# Mixing Things Up

LEARNING UNDEFEATED
Educate | Elevate | Empower

**Name:**

Often there is confusion whether substances mixed together create a new substance (chemical change) or are simply a mixture of the two starting substances (physical change).

A chemical reaction occurs when atoms of one or more substances rearrange to form one or more new substances. In a chemical change, the atoms that make up the original substances are regrouped into different molecules, and these new molecules have different properties from those of the reactants.

A mixture is made when two or more substances are combined to blend physically, but not chemically. Each molecule remains the same, but now has new neighbors next to it. The components of a mixture maintain their original properties and can be separated easily by physical methods such as filtration, sifting, and distillation.

There are two types of mixtures, heterogeneous and homogeneous. In a homogeneous mixture, all the substances are evenly distributed throughout the mixture. We see examples of homogeneous mixtures in saltwater, steel, and the air we breathe. They are especially common in liquid mixtures because of a property called solubility. Solubility is the property that refers to the ability of a substance to dissolve into another. For example, salt is soluble in water but is insoluble in rubbing alcohol. This means the salt seems to disappear in water while it remains in crystals in alcohol. If you drink that water you can still taste the salt because, instead of staying in its solid form, it has broken down into small pieces that are now suspended in the water.

Opposite from homogeneous mixtures are heterogeneous mixtures. In a heterogeneous mixture the substances are not evenly distributed. Often we are able to see the components separately in heterogeneous mixtures. Heterogeneous mixtures include things like chocolate chip cookies, oil and water, and salads.

In our experiment today, we will be investigating powdered drink mix. We want to learn if powdered Gatorade mix chemically reacts with water to create a new substance called Gatorade or if it is a mixture.

**The main ingredients in most powdered drink mixes are sugar, citric acid, salt, and natural/artificial flavors. With this information, make a hypothesis: do you think the powdered Gatorade forms a mixture or chemically reacts to create Gatorade?**

## Investigating Gatorade Powder

### MATERIALS NEEDED

- 125mL Erlenmeyer flasks x2
- Lab tape
- Permanent maker
- Scale
- Weigh boats
- Powdered mix
- Water
- Graduated cylinders x2
- Small flask/bottle
- Funnel
- Filter paper
- Hot plate
- Metal Stand
- Clamps
- Rubber stopper and vinyl tubing
- Ice bath

## PART I — Preparing the Powdered Drink

- ☐ 1. With a piece of tape, label your 125mL Erlenmeyer flasks "1" and "2."
- ☐ 2. Measure 0.3g of powdered mix on a scale.
- ☐ 3. Transfer the 0.3g of powdered mix to the small unlabeled flask/bottle.
- ☐ 4. With a graduated cylinder, add 30mL of water to the flask/bottle.
- ☐ 5. Swirl the contents of the bottle to combine the water and powdered mix until the powder no longer sits at the bottom of the flask.

## PART II — Separating by Filtration

- ☐ 6. Place a funnel with a filter on flask 1.
- ☐ 7. Pour the liquid from the flask/bottle slowly into flask 1 through the filter paper.

**QUICK CHECK:**

? Did the filter allow us to separate any of the components? Why or why not?

## PART III — Separating by Distillation

- ☐ 8. Dispose of the filter and take flask 1 to the hot plate.
- ☐ 9. Use the metal stand and clamp to stabilize flask 1 on the hot plate.
- ☐ 10. Insert the rubber stopper to flask 1.
- ☐ 11. Place flask 2 into the ice bath near the hot plate.
- ☐ 12. Feed the vinyl tubing from the rubber stopper in flask 1 to flask 2. (See diagram in Figure 1.)
- ☐ 13. Turn the hot plate on to the temperature set by your instructor and leave set up as is for 30 minutes. Continue to part 4 while waiting.

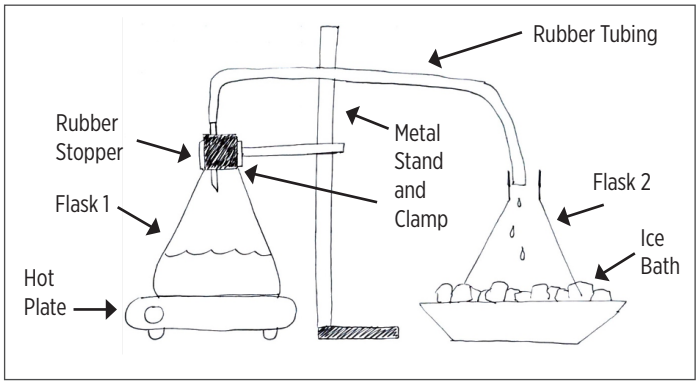


*Figure 1: Distillation Set Up*

## PART IV — Calculating Density

- ☐ 14. Measure 1g of powdered mix on a scale.
- ☐ 15. Transfer the 1g of powdered mix to a 10mL graduated cylinder. Tap the cylinder on the table to make sure all of the mix is at the bottom.
- ☐ 16. Measure the volume of space that 1g of powdered drink mix occupies and record that measurement in Table 1 below.
- ☐ 17. Calculate the density of the powder by dividing the mass by the volume (grams / milliliters) and record your answer in Table 1.
- ☐ 18. Place a 50mL graduated cylinder on top of your scale and zero it.
- ☐ 19. Add 20mL of water to the graduated cylinder and record the mass of the water on the scale in Table 1.
- ☐ 20. Calculate the density of the water by dividing the mass by the volume (grams / milliliters) and record your answer in Table 1.

**TABLE 1**

| Initial Components | Powdered Drink Mix | Water |
|---|---|---|
| Mass (g) | **1 g** | |
| Volume (mL) | | **20mL** |
| Density (g/mL) | | |

**QUICK CHECK:**

What do you notice happening in flask 1? What physical change is occurring?

What do you notice happening in the vinyl tubing? What physical change is occurring?

## PART V — Analyzing Products

- [ ] 21. After 30 minutes on the hot plate, turn the hot plate off and remove flask 2 from the ice bath. Let the flask sit on the table until it reaches room temperature (approx. 5 minutes).
- [ ] 22. Place a 50mL graduated cylinder on a scale and zero it.
- [ ] 23. Pour all of the collected liquid from flask 2 to the cylinder.
- [ ] 24. Record the mass and volume of the liquid in Table 2.
- [ ] 25. Calculate the density of the liquid by dividing the mass by the volume (grams / milliliters) and record your answer in Table 2.

**TABLE 2**

| Final Components | Flask 2 Substance |
|---|---|
| Mass (g) | |
| Volume (mL) | |
| Density (g/mL) | |

**QUICK CHECK:**

Does the density of the substance in flask 2 match either of our initial components? Does that mean the drink was a mixture or a new substance? Was it a physical or chemical change to make the drink?