



## MINERAL AND ROCK MATCH

### PURPOSE

Students need to have a basic introduction to rocks and minerals as well as some knowledge of the periodic table before doing this activity.

Elements are the simple building blocks of the earth. Minerals are simply made up of one or more elements. Rocks are divided into three categories depending upon how they were formed. Sub-categories are used for some rock types.

This activity is to help students learn the Periodic Table of Elements and how some minerals are actually combinations of several elements. It will also help increase their knowledge of the three types of rocks and some identifying features of both selective minerals and rocks.

### MATERIALS

- Cards with minerals or rock names
- Cards with identifying information
- Cards with element(s) symbol

### INSTRUCTIONS

Divide the students up into three groups. Each student in a particular group will have one type of card, i.e., one group will each get a mineral or rock while the other two groups will each have one of the remaining groups.

Students will be given a set amount of time (5 to 10 minutes) to find the other two cards that match the one they have. Once all cards are matched, have different ones read their cards and explain how they arrived at their match.

Be sure to allow time for questions and further explanation of identification possibilities. If desired, students could study the rock cycle and mineral identification before this activity to increase their knowledge of both rocks and minerals.

### OPTIONS

Have another set of cards made up with products from the minerals and rocks used and divide the students into four groups. Have a student with an element card hold the card up and wait for the other students to hold theirs up. Reverse the order or exchange cards until the students are comfortable with their understanding of elements and rocks.

Introduce alloys and compounds into the game with the teacher calling out the name of a mixture and the students with the correct cards can stand. Add other mineral and rock cards as desired.



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<u>Mineral</u> <b>Barite</b>	<b>BaSO<sub>4</sub></b>	A gray colored, hardness of 3 to 3.5, streaks white, glassy or pearly luster and 4.5 specific gravity.
<u>Mineral</u> <b>Fluorite</b>	<b>CaF<sub>2</sub></b>	White, pink to pale green, streaks white with a glassy luster, 4.0 hardness and a 3.1 to 3.3 specific gravity.
<u>Rock</u> <b>Coal</b>	<u>Sedimentary</u> <b>C</b>	Dark brown to black, glassy texture, brittle. Hardness and specific gravity vary.
<u>Mineral</u> <b>Gold</b> (Native)	<b>Au</b>	Yellow, metallic luster, streaks yellow, a 3.0 hardness and 15.3 to 19.3 specific gravity.
<u>Mineral</u> <b>Quartz</b>	<b>SiO<sub>2</sub></b>	White, pinks, browns & blacks with a glassy luster, streaks white, has a 7.0 hardness and a 2.6 specific gravity.
<u>Mineral</u> <b>Copper Ore</b> (Chalcopyrite)	<b>CuFeS<sub>2</sub></b>	Brass-yellow, with a metallic luster, streaks black, a 3.5 to 4.0 hardness and a 4.0 specific gravity.
<u>Mineral</u> <b>Gypsum</b>	<b>CaSO<sub>4</sub> · 2H<sub>2</sub>O</b>	Clear to white, streaks white, glassy to chalky luster, a 1.5 to 2.0 hardness and a 2.3 specific gravity.
<u>Mineral</u> <b>Magnetite</b>	<b>Fe<sub>3</sub>O<sub>4</sub></b>	Black with a reddish brown streak, metallic luster, 6.0 hardness and a 5.0 specific gravity.
<u>Mineral</u> <b>Silver</b> (Native)	<b>Ag</b>	Gray-white with a silver streak, bright metallic, 2.5 to 3.0 hardness and a 10.0 to 12.0 specific gravity.
<u>Mineral</u> <b>Pyrite</b>	<b>FeS<sub>2</sub></b>	Brassy, dark yellow with a greenish-black streak, metallic luster, hardness of 6.0 to 6.5, specific gravity 5.0 to 5.2. Cubic crystals.
<u>Mineral</u> <b>Sulfur</b>	<b>S</b>	Yellow, resinous to glassy luster, streaks pale yellow, 2.0 hardness and a 2.0 specific gravity.
<u>Mineral</u> <b>Calcite</b>	<b>CaCO<sub>3</sub></b>	White, clear, yellow, pink or blue, with a white streak, glassy luster, 3.0 to 4.0 hardness and a 2.7 specific gravity.

<u>Rock</u> <b>Granite</b>	<u>Igneous, Intrusive</u> SiO <sub>2</sub> , Al, K, Na, Ca Numerous types	Coarse grained, light colored, Chiefly quartz (up to 50%) and feldspar. Extremely hard.
<u>Rock</u> <b>Gabbro</b>	<u>Igneous, Intrusive</u> Numerous types. Ca, Al, Si, O, Fe. Maybe P and Ti.	Fine to coarse grained, dark colored with interlocking grains of feldspar and hornblende.
<u>Rock</u> <b>Basalt</b>	<u>Igneous, Extrusive</u> Si, O, Al, Mg, Fe, Na, Ca. Numerous types	Dark, fine grained. Usually rich in iron and magnesium.
<u>Rock</u> <b>Pumice</b>	<u>Igneous, Extrusive</u> Usually 65% to 70% SiO <sub>2</sub> and 10% to 20% Al <sub>2</sub> O <sub>3</sub> . Usually K, Na, and Ca	Light and frothy. Gas bubbles are trapped in the rock during rapid cooling.
<u>Rock</u> <b>Conglomerate</b>	<u>Sedimentary</u> Numerous types: particles cemented by CaCO <sub>3</sub> , SiO <sub>2</sub> , and iron oxides (FeO, Fe <sub>2</sub> O <sub>3</sub> , Fe <sub>3</sub> O <sub>4</sub> )	Coarse grained, with fine grained matrix cemented by calcite, silica or iron oxide.
<u>Rock</u> <b>Sandstone</b>	<u>Sedimentary</u> Numerous types, mostly SiO <sub>2</sub> , cemented by clay-sized sands or silica or carbonate cement.	Fine to medium grained, composed of many rounded or angular fragments set in fine-grained matrix.
<u>Rock</u> <b>Shale</b>	<u>Sedimentary</u> Numerous types. Mainly contains Si, O, Al, Mg, Fe, K, Ca, Na, sometimes C	Fine grained, formed by compressing clay, silt or mud. Breaks easily into thin layers.
<u>Rock</u> <b>Limestone</b>	<u>Sedimentary</u> 50% of rock is CaCO <sub>3</sub> and/or CaMg(CO <sub>3</sub> ) <sub>2</sub>	Fine to coarse grained with 50% or more being a carbonate rock.
<u>Rock</u> <b>Gneiss</b>	<u>Metamorphic</u> Si, O, Al, K, Na, Ca Maybe Fe, Ti, Mg, Mn	Coarse grained. Light-colored bands (quartz & feldspar) of granular texture. Dark bands (mica and/or hornblende) are layered (foliated).
<u>Rock</u> <b>Quartzite</b>	<u>Metamorphic or Sedimentary</u> Mainly composed of SiO <sub>2</sub>	Formed by recrystallization of sandstone or chert, or grains cemented together by fine silica.
<u>Rock</u> <b>Schist</b>	<u>Metamorphic</u> Numerous types. Mainly O, Si, Al, Mg,	Parallel layers of flaky minerals such as mica. Easily split or cleaved. Crystalline rock. Occurs in thin layers
<u>Rock</u> <b>Marble</b>	<u>Metamorphic</u> Essentially CaCO <sub>3</sub> and/or CaMg(CO <sub>3</sub> ) <sub>2</sub>	Fine to coarse grained. From limestone, recrystallized calcite and/or dolomite.

## MINERAL IDENTIFICATION

**PURPOSE:** This activity will teach the student to identify minerals using the physical properties of each mineral. This is accomplished through observation and testing of the minerals involved.

### INSTRUCTIONS:

1. Set up mineral stations for each mineral the students are to identify. If necessary, some stations may have two minerals to identify.
2. Each station should be equipped with one each of the following items:
  - Eye dropper
  - Vinegar or 10% solution of HCL (Hydrochloric acid)
  - Glass plate
  - Penny
  - Streak plate (white unglazed porcelain)
  - Magnet
  - Steel blade or knife
3. Divide students into equal groups. Have the number of student groups match the number of mineral stations.
4. Distribute to each student the Mineral Worksheet. Have students read the descriptions at the bottom of Mineral Worksheet.
5. Have student groups move to the mineral stations with one group of students at each station. Have the students perform the physical property tests listed and record the test results on the Mineral Worksheet.
6. Rotate the student groups through each of the work stations performing the tests at each station. Allow 3 to 5 minutes per mineral per station.
7. Handout the Mineral Identification sheet (page 2 of this packet). The Rock Identification sheet (page 3) would provide a real challenge.
8. Have students compare their test results with the Mineral Identification sheet. Can the students correctly name each of the minerals using their test results? If the students can correctly identify their mineral from the testing, have them write the name of the mineral on the Mineral Worksheet.

**REVIEW:** The students learned to perform tests for physical properties of minerals, observe the test results and then identify a mineral using the test results.

# MINERAL WORKSHEET

Using Physical Properties to identify minerals

Sample #	Color	Feel	Streak	Smell	Luster	Magnetic	Chemical	Hardness	Weight

**Sample #**  
 White, black, gray, green, yellow, blue, red, orange, brown, etc.

**Color**

**Feel**  
Texture  
 • Gritty— Sandy  
 • Powdery— Earthy or chalky  
 • Smooth— Glass  
 • Smooth & sticky— Waxy  
 • Sharp— Metallic

**Streak**  
 Color of the mineral when it's scratched across a streak plate

**Smell**  
 • Earthy  
 • Sour  
 • Sweet  
 • Rotten egg  
 • Other

**Luster**  
 • Glassy/vitreous- shines like glass  
 • Earthy/chalky-dull  
 • Metallic-looks like metal  
 • Waxy/silky/pearly-has a muted shine

**Magnetic**  
 Attracts to a magnet  
 Yes or No

**Chemical**  
 Reacts to acid (fizzes)  
 Yes or No

**Hardness**  
 Moh's Scale  
 Mineral scratched by  
 1 Fingernail  
 2 Fingernail  
 3  
 4 Penny  
 5 Steel (knife blade)  
 6 Glass  
 7-10 Mineral will scratch steel/ glass

**Weight**  
 Specific gravity  
 weight goes from very light (Diatomite) to very heavy (Magnetite)

## THE ROCK CYCLE

**rock** \ 'rāk \ n:

**ROCKS! WHAT ARE THEY?** Rocks are aggregates of any combination of minerals (Quartz, Calcite, Galena), elements (S-sulfur, Au-Gold), solid organic material (coal), and/or other rocks.

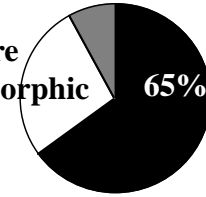
The relative abundance of the three rock groups in the earth's crust:

8% are Sedimentary

27% are

Metamorphic

65% are Igneous



**ROCKS = MINERALS ± ELEMENTS ± SOLID ORGANICS ± OTHER ROCKS**

### IGNEOUS ROCKS

Ultimately the parent of all other rocks.

**Magma** is hot molten rock material generated within the earth. When magma reaches the surface it is called **lava**. Igneous rocks are the result of cooling and crystallization of magma and lava.

These include **intrusive** rocks that crystallize below the earth's surface (granite, gabbro), and **extrusive** rocks that crystallize on the earth's surface (obsidian, rhyolite, basalt).

**Intrusive igneous rocks** cool slowly, producing a *coarse texture* with mineral grains visible to the naked eye. The minerals that form are determined by the chemistry of the magma and the way that it cools (relatively slowly or quickly, steadily or variably). The grains are typically interlocking, and of more-or-less the same size.

These rocks can vary in *color* from almost white to dark green and black, including varying tones of gray, pink, and red.

Granite	Light-intermediate color, quartz present
Diorite	Intermediate-dark color, quartz absent
Gabbro	Dark color (very), few light minerals

Large, irregular *intrusive rock masses* are called **batholiths** (e.g. the Sierra Nevada).

**Dikes** are tabular igneous bodies formed vertically or across sedimentary bedding.

Those formed horizontally or parallel to bedding are called **sills**.

**Extrusive igneous rocks** (sometimes called volcanic) cool quickly, which causes very small crystals to form, if any at all. This produces *fine-grained rocks*, which without a microscope, can be identified only by color. The *color* is determined by the minerals that form during cooling.

Like the intrusive rocks, the minerals formed reflect the chemistry of the magma. Colors vary from white to black, with pink, tan, and gray being common intermediate colors. The *texture* of these rocks can also be influenced by the amount of gas trapped in the lava when it cools.

Rhyolite	Usually pink or tan, sometimes white
Obsidian	Volcanic glass, often black but many colors are possible.
Andesite	Intermediate-dark color
Basalt	Dark gray or gray-green to black

## SEDIMENTARY ROCKS

Rocks formed from the consolidation of loose sediment (Sandstone) or from chemical precipitation (Limestone) at or near the earth's surface.

Sedimentary rocks are formed by the weathering, (physical and chemical) of igneous, metamorphic and other sedimentary rocks. The weathered fragments are transported via water, air or ice before they are deposited and transformed.

Sediments are transformed into rocks by:

**Cementation**, usually by calcite, silica or iron oxides that glue the fragments together.

**Compaction**, fragments being squashed together.

**Re-crystallization**, which produces interlocking textures.

Sedimentary rocks generally occur in layers or beds that range in thickness from inches to thousands of feet. Their texture ranges from very fine grained, to very coarse. Colors include red, brown, gray, yellow, pink, black, green and purple.

Examples of sedimentary rocks are: limestone sandstone shale  
conglomerate gypsum calcite

## METAMORPHIC ROCKS

Rocks derived from pre-existing igneous and sedimentary rocks.

The original rock has been changed in form by the earth's temperature, pressure and chemical fluids to form a new metamorphic rock. Examples would include areas where an igneous intrusion forces its way through the earth's crust resulting in pressure and temperature changes due to heat, force and friction.

Metamorphism can also occur in areas of stress such as faulting and folding of rock or in areas of plate tectonics such as the oceanic crust colliding into the continental crust. The principal characteristic of metamorphic changes is that they occur while the rock is solid.

*Texture* characteristics are very important in classifying metamorphic rocks. They range from very fine grained to coarse grained minerals. Metamorphic rocks can be divided into two textural groups, foliated (layered) and unfoliated (not layered).

**Foliation:** Parallel layers of minerals, sometimes of different composition, giving the rock a distinctive planar to platy feature (Schist, Gneiss).

**Rock Cleavage:** A property of a rock that allows for easy breaking along parallel planes or surfaces. Metamorphic rocks tend to break or cleave most easily along planes parallel with foliation.

**Unfoliated:** No preferred orientation of minerals. The rock has no preferred orientation of breakage (Quartzite and Marble).

<u>Original Rock</u>	<u>Metamorphic Rock</u>
Mudstone/Shale	Slate
Shale	Chlorite Schist
Basalt/Gabbro	Biotite Schist
Granite/Diorite	Gneiss
Limestone/Dolomite	Marble
Quartz-rich Sandstone	Quartzite

## **PLATE TECTONICS:**

The surface of the earth is always shifting and moving. The oceanic plates are mostly made of dense basaltic rock and the continental plates are mostly made of lighter granitic igneous, sedimentary and metamorphic rocks. When an oceanic plate collides with a continental plate it is most often pushed beneath the continental plate.

This subduction process carries the rock to increased temperature and pressure zones within the earth's crust and mantle, eventually causing the rock to become molten magma. New sources of volcanic or intrusive igneous rocks can form from the material to begin another cycle.

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### **PLATE TECTONICS WITH AN ORANGE**

**PURPOSE:** To acquaint students with the concept of plate tectonics.

**MATERIALS:** oranges (one for each student or two can share)  
clay or play dough (optional)  
toothpicks

#### **INSTRUCTIONS:**

1. Have the students peel the orange without the use of a knife and in as few pieces as possible. This peel represents the earth's crust and the crust is in pieces just like the orange peel.
2. Have the students lay the orange peel on their work surface and record their observations.
3. Tell the students to replace the peel on the orange, securing the peel with toothpicks.

#### **DISCUSSION:**

1. The earth is spherical like the orange although it is difficult to see the roundness of the earth except from space.
2. What did the students observe when the orange peel was laying on their work surface? Did they notice that the pieces flattened out. The pieces didn't appear to be as round as they were when attached to the orange.
3. Now that the peel is back on the orange, this better represents the earth's crust. The cracks are called faults and it is the shifting of the plates (orange peel) which causes earthquakes and volcanic activity.

#### **EVALUATION:**

1. How do the continents fit into this theory?

**OPTIONS:** Since most of the fault lines on the earth's crust are not visible, the students may wish to roll out a thin piece of clay (or play dough) and cover the orange. They should carefully remove the toothpicks as the clay is placed.



# Minerals and YOU

You wake up in the morning and switch on the light. You wash your face, brush your teeth, and get dressed. You turn on the radio and eat breakfast—a bowl of cereal, a glass of juice, perhaps some toast and a cup of coffee or tea. You look out the window, then head for the door—ready to start the day.

And almost everything you've done so far—and everything you'll do for the rest of the day—would be impossible without minerals.

Water pipes and electric wiring; refrigerator, radio, toaster, lamp, and light bulb; sheets, towels, and clothing; soap and toothpaste; window, cereal bowl, juice glass, coffee cup; water faucet, spoon, doorknob—all were made from or with minerals. Even breakfast reached your table with the help of minerals.

## Minerals and the Modern World

Minerals touch our lives in hundreds of ways each day. Life as we know it would not exist without them. Everything that cannot be grown—that's neither plant nor animal—is a mineral or made from minerals.

Agriculture, construction, manufacturing, transportation, electronics, art, science—almost every area of human activity depends in some way on minerals. The raw materials we take out of the ground are as critical to our way of life—and life itself—as food and water.

We consume minerals in amounts that range from billions of tons of sand and gravel a year to only thousands of pounds of rhenium—a metal used in producing lead-free gasoline. In the United States alone, it takes more than 2 billion tons of minerals each year to maintain our way of life. That's about 10 tons of minerals for every man, woman, and child. From those minerals we get the products we need to live and those that make life more comfortable.

## Agriculture

Our dependence on minerals begins with the most basic requirement for life—food. Minerals are essential to the many activities involved in putting food on our tables. Fertilizers made from potash, phosphate rock, sulfur, and nitrogen help plants grow. Farmers use metal tractors and combines to plant and harvest crops. They ship fruit, vegetables, grain, and livestock to market in trucks, railroad cars, and airplanes—all made of metal. Food processors use metal machines and equipment; they package food in metal cans and other containers made from or with minerals.

In addition, like all plants and animals, we need mineral nutrients to keep us alive and well. The foods we eat supply iron, calcium, phosphorus, magnesium, copper, zinc; we even take vitamins containing minerals to make sure we get enough.

## Construction

Minerals provide the building blocks for the houses and apartment buildings we call

home; for the towns and cities where we live, work, and play; and for the roads, highways, and bridges that connect them.

We find the products of pits, quarries, and mines from basement to attic, from parking garage to penthouse. Our houses, apartment buildings, offices, and factories have walls of brick, stone, concrete . . . roofs made from asphalt and gravel . . . concrete foundations and gypsum wallboard . . . metal air conditioners, furnaces, and ventilation ducts . . . and a network of copper pipes, wires, and cables that bring water, light, and power.

Other minerals and mineral-based materials used in construction include cement, sand, clay, tile, lime, glass, aluminum, iron and steel, lead, and zinc.

## Manufacturing

Many of the goods and products we use each day are made from minerals. Stoves, TVs, refrigerators, microwave ovens, washing machines, radios, and dishwashers contain steel, aluminum, and other metals. Aluminum pots and stainless

steel kitchen utensils . . . brass doorknobs and picture frames . . . plates and porcelain vases made from China clay . . . metal tools, bolts, screws, and nails . . . soaps and detergents made from boron, phosphates, soda ash . . . toothpaste, aspirin tablets, lipstick, eye shadow and other cosmetics containing clay—we find mineral products in every room, closet, and cabinet.

Many materials that are not in themselves minerals could not be made without them. We use sand, selenium, silicon, soda ash, and other minerals to manufacture glass. Making paper may require clay, lime, or sodium sulfate. Minerals like titanium, lead, and cadmium help give paints their color, white talc, mica, and clay help them last longer.

Minerals actually make possible the manufacture of almost every product bought and sold today. The machines used in factories, plants, mills, and refineries are made from steel and other metals. The processes involved in refining petroleum, making steel, and producing textiles, paper, glass, plastics, and fertilizers depend on chemicals made from minerals.

### **Transportation**

In the modern world, minerals take us wherever we want to go—from the local shopping center to the moon. If we want to move people and materials, we need minerals. Cars, trucks, and buses; trains, subways, and the rails they run on; barges, ships, and the cranes that unload them—all are made from metal.

Cars, for example, contain iron and steel, manganese,

chromium, lead, zinc, platinum, copper, and aluminum. We drive them on streets, highways, and bridges made from asphalt, sand, gravel, and concrete. Road crews use sand and salt to keep them from skidding on snow and ice. Even the gas in their tanks was prepared using mineral-based chemicals.

Minerals carry us into the air and beyond the atmosphere. Jets made of aluminum, chromium, cobalt, columbium, tantalum, and titanium take off by the thousands each day. Satellites, missiles, and space orbiters depend on the permanence, strength, reliability, and corrosion resistance of these metals. Gold used in the space suits of astronauts and as thin coatings on equipment protects both from the deadly radiation and heat of the sun.

### **Electronics**

The advances in electronics and computer technology that made possible the exploration of space and hundreds of other technical achievements would be inconceivable without minerals.

Copper, for example, transformed the way we live. Its ability to conduct electricity not only gave us new ways to light and heat our homes, but opened the way to a world of machines that can do almost anything except think. And today's computer scientists are working on that.

Directly or indirectly, the electronics and computer industries use almost every mineral mined today.

It takes 42 different minerals, for example, to make something as seemingly simple as a telephone handset. From aluminum and beryllium to yttrium and zinc—minerals put light, power, communication, information, and entertainment at our fingertips.

### **Art and Science**

Minerals provide the materials for men and women to express and explore themselves and the world. Painters and sculptors use mineral products—pigments, clay, marble. The photographer and movie maker would have no art without silver—the metal that makes it possible to record images on film. Symphony orchestras, brass bands, and rock superstars make music with instruments made from metal; listening to recorded music would be impossible without equipment made of a wide range of minerals.

The instruments of science—from microscopes and supercomputers to test tubes and beakers—also depend on minerals. With these instruments, scientists have explored the world from cell to solar system, discovering new treatments for disease, new sources of energy, even new galaxies.

Less positively, minerals have been a part of human warfare since the first caveman cast the first stone. Yet, today, that too is changing—minerals are being used in almost every aspect of our efforts to ensure world peace.

As long as civilization as we know it endures, minerals will be there, playing an essential part in our daily lives.

## Makeup— A Wealth of Minerals

Have you ever read the ingredients in makeup, shampoo, or toothpaste? It might surprise you. Many personal-care products contain a wealth of mineral materials taken from the earth. Take, for example, eye shadow:

One of the first ingredients listed in eye shadow is usually talc - a magnesium silicate mineral. Its platy crystal habit is in part the reason why talc has been an important ingredient in cosmetics since 3500 B.C. The plates glide smoothly across each other, allowing makeup to be applied easily. They lie across the pores in the skin and lessen the chance of clogging pores, while providing texture to the skin. Yet they are translucent enough not to be seen.

Talc is resistant to acids, bases, and heat and tends to repel water. In addition to eye shadows, talc is used in loose and pressed powders, blushes, is a filler in some deodorants, and is added to lotions and creams. Talc can also be found in chewing gum and pharmaceuticals.

Mica, a mineral widely used in eye shadows, powder, lipstick, and nail polish, is added to give luster or pearlescence to a product. Mica is resistant to ultraviolet light, heat, weather and chemical attack and adheres to the skin. Like talc, it has excellent slip characteristics and may be used to replace talc in a makeup. When coated with iron oxide, mica flakes sparkle with a gold tint.

Kaolin, a clay, is added to makeup to absorb moisture. It covers the skin well, will stay on the skin, and is resistant to oil. Kaolin and another clay, bentonite, are added to the earth-based face masks or packs predominately for their cleansing

effects. Clays are also used as fillers in different products.

Powdered calcite, a calcium carbonate, absorbs moisture. Because of this, calcite and a magnesium carbonate, processed form dolomite, are added to powders to increase the ability of the makeup to absorb moisture.

When it comes to makeup, color is the name of the game. Minerals provide the color to eyes, cheeks, lips, and nails. Iron oxide, one of the most important color minerals, was used by Cleopatra in the form of red ochre as rouge.

Today, iron oxides give red, orange, yellow, brown, and black tones to makeup. Chrome oxides are used for greens; manganese violet for purple; ground lapis lazuli may be added to makeup for blue. Ultramarine blue and pink coloring is made from a mixture of kaolin, soda ash, sulfur, and charcoal.

Even gold has historically been used as a colorant. Ancient Egyptians used gold to color skin and hair. Gold can still be found in powders and makeup to add a 'rich' golden sheen to the skin.

As an artist starts a painting with a bright white canvas to give the colors brightness and intensity, titanium dioxide is added to brighten and intensify the color of makeup, and to give whiteness and opacity. Titanium dioxide is also a natural sunblock and, like talc, iron oxides, and gold, it has been used for centuries. Titanium dioxide can be found in any makeup—shadow, blush, nail polish,

lotions, lipstick, and powders. Titanium dioxide also makes Oreo cookies frosting extra-white and is the 'M' on M&M's candy.

Minerals also find their way into health-care products we use daily. Salt is effective in treating skin disease and is used in some soaps. Fluorite, processed for fluoride, is added to toothpaste and drinking water to help prevent tooth decay.

Calcium carbonate (calcite) and baking soda (nahcolite) are abrasives in toothpaste. A borax and beeswax mixture is added to cleansing creams as an emulsifier to keep oil and water together. Boric acid is a mild antiseptic and is added to powder as a skin-buffering agent.

Zinc oxide is added to creams to allow the cream to cover more thoroughly. Zinc oxide ointment, which contains approximately 20% zinc oxide, is used to heal dry, chapped skin. When an unlucky hiker runs into poison ivy, calamine-base lotions are often used to soothe the itchy skin. Calamine is another name for hemimorphite, a zinc silicate mineral.

As you can see, minerals are found in many things we use. So, the next time you are in the supermarket, take a moment and acquaint yourself with the multitude of minerals that are a part of our daily lives.

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## A Brief List

### Industrial Minerals Used Around the House

#### Item— Minerals Needed to Produce Them

Carpet— *Calcium carbonate, limestone*

Glass/Ceramics— *Silica sand, limestone, talc, lithium, borates, soda ash, feldspar*

Linoleum— *Calcium carbonate, clay, wollastonite*

Glossy paper— *Kaolin clay, limestone, sodium sulfate, lime, soda ash, titanium dioxide*

Cake/Bread— *Gypsum, phosphates*

Plant fertilizers— *Potash, phosphate, nitrogen, sulfur*

Toothpaste— *Calcium carbonate, limestone, sodium carbonate, fluorite*

Lipstick— *Calcium carbonate, talc*

Baby powder— *Talc*

Hair cream— *Calcium carbonate*

Counter tops— *Titanium dioxide, calcium carbonate, aluminum hydrate*

Household cleaners— *Silica, pumice, diatomite, feldspar, limestone*

Caulking— *Limestone, gypsum*

Jewelry— *Precious and semi-precious stones*

Kitty litter— *Attapulgit, montmorillonite, zeolites, diatomite, pumice, volcanic ash*

Fiberglass roofing— *Silica, borates, limestone, soda ash, feldspar*

Potting soil— *Vermiculite, perlite, gypsum, zeolites, peat*

Paint— *Titanium dioxide, kaolin clays, calcium carbonate, mica, talc, silica, wollastonite*

Concrete— *Limestone, gypsum, iron oxide, clay*

Wallboard— *Gypsum, clay, perlite, vermiculite, aluminum hydrate, borates*

Spackling— *Gypsum, mica, clay, calcium carbonate*

Pencil— *Graphite, clay*

Carbon paper— *Bentonite, zeolite*

Ink— *Calcium carbonate*

Microwavable container— *Talc, calcium carbonate, titanium dioxide, clay*

Sports equipment— *Graphite, fiberglass*

Pots and pans— *Aluminum, iron*

Optical fibers— *Glass*

Fruit juice— *Perlite, diatomite*

Sugar— *Limestone, lime*

Drinking water— *Limestone, lime, salt, fluorite*

Vegetable oil— *Clay, perlite, diatomite*

Medicines— *Calcium carbonate, magnesium, dolomite, kaolin, barium, iodine, sulfur, lithium*

Porcelain figurines— *Silica, limestone, borates, soda ash, gypsum*

Television— *35 different minerals & metals*

Automobile— *15 different minerals & metals*

Telephone— *42 different minerals & metals*

## **FOURTH OF JULY FIREWORKS DEPEND UPON MINERALS**

Take a moment to consider the minerals that make fireworks such a spectacular part of the festivities. Each color in a fireworks display is produced by a specific mineral compound:

- Bright greens are made with barium.
- Deep reds are a product of strontium.
- Blues come from copper.
- Yellows require sodium.

More colors can be created by mixing compounds. Strontium and sodium together produce a brilliant orange. Titanium, zirconium and magnesium alloys combine to make a silvery white. Copper and strontium mix to yield a lavender.

Certain minerals are used for special effects. Iron filings and small particles of charcoal produce gold sparks. If you want a loud flash, fine aluminum powder is the fuel to choose. Larger particles, such as small flakes

or granules, give a longer, shower-like effect. Magnalium, a magnesium-aluminum alloy, can produce a tiny series of silvery-white flashes. Aluminum, antimony sulfide and perchlorate are some flash mixtures.

Although fireworks date back to ancient China, they continue to grow in popularity. Just in the past decade, their use has doubled to nearly 30,000 short tons per year. Of this amount, consumers buy two-thirds. The remainder go for fireworks displays. About 85 percent of consumer fireworks and half of the display variety are imported from China, Japan, Korea and such European countries as France and Italy.

The role of minerals in fireworks is just one example of society's growing reliance upon minerals for the manufacture of everything from automobiles to toothpaste.