

## **TOPIC TITLE: Accuracy of measuring tools & Determining Density of an Unknown Solid**

### **STANDARDS:**

5.1.12.B.2. Build, refine, and represent evidence-based models using mathematical, physical, and computational tools.

5.2.12.A.2. Account for the differences in the physical properties of solids, liquids, and gases.

### **LEARNING OBJECTIVE(S)**

Students will be able to:

- Determine how many significant figures to include in their measurements based on the tool being utilized.
- Explain why significant figures are important in measurements and calculations of data.
- Choose appropriate tools and develop a procedure to use in the determination of an unknown object's density.

### **ESSENTIAL QUESTIONS:**

- How do you determine how many significant figures to include in a measurement given a specific tool?
- Why are significant figures important in measurements and calculations of data?
- Why is it important to accurately record your data?
- How will your observation enable you to identify unknowns?
- How can you write proper lab procedures? How much detail must you include?

### **PROCEDURES/LABS/ACTIVITIES:.**

- “Determining the thickness of Al Foil” Lab
  - Students will physically take measurements such as the mass and volume of a piece of aluminum block and the length and width of a piece of aluminum foil. These measurements will allow them to indirectly determine the thickness of aluminum foil. Students will be assessed on the correct number of significant figures they include in their data as well as their calculations.
- “Determining the Density of an Unknown Solid” Lab
  - Students are given an object and limited tools. They are to accurately record the materials used and the procedure performed. Guiding analysis questions will enable them to calculate their experimental density and they will compare it with the actual density of their unknown solid. Solids will vary in identity, size, and shape. Lab groups will then swap their written lab report and then asked to perform the procedure and determine the density. A written evaluation of the procedure will be included. A rubric will be provided to guide the evaluation.

### **EVALUATIONS:**

- Report on measurement of the thickness to the correct number of significant figures.
- Report on measurement of the density of the “unknown solid” to the correct number of significant figures.

## **TOPIC TITLE: Rates of Reactions**

### **STANDARDS**

5.1.8. B.2. Gather, evaluate, and represent evidence using scientific tools, technologies, and computational strategies.

### **LEARNING OBJECTIVE(S)**

Students will be able to:

- Determine the factors that affect the rate of a chemical reaction.

### **ESSENTIAL QUESTIONS:**

- In what ways is chemical kinetics useful?
- How is the rate of a reaction measured?
- How does the collision model explain which factors affect the rate of a reaction?

### **PROCEDURES/LABS/ACTIVITIES:**

- “Kitchen Chemicals” Lab – “Determining Factors that affect Reaction Rate”
  - Students are asked to plan their own procedure to reach given objectives, including obtaining data and answering questions based on the objective.
  - Students will focus on how to accurately record their observations of basic chemical reactions with household chemicals to enable them to identify unknowns. Students will be asked to criticize another lab group’s data and conclusion. A rubric will be provided to guide the group in their evaluation of the other group’s data and analysis of data.
  - Materials available: varying sizes of beakers, spatulas, weighing dishes, hot plate, distilled water, vinegar, baking soda, mortar and pestle, and 3 alka seltzer tablets.
  - Students will then be asked to critique their own lab and comment on how to improve their approach/procedure.

### **EVALUATIONS:**

- Written report describing the factors that affect the rate of a reaction.

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