Minerals are the source of gemstones, metals, and a variety of materials used to make many products.

Usually, a gemstone is a hard, colorful mineral that has a brilliant or glassy luster. People value gemstones for their color, luster, and durability, and for the fact that they are rare.

Once a gemstone is cut and polished, it is called a gem. Gems are used mainly for jewelry and decoration. They are also used for mechanical parts and for grinding and polishing.

Some minerals are the sources of metals such as aluminum, iron, copper, or silver. Metals are useful because they can be stretched into wire (ductile), flattened into sheets, and hammered or molded without breaking (malleable).

Metals: metal tools and machinery, the metal filament in a light bulb, aluminum foil, and the steel beams used to frame office buildings all began as minerals inside Earth’s crust.

There are many other useful minerals besides metals and gems. People use materials from these minerals in foods, medicines, fertilizers, and building materials. Ex. Talc is in powder; Calcite is used in optical instruments like microscopes; Quartz is in glass, electronic equipment & watches; Gypsum is in wallboard, stucco and cement.

To produce metal from a mineral:
A rock containing the mineral must be located through prospecting→ mined, or removed from the ground →
Then the rock must be processed to extract the metal.

An **ore** is a rock that contains a metal or other useful mineral that can be mined and sold at a profit. Most metals do **not** occur in pure form. A metal usually occurs as a mineral that is a combination of those metal & other elements. Ex. Copper comes from ores containing the mineral Chalcopyrite (which also contains iron & sulfur).

A **prospector** is anyone who searches, or prospects, for an ore deposit.

Geologists prospect for ores by:
1. observing rocks on the land surface
2. studying maps of rocks beneath the surface.

Geologists’ make careful measurements of Earth’s magnetic field over the deposit to map the ore deposit. This helps miners decide how to remove the ore from the ground.

There are three types of mines:
1. **strip mines**- In strip mining, earthmoving equipment scrapes away soil to expose ore on the surface.

2. **open pit mines**- In open pit mining, miners use giant earthmoving equipment to dig a tremendous **pit** which start on the surface & extend deep under ground and remove ore deposits.

3. **shaft mines**- For ore deposits that occur in **veins**, miners dig shaft mines. Shaft mines often have a network of tunnels that start at the surface and extend deep into the ground, following the veins of ores.
Smelting is the process in which useful metals are extracted from ores. This process is linked to metals found as early as 4000 BC.

an ore is mixed with other substances → then melted to separate the useful metal from other elements the ore contains → AFTER smelting, additional processing is needed to remove impurities from the metal → a small amount of carbon may be added to it → the result is an alloy, a solid mixture of two or more elements, at least one of which is a metal. To be considered an alloy, the mixture must have the characteristic properties of a metal. Alloys have special properties: stronger (add manganese), rust-resistant (add chromium & nickel).

The smelting of Iron ore is as follows:
1. Iron ore is crushed and mixed with limestone & coke (coal) →
2. The mixture is placed in a blast furnace → hot air is blown in to make coke burn →
3. Burning produces chemical changes in the mixture → carbon dioxide gas and molten iron are produced →
4. Denser molten iron sinks to bottom or the furnace → impurities left in the ore combine with limestone to produce slag →
5. Slag & molten iron are poured off through taps.