Chapter 2

1. Which of the following Greek philosophers is most closely associated with the concept of an atom?
   a. Aristotle
   b. Democritus
   c. Plato
   d. Zeno

ANSWER: b
TOPICS: 2.1 - COMPOSITION OF MATTER
KEYWORDS: BLOOM'S: REMEMBER

2. Which Greek philosopher thought that matter was infinitely divisible?
   a. Aristotle
   b. Democritus
   c. Plato
   d. Zeno

ANSWER: d
TOPICS: 2.1 - COMPOSITION OF MATTER
KEYWORDS: BLOOM'S: REMEMBER

3. Which language is the word "atom" derived from?
   a. Arabic
   b. Greek
   c. Hebrew
   d. Latin

ANSWER: b
TOPICS: 2.1 - COMPOSITION OF MATTER
KEYWORDS: BLOOM'S: REMEMBER

4. Which of the following best compares Democritus's view of matter and our current view?
   a. Both views are based on belief only.
   b. Both views are based on firm experimental evidence.
   c. The ancient view is based on thought only, but the current view is based on experimental evidence.
   d. Both views are based on a combination of thought and experimental evidence.

ANSWER: c
TOPICS: 2.1 - COMPOSITION OF MATTER
KEYWORDS: BLOOM'S: REMEMBER

5. The symbols for the elements in the periodic table are derived from three languages. Which of the following is **not** one of those languages?
   a. English
   b. French
   c. German
   d. Latin

ANSWER: b
TOPICS: 2.2 - CLASSIFYING MATTER
KEYWORDS: BLOOM'S: REMEMBER

6. Which of the following elements is named after a continent?
   a. As
   b. Au
   c. Eu
   d. all of these

ANSWER: c
TOPICS: 2.2 - CLASSIFYING MATTER
KEYWORDS: BLOOM'S: REMEMBER

7. Which of the following elements is named after a country?
   a. Fr
   b. Ge
   c. Po
   d. all of these

ANSWER: d
TOPICS: 2.2 - CLASSIFYING MATTER
KEYWORDS: BLOOM'S: REMEMBER

8. Which of the following elements is named after a city?
   a. B
   b. Be
   c. Bi
   d. Bk

ANSWER: d
TOPICS: 2.2 - CLASSIFYING MATTER
KEYWORDS: BLOOM'S: REMEMBER

9. Which of the following elements is named after a person?
   a. Er
   b. Fr
   c. Os
   d. Sg

ANSWER: d
TOPICS: 2.2 - CLASSIFYING MATTER
KEYWORDS: BLOOM'S: REMEMBER

10. Which of the following elements is named after a planet?
   a. As
   b. Er
   c. U
   d. V

ANSWER: c
TOPICS: 2.2 - CLASSIFYING MATTER
KEYWORDS: BLOOM'S: REMEMBER

11. Which of the following is **not** a proper symbol for an element?
    a. C
    b. Ca
    c. CO
    d. Co

ANSWER: c
TOPICS: 2.2 - CLASSIFYING MATTER
KEYWORDS: BLOOM'S: UNDERSTAND

12. Which of the following statements describes a compound?
    a. A compound is a pure substance.
    b. A compound obeys the law of constant composition.
    c. A compound is both a pure substance and obeys the law of constant composition.
    d. A compound is neither a pure substance nor obeys the law of constant composition.

ANSWER: c
TOPICS: 2.2 - CLASSIFYING MATTER
KEYWORDS: BLOOM'S: UNDERSTAND

13. Which of the following statements describes a mixture?
    a. The component elements of a mixture can be present in any mass ratio.
    b. Chemical techniques are required to separate the components of a mixture.
    c. The component elements of a mixture can be present in any mass ratio and chemical techniques are required to separate the components of a mixture.
    d. The component elements of a mixture cannot be present in any mass ratio and chemical techniques are not required to separate the components of a mixture.

ANSWER: a
TOPICS: 2.2 - CLASSIFYING MATTER
KEYWORDS: BLOOM'S: UNDERSTAND

14. When a sample of a particular solid is examined under a microscope, clearly distinguishable black and yellow regions are observed. Which type of matter is this sample?
    a. a compound
    b. an element
    c. a homogeneous mixture
    d. a heterogeneous mixture

ANSWER: d
TOPICS: 2.2 - CLASSIFYING MATTER
KEYWORDS: BLOOM'S: APPLY

15. Zinc can be mixed in differing amounts with copper to form an alloy called brass. Which of the following is brass an example of?
    a. a compound
    b. an element
    c. a homogeneous mixture
    d. a heterogeneous mixture

ANSWER: c
TOPICS: 2.2 - CLASSIFYING MATTER
KEYWORDS: BLOOM'S: UNDERSTAND

16. When a strong magnet is brought near a sample that contains both iron and sulfur, the iron and the sulfur are separated from one another. Which type of matter is this sample?

a. It is a compound.
b. It is a homogeneous mixture.
c. It is a heterogeneous mixture.
d. The information given is not enough to answer this question.

ANSWER: c
TOPICS: 2.2 - CLASSIFYING MATTER
KEYWORDS: BLOOM'S: UNDERSTAND

17. When a strong magnet is brought near a sample that contains both iron and sulfur, the iron and the sulfur are not separated from one another. Which type of matter is this sample?

a. It is a compound.
b. It is a homogeneous mixture.
c. It is a heterogeneous mixture.
d. The information given is not enough to answer this question.

ANSWER: a
TOPICS: 2.2 - CLASSIFYING MATTER
KEYWORDS: BLOOM'S: APPLY

18. Sodium is a highly reactive metal and chlorine is a toxic gas. When they are mixed, they form sodium chloride, which is essential for life. Which of the following statements is true when sodium and chlorine are brought into contact with one another?

a. They form a heterogeneous mixture.
b. They form a homogenous mixture.
c. They form a compound.
d. They may form a heterogeneous or a homogeneous mixture depending on the conditions that prevail during the interaction.

ANSWER: c
TOPICS: 2.2 - CLASSIFYING MATTER
KEYWORDS: BLOOM'S: UNDERSTAND

19. Aluminum and fluorine form a compound in which aluminum and fluorine atoms are present in the ratio 1:3. What is the correct formula for this compound?

a. AF_3
b. $AlFl_3$
c. AlF_3
d. $Al(F_2)_3$

ANSWER: c
TOPICS: 2.2 - CLASSIFYING MATTER
KEYWORDS: BLOOM'S: UNDERSTAND

20. Sodium chlorate, an ingredient in many common herbicides, has sodium, chlorine, and oxygen atoms in the ratio 1:1:3. What is the correct formula for sodium chlorate?

a. $NaCO_3$

b. $SoClO_3$

c. $NaClO_3$

d. $SoCO_3$

ANSWER: c
TOPICS: 2.2 - CLASSIFYING MATTER
KEYWORDS: BLOOM'S: UNDERSTAND

21. Ammonium nitrate is a compound that is used in fertilizers and explosives. It has nitrogen, hydrogen, and oxygen atoms in the ratio 2:4:3. What is the correct formula for ammonium nitrate?

a. $N_4H_8O_6$

b. $N_2H_4O_3$

c. $NH_2O_{1.5}$

d. $N_3H_4O_2$

ANSWER: b
TOPICS: 2.2 - CLASSIFYING MATTER
KEYWORDS: BLOOM'S: UNDERSTAND

22. Sodium bicarbonate has sodium, hydrogen, carbon, and oxygen atoms in the ratio 1:1:1:3. What is the correct formula for sodium bicarbonate?

a. $NaBiCO_3$

b. $NaHCO_3$

c. $SoHCO_3$

d. $SoBiCO_3$

ANSWER: b
TOPICS: 2.2 - CLASSIFYING MATTER
KEYWORDS: BLOOM'S: UNDERSTAND

23. Which of the following laws enables us to characterize a compound by a specific chemical formula?

a. the law of conservation of energy

b. the law of conservation of mass

c. the law of constant composition

d. all of these

ANSWER: c
TOPICS: 2.3 - POSTULATES OF DALTON'S ATOMIC THEORY
KEYWORDS: BLOOM'S: UNDERSTAND

24. Which of the following statements, which was a part of Dalton's atomic theory, was later proved to be false?

a. All matter is made up of very tiny indivisible particles called atoms.

b. In ordinary chemical reactions, no atom of any element disappears or is changed into an atom of another element.
c. Compounds are formed by the chemical combination of two or more elements.
d. A molecule is a tightly bound combination of two or more atoms that act as a single unit.

ANSWER: a
TOPICS: 2.3 - POSTULATES OF DALTON'S ATOMIC THEORY
KEYWORDS: BLOOM'S: UNDERSTAND

25. Which of the following elements occurs naturally in the monoatomic form under normal atmospheric conditions?
a. oxygen
b. fluorine
c. hydrogen
d. helium

ANSWER: d
TOPICS: 2.3 - POSTULATES OF DALTON'S ATOMIC THEORY
KEYWORDS: BLOOM'S: REMEMBER

26. Several elements occur naturally as diatomic molecules under normal atmospheric conditions. Which of the following elements does **not** occur naturally as a diatomic molecule?
a. chlorine
b. hydrogen
c. nitrogen
d. sulfur

ANSWER: d
TOPICS: 2.3 - POSTULATES OF DALTON'S ATOMIC THEORY
KEYWORDS: BLOOM'S: REMEMBER

27. How many elements occur naturally as diatomic molecules?
a. 0
b. 5
c. 6
d. 7

ANSWER: d
TOPICS: 2.3 - POSTULATES OF DALTON'S ATOMIC THEORY
KEYWORDS: BLOOM'S: REMEMBER

28. Which element is present in the largest amount (by mass) in the human body?
a. carbon
b. hydrogen
c. nitrogen
d. oxygen

ANSWER: d
TOPICS: 2.3 - POSTULATES OF DALTON'S ATOMIC THEORY
KEYWORDS: BLOOM'S: REMEMBER

29. Which element is present in the largest amount (by number of atoms) in the human body?
    a. carbon
    b. hydrogen
    c. nitrogen
    d. oxygen

ANSWER: b
TOPICS: 2.3 - POSTULATES OF DALTON'S ATOMIC THEORY
KEYWORDS: BLOOM'S: REMEMBER

30. Which element accounts for nearly half the mass of the Earth's crust?
    a. carbon
    b. iron
    c. oxygen
    d. silicon

ANSWER: c
TOPICS: 2.3 - POSTULATES OF DALTON'S ATOMIC THEORY
KEYWORDS: BLOOM'S: REMEMBER

31. Which of the following subatomic particles are found in the nucleus?
    a. electrons
    b. neutrons
    c. protons
    d. protons and neutrons

ANSWER: d
TOPICS: 2.4 - COMPOSITION OF ATOMS
KEYWORDS: BLOOM'S: UNDERSTAND

32. Which of the following statements correctly describes a proton?
    a. On the scale of subatomic particles, it is massive and has a +1 charge.
    b. On the scale of subatomic particles, it is massive and has a –1 charge.
    c. On the scale of subatomic particles, it is light and has a +1 charge.
    d. On the scale of subatomic particles, it is light and has a –1 charge.

ANSWER: a
TOPICS: 2.4 - COMPOSITION OF ATOMS
KEYWORDS: BLOOM'S: UNDERSTAND

33. Which of the following statements correctly describes an electron?
    a. On the scale of subatomic particles, it is massive and has a +1 charge.
    b. On the scale of subatomic particles, it is massive and has a –1 charge.
    c. On the scale of subatomic particles, it is light and has a +1 charge.
    d. On the scale of subatomic particles, it is light and has a –1 charge.

ANSWER: d
TOPICS: 2.4 - COMPOSITION OF ATOMS
KEYWORDS: BLOOM'S: UNDERSTAND

34. Which of the following statements is true of neutrons?
    a. Neutrons carry a positive charge.
    b. Neutrons carry a negative charge.
    c. Neutrons do not carry an electrical charge.
    d. Neutrons do not have mass.

ANSWER: c
TOPICS: 2.4 - COMPOSITION OF ATOMS
KEYWORDS: BLOOM'S: UNDERSTAND

35. What is the approximate mass of a proton?
    a. 12 g
    b. 1 g
    c. 12 amu
    d. 1 amu

ANSWER: d
TOPICS: 2.4 - COMPOSITION OF ATOMS
KEYWORDS: BLOOM'S: REMEMBER

36. What is the approximate mass of a neutron?
    a. 12 g
    b. 1 g
    c. 12 amu
    d. 1 amu

ANSWER: d
TOPICS: 2.4 - COMPOSITION OF ATOMS
KEYWORDS: BLOOM'S: REMEMBER

37. What is the approximate mass of an electron?
    a. 1 amu
    b. 1 g
    c. 0.0005 amu
    d. 0.0005 g

ANSWER: c
TOPICS: 2.4 - COMPOSITION OF ATOMS
KEYWORDS: BLOOM'S: REMEMBER

38. Which element is currently used to define the atomic mass unit?
    a. hydrogen-1
    b. carbon-12
    c. oxygen-16
    d. none of these

ANSWER: b
TOPICS: 2.4 - COMPOSITION OF ATOMS
KEYWORDS: BLOOM'S: REMEMBER

39. Which of the following defines the mass number of an atom?
    a. the number of protons in the atom
    b. the number of neutrons in the atom
    c. the total number of protons and neutrons in the atom
    d. the total number of protons, neutrons, and electrons in the atom

ANSWER: c
TOPICS: 2.4 - COMPOSITION OF ATOMS
KEYWORDS: BLOOM'S: UNDERSTAND

40. Which of the following defines the atomic number of an atom?
    a. the number of protons in the atom
    b. the number of neutrons in the atom
    c. the total number of protons and neutrons in the atom
    d. the total number of protons, neutrons, and electrons in the atom

ANSWER: a
TOPICS: 2.4 - COMPOSITION OF ATOMS
KEYWORDS: BLOOM'S: UNDERSTAND

41. What is the mass number of an atom that is made up of 38 protons, 49 neutrons, and 38 electrons?
    a. 38
    b. 49
    c. 87
    d. 125

ANSWER: c
TOPICS: 2.4 - COMPOSITION OF ATOMS
KEYWORDS: BLOOM'S: APPLY

42. What is the mass number of an atom that is made up of 27 protons, 32 neutrons, and 27 electrons?
    a. 89
    b. 59
    c. 32
    d. 27

ANSWER: b
TOPICS: 2.4 - COMPOSITION OF ATOMS
KEYWORDS: BLOOM'S: APPLY

43. Which of the following statements best characterizes the isotopes of an element?
    a. They have different numbers of electrons.
    b. They have different numbers of neutrons.
    c. They have different numbers of protons.
    d. They have different numbers of protons, neutrons, and electrons.

ANSWER: b
TOPICS: 2.4 - COMPOSITION OF ATOMS
KEYWORDS: BLOOM'S: UNDERSTAND

44. How many neutrons are present in a boron-10 atom?

a. 3
b. 4
c. 5
d. 6

ANSWER: c
TOPICS: 2.4 - COMPOSITION OF ATOMS
KEYWORDS: BLOOM'S: APPLY

45. Suppose a new element named questinium has two isotopes. These isotopes are Qu-297 (40.30%, 296.78 amu) and Qu-301 (59.70%, 300.88 amu). What is the atomic weight of questinium, reported to the correct number of significant digits?

a. 299 amu
b. 299.0 amu
c. 299.12 amu
d. 299.23 amu

ANSWER: d
TOPICS: 2.4 - COMPOSITION OF ATOMS
KEYWORDS: BLOOM'S: APPLY

46. Which of the following contains two species that have the same mass number?

a. ^{14}C and ^{14}N
b. ^{12}C and ^{13}C
c. 14_C and 14_N and 12_C and 13_C
d. Neither 14_C and 14_N nor 12_C and 13_C

ANSWER: a
TOPICS: 2.4 - COMPOSITION OF ATOMS
KEYWORDS: BLOOM'S: APPLY

47. Which of the following contains two species which are a pair of isotopes?

a. ^{14}C and ^{14}N
b. ^{12}C and ^{13}C
c. both 14_C and 14_N and 12_C and 13_C
d. neither 14_C and 14_N or 12_C and 13_C

ANSWER: b
TOPICS: 2.4 - COMPOSITION OF ATOMS
KEYWORDS: BLOOM'S: APPLY

48. Which of the following is true of the atomic weight of an element?

a. It is the weight of the heaviest isotope.
b. It is the weight of the lightest isotope.
c. It is the weight of the most abundant isotope.
d. It is a weighted average obtained from the weights and abundances of the isotopes.

ANSWER: d
TOPICS: 2.4 - COMPOSITION OF ATOMS
KEYWORDS: BLOOM'S: UNDERSTAND

49. Which of the following statements is true of the nucleus of an atom?
    a. The nucleus occupies only a tiny fraction of the total volume of the atom, and most of the mass of the atom is concentrated in its nucleus.
    b. The nucleus occupies a large fraction of the total volume of the atom, and most of the mass of the atom is concentrated in the region surrounding the nucleus.
    c. The nucleus occupies a large fraction of the total volume of the atom, and most of the mass of the atom is concentrated in its nucleus.
    d. The nucleus occupies only a tiny fraction of the total volume of the atom, and most of the mass of the atom is concentrated in the region surrounding the nucleus.

ANSWER: a
TOPICS: 2.4 - COMPOSITION OF ATOMS
KEYWORDS: BLOOM'S: UNDERSTAND

50. If you could line up atoms of lead-208, approximately how many atoms are required to form a line 1 inch long? Note that an atom of lead-208 has a diameter of 1.6×10^{-10} m.
    a. 82
    b. 208
    c. 8.2×10^{7}
    d. 1.6×10^{12}

ANSWER: c
TOPICS: 2.4 - COMPOSITION OF ATOMS
KEYWORDS: BLOOM'S: APPLY

51. If you could line up the nuclei of lead-208, approximately how many nuclei are required to form a line 1 inch long? Note that a nucleus of lead-208 has a diameter of 1.6×10^{-14} m.
    a. 82
    b. 208
    c. 8.2×10^{7}
    d. 1.6×10^{12}

ANSWER: d
TOPICS: 2.4 - COMPOSITION OF ATOMS
KEYWORDS: BLOOM'S: APPLY

52. What are the horizontal rows of the periodic table called?
    a. cycles
    b. periods
    c. families
    d. none of these

ANSWER: b
TOPICS: 2.5 - THE PERIODIC TABLE

KEYWORDS: BLOOM'S: REMEMBER

53. What are the vertical columns of the periodic table called?
    a. families
    b. periods
    c. either families or periods
    d. neither families nor periods

ANSWER: a
TOPICS: 2.5 - THE PERIODIC TABLE
KEYWORDS: BLOOM'S: REMEMBER

54. What are the elements in the "A" columns of the periodic table called?
    a. main group elements
    b. inner transition elements
    c. transition elements
    d. none of these

ANSWER: a
TOPICS: 2.5 - THE PERIODIC TABLE
KEYWORDS: BLOOM'S: REMEMBER

55. What are the elements in the "B" columns of the periodic table called?
    a. main group elements
    b. inner transition elements
    c. transition elements
    d. none of these

ANSWER: c
TOPICS: 2.5 - THE PERIODIC TABLE
KEYWORDS: BLOOM'S: REMEMBER

56. Which column of the periodic table contains the alkali metals?
    a. 1A
    b. 2A
    c. 7A
    d. 8A

ANSWER: a
TOPICS: 2.5 - THE PERIODIC TABLE
KEYWORDS: BLOOM'S: REMEMBER

57. Which column of the periodic table contains the halogens?
    a. 1A
    b. 4A
    c. 7A
    d. 8A

ANSWER: c
TOPICS: 2.5 - THE PERIODIC TABLE

KEYWORDS: BLOOM'S: REMEMBER

58. Which of the following columns of the periodic table does **not** contain any metallic elements?
    a. 4A
    b. 5A
    c. 6A
    d. 7A

ANSWER: d
TOPICS: 2.5 - THE PERIODIC TABLE
KEYWORDS: BLOOM'S: UNDERSTAND

59. Which of the following columns of the periodic table contains only gaseous elements?
    a. 5A
    b. 6A
    c. 7A
    d. 8A

ANSWER: d
TOPICS: 2.5 - THE PERIODIC TABLE
KEYWORDS: BLOOM'S: UNDERSTAND

60. Which of the following contains only transition metals?
    a. Ca, Cr, Fe, and Ni
    b. V, K, P, and B
    c. Cr, Mn, Ni, and Cu
    d. none of these

ANSWER: c
TOPICS: 2.5 - THE PERIODIC TABLE
KEYWORDS: BLOOM'S: APPLY

61. Which of the following contains only metals?
    a. Na, Mg, Si, and P
    b. Al, Na, Li, and Be
    c. He, Al, Si, and Mg
    d. none of these

ANSWER: b
TOPICS: 2.5 - THE PERIODIC TABLE
KEYWORDS: BLOOM'S: APPLY

62. Which of the following contains only nonmetals?
    a. C, Si, B, and Be
    b. P, B, Si, and Na
    c. F, Cl, He, and C
    d. none of these

ANSWER: c
TOPICS: 2.5 - THE PERIODIC TABLE

KEYWORDS: BLOOM'S: APPLY

63. Which of the following is a metalloid?
    a. S
    b. Si
    c. Sn
    d. Sr

ANSWER: b
TOPICS: 2.5 - THE PERIODIC TABLE
KEYWORDS: BLOOM'S: APPLY

64. Which is the only nonmetal to appear on the left side of the periodic table?
    a. hydrogen
    b. helium
    c. carbon
    d. oxygen

ANSWER: a
TOPICS: 2.5 - THE PERIODIC TABLE
KEYWORDS: BLOOM'S: REMEMBER

65. Which of the following sets of elements is not included in the main body of the periodic table and is shown separately at the bottom?
    a. halogens
    b. noble gases
    c. inner transition elements
    d. main group elements

ANSWER: c
TOPICS: 2.5 - THE PERIODIC TABLE
KEYWORDS: BLOOM'S: UNDERSTAND

66. Which group of elements is characterized by the properties of ductility, malleability, and the ability to conduct heat and electricity?
    a. all elements
    b. metallic elements
    c. metalloid elements
    d. nonmetallic elements

ANSWER: b
TOPICS: 2.5 - THE PERIODIC TABLE
KEYWORDS: BLOOM'S: UNDERSTAND

67. Which of the following is formed when sodium reacts with water?
    a. NaH
    b. NaO
    c. Na_2O
    d. NaOH

ANSWER: d
TOPICS: 2.5 - THE PERIODIC TABLE
KEYWORDS: BLOOM'S: UNDERSTAND

68. Which of the following is formed when potassium reacts with water?
    a. KH
    b. KO
    c. KOH
    d. K_2O

ANSWER: c
TOPICS: 2.5 - THE PERIODIC TABLE
KEYWORDS: BLOOM'S: UNDERSTAND

69. Which of the following statements is true?
    a. The boiling point of sodium is lower than that of potassium.
    b. The boiling point of lithium is lower than that of sodium.
    c. The boiling point of fluorine is lower than that of chlorine.
    d. The boiling point of neon is lower than that of helium.

ANSWER: c
TOPICS: 2.5 - THE PERIODIC TABLE
KEYWORDS: BLOOM'S: UNDERSTAND

70. Why is strontium-90 an especially dangerous radioactive isotope?
    a. It has an exceptionally short half-life and rapidly settles to the ground when carried by winds.
    b. It has exceptionally intense radioactivity and is a cause of sudden death in cows.
    c. It is deposited in bones and teeth and is not readily eliminated from the human body.
    d. All of these are correct.

ANSWER: c
TOPICS: 2.5 - THE PERIODIC TABLE
KEYWORDS: BLOOM'S: UNDERSTAND

71. What is the name given to the lowest possible energy state of an electron?
    a. the zeroth state
    b. the bottom state
    c. the ground state
    d. none of these

ANSWER: c
TOPICS: 2.6 - ARRANGEMENT OF ELECTRONS IN AN ATOM
KEYWORDS: BLOOM'S: REMEMBER

72. Which of the following sets of numbers could be used to designate the principal energy levels (shells) in an atom?
    a. –1, 0, 1, 2, and 3
    b. 0, 1, 2, 3, and 4
    c. 1, 2, 3, 4, and 5
    d. all of these

ANSWER: c
TOPICS: 2.6 - ARRANGEMENT OF ELECTRONS IN AN ATOM
KEYWORDS: BLOOM'S: REMEMBER

73. Which of the following sets of alphabets is used to designate subshells?
    a. *t*, *q*, *e*, and *g*
    b. *s*, *p*, *d*, and *f*
    c. *r*, *o*, *c*, and *e*
    d. *q*, *n*, *b*, and *d*

ANSWER: b
TOPICS: 2.6 - ARRANGEMENT OF ELECTRONS IN AN ATOM
KEYWORDS: BLOOM'S: REMEMBER

74. How many electrons can be accommodated in the fourth shell of an atom?
    a. 2
    b. 8
    c. 18
    d. 32

ANSWER: d
TOPICS: 2.6 - ARRANGEMENT OF ELECTRONS IN AN ATOM
KEYWORDS: BLOOM'S: REMEMBER

75. How many orbitals are there in the 4*p* subshell?
    a. 1
    b. 2
    c. 3
    d. 4

ANSWER: c
TOPICS: 2.6 - ARRANGEMENT OF ELECTRONS IN AN ATOM
KEYWORDS: BLOOM'S: REMEMBER

76. How many orbitals are there in the 3*d* subshell?
    a. 3
    b. 5
    c. 7
    d. 8

ANSWER: b
TOPICS: 2.6 - ARRANGEMENT OF ELECTRONS IN AN ATOM
KEYWORDS: BLOOM'S: REMEMBER

77. How many electrons can be accommodated in the 4*p* subshell?
    a. 4
    b. 6
    c. 8
    d. 18

ANSWER: b
TOPICS: 2.6 - ARRANGEMENT OF ELECTRONS IN AN ATOM
KEYWORDS: BLOOM'S: REMEMBER

78. How many electrons can be accommodated in the 3*d* subshell?
    a. 3
    b. 6
    c. 10
    d. 18
ANSWER: c
TOPICS: 2.6 - ARRANGEMENT OF ELECTRONS IN AN ATOM
KEYWORDS: BLOOM'S: REMEMBER

79. How many electrons can be accommodated in the 2*d* subshell?
    a. 2
    b. 5
    c. 10
    d. None, there is no 2*d* subshell.
ANSWER: d
TOPICS: 2.6 - ARRANGEMENT OF ELECTRONS IN AN ATOM
KEYWORDS: BLOOM'S: REMEMBER

80. Which of the following types of orbitals can hold a maximum of 10 electrons when filled?
    a. *s*
    b. *p*
    c. *d*
    d. *f*
ANSWER: c
TOPICS: 2.6 - ARRANGEMENT OF ELECTRONS IN AN ATOM
KEYWORDS: BLOOM'S: REMEMBER

81. Which of the following types of orbitals comes in sets of seven?
    a. *s*
    b. *p*
    c. *d*
    d. *f*
ANSWER: d
TOPICS: 2.6 - ARRANGEMENT OF ELECTRONS IN AN ATOM
KEYWORDS: BLOOM'S: REMEMBER

82. If we consider the elements C, N, and O, which types of orbitals do these elements use in bonding?
    a. only *s*
    b. only *p*
    c. both *s* and *p*
    d. *s*, *p*, and *d*

ANSWER: c
TOPICS: 2.6 - ARRANGEMENT OF ELECTRONS IN AN ATOM
KEYWORDS: BLOOM'S: REMEMBER

83. Which of the following statements describes an orbital?
a. Orbitals fill in the order of increasing energy from lowest to highest.
b. Each orbital can hold up to two electrons with opposite spins.
c. When there is a set of orbitals of equal energy, each orbital becomes half-filled before any of them becomes completely filled.
d. All of these are correct.

ANSWER: d
TOPICS: 2.6 - ARRANGEMENT OF ELECTRONS IN AN ATOM
KEYWORDS: BLOOM'S: UNDERSTAND

84. How are electrons distributed among orbitals of equal energy?
a. The electrons will occupy the same orbital rather than separate orbitals and have opposite spins.
b. The electrons will occupy the same orbital rather than separate orbitals and have like spins.
c. The electrons will occupy different orbitals and have opposite spins.
d. The electrons will occupy different orbitals and have like spins.

ANSWER: d
TOPICS: 2.6 - ARRANGEMENT OF ELECTRONS IN AN ATOM
KEYWORDS: BLOOM'S: UNDERSTAND

85. Which of the following is true when comparing two electrons that are in different shells of an atom?
a. The electron in the higher-numbered shell is closer to the nucleus and is easier to remove.
b. The electron in the higher-numbered shell is closer to the nucleus and is harder to remove.
c. The electron in the higher-numbered shell is farther from the nucleus and is easier to remove.
d. The electron in the higher-numbered shell is farther from the nucleus and is harder to remove.

ANSWER: c
TOPICS: 2.6 - ARRANGEMENT OF ELECTRONS IN AN ATOM
KEYWORDS: BLOOM'S: UNDERSTAND

86. Electrons can sometimes fill orbitals in manners that defy specified rules. If they do so, we say that the atom is in an excited state. Which of the following represents the excited state of an atom?
a. $1s^2 2s^2 2p^6 3s^2$
b. $1s^2 2s^2 2p^6 3s^1 3p^1$
c. both $1s^2 2s^2 2p^6 3s^2$ and $1s^2 2s^2 2p^6 3s^1 3p^1$
d. neither $1s^2 2s^2 2p^6 3s^2$ nor $1s^2 2s^2 2p^6 3s^1 3p^1$

ANSWER: b
TOPICS: 2.6 - ARRANGEMENT OF ELECTRONS IN AN ATOM
KEYWORDS: BLOOM'S: APPLY

87. Electrons can sometimes fill orbitals in manners that defy specified rules. If they do so, we say that the atom is in an excited state. Which of the following represents the excited state of an atom?

a. $1s^2 2s^2 2p_x^2$
b. $1s^2 2s^1 2p_x^1 2p_y^1 2p_z^1$
c. both $1s^2 2s^2 2p_x^2$ and $1s^2 2s^1 2p_x^1 2p_y^1 2p_z^1$
d. neither $1s^2 2s^2 2p_x^2$ nor $1s^2 2s^1 2p_x^1 2p_y^1 2p_z^1$

ANSWER: c
TOPICS: 2.6 - ARRANGEMENT OF ELECTRONS IN AN ATOM
KEYWORDS: BLOOM'S: APPLY

88. Which of the following represents the correct order of filling orbitals?
a. 1*s*, 2*s*, 3*s*, 2*p*, 3*p*, and 3*d*
b. 1*s*, 2*s*, 2*p*, 3*s*, 3*p*, and 3*d*
c. 1*s*, 2*p*, 3*d*, 2*s*, 3*s*, and 3*p*
d. none of these

ANSWER: b
TOPICS: 2.6 - ARRANGEMENT OF ELECTRONS IN AN ATOM
KEYWORDS: BLOOM'S: APPLY

89. Which of the following correctly represents the electronic configuration of sulfur?
a. $1s^2 2s^2 2p^6 3s^2 3p^4$
b. $1s^2 2s^2 2p^6 3s^2 3p_x^2 3p_y^1 3p_z^1$
c. $[Ne]3s^2 3p^4$
d. all of them

ANSWER: d
TOPICS: 2.6 - ARRANGEMENT OF ELECTRONS IN AN ATOM
KEYWORDS: BLOOM'S: APPLY

90. What is the maximum number of unpaired electrons in a Lewis dot structure?
a. 1
b. 3
c. 4
d. 8

ANSWER: c
TOPICS: 2.6 - ARRANGEMENT OF ELECTRONS IN AN ATOM
KEYWORDS: BLOOM'S: REMEMBER

91. How many valence electrons are there in an oxygen atom?
a. 2
b. 4
c. 6
d. 8

ANSWER: c
TOPICS: 2.6 - ARRANGEMENT OF ELECTRONS IN AN ATOM
KEYWORDS: BLOOM'S: REMEMBER

92. How many unpaired electrons are there in a carbon atom in its ground state?
    a. 1
    b. 2
    c. 3
    d. 4

ANSWER: b
TOPICS: 2.6 - ARRANGEMENT OF ELECTRONS IN AN ATOM
KEYWORDS: BLOOM'S: UNDERSTAND

93. How many unpaired electrons are there in a nitrogen atom in its ground state?
    a. 2
    b. 3
    c. 4
    d. 5

ANSWER: b
TOPICS: 2.6 - ARRANGEMENT OF ELECTRONS IN AN ATOM
KEYWORDS: BLOOM'S: UNDERSTAND

94. How many unpaired electrons are there in an oxygen atom in its ground state?
    a. 1
    b. 2
    c. 4
    d. 8

ANSWER: b
TOPICS: 2.6 - ARRANGEMENT OF ELECTRONS IN AN ATOM
KEYWORDS: BLOOM'S: UNDERSTAND

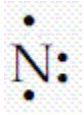
95. How many unpaired electrons are there in a fluorine atom in its ground state?
    a. 1
    b. 3
    c. 5
    d. 7

ANSWER: a
TOPICS: 2.6 - ARRANGEMENT OF ELECTRONS IN AN ATOM
KEYWORDS: BLOOM'S: UNDERSTAND

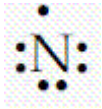
96. How many unpaired electrons are there in a boron atom in its ground state?
    a. 1
    b. 2
    c. 3
    d. 4

ANSWER: a
TOPICS: 2.6 - ARRANGEMENT OF ELECTRONS IN AN ATOM
KEYWORDS: BLOOM'S: UNDERSTAND

97. Which of the following is the correct Lewis dot picture of the nitrogen atom?

a. 

b. 

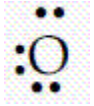
c. 

d. 

ANSWER: d
TOPICS: 2.6 - ARRANGEMENT OF ELECTRONS IN AN ATOM
KEYWORDS: BLOOM'S: UNDERSTAND

98. Which of the following is the correct Lewis dot picture of the oxygen atom?

a. 

b. 

c. 

d. 

ANSWER: a
TOPICS: 2.6 - ARRANGEMENT OF ELECTRONS IN AN ATOM
KEYWORDS: BLOOM'S: UNDERSTAND

99. Which of the following determines the number of valence electrons in an atom of a main group element?

a. the element's atomic number
b. the element's atomic weight
c. the element's column number
d. none of these

ANSWER: c
TOPICS: 2.7 - ELECTRON CONFIGURATION AND THE PERIODIC TABLE
KEYWORDS: BLOOM'S: UNDERSTAND

100. Which statement is true of the electronic configurations of a family in the periodic table?

a. The number of valence electrons is not equal to the group number.
b. The number of valence electrons is equal to the group number.

c. The valence electrons are always paired.
d. The valence electrons are never paired.

ANSWER: b
TOPICS: 2.7 - ELECTRON CONFIGURATION AND THE PERIODIC TABLE
KEYWORDS: BLOOM'S: UNDERSTAND

101. How many valence electrons are present in a carbon atom?
a. 1
b. 2
c. 3
d. 4

ANSWER: d
TOPICS: 2.7 - ELECTRON CONFIGURATION AND THE PERIODIC TABLE
KEYWORDS: BLOOM'S: REMEMBER

102. In the regions of the periodic table associated with the main group elements, which type of orbitals are being filled?
a. *s* only
b. *p* only
c. *s* or *p*
d. *d* only

ANSWER: c
TOPICS: 2.7 - ELECTRON CONFIGURATION AND THE PERIODIC TABLE
KEYWORDS: BLOOM'S: UNDERSTAND

103. In the region of the periodic table associated with the transition elements, which type of orbitals are being filled?
a. *s*
b. *p*
c. *d*
d. *f*

ANSWER: c
TOPICS: 2.7 - ELECTRON CONFIGURATION AND THE PERIODIC TABLE
KEYWORDS: BLOOM'S: UNDERSTAND

104. In the region of the periodic table associated with the inner transition elements, which type of orbitals are being filled?
a. *s*
b. *p*
c. *d*
d. *f*

ANSWER: d
TOPICS: 2.7 - ELECTRON CONFIGURATION AND THE PERIODIC TABLE
KEYWORDS: BLOOM'S: UNDERSTAND

105. How many elements are there in period 2?
a. 2

b. 6
c. 8
d. 18

ANSWER: c
TOPICS: 2.7 - ELECTRON CONFIGURATION AND THE PERIODIC TABLE
KEYWORDS: BLOOM'S: REMEMBER

106. How many elements are there in period 3?
a. 2
b. 6
c. 8
d. 18

ANSWER: c
TOPICS: 2.7 - ELECTRON CONFIGURATION AND THE PERIODIC TABLE
KEYWORDS: BLOOM'S: REMEMBER

107. How many elements are there in period 4?
a. 2
b. 6
c. 8
d. 18

ANSWER: d
TOPICS: 2.7 - ELECTRON CONFIGURATION AND THE PERIODIC TABLE
KEYWORDS: BLOOM'S: REMEMBER

108. Which type of subatomic particle does an atom gain or lose to become an ion?
a. An atom gains or loses protons.
b. An atom gains or loses neutrons.
c. An atom gains or loses electrons.
d. It depends on the atom involved.

ANSWER: c
TOPICS: 2.8 - PERIODIC PROPERTIES
KEYWORDS: BLOOM'S: UNDERSTAND

109. Which of the following elements has the largest atoms?
a. Al
b. Mg
c. Na
d. None, they are all the same size.

ANSWER: c
TOPICS: 2.8 - PERIODIC PROPERTIES
KEYWORDS: BLOOM'S: UNDERSTAND

110. Which of the following elements has the smallest atoms?
a. Al

b. Mg
c. Na
d. None, they are all the same size.

ANSWER: a
TOPICS: 2.8 - PERIODIC PROPERTIES
KEYWORDS: BLOOM'S: UNDERSTAND

111. Which of the following elements has the largest atoms?
a. Rb
b. K
c. Na
d. None, they are all the same size.

ANSWER: a
TOPICS: 2.8 - PERIODIC PROPERTIES
KEYWORDS: BLOOM'S: UNDERSTAND

112. Which of the following elements has the smallest atoms?
a. Rb
b. K
c. Na
d. None, they are all the same size.

ANSWER: c
TOPICS: 2.8 - PERIODIC PROPERTIES
KEYWORDS: BLOOM'S: UNDERSTAND

113. Which of the following elements has the largest atoms?
a. Ca
b. K
c. Mg
d. Na

ANSWER: b
TOPICS: 2.8 - PERIODIC PROPERTIES
KEYWORDS: BLOOM'S: UNDERSTAND

114. Which of the following elements has the smallest atoms?
a. Ca
b. K
c. Mg
d. Na

ANSWER: c
TOPICS: 2.8 - PERIODIC PROPERTIES
KEYWORDS: BLOOM'S: UNDERSTAND

115. Which of the following elements has the largest atoms?
a. Cl

b. P
c. S
d. None, they are all the same size.

ANSWER: b
TOPICS: 2.8 - PERIODIC PROPERTIES
KEYWORDS: BLOOM'S: UNDERSTAND

116. Which of the following elements has the smallest atoms?
a. Cl
b. P
c. S
d. None, they are all the same size.

ANSWER: a
TOPICS: 2.8 - PERIODIC PROPERTIES
KEYWORDS: BLOOM'S: UNDERSTAND

117. What is the ionization energy of an atom?
a. the energy released when an atom gains an electron
b. the energy released when an atom loses an electron
c. the energy required to add an electron to an atom
d. the energy required to remove an electron from an atom

ANSWER: d
TOPICS: 2.8 - PERIODIC PROPERTIES
KEYWORDS: BLOOM'S: UNDERSTAND

118. When potassium loses an electron to form K^+, which electron is lost?
a. 1*s*
b. 2*s*
c. 3*s*
d. 4*s*

ANSWER: d
TOPICS: 2.8 - PERIODIC PROPERTIES
KEYWORDS: BLOOM'S: APPLY

119. Which of the following is true of the ionization energy of elements?
a. Ionization energy generally decreases as we move from left to right in the periodic table.
b. Ionization energy generally increases as we move from top to bottom in the periodic table.
c. Ionization energy generally increases as we move from left to right in the periodic table.
d. Ionization energy generally remains the same as we move from top to bottom in the periodic table.

ANSWER: c
TOPICS: 2.8 - PERIODIC PROPERTIES
KEYWORDS: BLOOM'S: UNDERSTAND

120. In comparing sodium and potassium, which of the following statements is true?

a. Sodium is more likely to lose an electron than potassium because sodium has a higher ionization energy than potassium.
b. Sodium is more likely to lose an electron than potassium because sodium has a lower ionization energy than potassium.
c. Sodium is less likely to lose an electron than potassium because sodium has a higher ionization energy than potassium.
d. Sodium is less likely to lose an electron than potassium because sodium has a lower ionization energy than potassium.

ANSWER: c
TOPICS: 2.8 - PERIODIC PROPERTIES
KEYWORDS: BLOOM'S: APPLY

121. Which of the following gives the correct order of ionization energies?
a. Li > Na > K > Rb
b. Na < Mg < P < Cl
c. both Li > Na > K > Rb and Na < Mg < P < CI
d. neither Li > Na > K > Rb or Na < Mg < P < CI

ANSWER: c
TOPICS: 2.8 - PERIODIC PROPERTIES
KEYWORDS: BLOOM'S: APPLY

122. Which of the following gives the correct order of ionization energies?
a. Li < Na < K < Rb
b. Na < Mg < P < Cl
c. both Li < Na < K < Rb and Na < Mg < P < CI
d. neither Li < Na < K < Rb or Na < Mg < P < CI

ANSWER: b
TOPICS: 2.8 - PERIODIC PROPERTIES
KEYWORDS: BLOOM'S: APPLY

123. Which of the following gives the correct order of ionization energies?
a. Li < Na < K < Rb
b. Na > Mg > P > Cl
c. both Li < Na < K < Rb and Na > Mg > P > CI
d. neither Li < Na < K < Rb or Na > Mg > P > CI

ANSWER: d
TOPICS: 2.8 - PERIODIC PROPERTIES
KEYWORDS: BLOOM'S: APPLY

124. Which of the following gives the correct order of ionization energies?
a. Li > Na > K > Rb
b. Na > Mg > P > Cl
c. both Li > Na > K > Rb and Na > Mg > P > CI
d. neither Li > Na > K > Rb or Na > Mg > P > CI

ANSWER: a

TOPICS: 2.8 - PERIODIC PROPERTIES
KEYWORDS: BLOOM'S: APPLY

125. Which of the following has the highest ionization energy?
a. Br
b. Cl
c. F
d. I
ANSWER: c
TOPICS: 2.8 - PERIODIC PROPERTIES
KEYWORDS: BLOOM'S: APPLY

126. Which of the following has the lowest ionization energy?
a. Br
b. Cl
c. F
d. I
ANSWER: d
TOPICS: 2.8 - PERIODIC PROPERTIES
KEYWORDS: BLOOM'S: APPLY

127. Which of the following has the highest ionization energy?
a. Ba
b. Ca
c. Mg
d. Sr
ANSWER: c
TOPICS: 2.8 - PERIODIC PROPERTIES
KEYWORDS: BLOOM'S: APPLY

128. Which of the following has the lowest ionization energy?
a. Ba
b. Ca
c. Mg
d. Sr
ANSWER: a
TOPICS: 2.8 - PERIODIC PROPERTIES
KEYWORDS: BLOOM'S: APPLY

129. Which of the following has the highest ionization energy?
a. Cl
b. F
c. N
d. O
ANSWER: b

Chapter 2

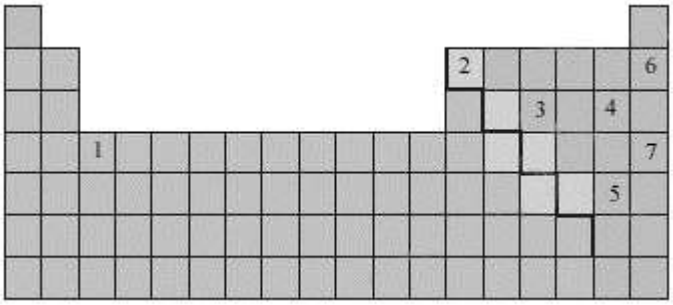
TOPICS: 2.8 - PERIODIC PROPERTIES
KEYWORDS: BLOOM'S: APPLY

130. Which of the chemical elements has the highest ionization energy?
a. F
b. H
c. He
d. U
ANSWER: c
TOPICS: 2.8 - PERIODIC PROPERTIES
KEYWORDS: BLOOM'S: APPLY

131. How do ionization energies vary across a period from the left to the right of the periodic table?
a. They consistently decrease.
b. They consistently increase.
c. They generally decrease, but there are some exceptions.
d. They generally increase, but there are some exceptions.
ANSWER: d
TOPICS: 2.8 - PERIODIC PROPERTIES
KEYWORDS: BLOOM'S: UNDERSTAND

132. Which of the following statements correctly describes ionization energies?
a. Ionization energies are always positive as the process of electron removal is always endothermic.
b. Ionization energies generally increase as we go from top to bottom within a column of the periodic table.
c. Ionization energies are always positive as the process of electron removal is always endothermic and ionization energies generally increase as we go from top to bottom within a column of the periodic table.
d. Ionization energies are neither positive nor do they generally increase.
ANSWER: a
TOPICS: 2.8 - PERIODIC PROPERTIES
KEYWORDS: BLOOM'S: UNDERSTAND

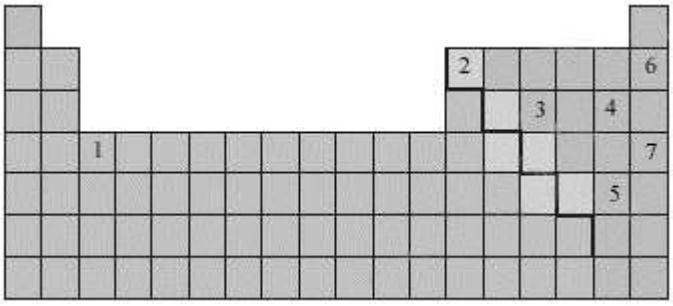
133. Consider the periodic table given below.



Which number represents an element classified as an alkali metal?
a. 1 b. 2
c. 3 d. 4
e. 5 f. 6
g. 7 h. none of these

ANSWER: h
TOPICS: 2.5 - THE PERIODIC TABLE
KEYWORDS: BLOOM'S: APPLY

134. Consider the periodic table given below.

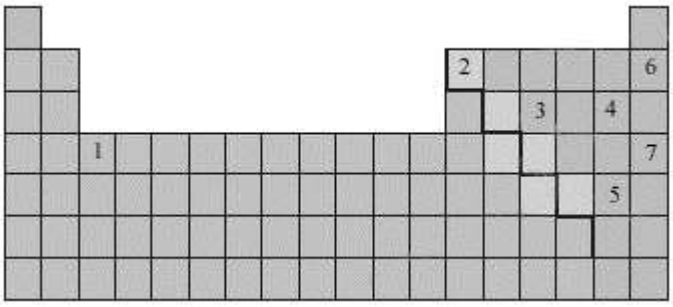


Which number represents an element classified as a metalloid?

a. 1 b. 2
c. 3 d. 4
e. 5 f. 6
g. 7 h. none of these

ANSWER: b
TOPICS: 2.5 - THE PERIODIC TABLE
KEYWORDS: BLOOM'S: APPLY

135. Consider the periodic table given below.



Which number represents an element classified as a noble gas?

a. 1 b. 2
c. 3 d. 4
e. 5 f. 6
g. 7 h. More than one is a noble gas.

ANSWER: h
TOPICS: 2.5 - THE PERIODIC TABLE
KEYWORDS: BLOOM'S: APPLY

136. Consider the periodic table given below.

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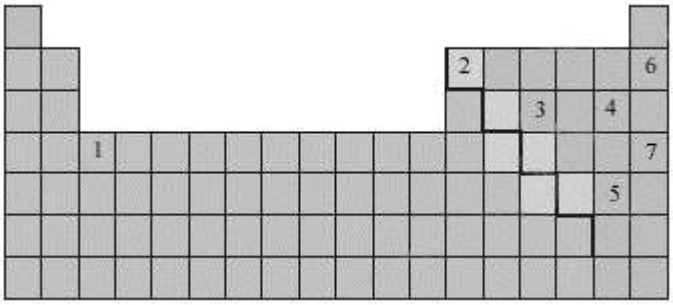
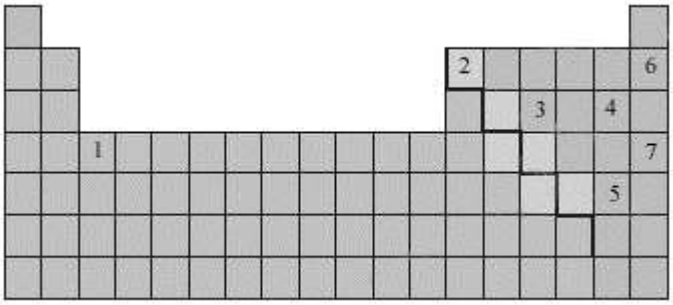


Which number represents an element classified as a transition metal?

a. 1 b. 2
c. 3 d. 4
e. 5 f. 6
g. 7 h. none of these

ANSWER: a
TOPICS: 2.5 - THE PERIODIC TABLE
KEYWORDS: BLOOM'S: APPLY

137. Consider the periodic table given below.

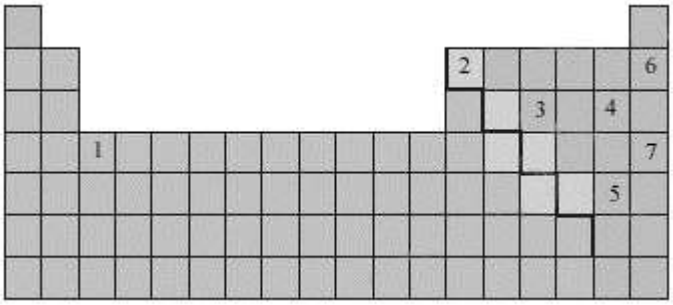


Which number represents the element with the largest atomic weight among the given elements?

a. 1 b. 2
c. 3 d. 4
e. 5 f. 6
g. 7

ANSWER: e
TOPICS: 2.5 - THE PERIODIC TABLE
KEYWORDS: BLOOM'S: APPLY

138. Consider the periodic table given below.



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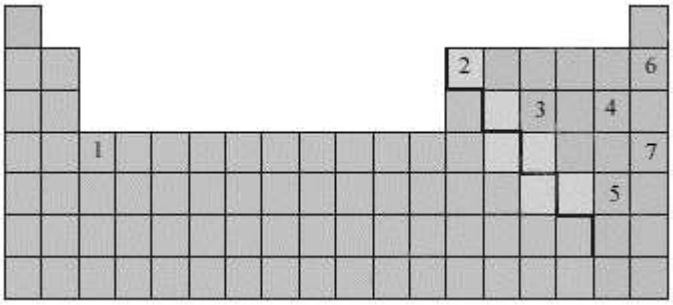
Which number represents an element that is **not** classified as a main group element?

a. 1 b. 2
c. 3 d. 4
e. 5 f. 6
g. 7 h. All are main group elements.

ANSWER: a
TOPICS: 2.5 - THE PERIODIC TABLE
KEYWORDS: BLOOM'S: APPLY

139. Consider the periodic table given below.

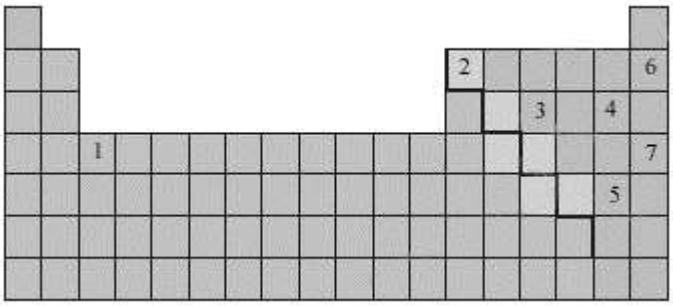


Which number represents the element with the smallest number of protons among the given elements?

a. 1 b. 2
c. 3 d. 4
e. 5 f. 6
g. 7

ANSWER: b
TOPICS: 2.5 - THE PERIODIC TABLE
KEYWORDS: BLOOM'S: APPLY

140. Consider the periodic table given below.



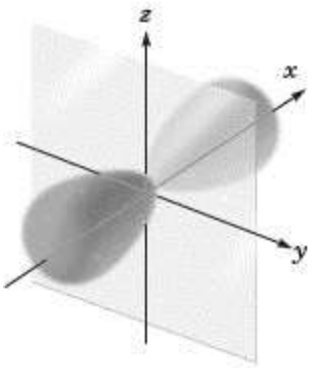
Of the elements numbered, which number represents the halogen with the highest melting point?

a. 1 b. 2
c. 3 d. 4
e. 5 f. 6
g. 7 h. There is only one halogen numbered.

ANSWER: e
TOPICS: 2.5 - THE PERIODIC TABLE
KEYWORDS: BLOOM'S: APPLY

Chapter 2

141. Consider the image given below.

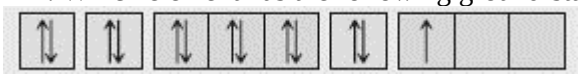


Which of the following is the correct designation for the orbital?

a. *s*
b. p_x
c. p_y
d. p_z
e. *d*

ANSWER: b
TOPICS: 2.6 - ARRANGEMENT OF ELECTRONS IN AN ATOM
KEYWORDS: BLOOM'S: UNDERSTAND

142. Which element has the following ground-state electron configuration?



a. Al
b. Na
c. B
d. Ga
e. none of these

ANSWER: a
TOPICS: 2.6 - ARRANGEMENT OF ELECTRONS IN AN ATOM
KEYWORDS: BLOOM'S: APPLY