

Chapter 02 - Atoms, Elements, and Minerals

**Chapter 02**  
**Atoms, Elements, and Minerals**

**True / False Questions**

1. A mineral is defined as a crystalline solid that is naturally occurring, has a specific chemical composition and forms through geologic processes.

**TRUE**

*Bloom's Level: 1. Remember*  
*Topic: Earth Materials*

2. The innermost energy level in the standard model of an atom is full when it possesses eight electrons.

**FALSE**

*Bloom's Level: 2. Understand*  
*Topic: Earth Materials*

3. The atomic mass number is equal to the number of neutrons in an atom.

**FALSE**

*Bloom's Level: 1. Remember*  
*Topic: Earth Materials*

4. The atomic number of an element is equal to the number of protons in each atom.

**TRUE**

*Bloom's Level: 1. Remember*  
*Topic: Earth Materials*

5. Rocks are defined as naturally-formed aggregates of minerals or mineral-like substances.

**TRUE**

*Bloom's Level: 1. Remember  
Topic: Earth Materials*

6. The number of neutrons in an atom controls the chemical behavior of an element.

**FALSE**

*Bloom's Level: 1. Remember  
Topic: Earth Materials*

7. Silica is a term for oxygen combined with silicon.

**TRUE**

*Bloom's Level: 1. Remember  
Topic: Earth Materials*

8. It is clear that exposure to white asbestos causes cancer among non-smoking asbestos workers.

**FALSE**

*Bloom's Level: 2. Understand  
Topic: Earth Materials*

9. Both graphite and diamond are made of carbon.

**TRUE**

*Bloom's Level: 1. Remember  
Topic: Earth Materials*

10. All of the most common rock-forming minerals in Earth's crust are silicate minerals.

**TRUE**

*Bloom's Level: 1. Remember*  
*Topic: Earth Materials*

11. Clay minerals are very common in the Earth's upper mantle.

**FALSE**

*Bloom's Level: 1. Remember*  
*Topic: Earth Materials*

12. Calcite (calcium carbonate) is the most common non-silicate mineral in the Earth's crust.

**TRUE**

*Bloom's Level: 1. Remember*  
*Topic: Earth Materials*

13. Non-silicate minerals are more abundant in the deeper parts of Earth's crust than in the crust as a whole.

**FALSE**

*Bloom's Level: 1. Remember*  
*Topic: Earth Materials*

14. The quality and intensity of light that is reflected from the surface of a mineral is termed luster.

**TRUE**

*Bloom's Level: 1. Remember*  
*Topic: Earth Materials*

15. A mineral specimen with a Mohs hardness of 5 can scratch a mineral specimen with a hardness of 3.

**TRUE**

*Bloom's Level: 2. Understand  
Topic: Earth Materials*

16. Minerals that have the same chemical composition but have different crystalline structures exhibit polymorphism

**TRUE**

*Bloom's Level: 2. Understand  
Topic: Earth Materials*

17. Color is the least reliable physical property in mineral identification.

**TRUE**

*Bloom's Level: 2. Understand  
Topic: Earth Materials*

18. Diamond has no cleavage.

**FALSE**

*Bloom's Level: 1. Remember  
Topic: Earth Materials*

19. Specific gravity is the ratio of a mass of a substance to the mass of an equal volume of air.

**FALSE**

*Bloom's Level: 1. Remember  
Topic: Earth Materials*

20. The crystal form of a mineral is a set of faces that have a definite geometric relationship to one another.

**TRUE**

*Bloom's Level: 1. Remember  
Topic: Earth Materials*

### Multiple Choice Questions

21. In order for a particular type of material to be classified as a mineral, it must \_\_\_\_.

- A. be a solid
- B. occur naturally
- C. have a crystalline structure
- D. have a definite chemical composition
- E.** All of the answers are correct.

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22. The atomic number of an element equals the number of \_\_\_\_\_ in each atom.

- A. electrons
- B. neutrons
- C.** protons
- D. Answers neutrons and protons are both correct; answer a is not correct.
- E. Answers electrons, neutrons and protons are all correct.

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23. The atomic mass number of an atom is the total number of \_\_\_\_ in the atom.

- A. electrons
- B. neutrons
- C. protons
- D.** protons and neutrons
- E. protons, neutrons, and electrons

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*Topic: Earth Materials*

24. \_\_\_\_\_ of an element are atoms containing different numbers of neutrons but the same number of protons.

- A. Ions
- B. Classes
- C. Particles
- D.** Isotopes
- E. Varieties

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*Topic: Earth Materials*

25. The atomic mass number of common oxygen is 16 because it has \_\_\_\_ protons and \_\_\_\_ neutrons.

- A. 7; 9
- B.** 8; 8
- C. 9; 7
- D. 5; 11
- E. 10; 6

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26. Carbon-14 has eight \_\_\_\_.

- A. protons
- B. nuclei
- C. neutrons
- D. isotopes
- E. atoms

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*Topic: Earth Materials*

27. The isotope composition of \_\_\_\_\_ in foraminifera shells from sediment cores are used to determine climate change in Earth history.

- A. oxygen
- B. carbon
- C. uranium
- D. lead
- E. helium

*Bloom's Level: 1. Remember*

*Topic: Climate, Weather, and Their Influences on Geology*

*Topic: Earth Materials*

28. The two most abundant elements in Earth's crust are \_\_\_\_.

- A. iron and magnesium
- B. carbon and hydrogen
- C. carbon and oxygen
- D. hydrogen and oxygen
- E. oxygen and silicon

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*Topic: Earth Materials*

29. When seawater evaporates, its sodium and chlorine are electronically attracted to one another and crystallize into \_\_\_\_.

- A. quartz
- B. halite**
- C. clay
- D. calcite
- E. hematite

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30. The mineral \_\_\_\_ reacts with weak hydrochloric acid to produce carbon dioxide gas, i.e., it effervesces (fizzes) in dilute acid.

- A. calcite**
- B. feldspar
- C. quartz
- D. biotite
- E. amphibole

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31. The \_\_\_\_\_ group and the \_\_\_\_ group are sheet silicates characterized by one direction of cleavage.

- A. amphibole; pyroxene
- B. feldspar; quartz
- C. olivine; plagioclase
- D. mica; clay**
- E. carbonate; sulfide

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32. Two examples of framework silicates are \_\_\_\_\_ and \_\_\_\_\_.

- A. calcite; dolomite
- B. olivine; pyroxene
- C. quartz; feldspar**
- D. biotite; muscovite
- E. amphibole; olivine

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33. \_\_\_\_\_ is the ability of a mineral to break, when struck or split, along preferred planar directions.

- A. Cleavage**
- B. Crystal form
- C. Facets
- D. Planes
- E. Form

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34. A silica tetrahedron is composed of four atoms of the element \_\_\_\_ and one atom of \_\_\_\_.

- A. silicon; aluminum
- B. silicon; oxygen
- C. silicon; iron
- D. oxygen; silicon**
- E. aluminum; silicon

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35. The common mineral \_\_\_\_ is an example of an isolated silica tetrahedron structure.

- A. amphibole
- B. feldspar
- C. olivine**
- D. pyroxene
- E. mica (biotite, muscovite, etc.)

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36. Five of the six minerals collectively known as asbestos contain single chains of silica tetrahedral and belong to the \_\_\_\_\_.

- A. amphiboles
- B. feldspars
- C. olivines
- D. pyroxenes**
- E. micas

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37. The \_\_\_\_\_ group of minerals is characterized by two parallel chains of silica tetrahedra in their structure.

- A. amphibole**
- B. feldspar
- C. olivine
- D. pyroxene
- E. mica (biotite, muscovite, etc.)

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38. The \_\_\_\_\_ group of minerals are sheet silicates.

- A. amphibole
- B. feldspar
- C. olivine
- D. pyroxene
- E.** mica

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39. Non-silicate minerals include the halides like \_\_\_\_\_.

- A. calcite
- B.** halite
- C. magnetite
- D. pyrite
- E. gypsum

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40. The mineral \_\_\_\_ is an example of a native element.

- A. quartz
- B. feldspar
- C. calcite
- D.** graphite
- E. halite

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*Topic: Earth Materials*

41. A pulverized mineral (usually on a piece of white unglazed porcelain) gives a color called its \_\_\_\_, that is usually more reliable than the color of the specimen itself.

- A. dust
- B. chroma
- C. streak**
- D. smear
- E. powder

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42. The softest mineral on Mohs' hardness scale is \_\_\_\_.

- A. gypsum
- B. talc**
- C. diamond
- D. quartz
- E. mica

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*Topic: Earth Materials*

43. What is the special property of the mineral halite?

- A. It has 5 directions of cleavage.
- B. It has a hardness of -3.
- C. It can transmit electricity.
- D. It tastes like salt.**
- E. It has an extremely high melting temperature.

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44. \_\_\_\_ has the property of generating electricity when squeezed in a certain crystallographic direction.

- A. Copper
- B. Mica
- C. Amphibole
- D. Gold
- E.** Quartz

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45. The hardest mineral has a hardness of \_\_\_\_ on Mohs' relative hardness scale.

- A. 1
- B.** 10
- C. 100
- D. 1000
- E. 10000

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46. Calcite has \_\_\_\_ direction of cleavage.

- A. 1
- B. 2
- C.** 3
- D. 4
- E. 6

*Bloom's Level: 1. Remember*  
*Topic: Earth Materials*

47. In some minerals the bonds are equally strong in all directions, therefore they have no cleavage but instead \_\_\_\_\_ along irregular surfaces that are commonly curved.

- A. luminesce
- B. chip
- C. flatten
- D. bend
- E.** fracture

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48. The third most abundant element in the Earth's crust is \_\_\_\_\_; it is more common than iron.

- A. magnesium
- B.** aluminum
- C. calcium
- D. fluorine
- E. tin

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49. The mineral \_\_\_\_ is strongly magnetic.

- A. calcite
- B. pyrite
- C.** magnetite
- D. magnesite
- E. quartz

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50. \_\_\_\_\_ and sapphire are both varieties of the common mineral corundum.

- A. Emerald
- B. Turquoise
- C.** Ruby
- D. Beryl
- E. Peridot

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*Topic: Earth Materials*

51. \_\_\_\_\_ is an expansive (swells when wet) clay mineral.

- A. Quartz
- B. Olivine
- C. Pyroxene
- D.** Montmorillonite
- E. Mica

*Bloom's Level: 1. Remember*

*Topic: Earth Materials*

52. \_\_\_\_\_ is the most common element in the Earth's crust.

- A.** Oxygen
- B. Iron
- C. Magnesium
- D. Hydrogen
- E. Fluorine

*Bloom's Level: 1. Remember*

53. Some minerals have the same chemical composition but different crystal structures, a phenomenon termed \_\_\_\_\_.

- A. alteration
- B. recrystallization
- C. metamorphism
- D. isotopes
- E.** polymorphism

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54. \_\_\_\_\_, a Danish naturalist, was the first to note that the angle between two adjacent faces of a crystal of quartz is always exactly the same.

- A. Einstein
- B.** Steno
- C. Plummer
- D. McGearry
- E. Carlson

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55. Specific gravity is the ratio of the mass of a mineral to the mass of an equal volume of \_\_\_\_.

- A.** liquid water
- B. solid water
- C. quartz
- D. diamond
- E. air

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56. Plagioclase feldspar commonly exhibits \_\_\_, straight, parallel lines on the flat surfaces of one of the two cleavage directions.

- A. parallelograms
- B. grooves
- C. lamitations
- D.** striations
- E. laminations

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57. \_\_\_\_ elements make up 98% of the Earth's crust.

- A. Fourteen
- B. Ninety-two
- C. Two
- D. Twenty
- E.** Eight

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58. \_\_\_\_\_ are the smallest electrically neutral assemblies of matter and energy that we know of in the universe.

- A. Isotopes
- B.** Atoms
- C. Ions
- D. Electrons
- E. Protons

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59. The most common minerals in the Earth's crust are the \_\_\_\_\_.

- A. silicates
- B. carbonates
- C. halides
- D. sulfides
- E. sulfates

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*Topic: Earth Materials*

60. On Mohs' scale of hardness your fingernail has a value of \_\_\_\_.

- A. 12
- B. 5
- C. 2½
- D. 6½
- E. 9

*Bloom's Level: 2. Understand*

*Topic: Earth Materials*