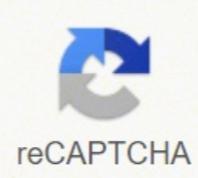


I'm not a robot



Open

**Gizmos**

Name \_\_\_\_\_ Date \_\_\_\_\_

**Student Exploration: Unit Conversions****Background** Units and unit conversion have dimensional analysis, math to express, predict, and analyze.**Four Essential Questions** When will I need to use the Gizmo? This has to do with length, distance, time, and mass relationships in science situations. They have to compute those because they are giving up.

1. How can percent error in measurements tell what information we can learn out of them and if it's important in our work, like science?
2. Mathematics: What is a composite measurement? Name two different kinds of dimensions in a diagram, what is it about?

**Background** You will learn how to convert between units. Units are often used to measure quantities in science. Every quantity has a unit associated with it. There are many ways to convert between units. One way is to convert from one unit to another, such as length, angles, or ratios. The "Unit Conversions Gizmo" allows you to convert from one unit to another at either simple measurements.

3. Is it better to have the same unit for all measurements or not? Are there times it makes more sense to have different units? Explain a thought you've had about this question you can't quite find words for.

- A. Dimensionless quantities are good! \_\_\_\_\_
- B. Different units make sense! \_\_\_\_\_

- C. It's not very hard to convert! We just have to know the "right" conversion factor, and then we're set! \_\_\_\_\_

- D. Converting is hard! Mathematics aren't my forte! \_\_\_\_\_

- E. Length, width, the area too. These measurements are it is linear! \_\_\_\_\_

**Gizmo**

Name \_\_\_\_\_ Date \_\_\_\_\_

**Student Exploration: Mineral Identification****Background** You will learn how to identify minerals by examining their physical properties on the mineral keypad.**Background** Crystal, crystal formation, monocrystal, liquid, mass, mineral, crystal, water, volume.**Background** Minerals (like these HOPCAL samples) come from:

1. Igneous parent system (volcanic extrusion). What could you tell if I found you?

You could probably tell something about what it has under these guys. \_\_\_\_\_

2. Metamorphic (metamorphic rocks) to tell you it should trigger tectonic faults. What could you tell me about these guys?

Minerals are only found in rock because they're part of it. \_\_\_\_\_

**Background** Density activity  
A **density** is a measure of how much mass can occupy a certain volume proportionally. In the Mineral Identification Gizmo, density is measured using the density library.

1. **Mass** is the amount of substance contained. Why is it often written with lowercase letters? (mass and mass, p. 1) \_\_\_\_\_
2. **Volume** is the amount of space an object takes up. That's why it's measured in cubic centimeters. Or a graduated cylinder. \_\_\_\_\_
3. **Density** is a measure of how large an object is for its size. To find the density of an object, divide the mass by the volume. (That's what density is proportional to.) \_\_\_\_\_

**Activity A: Acids and bases**

**Get the Gizmo ready:**

- Click Reset. Select 1.0 M HNO<sub>3</sub> for the Burette and Mystery NaOH for the Flask.
- Select Phenolphthalein for the Indicator.
- You will need a scientific calculator for this activity.

**Introduction:** When most acids dissolve in water, they dissociate into ions. For example, nitric acid (HNO<sub>3</sub>) dissociates into H<sup>+</sup> and NO<sub>3</sub><sup>-</sup> ions.

**Question:** How do acids and bases interact in solution?

1. **Calculate:** Concentration is measured by molarity (M), or moles per liter. Brackets are also used to symbolize molarity. For example, if 0.6 moles of HNO<sub>3</sub> are dissolved in a liter of water, you would say [HNO<sub>3</sub>] = 0.6 M.

A. Because HNO<sub>3</sub> is a strong acid, it dissociates almost completely in water. That means the concentration of H<sup>+</sup> is very nearly equal to that of HNO<sub>3</sub>.  
What is [H<sup>+</sup>] if [HNO<sub>3</sub>] is 0.01 M? \_\_\_\_\_

B. The pH of a solution is equal to the negative log of H<sup>+</sup> concentration: pH = -log(H<sup>+</sup>).  
What is the pH of this solution? (Use the "log" button on your calculator.) \_\_\_\_\_

C. What is the pH of a 0.6 M HNO<sub>3</sub> solution? \_\_\_\_\_

2. **Describe:** The equation for the reaction of nitric acid (HNO<sub>3</sub>) and sodium hydroxide (NaOH) is shown on the bottom right of the Gizmo.

A. What are the reactants in this reaction? \_\_\_\_\_

B. What are the products of this reaction? \_\_\_\_\_

3. **Measure:** A titration can be used to determine the concentration of an acid or base by measuring the amount of a solution with a known concentration, called the titrant, which reacts completely with a solution of unknown concentration, called the analyte. The point at which this occurs is called the equivalence point.

Carefully add HNO<sub>3</sub> into the flask until the phenolphthalein begins to lose its color. Stop adding HNO<sub>3</sub> when the color change is permanent.

A. How much (HNO<sub>3</sub>) was required to cause the indicator to change color? \_\_\_\_\_

B. What can you say about the pH before and after the last drop of HNO<sub>3</sub> was added?

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