Preparing A Solution of Known Concentration

Purpose

There are two main objectives of this experiment.

1. to prepare a stock solution of 0.10 M glucose
2. to prepare glucose solutions with concentrations of 0.050 M, 0.025 M, 0.013 M, 0.006 M, and 0.003 M

### Introduction

A stock solution is a solution that can be used to make other solutions with lower concentrations. In part A of this experiment you will make 100 mL of a stock solution that has a concentration of 0.10 M glucose starting with solid glucose and water. Molarity is defined as moles of solute per liters of solution. The glucose is the solute and the water is the solvent. You will need to determine how many grams of solid glucose and how much water to use in order to make the stock solution.

A diluted solution is a solution that has had water added to it in order to lower the concentration. In part B of this experiment, you will dilute your stock solution to make a solution with a glucose concentration of 0.050 M (half the concentration of the stock solution). This is done by mixing 50 mL of the stock solution with 50 mL of water. The concentration of the diluted solution can be cut in half again by taking out 50 mL of the 0.050 M solution and mixing it with 50 mL of water. The newly diluted solution has a concentration of 0.025 M (half the concentration of the diluted solution). The stepwise process of making solutions of lower concentration from previously diluted solutions is called a serial dilution. In this experiment you will perform 5 dilutions in order to obtain the following concentrations of glucose solutions: 0.050 M, 0.025 M, 0.013 M, 0.006 M, and 0.003 M.

### Materials

Be certain that you can identify the equipment and reagents listed below, before starting the experiment.

* Solid glucose, C6H12O6
* Tap water
* 100 mL volumetric flask
* 100 mL graduated cylinder
* 2 250 mL beakers
* funnel
* plastic pipet
* stirring rod
* 6 test tubes
* test tube rack
* sharpie marker
* food coloring
* balance

### Safety and Waste Management

The glucose solutions may be safely disposed of in the sink.

### Procedure

# Part A. Making a Stock Solution of 0.10 M Glucose

1. Measure the amount of glucose necessary for the solution. See your answer to pre-activity question #5.
2. Put the glucose in a 250 mL beaker.
3. Use a graduated cylinder to measure 50 mL of tap water. Add the tap water to the glucose and stir to dissolve.
4. Insert a funnel into the neck of the 100 mL volumetric flask. Pour the dissolved glucose into the 100 mL volumetric flask.
5. Carefully add enough tap water to the volumetric flask to reach the 100 mL line. Use a pipet to add water drop by drop. Be careful not to go past the 100 mL line.
6. Pour the solution back into the 250 mL beaker. This is your stock solution.

# Part B. Serial Dilution: Making 0.050 M, 0.025, .013 M, and 0.006 M, and 0.003 M Glucose Solutions

1. Obtain 6 test tubes and a test tube rack. Label the test tubes as follows:

Test Tube Number Label

* 1. 0.10 M stock
  2. 0.050 M
  3. 0.025 M
  4. 0.013 M
  5. 0.006 M
  6. 0.003 M

1. Add 2 drops of food coloring to your stock solution. Stir. Fill the first test tube ¾ of the way up with the stock solution.
2. Using a graduated cylinder, measure 50 mL of your stock solution from the beaker. Pour into another 250 mL beaker. You may discard the rest of the stock solution in the sink.
3. Using a graduated cylinder, measure 50 mL of tap water. Add the water to the stock solution in the beaker. Stir. This is the first diluted solution, which has a concentration of 0.050 M glucose.
4. Fill the second test tube ¾ of the way up with the first diluted solution.
5. Using a graduated cylinder, measure 50 mL of the diluted solution from the beaker. Pour into another 250 mL beaker. You may discard the rest of the diluted solution.
6. Using a graduated cylinder, measure 50 mL of tap water. Add the water to the solution in the beaker. Stir. This is the next diluted solution, which has a concentration that is half of the previous solution.
7. Fill the next test tube ¾ of the way up with the newly diluted solution.
8. Repeat steps 6 -8 three more times.
9. Observe the color of each of the solutions in the test tubes. Record observations.
10. Clean up. All solutions may safely be disposed of in the sink.

### Pre-activity Questions

1. What is a stock solution?

2. What is a diluted solution?

3. Draw a sketch of the following pieces of glassware.

a. beaker

b. graduated cylinder

c. volumetric flask

4. What is molarity?

5. Calculate how many grams of glucose are needed to make 100 mL of 0.10 M glucose. The chemical formula for glucose is C6H12O6 .

6. Starting with a stock solution that is 0.10 M glucose, determine the following concentrations. Round your answers to the thousandths place

a. What is the molarity if the concentration of the stock solution is cut in half?

b. What is the molarity if the concentration of the solution in part a is cut in half?

c. What is the molarity if the concentration of the solution in part b is cut in half?

d. What is the molarity if the concentration of the solution in part c is cut in half?

e. What is the molarity if the concentration of the solution in part d is cut in half?

### Post-activity Questions

1. Identify the solute and the solvent used in your stock solution.

2. Describe the color of the stock solution and the diluted solutions. Were they identical in color? Explain.

3. a. How many grams of glucose are in 100.0 mL of 0.003 M glucose?

1. Would it be possible to accurately measure this amount of glucose using the balance in our lab? Explain.
2. Describe a practical way of making a very dilute solution.

4. Part B of this experiment involves a serial dilution. In your own words, what is meant by the term serial dilution?

5. Describe how you would make 200. grams of a solution that is 5.0% by mass glucose. Tell how many grams of glucose and how many grams of water are needed.