Your name_____ Lab & Table Number_____

Names of students present in your group _____

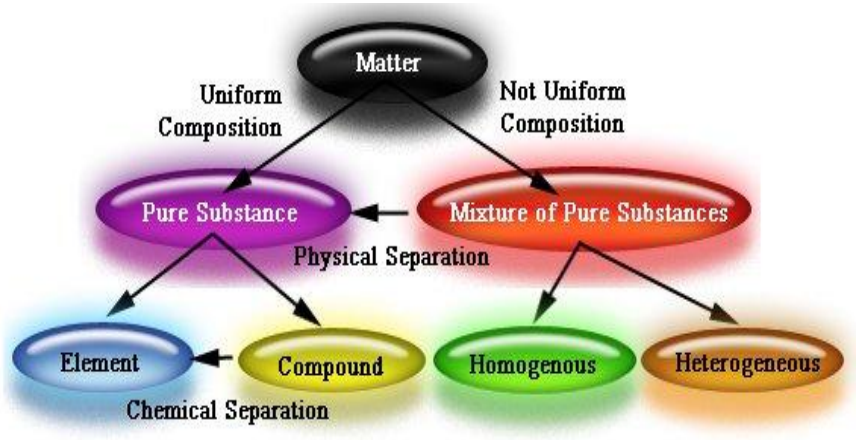
_____

Lab Instructor

SCI 265 INVESTIGATION

CHARACTERISTICS OF MATTER

Matter is anything that has mass and occupy a volume. Based on composition, matter can be classified according to the figure below.



Define in your own words the following terms and provide an example of each:

1. element

2. atom

3. compound

4. molecule

Check your answers with your instructor

In this lab exercise, you will be performing a series of experiments that illustrate the characteristics of matter presented in the figure above.

Equipment and Supplies recommended for experiments 1 and 2:

A large syringe, a black stopper, marshmallows.

Experiment 1

Obtain two marshmallows from the box. Place one marshmallow inside the syringe with the black stopper removed, gently push the marshmallow into the barrel with the plunger. Replace the black stopper, hold it in place, and slowly pull the plunger out. Repeat the procedure, this time slowly push the plunger in.

1. *Describe your observations.*

2. *Explain your observations.*

Experiment 2

Weigh 0.1 g of each of the following: sand, iron filings, and copper sulfate pentahydrate. Place the copper sulfate in a 100-mL beaker, and 10 mL of water and mix thoroughly.

3. *What type of mixture is this?*

Add the iron and the sand to the beaker containing the copper sulfate and water. Thoroughly mix and let stand for 1 minute.

4. *What type of mixture is this?*

Design an experiment to separate the iron from the copper sulfate, sand, and tap water.
(*Have your method approved by your instructor before doing the experiment)*

At the end of the experiment return the iron and the copper solution to the designated containers.

Based on the observations of this experiment

5. *How would you define a homogeneous mixture?*

6. *How would you define* a heterogeneous *mixture?*

Experiment 3

Material Needed

- Poly(sodium-acrylate)
- Straw scooper
- 30-mL beaker
- Beral Pipette

PROCEDURE
Measure one small scoop of sodium polyacrylate into a small beaker (30-mL beaker). Add 1 full pipette of tap water.

7. *Record your observations.*

   Invert the beaker.

8. *Record observations.*

   Add water several times.

9. *Record observations.*

You may touch the product with your hands. Dispose of the mixture in the wastebasket. Clean the beaker with soap and tap water.

Experiment 4

Material Needed

- 250-mL beaker
- 50-mL beaker
- Glass stirring rod
- 25 mL Elmer's Glue-All
- 10-mL graduated cylinder
- 20 mL water
- 5 mL borax solution
- Petri dish

PROCEDURE
Measure 25 mL of Elmer's glue in the 50-mL beaker and pour into 250 mL beaker.
Measure 20 mL of tap water with the graduated cylinder. Add to the glue and stir well.
Measure 5 mL of borax solution with the graduated cylinder and stir into mixture.
You may add a few drops of food coloring.
The solid material can be removed and kneaded (it will be sticky at first). Knead the material and set it aside in a petri dish.

10. *Describe the changes you observed as you add each ingredient.*

11. *How would you describe this material.*

Experiment 5

Material Needed

- 50-mL beaker
- Glass stirring rod
- 25 mL Elmer's Glue-All
- 10-mL graduated cylinder
- 20 mL polyvinyl alcohol
- 2 mL borax solution
- Petri dish
- Food coloring

PROCEDURE
Measure 20 mL of polyvinyl alcohol into a 50 mL beaker.
Measure 2 mL of borax solution using the graduated cylinder. Add the borax solution to the polyvinyl alcohol and stir quickly.
Remove the solid material, if the material is really soupy then add an additional 1-2 mL of the borax solution. You may add a few drops of food coloring.
Knead the material and set it aside in a petri dish for later.

12. *Describe the changes you observe as you add each ingredient.*

13. *How would you describe this material.*

Experiment 6

Material Needed

- 250-mL beaker
- 50-mL beaker
- Glass stirring rod
- 25 mL Elmer's Glue-All
- 10-mL graduated cylinder
- 5 mL talcum powder
- 5 mL borax solution
- Petri dish

PROCEDURE
Fill the cap of the talcum powder bottle half full. Measure out 25 mL of Elmer's glue using a 50-mL beaker. Add 20 mL of water to the glue and stir thoroughly. Add the talcum powder and stir thoroughly. Measure 5 mL of the borax solution using the graduated cylinder and pour the borax solution into the mixture and stir well. You may add a few drops of food coloring. Remove the solid material and knead it; it will be sticky until you knead it for a few minutes. Put into petri dish and save it for later.

14. *Describe the changes you observe as you add each ingredient.*

15. *How would you describe this material.*

Now perform the following experiments on EACH material synthesized in Experiment 4, 5, and 6.

16. Compare the results.

Polymer			
Stretch slowly			
Stretch rapidly			
Describe texture			
How far will the polymer stretch?			

What you just synthesized in experiment 5, 6, and 7 are Silly Putty®, Slime®, and Gak®. These are toys you may have played with in the past. All three are materials called polymers.

Silly Putty® is a silicone polymer first made by a chemist at General Electric in 1941. It was an unsuccessful attempt to make synthetic rubber out of silicon. Similar material can be made out of glue and sodium borate, $Na_2B_4O_7$ (also known as borax).

Slime® is a gel-like polymer made by cross-linking guar gum and borax. Cross-linking means that covalent bonds are formed between adjacent chains of a polymer.

Gak® is similar to Slime®, as it is also a polymer made of guar gum. Its properties are not the same as Slime®, as other ingredients are added.

Besides the type of bonds in between atoms (like the ionic and the covalent bond) that are called *intramolecular forces*, there are interactions between molecules called intermolecular forces. Some properties of these polymers are determined by *intermolecular forces*. Also the *intermolecular forces* and the temperature are responsible for the states of matter: solid, liquid and gas state.

Follow up

17. Create some criteria which you can use to distinguish between a physical and a chemical change. Use observations from the lab procedures to create these criteria.

For each experiment, write a conclusion:

Experiment	Physical change	Chemical change	Evidence you observed to support this.
1			
2			
3			
4			
5			
6			

18. How would you explain the concept of physical change and chemical change to elementary school students?

19. Identify the following as either chemical or physical changes:

A. Burning propane for a barbeque
B. Food Spoiling
C. Breaking a Glass
D. Mowing the Grass
E. Baking brownies
F. Boiling Water

20. Identify each as an element, compound, or mixture:

A. Air
B. Sulfur
C. Salad dressing
D. Water
E. Sodium bicarbonate
F. Fruit Punch
G. Sodium chloride (table salt)