CLASS NOTES

- **Rock** - any naturally formed solid that is part of Earth or any other celestial object
  - Minerals are the ____________ needed to form the different types of rocks

- **Mineral** - most geologists define a "mineral" as:
  1. ________________
  2. ________________
  3. ________________
  4. ________________
  5. ________________

- Minerals form in the following manners:
  1. Precipitation from evaporating seawater
  2. Crystallization around cooling magma
  3. Under extreme heat and pressure [recrystallization]
  4. From hydrothermal solutions flowing through ground cracks

- Most rock forming minerals are silicates that result in a tetrahedron shape
  - Four-sided units of 4 ____________ and 1 _______________
Minerals

• Physical and chemical properties of a minerals are determined by the:

- 

• Each mineral has a set of physical and chemical properties that can be used to identify the sample
• The following methods are used to classify minerals:
  1. **Color** - a visual attribute of an object based on perception
     • One of the most obvious, but not the most reliable
     • Many of the ______________ known minerals share similar colors
  2. **Streak** - Weathering changes the outside color, but streak gives the true color
  3. **Luster** - Two types of luster:
     • Metallic Luster - shines like stainless steel
     • Nonmetallic Luster - earthy or dull shine
  4. **Density** - 

Minerals

- Methods used to classify minerals [continued]:

5. **Hardness**

   - Mohs Hardness Scale is used to classify hardness

<table>
<thead>
<tr>
<th>Hardness</th>
<th>Mineral</th>
<th>Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Talc</td>
<td>Finger nail scratches easily</td>
</tr>
<tr>
<td>2</td>
<td>Gypsum</td>
<td>Finger nail scratches</td>
</tr>
<tr>
<td>3</td>
<td>Calcite</td>
<td>Copper penny scratches</td>
</tr>
<tr>
<td>4</td>
<td>Fluorite</td>
<td>Steel knife scratches easily</td>
</tr>
<tr>
<td>5</td>
<td>Apatite</td>
<td>Steel knife scratches</td>
</tr>
<tr>
<td>6</td>
<td>Feldspar</td>
<td>Steel knife will not scratches</td>
</tr>
<tr>
<td>7</td>
<td>Quartz</td>
<td>Will scratch glass and steel</td>
</tr>
<tr>
<td>8</td>
<td>Topaz</td>
<td>Harder than any common mineral</td>
</tr>
<tr>
<td>9</td>
<td>Corundum</td>
<td>Scratches topaz</td>
</tr>
<tr>
<td>10</td>
<td>Diamond</td>
<td>Hardest mineral</td>
</tr>
</tbody>
</table>

6. **Cleavage**

   - Example: _____________________________

   - Cleavage Examples
Minerals

- Methods used to classify minerals [continued]:

7. Fracture - ________________________________________________________________
   • Example: _____________________________

Fracture Examples

8. Acid Test - when hydrochloric [HCl] acid is placed on a mineral it can effervesce [bubble]
   • Example: _____________________________

9. Magnetism - when a mineral is attracted to a magnet
   • Example: _____________________________

10. Fluorescence - when a mineral glows under ultraviolet light
    • Example: _____________________________

11. Taste - when a mineral tastes salty
    • Example: _____________________________

12. Smell - when a mineral exhibits a distinctive smell
    • Example: _____________________________

13. Radioactivity - some minerals gives off radiation that can be measured with Geiger counter
    • Example: _____________________________
PART I QUESTIONS: MULTIPLE CHOICE

1. Which common nonmetallic mineral has a white-yellow streak?
   a. graphite
   b. calcite
   c. sulfur
   d. dolomite

2. The mineral mica breaks evenly along flat sheets mainly because of its
   a. density
   b. chemical composition
   c. atomic arrangement
   d. hardness

3. Which mineral has nonmetallic luster, exhibits cleavage, and feels greasy?
   a. halite
   b. gypsum
   c. talc
   d. olivine

4. Which property is most useful in mineral identification?
   a. size
   b. color
   c. texture
   d. hardness

5. Certain minerals usually break along flat surfaces, while other minerals break unevenly. This
   characteristic is due to the
   a. luster of the mineral
   b. age of the mineral
   c. force with which the mineral is broken
   d. internal arrangement of the mineral's atoms

6. The physical properties of a mineral are largely due to its
   a. internal arrangement of atoms
   b. volume
   c. organic composition
   d. melting point

7. Which element combines with silicon to form the tetrahedral structure of the silicate minerals?
   a. nitrogen
   b. potassium
   c. hydrogen
   d. oxygen
8. Quartz mineral samples are best identified by their
   a. hardness
   b. color
   c. size
   d. mass

9. Which property is least useful in mineral identification?
   a. streak
   b. color
   c. luster
   d. hardness

10. Which property of a mineral most directly results from the internal arrangement of its atoms?
   a. volume
   b. color
   c. crystal shape
   d. streak

11. Which common minerals fizzes when dilute hydrochloric acid [HCl] is placed on it?
    a. calcite and feldspar
    b. feldspar and quartz
    c. quartz and dolomite
    d. calcite and dolomite

12. Which of the following minerals has metallic luster, silver color, black streak, and contains iron?
    a. graphite
    b. galena
    c. magnetite
    d. pyrite

13. The minerals talc, muscovite mica, quartz, and olivine are similar because they
    a. have the same hardness
    b. are the same color
    c. contain silicon and oxygen
    d. break along cleavage planes

14. Which mineral is commonly mined as a source of the element lead [Pb]?
    a. galena
    b. magnetite
    c. quartz
    d. gypsum

15. Which mineral will scratch fluorite, galena, and pyroxene?
    a. graphite
    b. calcite
    c. olivine
    d. dolomite
Minerals

For questions 16 through 19, use the table below that shows data for a student’s collection of mineral samples A through I. For each mineral sample, the student recorded mass, volume and density. The density for rock D and the volume for rock B have been left blank.

<table>
<thead>
<tr>
<th>Mineral</th>
<th>Mass [grams]</th>
<th>Volume [cm³]</th>
<th>Density [g/cm³]</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>82.9</td>
<td>34.4</td>
<td>2.41</td>
</tr>
<tr>
<td>B</td>
<td>114.2</td>
<td></td>
<td>2.68</td>
</tr>
<tr>
<td>C</td>
<td>144.7</td>
<td>63.2</td>
<td>2.29</td>
</tr>
<tr>
<td>D</td>
<td>159.4</td>
<td>59.7</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>87.7</td>
<td>33.1</td>
<td>2.65</td>
</tr>
<tr>
<td>F</td>
<td>59.6</td>
<td>21.0</td>
<td>2.84</td>
</tr>
<tr>
<td>G</td>
<td>201.1</td>
<td>68.4</td>
<td>2.94</td>
</tr>
<tr>
<td>H</td>
<td>85.1</td>
<td>11.2</td>
<td>7.60</td>
</tr>
<tr>
<td>I</td>
<td>110.2</td>
<td>47.3</td>
<td>2.33</td>
</tr>
</tbody>
</table>

16. The approximate density of rock sample D is
   a. 2.75 g/cm³
   b. 3.75 g/cm³
   c. 3.32 g/cm³
   d. 2.67 g/cm³

17. The approximate volume of rock sample B is
   a. 12.6 grams
   b. 22.0 grams
   c. 32.5 grams
   d. 42.6 grams

18. Based in the density data, what is the name of Mineral H?
   a. Graphite
   b. Sulfur
   c. Galena
   d. Quartz

19. The student broke rock G into two pieces. Compared to the density of the original rock, the density of one piece would most likely be?
   a. the same
   b. greater
   c. less
PART II QUESTIONS: FREE RESPONSE

Base your answers to questions 20 and 24 on the data table below and on your knowledge of Earth Science. The table provides information about four minerals, A through D.

<table>
<thead>
<tr>
<th>Mineral</th>
<th>Breakage</th>
<th>Hardness</th>
<th>Luster</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>cleavage</td>
<td>2.5</td>
<td>metallic</td>
<td>silver</td>
</tr>
<tr>
<td>B</td>
<td>cleavage</td>
<td>2.5</td>
<td>nonmetallic</td>
<td>black</td>
</tr>
<tr>
<td>C</td>
<td>cleavage</td>
<td>3</td>
<td>nonmetallic</td>
<td>colorless</td>
</tr>
<tr>
<td>D</td>
<td>fracture</td>
<td>6.5</td>
<td>nonmetallic</td>
<td>green</td>
</tr>
</tbody>
</table>

20. Mineral A could most likely be what mineral?

21. Mineral B could most likely be what mineral?

22. Mineral C could most likely be what mineral?

23. Mineral D could most likely be what mineral?

24. What determines the physical properties of the minerals in the data table above?