Name _____ Date _____ Class _____

Chapter 1

CHEMACTIVITY

A Science Experiment

The keys to science are observation and measurement, which are often used together in experiments. Experiments are carried out to test hypotheses that attempt to explain the world around us. Also, experiments can lead to new hypotheses.

Chemistry experiments are often designed to gather information about what cannot be directly observed. The purpose of this activity is to demonstrate how an experiment can provide information about something that cannot be seen.

Objectives

- **Record data** for repeated trials of an experiment.
- **Determine** the unknown size of an object without direct measurement.

Materials

spheres, 7 per lab group
meter stick
masking tape

Procedure

1. Use masking tape to make a line approximately 60 cm long across your lab table as shown in the diagram. Measure and record the exact length of the line in the data table below. The line will be called your field of action and should not include any faucets, power boxes, or gas jets.
2. Place 6 spheres along your marked line across the width of the table.
3. Place the remaining sphere about one meter away from the lined up spheres.
4. Without looking, one partner will roll the single sphere toward the line of spheres. The other partner will note on a separate sheet of paper if there is a hit or miss. This partner will replace a hit sphere back into position and return the bombarding sphere to the other partner for another trial. Continue for 100 trials.
5. Switch partners and repeat step 4.
6. Total the number of trials and the hits for you and your partner. Record these totals in your data table.
7. Collect the total numbers of hits and trials from each lab group, sum them up with your own totals, and record them.
8. Measure the diameter of the spheres by placing a sphere against a meter stick.

Data and Observations

Observations	Your data	Class data
A. Width of field (cm)		–
B. Number of target spheres		–
C. Total number of hits		–
D. Total number or trials		–
E. Calculated sphere diameter (cm)		
F. Actual diameter of sphere (measured) (cm)		–

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Analysis and Conclusions

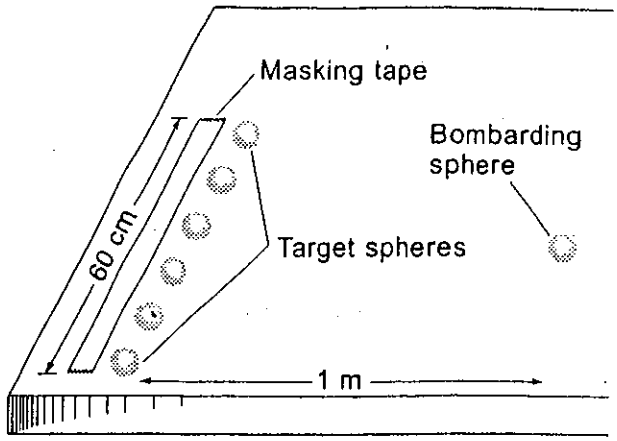
1. Were there more hits or misses in your own trials?

_____

2. On what does the hit/miss ratio depend?

_____

_____



3. The calculated diameter of the spheres is determined by using the formula:

$$\text{Diameter} = \frac{\text{Field width (A)} \times \text{Hits (C)}}{2 \times \#\text{ of target spheres (B)} \times \text{Trials (D)}}$$

Calculate the sphere diameter from your own numbers of hits and trials. Record the result.

4. Calculate the sphere diameter from the total hits and trials for the whole class. Record the result.

5. Were the individual or the class average results closest to the actual value for the diameter of the sphere?

_____

_____

6. What would have happened to your data if the size of the spheres were twice as large? Half as large?

_____

_____

7. How does the number of trials affect the results?

_____

_____

Extension and Application

Investigate the gold foil experiment carried out by Ernest Rutherford. How was that experiment similar to this one? What conclusion was drawn?

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