

LEARNING ACTIVITY:

MINERAL ELECTRICAL CONDUCTIVITY

Grades 7-12



People must mine minerals to provide all kinds of materials that we depend on in our lives. For example, wires and circuit boards used in electronics are made of mined minerals. Copper, which is refined from rocks containing copper sulfide and copper oxide, is the most common mineral used in electronics because it is an excellent electrical conductor.



Minerals and ores can pass electricity if they are *conductors*. Some are *semi-conductors*, which pass electricity only with proper conditions. Most minerals and ores are *insulators*—they do not allow electricity to pass through them.

The purpose of this activity is to test the conductivity of various minerals with a simple electrical circuit and draw conclusions about which ones would be used in electronics.

Materials

- A selection of minerals for testing, such as quartz, molybdenum, gypsum, marble, zinc, copper (from a penny), silver, galena, graphite (from a pencil), or others. All should be cleaned of varnish or tarnish
- Battery pack (four D-size)
- Lightweight electrical wire with ends stripped (or alligator clips) to serve as probes
- A flashlight-size light bulb, bell, or small buzzer
- Notebook and pen

Procedure

1. Explore and discuss how the conductivity tester works by completing a circuit with one of the test materials. Touch the wire from the battery pack and the wire from the bell to the test material. Electricity from the battery pack will need to move through wires to the bell, continue through the test mineral and back to the battery supply. If the circuit is complete, the bell will sound.
2. Complete the circuit with each of the test materials. Those materials that conduct electricity will make the bell sound, those that do not conduct electricity (insulators) will not make the bell sound.
3. Sharpen both ends of a graphite pencil. Test both the conductivity of the pencil's wood casing and the graphite core. A certain amount of clay may be mixed with the graphite core. The addition of clay makes the pencil's graphite core a poorer conductor than pure graphite.
4. Observe that the conductivity of minerals and materials is not based on what the material looks like. Record your observations about which materials are good conductors and which are insulators, based on the activity using various test minerals.
5. Discuss: It is important to realize that even a minor amount of tarnish or oxide coating on native silver or native copper can interrupt electrical continuity. Experimenters should



also be aware that some specimens are sold after they have been coated with a clear layer of varnish (to protect them from tarnishing). A coating of varnish will interrupt electrical continuity. Graphite is a good conductor even though it does not look like the metals.

6. Draw conclusions from your findings. Which minerals were the best conductors of electricity? What other characteristics of these minerals make them ideal for electrical wires or other new technologies?

For additional demonstrations of mineral properties, activities, mini-lessons, SMART board lessons, coloring pages, and videos, visit www.MineralsEducationCoalition.org.

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