Name: _____ Date: _____

Properties of Minerals

Science Literacy Article

Minerals are solid, inorganic substances that occur naturally. Most minerals are compounds of two or more elements (i.e. quartz – SiO_2), but some are made up of a single element (i.e. gold – Au). Minerals are also the building blocks for making rocks. Most rocks contain a mixture of several different minerals. However, unlike the rocks they are found in, all minerals have a definite chemical composition and crystalline structure. Scientists can identify minerals using some key properties:

- **Hardness** is the ability of a mineral to resist scratching. The Mohs Scale of Mineral Hardness ranks minerals from *1 (softest) to 10 (hardest)* based on their scratch resistance. Talc is the softest mineral because it cannot scratch anything greater than a 1. Diamonds are the hardest mineral and can scratch anything less than 10.
    - To determine the hardness of a mineral, hold the mineral firmly and *try to scratch it with another object of known hardness* (i.e. fingernail – hardness of 2.5). Look for a scratch line on the mineral. You may have to rub your finger over the line to feel if there is a scratch. If the mineral was *able to be scratched*, then it is *softer* than the other object. If the mineral was *not able to be scratched*, then it is *harder* than the other object. Repeat the process with other objects of known hardness to determine the approximate hardness of the mineral sample.
- **Luster** is the way in which a mineral reflects light. You can test the luster of a mineral by holding a sample of the mineral up to a light or shining a light on the surface of the mineral. The two main categories of luster are:
    - **Metallic** luster refers to minerals that have the look of metal or a silvery appearance.
    - **Nonmetallic** luster refers to minerals that are vitreous (look of glass), greasy (look of oil coated substance), resinous (look of resin), silky (look of silk), pearly (look of pearl), adamantine (look of diamond), and earthy (dull look).
- **Color** is the appearance of a mineral due to the absorption and reflection of certain light rays. Generally color is not a good property to be used when identifying minerals because many minerals exist in *different* colors. For example, the mineral fluorite typically exists in the colors purple, green, and yellow but it can also be found in colorless, blue, red, and even black.
- **Streak** is the color of a mineral in powder form. The color of the powder may *differ* from the actual color of the mineral. In order to test the streak of a mineral, firmly drag a mineral sample across a streak plate (like you are drawing with it) and observe the *color of the streak that the mineral leaves on the plate* (this is the powder). Most streak plates have a hardness of 6.5 – 7. Therefore, *minerals that are harder than a streak plate* (6.5 – 7) are said to have "*no streak*" or "*colorless streak*."
- Every mineral that exists has a **crystal structure**. Crystals are solids in which the atoms are arranged in an orderly, repeating, three-dimensional pattern. There are many types of crystal structure.

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- **Cleavage** is the tendency of a mineral to split along flat, smooth surfaces. The cleavage of a mineral is *determined by its crystal structure*. Not all minerals have cleavage, but those that do generally split along 1, 2, 3, or 4 surfaces.
- **Fracture** is the manner in which a mineral breaks along an irregular surface. All minerals exhibit fracture. Fracture differs from cleavage because it is the *"chipping" shape left when a mineral breaks*. There are many different ways that minerals fracture.

To recap, here are the most commonly used properties to identify minerals:

1. **Hardness** – how hard a mineral is (on a scale from 1-10)
2. **Luster** – the shininess of a mineral
3. **Color** – the color of a mineral
4. **Streak** – the color of the powder left behind on a streak plate
5. **Crystal structure** – the pattern created in the structure of the mineral
6. **Cleavage** – when a mineral breaks into flat, smooth surfaces
7. **Fracture** – the way that a mineral breaks on an irregular surface

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