# WEIGHT RELATIONS IN CHEMICAL CHANGES

## OBJECTIVE

1. To determine the weight relationship in a chemical change

## INTRODUCTION

Chemical changes, or reactions, occur between discrete particles (atoms, ions, or molecules) in ratios of small whole numbers. Moles are the units used to count these particles, and so their ratios are also small whole numbers. This is true regardless of the weights of the individual particles. All particles of one substance will have the same average weight, but particles of two different substances will have different average weights. Thus, ratios by weight are seldom simple whole numbers. We shall study this fundamental idea in chemistry in this experiment.

To obtain the best results for this experiment, weights should be determined carefully to the nearest 0.001 g. When you go to the balance to obtain any of the weights used in this experiment, take your LABORATORY REPORT sheet so that you can write the weight down as you read it off the balance. Don't try to remember it to write down later. Lab partners should check each other's weight determination.

In this experiment, zinc metal is placed in a solution of lead acetate. Zinc is more active than lead. Review Part III of the Experiment 5 introduction and complete the expected reaction below, before beginning the lab.

$$Zn + Pb^{+2} \text{ ------>}$$

PROCEDURE

Obtain a strip of zinc metal and polish it gently with a piece of fine steel wool. Then obtain its weight to the nearest 0.001 g.

Put 50 mL of 0.1 M lead acetate solution in a 100 ml beaker, and stand the zinc strip in the solution, leaving it undisturbed for about 20 minutes. Observe and record the change in appearance of the zinc strip.

After the specified time, gently lift the zinc strip, now coated with lead deposits, from the solution. Stir it around for about two minutes in a small beaker containing a minimum volume of distilled water in order to remove as much of the salts as possible from the spongy lead deposit. Repeat this, rinsing with a fresh supply of distilled water. Then take the strip (still in the beaker) to the hood where you can rinse out the water with acetone provided in squeeze bottles.

Put your name in pencil on an 11-cm circle of filter paper and weigh it carefully to 0.001 g. Using a steel spatula, carefully scrape the lead deposits onto the filter paper. Using the remaining exposed part of the paper, wipe as much as possible of the residual lead onto the paper. Put the lead and paper in the oven to dry. The drying should be done as quickly as possible to avoid oxidizing any of the lead by air. Weigh the lead and paper.

Allow the zinc strip to air dry for about 5 minutes and weigh it to 0.001 g. Polish it gently with fine steel wool and reweigh the strip, again to 0.001 g. Any weight loss in this last procedure represents lead that you have not wiped from the strip with filter paper, and that difference should be added to the final amount of lead weighed on the filter paper.

WEIGHT RELATIONS
LABORATORY REPORT

NAME_____

DATE _____

Data:

Initial weight of zinc strip: _____

Observation of Reaction:_____

_____

Weight of filter paper: _____

Weight of lead and paper: _____

Weight of zinc strip after scraping, wiping with paper, and air drying: _____

Weight of zinc strip after buffing with steel wool: _____

Results: SHOW YOUR WORK

Total weight of zinc dissolved: _____

Weight of lead on paper: _____

Weight of lead buffed from zinc strip: _____

Total weight of lead formed: _____

Moles of zinc dissolved: _____

Moles of lead formed: _____

Ratio of: $\frac{\text{Weight lead formed}}{\text{Weight zinc dissolved}}$ _____ 1.00

Ratio of: $\frac{\text{Moles lead formed}}{\text{Moles zinc dissolved}}$ _____ 1.00

QUESTIONS

1. State briefly why more grams of lead formed than grams of zinc "disappeared" from the strip, even though they react in a "1:1 ratio."

2. Zinc ions cannot exist in solution by themselves, because their charges must be balanced by an equal number of charges on negative ions. What are (a) the symbol and (b) the name for the negative ion in the solution?

3. What is the name of the salt formed after reaction? What is the formula for this compound? Calculate its formula weight.

4. How would your calculated ratio of moles of lead to moles of zinc be affected if the lead were still wet when you weighed it?