

EXPERIMENT 13.1

Preparation of a solution of known concentration

STUDENT LABORATORY NOTES

Introduction

A solution of known concentration is called a *standard solution*. In this procedure, a standard solution will be prepared from solid sodium carbonate because it is readily available, reasonably pure and does not react with carbon dioxide in air. Any moisture that the solid has absorbed can be removed by simply drying it in the oven for one hour.

Aim

To prepare a solution of known concentration

Preparation for task

Location to conduct this task

In the laboratory

Duration

50 minutes

Group size

Two or three students

Methodology

Materials (per group)

- Dry Na_2CO_3
- Weighing bottle or beaker
- 250 mL volumetric flask
- 300 mL distilled water
- Dropping pipette and funnel

Materials (for class)

- Measuring scales
- Containers to dispose waste

Method

1. Calculate the mass of dry Na_2CO_3 to be used to make up a 250 mL volume of solution with a concentration of 0.050 mol L^{-1} .
2. Place a dry weighing bottle or beaker onto an electronic balance and tare its weight (make it zero).
3. Add the Na_2CO_3 solid (that you calculated in step 1) into the clean, dry weighing bottle or beaker. Record the mass.
4. Transfer the solid into the 250 mL volumetric flask by using a funnel.
5. Rinse the weighing bottle or beaker as well as the funnel with distilled water into the volumetric flask, such that all Na_2CO_3 solid is transferred into the volumetric flask.
6. Add distilled water until the flask is about half full. Stir the contents by swirling the flask until the solid is completely dissolved.
7. Add more water until the level is about 1 cm from the calibration line on the neck of the flask. Use the dropping pipette to carefully add water, drop by drop, until the bottom of the meniscus is level with the calibration line.
8. Mix the contents by inserting the stopper, then inverting the flask and shaking. Repeat until thoroughly mixed.

Health and safety guidelines

- Wear a lab coat, safety glasses and gloves as a precaution during this investigation.
- Be sure to sweep any broken glass up. Do not pick up directly.
- Sodium carbonate causes eye and skin irritation.

Results

Mass of Na_2CO_3 required for standard solution

Observations

Discussion questions

1. Why is thorough mixing of the contents important?

2. From the mass of the solid, calculate the concentration of the sodium carbonate solution.

3. Given the mass of solute you used, did you expect the concentration of your solution to be 0.050 mol L^{-1} ?

4. Identify and suggest improvements for possible errors that may have occurred in this experiment.

5. Would completing this experiment in a higher temperature have affected the concentration? Justify your response.

Conclusion

Explain how a solution of known concentration can be prepared.