

Activity 2: Taking Measurements and Reporting Significant Figures

Learning Objectives

Part 1 Calculate percentages

Calculate percent error

Part 2 Report significant figures correctly

Estimated Completion Time 45–60 Minutes

Instructor Information

Supplies: Mini packs of M&M candies or other candies. The number of grams per package must be available.

It is important to point out to students that counting integers (as in the counting of M&Ms) are numbers with infinite significant figures since they are counting items. This is in contrast to the number of grams per package which is measured and has a finite number of significant figures.

Activities 2 and 3 could be performed during a laboratory period. If this is done, care must be taken that students do not eat the M&Ms in the laboratory.

ANSWERS TO QUESTIONS

Part 1. Making Predictions and Taking Measurements.¹

- A. Students will make predictions.
- B. Students should use the percentage definition to calculate the % of M&Ms in their package. The instructor should give students the mass of one package (nutritional information is located on the large bag containing the candies). Students should also calculate the grams/M&M (this is often miscalculated as M&Ms/gram).

¹ Part 1 activity adapted with permission from *Instructor's Manual and Complete Solutions for Chemistry: An Introduction to General, Organic, and Biological Chemistry* 9e by Karen Timberlake, Pearson Benjamin-Cummings, 2006.

- C. Information will be similar to part B but with data instead of predicted values.
- D. Values for percent error will vary based on student predictions.
- E. Student values will vary.

Part 2. Significant Figures

1. Answers will vary, usually 2.
2. a. 2 b. 3 c. 4 d. 3
3. The answers will vary; however, if two significant figures are in the mass of the M&Ms, the answers using this weight should have 2 significant figures.
4. a. 54 b. 25 c. 1.24 d. 200

Activity 2: Skill Development

Significant Figures

1. a. 2 b. 4 c. 4 d. 3
2. a. 2 b. 1 c. 5 d. 4
3. a. 600 b. 16.09 c. 9.47 d. 4
4. a. 3.5 b. 43.3 c. 0.071 d. 19.021

Calculating Percent

1. $\frac{200 \text{ mg}}{2,000 \text{ mg}} \times 100 = 10\%$
2. $\frac{12 \text{ Raman meals}}{20 \text{ total meals}} \times 100 = 60\%$
3. After 1 week: $\frac{5.0 \text{ lb}}{145 \text{ lb}} \times 100 = 3.4\%$
 After 3 weeks: $\frac{10. \text{ lb}}{145 \text{ lb}} \times 100 = 6.9\%$

$$4. \frac{(\$582.37 - \$500.00)}{\$582.37} \times 100 = 14.144\%$$

$$5. \text{ Use Percent Error} = \left| \frac{\text{Theoretical-observed}}{\text{Theoretical}} \right| \times 100$$

$$a. \left| \frac{(0.250 - 0.208 \text{ g})}{0.250 \text{ g}} \right| \times 100 = 16.8\%$$

$$b. \frac{0.208 \text{ g}}{0.250 \text{ g}} \times 100 = 83.2\%$$