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CORRECT ANSWERS ARE LOCATED IN THE 2ND HALF OF THIS DOC.

TRUE/FALSE - Write 'T' if the statement is true and 'F' if the statement is false.

1) Isotopes are atomic nuclei that are radioactive.
   - ◎ true
   - ◎ false

2) Isotopes of an element differ in the number of neutrons within their nuclei.
   - ◎ true
   - ◎ false

3) Anions are negatively charged and cations are positively charged.
   - ◎ true
   - ◎ false

4) The crystalline structure of a mineral is always apparent in a hand sample.
   - ◎ true
   - ◎ false

5) The physical properties of a mineral are closely related to its internal atomic arrangement (crystal structure).
   - ◎ true
   - ◎ false

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6) The term cleavage refers to a mineral's tendency to break preferentially in certain directions within the crystal structure.
   - ◎ true
   - ◎ false

7) The basic building blocks of the silicate minerals are tetrahedra made of silicon and carbon.
   - ◎ true
   - ◎ false

8) Diamond and graphite have the same chemical composition.
   - ◎ true
   - ◎ false

9) Quartz is the most abundant silicate mineral, or group of silicate minerals, in the crust.
   - ◎ true
   - ◎ false

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10) The sulfide mineral group includes many valuable ores.
- ◎ true
- ◎ false

11) Plutonic rocks are typically fine-grained owing to a faster rate of cooling than volcanic rocks.
- ◎ true
- ◎ false

12) An igneous rock that is dark in color is relatively poor in silicate minerals, and can be described as *mafic*.
- ◎ true
- ◎ false

13) A conglomerate is a clastic sedimentary rock that is coarse-grained.
- ◎ true
- ◎ false

14) Metamorphic rocks are formed at extremely high temperatures that are usually hot enough to melt them.
- ◎ true
- ◎ false

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15) Chemical sedimentary rocks are those precipitated from lava.
- ◎ true
- ◎ false

16) Clastic sedimentary rocks are classified or named on the basis of the size of the fragments that form the rock.
- ◎ true
- ◎ false

17) The grain size of an igneous rock is generally related to how quickly the melt cooled: the slower the cooling, the larger the crystals.
- ◎ true
- ◎ false

18) Regional metamorphism occurs when magma bakes the rocks it encounters as it moves through the subsurface.
- ◎ true
- ◎ false

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19) An igneous rock becomes a sedimentary rock through the processes of weathering, sedimentation, and lithification.
- ◎ true
- ◎ false

CHECK ALL THE APPLY. Choose all options that best completes the statement or answers the question.

20) Choose all the ways a rock may respond to the process of metamorphism.
- A) Minerals recrystallize.
- B) New minerals form.
- C) Rock deform in shape.
- D) Rocks completely melt.

21) Rocks that undergo metamorphism deform, change their texture, and even acquire new minerals. The sources of the elevated heat and pressure for metamorphism are
- A) overlying rocks.
- B) nearby cooling magma.
- C) tectonic movements.
- D) surface erosion.
- E) longtime exposure to solar radiation.

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MULTIPLE CHOICE - Choose the one alternative that best completes the statement or answers the question.

22) Which of the following qualities would disqualify a substance from being a mineral?
- A) It has a internal crystal structure.
- B) It is synthetic.
- C) It has a definite chemical composition.
- D) It is inorganic.

23) What is the atomic number of an atom that has 20 protons and 20 neutrons in its nucleus?
- A) 20
- B) 40
- C) 400
- D) Cannot determine because not enough information is given

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24) Atoms of the same element that have different numbers of neutrons are _____ of that element.
A) ions
B) isotopes
C) species
D) daughters

25) Which of the following physical properties is not unique to a particular mineral making it unreliable to use alone in mineral identification?
A) hardness
B) cleavage
C) density
D) color

26) The regular, internal arrangement of ions or atoms in a material makes it
A) amorphous.
B) noncrystalline.
C) crystalline.
D) a silicate

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27) The most common minerals in the crust are
A) carbonates.
B) silicates.
C) sulfates.
D) sulfides.

28) Silicates rich in iron and/or magnesium are termed
A) cations.
B) feldspars.
C) ferromagnesian.
D) magnetite.

29) Which of the following is a silicate mineral?
A) galena
B) calcite
C) micas
D) magnetite

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30) Which of the following does not describe the clay mineral group?
- A) Some types expand when wet and shrink when dry.
- B) They are sheet silicates.
- C) They are useful in making ceramics and building materials.
- D) Their structure makes them sticky, so they are commonly used in making adhesives.

31) Native elements are those elements that
- A) only have one isotope.
- B) exist naturally on Earth.
- C) exist naturally in only one specific country.
- D) occur as minerals consisting of a single element.

32) Which of the following is not a member of the silicate group of minerals?
- A) quartz
- B) feldspar
- C) mica
- D) diamond

33) Which of the following is a member of the carbonate mineral group?
- A) calcite
- B) pyrite
- C) gypsum
- D) mica

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34) Rocks that crystallize from magma are _____ rocks.
- A) igneous
- B) metamorphic
- C) sedimentary
- D) clastic

35) Sedimentary rocks include
- A) pieces of other rocks cemented together (sandstone, shale).
- B) chemical precipitates (halite, gypsum).
- C) organically precipitated components cemented together (shells cemented to form limestone).
- D) organically formed materials compressed together (partially decomposed plant material formed into lignite or coal).
- E) All of these choices are correct.

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36) A subgroup of silicates that includes minerals used in ceramics, construction, and drilling for oil is the
A) clay subgroup.
B) ferromagnesian subgroup.
C) mica subgroup.
D) zeolite subgroup.

37) Rocks that are formed by the crystallization of new minerals in the solid state (i.e., without melting) due to heat and/or pressure are _____ rocks.
A) igneous
B) sedimentary
C) ultramafic
D) metamorphic

38) Lava creates _____ igneous rocks, and magma creates _____ igneous rocks.
A) volcanic; plutonic
B) plutonic; volcanic
C) mafic; felsic
D) felsic; mafic

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39) Which of the following is an igneous rock?
A) salt
B) limestone
C) granite
D) gneiss

40) Which of the following rock is an example of an extremely rapid rate of cooling?
A) granite
B) obsidian
C) basalt

41) Clastic sedimentary rocks are formed
A) from the broken-up fragments of preexisting rocks.
B) from chemicals dissolved in solution.
C) at very high temperatures because the grains must be fused together to make rock.
D) only in water.

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42) The process by which sediments are converted to sedimentary rocks is called
- A) diagenesis.
- B) metamorphosis.
- C) crystallization.
- D) lithification.

43) An example of a clastic sedimentary rock is
- A) limestone.
- B) gypsum.
- C) shale.
- D) coal.

44) An example of a chemical sedimentary rock is
- A) sandstone.
- B) limestone.
- C) shale.
- D) conglomerate.

45) Which of the rocks listed is a metamorphic rock?
- A) granite
- B) basalt
- C) schist
- D) shale

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46) The concept of the rock cycle is that
- A) rocks are moved around the world by geologic processes.
- B) rocks are continually undergoing change, being transformed into new rocks.
- C) the world changes, but rocks are permanent.
- D) rocks must be cycled deep into the crust to be made into different rocks.

47) Which of the following statements about asbestos is true?
- A) Asbestos is a mineral belonging to the carbonate group of minerals.
- B) The type of asbestos most commonly used in construction materials (chrysotile or "white asbestos") is also the most hazardous to health.
- C) Asbestos can occur in any one of the three rocks types, igneous, sedimentary, or metamorphic.
- D) Asbestos is used as a generic term for minerals with fibrous crystals.

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48) The silicate tetrahedron is composed of
- A) 4 oxygen and 2 silicon atoms.
- B) 4 silicon and 1 oxygen atoms.
- C) 4 silicon and 2 oxygen atoms.
- D) 4 oxygen and 1 silicon atoms.

49) Which mineral subgroup is the most abundant in Earth's crust?
- A) micas
- B) garnet
- C) ferromagnesian
- D) feldspars

50) Which is not part of the definition of a mineral?
- A) naturally occurring
- B) aggregate of elements
- C) definite chemical composition
- D) orderly internal arrangement

51) Pure ice is a mineral while pure liquid water is not. Why?
- A) Liquid water doesn't have an orderly internal arrangement of atoms.
- B) Liquid water doesn't occur naturally.
- C) Liquid water doesn't have a definite chemical composition.
- D) All of these choices are correct.

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52) Contact metamorphism
- A) occurs over hundreds of square miles.
- B) occurs next to igneous intrusions.
- C) creates foliated rocks
- D) is associated with faulting.

53) Examples of foliated metamorphic rocks are
- A) marble and quartzite.
- B) shale and andesite.
- C) limestone and marble.
- D) slate and schist.

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54) The shape of mineral crystals depends mostly on
A) chemical composition.
B) internal atomic arrangement.
C) bonding and hardness.
D) chemical purity.

55) The number of naturally occurring chemical elements, as shown in the periodic table, is approximately
A) 36.
B) 90.
C) 106.
D) 200.

56) An element's chemical identity is determined by its
A) number of isotopes.
B) atomic number.
C) number of neutrons.
D) atomic mass number.

57) Isotopes of the same element
A) differ in atomic number.
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B) have different atomic mass numbers.
C) differ in their number of electrons.
D) differ in their chemical behavior.

58) Which mineral property is measured by comparing one mineral to another, and whether or not one can be scratched by the other?
A) hardness
B) cleavage
C) color
D) streak

59) In an electrically neutral atom,
A) electrons and protons have no charge.
B) the electron shells are completely filled.
C) the number of protons and the number of electrons are the same.
D) the number of neutrons is equal to the sum of the number of protons and electrons.

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60) Which of these statements doesn't fit the definition of mineral?
- A) Minerals are crystalline solids.
- B) Minerals are produced through biological processes.
- C) Minerals are naturally occurring substances.
- D) Minerals exist as elements or compounds.

61) The two fundamental characteristics that distinguish a mineral from all other minerals are its
- A) color and hardness.
- B) hardness and cleavage.
- C) chemical composition and crystal structure.
- D) density and streak.

62) All of the following are examples of clastic sedimentary rocks except
- A) conglomerate.
- B) shale.
- C) sandstone.
- D) limestone.

63) What type of rock is made through the process of lithification?
- A) clastic sedimentary
- B) plutonic igneous
- C) metamorphic
- D) chemical sedimentary
- E) volcanic igneous

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64) Covalent bonding occurs when atoms
- A) share electrons.
- B) are attracted because they have opposite charges.
- C) exist together in a cloud of electrons.
- D) are forced together by pressure.

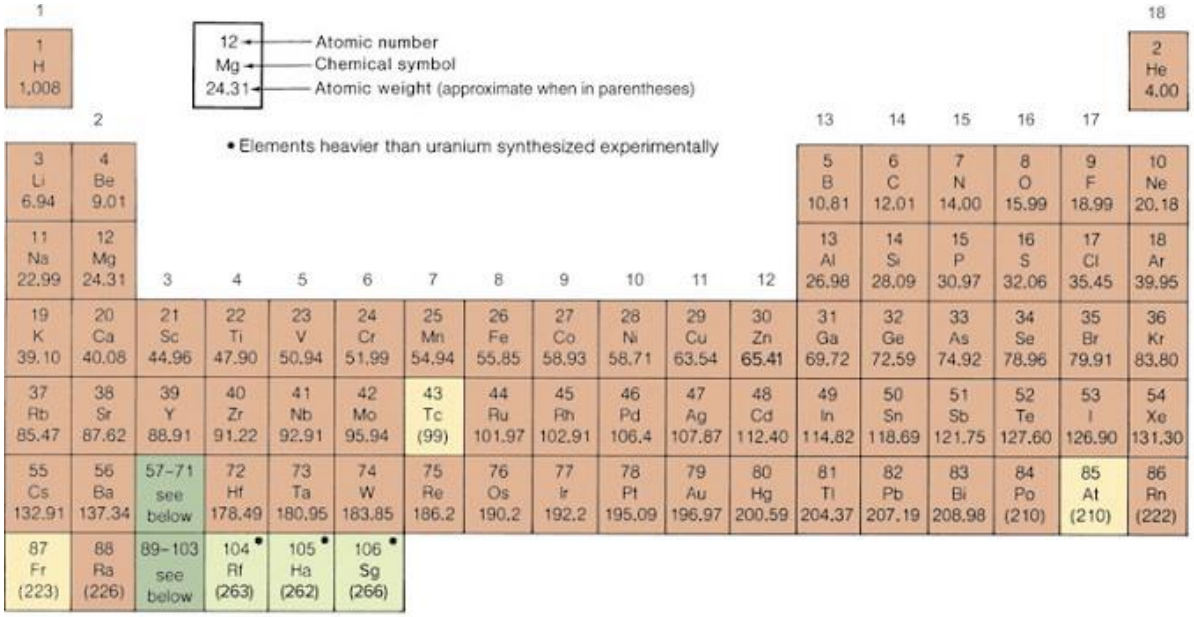
65) If two atoms are attracted to each other because they have opposite charges, they will bond
- A) ionically.
- B) covalently.
- C) metallically.

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66) Refer to the periodic table. What is the atomic weight of carbon?



A) 6
B) 20
C) 12.01
D) 40.08

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67) Based on the two photos of pyrite, what can be inferred about its characteristics as a mineral?



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A) The two forms of the mineral have significantly different chemical compositions.
B) The two forms of the mineral have different internal structures.
C) Pyrite, like other minerals, can take more than one outward crystal form.
D) The mineral has a different chemical composition and a different crystal structure.

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Answer Key

Test name: Chapter 02

1) FALSE
Some but not all isotopes are *radioactive*, meaning their nuclei change into nuclei of other elements with time.

2) TRUE
For example, carbon-12 has six protons and six neutrons; carbon-13 has six protons and seven neutrons.

3) TRUE
Ions have unbalanced charges: anions has more electrons than protons, and cations have more protons than electrons.

4) FALSE
Minerals with well-developed crystals shapes, or faces, are relatively rare either because of the conditions the mineral was formed in or because the mineral has been worn-down.

5) TRUE
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6) TRUE
Minerals that cleave do so because there are planes of weak bonding within the crystal structure.

7) FALSE
They are tetrahedra, but they are made of one silicon and four **oxygen** atoms.

8) TRUE
Diamond and graphite are both made entirely of carbon. However, their internal structures vary resulting in different physical properties.

9) FALSE
Quartz is a silicate and it is common, but the most common are the feldspar group.

10) TRUE
The sulfides include compounds of lead, copper, zinc, and iron. Examples include the minerals pyrite (iron) and galena (lead).

11) FALSE

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Plutonic rocks cool slowly beneath the surface, allowing large coarse grains to form. Volcanic rocks are formed extrusively, on the surface, so they cool quickly and form fine (small) grains.

12) TRUE
Mafic is the compositional term we use to describe igneous rocks that are relatively poor in silica content; they are usually dark in color.

13) TRUE
14) FALSE
If temperatures are hot enough to melt rocks, then lava is formed which creates igneous rocks. Rocks are metamorphosed primarily in the solid state.

15) FALSE
Chemical sedimentary rocks are formed from precipitation (growth in a solution), but that solution is water full of dissolved minerals rather than molten rock.

16) TRUE
For example, shale is made of silt and clay, and sandstone from sand.

17) TRUE
Plutonic rocks cool slowly under the surface to form large crystals; volcanic rocks cool quickly at the surface to form small crystals.

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18) FALSE
This describes **contact** metamorphism. Regional metamorphism specifically accompanies mountain-building processes.

19) TRUE
The igneous rock is broken down, transported and deposited, and then compacted over time.

20) [A, B, C]
21) [A, B, C]
22) B
Minerals are naturally occurring. Some mineral equivalents can be created in a laboratory, but they are not, by definition, *minerals*.

23) A
The atomic number is equal to the number of protons. Calcium has 20 protons, so its atomic number is 20.

24) B

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25) D
26) C
27) B
28) C
29) C
30) D
31) D
32) D
33) A
34) A
35) E
36) A
37) D
38) A
39) C
40) B
41) A
42) D
43) C
44) B
45) C
46) B
47) D
48) D
49) D
50) B
51) A
52) B
53) D
54) B
55) B
56) B
57) B
58) A
59) C
60) B
61) C
62) D

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Limestone is a chemical sedimentary rock made through precipitation, whereas the others are clastic rocks formed through lithification.

63) A
Lithification is the process by which pieces of other rock are compressed and cemented together over time. These pieces can be very large to very, very small.

64) A
65) A
66) C
The *atomic weight* of carbon (C) is 12.01.

67) C
Because both examples are a form of pyrite, they are chemically the same. Their physical properties, however, are observably different because of the differences in their internal crystalline structures.

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