

Study Questions: Matter and Minerals

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The quiz about matter and minerals will involve questions like the ones that follow.

Note: Whenever you see reference to *Tarbuck*, in the following questions, that means the eText of the textbook by Tarbuck and others, **Earth**

1. What is an atom or molecule with a charge (positive or negative) called?
2. What are the three most abundant elements in Earth's crust (by weight or by volume), listed in order with the most abundant first? *Hint:* Study Figure 3.28 in *Tarbuck*.
3. What are the three states of matter that are most relevant in the geosciences?
4. Which of the three primary sub-atomic particles (proton, neutron, electron) is most significantly involved in chemical bonding?
5. What kind of chemical bond connects two or more atoms with different charges?
6. In what kind of chemical bond are electrons shared by two or more nuclei, in order to fill their valence shells?
7. In what kind of chemical bond are electrons free to move among several nuclei?
8. What is the name of the structure in which atoms or molecules are bound in a regular 3-dimensional geometric pattern, as is commonly depicted by "ball-and-stick" models?
9. What is a good general definition of a mineral? **Answer:** A mineral is (1) a naturally occurring solid, (2) that does not form solely through biological activity, (3) that has a crystalline or lattice structure, (4) whose chemical composition is fixed or varies within a set, narrow range, and (5) with diagnostic physical properties.
10. What is the general name given to the crystalline structures in which the two most common elements in Earth's crust are bound together - a type of structure that forms the basis for the most common minerals in Earth's crust? *Hint:* Study Figures 3.29-3.31 in *Tarbuck*.
11. What is the name of the property of a crystal that breaks along specific parallel planes, because there are planes of weakness within that crystal lattice?
12. If a mineral breaks to form planar sheets (but breaks irregularly in all other directions), how many directions of cleavage does it have?
13. If a mineral breaks to form cubic/rectangular prisms, how many directions of cleavage does it have?
14. If a mineral only breaks to form irregular surfaces like glass does, how many directions of cleavage does it have?
15. What is the name of the property of a mineral that relates to its resistance to abrasion/scratching?
16. What is the hardest mineral?
17. What is the Mohs-Scale value of the hardest mineral?
18. What is the Mohs-Scale value of glass?
19. What is the Mohs-Scale value of a typical fingernail?
20. What term is used to describe the ratio of the mass of an object to its volume? (Note that *Tarbuck* refers to the ratio of the weight of a substance to its volume, but this is not correct.)
21. What property of a mineral describes the way light interacts with the surface — whether most of the light reflects off the outermost few lattice layers — of the mineral? *Hint:* The two major classes of this property are *metallic* and *non-metallic*.
22. What property of a mineral describes the way light is selectively absorbed and re-transmitted by the mineral?
23. What odd term is used to describe the color of a fine powder of a mineral? *Hint:* We drag minerals that are softer than quartz across pieces of unglazed porcelain to examine this property.
24. What are the two most abundant types of minerals in Earth's crust, both of which are silicates? *Hint:* Refer to Figure 3.32 in *Tarbuck*.
25. What is an example of a mineral whose structure is based on *isolated* silica tetrahedra? *Hint:* Refer to Figure 3.31 in *Tarbuck*.
26. What is an example of a mineral whose structure is based on a *single chain* of silicate tetrahedra? *Hint:* Refer to Figure 3.31 in *Tarbuck*.
27. What is an example of a mineral whose structure is based on a *double chain* of silicate tetrahedra? *Hint:* Refer to Figure 3.31 in *Tarbuck*.
28. What is an example of a mineral whose structure is based on a *sheet* of silicate tetrahedra? *Hint:* Refer to Figure 3.31 in *Tarbuck*.
29. What is an example of a mineral whose structure is based on a *3-dimensional framework* of silicate tetrahedra? *Hint:* Refer to Figure 3.31 in *Tarbuck*.
30. What visible characteristic is shared by all *mafic* minerals?
31. What family of silicate minerals is quite prevalent in soils, and develops from the chemical weathering of feldspars and other minerals?
32. What are two minerals commonly formed by the evaporation of salty water from the sea or inland lakes?
33. What are two common minerals that contain calcium, carbon and oxygen (perhaps among other elements)?