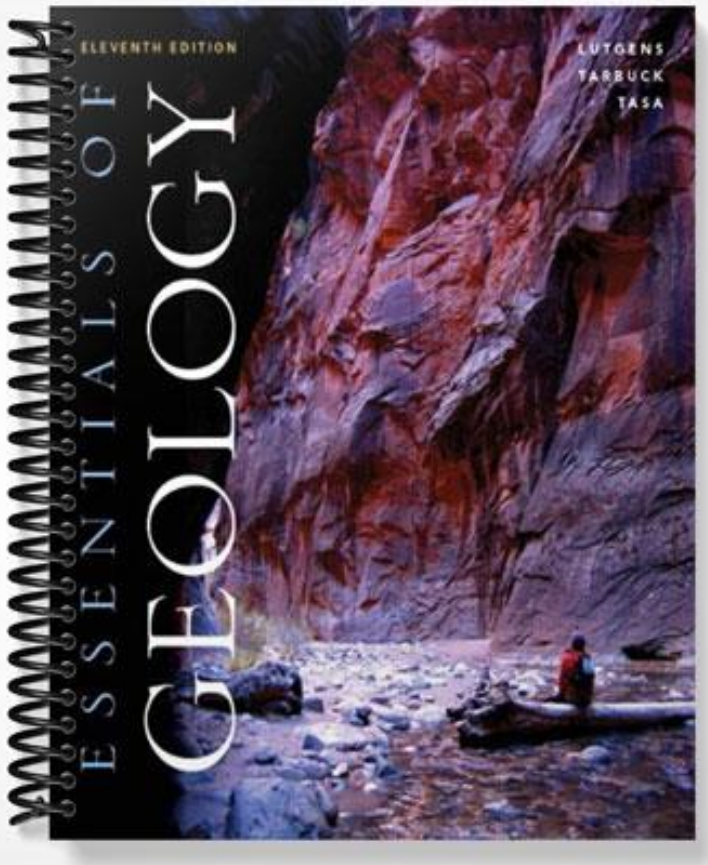
TEST BANK


ELEVENTH EDITION
ESSENTIALS OF
GEOLOGY
LUTGENS
TARBUCK
TASA

Essentials of Geology, 11e **(Lutgens/Tarbuck/Tasa)**
Chapter 2 Matter and Minerals

1) Which of the following best defines a mineral and a rock?
A) A rock has an orderly, repetitive, geometrical, internal arrangement of minerals; a mineral is a lithified or consolidated aggregate of rocks.
B) A mineral consists of its constituent atoms arranged in a geometrically repetitive structure; in a rock, the atoms are randomly bonded without any geometric pattern.
C) In a mineral the constituent atoms are bonded in a regular, repetitive, internal structure; a rock is a lithified or consolidated aggregate of different mineral grains.
D) A rock consists of atoms bonded in a regular, geometrically predictable arrangement; a mineral is a consolidated aggregate of different rock particles.
Answer: C
Diff: 1
Chapter Subhead: 2.1 Minerals: Building Blocks of Rocks
Bloom's: Understanding

2) Which of the following is not a fundamental particle found in atoms?
A) neutron
B) selectron
C) electron
D) protons
Answer: B
Diff: 1
Chapter Subhead: 2.2 Atoms: Building Blocks of Minerals
Bloom's: Remembering, Understanding

3) Atoms of the same element, zinc for example, have the same number of _____.
A) electrons in the nucleus
B) protons in the nucleus
C) neutrons in the outer nuclear shell
D) electrons in the valence bond level
Answer: B
Diff: 1
Chapter Subhead: 2.2 Atoms: Building Blocks of Minerals
Bloom's: Remembering

4) Which of the following is an accurate description of ionic bonding?
A) Nuclei of bonding atoms exchange electrons; the resulting ions are bonded together by the attractive forces between the negative and positive nucleons.
B) Atoms of two different elements share electrons and protons; the resulting compound is bonded together by the strong, binding energy of shared protons.
C) Nuclei of two different atoms share electrons, and the resulting compound is tightly bonded by the very strong, induced, electronuclear bonds.
D) Atoms of different elements, having gained or lost electrons, form negative and positive ions that are bonded together by attractive forces between ions with opposite charges.
Answer: D
Diff: 1
Chapter Subhead: 2.3 Why Atoms Bond
Bloom's: Understanding

5) Which of the following is correct for isotopes of the same element?
A) The atoms have different numbers of protons and the same number of neutrons.
B) The atoms have the same number of electrons and different numbers of protons.
C) The atoms have different numbers of neutrons and the same number of protons.
D) The atoms have different numbers of electrons but the same number of neutrons.
Answer: C
Diff: 1
Chapter Subhead: 2.4 Isotopes and Radioactive Decay
Bloom's: Remembering

6) What mineral is the hardest known substance in nature?
A) silicate
B) native gold
C) diamond
D) muscovite
Answer: C
Diff: 1
Chapter Subhead: 2.5 Physical Properties of Minerals
Bloom's: Remembering

7) Which carbonate mineral reacts readily with cool, dilute hydrochloric acid to produce visible bubbles of carbon dioxide gas?
A) calcite
B) quartz
C) dolomite
D) plagioclase
Answer: A
Diff: 1
Chapter Subhead: 2.5 Physical Properties of Minerals
Bloom's: Remembering

8) Which mineral is composed of silicon dioxide (SiO_2)?
A) calcite
B) diamond
C) olivine
D) quartz
Answer: D
Diff: 1
Chapter Subhead: 2.8 Common Silicate Minerals
Bloom's: Remembering

9) Which of the following minerals is a silicate?
A) hematite
B) muscovite
C) calcite
D) halite
Answer: B
Diff: 1
Chapter Subhead: 2.8 Common Silicate Minerals
Bloom's: Remembering

10) A cubic centimeter of quartz, olivine, and gold weigh 2.5, 3.0, and 19.8 grams respectively. This indicates that _____.
A) gold has a higher density and specific gravity than quartz and olivine
B) gold is 6 to 7 times harder than olivine and quartz
C) gold and olivine are silicates, quartz is elemental silicon
D) olivine and quartz powders are harder than metallic gold
Answer: A
Diff: 2
Chapter Subhead: 2.5 Physical Properties of Minerals
Bloom's: Applying, Analyzing

11) Which one of the following is a sodium and calcium feldspar with twinning striations?
A) orthoclase
B) microcline
C) plagioclase
D) sanidine
Answer: C
Diff: 1
Chapter Subhead: 2.8 Common Silicate Minerals
Bloom's: Remembering

12) Which of the following minerals is a ferromagnesian silicate?
A) quartz
B) orthoclase
C) hornblende
D) muscovite
Answer: C
Diff: 1
Chapter Subhead: 2.8 Common Silicate Minerals
Bloom's: Remembering

13) Which of the following minerals is in the mineral group known as mica?
A) orthoclase
B) muscovite
C) augite
D) olivine
Answer: B
Diff: 1
Chapter Subhead: 2.8 Common Silicate Minerals
Bloom's: Remembering

14) Which of the following best characterizes ferromagnesian silicates?
A) They contain iron and magnetite, are black in color, and they have metallic lusters.
B) They are black to dark-green silicate minerals containing iron and magnesium.
C) They contain magnetite and ferroite, and they are clear to light green.
D) They are mostly clear, colorless, and rich in the elements magnesium and ferrium.
Answer: B
Diff: 1
Chapter Subhead: 2.8 Common Silicate Minerals
Bloom's: Understanding

15) Which one of the following mineral groups exhibits a sheet-like silicate structure?
A) carbonates
B) pyroxenes
C) clays
D) feldspars
Answer: C
Diff: 1
Chapter Subhead: 2.8 Common Silicate Minerals
Bloom's: Remembering

16) Which one of the following is a typical product of weathering?
A) micasmicas
B) ferromagnesians
C) feldspars
D) clays
Answer: D
Diff: 1
Chapter Subhead: 2.8 Common Silicate Minerals
Bloom's: Remembering

17) The ion at the center of a silicate tetrahedron is surrounded by _____.
A) 4 oxygen ions
B) 6 oxygen ions
C) 4 sodium ions
D) 6 sodium ions
Answer: A
Diff: 1
Chapter Subhead: 2.7 The Silicates
Bloom's: Remembering

18) Which one of the following describes a mineral's response to mechanical impact?
A) luster
B) cleavage
C) streak
D) crystal form
Answer: B
Diff: 1
Chapter Subhead: 2.5 Physical Properties of Minerals
Bloom's: Understanding

19) Which of the following denotes the purity of gold used in jewelry?
A) carnot
B) carette
C) karat
D) carlot
Answer: D
Diff: 1
Chapter Subhead: 2.2 Atoms: Building Blocks of Minerals - "Did You Know?" Box
Bloom's: Remembering

20) Ruby and sapphire are red and blue forms of the mineral _____.
A) diamond
B) turquoise
C) emerald
D) corundum
Answer: D
Diff: 1
Chapter Subhead: 2.3 Why Atoms Bond - "Did You Know?" Box
Bloom's: Remembering

21) All silicate minerals contain which two elements?
A) iron, silicon
B) silicon, sodium
C) oxygen, carbon
D) silicon, oxygen
Answer: D
Diff: 1
Chapter Subhead: 2.7 The Silicates
Bloom's: Remembering

22) What element is the most abundant in the Earth's crust by weight?
A) carbon
B) chlorine
C) oxygen
D) sodium
Answer: C
Diff: 1
Chapter Subhead: 2.7 The Silicates
Bloom's: Understanding

23) The strong tendency of certain minerals to break along smooth, parallel planes is known as _____.
A) streak
B) cleavage
C) cracking luster
D) crystal form
Answer: B
Diff: 1
Chapter Subhead: 2.5 Physical Properties of Minerals
Bloom's: Understanding

24) What in the name given to an atom that gains or loses electrons in a chemical reaction?
A) molecule
B) ion
C) isotope
D) nucleon
Answer: B
Diff: 1
Chapter Subhead: 2.3 Why Atoms Bond
Bloom's: Remembering

25) An atom's mass number is 13 and its atomic number is 6. How many neutrons are in its nucleus?
A) 19
B) 7
C) 13
D) 6
Answer: B
Diff: 1
Chapter Subhead: 2.2 Atoms: Building Blocks of Minerals
Bloom's: Applying

26) Which one of the following is not true for minerals?
A) They have a specific, internal, crystalline structure.
B) They can be a liquid, solid, or glass.
C) They have a specific, predictable chemical composition.
D) They can be identified by characteristic physical properties.
Answer: B
Diff: 1
Chapter Subhead: 2.1 Minerals: Building Blocks of Rocks
Bloom's: Understanding

27) In which type of chemical bonding are electrons shared between adjacent atoms?
A) ionic
B) subatomic
C) covalent
D) isotopic
Answer: C
Diff: 1
Chapter Subhead: 2.3 Why Atoms Bond
Bloom's: Remembering

28) How do the electrons behave in a mineral with metallic bonding?
A) They are tightly bound to certain atoms and cannot readily move.
B) They can move relatively easily from atom to atom inside the mineral.
C) They react with protons to make neutrons in the outer valence shells.
D) They move to adjacent negative ions, forming positive ions.
Answer: B
Diff: 1
Chapter Subhead: 2.3 Why Atoms Bond
Bloom's: Understanding

29) Which group of minerals are the most abundant in the Earth's crust?
A) sulfides
B) carbonates
C) silicates
D) chlorides
Answer: C
Diff: 1
Chapter Subhead: 2.6 Mineral Groups
Bloom's: Remembering

30) Which the following denotes the massive, positively charged, nuclear particles?
A) protons
B) electrons
C) isotrons
D) neutrons
Answer: A
Diff: 1
Chapter Subhead: 2.2 Atoms: Building Blocks of Minerals
Bloom's: Remembering

31) What are the lightest or least massive of the basic atomic particles?
A) uranium nuclei
B) protons
C) electrons
D) neutrons
Answer: C
Diff: 1
Chapter Subhead: 2.2 Atoms: Building Blocks of Minerals
Bloom's: Understanding

32) Which of the following has the highest specific gravity?
A) wood
B) water
C) gold
D) quartz
Answer: C
Diff: 1
Chapter Subhead: 2.5 Physical Properties of Minerals
Bloom's: Applying

33) Which of the following will react readily with acids such as hydrochloric?
A) calcite
B) quartz
C) diamond
D) talc
Answer: A
Diff: 1
Chapter Subhead: 2.5 Physical Properties of Minerals
Bloom's: Remembering

34) Which of the following describes the light reflecting and transmission characteristics of a mineral?
A) luster
B) color streak
C) virtual absorption
D) fluorescence
Answer: A
Diff: 1
Chapter Subhead: 2.5 Physical Properties of Minerals
Bloom's: Remembering

35) What is the name of dark-colored mica?
A) calcite
B) biotite
C) quartz
D) olivine
Answer: B
Diff: 1
Chapter Subhead: 2.8 Common Silicate Minerals
Bloom's: Remembering

36) Hornblende and the other amphiboles have what type of silicate structure?
A) metallic
B) sheet
C) 3-D framework
D) double chains
Answer: D
Diff: 1
Chapter Subhead: 2.8 Common Silicate Minerals
Bloom's: Remembering

Word Analysis. Examine the words and/or phrases for each question below and determine the relationship among the majority of words/phrases. Choose the option which does not fit the pattern.

37) a. electron b. atom c. proton d. neutron
Answer: b
Diff: 1
Chapter Subhead: 2.2 Atoms: Building Blocks of Minerals
Bloom's: Understanding

38) a. hardness b. streak c. luster d. cleavage
Answer: c
Diff: 1
Chapter Subhead: 2.5 Physical Properties of Minerals
Bloom's: Understanding

39) a. quartz b. olivine c. feldspar d. calcite
Answer: d
Diff: 1
Chapter Subhead: 2.8 Common Silicate Minerals; 2.9 Important Nonsilicate Minerals
Bloom's: Applying

40) a. olivine b. quartz c. amphibole d. pyroxene
Answer: b
Diff: 1
Chapter Subhead: 2.8 Common Silicate Minerals
Bloom's: Applying

41) a. galena b. calcite c. gypsum d. halite
Answer: a
Diff: 2
Chapter Subhead: 2.9 Important Nonsilicate Minerals
Bloom's: Applying

42) Calcite and dolomite are both carbonate minerals.
Answer: TRUE
Diff: 1
Chapter Subhead: 2.9 Important Nonsilicate Minerals
Bloom's: Applying

43) Rocks are aggregates of one or more minerals.
Answer: TRUE
Diff: 1
Chapter Subhead: 2.1 Minerals: Building Blocks of Rocks
Bloom's: Remembering

44) Mineral luster is broadly classified as either being metallic or opaque.
Answer: FALSE
Diff: 1
Chapter Subhead: 2.5 Physical Properties of Minerals
Bloom's: Remembering

45) Electrically neutral atoms have equal numbers of electrons and protons.
Answer: TRUE
Diff: 1
Chapter Subhead: 2.2 Atoms: Building Blocks of Minerals
Bloom's: Remembering

46) Rock-forming silicate minerals have higher specific gravities than water.
Answer: TRUE
Diff: 1
Chapter Subhead: 2.5 Physical Properties of Minerals
Bloom's: Applying

47) In a silicon-oxygen structural unit, silicon atoms occupy corners of a tetrahedron.
Answer: FALSE
Diff: 1
Chapter Subhead: 2.7 The Silicates
Bloom's: Remembering

48) Calcite and halite react with dilute acids to evolve carbon dioxide.
Answer: FALSE
Diff: 2
Chapter Subhead: 2.5 Physical Properties of Minerals
Bloom's: Understanding, Applying

49) All atoms of the same element have the same atomic number.
Answer: TRUE
Diff: 1
Chapter Subhead: 2.2 Atoms: Building Blocks of Minerals
Bloom's: Remembering

50) Orthoclase and plagioclase feldspars have quite different forms of cleavage.
Answer: FALSE
Diff: 1
Chapter Subhead: 2.5 Physical Properties of Minerals
Bloom's: Understanding

51) Diamond and quartz are both minerals composed of a single element.
Answer: FALSE
Diff: 1
Chapter Subhead: 2.8 Common Silicate Minerals; 2.9 Important Nonsilicate Minerals
Bloom's: Understanding

52) The micas, biotite and muscovite, both exhibit one direction of cleavage.
Answer: TRUE
Diff: 1
Chapter Subhead: 2.8 Common Silicate Minerals, Figure 2.24
Bloom's: Remembering

53) Nonmetallic minerals like quartz and gypsum have no industrial uses.
Answer: FALSE
Diff: 1
Chapter Subhead: 2.9 Important Nonsilicate Minerals
Bloom's: Remembering

54) Ferromagnesian silicate minerals contain some magnesium and/or iron.
Answer: TRUE
Diff: 1
Chapter Subhead: 2.8 Common Silicate Minerals
Bloom's: Remembering

55) Positive ions are atoms that have gained electrons during a chemical reaction.
Answer: FALSE
Diff: 1
Chapter Subhead: 2.3 Why Atoms Bond
Bloom's: Understanding

56) Isotopes of the same element have the same mass number.
Answer: FALSE
Diff: 1
Chapter Subhead: 2.4 Isotopes and Radioactive Decay
Bloom's: Remembering

57) Moh's hardness scale is a relative measure of which physical property of minerals?
Answer: hardness
Diff: 1
Chapter Subhead: 2.5 Physical Properties of Minerals
Bloom's: Remembering

58) What physical property denotes the color of a powdered mineral?
Answer: streak
Diff: 1
Chapter Subhead: 2.5 Physical Properties of Minerals
Bloom's: Remembering

59) The physical property denoting a mineral's tendency to crack along parallel, planar surfaces is known as what?
Answer: cleavage
Diff: 1
Chapter Subhead: 2.5 Physical Properties of Minerals
Bloom's: Remembering

60) What is the hardest mineral known?
Answer: diamond
Diff: 1
Chapter Subhead: 2.5 Physical Properties of Minerals
Bloom's: Remembering

61) What is the chemical composition of graphite and diamond?
Answer: carbon
Diff: 1
Chapter Subhead: 2.9 Important Nonsilicate Minerals
Bloom's: Remembering

62) In atoms, which electrons are involved in chemical bonding?
Answer: valence
Diff: 1
Chapter Subhead: 2.3 Why Atoms Bond
Bloom's: Understanding

63) A compound is a stable chemical substance composed of two or more what?
Answer: elements
Diff: 1
Chapter Subhead: 2.2 Atoms: Building Blocks of Minerals
Bloom's: Remembering

64) What is the dominant form of chemical bonding exhibited by minerals such as native gold, native copper and copper-rich sulfides?
Answer: metallic
Diff: 1
Chapter Subhead: 2.3 Why Atoms Bond
Bloom's: Remembering

65) What two major characteristics differentiate minerals from natural glasses?
Answer: solid, internal arrangement of atoms
Diff: 1
Chapter Subhead: 2.1 Minerals: Building Blocks of Rocks
Bloom's: Applying

66) Most glasses and some minerals exhibit a type of fracture characterized by nested and curved, crack surfaces. What term describes this property?
Answer: conchoidal
Diff: 1
Chapter Subhead: 2.5 Physical Properties of Minerals
Bloom's: Remembering

67) Parallel, straight, linear imperfections visible on the cleavage surfaces of plagioclase feldspar are called what?
Answer: striations
Diff: 1
Chapter Subhead: 2.8 Common Silicate Minerals
Bloom's: Remembering

68) What is the smallest particle of matter that exhibits and defines the distinctive chemical characteristics of the individual elements?
Answer: atom
Diff: 1
Chapter Subhead: 2.2 Atoms: Building Blocks of Minerals
Bloom's: Remembering

69) What ferromagnesian silicate mineral is named for its green color?
Answer: olivine
Diff: 1
Chapter Subhead: 2.8 Common Silicate Minerals
Bloom's: Remembering

70) What mineral group forms by the breakdown and weathering of rock-forming silicate minerals and are important constituents of soils?
Answer: clays
Diff: 1
Chapter Subhead: 2.8 Common Silicate Minerals
Bloom's: Understanding

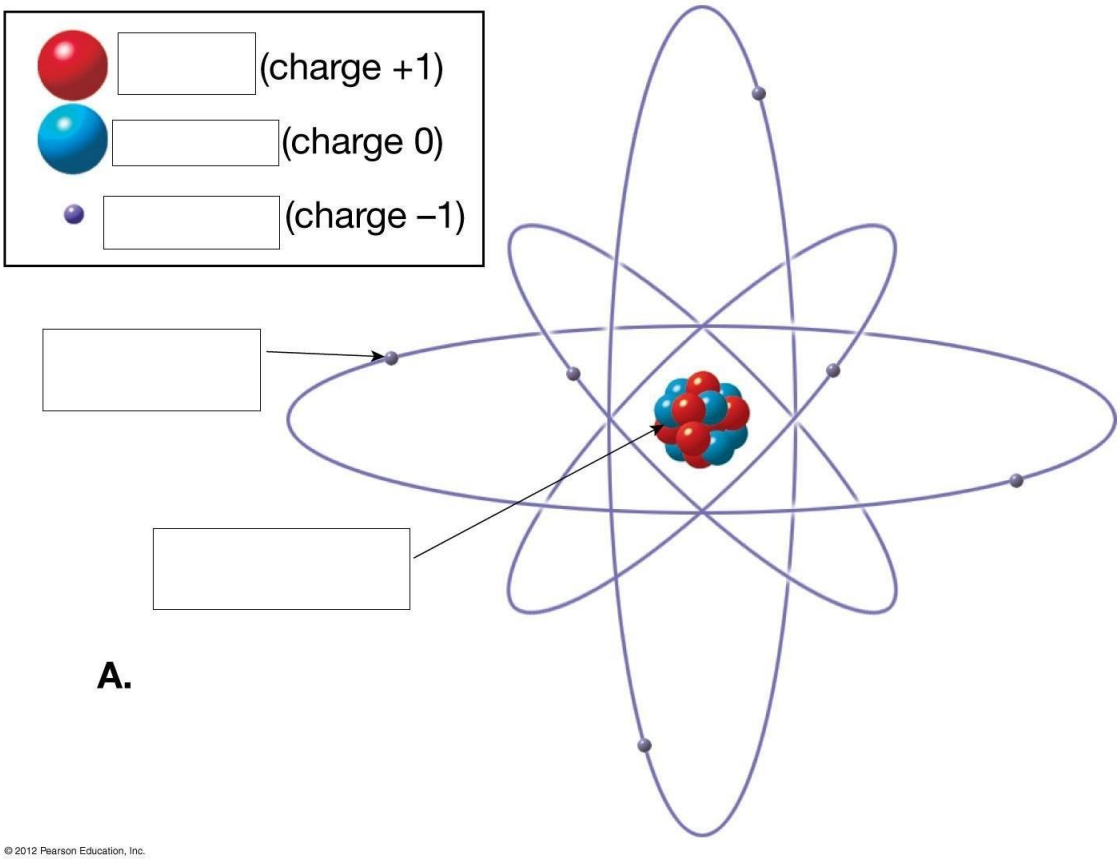
Critical thinking and discussion questions. Use complete sentences, correct spelling, and the information presented in Chapter 2 to answer the questions below.

71) Overall, the physical properties of minerals provide a reliable means to identify common minerals. However, certain properties can exhibit a range of characteristics or values making them less useful for identification purposes. Choose three physical properties that might vary considerably between samples of the same mineral and explain why such variability would exist.
Diff: 2
Chapter Subhead: 2.5 Physical Properties of Minerals
Bloom's: Applying, Evaluating

72) Based on the brief discussion of chemistry and chemical bonding in chapter 2, why do minerals rarely exhibit pure chemical compositions (100% always the same chemical composition)?
Diff: 2
Chapter Subhead: 2.3 Why Atoms Bond
Bloom's: Evaluating

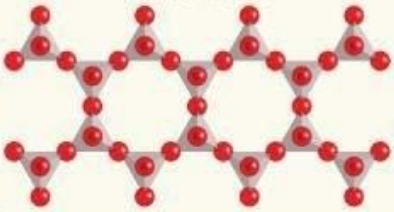
73) Considering the composition and structure of Earth discussed in chapter 1, do you think all of the possible silicate (and even mineral) structures have been identified by scientists? Discuss why or why not. Also, does this same reasoning apply to all possible chemical elements of Earth?
Diff: 3
Chapter Subhead: 2.7 The Silicates
Bloom's: Analyzing, Evaluating

74) Label the various parts of an atom in the diagram below.



Answer: See Figure 2.4A in chapter 2 of the Essentials of Geology, 11e textbook
Diff: 1
Chapter Subhead: 2.2 Atoms: Building Blocks of Minerals
Bloom's: Remembering, Understanding

75) Fill in the table below on silicate minerals

Mineral/Formula	Cleavage	Silicate Structure
Olivine group $(Mg, Fe)_2SiO_4$	(a)	Single tetrahedron 
(b)	Two planes at 90°	Single chains 
(c)	(d)	Double chains 

Answer:
(a) none
(b) pyroxene group - augite
(c) amphibole group - hornblende
(d) two planes at 60 and 120 degrees
Diff: 2
Chapter Subhead: 2.8 Common Silicate Minerals
Bloom's: Applying, Remembering