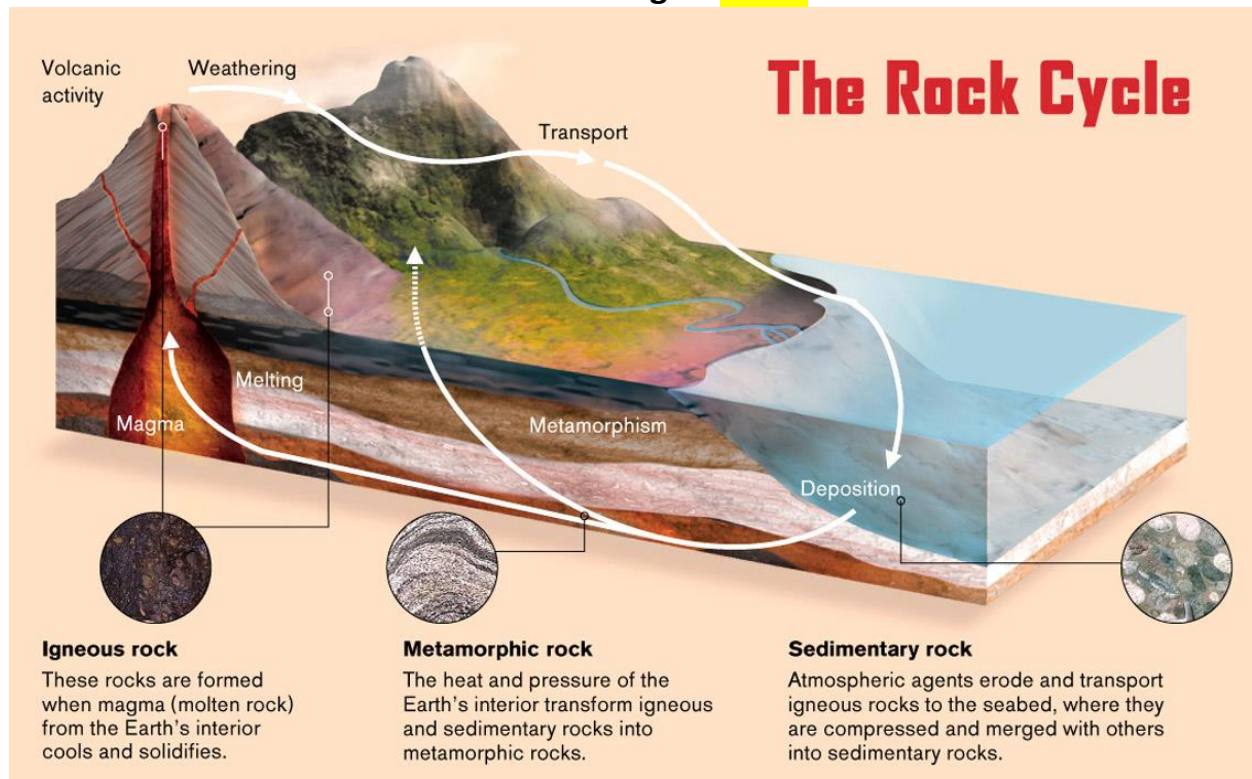


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Earth Science 11: Metamorphic Rocks

Textbook Pages: 66-71



Metamorphism: when a rock encounters physical or chemical conditions significantly different from those it formed in.

- the rock changes state until an equilibrium with the new environment is reached.


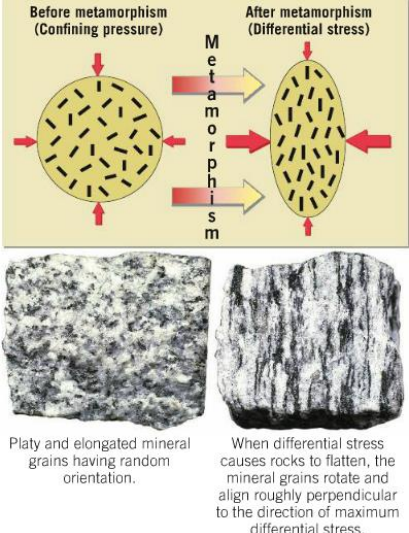
Metamorphism causes changes in:

- rock texture (grain size)
- chemical composition (the minerals present)
- internal structure (density and porosity).

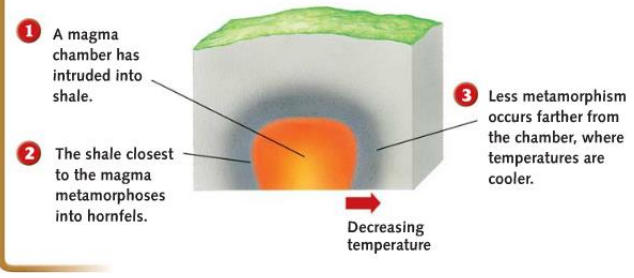
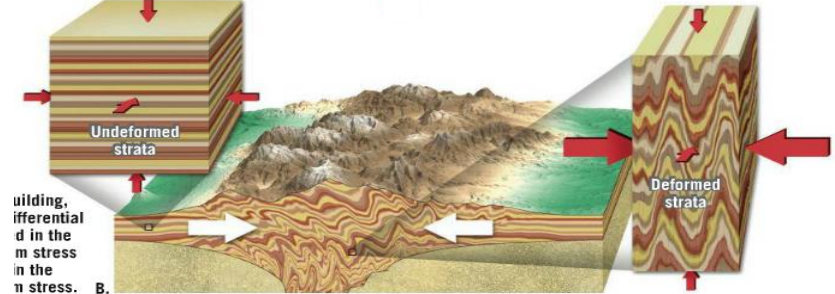
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Causes of Metamorphism

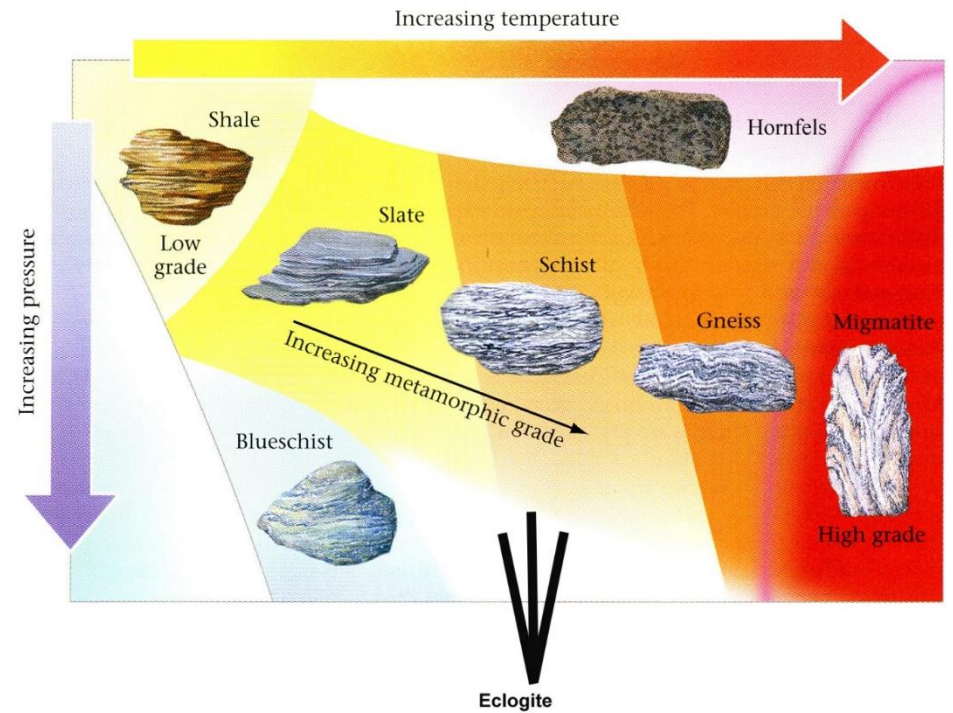
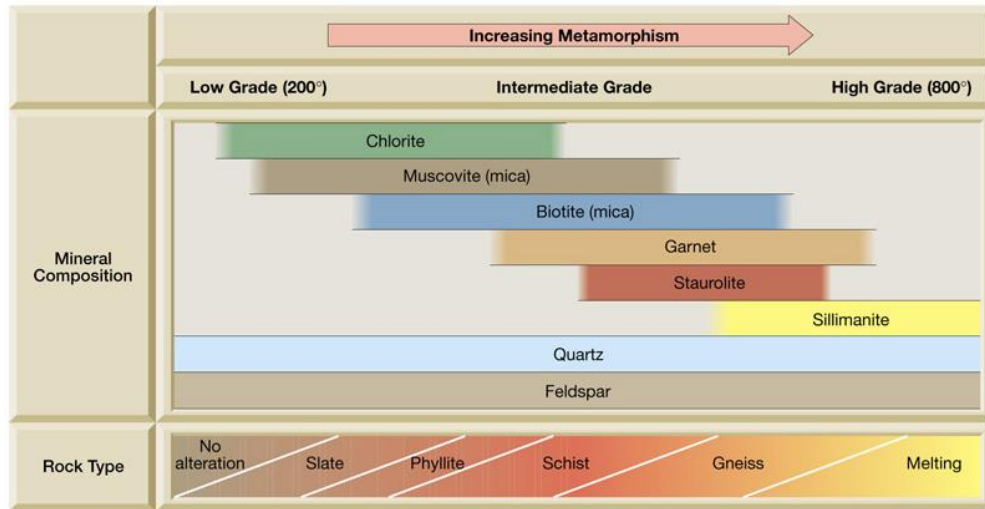
Heat	Increase in temperature causes recrystallization (transformation of existing minerals into new minerals)	What are two sources of heat inside earth? Igneous intrusions and geothermal gradient (temp increases as you move towards the core)
Confining and Differential Pressure	Confining: pressure equal in all directions Differential: pressure is not equal in all directions (minerals will be stretched perpendicular to the direction of greatest stretch – causes foliation) 	 <p>Platy and elongated mineral grains having random orientation.</p> <p>When differential stress causes rocks to flatten, the mineral grains rotate and align roughly perpendicular to the direction of maximum differential stress.</p>
Chemically active fluids	Iron rich fluids	

Types of Metamorphism










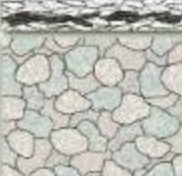


Contact	Regional
<p>Covers a small area and is caused by an increase in heat, typically from an igneous intrusion.</p>	<p>Covers a large area and is caused by an increase in heat and pressure, typically from a convergent plate boundary.</p>
<p>Contact Metamorphism</p>  <p>The diagram illustrates contact metamorphism. A central orange magma chamber is shown intruding into a grey shale layer. A red arrow labeled 'Decreasing temperature' points away from the chamber. Three numbered points describe the process: 1. A magma chamber has intruded into shale. 2. The shale closest to the magma metamorphoses into hornfels. 3. Less metamorphism occurs farther from the chamber, where temperatures are cooler.</p>	 <p>The diagram illustrates regional metamorphism. It shows a cross-section of the Earth's crust with layers of rock. On the left, 'Undeformed strata' are shown as flat, horizontal layers. On the right, 'Deformed strata' are shown as wavy, folded layers. Red arrows indicate compressional forces from the sides, and white arrows indicate horizontal movement. A label 'Building, differential stress in the crust' is partially visible on the left side.</p>

Metamorphic Grade

- describes the degree to which a rock has undergone metamorphism. This is indicated by index minerals which only form under specific temperature and pressure ranges.



Metamorphic Rock Identification

Metamorphic Rock	Texture	Comments	Parent Rock
Slate 	F o l i a t e d	 <p>Composed of tiny chlorite and mica flakes, breaks in flat slabs called slaty cleavage, smooth dull surfaces</p>	Shale, mudstone, or siltstone
Phyllite 		 <p>Fine-grained, glossy sheen, breaks along wavy surfaces</p>	Shale, mudstone, or siltstone
Schist 		 <p>Medium- to coarse-grained, scaly foliation, micas dominate</p>	Shale, mudstone, or siltstone
Gneiss 		 <p>Coarse-grained, compositional banding due to segregation of light and dark colored minerals</p>	Shale, granite, or volcanic rocks
Marble 	N o n f o l i a t e d	 <p>Medium- to coarse-grained, relatively soft (3 on the Mohs scale), interlocking calcite or dolomite grains</p>	Limestone, dolostone
Quartzite 		 <p>Medium- to coarse-grained, very hard, massive, fused quartz grains</p>	Quartz sandstone

- The Descriptions and identifications of metamorphic rocks are based on the parent rock, mineral content and texture (foliated or non-foliated).

*Complete Activity ** (pg.)in your workbook