

ACTIVITY 4: USES OF NEVADA'S MINERALS SCAVENGER HUNT

NOTE TO TEACHERS: This activity conforms to the Nevada Science Content Standards listed below:

Grade 4 and 5

- ✓ Science, Technology and Society (Nature of Science Unifying Concept B):

RISKS AND BENEFITS

N.5.B.2 - Impact of Technology on Society

COLLABORATION

N.5.B.3 - Team Work and Sharing

- ✓ Matter (Physical Science Unifying Concept A):

PROPERTIES OF MATTER

P.5.A.1 - Matter Exists in Different States which have Distinct Physical Properties

P.5.A.3 - Material Classification by Observable Physical and Chemical Properties

INTRODUCTION: Why do you suppose we mine rocks and minerals? It costs a lot of money to dig and haul all that rock material. Does anybody know where all of this rock goes after it's dug out of the ground? Does anyone know what the rocks and minerals we have studied today are used for, other than making a nice mineral kit?

We use rocks and minerals in everything in our lives today! In fact, your homes and schools and everything in them...everything we use today...either is grown (plants, trees, sheep, etc.) or it has to be mined from the earth. In fact, plants (trees for lumber, fruit and vegetables) and animals couldn't grow without the minerals in the earth that they use for nutrition. It is virtually impossible to farm, process food and manufacture clothing items without tools and machinery made from mineral products.

In a lifetime each American citizen will use -

91,000 pounds of iron and steel
795 pounds of lead
757 pounds of zinc
1,500 pounds of copper
3,593 pounds of coal, and,
more than 1.2 million pounds of sand, gravel, stone, clay, and cement.

In this activity, students will be able to make the connection between a variety of Nevada mineral samples and the products they are made into.

ITEMS NECESSARY FOR THIS ACTIVITY:

- ☺ "Nevada Minerals Used in Our Homes" Posters or 8 ½ by 14" handouts
- ☺ Lots of magazines and advertisement sections from newspapers
- ☺ 8 ½ by 11" sheets of plain paper
- ☺ Paste or glue sticks
- ☺ Scissors
- ☺ Marking pens
- ☺ Optional: Nevada Mining Association mineral kit samples
- ☺ Nevada Minerals and Their Uses Scavenger Hunt List

ACTION: Divide the class into groups of 4 or 5 students. Hand out the Nevada Minerals and Their Uses Scavenger Hunt List to each group. Assign (or have each team pick) 1 or 2 minerals to work on. Place the selected or assigned minerals on 8 ½ by 11" sheets of paper that have been labeled with the mineral name on each group's table. Provide "Nevada Minerals Used in Our Homes" posters, a selection of magazines and newspaper ads, paste/glue sticks, scissors, and marking pens for each group. The name(s) of the mineral(s) chosen or assigned should be written at the top of the poster, along with the name of each group member.

Have the students divide the poster "house" into rooms such as the living room, kitchen, bedrooms, bathroom, etc. using the marking pens. Indicate to the students that they should try to place the scavenger hunt cutouts in the room of the house where they would normally be found. Items found outside the house should be placed along side or below the house.

In "scavenger hunt" fashion, each team should go through the stacks of magazines and newspaper ads, looking for pictures of items from the Scavenger Hunt List that correspond to the mineral(s) they chose or were assigned. The pictures of their mineral products should be cut out and pasted to the poster. This should be a timed activity with approximately 15 to 20 minutes allotted. The idea is to see which team can come up with the most pictures of their listed mineral products.

Each team should give a brief (2 minutes or so) oral report on their mineral/product poster, explaining the connection of each picture to the mineral in question. Display the posters in your classroom. (NOTE: If desired, the posters could be mounted on poster board for durability.)

(NOTE TO TEACHERS: As scientists, engineers, and technicians learn more about the properties of various minerals and rocks and their applications to the needs of humanity, they are discovering new and innovative uses for these minerals and rocks. The list of uses for minerals is constantly changing and increasing. You will probably add many more products and uses to the "Scavenger Hunt List" as time goes by.

ACTIVITY 4A: Give a copy of the "Scavenger Hunt List" to each student to take home. Have them gather 3 or 4 of the listed mineral products from home and display the products around the appropriate mineral or rock samples.

NEVADA MINERALS AND THEIR USES SCAVENGER HUNT LIST

MINERAL: USES

1. **BARITE** (Barium sulfate, a non-metallic mineral): Paint. Rubber. Oil, gas, and water well drilling mud. Optical glass. White toothpaste. Tires. Bowling balls. Barium medicines. TV picture tubes. Green color in fireworks.
2. **FLUORITE** (Calcium fluoride, a non-metallic mineral): Used in the manufacture of iron, steel, uranium and aluminum. Optical glass. Enamel paints. Sodium fluoride in drinking water and toothpaste. Insecticides. Spray can propellants. Refrigerant in refrigerators, freezers, air conditioners. Nuclear missile fuel.
3. **GARNET** (Variety: Grossularite, calcium aluminum silicate, a non-metallic mineral): Used in sandpaper as an abrasive, jewelry, gemstone, collector specimens.
4. **GALENA** (Lead sulfide, a metallic mineral): Lead acid car batteries, fishing weights, X-ray shielding, ammunition, tire weights, glass additive (lead crystal).
5. **FELDSPAR** (Variety: Orthoclase, potassium aluminum silicate, a non-metallic mineral): Manufacture of glass, porcelain (high tension electrical insulators, ceramic glazes and dental products), enamel, mild abrasive in scouring powder.
6. **GYPSUM** (Hydrous calcium sulfate, a non-metallic mineral): Wallboard. Bakery products. Chocolate manufacturing. Cake icing. Soil conditioner. Plaster of Paris (orthopedic casts and statues). Industrial cement. Molded pottery. Caulk. Putty. Interior construction materials.
7. **CALCITE** (Calcium carbonate - a non-metallic mineral): Portland cement used in construction of buildings, roads, bridges, sidewalks, etc. Steel making. Mortar. Building stone. Glass. Brown paper products (grocery/lunch bags). Bakery items. Toothpaste. Linoleum & counter tops. Fiberglass. Carpet backing (adds strength to the nylon or wool fibers). Composite materials for auto interiors. Microwave-safe plastic dishes. Sugar manufacturing. Antacids. Porcelain. Aspirin. Fine powder on chewing gum. Water treatment. Bleach. Fertilizers. Pesticides. Soil conditioner.
8. **MAGNETITE** (Iron oxide, a metallic mineral): Iron and steel used for cars, trucks, ships, bridges, buildings, machinery, tools, kitchen appliances, cans, cooking utensils (stainless steel) and thousands of other items.
9. **AZURITE AND MALACHITE**: (Non-metallic copper carbonate minerals): Electrical wiring. Copper pipe and tubing. Coins, including pennies (pennies made after 1982 have a thin coating of copper on zinc). Copper jewelry. Industrial machinery. Ammunition. Cooking utensils. Blue pigments and dyes. Necessary mineral in our diet found in mineral supplements. Manufacture of brass and bronze metals and sterling silver.
10. **PYRITE** (Iron sulfide, a metallic mineral): Sulfur and sulfuric acid, the "King" of industrial chemicals.
11. **QUARTZ** (Silicon dioxide, a non-metallic mineral, also found in sand and sandstone): Glass. Abrasives for sanding and grinding. Fiberglass. Optical fibers in telecommunications equipment. Computer chips. Porcelain for sinks, toilets, bath tubs. Polish in toothpaste. Laundry detergent. Casting metal parts (auto engines and aerospace parts, etc.).
12. **SULFUR** (A non-metallic native element): Petroleum refining. Insecticides. Fertilizers. Paper. Plastic. Rubber. Rayon fabric. Steel making. Medicines. Photography. Gun powder. Car batteries. Soil conditioner. Matches. Fireworks.

USES FOR THE 12 MINERALS FEATURED IN THE Nevada Mining Association KIT

1. **BARITE** (Barium sulfate, a non-metallic mineral). The barium atom is the largest atom in the Periodic Chart of the Elements. This gives the barite its heavy weight relative to the other non-metallic minerals.
 - Barite is used mainly as a weighting agent in drilling muds (when drilling oil, gas, and geothermal wells)
 - Filler in light-colored paints (gives them body and makes them flow evenly)
 - Manufacture of rubber tires, glass, and plastics (bowling balls = heavy)
 - Brake linings of cars, in white toothpaste, and superconductors
 - Barium carbonate is used in TV picture tubes, to make the green color in fireworks, in medicines (barium "cocktail" for GI Series), and in optical glass.

2. **FLUORITE:** (Calcium fluoride, a non-metallic mineral). Its major uses include:
 - About 70% of the fluorite produced goes into the production of HF (Hydrofluoric Acid) which is key to the manufacture of aluminum and is also used to produce plastic, chemicals, and fluorocarbons which are used in refrigerants (FREON®) for refrigerators, freezers, and air conditioners, in resins, solvents, and pharmaceuticals.
 - About 25% of the fluorite produced is used as a fluxing agent which is added to molten iron ore in blast furnaces to help the ingredients mix together better and absorb impurities in the manufacture of iron and steel.
 - Fluorite is used in decorative tiles and brick, opaque enamel for appliances, and optical glass.
 - It is added to toothpaste and drinking water (in the form of sodium fluoride which can reduce tooth decay by 60%)
 - Insecticides, nylon, and Teflon®.

3. **GARNET:** (A complex family of silicates containing combinations of iron, aluminum, magnesium, manganese, calcium and chromium, non-metallic). Its various uses include:
 - sandpaper,
 - jewelry,
 - gemstones,
 - prized collector specimens.

4. **GALENA:** (Lead sulfide, a metallic mineral). This dense, shiny cubic mineral often has silver associated with it. It is a very brittle mineral. The major uses for lead include:
 - car batteries (lead-acid)
 - solder
 - ammunition
 - fishing weights
 - tire weights
 - glass additive ("leaded" glass)
 - X-ray shielding

5. **FELDSPAR:** (Variety - Orthoclase - calcium aluminum silicate, a non-metallic mineral) The major uses for feldspar include:
 - Glass,
 - Porcelain (high tension electrical insulators, ceramic glazes and dental products),
 - Enamel,
 - Mild abrasive in scouring powder.

6. **GYPSUM:** (Hydrated calcium sulfate, a non-metallic mineral). The major uses of gypsum include:
 - Wallboard,
 - Plaster-of-Paris (surgical and orthopedic casts),
 - Hardening retarder in cement,
 - Soil conditioner,
 - Used in bakery items, such as cake mixes and icing, and in the brewing industry
 - Paint, mortars, putty, building plaster, manufacture of glass, and in molded pottery.

7. **CALCITE:** (Calcium carbonate, a non-metallic mineral, is the major component of the rock limestone). Calcite and limestone are very abundant earth materials and are among the most widely used in industry.
 - Calcite in the form of limestone is used mainly in the manufacture of portland cement for concrete and mortar in the construction industry. (Concrete is a mixture of portland cement, water, sand, and rock aggregate.) Concrete is used for building, highways, dams, bridges, sewers, sidewalks, water pipes, etc.
 - The second major use for calcite/limestone is the production of lime, which is used as a flux in the smelting of steel; as a neutralizer of acid solutions at mines and manufacturing plants; in water treatment (it removes phosphorus and nitrogen from sewage plant effluent); in the refining of base metals, petroleum, and sugar.
 - Lime is essential in the manufacture of paper (brown paper shopping bags), petrochemicals, insecticides, linoleum, counter tops, fiberglass, glass, carpet backing, rubber tires, the composite materials used in auto interiors, microwave plastics, bleach, and chrome chemicals.

- Lime is used in soil stabilizers for construction projects, as a soil neutralizer and conditioner, in calcium phosphate fertilizers, and in pesticides.
 - Finely crushed limestone is the powdery coating on chewing gum.
 - It is a major component in antacids, aspirin, and porcelain.
 - It is used in bakery items, taco shells, and in toothpaste.
 - Calcium is produced from calcite and is used to reduce metal oxides to the metallic state, and is used as an agent in alloying.
 - Calcium is the fifth most abundant element in the earth's crust. Calcium helps build strong bones and teeth, and as a dietary supplement aids in the formation of healthy muscle tissue, aids in blood clotting, and in maintenance of cell membranes.
- 8. MAGNETITE:** (Ferrous and ferric iron oxide, a metallic mineral, iron ore). Iron ore is probably the most important mineral civilized man has ever dug from the earth. In ancient times, it was the strongest and hardest known metal. It is the second most common metal on earth (the most common is aluminum). It is typically magnetic.
- Magnetite is the raw material used for the production of iron and steel. Over 80% of iron ore is used to produce steel on which modern societies and economics are based. Steel is used in construction of all types (buildings, bridges), in automobiles, ships, machinery and tools, cooking utensils, and for making stainless steel appliances and cooking and eating utensils.
 - Iron is an essential human nutrient, primarily as a carrier of oxygen in the body. It is contained in hemoglobin in the blood and myoglobin in the muscles.
- 9. AZURITE AND MALACHITE:** (Non-metallic copper carbonate minerals). Found in the upper oxidized zone of copper deposits by the reaction between carbonated waters and copper minerals (copper sulfides) or between copper sulphate solutions and limestone. Azurite (blue) and malachite (green) are usually always found together, often associated with limonite, calcite, chalcocite, chrysocolla, and copper oxides.
- 55% of the copper used in the U.S. goes to produce electrical wires for electric motors, generators, power lines, and in the telecommunications industry (telephones). Only silver is a better electrical conductor than copper.
 - Another 40% of copper used in this country goes into making brass (an alloy of copper and zinc). Bronze, which is made by combining copper and tin, was used by the ancient Egyptians and Romans. Both of these metals are stronger than pure copper.
 - Copper also goes into coins, cooking utensils, copper pipe, sterling silver, ammunition, and blue pigments.
 - Copper is necessary for the formation of hemoglobin. It also keeps bones, blood vessels, and nerves healthy.
- 10. PYRITE:** (Iron sulfide, a metallic mineral): The major uses for pyrite include:
- Sulfur
 - Sulfuric acid - the "King" of industrial chemicals
- 11. QUARTZ:** (Silicon dioxide, a non-metallic mineral). Quartz is the most common mineral in the continental crust. It is very durable because of its hardness (7), it is insoluble in acids, and is resistant to fusion. Quartz is mined commercially most often in the form of silica sand, sandstone, or in the metamorphic rock quartzite. Its uses include:
- Quartz is the main ingredient in glass. 80% of silica sand mined goes into the manufacture of glass, fiberglass, optical fibers for telecommunication, computer chips, porcelain, and tiles, including the heat-resistant tiles on the space shuttles.
 - It is used in making silicon carbide, an abrasive for sand-blasting, grinding glass, sawing and polishing of dimension stone.
 - Manufacture of sodium silicate (liquid glass) which is used in laundry detergents, coatings on hazardous waste containers, and in toothpaste.
 - About 17% of the silica sand goes for refractory uses, such as: foundry molds (casts for metal parts) for the electrical, aerospace, and automotive industries (car engine blocks), acid liners in steel furnaces, and in the manufacture of acid refractory products.
 - Finally, it has metallurgical uses as a component in preparation of silicon alloys or as a flux in preparation of elemental phosphorus.
- 12. SULFUR:** (Sulfur, a native element). Sulfur melts easily, and has a characteristic "rotten egg" odor. Sulfur is very important in the chemical industries. It goes into practically everything we eat, wear, and use.
- Almost 90% of the sulfur consumed in the U.S. goes into the manufacture of sulfuric acid, known as "the king of chemicals". 70% of this acid is used for agricultural chemicals (nitrogen and phosphatic fertilizers).
 - Sulfur and sulfuric acid is also essential in the manufacture of paper, steel, in treating copper and other ores,
 - Storage batteries (automotive), photographs, rayon and other synthetic fibers,
 - Medicines (sulfa drugs),
 - Pesticides,
 - Explosives,
 - Vulcanization of rubber (car and truck tires),
 - Manufacture of plastics, matches, petroleum and coal products, water-treatment compounds, soaps and detergents, pigments and paints.