

NEVADA'S MINERAL RESOURCES: THEIR PHYSICAL PROPERTIES AND USES

MODIFIED FROM ACTIVITIES CREATED BY
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This group of activities is designed for the elementary grades 3-5 and will help students learn about the properties of minerals mined in Nevada using basic scientific inquiry methods; the locations in Nevada where useful minerals are found; and the uses of minerals in our everyday lives.

ACTIVITY I. MINERAL DETECTIVE

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

Grades 4 and 5

- √ Scientific Inquiry (Nature of Science Unifying Concept A):
 - USING DATA**
 - N.5.A.1 - Investigations
 - N.5.A.2 - Comparing results
 - RECORD KEEPING**
 - N.5.A.3 - Drawing Conclusions from Evidence
 - SAFE EXPERIMENTATION**
 - N.5.A.5 - Plan and conduct a safe and simple investigation

- √ Science, Technology and Society (Nature of Science Unifying Concept B):
 - RISKS AND BENEFITS**
 - N.5.B.1 - Diversity
 - 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

- √ Earth's Composition and Structure (Earth and Space Science Unifying Concept C)
 - EARTH'S COMPOSITION AND RESOURCES**
 - E.5.C.4 - Rock is Composed of Different Combinations of Minerals

ITEMS NECESSARY FOR THIS ACTIVITY:

Nevada Mining Association mineral kit samples
"Mineral Detective" poster (1 per group of 4 to 6 students) or individual 8 ½ " by 14" "Mineral Detective"
handouts (1 per student)
Unglazed porcelain tile
Small square of plate glass
Quartz crystal
Penny
Steel nail, blade or file
Magnet
Pen or pencil
Hand lens or magnifying glass.

INTRODUCTION: Have any of you ever picked up an interesting mineral or rock and taken it home? Maybe there's a really neat one out in your back yard, in the school yard, or maybe there's a big rocky cliff you've admired while out on a hike. Have you started a mineral or rock collection yet? Here's your chance to learn a little bit more about the minerals and rocks you so admire in nature.....

WHAT IS A MINERAL? Minerals are naturally occurring inorganic substances made up of definite combinations of chemical elements and are crystalline solids. Their atoms are arranged in an orderly and repeated pattern.

WHAT IS A ROCK? Rocks are combinations or aggregates of one or more minerals.

As you collect mineral or rock specimens, you probably noticed that each one has its own special features or characteristics that make it different from all others. Let's compare minerals to people: We are called people or human beings and each of us has certain characteristics (distinguishing traits) that belong only to us. These differences make each of us very special and unique in our school, our city, and in our world. We can be tall or short, plump or thin, smiling or grumpy. We all come with unique hair, skin, and eye coloring. Some of us excel at sports, others in reading. We come from a variety of environments all around the world. Others are attracted to us and want to get to know us because of the special differences they find attractive. The same reasoning can apply to our attraction to minerals and rocks.

If you have some favorite minerals or rocks, there are probably some special qualities that attracted you to them. Maybe it's the color, or the weight, or the hardness, or its feel, or the way it shines in the light that you find fascinating.

We have a collection of 12 minerals for you to investigate. You will have the chance to become mineral scientists or "Mineral Detectives" and study characteristics or clues to see how minerals are similar or different from one another. Who knows what a "detective" or a "scientist" is?

Detectives and scientists are very curious people. They spend a great deal of time observing things. What does the word "observe" mean? When we observe an object, we use our senses of sight, touch, smell, hearing, and taste, to learn more about that object. To "observe" or learn about the minerals and rocks in our collection, we are going to use some of our senses and some special equipment. The senses we will use are primarily sight, touch, and smell. The special equipment includes unglazed porcelain, glass plate, penny, steel nail, our fingernail, magnet, and a magnifying glass.

Scientists and detectives ask a lot of questions. Asking questions helps them to learn more about the things they are investigating or "detecting". In our first activity, we are going to ask questions about the mineral samples and use our senses and equipment to find the answers.

We will examine and test the mineral samples in eight different ways to determine their special characteristics. As you perform each of the tests, you will be asked to group the samples with the same characteristics together. Scientists spend a lot of their time in this type of activity. They observe things; they ask questions about those things; they use their senses and equipment to determine the similarities and differences between objects and try to classify or group the objects they are studying.

ACTION: So, let's get started!! If there are groups of students, provide a poster-sized "Mineral Detective" sheet for each group. If this is done as an individual activity, each student should have an 8 1/2" by 14" "Mineral Detective" handout. Pens, pencils, or marking pens should be available. A full set of the 12 mineral samples should be present for each group. If the teacher has an abundance of samples, this activity can be done by individuals. All of the samples should be placed in the magnifying glass at the top of the poster or handout.

STEP 1:

- ◆ USING YOUR SENSE OF **SMELL**, SMELL THE SPECIMENS.
- ◆ DO THEY HAVE DIFFERENT SMELLS?
- ◆ PLACE THE SAMPLES THAT HAVE A SIMILAR SMELL IN GROUPS ACROSS THE POSTER BESIDE THE **SMELL** CATEGORY.
- ◆ CIRCLE EACH GROUP AND WRITE A DESCRIPTION OF THE SMELL.

STEP 2:

- ◆ USING YOUR SENSE OF **SIGHT**, LOOK AT A FRESH SURFACE OF EACH SPECIMEN. SOME ARE SHINY LIKE GLASS (**GLASSY** OR **VITREOUS**); SOME ARE DULL (**EARTHY** OR **CHALKY**); SOME LOOK LIKE METAL (**METALLIC**); SOME APPEAR WAXY, PEARLY, OR SILKY.
- ◆ THE WAY MINERAL SHINES OR REFLECTS LIGHT IS CALLED **LUSTER**.
- ◆ PUT THE **GLASSY** SAMPLES IN A GROUP. NEXT, GROUP THE MINERALS THAT APPEAR **EARTHY** OR **CHALKY**. NEXT, GROUP THE SAMPLES THAT LOOK LIKE METAL (**METALLIC**) TOGETHER. FINALLY, GROUP THE SAMPLES THAT APPEAR **WAXY**, **SILKY**, OR **PEARLY**.

STEP 3:

- ◆ USING THE MAGNET, SEE WHICH OF THE SAMPLES ARE **MAGNETIC** (ATTRACTED TO THE MAGNET), AND WHICH ARE NOT. ARRANGE THE SAMPLES IN MAGNETIC AND NON-MAGNETIC GROUPS, AND CIRCLE EACH GROUP.

STEP 4:

- ◆ USING YOUR SENSE OF SIGHT, ARRANGE THE MINERAL SAMPLES INTO GROUPS BY **COLOR**. PUT THE WHITE ONES TOGETHER, THE BROWN ONES TOGETHER, AND SO ON.

STEP 5:

- ◆ NOW, PICK UP THE WHITE UNGLAZED PORCELAIN TILE AND SCRATCH EACH SPECIMEN ACROSS IT. THE POWDERY MARK THAT IS LEFT ON THE TILE IS CALLED THE **STREAK**. EACH MINERAL MAY OCCUR IN SEVERAL DIFFERENT COLORS IN NATURE, BUT THE STREAK OF A MINERAL OR ROCK IS ITS TRUE COLOR. THE STREAK MAY BE VASTLY DIFFERENT FROM THE COLOR OF THE SPECIMEN. GROUP THE SAMPLES BY THEIR STREAK COLOR.

STEP 6:

- ◆ USING YOUR SENSE OF TOUCH, RUB YOUR FINGERTIPS OVER THE SURFACE OF EACH SAMPLE. SOME WILL FEEL SANDY OR GRITTY, OTHERS WILL FEEL POWDERY (**EARTHY** OR **CHALKY**); STILL OTHERS WILL FEEL WAXY, OR POSSIBLY METALLIC.
- ◆ GROUP THE SAMPLES ACCORDING TO THE WAY THEY FEEL; CIRCLE EACH GROUP AND WRITE IN YOUR DESCRIPTIVE WORD FOR **FEEL**.

STEP 7:

- ◆ NOW WE WILL TEST THE MINERAL SAMPLES FOR **HARDNESS** (OR THE SAMPLES' RESISTANCE TO SCRATCHING) USING OUR FINGERNAILS FOR THE SOFTEST MINERALS AND ADDITIONAL EQUIPMENT FOR THE HARDER SPECIMENS.
- ◆ LINE UP THE SAMPLES ACCORDING TO THE FOLLOWING DIRECTIONS:
 - ON THE FIRST LINE, PLACE ALL SAMPLES THAT CAN BE SCRATCHED WITH YOUR **FINGERNAIL**,
 - ON THE SECOND LINE, PLACE ALL SAMPLES THAT CAN BE SCRATCHED WITH A **PENNY**,
 - ON THE THIRD LINE, PLACE THE SAMPLES THAT CAN BE SCRATCHED WITH A **STEEL NAIL**,
 - ON THE FOURTH LINE, PLACE THE SAMPLES THAT CAN BE SCRATCHED BY A **QUARTZ CRYSTAL**, IF AVAILABLE,

- ON THE FIFTH LINE, PLACE ALL SAMPLES THAT CAN SCRATCH A STEEL NAIL OR A GLASS PLATE. **NOTE TO TEACHERS: NEVER ALLOW STUDENTS TO HOLD THE GLASS PLATE TO SCRATCH SAMPLES-IT COULD BREAK!! ALWAYS HAVE STUDENTS LAY THE GLASS PLATE ON A FLAT SURFACE AND RUN THE SAMPLE ACROSS THE GLASS SURFACE.**

STEP 8:

- ◆ THE FINAL TEST! USING OUR SENSE OF TOUCH ONCE AGAIN, LET'S COMPARE THE **WEIGHTS** OF THE MINERAL SAMPLES.
- ◆ WE'RE SIMPLY GOING TO GROUP THE SAMPLES BY HOW THEIR WEIGHTS COMPARE TO ONE ANOTHER.
- ◆ GROUP THE SAMPLES INTO **LIGHT, MEDIUM, AND HEAVY** CATEGORIES. CIRCLE EACH GROUP AND LABEL.
- ◆ **NOTE FOR TEACHERS: IF YOU HAVE EQUIPMENT AVAILABLE, YOU CAN CONDUCT SPECIFIC GRAVITY TESTS TO COMPARE THE WEIGHTS OF MINERAL SAMPLES. SPECIFIC GRAVITY IS THE WEIGHT OF ANY MATERIAL IN PROPORTION TO THE WEIGHT OF AN EQUAL VOLUME OF WATER. CHECK YOUR SCIENCE TEXTBOOKS FOR MORE INFORMATION ON SPECIFIC GRAVITY.**

You have just learned some basic scientific methods that geologists use to distinguish minerals from each other. There are a number of other tests that these "Mineral Detectives" use to identify minerals and rocks. Certain minerals will "fizz" when hydrochloric acid or heated white vinegar is dropped on them; others will fluoresce (glow in the dark) when exposed to certain wavelengths of ultraviolet light. Certain minerals have a distinctive taste (halite, also known as salt, for example). Taste should **NEVER** be used as a test method in the classroom!!!

There are many books published that list the physical and chemical characteristics of the over 4,000 known minerals and the thousands of different rock types found on earth. For more information, visit your school library or local public library; book shops, and scientific supply catalogs. New mineral discoveries are made every year as we develop more sophisticated methods and equipment to measure individual mineral traits and characteristics.