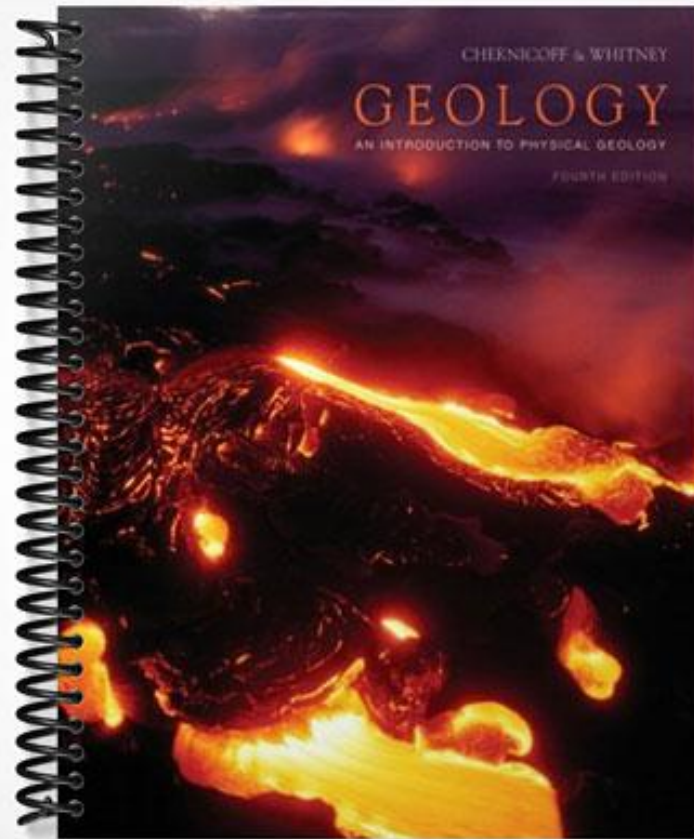


**TEST BANK**



Geology (Chernicoff)  
Chapter 2 Minerals

Multiple-Choice Questions

1) A rock is best defined as:

- A) aggregates of several crystals.
- B) aggregates of one or more naturally occurring solids of definite chemical composition.
- C) aggregates of one or more minerals.
- D) aggregates of naturally occurring solids of definite crystalline structure.

Answer: C

Page Ref: 38

Topic: What Is a Mineral?

Skill: Factual/Definitional

2) In geology, a mineral is defined as:

- A) a natural substance that is neither animal nor plant, has a specific composition and structure, and contains one or more silicon-oxygen tetrahedra.
- B) a solid substance or element that is essential to human nutrition.
- C) a naturally occurring crystalline inorganic solid that contains only one element.
- D) a naturally occurring, usually inorganic, solid consisting of chemical elements in specific proportions, whose atoms are arranged in a systematic internal pattern.

Answer: D

Page Ref: 40

Topic: What Is a Mineral?

Skill: Factual/Definitional

3) Opal should NOT be considered a mineral because:

- A) it does not have a definite shape.
- B) it is organic in origin.
- C) it does not have a systematic internal organization of its atoms.
- D) it does not contain silicon-oxygen tetrahedrons.

Answer: C

Page Ref: 40

Topic: What Is a Mineral?

Skill: Conceptual/Analytical

4) The smallest particle of an element that retains all of the element's chemical properties is the:

- A) proton.
- B) atom.
- C) molecule.
- D) mineral.

Answer: B

Page Ref: 40

Topic: What Is a Mineral?

Skill: Factual/Definitional

5) One carbon isotope has 6 protons, 8 neutrons, and 6 electrons. Its atomic mass is:

- A) 6.
- B) 12.
- C) 14.
- D) 20.

Answer: C

Page Ref: 41

Topic: What Is a Mineral?

Skill: Conceptual/Analytical

6) The property that distinguishes an atom to be that of a particular element is:

- A) the number of electrons it has.
- B) the number of protons it has.
- C) the number of neutrons it has.
- D) the number of neutrons and protons together.

Answer: B

Page Ref: 41

Topic: What Is a Mineral?

Skill: Factual/Definitional

7) The element carbon has 6 protons and 6 electrons, and one isotope has 8 neutrons. The atomic number of this isotope of carbon is:

- A) 6.
- B) 12.
- C) 14.
- D) 20.

Answer: A

Page Ref: 41

Topic: What Is a Mineral?

Skill: Conceptual/Analytical

8) Which characteristics of an atom determine whether it will bond with other atoms?

- A) Number of protons and net electrical charge.
- B) Number of neutrons and number of electrons in the outer shell.
- C) Number of electrons in the outer shell and net electrical charge.
- D) Number of neutrons and net electrical charge.

Answer: C

Page Ref: 42-43

Topic: What Is a Mineral?

Skill: Factual/Definitional

9) Which of the following atoms would be LEAST likely to bond with other atoms?

- A) An atom with 7 electrons in its outer shell and the same number of electrons as protons.
- B) An atom with 8 electrons in its outer shell and the same number of electrons as protons.
- C) An atom with 8 electrons in its outer shell and fewer electrons than protons.
- D) An atom with 7 electrons in its outer shell and fewer electrons than protons.

Answer: B

Page Ref: 42-43

Topic: What Is a Mineral?

Skill: Conceptual/Analytical

10) An atom with only one electron in its outer shell loses that electron, and does the following EXCEPT:

- A) become the atom of a different element.
- B) become electrically positive.
- C) become more chemically stable.
- D) become likely to form an ionic bond with another atom.

Answer: A

Page Ref: 43

Topic: What Is a Mineral?

Skill: Factual/Definitional

11) In an ionic bond, atoms:

- A) share electrons.
- B) become less chemically stable.
- C) achieve electrical neutrality.
- D) lose or gain electrons.

Answer: D

Page Ref: 43

Topic: What Is a Mineral?

Skill: Factual/Definitional

12) In a covalent bond, atoms:

- A) share electrons.
- B) share protons.
- C) become less chemically stable.
- D) must have opposite electrical charges.

Answer: A

Page Ref: 43

Topic: What Is a Mineral?

Skill: Factual/Definitional

13) In metallic bonding, which of the following is NOT true?

- A) Atoms are packed tightly together.
- B) A cloud of electrons roams independently, unattached to any specific nucleus.
- C) The electron cloud is negatively charged and is attracted to the positively charged nuclei.
- D) Metallic bonding is the most common type of bonding among minerals.

Answer: D

Page Ref: 43

Topic: What Is a Mineral?

Skill: Conceptual/Analytical

14) Which of the following characteristics is NOT imparted by metallic bonding?

- A) Metallic luster.
- B) Extreme hardness.
- C) Conductivity of electric current.
- D) High specific gravity.

Answer: B

Page Ref: 43

Topic: What Is a Mineral?

Skill: Factual/Definitional

15) Which of the following statements concerning hydrogen bonding is NOT true?

- A) For geologists, it is the most important type of intermolecular bonding.
- B) It occurs because the water molecule is polar; the oxygen side of the water molecule carries a positive charge and the hydrogen side carries a negative charge.
- C) It can be used to explain why so many substances dissolve in water.
- D) Although weaker than ionic bonding, it can often separate ionically bonded compounds into its component ions.

Answer: B

Page Ref: 44

Topic: What Is a Mineral?

Skill: Conceptual/Analytical

16) A van der Waals bond is a type of:

- A) ionic bond.
- B) covalent bond.
- C) metallic bond.
- D) intermolecular bond.

Answer: D

Page Ref: 44

Topic: What Is a Mineral?

Skill: Factual/Definitional

17) Which of the following statements concerning crystals is NOT true?

- A) They are considered crystals only if they are naturally occurring.
- B) They possess an orderly arrangement of ions or atoms in a three-dimensional latticework.
- C) In well-formed crystals of a given mineral, angles among the planar surfaces are always the same.
- D) On a microscopic level, the crystals of any given mineral possess exactly the same structure even if the crystals are not well formed.

Answer: A

Page Ref: 45

Topic: Mineral Structure

Skill: Conceptual/Analytical

18) A mineraloid is the same as a mineral EXCEPT:

- A) it is not a naturally occurring substance.
- B) it does not possess an orderly internal arrangement.
- C) it is not inorganic.
- D) it does not form from the cooling of molten rock.

Answer: B

Page Ref: 45

Topic: Mineral Structure

Skill: Factual/Definitional

19) The kinds of mineral formed in a particular time and place depend on all of the following EXCEPT:

- A) the relative abundances of available elements.
- B) the relative sizes and fit of the atoms and ions of the available elements.
- C) the shape of the space in which the mineral forms.
- D) the temperature and pressure at the time of formation.

Answer: C

Page Ref: 45

Topic: Mineral Structure

Skill: Conceptual/Analytical

- 20) In a crystal structure, which of the following is true?
- A) Smaller negative ions occur between larger positive ions.
  - B) Negative ions bond proportionally with equal-sized positive ions.
  - C) Smaller positive ions occur between larger negative ions.
  - D) Negative ions bond together by sharing electrons.

Answer: C

Page Ref: 46

Topic: Mineral Structure

Skill: Factual/Definitional

- 21) Which of the following statements concerning mineral crystal formation is NOT true?
- A) Given two elements of equal abundance, the element that contributes more readily to mineral formation is the one that "fits" better on an atomic level.
  - B) Atoms of a similar size can often replace one another within a crystal structure without changing the identity of the crystal.
  - C) Because the identity of the available atoms remains constant, the formation of crystals is independent of the rate of cooling of the molten rock from which it forms.
  - D) The physical space available in which a crystal grows is a limiting factor in the shape of a crystal.

Answer: C

Page Ref: 46

Topic: Mineral Structure

Skill: Conceptual/Analytical

- 22) In the mineral olivine, iron and magnesium can substitute freely in the crystal for all of the following reasons EXCEPT:

- A) they are similar in size.
- B) they have the same charge.
- C) they are both abundant in the Earth's crust.
- D) they have the same atomic mass.

Answer: D

Page Ref: 46

Topic: Mineral Structure

Skill: Factual/Definitional

- 23) The term polymorphism refers to:
- A) two mineral crystals that, because of space restrictions, reached different degrees of development.
  - B) two mineral crystals that have the same identity but different color, shape, or texture.
  - C) two mineral crystals that have the same chemical composition but different crystal structure.
  - D) two mineral crystals that have the same identity, but whose atomic structure includes ionic substitutions by alternate elements.

Answer: C

Page Ref: 46

Topic: Mineral Structure

Skill: Conceptual/Analytical

- 24) The best single property by which most minerals can be identified is:
- A) color, which depends on how much light a mineral's specific chemical makeup and crystal structure cause it to absorb or reflect.
  - B) streak, the color of the powdered mineral without trace impurities.
  - C) hardness, its resistance to scratching or abrasion.
  - D) none of the above, because minerals can seldom be identified on the basis of only one property.

Answer: D

Page Ref: 47

Topic: How Minerals Are Identified

Skill: Factual/Definitional

25) Which of the following statements about mineral identification is NOT true?

- A) Many different types of minerals may exhibit the same color.
- B) Many types of minerals occur in more than one color.
- C) Color is one of the most reliable ways by which minerals can be identified.
- D) A mineral may receive its color from only minute amounts of specific elements included within its structure.

Answer: C

Page Ref: 47

Topic: How Minerals Are Identified

Skill: Factual/Definitional

26) Which of the following statements regarding mineral identification is NOT true?

- A) Hardness is determined using the Moh's Hardness Scale.
- B) Effervescence refers to the tendency of some minerals to fizz when exposed to acid.
- C) Luster refers primarily to whether the mineral appears to shine when its surface is wet.
- D) Cleavage refers to the tendency of the mineral to break or cleave along distinct planes.

Answer: C

Page Ref: 47

Topic: How Minerals Are Identified

Skill: Factual/Definitional

27) The purpose of rubbing a mineral across an unglazed porcelain slab, the streak plate, is:

- A) to observe the color of a mineral in its powdered form.
- B) to remove dirt and corrosion from the mineral so that its true color can be observed.
- C) to remove the atoms of trace impurities that may exist within the structure of the mineral.
- D) to determine if a streak will form on the mineral.

Answer: A

Page Ref: 48

Topic: How Minerals Are Identified

Skill: Factual/Definitional

28) Which of the following statements about mineral hardness is NOT true?

- A) Hardness refers to how easily or how resistant a mineral is to breakage.
- B) Hardness is dependent on the strength of a mineral's weakest bonds.
- C) Hardness of a mineral is determined by scratching it with a series of other substances of known hardness.
- D) Hardness ranges from 1 (the softest) to 10 (the hardest) on a scale called the Mohs Hardness Scale.

Answer: A

Page Ref: 48

Topic: How Minerals Are Identified

Skill: Factual/Definitional

29) Mineral hardness refers to:

- A) strength of the bonds in the crystal structure.
- B) equal bond strength in the crystal structure.
- C) unequal bond strength in the crystal structure.
- D) durability of the mineral.

Answer: A

Page Ref: 48

Topic: How Minerals Are Identified

Skill: Conceptual/Analytical

- 30) If a mineral exhibits cleavage, it:
- A) breaks very easily.
  - B) always occurs in the same shape.
  - C) fractures as a curved, shell-shaped (conchoidal) surface.
  - D) breaks consistently along distinct planes.

Answer: D

Page Ref: 51

Topic: How Minerals Are Identified

Skill: Factual/Definitional

- 31) Mineral cleavage indicates:
- A) strength of the bonds in the crystal structure.
  - B) equal bond strength in the crystal structure.
  - C) unequal bond strength in the crystal.
  - D) brittle nature of the mineral.

Answer: C

Page Ref: 51

Topic: How Minerals Are Identified

Skill: Conceptual/Analytical

- 32) Fracture in a mineral indicates:
- A) strength of the bonds in the crystal structure.
  - B) equal bond strength in the crystal structure.
  - C) unequal bond strength in the crystal structure.
  - D) brittle nature of the minerals.

Answer: B

Page Ref: 51

Topic: How Minerals Are Identified

Skill: Conceptual/Analytical

- 33) Diamond cutters have traditionally made use of which mineral property?

- A) Hardness.
- B) Cleavage.
- C) Fracture.
- D) Specific gravity.

Answer: B

Page Ref: 52

Topic: Cutting Diamonds

Skill: Factual/Definitional

- 34) In the laboratory, the specific gravity of a mineral can be determined by the ratio of the substance's:

- A) size to the weight of an equal volume of water.
- B) weight to the weight of an equal volume of water.
- C) volume to the volume of an equal weight of water.
- D) weight to its mass.

Answer: B

Page Ref: 53

Topic: How Minerals Are Identified

Skill: Factual/Definitional



35) The most important (i.e., most abundant) mineral group is the:

- A) silicates.
- B) oxides.
- C) sulfates.
- D) carbonates.

Answer: A

Page Ref: 55

Topic: Some Common Rock-Forming Minerals

Skill: Factual/Definitional

36) The silicon-oxygen tetrahedron consists of:

- A) one large silicon atom and four smaller oxygen atoms.
- B) one small silicon atom and four larger oxygen atoms.
- C) one large oxygen atom and four smaller silicon atoms.
- D) one small oxygen atom and four larger silicon atoms.

Answer: B

Page Ref: 55

Topic: Some Common Rock-Forming Minerals

Skill: Factual/Definitional

37) Silicon-oxygen tetrahedra can form as independent tetrahedra, single chains, double chains, sheets, and frameworks. A list of the minerals corresponding to these, in order, are:

- A) olivine, pyroxene, amphibole, mica, quartz.
- B) pyroxene, mica, quartz, amphibole, olivine.
- C) quartz, feldspar, olivine, amphibole, mica.
- D) olivine, quartz, mica, feldspar, amphibole.

Answer: A

Page Ref: 55-58

Topic: Some Common Rock-Forming Minerals

Skill: Factual/Definitional

38) The mineral quartz is distinctive because it consists of:

- A) independent tetrahedra composed entirely of silicon and oxygen.
- B) independent tetrahedra in which the silicon atoms are often replaced with atoms of aluminum, potassium, sodium, or calcium.
- C) a three-dimensional framework composed entirely of silicon and oxygen.
- D) a three-dimensional framework in which the silicon atoms are often replaced with atoms of aluminum, potassium, sodium, or calcium.

Answer: C

Page Ref: 59

Topic: Some Common Rock-Forming Minerals

Skill: Conceptual/Analytical

39) Smectite clay is used for all of the following EXCEPT:

- A) as a prime ingredient in kitty litter.
- B) as a crucial cleansing agent for large industrial spills.
- C) to heal and patch fractures in rock and concrete.
- D) as a common cure for intestinal ailments.

Answer: D

Page Ref: 60

Topic: The Pros and Cons of Swelling Clays

Skill: Factual/Definitional

40) All of the following statements concerning nonsilicates are true EXCEPT:

- A) they constitute only about 5% of the Earth's crust.
- B) the native elements do not combine in nature with other elements.
- C) they form the two most abundant minerals in the Earth's crust.
- D) they are the best source for metals.

Answer: C

Page Ref: 60

Topic: Some Common Rock-Forming Minerals

Skill: Conceptual/Analytical

41) Which of the following is the most appropriate statement regarding the naming of minerals?

- A) The names of minerals are based on the elements that form them.
- B) The names of minerals are based on geographic locations, distinctive physical characteristics, and so on, rather than on a conventional system.
- C) The names of minerals, like those of plants and animals, have been given in Latin for the purpose of international uniformity.
- D) The names of minerals are based on a strict systematic international code, and always begin with successive letters of the Latin alphabet in the order in which the mineral is discovered.

Answer: B

Page Ref: 61-62

Topic: Some Common Rock-Forming Minerals

Skill: Factual/Definitional

42) Which of the following statements about gemstones is NOT true?

- A) Gemstones are formed only from very rare minerals.
- B) Gemstones can form when molten rock cools and crystallizes deep underground.
- C) Gemstones can form when preexisting rock is subjected to extraordinary pressure and heat.
- D) The color in gemstones may result from a few atoms scattered throughout its crystal structure.

Answer: A

Page Ref: 65

Topic: Gemstones

Skill: Conceptual/Analytical

43) Which of the following statements concerning diamonds is NOT true?

- A) Diamonds are most often found in kimberlite pipes.
- B) Diamonds are formed as a result of extreme pressure on coal that has been buried to a depth of more than 150 kilometers (90 miles).
- C) Only a few kimberlite pipes produce gem-quality diamonds.
- D) Diamond is the world's hardest natural substance.

Answer: B

Page Ref: 65-66

Topic: Gemstones

Skill: Conceptual/Analytical

44) Which one of the following properties will distinguish cubic zirconia from real diamond?

- A) Color.
- B) Streak.
- C) Specific gravity.
- D) Luster.

Answer: C

Page Ref: 65-66

Topic: Gemstones

Skill: Factual/Definitional

45) All of the following statements concerning synthetic gems are true EXCEPT:

- A) many of the diamonds used in both industry and in jewelry are synthetic.
- B) many synthetic gems are indistinguishable from natural ones except by laboratory analysis.
- C) synthetic gems are generally cheaper than natural gems.
- D) synthetic gems are generally inferior to natural gems.

Answer: D

Page Ref: 66

Topic: Gemstones

Skill: Conceptual/Analytical

46) Which of the following examples of minerals that form under the given environments is NOT possible?

- A) Deposits of halite form from the evaporation of saltwater.
- B) Deposits of calcite form from the slow cooling of molten rock.
- C) Deposits of glaucophane form in deep-sea trenches.
- D) Deposits of stishovite form from meteorite impacts.

Answer: B

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Topic: Minerals as Clues to the Past

Skill: Conceptual/Analytical

## Essay Questions

1) Many minerals are important in our everyday lives. List four of these minerals and their uses.

Answer: (Answers will vary and could include four from among the following.)

Quartz is used in clocks and watches; calcium, phosphorus, fluorine, sodium, potassium, and iron are all important to nutrition; talc is used in talcum powder; sulfur is used in fertilizer, paint, and synthetic fibers; aluminum is used in cans and lawn chairs, and diamonds are in dentists' drill bits.

Topic: Introduction

2) Why does the discussion of minerals include a review of chemistry?

Answer: All minerals are chemical compounds. Their chemical compositions and ordered internal arrangements of atoms determine their distinctive characteristics and properties. We demand these qualities as we seek materials with strength, durability, electrical conductivity, or high reflectivity.

Topic: What Is a Mineral?

3) Explain why the crystals of any given mineral always form in the same geometric shape if allowed to grow in an unrestricted space.

Answer: Every crystal of a given mineral has the same crystal structure; its internal arrangement of ions or atoms is consistent. For a crystal that grows in an unrestricted space, the shape of a crystal is the external expression of the mineral's microscopic internal crystal structure repeated in three-dimensional units.

Topic: What Is a Mineral?

4) Why is the chemical composition of a mineral such as olivine not consistent?

Answer: Olivine is an example of a mineral in which ionic substitution may take place. Ionic substitution occurs when certain ions of similar size and charge are available and replace one another within a crystal structure during the mineral's formation. As a result, some minerals that have the same internal arrangement of ions may have minor variations in composition.

Topic: Mineral Structure

5) Describe the silicon-oxygen tetrahedron. Why is it important?

Answer: The silicon-oxygen tetrahedron consists of one small silicon atom surrounded and bonded ionically to four large oxygen atoms. The tetrahedron is important because the silicate minerals, which are formed from silicon-oxygen tetrahedra, make up more than 90% of the weight of the Earth's crust.

Topic: Some Common Rock-Forming Minerals

6) Quartz and feldspar are both silicates formed from a three-dimensional framework of silica tetrahedra, but they are completely different minerals. Describe three ways in which they differ.

Answer: Three ways in which quartz and feldspar differ are as follows: 1) Composition: Quartz is the only mineral with a crystalline structure composed entirely of silicon and oxygen, although other ions may be trapped within it. In feldspar, the silicon atoms are often replaced with atoms of aluminum, potassium, sodium, or calcium. 2) Cleavage: A fully developed quartz crystal is a perfect prism with a pyramid on each end, but it displays conchoidal fracture rather than cleavage. Feldspar has two prominent cleavage planes that intersect at a 90° angle. 3) Hardness: Quartz has a hardness of 7; feldspar has a hardness of about 6.

Topic: Some Common Rock-Forming Minerals

7) Olivine is a common, iron-bearing silicate mineral, yet iron is mined from oxides such as hematite and magnetite. Why?

Answer: Olivine forms at very high temperatures and would require high temperatures to melt and separate. Oxides have much lower melting points, and are thus easier to separate economically. Iron oxides are more concentrated in the banded iron formations as well.

Topic: Some Common Rock-Forming Minerals

8) Why are the names of minerals not based on the elements from which they are made? How are minerals named?

Answer: The names of minerals are not based on the elements from which they are made for two reasons. First, the same elements can be arranged to form more than one type of mineral. Second, the chemical compositions of some minerals are so complex that a name based on their formulas would not be practical. An international commission approves the names proposed for new minerals as they are identified. Mineral names are based on such diverse things as geographical locations, distinctive physical characteristics, and people.

Topic: Some Common Rock-Forming Minerals

9) Discuss what gemstones are and how they form.

Answer: Gemstones are precious or semiprecious minerals that display particularly appealing color, luster, or crystal form and can be cut or polished for ornamental purposes. Many gemstones form from rare minerals, but many form from very common minerals that contain small amounts of other elements that alter their color. Gemstones form under conditions that promote the development of perfect, large crystals, either when molten rock cools and crystallizes deep underground or when preexisting rock is subjected to extraordinary pressure and heat.

Topic: Gemstones

10) Describe three examples of how specific minerals can be used to determine the geologic events and environmental conditions that may have produced them.

Answer: 1) Large deposits of halite (table salt) have been found in Michigan, Kansas, and Louisiana. Knowing that halite forms by the evaporation of saltwater, geologists believe these areas were once covered by ancient saltwater seas. 2) Glaucophane, a blue variety of amphibole, is known to form only in high-pressure, low-temperature conditions. This environment is found only in deep-sea trenches where oceanic plates are subducting at convergent plate boundaries. 3) Stishovite, a polymorph of quartz, forms only at temperatures higher than 1200°C and pressures in excess of 130,000 times that found at sea level. Geologists believe that such extreme conditions probably indicate a meteorite impact.

Topic: Minerals as Clues to the Past