Unit 3 Lesson 1 Minerals
Animal, Vegetable, or Mineral?

What do minerals have in common?

• Not all minerals are sparkling gems, but they all have certain characteristics in common.

• A **mineral** is a naturally occurring, inorganic solid with a definite crystalline structure and chemical composition.
What do minerals have in common?

• All minerals contain one or more elements, which are pure substances that cannot be broken down into simpler substances by chemical means.

• Each element is made up of one kind of atom, the building block of matter.

• Stable particles that are made up of strongly bonded atoms are called molecules.
What do minerals have in common?

• A substance made up of molecules of two or more elements is called a **compound**.

• The chemical composition of a mineral is determined by the element or compound that makes up the mineral.

• A mineral composed of only one element is called a **native element**.
What do minerals have in common?

- In the mineral quartz, each silicon atom forms a bond with up to four oxygen atoms.
What do minerals have in common?

• **Matter** is anything that has mass and volume.

• **Volume** refers to the amount of space something takes up.

• All minerals are solid, meaning each has a definite volume and shape.
What do minerals have in common?

• All minerals are inorganic, which means they are not produced by living things or from the remains of living things.

• All minerals are naturally occurring.
What do minerals have in common?

• All minerals form **crystals**, which are solid geometric forms produced by a repeating pattern of atoms or molecules.
How are minerals formed?

- The type of mineral that forms depends on the elements present in the area and the temperature and pressure.

- Many minerals form from magma, which is molten rock inside Earth. As magma cools, the atoms join together to form different minerals.

- Minerals also form from lava, which is molten rock that has reached Earth’s surface.
How are minerals formed?

• Many minerals form by metamorphism.

• High temperature and pressure within Earth cause new minerals to form as bonds between atoms break and reform with different atoms.
How are minerals formed?

• Minerals also form from solutions.

• Water usually has substances dissolved in it. As it evaporates, these substances form into solids and come out of solution, or precipitate.

• As hot water cools, dissolved substances may precipitate out of solution.
How are minerals classified?

- Minerals are usually classified based on their chemical composition as silicate or nonsilicate minerals.

- Most common minerals are *silicate minerals*, containing a combination of silicon and oxygen.

- Most silicate minerals are formed from *silicate tetrahedrons*, each made of one silicon atom bonded to four oxygen atoms.
How are minerals classified?

- *Nonsilicate minerals* are minerals that do not contain the silicate tetrahedron building block.

- Groups of nonsilicate minerals include native elements, halides, sulfates, carbonates, oxides, and sulfides.
Name That Mineral!

What properties can be used to identify minerals?

• Color is helpful, but not the best way to identify a mineral.

• The color of the powdered form of a mineral is its **streak**, found by rubbing it against a white tile **streak plate**.

• The way a surface reflects light is called **luster**. Two major types of luster are metallic and nonmetallic.
What properties can be used to identify minerals?

• The tendency of a mineral to split along specific planes of weakness to form smooth, flat surfaces is called **cleavage**.

• A mineral with cleavage breaks along flat surfaces that generally run parallel to planes of weakness in the crystal structure.

• Minerals that don’t have cleavage will fracture, or break unevenly, along curved or jagged surfaces.
What properties can be used to identify minerals?

- *Density*, which is the amount of matter in a given amount of space, can be used to tell many similar-looking minerals apart.

- A mineral’s resistance to being scratched is called its *hardness*. Mineral hardness is compared using the Mohs hardness scale.

- A few minerals exhibit special properties such as magnetism.
Made from Minerals

- Many useful substances come from minerals.

- The metal titanium comes from several minerals, including rutile.

- Titanium is very valuable because it resists corrosion and is as strong as steel, but is much lighter than steel.
Made from Minerals

- Titanium is used for surgical devices because it resists corrosion and has elasticity similar to human bone.

- Titanium dissipates heat, making it ideal for exhaust pipes.

- Titanium is also valued for its shiny metallic luster, so it has also been used in architectural designs.