

Notes on Metamorphic Rocks and Deformation of Crust Mountains- Chapter 10, 5

Name _____

Date _____ Class _____

Vocabulary List (Number, write and define these words on another sheet of paper, those that have a * please illustrate, be creative!) (35)

metamorphic rock	metamorphism	contact metamorphism
foliated*	unfoliated	fault
metamorphic rocks	anticline*	dome mountain*
fault plane	compression	fault-block mountain*
folded mountain*	folding	deformation
footwall*	fracture	graben*
hanging wall*	isostasy	isostatic adjustment
monocline	mountain belt	mountain range
mountain system	normal fault*	plateau
reverse fault*	shearing	strain
stress*	strike-slip fault*	syncline*
tension	thrust fault	

Metamorphic Rocks

A. Introduction

1. Formed from existing rocks that were changed by high _____, high _____, and chemical reactions
2. _____ (12 to 16 km beneath earth's surface) squeeze the molecules closer together and forms a denser rock
3. _____ (100 C to 800 C) makes the rock soft enough for the minerals to change
4. Metamorphism make the original rock _____
5. _____ metamorphism- hot magma pushes through existing rock changing structure and mineral composition of rocks near or touching the magma
6. _____ metamorphism- metamorphism over a large area due to plate tectonics

B. Types of metamorphic rocks

1. _____ - rocks that have layers of mineral crystals; they tend to break along these bands or streaks
2. _____ - rocks that do not have bands of minerals; they do not break in layers

C. Examples of metamorphic rocks

1. Slate
 - a. Metamorphosed _____
 - b. Fine-grained and foliated
 - c. Splits easily in one direction
 - d. Used for blackboards, roofing tiles and pool tables
2. Schist
 - a. Highly metamorphosed _____
 - b. Medium-grained and foliated
 - c. Looks like glitter (visible flaky crystals of mica)
2. Gneiss
 - a. Metamorphosed _____
 - b. Coarse-grained and foliated (dark and light bands)
3. Quartzite
 - a. Metamorphosed _____ (crystalline quartz)
 - b. Very resistant to weathering (hard and dense) and unfoliated
 - c. Can be white, gray, brown, or red

4. Marble

- a. Metamorphosed _____ (crystalline calcite)
- b. Very resistant to weathering (hard and dense) and unfoliated
- c. Used to make tiles, rolling pins, trophy bases, etc.
- d. Anthracite (hard) coal

5. Metamorphosed _____

- a. Harder and more lustrous than bituminous coal and unfoliated
- b. Breaks with conchoidal fracture (like obsidian)
- c. Usually forms in folded mountain regions (eastern PA)

Rock Chart

Sediment	Original	Metamorphic Rock
Mud (Mica)		Slate
	Slate	
Magma		Gneiss
	Sandstone	
		Marble
Fossils		

Chapter 5 Deformation of the Crust

5.1 How the Crust is Deformed

1. What is meant by deformation of crust?

- The _____ of Earth's crust
- Major cause for deformation is _____, but not the only force that shapes the crust

2. What is isostasy and isostatic adjustments?

- Isostasy- balance of upward force from the mantle and the downward force of the weight of the _____
- Isostatic adjustments- the up and down movements that causes the crust to bend and rocks to _____

3. What kind of isostatic adjustment is occurring near the Appalachian Mountains?

- Due to weathering and erosion, the overall weight and height of the mountains has decreased causing the _____

4. What kind of isostatic adjustment has occurred near the Mississippi River and areas where glaciers were once present?

- The _____ carries large amounts of sediments from North America into the Gulf of Mexico, the weight of all of these sediments is causing the surrounding area to sink
- _____ caused the crust underneath to sink, but now is the presence of no ice Canada and Northern Europe are rising

5. What are the three types of stress placed on crustal rocks?

- _____ - rocks are squeezed together, reduces the volume of rocks (become more dense), tends to push the rocks up or deeper into the crust
- _____ - rocks are pulled apart, rocks tend to become thinner
- _____ - pushes rocks in opposite horizontal direction, causing rocks to bend, twist or break apart as they slide past each other

5.2 The Results of Stress

1. What three scenarios occur to rocks that are folded?

- _____ - upcurved folds in the layers
- _____ - downcurved folds in the layers
- _____ - gently dipping bends in horizontal rock layers

2. What occurs when there is large scale folding of anticlines and synclines

- anticlines- produce _____
- synclines- produces _____

3. What's the difference between faulting and folding?

- Cooler temperatures causes rocks to fault rather than _____

4. What's the difference between a fracture and a fault?

- fracture- _____ along either side of a break
- fault- when rocks do move

5. What is a hanging wall and a footwall?

- _____ - rocks above the normal fault plane
- _____ - rocks below the fault plane

6. What are the four basic types of faults?

- _____ - occur along divergent boundaries, occur in a series of parallel fault lines, forming steep step-like landforms (ex. Great Rift Valley)
- _____ - compression causes the hanging wall to move up relative to the footwall
- _____ - a special type of reverse fault, fault plane is at a low angle or nearly horizontal, common in steep mountains such as the Rockies and Alps
- _____ - rocks on either side of the fault plane slide horizontally, occur usually at transform boundaries such as the San Andreas Fault

5.3 Mountain Formation

1. What is the difference between a mountain range, a mountain system and a mountain belt?

- _____ - a group of individual mountains make up a range (Mt. St. Helen's part of Cascade Range, and Mount Everest is part of the Himalayan Range)
- Mountain system- groups of adjacent mountain ranges make up a system (Great Smokey, Blue Ridge, Cumberland and Green mountain ranges make up the Appalachian mountain system)
- _____ - the largest mountain systems are part of larger mountain belts (two major belts of the world- Eurasian-Melanesian belt and Circum-Pacific belt)

2. What results when oceanic and continental crust collide?

- Volcanic mountains due to subduction of oceanic crust (ex. Cascades Mountains in NW U.S.)
- _____ - part of the oceanic crust are scraped off and become mountains on the continental crust

3. What results when two oceanic plates collide?

- One oceanic plate subducts underneath the other creating volcanic mountains forming an _____ on the ocean floor (ex. Mariana Islands, in the N. Pacific Ocean are peaks that rose above sea level)

4. What results when two continental plates collide?

- Produces intense deformation creating _____ (ex. Indian plate collided with Eurasian plate creating the Himalayan Mountains)

5. How do scientists classify mountains?

- By the way in which crust was deformed and shaped by _____

6. Describe folded mountains and plateaus:

- Highest mountains on Earth, found where continents have _____
- Rocks are squeezed together like _____
- Ex: Alps, Himalayas, _____
- Same force uplifts _____ - large flat-topped rocks high above sea level that have been slowly uplifted usually found next to mountain ranges (ex: Colorado plateau and Tibetan plateau)

7. Describe fault-block mountains and grabens:

- Mountains formed by faults where large blocks of Earth's crust are lifted and tilted
- Ex: _____, form nearly parallel ranges every 80 km
- _____ - long, narrow valleys that develop when steep faults break the crust into blocks and slip downward relative to the surrounding blocks, ex: Death Valley in CA

8. Describe what type of volcanic mountains form at these locations:

- _____ - large underwater mountain chains- such as mid-ocean ridge, sometimes peaks rise above water = Iceland and the Azores
- _____ - subduction zones causes Cascade Range and Island Arcs of N. Pacific
- _____ - largest volcanoes on Earth, form on middle of plate, Hawaiian Islands are 30,000 feet tall from bottom of ocean

9. What is a dome mountain?

- Molten rocks rises to the crust and pushed up rock layers in a circular dome pattern, eventually the rock layers erode away and the hardened rock is exposed such as the

_____ -

Tracking Plate Movements (page 90-91)

1. What is the purpose of the Lageos sphere and how does it work?

- From an orbit it reflects laser from a station on Earth and calculate the movement of _____
- It enables scientists to predict the future geography of Earth, predict geologic activity, study minute changes in Earth's gravity and _____

The Disappearing Mediterranean (page 93)

1. What two plates are causing the Alps to grow in height and shrinking the Mediterranean?

- African Plate and Eurasian Plate
- Italy is part of the African plate, eventually it will be completely _____ the Eurasian plate along with the Mediterranean