7th Grade Unit 2: Earth’s Structures

lesson 1: What are minerals, how do they form, and how can they be identified?

mineral- a naturally occurring, usually, solid with a crystalline structure and definite

chemical composition

* chemical composition
  + elements­- a pure substance made of one kind of atom (ex. Gold)
  + atom- the smallest building block of matter
  + molecule- 2 or more atoms bound together
  + compound- a substance made of 2 or more kinds of atoms or molecules
  + mineral composition is determined by the element or compound that

makes that mineral

* solid
  + matter- anything that has volume (takes up space) and mass; made of atoms
  + liquid and gas aren’t minerals but the solid form of the substance can be
  + ex. water and steam are not but ice is a mineral (crystal structure, etc.)
* inorganic- not from living things (except kidney stones)
* naturally occurring- not made by people or in a lab
* crystalline structure
  + crystal- a solid geometric form that results from a repeating pattern

in the atoms or molecules

* + diamonds and pencil lead (graphite) both made of carbon atoms

they are just arranged in different crystal structures

|  |  |  |
| --- | --- | --- |
|  | Cardboard | Topaz |
| def. chem. comp. | N | Y |
| solid | Y | Y |
| inorganic | N | Y |
| naturally occurring | N | Y |
| crystalline struc. | N | Y |
| MINERAL | N | Y |

Mineral formation happens:

* as magma cools the atoms in it can form into crystal shapes making minerals
* by metamorphism as temp and pressure cause atomic bonds to form and break

(ex. graphite becomes diamond)

* from solutions; substances dissolved in water form solids (precipitate) when they

leave the solution

2 main groups on minerals:

* silicates-minerals that contain oxygen and silicon atoms
  + make up most of Earth’s crust
  + feldspar, quartz, and mica
* non-silicate minerals- minerals that don’t have a tetrahedron shape (no silicon)
  + contain carbon, oxygen, fluorine, iron, and sulfur
  + 6 classes:
    - native element-one type of atom (gold)
    - halides-have fluorine and chlorine (fluorite)
    - sulfates- have sulfur combined w/ oxygen (barite)
    - carbonates- have carbon (calcite)
    - oxides- have iron (corundum)
    - sulfides- have sulfur combined w/ another atom (pyrite)

Minerals are identified by their properties

* + color, luster, hardness, streak, cleavage, and fracture
  + color:
    - color tells you the chemical composition or the atoms in the mineral
    - different minerals can be the same color so it’s not the best way

to identify

* luster- the way a surface reflects light (shiny or dull)
  + metallic or nonmetallic
  + silky, waxy, pearly, earthy
* streak- the color of the powdered form of a mineral
  + streak plate is the tile you rub the mineral rock on
  + not all streaks are the same color as the mineral in rock form
  + a good way to identify a mineral
* cleavage- the tendency of a mineral to split along flat planes and make smooth

flat surface

* fracture breaks that don’t happen along a flat plane
* density is how much mass is in a given volume
* can be used to tell similar looking minerals apart
* gold density of 19 g/cm³ and the similar pyrite ‘fools gold’ 5 g/cm³
* special properties
* magnetic, clear (transparent), glow in UV light, refract (bend) light
* Hardness
  + measured by the Mohs hardness scale

(add in printed table)

*lesson 2&3: What is the rock cycle? How do rocks form?*

*vocab: weathering, erosion, deposition, igneous rock, sedimentary rock, metamorphic rock,*

*rock cycle, uplift, subsidence, rift zone, composition, texture*

A rock:

* can be made from organic sources (petrified wood, amber)
* can be made of several types of minerals
* can be made from non-organic & non-mineral things (glass)

rock- a combination of 1 or more minerals or organic material

Rocks are classified by:

* composition- make up; the materials in an object
  + most rocks contain silicate minerals (quartz, feldspar, mica)
  + limestone is mostly calcite
* texture- the size, shape, and position of the grains that make up a rock
  + course texture= large grains
  + fine texture= small grains
  + gives clue to how the rock formed

Processes that change rock:

* weathering- process the water, wind, ice, and temp. change breakdown rock
  + creates sediment (sand, pebbles, etc.) [tiny fragments of rock]
* erosion- process of moving sediment from one place to another by water, wind,

ice (glaciers), or gravity

* deposition- the process of the sediment coming to rest in a new location
* temp. and pressure
  + rock buried under layers of sediment get squeezed and cemented together
  + high temp can soften the rock allowing it to change
* melting and cooling

3 classes of rock:

* igneous rock- rock formed from cooled magma or lava
  + magma-melted rock below Earth’s surface
  + lava- melted rock above Earth’s surface
  + 2 kinds of igneous rock:
    - intrusive igneous rock- forms from magma under the surface
      * cools really slowly so it forms large mineral crystals
      * ex. granite
* extrusive igneous rock- forms from lava above the surface
* cools fast so very small or no crystals form
* can have a spongy appearance from trapped gases
* ex. basalt, pumice, obsidian
* sedimentary rock- rock that forms when minerals from a solution or sediment

get pressed and cemented together

* happens mainly near the surface
* made by weathering, erosion, deposition, and cementation
* 3 kinds of sedimentary rock:
  + clastic sedimentary rock
    - “clast”=chunk or piece
    - made from sediment cemented by pressure
    - ex. shale, sandstone, conglomerate, breccia
* chemical sedimentary rock
  + form as water evaporates (leaves behind salt or other

minerals)

* + ex. halite
* organic sedimentary rock
  + form from the remains of once living things
  + ex. limestone from microscopic shellfish
  + ex. coal from buried plant material after millions of years
* the only type of rock where fossils are found; once living things get

buried in sediment and turn to rock over time

* rock created in layers
* metamorphic rock- forms from pressure, temperature, or chemical processes changing

the rock

* forms deep in the crust over millions of years
* created when another rock gets changed by pressure, temp., chemical reaction, or

a fluid affecting the original rock

* 2 kinds of metamorphic rock:
  + foliated metamorphic rock- grains are arranged in plains or bands

called foliation; form in the direction the pressure has moved; looks

like stripes (ex. sedimentary rock called shale becomes slate, then schist

, then gneiss [nice])

* + nonfoliated metamorphic rock- doesn’t have mineral grains in plains (stripes);

usually made from one or just a few minerals (ex. sedimentary quartz sandstone

becomes quartzite and sedimentary limestone becomes marble)

rock cycle- the series of processes that changes one type of rock into another

melting and cooling- igneous rock

weathering, erosion, deposition, and cementation- sedimentary rock

temperature and pressure- metamorphic rock

Tectonic plate motion can affect rock

uplift- the rising of regions of the crust to higher elevation

subsidence- the sinking of regions of the crust to lower elevation

* uplift makes erosion happen faster while subsidence creates basins (bowls) where

sediment can be deposited

rift zone- a area created when plates of rock pull apart to form deep cracks

* when the rock pulls apart a section drops down and the crack can fill with lava/magma