

Student's Card 1

MineralCheck

Module 1

Objective: Identification of mineral samples.

Introduction

Minerals surround us at every turn in our daily lives. Modern society depends on them because minerals are used to construct buildings and smart devices. Minerals are necessary to produce almost every item we use. There are over 4,500 different minerals on Earth, but only a little over ten are so common that make up to 90% of the mass of the Earth's crust. Each mineral has different properties by which it can be recognized. How come we do not know minerals better? Learn to correctly describe the mineral using teaching aids and identify it by answering questions in the Mineral Identification Key – MineralCheck and find out what we use it for in everyday life.

Necessities

- 1) Minerals to identify
- 2) Geological investigation kit (magnifying glass, copper coin, nail, glass pane, ceramic tile, magnet, force measuring device, net, a glass and a dropper with 10% hydrochloric acid - HCl).
- 3) Worksheet for describing the properties of minerals (Appendix 2).
- 4) Teaching aids (Appendix 3)
- 5) Mineral identification key - MineralCheck (Appendix 4)

Lab Procedure

You will identify minerals by observing and testing their properties. First, use a teaching aids to determine different properties of a mineral and write your findings on the prepared worksheet. Be accurate in observing the mineral and pay attention to small differences. Have a wide and open mind. Always use a teaching aid to help you decide.

- Describe each **mineral shape** by comparing it to geometric forms.
- Determine **lustre**, which is a property that tells us how much light is reflected from the mineral surface.
- Describe the **colour** of the mineral in one or more words. Mineral colour is often not the defining characteristic of minerals.
- More important is the **streak colour**. Drag one edge of a mineral across a ceramic tile. In this way, you powder the mineral, and even if two of the same minerals are coloured differently, the streak colour is always the same. Examine the streak (line) to determine its colour and to confirm that it is a powder and not grains or fragments of mineral.
- You can describe the property of **transparency** by observing how much light passes through a mineral. Through a transparent mineral we can view objects, translucent are those where the outlines of objects viewed through the mineral are not sharp, opaque are those that do not allow light to pass through (these are usually metallic minerals).

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- **Cleavage** is a property of minerals that, when subjected to force, cleave certain surfaces that are parallel to one of the crystalline surfaces (the inner surfaces of weakness). Do not break the mineral! Instead, look at the pictures in the learning aid in Appendix 3.
- When describing mineral **hardness** in the MineralCheck toolkit, we mean relative hardness, which tells us whether the mineral is harder than the other minerals or everyday objects with known hardness we are comparing its hardness to. To perform the hardness test, place the mineral on a tabletop and place a tip of the reference object against a flat, unmarked surface of the unknown mineral. Press the reference object firmly against the mineral and intentionally drag it across the flat surface. In the case of a glass slide, drag the mineral against the glass. If the object scratches the mineral or vice versa, it means that the mineral or object has a lower hardness than the object.
- To determine **specific gravity**, you need a net for a mineral, a glass/container with water and a force meter. Place mineral in a net and then hung on the force meter. First, measure the strain (weight in N) in air. Then completely submerge the net with the mineral in water and also measure the strain (weight in N) in the water. Use the formula below to calculate the specific gravity of the mineral.

$$\text{Specific gravity} = \frac{\text{weight of the object in air}}{\text{weight of the object in air} - \text{weight of the object in water}}$$

- The **magnetism** of the mineral is determined by observing whether the observed mineral and a magnet attract each other.
- When you drop **HCl** on a mineral, observe if you notice bubbles on the surface. This is a sign that a **reaction** has occurred.
- We also describe **sensory properties**. These are the properties that we can perceive with our senses, such as the smell, taste or feel of the mineral. For example, is mineral light, heavy, warm, cold, or does it have some other specific feeling?

Once you have described the properties of all the minerals, use the Mineral Identification Key – MineralCheck to determine the names of the minerals. Answer the questions in the key based on the properties described and compare the properties of the different minerals in the table. When you have found your mineral, write down its name and classification of mineral according to use on the worksheet. Then find the uses of the minerals you identified on the Internet and discuss them with your teacher.

Additional Safety Notes



Work with the investigation kit:

- You need to be careful with the glass and the streak plate - not to break it or cut yourself.
- You need to be careful with the nail or some other iron object, so you do not cut or stab yourself.
- Since working with acids is dangerous, use only dilute hydrochloric acid. We use 10% or 1 molar HCl. Alcoholic vinegar can also be used instead of HCl. In this case, the reaction is somewhat less turbulent.

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Calculations

For calculations with this experiment, we use Archimedes' Principle. Archimedes discovered that the weight of body in air minus its weight in water is equivalent to the weight of the water displaced by the body. When a body is placed in water, the volume of water displaced is equal to the volume of the body. When the body is placed in water that it undergoes an apparent loss of weight. This loss of weight is equal to the weight of the water displaced.

loss of weight in water = weight of the object in air – weight of the object in water

So, all we need to do is weigh the object in air first and then suspend it in water for the second weighing. And then use this formula to calculate the specific gravity:

$$\text{Specific gravity} = \frac{\text{weight of the object in air}}{\text{weight of the object in air} - \text{weight of the object in water}}$$

Questions/Quiz



What is a mineral?

What are Mineral resources?

Can minerals be identified only by their colour?

When describing minerals, which of the properties is more important: the colour of the mineral or the colour of the mineral streak and why?

What does the relative hardness of the mineral tell us? Which scale of relative hardness of minerals do you know?