



**IQRA NATIONAL UNIVERSITY**

# **ENGINEERING GEOLOGY**

## **Lecture 04**

**Minerals and identification of minerals & properties**

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## GOAL

**To examine what a mineral is, and what criteria must be met for a substance to be considered a mineral.**

**WHAT ARE MINERALS?**

# MINERALS

In the most basic sense minerals are the building blocks of the rocks.

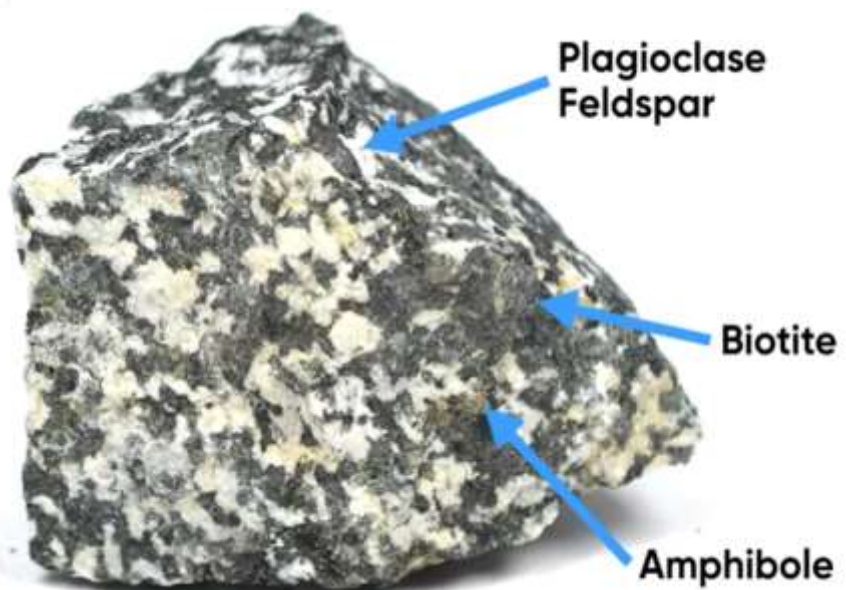
They are; what makeup the rocks we find on the surface of the earth.

Minerals are solid substances that are present in nature and can be made of one element or more elements combined together (chemical compounds).



Igneous Rock

# Diorite



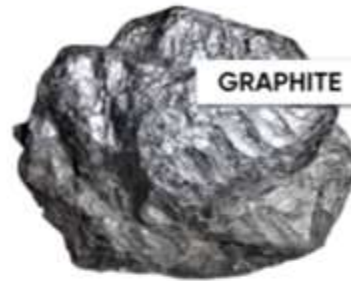
# COMMON MINERALS



PYRITE



SULFUR



GRAPHITE



GARNET



QUARTZ



GALENA



GYPSUM



MAGNETITE



OLIVINE



ORTHOCLASE



# Uses of Minerals



Graphite



But what makes a mineral a mineral?

# **5 CRITERIA**





**The substance must exist  
as a solid under normal  
conditions on Earth.**



**The substance must be naturally occurring on Earth, not man-made.**

#3

The substance must be **inorganic**, not living or made from living things.



**The substance must have  
a **fixed chemical formula**,  
made of a specific  
combination of elements.**

#5

**The atoms making up the substance must be arranged in an specific structure.**

# Is this a mineral?

- Solid
- Naturally Occurring
- Inorganic
- Fixed Chemical Formula
- Specific Atomic Structure

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# Specific Atomic Structure

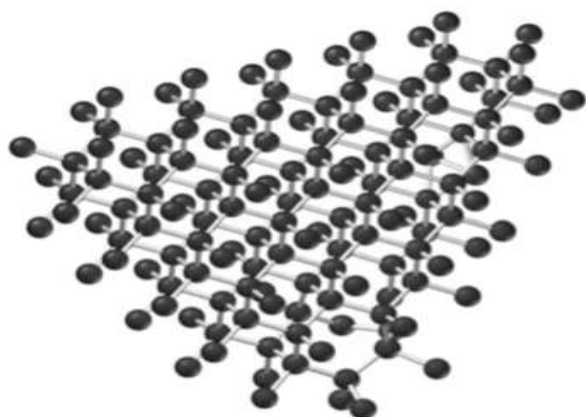
All physical properties  
of a mineral are the  
result of the **internal  
arrangement of atoms.**



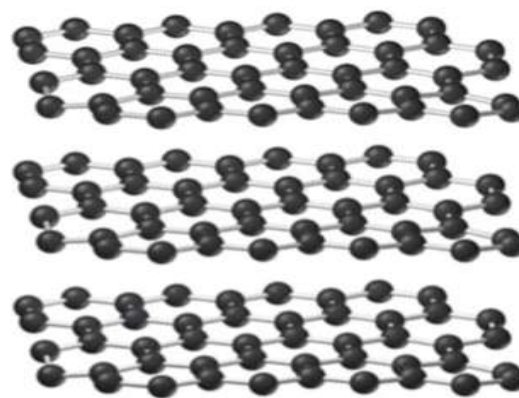
**Diamond**  
**(C)**



**Graphite**  
**(C)**



**Diamond**  
**(C)**



**Graphite**  
**(C)**



# Summary

Minerals must be solid, naturally occurring, inorganic, with specific chemical composition and atomic arrangements.

## GOAL

**To explore minerals' physical characteristics and ways to use them for mineral identification.**

# COLOR

The visible color that a mineral sample appears to the naked eye.

Color is not a reliable characteristic to use for mineral identification.





**All of these samples are Quartz**



# STREAK

The color of the mineral in its powdered form.

Streak is tested by rubbing a sample against an unglazed ceramic streak plate.



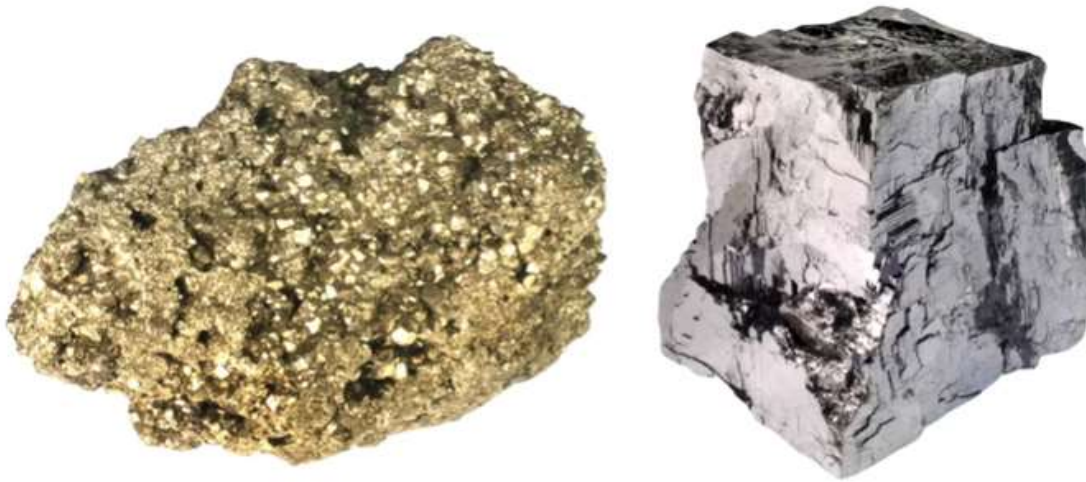
# LUSTER

The way in which light reflects off of a mineral's surface.

The two main types are **metallic** and **nonmetallic**.

Additional lusters include vitreous, resinous, pearly, greasy, silky, adamantine, dull, and waxy.





**Metallic Luster**



**Nonmetallic Luster**



# BREAKAGE

The way in which a mineral sample will tend to break.

Minerals that display **cleavage** break along smooth planes parallel to zones of weak bonding.

Minerals that display **fracture** tend to break along curved surfaces without a definite shape.



**Cleavage**

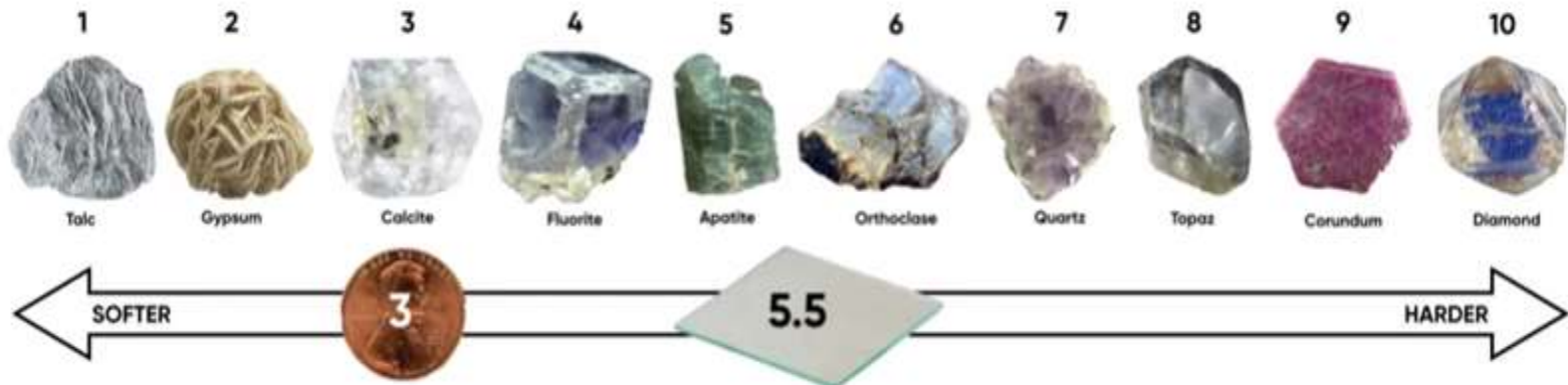


**Fracture**

# HARDNESS

Hardness is a mineral's resistance to being scratched.

## Moh's Scale of HARDNESS



**END OF THE LECTURE**

