Characteristics of a Mineral

1. What is a mineral? Complete each phrase below to describe the properties minerals must have:
   - naturally occurring- not made
   - inorganic- never living.
   - Solid
   - Definite internal structure- grows as a crystal.
   - Definite chemical composition- pure substance.

2. Based on your answer to number 1, could you consider the graphite in your pencil to be a mineral?
   Yes  -  No  
   Explain your answer- it is naturally occurring and mined (meets all 5 characteristics)

3. Based on your answer to number 1, could you consider the metal in your chair leg to be a mineral?
   Yes  -  No  
   Explain your answer- the metal in the chair is manmade and not a pure substance.

4. What is a crystal?
   A crystal is a solid structure with a repeating pattern of atoms. Many crystalline structures determine if the mineral will have cleavage or fracture.

Mineral Formation

5. Complete the chart below to classify each mineral group:

<table>
<thead>
<tr>
<th>Mineral Group Name:</th>
<th>Silicates</th>
<th>Carbonates</th>
<th>Evaporates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formation and Description:</td>
<td>Cooling of molten rock (magma)</td>
<td>Mineral water solution is still for a very long time and the minerals precipitate (fall) out of solution.</td>
<td>Mineral water solution – the water is evaporated by the sun (generally during summer-time – drought) and the mineral deposit is left behind.</td>
</tr>
<tr>
<td>Common Locations:</td>
<td>Volcanoes</td>
<td>Caves and Ocean Floors</td>
<td>Dessert Lakes and Shallow Seas</td>
</tr>
<tr>
<td>Composition (Elements):</td>
<td>Silicon (Si) and Oxygen (O)</td>
<td>____ (CO₃)</td>
<td></td>
</tr>
<tr>
<td>Example(s):</td>
<td>Quartz, Feldspar, Micas (Muscovite and Biotite)</td>
<td>Calcite and Dolomite</td>
<td>Halite and Gypsum</td>
</tr>
</tbody>
</table>

Properties to Identify Minerals

6. How do you test a mineral’s hardness and name the scale used to rank their hardness values.
A mineral’s hardness can be tested by the minerals resistance to being scratched by common tools with standard hardness values. The standard tools are fingernail (2.5), penny (3), iron nail (5), and glass plate (5.5). All minerals are compared to Moh’s hardness scale.

7. The mineral hardness scale states that the hardest mineral is a #10 and is called diamond, while the softest mineral is a #1 and is called talc.

8. List the hardness values of each of the tools listed below:
   - finger nail: 2.5  
   - copper (penny): 3  
   - iron nail: 5  
   - glass plate: 5.5
9. Mineral Hardness Brain Teaser: Read the statements below and assign a hardness value for each of the minerals listed below:

<table>
<thead>
<tr>
<th>Clue</th>
<th>Statement</th>
<th>Hardness Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mineral X is scratched by an iron nail and mineral T, but not a penny.</td>
<td>?</td>
</tr>
<tr>
<td>2</td>
<td>However, minerals L and S will not scratch mineral X.</td>
<td>Mineral X - 4</td>
</tr>
<tr>
<td>3</td>
<td>Mineral L will scratch mineral S, but a penny can scratch it.</td>
<td>Mineral L - 2.5</td>
</tr>
<tr>
<td>4</td>
<td>Your fingernail can scratch mineral S.</td>
<td>Mineral S - 2</td>
</tr>
<tr>
<td>5</td>
<td>An iron nail cannot scratch mineral T.</td>
<td>Mineral S - 2</td>
</tr>
<tr>
<td>6</td>
<td>Interestingly, mineral Y can scratch mineral T and a glass plate.</td>
<td>Mineral Y - &gt;6</td>
</tr>
</tbody>
</table>

What is the hardness of each mineral?

10. A mineral’s physical properties like how it breaks or its hardness are largely caused by its crystalline structure.

11. What is the difference between cleavage and fracture?
   Cleavage is when the mineral breaks in the same smooth plane every time. Fracture is when the mineral breaks irregularly.

12. Mineral tests and results- examine the picture to the right and determine which mineral property is being tested in each test and also explain what conclusions you can make about each mineral based on the results shown:

   **Test A:** What property is being tested: **Cleavage or Fracture**
   - What conclusions can be made about this mineral based on these test results? *The mineral displays cleavage*

   **Test B:** What property is being tested: **Streak – color of the dust**
   - What conclusions can be made about this mineral based on these test results? *The mineral displays a dark streak and most likely has a metallic luster*

   **Test C:** What property is being tested: **Hardness**
   - What conclusions can be made about this mineral based on these test results? *The mineral scratched the glass and is harder than 5.5 on Moh’s Scale.*

13. Define luster and list the 4 luster varieties:
   - Luster – the way a mineral reflects light
   - Metallic – Shines like a metal
   - Non-metallic Glassy – shines like glass
   - Non-metallic Pearly – milky white and variety of reflected colors
   - Non-metallic Earthy – looks like dirt

14. What is the property name when examining the color of a powdered mineral? **Streak**
   - Generally a light colored powder is left from a non-metallic luster
   - Generally a dark colored powder is left from a metallic luster
   - Why do some minerals have no streak? The mineral is harder than the streak plate and no powder is left

15. What mineral reacts with hydrochloric acid and how does this occur? **Calcite is a carbonate that contains CO\(_3\)^-**. When placed in an acid the solid CO\(_3\)^- bonds break releasing CO\(_2\) and O\(_2\) a gas – fizzes.