	10.1 Rocks and the Rock Cycle
Intro	 Magma is the parent material for all rocks. Once the magma cools and hardens, many changes can
	 Occur. Geology: the study of the origin, history, structure, and the forces that shape the solid earth.
3 Major Types of Rock	 Igneous Sedimentary Metamorphic
Igneous Rock	 Metamorphic Formed when magma cools and hardens
	Igneous means "from fire" in Latin
Sedimentary Rock	•Rock, minerals, and organic matter that have been broken down into fragments known as sediment.
	•When sediment deposits harden after being <u>compressed</u> or <u>cemented</u> together, they form sedimentary rock.
Metamorphic Rock	 Certain forces and processes can change rock into another form.
	•Tremendous <u>pressure</u> , extreme <u>heat</u> , and <u>chemical processes</u> can create metamorphic rock.
The Rock Cycle	•Any of the 3 types of rock can be changed into any other type by geologic activity.
	•This series of changes is called the rock cycle. •(See page 177 for a good illustration.)
	Deposition Deposition
	Lithification Uplift & Exposure Lithification Uplift & Exposure Lithification Lithific
	Consolidation Igneous Rocks (Intrusive)
	Metamorphic Rocks Crystallization Melting Magma

	Chapter 10, Section 2 - Igneous Rock
Intrusive vs. Extrusive	•Intrusive igneous rocks form when magma cools deep below the surface.
	•Extrusive igneous rocks form when lava cools rapidly on the surface.
	 Intrusive and extrusive rocks differ mainly in the size of their crystalline mineral masses (or grains).
Texture of Igneous Rocks	 Crystal size gives the rocks texture.
	Intrusive rocks cool slowly underground
	•Cool slowly = large crystals.
	 Large crystals = coarse-grained texture.
	•Extrusive rocks cool rapidly on the surface
	 Rapid cooling = small crystals.
	•Small crystals = fine-grained texture.
Lava Glass	•When highly viscous, silica-rich magma cools rapidly, crystals don't have time to form.
	 Obsidian is formed this way.
Got Gas? Cool Fast!	 When magma with lots of dissolved gases cools rapidly, the gases become trapped in the rock.
	 This produces a rock full of holes, like pumice.
Mixed large & small crystals	 porphyritic texture = a mix of large and small crystals . Because
	 Some igneous rocks form from magma that cools slowly at first, then rapidly as it nears the surface.
	•This produces large crystals surrounded by smaller crystals.
Composition of Igneous Rocks	•felsic: high silica, light color. Main mineral components are orthoclase feldspar and quartz.
	•intermediate: medium-colored made of plagioclase feldspar, hornblende, pyroxene minerals and biotite mica.
	•mafic: low silica, lots of iron and magnesium. Main minerals are plagioclase feldspar and pyroxene minerals. Dark color (usually).

Igneous Rock Structures •Intrusions vs extrusions	 Intrusions = igneous rock that form underground. Extrusions = igneous rock formed on the surface.
Intrusions	 Batholith: largest. Means "deep rock". At least 100 square km. Stock: less than 100 square km. Laccolith: "lake of rock". Dome or arc of rock pushed up. Sill: parallel layers of hardened magma. Dike: vertical layers of hardened magma.
Extrusions	 •Volcano: extrusive rock surrounding a central vent. •Solid central vent of an eroded volcano is called a volcanic neck. •Lava plateau: when lava spreads out and fills a large area, covering hills & valleys. Comparing Intrusions & Extrusions

r

	Chapter 10, Section 3 - Sedimentary Rock
What is sediment?	•Most sedimentary rock is made up of combinations of different types of sediment , which is loose fragments of rock, minerals, and organic materials.
What processes turn sediment into sediment into rock?	•Two main processes convert loose sediment into sedimentary rock— <u>compaction</u> and <u>cementation</u> .
	•compaction sediment is buried beneath other layers and the pressure forces fragments together
	•cementation dissolved minerals bind sediment grains together to form rock
Formation of Sedimentary Rocks	 There are three main classes of sedimentary rocks Clastic: forms from deposited fragments compacted and/or cemented together. Chemical: formed from minerals that precipitate from water. Organic: forms from the remains of organisms.
Types of Sedimentary Rock Clastic Sedimentary Rocks	•clastic sedimentary rock forms when fragments of preexisting rocks are compacted or cemented together
	• <u>classified by the size</u>
	 conglomerate: rock that contains <u>large</u>, rounded pieces breccia rock that contains <u>large</u>, angular pieces sandstone rock composed of sand-sized grains shale rock composed of clay-sized particles
Chemical Sedimentary Rocks	•chemical sedimentary rock rock that forms when minerals precipitate (or settle) from a solution
Evaporites	 When water evaporates, the minerals that were dissolved in the water are left behind. Rocks that form through evaporation are called <i>evaporites</i>. Gypsum and halite are common evaporites.

Organic Sedimentary Rocks	 •organic sedimentary rock rock that forms from the remains of plants or animals •Examples: coal and some limestones •Coal forms from decayed plant remains that are compacted into carbon.
	•Organic limestones form when marine organisms, such as coral, clams, oysters, and plankton, remove the minerals calcite and aragonite from sea water. When they die, their shells become limestone.
	celled marine organisms.
Sedimentary Rock Features	 Sedimentary rocks have a number of easily identifiable features.
	 Stratification (layering)
	•Ripple marks
	•Mud cracks
	•Fossils
	•Concretions
Stratification	•Layering of sedimentary rock is called <i>stratification</i> . Stratified layers, also called <i>beds</i> , vary in thickness and composition.
	 Stratification occurs when the conditions of sediment deposition change.
Ripple Marks	•Ripple marks form when air or water flows over sand to form ripples, and the ripples are preserved in the rock. Ripple marks form at the beach or on a river bed.
Mud Cracks	 Mud cracks form when muddy deposits dry and shrink. The shrinking causes the drying mud to crack. Mud cracks form on river floodplains or on dry lake beds.
Fossils	 Fossils are the remains of organisms that are preserved in rock
Concretions	•Concretions are lumps of minerals that precipitate from fluids and build up around a nucleus or in a cavity in existing rock
	• i ne crystal cavities are called <i>geodes</i> .

	Chapter 10, Section 4 - Metamorphic Rock
Metamorphism	•The changing of one type of rock to another by <u>heat</u> , <u>pressure</u> , and <u>chemical processes</u> is called metamorphism .
	•Most metamorphic rock forms deep beneath the surface of the earth.
	•All metamorphic rock is formed from existing igneous, sedimentary, or metamorphic rock.
Formation of Metamorphic Rocks	•Contact metamorphism: rock that comes into contact with magma.
	• Regional metamorphism : tectonic activity (plate movement) causes tremendous heat and pressure in rocks at plate edges.
	•Most metamorphic rock is formed by <u>regional metamorphism</u> .
Classification of Metamorphic Rocks	•foliated or nonfoliated?
	•Nonfoliated = no stripes
Foliated Rocks	 Can form in one of 2 ways
(striped/banded)	• <u>Extreme pressure</u> can flatten the minerals in the original rock and push them into parallel bands (stripes).
	 Foliation can also occur when minerals of <u>different densities</u> <u>separate</u> into bands.
	•Examples: slate, schist, gneiss
Nonfoliated Rocks	•No bands of crystals (no strings)
(no stripes/no bands)	•Quartzite = metamorphosed sandstone. Heat and pressure recrystallize the sandstone so the spaces between the grains disappear. Quartzite is very durable and weathers very slowly.
	•Marble = metamorphic rock formed from the compression of limestone.