

## Activity 2: Taking Measurements and Reporting Significant Figures

### *Learning Objectives*

Part 1      Calculate percentages

Part 2      Report significant figures correctly

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**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 because 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.

### **ANSWERS TO QUESTIONS**

#### **Part 1. Making Predictions and Taking Measurements<sup>1</sup>**

- A. Students will make predictions.
- B. Students should use the percentage definition to calculate the percentage 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 per M&M (this is often miscalculated as M&Ms per gram).
- 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.

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<sup>1</sup> 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.

E. Student values will vary.

## Part 2. Significant Figures

- Answers will vary, usually 2.
- a. 2          b. 3          c. 4          d. 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.
- a. 54          b. 25          c. 1.24          d. 200

## Activity 2: Skill Development

### *Significant Figures*

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- a. 2          b. 4          c. 4          d. 3
- a. 2          b. 1          c. 5          d. 4
- a. 600          b. 16.09          c. 9.47          d. 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.  $\frac{12 \text{ Ramaen meals}}{20 \text{ total meals}} \times 100 = 60\%$

3. After 1 week:  $\frac{5.0 \text{ lbs.}}{145 \text{ lbs.}} \times 100 = 3.4\%$

After 3 weeks:  $\frac{10. \text{ lbs.}}{145 \text{ lbs.}} \times 100 = 6.9\%$

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

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

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

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