

Name _____

General Information about Copper

Blast It! (Learning About Copper)

Introduction

Do you play CD's or cassette tapes? Use a computer? Play video games? Watch TV? Use a VCR? Use batteries? Talk on a phone? Turn on lights? Use a microwave? Take a shower? Ride in a car? Use coins? Then you use copper! All of these items need copper!

Arizona is known for its copper deposits. Of all the 50 states, Arizona produces the most copper--about 65%. This is the reason this state is called the "Copper State." Arizona has been the leading producer in the nation of this metal since 1910. The copper industry is important to Arizona's economy, employing thousands of people and bringing in billions of dollars.

Copper Formation

How was copper formed in Arizona?

"While it was copper that gave birth to the electrical age, **volcanoes** gave birth to copper. The volcanic age left copper deposits, hidden deep beneath the earth's surface, in a diagonal line from one end of Arizona to the other." [Arizona Mining Association (AMA) website]

Volcanic rocks located throughout Arizona have left us with great copper deposits. **Copper** is a metallic mineral that we find in the **crust** of the earth. We locate it in **ore** deposits. Arizona has a lot of **igneous rocks**. These are rocks that were molten **magma**. The tremendous heat and pressure within the earth produced this magma. Some of this magma was thrust or intruded into other rocks. In addition, the groundwater found in the rocks next to the magma was also heated. This caused a chemical reaction that also changed other rocks located deep within the earth. Some of these rocks have big crystals along with little crystals. This tells us that the big rocks cooled over a long period of time, but the little crystals cooled faster. Thus, they solidified at different rates and are called copper "porphyry" (poor-fe-ree) rocks. .

The magma cooled and hardened into igneous rocks. These ore deposits can be found on the surface of our earth as well as deep within the crust of it. The surface rocks are formed due to weathering and erosion over time. Igneous rocks may also have other precious metals besides copper inside them.

Where is the Copper?

Prospectors came to our state in the 1800s to search for such minerals as copper, gold, and silver. They came with their burros and simple equipment, such as picks and shovels, and pans. They could find these minerals sometimes by just looking at rocks located on the surface of the earth. The earth was rich with minerals. As time went on, however, the ore deposits were harder to find. Picks, shovels, and pans were replaced by more sophisticated mining equipment. Miners had to search deeper in the earth for their ore deposits.

According to the AMA, copper is buried deep within the earth and "the average mine produces only 10 pounds of copper per ton of ore" and to obtain that amount "the average mine must move an additional two tons of barren rock." Using our math, one ton equals 2,000 pounds. The mine will find only 10 pounds of copper in that ton. The copper mines need to move a total of 3 tons (3 x 2,000 pounds or

6,000 pounds) of rock to locate the copper ore. In the 6,000 pounds of copper the mines will find copper in only 10 pounds of that rock. Think of 6,000 dots and only 10 of them have copper, and 5,990 dots do not contain copper. It is very important to be accurate in locating copper ore, because the exploration step is a very costly process.

One Ton = 2,000 pounds (10 pounds of copper somewhere in here)

One Ton = 2,000 pounds barren rock - no copper

One Ton = 2,000 pounds barren rock - no copper

Totals: Three Tons = 6,000 pounds (obtain 10 pounds of copper)

Types of Copper Mines

There are 2 types of copper mines. The first type of mine is an **open pit mine** or a surface mine. It is a copper mine that is located at the top of the ground. The ore is removed layer by layer and the land has a terraced appearance. These **terraces** are sometimes called benches. This mine has a variety of earth-moving equipment to remove the surface rock.

The second type of mine is an **underground mine**. The ore is under the earth and transferred to the surface. This type of mine has a vertical opening. This opening is called a **shaft**. There are also side openings that are horizontal called adits. Once the ore reaches the surface, the mine is ready to continue to the next step of processing.

Where are Some of the Copper Mines in Arizona?

There are three main copper industries in Arizona: ASARCO, BHP Copper, Inc., and Phelps Dodge Corporation. These industries have copper mines located around our state, in other states, and some also operate in other countries. For this lesson, we will locate major copper mines and copper towns in Arizona with a mapping activity.

Summary

Copper is an important natural resource, and Arizona is the leading producer of copper in our nation. Throughout volcanic rocks we locate this ore to produce much of the copper that goes into many of our products used everyday.

Name _____ **Copper Mines in Arizona - Map Activity Worksheet**

Locate the copper mines or towns around Arizona using cardinal directions (North, South, East, West). The map labels the rivers around Arizona and the cities of Phoenix and Tucson.

Some major Arizona copper mines or mining areas are:

1. Morenci in eastern Arizona (near Clifton)
2. Claypool in east-central Arizona (near Globe)
3. Bagdad in northwestern Arizona (near Prescott)
4. Green Valley in southern Arizona (south of Tucson)
5. Hayden/Ray area (northeast of Tucson)

Note: Most mines in Arizona are located in the central and southern part of our state in a diagonal pattern.

Put the correct letter from the copper map on the line to the left of each sentence.

_____ 1. Bagdad mine is north of Bill Williams River.

_____ 2. Green Valley mining area in Sierrita is south of Tucson and east of the Santa Cruz River.

_____ 3. Morenci is on the eastern side of our state north of the Gila River. It is the largest copper producer in North American and is an open pit mine.

_____ 4. Hayden/ Ray mines are to the north of San Pedros and Gila River junction.

_____ 5. Globe is north of Hayden/Ray mine.

_____ 6. Claypool is directly west of Globe.

_____ 7. Superior/Miami are to the west of Claypool and to the east of Phoenix.

_____ 8. The Copper Queen Mine is an underground mine in Bisbee and open for tours. It is located in southeastern Arizona and north of the Mexican border.

_____ 9. Jerome used to be a mining community west of Verde River. It is now an tourist and artist community.

_____ 10. Ajo is a mining area west of Tucson , south of Gila River north of the Mexican border.

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ANSWER KEY

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Blast It!! Learning About Copper

Vocabulary Words

Directions: Cut out definitions on right side. Match the definitions to vocabulary words.

Vocabulary words and Sentences

Definitions

| | |
|--|--|
| <p>volcanoes</p> <p>Some volcanoes in Arizona contain copper.</p> | <p>Vent or opening (fissure) in the earth's crust through which molten material (magma) can pass to the surface</p> |
| <p>ore</p> <p>The ore deposits contain copper.</p> | <p>Rock containing enough mineral value (copper) to warrant the expense of mining it</p> |
| <p>copper</p> <p>Copper is used in many of our products..</p> | <p>A reddish-brown metallic element (Cu) that is an excellent conductor of electricity</p> |
| <p>crust</p> <p>Copper is located in the crust of the earth.</p> | <p>Solid skin of the earth, 3-32 miles thick</p> |
| <p>igneous rocks</p> <p>Copper is found in igneous rocks.</p> | <p>Rock that develops as molten magma and lava cool</p> |
| <p>magma</p> <p>The magma is found in igneous rocks.</p> | <p>Molten rock material within the earth from which cooling igneous rocks results</p> |
| <p>open pit mine</p> <p>A copper mine above the ground is called an open pit mine.</p> | <p>A large hole dug and developed for the removal of ore that is near the Earth's surface (also called surface mining)</p> |
| <p>terraces</p> <p>Open pit mines often have many terraces.</p> | <p>Open pit mines that have various levels (also called "benches")</p> |

| | |
|---|--|
| <p>underground mine</p> <p>A copper mine located below the surface is called an underground mine.</p> | <p>An excavation beneath the surface of the Earth for the purpose of extracting minerals, such as copper</p> |
| <p>shaft</p> <p>Do not go near the shaft of the old mine.</p> | <p>Vertical opening in an underground mine</p> |

Sentence Game

1. Cut out the following ten vocabulary words.
2. Make sentence(s) out of the copper vocabulary words below.
3. Add your own extra words to make complete sentence(s).
4. Get a strip of calculator paper about 2 yards long.
5. Write your sentence(s) on the calculator paper inserting the words below in the proper spaces.
6. Glue the vocabulary words.
7. Share your sentences with other students.
8. Students can earn 10 points for each vocabulary word used.

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|----------------------|-----------------------------|
| volcanoes | magma |
| ore | open pit mine |
| copper | terraces |
| crust | underground mine |
| igneous rocks | shaft |