

at 80°C ? _____ at 110°C ? _____

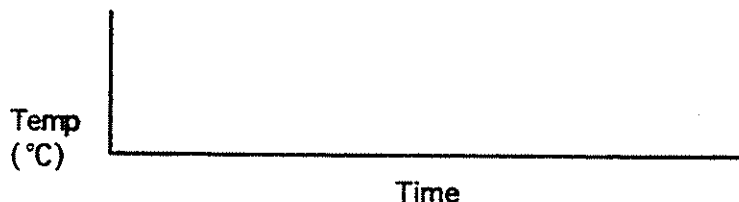
2. Does distilled water conduct electricity ? _____

3. What phase change is melting ? _____

Name: _____

Exercise : 3 -B Chapter 3 Review

1. Which is the hotter flame, a bunsen burner or a candle ? _____
2. What is the hottest part of a bunsen burner flame ? _____
3. What is combustion ? _____
4. What are the products of complete combustion ? _____
5. What are the 3 common phases of matter ? _____
6. When solid water changes to liquid water, it is called ? _____
7. When liquid water changes to gaseous water, it is called ? _____
8. When gaseous water changes to liquid water, it is called ? _____
9. When liquid water changes to solid water, it is called ? _____
10. When you are on top of a mountain, the boiling temperature of water is (above, the same, below) 100 °C.
11. When you touch something hot, the molecules in your hand move (faster, the same, slower).
12. When you touch a hot cup of tea with your hand, the heat travels from _____
to _____.
13. At what temperature does ice melt ? _____
14. At what temperature does water boil ? _____
15. At what temperature does steam condense ? _____
16. At what temperature does water freeze ? _____
17. Draw the cooling curve for water when it starts at 50 °C, and goes to ice at -30 °C. Label the 0 °C portion of the curve. Label the area where the water freezes.



Compare / Contrast With Summary

Concept 1

Ionic Bonds

Concept 2

Covalent Bonds

Metallic Bonds

How Alike?

How Different?

With Regard To

Summarize:

DETAILS (Literary Element)



**MAIN
IDEA**