



Chapter 1

LABORATORY MANUAL

● Solving a Problem with a Scientific Method 1

A method by which a scientist solves a problem is called a scientific method. This method usually includes observation, experimentation, interpretation, and hypothesis formation. Scientific methods are often compared to the procedures a detective uses in solving a crime or problem. The following investigation creates a scientific problem for you and asks you to solve it. You will use scientific methods in attempting to solve the problem.

To prepare 1 L. of solution: 1000 mL. water, 10 g sodium hydroxide
10 g glucose, 1 mL. 1% methylene blue (Dissolve 0.1 g methylene blue powder in 10 mL. ethyl alcohol). Allow solution to sit 10 minutes to turn colorless.

Strategy

You will use a scientific approach to solve whether or not flasks A and B contain similar or different liquids.

You will make careful observations.

You will record accurate experimental results.

You will use your data as a basis for deciding if the two liquids are similar or different.

Materials



2 Erlenmeyer flasks containing liquids
clock or watch with second hand

2 stoppers (to fit flasks)
beaker

apron
goggles

gloves

Part A Observation

CAUTION: Use care when handling sharp objects.

CAUTION: Do not taste, eat, or drink any materials used in the lab.

CAUTION: Inform your teacher if you come in contact with any chemicals.

Procedure

- Examine the two flasks. DO NOT remove the stoppers and DO NOT shake the contents.
- Notice the flasks have been labeled A and B.
- Record in Table 1 two or three similarities or differences between the two flasks.

- Do you think both flasks contain the same liquid? Explain. _____

- Is your answer to question a based on experimentation or guessing? _____

- Would scientists guess at answers to questions or would they experiment first? _____

- Do both flasks contain exactly the same amount of liquid? _____

Data and Observations

Prepare fresh solution each day. If color formation is weak, add several drops of 1% methylene blue.

Table 1

Similarities	Differences

Caution! Be sure flasks are tightly stoppered.

Part B Experimentation

Experiment 1—What happens if you shake the liquids?

Procedure

1. Give each flask *one hard shake using an up-and-down motion of your hand*. Make sure your thumb covers the stopper as you shake. Use FIGURE 1 as a guide.
2. Observe each flask carefully.
3. Record your observations in Table 2. Again, look for similarities and differences.
 - a. After shaking the flasks, do you think they contain different liquids?

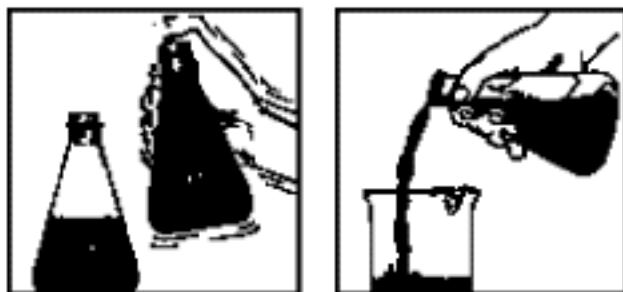


FIGURE 1

- b. What was present in flask A that may have been responsible for the change in the liquid?

Data and Observations

Table 2—Experiment 1

Similarities	Differences

Experiment 2—What happens if you remove some of the liquid in flask B so it appears like flask A?

Caution! If solution comes in contact with skin or eyes, immediately flush with water.

Procedure

1. Remove the stopper from flask B and pour out half of the contents into a beaker or other suitable container (see FIGURE 1). Make sure that the amount of liquid in flask B is equal to the amount of liquid in flask A.
2. Replace the stopper. Give both flasks *one hard shake using an up-and-down motion of your hand*. Hold stopper in place while shaking.
3. Observe each flask carefully.
4. Record any similarities or differences observed in Table 3.
 - a. Do both flasks now appear to contain the same liquid?

- b. What may have been added to flask B that was not present before?

Data and Observations

Table 3—Experiment 2

Similarities	Differences