Name: _____ Date: _____

Student Exploration: Mineral Identification

Vocabulary: crystal, density, hardness, homogeneous, luster, mass, mineral, streak, volume

Prior Knowledge Questions (Do these BEFORE using the Gizmo.)

1. Suppose you find a yellow piece of metal in a stream. How could you tell if it is real gold?

   _____

   _____

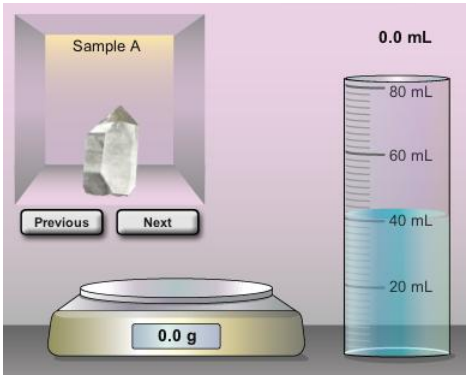
2. In the city a street peddler offers to sell you a diamond ring for thirty bucks. How could you test if the rock in the ring is a real diamond?

   _____

   _____

Gizmo Warm-up: Determining density

A **mineral** is a naturally formed crystal. You can identify a mineral by its properties. In the *Mineral Identification* Gizmo™, under **Choose property to test**, select **Density**.



Balance **Grad. cylinder**

1. **Mass** is the amount of substance in an object. Drag the mineral sample onto the balance.

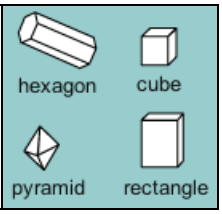
   What is the mass of the mineral? _____ (Units are grams, g.)

2. **Volume** is the amount of space an object takes up. The volume is measured by how much the water rises in a graduated cylinder. Drag the mineral into the cylinder.

   What is the volume of the mineral? _____ (Units are milliliters, or mL.)

3. **Density** is a measure of how "light" or "heavy" an object is for its size. To find the density of an object, divide the mass by the volume. (Calculators are recommended.)

   What is the density of the mineral? _____ (Units are grams per milliliter, g/mL.)

Activity A: **Mineral properties**	Get the Gizmo ready: • Under **Property**, select **Appearance**. • Check that **Sample A** is on the screen. (If not, press **Previous** until sample **A** is there.)	

Question: What properties allow us to identify minerals?

1. Observe: Minerals are made of atoms in a repeating pattern and often form **crystals**. The shapes of crystals can help identify the mineral. **Luster** is the way the mineral's surface reflects light. There are many ways to describe luster, four examples are shown. Color can sometimes be a useful way to identify a mineral, but it is not always reliable.

   A. Describe the crystal shape of **Sample A**: _____

   B. Describe its color and luster: _____

2. Calculate: Select the **Density** test. What is the density of **Sample A**? _____

3. Measure: Select the **Hardness** test. **Hardness** is a measure of how easily a mineral can be scratched. It is measured on a scale of 1 to 10 called Mohs scale. If a mineral scratches a fingernail (hardness 2.5) but not a penny (3.5), its hardness is about 3.

   A. Drag the mineral sample across each test object. Which objects are scratched?

   _____

   B. What is the estimated hardness of the mineral? _____

4. Observe: Select the **Streak** test. The **streak** is the color of a material's powder. You can observe the streak by rubbing the mineral across a tile called a "streak plate."

   Drag the mineral sample across the streak plate. What color is the streak? _____
   (Note: In some cases the streak is colorless and cannot be seen.)

5. Observe: Select the **Acid** test. Some minerals cause hydrochloric acid to bubble and fizz.

   Drag the eyedropper of acid over to the mineral. Does the acid fizz? _____

6. Identify: Now it is time to identify the mineral. Look at your *Mineral Key*. Find a mineral that has properties that match **Sample A**. Type the name under **Mineral name** in the Gizmo and press **Submit**. It may take several guesses to get it right.

   What mineral is **Sample A**? _____

Activity B: **Identifying minerals**	Get the Gizmo ready: • Click **Next** so that **Sample B** is showing.	

Goal: Use a key to identify minerals.

1. Collect data: Use the Gizmo to collect data about minerals **B** through **F**. Fill in the data table.

Sample	Crystal shape	Color/ Luster	Density	Hardness	Streak	Fizzes in acid?
B						
C						
D						
E						
F						

2. Identify: Use the *Mineral Key* to identify minerals **B** through **F**. **Submit** your answers in the Gizmo. (Use the **Previous** and **Next** buttons to switch samples.) Record your results below:

Sample	Mineral name (first try)	Mineral name (actual)	Correct on first try?
B			
C			
D			
E			
F			

3. On your own: Continue to practice identifying minerals. (There are 26 samples in the Gizmo – **A** through **Z**.) Record your findings in your notebook or on separate sheets of paper.

4. Form a conclusion: Which properties were most useful for identifying minerals? Why?

_____

_____

Mineral Key

Use the following steps to identify a mineral:

1. Decide if the mineral is metallic or non-metallic based on its luster and streak.
2. If the mineral is non-metallic, decide if it is light or dark in color.
3. Find a mineral in the list with the same density and hardness as your sample.
4. Check that the other properties—crystal shape, color, streak, acid reaction—match.

Metallic minerals (luster of each mineral ranges from metallic to dull)

Mineral	Crystal shape	Color	Density	Hardness	Streak	Fizzes in acid?
Galena (lead ore)	Cubic/ irregular	Gray	7.5 g/mL	3	Dark gray	No
Gold	Irregular	Golden yellow	19.3 g/mL	3	Yellow	No
Graphite (pencil lead)	Irregular	Dark gray	2.2 g/mL	2	Gray	No
Hematite (iron ore)	Irregular	Red-brown to black	5.3 g/mL	6	Red-brown	No
Magnetite (iron ore)	Irregular	Black	5.2 g/mL	6	Black	No
Malachite (copper ore)	Irregular	Dark green	4.0 g/mL	4	Light green	No
Pyrite (fool's gold)	Cubic/ irregular	Greenish yellow	5.0 g/mL	6	Dark green	No
Silver	Irregular	Silver gray	10.5 g/mL	3	Gray	No

Non-metallic minerals, mostly dark in color (glassy, pearly or dull luster)

Mineral	Crystal shape	Color/ luster	Density	Hardness	Streak	Fizzes in acid?
Corundum (Ruby)	Hexagon/ irregular	Dark red, glassy/dull	4.0 g/mL	9	Colorless	No
Garnet	Ball shape	Dark red, glassy/dull	4.0 g/mL	7	Colorless	No
Mica	Flat sheets	Black/white, glassy	3.0 g/mL	3	Colorless	No
Topaz	Hexagon/ irregular	Variable, glassy	3.5 g/mL	8	Colorless	No

Non-metallic minerals, mostly light in color (glassy, pearly or dull luster)

Mineral	Crystal shape	Color/ luster	Density	Hardness	Streak	Fizzes in acid?
Calcite	Rhombus/ irregular	Variable, glassy	2.7 g/mL	3	Colorless	Yes
Diamond	Pyramid/ irregular	Variable, glassy	3.5 g/mL	10	Colorless	No
Dolomite	Irregular	Variable, pearly/dull	2.9 g/mL	4	Colorless	Yes
Feldspar	Rectangle/ irregular	Pink/white, pearly	2.6 g/mL	6	Colorless	No
Fluorite	Pyramid/ irregular	Variable, glassy	3.2 g/mL	4	Colorless	No
Gypsum	Rectangle/ irregular	Variable, pearly/dull	2.3 g/mL	2	White	No
Halite	Cubic	Variable, glassy	2.2 g/mL	3	Colorless	No
Kaolinite	Irregular	Variable, dull	2.6 g/mL	2	White	No
Quartz	Hexagon/ irregular	Variable, glassy	2.6 g/mL	7	Colorless	No
Sulfur	Irregular	Yellow, waxy	2.1 g/mL	2	Yellow	No
Talc	Irregular	Variable, pearly	2.7 g/mL	1	White	No