There are over 4700 known minerals. We obtain most of the materials used in everyday life from minerals, including metals, chemicals used in manufacturing, food additives, etc. Ores are minerals that have a high concentration of a certain element, typically a metal. Examples are cinnabar (HgS), an ore of mercury, sphalerite (ZnS), an ore of zinc, or cassiterite (SnO₂), an ore of tin (Mineral).

**Part A:** The table lists several ores of metals and their chemical formulas. Identify the metal that each mineral ore is a source of by looking at the formula. You can use your ESRT to find the symbol for each element. Write the name of the metal in the appropriate column. Then classify each ore mineral in its appropriate mineral family (carbonate, oxide, or sulfide). Carbonates all contain CO₃. Oxides consist of a metal with oxygen and sulfides consist of a metal combined with sulfur.

<table>
<thead>
<tr>
<th>Ore</th>
<th>Formula</th>
<th>Name of Metal</th>
<th>Mineral Family (carbonate, oxide, or sulfide)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magnesite</td>
<td>MgCO₃</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bauxite</td>
<td>Al₂O₃</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sphalerite</td>
<td>ZnS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hematite</td>
<td>FeO₃</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zincite</td>
<td>ZnO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cinnabar</td>
<td>HgS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chalcopyrite</td>
<td>FeS₂</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Galena</td>
<td>PbS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uraninite</td>
<td>UO₂</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Siderite</td>
<td>FeCO₃</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Limonite</td>
<td>Fe₂O₃</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Cassiterite | SnO$_2$ |
---|---|
Magnetite | Fe$_3$O$_4$ |
Smithsonite | ZnCO$_3$ |
Cuprite | Cu$_2$O |
Stibnite | Sb$_2$S$_3$ |

1. What is an ore mineral?  ________________________________________________
   ____________________________________________________________

2. Based on the table, list the common mineral ores of the following metals
   Iron  ___________________________________________________
   Zinc  ___________________________________________________
   Copper ___________________________________________________
   Lead  ___________________________________________________
   Aluminum ___________________________________________________

3. State how these metals are used by modern society. For example, iron is used to make steel, which is used in construction, cars, utensils, etc.
   Zinc  ___________________________________________________
   Copper ___________________________________________________
   Lead  ___________________________________________________
   Aluminum ___________________________________________________

4. What is similar about magnetite and hematite? What makes them different minerals?
   ____________________________________________________________
Part B: Gems are minerals with an ornamental value, and are distinguished from non-gems by their beauty, durability, and usually, rarity. There are about 20 mineral species that qualify as gem minerals, which constitute about 35 of the most common gemstones. Gem minerals are often present in several varieties, and so one mineral can account for several different gemstones; for example, ruby and sapphire are both corundum, $\text{Al}_2\text{O}_3$ (Mineral).

Read the article "Gemstones" on pages 56-57 and answer the questions below.

5. What is a gemstone? What are characteristics of a gemstone?

____________________________________________________________________________________

6. What makes a gemstone valuable?

____________________________________________________________________________________

7. What is the difference between a precious stone and a semiprecious stone?

____________________________________________________________________________________

8. Why do some gems, such as diamonds, sapphires, and rubies command the highest prices?

____________________________________________________________________________________

9. Research your birthstone. Include the following: mineral name vs gemstone name (sometimes they are different), composition, physical properties, where it is found, and relative value. Include a picture and at least one other interesting fact about it. (For example, you can include info about the most famous specimen or mineral lore or mythology).

Attach as a separate page.
Part C: Industrial Minerals

Commercially valuable minerals and rocks are referred to as industrial minerals. For example, muscovite, a white mica, can be used for windows (sometimes referred to as isinglass), as a filler, or as an insulator (Mineral).

Research how the each mineral is used. You may use your ESRT, text or internet sources.

Quartz _______________________________________________________________

Gypsum _______________________________________________________________

Talc __________________________________________________________________

Halite __________________________________________________________________

Sulfur __________________________________________________________________

Feldspar ______________________________________________________________

Calcite _______________________________________________________________

Garnet __________________________________________________________________


Activity copyright by Gary Vorwald, Paul J. Gelinas JHS 2013  (May be used for educational purposes)