

**Preparation for:  
Geology Merit Badge**



## **Earth Rocks**

**2 den meetings to complete**

### **Takeaways**

- Learning about the science of geology
- Identifying and testing rocks and minerals
- Performing geological investigations while upholding the values of Leave No Trace

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### **Complete the following requirements:**

1. Do the following:
  - a. Explain the meaning of the word “geology.”
  - b. Explain why this kind of science is an important part of your world.
2. Look for different kinds of rocks or minerals while on a rock hunt with your family or your den.
3. Do the following:
  - a. Identify the rocks you see on your rock hunt. Use the information in your handbook to determine which types of rocks you have collected.
  - b. With a magnifying glass, take a closer look at your collection. Determine any differences between your specimens.
  - c. Share what you see with your family or den.
4. Do the following:
  - a. With your family or den, make a mineral test kit, and test minerals according to the Mohs scale of mineral hardness.
  - b. Record the results in your handbook.
5. Identify on a map of your state some geological features in your area.
6. Do the following:
  - a. Identify some of the geological building materials used in building your home.
  - b. Identify some of the geological materials used around your community.

The first meeting of this adventure can be the den outing—a rock hunt around your den meeting site or other conveniently accessible location. Have the Webelos Scouts complete requirement 1 and bring the information with them to discuss at the outing.

## **1: Explain the meaning of the word Geology and why this kind of science is an important part of your world**

Geology means the study of the Earth, specifically the rocks of which it is composed, and the processes by which they change over time. Geology can also refer to the study of the solid features of any terrestrial planet or natural satellite, such as Mars or the Moon.

Geology describes the structure of the Earth beneath its surface, and the processes that have shaped that structure. It also provides tools to determine the relative and absolute ages of rocks found in a given location, and also to describe the histories of those rocks. By combining these tools, geologists are able to chronicle the geological history of the Earth as a whole, and also to demonstrate the age of the Earth. Geology provides the primary evidence for plate tectonics, the evolutionary history of life, and the Earth's past climates.

In practical terms, geology is important for mineral and hydrocarbon exploration and exploitation, evaluating water resources, understanding of natural hazards, the remediation of environmental problems, and providing insights into past climate change. Geology also plays a role in geotechnical engineering.

## **2: Look for different kinds of rocks or minerals while on a rock hunt with your family or your den**

## **3: Identify the rocks you see on your rock hunt**

### **Let's Go Rock Collecting**

Before going on your rock hunt, be sure to get permission slips from the parents. You will need to be aware of the clothing you wear. You will need to bring lunch, water, collecting bag, notebook, labels, tools, goggles or face shields and a first aid kit.

#### **Clothes**

Wear old comfortable clothes you would wear hiking. Ankle high hiking shoes will help prevent bruises from contact with sharp stones.

#### **Collecting bag**

A knapsack-type collecting bag is ideal. Use one with pockets to hold maps, notebooks, small tools and labels. Use lunch-size brown bags to hold specimens. Take along newspaper to wrap the rocks in first.

#### **Field notebooks and labels:**

As you collect each specimen, give it a number. Put the labels on the rock before you wrap it up. In a small pocket notebook list the following information: Name; Location; Date; Collector. Later at home you can enter the information in your permanent record.

## Tools:

1. Hammers: A geologist hammer weighing 1-2 pounds is a practical hammer to take along on your expedition.
2. Chisels: 1 or more steel chisels are essential collecting tools. Do NOT use wood working chisels, as they can become dull and nicked quickly.
3. Magnifiers: A good hand lens or pocket magnifier will help you identify many characteristics of rocks.
4. Compass: A good compass is an invaluable tool. Learn how to use one to keep from getting lost.
5. Goggles & Face Shields: These are important pieces of safety equipment to use while hammering. Your eyes will thank you.

## First Aid Kit:

Any trip away from home requires a first aid kit. Keep one handy.

## Remember:

1. Ask for permission before going on private property.
2. Don't meddle with tools, machinery or animals.
3. Leave gates as you found them.
4. Stay on roads, don't walk or drive over growing crops.
5. Take only what you will use for yourself; leave something for others after you. Be courteous and considerate of the rights of others, and leave things as you found them as much as possible.

## 4: Make a Scale of Mineral Hardness

### Hardness Scale

The classic scale for hardness was published in 1822 by Frederick Mohs, an Austrian mineralogist who got the basic concept from scratch tests performed routinely by miners. Since Mohs published the scale, it bears his name rather than that of the unknown genius who thought of it. The scale selects 10 minerals as standards, arranging in order of increasing hardness. These are:

1 = Talc	6 = Orthoclase
2 = Gypsum	7 = Quartz
3 = Calcite	8 = Topaz
4 = Fluorite	9 = Corundum
5 = Apatite (fluorapatite)	10 = Diamond

These minerals were selected for their abundance, as well as their differing hardness. The scale is uneven. For example: diamond at 10 is much harder than corundum at 9, while fluorite at 4 is only slightly higher than calcite at 3.

A more limited but practical scale can be easily and cheaply obtained by observing that

**....your fingernail has a hardness of 2.5,**

**....a penny has a hardness of about 3.5,**

**....glass and a steel nail have nearly equal hardnesses of 5.5 and**

**....a streak plate has a hardness of 6.5.**

If I carry a nail and streak plate with me and can scrounge up a penny, I've got a handy, light weight mineral testing lab in my pocket.

Doing hardness tests requires some technique. You need to find a good surface or edge on your unknown to test. Take care to make sure you are testing the right grain - not the bit of quartz right next to it. In some case it is easier to scratch the unknown across the standard. (the point of an unknown mineral grain across a calcite cleavage). In other cases it is easier to test the standard across the unknown (tip of a nail across cleavage surface of the unknown grain). In an ideal case, you should try to do both, to double check your findings. You need to press hard enough to good effect, but not so hard as to fracture either sample. Practice will help you get the proper level of stress to exert.

As a result of your test, you will look for a scratch. Rub aside any powder to see if a distinct scratch has been left. Calcite will leave a trail of powder across quartz. Rub away the powder and you'll see the quartz is unharmed. A hand lens will help you see the scratch. In this way you can bracket the hardness of your unknown between two of your standards (harder than a fingernail, softer than a penny). The ease with which one substance scratches another is also useful. Quartz easily scratches calcite, telling you of a large hardness difference. Quartz will scratch feldspar with much more difficulty. When testing a standard against an unknown that is of equal hardness, both substances will leave shallow scratches on each other.

# 5: With your family or den, identify on a road map of your state some geological features in your area



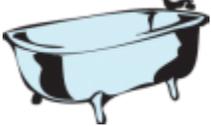
## 6: List some of the geologic materials used in building your home

Mineral	Product - Uses - Where Found
Aluminum	Aluminum foil, cosmetics, beverage cans, cooking pots, antacids, lotions
Chromium	Chrome fixtures (cars), stainless steel
Copper	Wires, pipes, cooking pots, brass, pennies
Fluorite (fluoride)	Toothpaste, drinking water
Gold	Dentistry, jewelry, computers, electronics
Gypsum	Wallboard, plaster
Halite (salt)	Table salt, preservatives, de-icers
Iron	Cosmetics, hair dye, steel, wrought iron
Lead	Car batteries, fuel tanks, TV tubes, x-ray shields, fishing sinkers
Nickel	Nickel coins, stainless steel, sheetrock
Perlite	Gardening
Silver	Photo developer, electronics, silverware, dentistry
Talc	Baby powder, antacids, primer
Tungsten	Filaments in light bulbs, drill bits
Zinc	Sun block, fertilizer, cosmetics, dandruff shampoo, pennies, dry-cell batteries

Hand out colored index cards with the materials listed - Aluminum, Calcium, Silicon or Boron, Lead or Zinc, Iron, Copper. Have a contest - which team can correctly locate the materials first. They have to stick the card on the part of the house that matches the card.

Aluminum (windows, doors), Calcium (cement), Silicon or Boron (glass), Lead or Zinc (pipes), Iron (nails, screws), Copper (gutters or wiring).

Match the minerals to the items they can be found in

- A.  Sunscreen \_\_\_\_\_
- B.  Chair \_\_\_\_\_
- C.  Trash Can \_\_\_\_\_
- D.  Bath Tub \_\_\_\_\_
- E.  Pencil \_\_\_\_\_
- F.  Watch \_\_\_\_\_
- G.  Hairspray \_\_\_\_\_
- H.  Cosmetics \_\_\_\_\_

1. Cassiterite
2. Chromite
3. Feldspar
4. Graphite
5. Quartz
6. Sulphur
7. Talc
8. Zincite

Key: A=8, B=6, C=2, D=3, E=4, F=5, G=1, H=7

<http://www.mineralogy4kids.org/?q=minerals-your-house>

# GEOLOGIST BADGE WITH MIKE WIMMER

At a Den meeting, I will bring 10 different items (some rocks, some minerals, and some other items.)

All participants will get a bag of goodies, which they keep.

Plus I show Dinosaur exhibits that I borrow from the museum.

You may invite BOTH boys and girls to your den or pack meeting if you like.

I tell facts that the museum and other geologists may Not tell you.

My presentation lasts approximately **60 minutes**.

I can use the GYM or go from room to room. In the summer, I can also set-up in your back yard.

I try to make boring rocks FUN!!!

I charge **\$3.00** per participant (the cost of materials.)

If you are outside of the Salt Lake area, there may be an additional gas expense.

I square dance every Thursday and Saturday night

Most other nights are free

## Mike Wimmer

Please email me at: [oquirrh3500@hotmail.com](mailto:oquirrh3500@hotmail.com)

or call me at: **801 - 964-1235** to schedule an appointment

