Using Minerals and Rocks

Natural resources are the foundation of our lives and lifestyles.
A **mineral deposit** is a mineral occurrence of sufficient size and grade (concentration) that might, under the most favorable of circumstances, be considered to have economic potential.
Ore is the naturally occurring material from which a mineral or minerals of economic value can be extracted.
*(**Source:** USGS, The Life Cycle of a Mineral Deposit, 2005)*

Metals
Metal is a class of chemical elements, such as iron, gold, and aluminum that have a characteristic luster, are good conductors of heat and electricity, and are opaque, fusible, and generally malleable and ductile.
Alloy is a substance having metallic properties and composed of two or more chemical elements, of which at least one is a metal.

Task: Complete the following text with the most suitable words from the clue:

conductors compounds elements heat lead luster melt strength

Which of these are verbs?

Minerals and rocks are the source for most of the earth's metals. A few metals, such as **copper** and **gold**, can be found as pure …… in nature. But most are found as mineral …….. of either oxygen (oxide minerals) or sulfur (sulfide minerals). Metals such as **chromium, tin, magnesium, aluminum**, and **iron** come from oxide minerals. Other important metals, such as **nickel, ……., zinc, and copper**, come from sulfide minerals.
Metals are an important group of elements because of properties that nearly all of them possess. In general, metals …….. easily. They conduct …… and electricity. They can be hammered or pressed into different shapes without breaking. And they have a certain kind of ……, or shine.
Metals are widely used today. **Steel**, which is made mostly from iron, has great ……**.** Tall buildings, long bridges, ocean liners, jet planes, and automobiles depend on steel, aluminum, and other metals for their strength. Most metals have many uses. **Copper** and **aluminum**, for example, are made into wire because they are good …….. of electricity. You can certainly think of many other products that make use of the earth's metals.

Tasks:

1. List physical properties of metals that distinguish them from nonmetals.

2. Explain and translate these words: tin, lead, ocean liners, jet planes

3. Give some more examples of using metals.

Nonmetals
Minerals and rocks also provide a source for important nonmetals.
Aggregate is a rock or mineral material used separately and as filler in cement, asphalt, plaster, and other materials.

*(**Source:** USGS, The Life Cycle of a Mineral Deposit, 2005)*

Tasks:

1. First of all get the meaning of the underlined words: cement (Us), china, pottery, gypsum plaster, wallboard, fertilizer, gemstone, jewelry, flint.

2. Complete the text with the most appropriate part A-G.

Sand, for example, is a nonmetal that is used in making cement, [1] _____ .
Sand is also used in making glass and the **silicon** chips are [2] _____ .
Sandstone has two major applications, as crushed stone and as dimension stone.
Dimension stone is used in the construction of roadways and road structures such as bridges, and in buildings, [3] _____ .
Clay, another common nonmetal, is used in making china and pottery.
Kaoline, a white clay, is also used [4] _____ .
Gypsum is used in making plaster and wallboard.
Limestone is used in making cement and finely ground limestone is used to remove pollution [5] _____ .

Compounds of phosphorus (**phosphates**) and of nitrogen (**nitrates**) are used [6] _____ .
Other uses of nonmetals include building stone, ornamental stone, and **gemstones** for jewelry. Small pieces of stone used as a surface for roads and paths are called chippings.
Flint, a hard grey stone, was used [7] _____ .

A) in the past for making tools.
B) both commercial and residential.
C) for making porcelain.
D) an important building material.
E) from the chimneys of brown coal power-plants.
F) in making fertilizers.
G) used in computers.

3. Give more examples of using nonmetals.

Minerals are used in products we use in our everyday lives.
Download the PDF fact sheets to discover what is in some of them.

http://www.mineralseducationcoalition.org/minerals-your-life

Tasks: Věra Hranáčová

Mining

"If it can´t be grown, it must be mined."

Mining has been a part of the Earth's history since prehistoric times. Mining has played a role throughout the millennia - from Neanderthals' use of stone, to ancient Egyptians', Greeks', Romans' and Incans' more sophisticated mining processes and uses of mined materials. From the Industrial Age and the ability of mass production, societies' progress has led to our Modern times' demand for bigger, faster, and stronger products.

http://www.mineralseducationcoalition.org/all-about-mining

Exploration

Any mineral or rock from which a needed substance can be removed cheaply enough and easily enough is called an **ore.** Geologists **prospect for** ores. A thin ore body is called a **vein**.

Both metals and nonmetals are obtained from ores, which are taken from the ground by a process called **mining**. The place the ore comes from is called a **mine**.

There are two basically different types of mines—**surface mines** and **underground mines**.
Surfice mines
a) **Open-pit / opencast mine** applies to a method of cutting into a vein or a bed from above rather than digging a mine under the ground. Copper and aluminum ores are frequently mined this way.
b) **Strip mine** is another type of a surface mine. Large earthmoving equipment removes the surface materials -**overburden**- to get down to the ore or fossil fuel. Coal is frequently mined this way.
c) **Quarry** (=lom) is a place where stone (limestone, slate, sandstone etc.) is dug out of the ground. **Dimension stone** is any rock material that is cut into specific sizes, typically as **blocks** and **slabs**.

When the process of mining or quarrying is finished, the mine becomes **abandoned**, or **disused**.
A mined ore must be processed in order to obtain a useful substance. For some substances, such as gold or gravel, a simple **crushing** or **washing** is all that is needed. For other substances such as iron, copper, or aluminum, the ore must be further **treated with heat**, **chemicals, or electricity** to obtain the metal. These processing methods are referred to as **refining** the ore.
Not all minerals and rocks that contain a needed substance are used as sources for that substance. Much depends on cost. Sometimes it costs too much to remove the rock or mineral from the earth. Sometimes it costs too much to remove the needed substance from the mineral or rock through a refining process. Sometimes it costs too much in terms of how the removing the material changes the earth's surface.

Mining inevitably disturbs land. Modern mines reclaim the surface during and after mining is completed, returning the land to useful purposes. Reclaimed mine lands are often more attractive to wildlife and human uses than before mining started.

Text Adapted from Fariel, R. - Hinds, R. - Berey,D.: Earth Science, Addison-Wesley 1987

http://www.mineralseducationcoalition.org/exploration

The total cost of obtaining and refining ores is, therefore, influenced by several factors:

1. **exploration**
2. **extraction**
3. **transport** of the ore to a refinery
4. **refining** the ore
5. **environmental reclamation**
6. the **loss** of the mined area for other purposes, especially where open-pit mining and strip mining are involved

Read more: http://www.mineralseducationcoalition.org/reclamation-stories

Tasks

1. Describe how useful substances are obtained from rocks and minerals.
Include the terms ore, mining, and refining.

*2. Substitute the underlined word compounds: **in terms of**, **referred to as** in the text.*

3. What is the total cost of obtaining and refining ores influenced by? Sum up.

*4. Look at some **earthmoving equipment** in the presentation saved in the syllabus in IS and find out their names in Czech.*

bucket wheel excavator = ,dredger excavator =
spreader =

***Task 5)** Do you know where the largest limestone **quarry** in the CR is?*
*Limestone is technically called **marble** in this case.*

***Task 6**) Enlarge your **vocabulary**:*

adit - štola (horizontální), **shaft -** šachta (vertikální)
hanging wall - strop, **footwall** - počva
slap heap = overburden **-** hlušina/skrývka
lode = vein -žíla, **reef -** a vein of quartz containing gold
deposit - ložisko; **prospect -** potenciální naleziště rudy, zkušební vzorek
prospect for - vyhledávat nerostné suroviny, provádět průzkum
prospecting hammer - geologické kladívko
prospect entry (průzkumná štola), **hole** (vrt, šachta, sonda), **pit**
recover - vydobýt
extraction/panning - rýžování
placer deposit - ložisko v náplavech, rozsyp
placer - rýžovisko (sejp): alluvial, marine, rýžoviště: bench (terasové), creek, river bar (říční), hillside (svahové), rozsypové ložisko: beach (příbřežní),
alluvial deposit of ore - aluviální rudní ložisko (rozsyp)
placer mining - těžba rýžováním, těžba rozsypů

Source: http://www.geology.cz/aplikace/encyklopedie/gslov.pl

In geology, a **placer deposit** or **placer** is an accumulation of valuable minerals formed by gravity separation during sedimentary processes. The name is from the Spanish word *placer*, meaning "alluvial sand". Placer mining is an important source of gold, and was the main technique used in the early years of many gold rushes, including the California Gold Rush. Types of placer deposits include alluvium, eluvium, beach placers, and paleoplacers.
Source: Wikipedia

Task 7) Fill in the missing terms.

1. A place where stone is dug out of the ground is called a _____ .
2. A mass of ore that is of value is a _____ .
3. A thin mass of rock or a mineral, especially a thin ore body is a _____ .
4. Rock or other material of no value that lies over a deposit of useful material is _____
5. A mineral deposit produced by liquids coming from magma that contain a large proportion of hot water is called a _____ deposit**.**

Source: Longman Illustrated Dictionary of Geology, York Press 1982

Homework*: Watch the videos** *about the sulfur mine in* **Indonesia** *or the copper mine in* ***Chuquicamata *(link in the syllabus) and* ***answer these questions****:*

Hardships of Sulfur mining in Java

1. *What kind of mine and is it? (Underground/surface - open pit/strip mine)*
2. *How large is the mine?*
3. *What is the depth of the lake and what is its altitude?*
4. *What health damage does this kind of mining cause?*
5. *How heavy is the load on the miners´ shoulders?*
6. *How far is the collection place?*
7. *How much does a miner carry in one day?*
8. *How much do the miners earn per one day?*
9. *How much do the farmers earn?*
10. *Could you work as a sulfur miner in Java for one day?*

Chuquicamata

1. *Where is the mine located?*
2. *What kind of mine is it?*
3. *How large is it in comparison with other mines in the world?*
4. *What size was it during M. Palin´s visit?*
5. *What kind of town Chuquicamata is?*
6. *How is the ore removed from the earth?*
7. *How is the copper ore further processed? What is it treated with?*
8. *Where is it done?*
9. *What are their "working hours"?*
10. *What is the ratio of the mined ore to the amount of the obtained copper?*
11. *What are the problems associated with mining and especially processing?*
12. *Will these problems slow down the production?*

Credit task: Prepare a presentation about a mine or a quarry. Find more about mined rocks in *http://www.mineralseducationcoalition.org/all-about-mining*

Tasks: Věra Hranáčová