



Identifying Rocks and Minerals Using the Mohs Hardness Test

Grades K – 12

Introduction

Some minerals are harder than others. The hardness of a mineral is a good tool for helping to identify it. You can also use other physical properties of an unknown mineral specimen — such as color, luster, streak, and specific gravity — to help identify it.

In 1812, a man named Fredrich Mohs invented a scale of hardness that later became known as the Mohs Scale, and is still used today. He selected ten standard minerals, and arranged them in order of increasing hardness. Talc is the softest, and diamond the hardest. Each mineral can scratch only those below it on the scale. In this activity, we will use the Mohs Hardness Test to compare the hardness of several minerals. The hardness of a mineral is a way of describing how easy or difficult it is to scratch the mineral.

Safety Suggestions

- Wear safety goggles or glasses.
- Wear protective clothing or an apron to protect clothing during this experiment. This activity will produce some powder from the substances tested.
- Do not put any of the materials used in this activity in your mouth.
- Do not put your hands on your face or near your mouth while doing this activity. Take care not to inhale any of the mineral particles and dust produced, and cover your work area with a sheet of brown paper or old newspaper.
- Caution: sharp objects. Be careful not to scratch yourself with the steel nail, and always work with an adult.
- At the conclusion of this activity, the paper used to cover the work area and any dust or mineral particles should be disposed of in the trash.

Materials

- 8 mineral samples, approximately 1 inch in size — possibilities include amethyst, azurite, calcite, lodestone, mica, pyrite, quartz, and talc (mineral study kits are available online for less than \$15)
- 1 fingernail (your own is fine!)
- 1 copper penny, dated 1982 or earlier
- 1 steel nail
- 1 sheet of graph paper
- 1 pencil
- Paper to cover your work area

Procedure

1. Create six columns across the top of the sheet of graph paper. Label the columns “Mineral,” “Fingernail (2.5),” “Copper (3),” “Steel (5.5),” “Quartz (7),” and “Hardness.” See the table that follows these procedures as an example.
2. In the table following these procedures, write the name of each mineral sample under the column headed “Mineral”. If needed, use a piece of graph paper to create a table for more minerals.
3. Cover your work area with paper.
4. Starting with the first mineral, test how hard it is by trying to scratch it — first with your fingernail, then the copper penny, then the nail, then the quartz. Be careful! Sometimes something that’s much softer than something else will leave a line of powder that looks a lot like a scratch. If you think you have a scratch, rub at it with your thumb. If it’s just powder, it’ll rub off, but if it’s really a scratch, it’ll still be there.
5. If you can scratch the mineral with your fingernail, put an “X” in the “Fingernail” column. If not, leave it blank and go on to the next column. If you can scratch the mineral with the penny, but an “X” in that

column. Keep going until you have tried to scratch the sample with all of your hardness testers. If nothing makes a scratch, leave all of the columns blank.

6. Your testing materials will leave a scratch if they are the same hardness as, or harder than, the sample. If you get a scratch, the hardness of the mineral is probably somewhere between the hardness of that testing material and the one before it. So, for example, if the quartz and the nail leave scratches on a sample but the penny doesn't, the hardness of the sample is most likely somewhere between copper (hardness 3) and steel (hardness 5.5). So, split the difference and call it a "4" on the Mohs Hardness Scale. Write this number down in the "Hardness" column.
7. If even the quartz will not make a scratch, your sample is harder than quartz (hardness 7), so write ">7" in the "Hardness" column. If all of the tests produce a scratch, your sample is softer than fingernails (hardness 2.5), so write "<2.5" in the "Hardness" column.
8. Repeat this procedure for all of your samples.
9. When you're done, turn the piece of paper over or use a new piece of paper and write a list of your mineral samples again. This time, list them in order of hardness, from softest (lowest number) to hardest (highest number). You now know the hardness of your samples compared with each other.

How does it work? Where's the chemistry?

Some minerals are harder than others because of how strongly their atoms are bound together. Hardness is one measure of the strength of the structure of the mineral compared to the strength of its chemical bonds. The hardest minerals are made of tiny particles that are held together very strongly.

What did you see?

Here is an example data table for this activity. The number of rows will depend upon how many mineral samples you have.

Mineral	Fingernail (2.5)	Copper (3)	Steel (5.5)	Quartz (7)	Hardness
1.					
2.					
3.					

References

- www.education.com/science-fair/article/mohs-hardness-test-minerals/