Geology 200, Questions for Test 1, 2009

Minerals - Chapter 3 and lecture notes

Define the difference between atoms, ions, and isotopes.

Give a brief definition of a mineral.

What other element might substitute for Ca in plagioclase feldspar? Why?

How do geologists identify minerals too small to be seen in a hand specimen?

Why do some minerals have cleavage?

What is the difference between a mineral and a rock?

Which type of bond is the strongest?
   A. ionic
   B. covalent
   C. metallic
   D. ironic

Bonding of two atoms may be accomplished by:
   A. sharing electrons between atoms
   B. transferring electrons between atoms
   C. electrical attraction between each nucleus
   D. both A and B
   E. A, B, and C

Which of the following is not a mineral in the strict definition of the term.
   A. salt
   B. diamond
   C. ice
   D. graphite
   E. coal

In the study of minerals, X-ray diffraction measures:
   A. chemical composition
   B. hardness
   C. specific gravity
   D. cleavage
   E. internal structure

The range of chemical composition in a mineral typically results from:
   A. time and place of origin
   B. ionic substitution
   C. changes in physical properties
   D. inclusions of other mineral grains
   E. change in atomic structure

Which of the following is not a physical property of a mineral?
   A. color
   B. crystal form
   C. chemical composition
   D. hardness
   E. specific gravity
Which of the following is a nonsilicate mineral?
A. quartz  
B. dolomite  
C. biotite  
D. clay

Which of the following is a mafic mineral?
A. pyroxene  
B. plagioclase  
C. K-feldspar  
D. Calcite

Which of the following is a sialic mineral?
A. olivine  
B. gypsum  
C. biotite  
D. muscovite

Which method is used to study the internal structure of a mineral?
A. atomic absorption spectrum  
B. X-ray diffraction  
C. Mass spectrometry  
D. Alchemy

What is the most abundant element in the earth's crust?
A. O, oxygen  
B. Si, silicon  
C. Al, aluminum  
D. Fe, iron

Weak atomic bonding in one direction in a mineral will result in:
A. striation  
B. softness  
C. cleavage  
D. fracture  
E. crystal faces

The property of a mineral that is characterized by breaks along parallel plains of weakness in one or more directions is called:
A. crystal habit  
B. hardness  
C. fracture  
D. luster  
E. cleavage

The most abundant mineral group in the earth’s crust is:
A. feldspars  
B. micas  
C. olivines  
D. pyroxenes  
E. quartz

Most rock forming minerals are:
A. sulfides  
B. silicates  
C. oxides  
D. carbonates

The most abundant element in the earth’s crust is:
A. iron  
B. calcium  
C. aluminum  
D. silicon  
E. oxygen
Which of the following is an amphibole mineral?
A. hornblende
B. biotite
C. olivine
D. pyroxene

Which of the following is not a silicate mineral?
A. muscovite
B. K-feldspar
C. Garnet
D. Gypsum
E. Amphibole

In silicates, silicon-oxygen tetrahedra may be linked to form all of the following EXCEPT:
A. single chains
B. sheets
C. double chains
D. rings
E. spheres

Which of the following is not a sialic mineral?
A. feldspar
B. muscovite
C. quartz
D. olivine

If a mineral lacks a crystal structure it is ____________________________.

The smallest particle of an element is an ____________________.

What is #1 on Moh’s Hardness Scale? What is #10?

Matching: write the correct letter next to each term
Isotope    ____  a. appearance of reflected light
Ion        ____  b. number of neutrons can vary
Covalent bond ____  c. breaks along zone of weakness
Ionic substituion ____  d. solid solution
Luster     ____  e. electrically charged
Cleavage   ____  f. shared electrons

Which crystal system has 90 degrees between the axes, and all axes are the same length?
A. isometric
B. orthorhombic
C. hexagonal
D. triclinic

Which crystal system has no right angles between the axes?
A. isometric
B. orthorhombic
C. hexagonal
D. triclinic

Which crystal system has four axes.
A. isometric
B. orthorhombic
C. hexagonal
D. triclinic

Give an example for each category of the chemical classification of minerals:
A. native element _____________________
Density of rocks is an important physical characteristic. Density is measured by comparison to water. What is the density of water?

Find the value of $x$ in each of the following equations. Check the attached Periodic Table if you need to.

- $\text{CaCO}_x$ _______
- $(\text{Mg, Fe})_x\text{SiO}_4$ _______
- $\text{CaAl}_2\text{Si}_x\text{O}_8$ _______

Label each type of silicon-oxygen tetrahedral groups shown below:
Give the environment(s) [major rock type(s)] for each of the following minerals:

Olivine ____________________________
Amphibole __________________________
K-feldspar __________________________
Calcite ___________________________
Biotite ___________________________
Illite ___________________________

Identify the Crystal System for each of the 4 mineral photos below.
What kind of fracture is shown below? ____________________________
Identify the types of cleavage shown in:
A. ____________________________
B. ____________________________

Name this blue mineral with a bladed habit: _____________________
Name this light colored mineral with characteristic twinning striations: ___________________________

What kind of mineral is shown below: ____________________________________________
Igneous and Metamorphic Rocks – Chapters 4 & 6 and lecture notes

Molten rock material, which is the parent substance of all igneous rock, is called:
A. basalt
B. mantle
C. lava
D. magma
E. granite

Which list shows magma in order of increasing viscosity?
A. rhyolite, andesite, basalt
B. andesite, basalt, rhyolite
C. basalt, rhyolite, andesite
D. basalt, andesite, rhyolite

Two stages of cooling are indicated by:
A. aphanitic texture
B. phaneritic texture
C. glassy texture
D. porphyritic texture
E. pyroclastic texture

A rock with an aphanitic texture would indicate:
A. magma generated at diverging plate margins
B. slow cooling of the magma
C. rapid cooling of the magma
D. two periods of cooling

An igneous rock consisting of broken fragments of crystals, shards of glass, and rock fragments has a:
A. pyroclastic texture
B. phaneritic texture
C. glassy texture
D. porphyritic texture

The two dominant minerals that make up granitic rocks are:
A. feldspar and mica
B. calcite and quartz
C. quartz and pyroxenes
D. quartz and feldspar

Granite, rhyolite, and obsidian may have the same
A. cooling history
B. texture
C. chemical composition
D. structural deformation

The largest volcanoes on Earth are
A. composite volcanoes
B. cinder cones
C. stratovolcanoes
D. shield volcanoes

Structures formed when lava erupts underwater are
A. pahoehoe flows
B. aa flows
C. pillow lavas
D. vesicles

The cooling of basalt often produces vertical fractures called:
A. columnar joints
B. faults
C. fissures
D. pressure ridges
Batholiths:
A. typically form deep in mountain belts
B. generally cut across the country rock into which they intrude
C. are large masses of coarse, crystalline rock, often of granitic composition
D. all of the above

The origin of basaltic magma is from:
A. complete melting of the upper mantle
B. partial melting of the upper mantle
C. partial melting of granitic crust
D. complete melting of the lithosphere

Most magma that reaches the earth’s surface originates:
A. from the earth’s liquid core
B. from partial melting of the lower mantle
C. from partial melting in the upper mantle and lower crust
D. from partial melting in the upper crust

An ancient lava flow can be distinguished from a sill by:
A. the extent of contact metamorphism of surrounding strata
B. the thickness of the igneous rock
C. the grain size of the minerals
D. all of the above

A rock with phaneritic texture composed of quartz, K-feldspar, Na-plagioclase, and biotite would be classified as:
A. basalt
B. gabbro
C. granite
D. andesite

The rate of crystallization of an igneous rock will greatly influence its:
A. color
B. grain size
C. density
D. chemical composition
E. all of the above

Which of the following rock types has little or no quartz and the same composition as diorite?
A. rhyolite
B. gabbro
C. andesite
D. basalt

A major difference between silicic and basaltic magmas:
A. silicic magmas are usually cooler
B. silicic magmas usually have more water
C. silicic magmas have higher concentration of SiO2
D. silicic magmas commonly erupt explosively
E. all of the above

Mount St. Helens, Washington, is a steep-sided cone built of lava flows, lava domes, and pyroclastic flows. What is the likely composition of the erupted rocks?
A. andesite and rhyolite
B. basalt and gabbro
C. granite and gabbro
D. basalt and andesite

When a typical subduction-related magma differentiates by fractional crystallization, the daughter melts become progressively:
A. enriched in MgO
B. enriched in CaO
C. enriched in SiO2
D. enriched in K2O
Which of the following types of magma might be created by the thorough mixing of basalt and rhyolite in a magma chamber?

A. Andesite  
B. Komatiite  
C. Granite  
D. Gabbro

Which of the following pairs of rocks do not have the same chemical composition?

A. Diorite-andesite  
B. Gabbro-basalt  
C. Basalt-peridotite  
D. Granite-rhyolite

The texture of an igneous rock.

A. Is controlled by its composition.  
B. Is determined by the kind of feldspar present.  
C. Records its cooling history  
D. Is caused by its melting history.

Define the term magma.

What are the two major types of igneous rock texture?

Explain how an igneous rock can be produced from magma that does not have the same composition as the rock from which it was melted.

What is fractional crystallization?

Why can’t a basalt be produced by partial melting of a granite?

Number the following minerals in the correct order of crystallization from Bowen's reaction series.

- K-feldspar ______
- Olivine ______
- Pyroxene ______
- Quartz ______
- Amphibole ______

Fill in the following table with the correct rock names.

<table>
<thead>
<tr>
<th></th>
<th>Felsic</th>
<th>Intermediate</th>
<th>Mafic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extrusive</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intrusive</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

What is a pluton?
Label the various intrusive igneous bodies shown below.

Partial melting of an igneous rock produces a melt that is more _______________ than the parent rock.

Continental crust is about ________ percent of the Earth's mass.

At what type of plate tectonic boundary would you expect to find basalt? ________________________

What is the precise plate boundary shown above? ____________________________________________
What is the precise plate boundary shown above?

The process of metamorphism may involve:
A. the growth of new minerals.
B. the development of new rock textures.
C. recrystallization
D. all of the above

Slaty cleavage results from:
A. parallel alignments of minute plates of mica, chlorite, or talc.
B. parallel arrangement of large plates of mica.
C. alternating layers of light and dark minerals.
D. growth of large equidimensional crystals.

Which of the following pairs of parent rock and its metamorphosed equivalent is not correctly matched?
A. Sandstone-quartzite
B. Shale-slate
C. Limestone-schist
D. Granite-gneiss

The texture exhibited by slate, schist, and gneiss is called:
A. Alignment
B. Cleavage
C. Foliation
D. Fracture
E. Stratification
Which of the following minerals found in a metamorphosed shale indicates the highest grade of metamorphism?
   A. Quartz
   B. Biotite
   C. Chlorite
   D. Garnet

Metamorphic transformations occur while a rock is in:
   A. the molten state
   B. the clastic state
   C. the solid state
   D. all of the above

Formation of metamorphic rock never involves which of the following?
   A. formation of new minerals from old
   B. increase in density
   C. complete melting of the material from which it formed
   D. change in shape of mineral grains

Marble commonly forms from metamorphism of
   A. basalt
   B. shale
   C. sandstone
   D. limestone

Foliation commonly
   A. cuts across relict bedding
   B. is perpendicular to the applied stress
   C. is vertical or nearly vertical
   D. all of the above

Which of the following is not foliated?
   A. gneiss
   B. schist
   C. slate
   D. marble
   E. phyllite

Which of the following rocks is formed by the metamorphism of sandstone?
   A. slate
   B. amphibolite
   C. quartzite
   D. marble
   E. gneiss

A foliated metamorphic rock with alternating layers of light and dark minerals is called a:
   A. schist
   B. gneiss
   C. marble
   D. slate

High pressure low-temperature (blueschist) metamorphic rocks originate at:
   A. convergent plate boundaries
   B. divergent plate boundaries
   C. transform plate boundaries
   D. all of the above

Regional metamorphism would best be developed
   A. above and below a sill
   B. in a fault zone
   C. deep in a folded mountain belt
   D. in buried sediment on the stable platform
Which of the following does not apply to the process of hydrothermal alteration?
A. it is common around igneous intrusions
B. during this process chemical reactions occur between hot fluid and preexisting country rock
C. many types of metallic ore deposits are formed by this process
D. it rarely changes the composition of the preexisting country rock

Seafloor metamorphism involves all of the following except:
A. conversion of olivine and pyroxene into hydrated silicates like chlorite
B. reactions with seawater heated as it flows through oceanic crust
C. high-pressure low temperature metamorphism
D. greenschist facies conditions

Matching: write the correct letter next to each term
Hornfels _____ a. no visible grains
Migmatite _____ b. parallels rock layers
Gneiss _____ c. partial melting
Aphanitic _____ d. large and small grain sizes
Porphyritic _____ e. contact metamorphism
Dike _____ f. cuts across rock layers
Sill _____ g. foliated

Fluid transport during metamorphism is termed _____________________________.

What are the two types of metamorphism?

What is the approximate temperature at which metamorphism begins? ___________

Name each of the rocks in the photos below. Left _______________ Right _______________
Matching: parent rocks and metamorphic rocks

<table>
<thead>
<tr>
<th>Parent Rock</th>
<th>Metamorphic Rock</th>
</tr>
</thead>
<tbody>
<tr>
<td>Granite</td>
<td>A. quartzite</td>
</tr>
<tr>
<td>Sediments</td>
<td>B. marble</td>
</tr>
<tr>
<td>Basalt</td>
<td>C. greenstone</td>
</tr>
<tr>
<td>Sandstone</td>
<td>D. biotite gneiss</td>
</tr>
<tr>
<td>Limestone</td>
<td>E. garnet gneiss</td>
</tr>
<tr>
<td>Shale</td>
<td>F. slate</td>
</tr>
</tbody>
</table>

A metamorphic outcrop was found to contain crystals of andalusite, sillimanite, and kyanite. In which metamorphic facies did the rock form? Use the above diagrams to answer the question.

Number the following rock types in order of increasing metamorphism.

schist  migmatite  phyllite  slate  gneiss
Label the metamorphic facies shown above.

A. ________________________________
B. ________________________________
C. ________________________________
D. ________________________________
E. ________________________________

**GPS and UTM**

What is the maximum number of satellites a GPS receiver can use at any one time?

What does GPS stand for?

What does UTM stand for in UTM Coordinates?

What does NAD27 stand for? What does WGS84 stand for?

When taking a GPS reading the first number is an ________________ coordinate, whereas the second number is the ________________ coordinate.

What is the minimum number of satellites required to determine an exact position and elevation?