CHAPTER 2 — ATOMS

MULTIPLE CHOICE

1. The name of which Greek philosopher is most closely associated with the concept of an atom?
   a. Aristotle
   b. Democritus
   c. Plato
   d. Zeno

   ANS: B PTS: 1 TOP: 2.1 - WHAT IS MATTER MADE OF?

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

   ANS: D PTS: 1 TOP: 2.1 - WHAT IS MATTER MADE OF?

3. The word atom is derived from a word in which language?
   a. Arabic
   b. Greek
   c. Hebrew
   d. Latin

   ANS: B PTS: 1 TOP: 2.1 - WHAT IS MATTER MADE OF?

4. Which of the following best compares Democritus' 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 was based on thought only, but our view is based on experimental evidence
   d. both views were based on a combination of thought and experimental evidence

   ANS: C PTS: 1 TOP: 2.2 - HOW DO WE CLASSIFY MATTER?

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

   ANS: B PTS: 1 TOP: 2.2 - HOW DO WE CLASSIFY MATTER?

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

   ANS: D PTS: 1 TOP: 2.2 - HOW DO WE CLASSIFY MATTER?

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

   ANS: D PTS: 1 TOP: 2.2 - HOW DO WE CLASSIFY MATTER?

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

   ANS: D PTS: 1 TOP: 2.2 - HOW DO WE CLASSIFY MATTER?

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

   ANS: D PTS: 1 TOP: 2.2 - HOW DO WE CLASSIFY MATTER?

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

   ANS: C PTS: 1 TOP: 2.2 - HOW DO WE CLASSIFY MATTER?

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

   ANS: C PTS: 1 TOP: 2.2 - HOW DO WE CLASSIFY MATTER?

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

   ANS: C PTS: 1 TOP: 2.2 - HOW DO WE CLASSIFY MATTER?

13. Which of the following statements describe a mixture?
   a. A mixture does not contain a fixed ratio by mass of the component elements.
   b. Chemical techniques are required to separate the components of a mixture.
   c. both a and b
   d. neither a nor b

   ANS: A PTS: 1 TOP: 2.2 - HOW DO WE CLASSIFY MATTER?

14. When a particular solid sample is examined under a microscope it is observed that there are regions which are black and regions which are yellow. What type of material is this sample?
   a. a compound
   b. an element
   c. a homogeneous mixture
   d. a heterogeneous mixture

   ANS: D PTS: 1 TOP: 2.2 - HOW DO WE CLASSIFY MATTER?

15. Zinc can be uniformly mixed in differing amounts in copper to an alloy called brass. Brass is an examples of which of the following?
   a. compounds
   b. elements
   c. homogeneous mixtures
   d. heterogeneous mixtures

   ANS: C PTS: 1 TOP: 2.2 - HOW DO WE CLASSIFY MATTER?

16. When a strong magnet is brought near to a sample which is known to contain both iron and sulfur the iron and the sulfur are separated from one another. What type of material is this sample?
   a. a compound
   b. a homogeneous mixture
   c. a heterogeneous mixture
   d. There is insufficient information to answer.

ANS: C PTS: 1 TOP: 2.2 - HOW DO WE CLASSIFY MATTER?

17. When a strong magnet is brought near to a sample which is known to contain both iron and sulfur the iron and the sulfur are not separated from one another. What type of material is this sample?
    a. a compound
    b. a homogeneous mixture
    c. a heterogeneous mixture
    d. There is insufficient information to answer.

    ANS: A PTS: 1 TOP: 2.2 - HOW DO WE CLASSIFY MATTER?

18. Sodium is a highly reactive metal and chlorine is a toxic gas, but when they come together the resulting material, sodium chloride, is essential for life. Which of the following 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 neutralize each other.
    d. They form a compound.

    ANS: D PTS: 1 TOP: 2.2 - HOW DO WE CLASSIFY MATTER?

19. Aluminum and fluorine form a compound in which the aluminum to fluorine ratio is 1:3. What is the correct formula for this compound?
    a. AF_3
    b. $AlFl_3$
    c. AlF_3
    d. $Al(F_2)_3$

    ANS: C PTS: 1 TOP: 2.2 - HOW DO WE CLASSIFY MATTER?

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. none of these

    ANS: C PTS: 1 TOP: 2.2 - HOW DO WE CLASSIFY MATTER?

21. Ammonium nitrate is a component of both fertilizers and explosives. Ammonium nitrate 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. $N_1H_2O_{1.5}$
    d. all of these

    ANS: B PTS: 1 TOP: 2.2 - HOW DO WE CLASSIFY MATTER?

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. none of these

    ANS: B PTS: 1 TOP: 2.2 - HOW DO WE CLASSIFY MATTER?

23. Which of the following techniques would be most effective in separating the components of salt water?
    a. pouring the liquid off the solid
    b. evaporation
    c. filtration
    d. none of these

    ANS: B PTS: 1 TOP: 2.2 - HOW DO WE CLASSIFY MATTER?

24. Which of the following could be used to separate the components of a mixture of ethyl alcohol (ethanol) and water?
    a. pouring the liquid off the solid
    b. distillation
    c. filtration
    d. none of these

    ANS: B PTS: 1 TOP: 2.2 - HOW DO WE CLASSIFY MATTER?

25. Which of the following enable us characterize a compound by a specific chemical formula?
    a. law of conservation of energy
    b. law of conservation of mass
    c. law of constant composition
    d. all of the above

    ANS: C PTS: 1
    TOP: 2.3 - WHAT ARE THE POSTULATES OF DALTON'S ATOMIC THEORY?

26. Which of the following statements, all of which were part of Dalton's atomic theory, was later shown to be false?
    a. All matter is made up of very tiny indivisible particles called atoms.
    b. All atoms of the same element have the same chemical properties.
    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 acts as a single unit.

    ANS: A PTS: 1
    TOP: 2.3 - WHAT ARE THE POSTULATES OF DALTON'S ATOMIC THEORY?

27. One of the postulates of Dalton's theory was incorrect. Which of the following best describes the effect of the incorrect postulate?
    a. Since one postulate was incorrect the theory must be discarded.
    b. The theory can still be used because the erroneous postulate does not have any effect on the physical properties of the elements.
    c. The theory can still be used because the erroneous postulate does not have any effect on the chemical properties of the elements.
    d. The theory can still be used because the erroneous postulate does not have any effect on either the chemical or physical properties of the elements.

    ANS: D PTS: 1
    TOP: 2.3 - WHAT ARE THE POSTULATES OF DALTON'S ATOMIC THEORY?

28. Although atoms are the smallest unit of an element, relatively few elements can be found in nature as individual atoms. Which of the following elements can be found as individual atoms?
    a. hydrogen
    b. iron
    c. krypton
    d. sulfur

    ANS: C PTS: 1
    TOP: 2.3 - WHAT ARE THE POSTULATES OF DALTON'S ATOMIC THEORY?

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

    ANS: D PTS: 1
    TOP: 2.3 - WHAT ARE THE POSTULATES OF DALTON'S ATOMIC THEORY?

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

ANS: D PTS: 1
TOP: 2.3 - WHAT ARE THE POSTULATES OF DALTON'S ATOMIC THEORY?

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

    ANS: D PTS: 1
    TOP: 2.3 - WHAT ARE THE POSTULATES OF DALTON'S ATOMIC THEORY?

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

    ANS: B PTS: 1
    TOP: 2.3 - WHAT ARE THE POSTULATES OF DALTON'S ATOMIC THEORY?

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

    ANS: C PTS: 1
    TOP: 2.3 - WHAT ARE THE POSTULATES OF DALTON'S ATOMIC THEORY?

34. Which subatomic particle(s) are found in the nucleus?
    a. electrons
    b. neutrons
    c. protons
    d. protons and neutrons

    ANS: D PTS: 1 TOP: 2.4 - WHAT ARE ATOMS MADE OF?

35. Which of the following 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

    ANS: A PTS: 1 TOP: 2.4 - WHAT ARE ATOMS MADE OF?

36. Which of the following 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

    ANS: D PTS: 1 TOP: 2.4 - WHAT ARE ATOMS MADE OF?

37. The neutron got its name because which of the following is true?
    a. it neutralizes protons
    b. it neutralizes electrons
    c. it does not have an electrical charge
    d. it has no effect on any atomic properties

    ANS: C PTS: 1 TOP: 2.4 - WHAT ARE ATOMS MADE OF?

38. The mass of a proton is approximately which of the following?
    a. 12 g
    b. 1 g
    c. 12 amu
    d. 1 amu

ANS: D PTS: 1 TOP: 2.4 - WHAT ARE ATOMS MADE OF?

39. The mass of a neutron is approximately which of the following?
    a. 12 g
    b. 1 g
    c. 12 amu
    d. 1 amu

ANS: D PTS: 1 TOP: 2.4 - WHAT ARE ATOMS MADE OF?

40. The mass of an electron is approximately which of the following?
    a. 1 amu
    b. 1 g
    c. 0.0005 amu
    d. 0.0005 g

ANS: C PTS: 1 TOP: 2.4 - WHAT ARE ATOMS MADE OF?

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

ANS: B PTS: 1 TOP: 2.4 - WHAT ARE ATOMS MADE OF?

42. The mass number of an atom is equal to which of the following?
    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

ANS: C PTS: 1 TOP: 2.4 - WHAT ARE ATOMS MADE OF?

43. The atomic number of an atom is equal to which of the following?
    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

ANS: A PTS: 1 TOP: 2.4 - WHAT ARE ATOMS MADE OF?

44. What is the mass number of an atom which is made up of 38 protons, 52 neutrons and 38 electrons?
    a. 38
    b. 52
    c. 90
    d. 128

ANS: C PTS: 1 TOP: 2.4 - WHAT ARE ATOMS MADE OF?

45. What is the mass number of an atom which is made up of 27 protons,33 neutrons and 27 electrons?
    a. 87
    b. 60
    c. 33
    d. 27

ANS: B PTS: 1 TOP: 2.4 - WHAT ARE ATOMS MADE OF?

46. Which is true of 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 chemical properties.

ANS: B PTS: 1 TOP: 2.4 - WHAT ARE ATOMS MADE OF?

47. Cobalt-60 is a radioactive isotope sometimes used in the treatment of cancer. Which of the following statements is true about an atom of cobalt-60?
    a. It contains 60 neutrons.
    b. It contains 60 protons.
    c. It contains 33 neutrons.
    d. It contains 33 protons.

    ANS: C PTS: 1 TOP: 2.4 - WHAT ARE ATOMS MADE OF?

48. Cobalt-60 is a radioactive isotope sometimes used in the treatment of cancer. Which of the following statements is true about an atom of cobalt-60?
    a. It contains 27 neutrons.
    b. It contains 27 protons.
    c. It contains 60 neutrons.
    d. It contains 60 protons.

    ANS: B PTS: 1 TOP: 2.4 - WHAT ARE ATOMS MADE OF?

49. Strontium-90 is a radioactive isotope which is particularly hazardous. Which of the following statements is true about an atom of strontium-90?
    a. It contains 52 neutrons.
    b. It contains 52 protons.
    c. It contains 90 neutrons.
    d. It contains 90 protons.

    ANS: A PTS: 1 TOP: 2.4 - WHAT ARE ATOMS MADE OF?

50. Strontium-90 is a radioactive isotope which is particularly hazardous. Which of the following statements is true about an atom of strontium-90?
    a. It contains 38 neutrons.
    b. It contains 38 protons.
    c. It contains 90 protons.
    d. It contains 90 protons.

    ANS: B PTS: 1 TOP: 2.4 - WHAT ARE ATOMS MADE OF?

51. It is commonly assumed that the isotopic abundances of a particular element are independent of the source of the element. If isotopic abundance does vary with location what is the consequence of that observation?
    a. Nothing, the observation is totally unimportant.
    b. The atomic weight determined for the element will depend on the source from which the element was obtained.
    c. The chemical behavior of the element will depend on the source from which the element was obtained.
    d. The atomic weight and the chemical behavior of the element will depend on the source from which the element was obtained.

    ANS: B PTS: 1 TOP: 2.4 - WHAT ARE ATOMS MADE OF?

52. 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. 299.2 amu
    d. 299.23 amu

    ANS: C PTS: 1 TOP: 2.4 - WHAT ARE ATOMS MADE OF?

53. Which of the following contains two species which have the same mass number?
    a. ^{14}C, ^{14}N
    b. ^{12}C, ^{13}C
    c. both a and b
    d. neither a nor b

    ANS: A PTS: 1 TOP: 2.4 - WHAT ARE ATOMS MADE OF?

54. Which of the following contains two species which are a pair of isotopes?
    a. ^{14}C, ^{14}N
    b. ^{12}C, ^{13}C
    c. both a and b
    d. neither a nor b

    ANS: B PTS: 1 TOP: 2.4 - WHAT ARE ATOMS MADE OF?

55. Which of the following is true of the atomic weight of an element?
    a. It is the weight of heaviest isotope.
    b. It is the weight 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.

    ANS: D PTS: 1 TOP: 2.4 - WHAT ARE ATOMS MADE OF?

56. Which of the following is true of a 1 gram sample of iron?
    a. It contains a very, very small number of atoms, since each individual atom has a large mass.
    b. It contains a very huge number of atoms, each of which is fairly massive.
    c. It contains a very, very huge number of atoms, each of which has an extremely tiny mass.
    d. none of the above

    ANS: C PTS: 1 TOP: 2.4 - WHAT ARE ATOMS MADE OF?

57. If you could line up atoms of lead-208, approximately how many atoms would you need to line up in order for them to form a line 1 inch long?
    a. 82
    b. 208
    c. 8.2×10^{7}
    d. 1.6×10^{12}

    ANS: C PTS: 1 TOP: 2.4 - WHAT ARE ATOMS MADE OF?

58. If you could line up the nuclei of lead-208, approximately how many nuclei would you need to line up in order for them to form a line 1 inch long?
    a. 82
    b. 208
    c. 8.2×10^{7}
    d. 1.6×10^{12}

    ANS: D PTS: 1 TOP: 2.4 - WHAT ARE ATOMS MADE OF?

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

    ANS: B PTS: 1 TOP: 2.5 - WHAT IS THE PERIODIC TABLE?

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

    ANS: A PTS: 1 TOP: 2.5 - WHAT IS THE PERIODIC TABLE?

61. What are the elements in the “A” columns of the period table called?
    a. main group elements
    b. inner transition elements
    c. metalloids
    d. transition elements

    ANS: A PTS: 1 TOP: 2.5 - WHAT IS THE PERIODIC TABLE?

62. What are the elements in the “B” columns of the period table called?
    a. main group elements
    b. inner transition elements
    c. metalloids
    d. transition elements

    ANS: D PTS: 1 TOP: 2.5 - WHAT IS THE PERIODIC TABLE?

63. Which column of the periodic table is commonly called the alkali metals?
    a. 1A
    b. 2A
    c. 7A
    d. 8A

    ANS: A PTS: 1 TOP: 2.5 - WHAT IS THE PERIODIC TABLE?

64. Which columns o the periodic table is commonly called the halogens?
    a. 1A
    b. 4A
    c. 7A
    d. 8A

    ANS: C PTS: 1 TOP: 2.5 - WHAT IS THE PERIODIC TABLE?

65. Which of the following columns of the periodic table contains no metallic elements?
    a. 4A
    b. 5A
    c. 6A
    d. 7A

    ANS: D PTS: 1 TOP: 2.5 - WHAT IS THE PERIODIC TABLE?

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

    ANS: D PTS: 1 TOP: 2.5 - WHAT IS THE PERIODIC TABLE?

67. Which of the following contains only transition metals?
    a. Ca, Cr, Fe, Ni,
    b. V, W, Xe, Zr
    c. Cr, Mo, Ni, Pt
    d. none of these

    ANS: C PTS: 1 TOP: 2.5 - WHAT IS THE PERIODIC TABLE?

68. Which of the following contains only metals?
    a. Ag, As, Ba, Ca
    b. Ag, Au, Pb, Rb
    c. As, Ge, Si, Te
    d. none of these

    ANS: B PTS: 1 TOP: 2.5 - WHAT IS THE PERIODIC TABLE?

69. Which of the following contains only nonmetals?
    a. C, Si, Ge, Sn
    b. P, As, Sb, Bi
    c. F, Cl, Br, I
    d. none of these

    ANS: C PTS: 1 TOP: 2.5 - WHAT IS THE PERIODIC TABLE?

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

ANS: B PTS: 1 TOP: 2.5 - WHAT IS THE PERIODIC TABLE?

71. Which of the following sequences gives the correct order as we move from left to right across a row of the period table?
    a. metal, metalloid, nonmetal
    b. metal, nonmetal, metalloid
    c. nonmetal, metal, metalloid
    d. nonmetal, metalloid, metal

ANS: A PTS: 1 TOP: 2.5 - WHAT IS THE PERIODIC TABLE?

72. Which of the following best describes the properties of the elements?
    a. Chemical and physical properties vary in a systematic way as one moves across a row of the periodic table.
    b. Chemical and physical properties vary in a systematic way as one moves down a column of the periodic table.
    c. both a and b
    d. neither a nor b

ANS: C PTS: 1 TOP: 2.5 - WHAT IS THE PERIODIC TABLE?

73. The properties of ductility, malleability, ability to conduct heat and electricity are characteristics of what type of material?
    a. all elements
    b. metallic elements
    c. metalloid elements
    d. nonmetallic elements

ANS: B PTS: 1 TOP: 2.5 - WHAT IS THE PERIODIC TABLE?

74. Which of the following products are formed when sodium reacts with water?
    a. $NaH + O_2$
    b. $NaO + H_2$
    c. $Na_2O + H_2$
    d. $NaOH + H_2$

ANS: D PTS: 1 TOP: 2.5 - WHAT IS THE PERIODIC TABLE?

75. Which of the following products are formed when potassium reacts with water?
    a. $KH + O_2$
    b. $KO + H_2$
    c. $KOH + H_2$
    d. $K_2O + H_2$

ANS: C PTS: 1 TOP: 2.5 - WHAT IS THE PERIODIC TABLE?

76. Group 8A of the periodic table was once known as the inert gases, but is now known as the noble gases. Which of the following resulted in the change of name?
    a. Once there were no known compounds of these elements, but now many compounds of all of the noble gases are known.
    b. Once there were no known compounds of these elements, but now a few compounds of some of the noble gases are known.
    c. These elements form no compounds and are extremely expensive.
    d. The elements only react with noble metals such as gold and platinum.

ANS: B PTS: 1 TOP: 2.5 - WHAT IS THE PERIODIC TABLE?

77. When comparing the boiling points of the halogens with those of the noble gases which of the following is true?
    a. The boiling points decrease as the elements get heavier, and the boiling point of the halogen is higher than that of the noble gas adjacent to it.
    b. The boiling points decrease as the elements get heavier, and the boiling point of the halogen is lower than that of the noble gas adjacent to it.

c. The boiling points increase as the elements get heavier, and the boiling point of the halogen is higher than that of the noble gas adjacent to it.
d. The boiling points increase as the elements get heavier, and the boiling point of the halogen is lower than that of the noble gas adjacent to it.

ANS: C PTS: 1 TOP: 2.5 - WHAT IS THE PERIODIC TABLE?

78. Which of the following is the reason that strontium-90 is considered an especially dangerous radioactive isotope?
a. It has an exceptionally short half-life.
b. It has an exceptionally intense radioactivity.
c. It is chemically incorporated into bone and teeth and is therefore not readily eliminated from the body.
d. all of the above

ANS: C PTS: 1 TOP: 2.5 - WHAT IS THE PERIODIC TABLE?

79. What is the name of the lowest possible energy state for an electron?
a. Bohr state
b. bottom state
c. ground state
d. none of the above

ANS: C PTS: 1
TOP: 2.6 - HOW ARE THE ELECTRONS IN AN ATOM ARRANGED?

80. 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, 3
b. 0, 1, 2, 3, 4
c. 1, 2, 3, 4, 5
d. all of these

ANS: C PTS: 1
TOP: 2.6 - HOW ARE THE ELECTRONS IN AN ATOM ARRANGED?

81. Which of the following is true of the number of subshells associated with a particular shell?
a. It depends on which atom is being considered.
b. It depends on the particular shell being considered.
c. It depends on both a and b.
d. It depends on neither a nor b.

ANS: B PTS: 1
TOP: 2.6 - HOW ARE THE ELECTRONS IN AN ATOM ARRANGED?

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

ANS: D PTS: 1
TOP: 2.6 - HOW ARE THE ELECTRONS IN AN ATOM ARRANGED?

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

ANS: C PTS: 1
TOP: 2.6 - HOW ARE THE ELECTRONS IN AN ATOM ARRANGED?

84. How many orbitals are there in the 3*d* subshell?

a. 3
b. 5
c. 7
d. 8

ANS: B PTS: 1
TOP: 2.6 - HOW ARE THE ELECTRONS IN AN ATOM ARRANGED?

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

ANS: B PTS: 1
TOP: 2.6 - HOW ARE THE ELECTRONS IN AN ATOM ARRANGED?

86. How many electrons can be accommodated in the 3*d* subshell?
a. 3
b. 6
c. 10
d. 18

ANS: C PTS: 1
TOP: 2.6 - HOW ARE THE ELECTRONS IN AN ATOM ARRANGED?

87. 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.

ANS: D PTS: 1
TOP: 2.6 - HOW ARE THE ELECTRONS IN AN ATOM ARRANGED?

88. Which of the following types of orbitals can hold 10 electrons when filled?
a. *s*
b. *p*
c. *d*
d. *f*

ANS: D PTS: 1
TOP: 2.6 - HOW ARE THE ELECTRONS IN AN ATOM ARRANGED?

89. Which of the following types of orbitals come in sets of seven?
a. *s*
b. *p*
c. *d*
d. *f*

ANS: D PTS: 1
TOP: 2.6 - HOW ARE THE ELECTRONS IN AN ATOM ARRANGED?

90. 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*

ANS: C PTS: 1
TOP: 2.6 - HOW ARE THE ELECTRONS IN AN ATOM ARRANGED?

91. Which of the following statements describe properties of orbitals?
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 the above

ANS: D PTS: 1

TOP: 2.6 - HOW ARE THE ELECTRONS IN AN ATOM ARRANGED?

92. When filling a set of orbitals of equal energy which of the following is true?
    a. There are no sets of orbitals of equal energy.
    b. Two electrons will occupy the same orbital rather than separate orbitals.
    c. Two electrons will occupy different orbitals and have opposing spins.
    d. Two electrons will occupy different orbitals and have like spins.

    ANS: D PTS: 1
    TOP: 2.6 - HOW ARE THE ELECTRONS IN AN ATOM ARRANGED?

93. Which of the following is true when comparing two electrons which 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 further from the nucleus and is easier to remove.
    d. The electron in the higher numbered shell is further from the nucleus and is harder to remove.

    ANS: C PTS: 1
    TOP: 2.6 - HOW ARE THE ELECTRONS IN AN ATOM ARRANGED?

94. Electrons can sometimes fill orbitals in a manner other than according to the rules we have specified. If they do so we say the atom is in an excited state. Which of the following represent(s) 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 a and b
    d. neither a nor b

    ANS: B PTS: 1
    TOP: 2.6 - HOW ARE THE ELECTRONS IN AN ATOM ARRANGED?

95. Electrons can sometimes fill orbitals in a manner other than according to the rules we have specified. If they do so we say the atom is in an excited state. Which of the following represent(s) 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 a and b
    d. neither a nor b

    ANS: C PTS: 1
    TOP: 2.6 - HOW ARE THE ELECTRONS IN AN ATOM ARRANGED?

96. Which of the following is the correct order of filling orbitals?
    a. 1*s*, 2*s*, 2*p*, 3*s*, 3*p*, 3*d*, 4*s*
    b. 1*s*, 2*s*, 2*p*, 3*s*, 3*p*, 4*s*, 3*d*
    c. 1*s*, 2*s*, 3*s*, 4*s*, 2*p*, 3*p*, 3*d*
    d. none of these

    ANS: B PTS: 1
    TOP: 2.6 - HOW ARE THE ELECTRONS IN AN ATOM ARRANGED?

97. 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

    ANS: D PTS: 1
    TOP: 2.6 - HOW ARE THE ELECTRONS IN AN ATOM ARRANGED?

98. What is the maximum number of unpaired electrons in a Lewis dot structure?
    a. 1
    c. 4

b. 3 d. 8

ANS: C PTS: 1
TOP: 2.6 - HOW ARE THE ELECTRONS IN AN ATOM ARRANGED?

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

ANS: C PTS: 1
TOP: 2.6 - HOW ARE THE ELECTRONS IN AN ATOM ARRANGED?

100. The number of valence electrons of a main group element is related to which of the following?
a. the element's atomic number c. the element's column number
b. the element's atomic weight d. none of the above

ANS: C PTS: 1
TOP: 2.6 - HOW ARE THE ELECTRONS IN AN ATOM ARRANGED?

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

ANS: B PTS: 1
TOP: 2.6 - HOW ARE THE ELECTRONS IN AN ATOM ARRANGED?

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

ANS: B PTS: 1
TOP: 2.6 - HOW ARE THE ELECTRONS IN AN ATOM ARRANGED?

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

ANS: B PTS: 1
TOP: 2.6 - HOW ARE THE ELECTRONS IN AN ATOM ARRANGED?

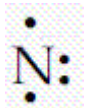
104. How many unpaired electrons are there in a fluorine atom in its ground state?
a. 1 c. 5
b. 3 d. 7

ANS: A PTS: 1
TOP: 2.6 - HOW ARE THE ELECTRONS IN AN ATOM ARRANGED?

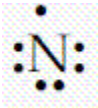
105. Which of the following is the correct Lewis dot picture of the carbon atom?
a. 
c. 
b. 
d. 

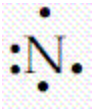
ANS: B PTS: 1
TOP: 2.6 - HOW ARE THE ELECTRONS IN AN ATOM ARRANGED?

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

a. 

b. 

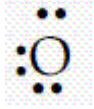
c. 

d. 

ANS: D PTS: 1
TOP: 2.6 - HOW ARE THE ELECTRONS IN AN ATOM ARRANGED?

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

a. 

b. 

c. 

d. 

ANS: A PTS: 1
TOP: 2.6 - HOW ARE THE ELECTRONS IN AN ATOM ARRANGED?

108. Which of the following is the most characteristic feature of the electronic configurations of the elements in a vertical column?

a. The electron configurations are identical.
b. The valence electrons are of the same type and number.
c. The valence electrons are always paired.
d. The valence electrons are never paired.

ANS: B PTS: 1
TOP: 2.7 - HOW ARE ELECTRON CONFIGURATION AND POSITION IN THE PERIODIC TABLE RELATED?

109. Which of the following is true about elements in the same horizontal row of the periodic table?

a. The number of valence electrons remains the same throughout the row.
b. The number of valence electrons decreases as we move left to right across a row.
c. The number of valence electrons increases as we move left to right across a row.
d. There is no simple relationship between the number of valence electrons and the position of the element.

ANS: C PTS: 1
TOP: 2.7 - HOW ARE ELECTRON CONFIGURATION AND POSITION IN THE PERIODIC TABLE RELATED?

110. 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

ANS: C PTS: 1
TOP: 2.7 - HOW ARE ELECTRON CONFIGURATION AND POSITION IN THE PERIODIC TABLE RELATED?

111. 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*

ANS: C PTS: 1
TOP: 2.7 - HOW ARE ELECTRON CONFIGURATION AND POSITION IN THE PERIODIC TABLE RELATED?

112. 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*

ANS: D PTS: 1
TOP: 2.7 - HOW ARE ELECTRON CONFIGURATION AND POSITION IN THE PERIODIC TABLE RELATED?

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

ANS: C PTS: 1
TOP: 2.7 - HOW ARE ELECTRON CONFIGURATION AND POSITION IN THE PERIODIC TABLE RELATED?

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

ANS: C PTS: 1
TOP: 2.7 - HOW ARE ELECTRON CONFIGURATION AND POSITION IN THE PERIODIC TABLE RELATED?

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

ANS: D PTS: 1
TOP: 2.7 - HOW ARE ELECTRON CONFIGURATION AND POSITION IN THE PERIODIC TABLE RELATED?

116. What type of particles can atoms gain or lose when they become ions?
a. protons
b. neutrons
c. electrons
d. It depends on the atom involved.

ANS: C PTS: 1 TOP: 2.8 - WHAT IS A PERIODIC PROPERTY?

117. Atoms of which of the following elements are largest?
a. Al
b. Mg
c. Na
d. None, they are all the same size.

ANS: C PTS: 1 TOP: 2.8 - WHAT IS A PERIODIC PROPERTY?

118. Atoms of which of the following elements are smallest?

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

ANS: A PTS: 1 TOP: 2.8 - WHAT IS A PERIODIC PROPERTY?

119. Atoms of which of the following elements are largest?
a. Rb
b. K
c. Na
d. None, they are all the same size.

ANS: A PTS: 1 TOP: 2.8 - WHAT IS A PERIODIC PROPERTY?

120. Atoms of which of the following elements are smallest?
a. Rb
b. K
c. Na
d. None, they are all the same size.

ANS: C PTS: 1 TOP: 2.8 - WHAT IS A PERIODIC PROPERTY?

121. Atoms of which of the following elements are largest?
a. Ca
b. K
c. Mg
d. Na

ANS: B PTS: 1 TOP: 2.8 - WHAT IS A PERIODIC PROPERTY?

122. Atoms of which of the following elements are smallest?
a. Ca
b. K
c. Mg
d. Na

ANS: C PTS: 1 TOP: 2.8 - WHAT IS A PERIODIC PROPERTY?

123. Atoms of which of the following elements are largest?
a. Cl
b. P
c. S
d. None, they are all the same size.

ANS: B PTS: 1 TOP: 2.8 - WHAT IS A PERIODIC PROPERTY?

124. Atoms of which of the following elements are smallest?
a. Cl
b. P
c. S
d. None, they are all the same size.

ANS: A PTS: 1 TOP: 2.8 - WHAT IS A PERIODIC PROPERTY?

125. The ionization energy of an atom is which of the following?
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

ANS: D PTS: 1 TOP: 2.8 - WHAT IS A PERIODIC PROPERTY?

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

ANS: D PTS: 1 TOP: 2.8 - WHAT IS A PERIODIC PROPERTY?

127. Which of the following is true of the ionization energy of the elements?
a. Ionization energy generally decreases as we move left to right and decreases as we move

top to bottom in the periodic table.
b. Ionization energy generally decreases as we move left to right and increases as we move top to bottom in the periodic table.
c. Ionization energy generally increases as we move left to right and decreases as we move top to bottom in the periodic table.
d. Ionization energy generally increases as we move left to right and increases as we move top to bottom in the periodic table.

ANS: C PTS: 1 TOP: 2.8 - WHAT IS A PERIODIC PROPERTY?

128. 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 likely to lose an electron than potassium because sodium has a lower ionization energy than potassium.

ANS: C PTS: 1 TOP: 2.8 - WHAT IS A PERIODIC PROPERTY?

129. Which of the following give(s) the correct order of ionization energies?
a. Li > Na > K > Rb
b. Na < Mg < P < Cl
c. both a and b
d. neither a nor b

ANS: C PTS: 1 TOP: 2.8 - WHAT IS A PERIODIC PROPERTY?

130. Which of the following give(s) the correct order of ionization energies?
a. Li < Na < K < Rb
b. Na < Mg < P < Cl
c. both a and b
d. neither a nor b

ANS: B PTS: 1 TOP: 2.8 - WHAT IS A PERIODIC PROPERTY?

131. Which of the following give(s) the correct order of ionization energies?
a. Li < Na < K < Rb
b. Na > Mg > P > Cl
c. both a and b
d. neither a nor b

ANS: D PTS: 1 TOP: 2.8 - WHAT IS A PERIODIC PROPERTY?

132. Which of the following give(s) the correct order of ionization energies?
a. Li > Na > K > Rb
b. Na > Mg > P > Cl
c. both a and b
d. neither a nor b

ANS: A PTS: 1 TOP: 2.8 - WHAT IS A PERIODIC PROPERTY?

133. Which of the following has the highest ionization energy?
a. Br
b. Cl
c. F
d. I

ANS: C PTS: 1 TOP: 2.8 - WHAT IS A PERIODIC PROPERTY?

134. Which of the following has the lowest ionization energy?
a. Br
b. Cl
c. F
d. I

ANS: D PTS: 1 TOP: 2.8 - WHAT IS A PERIODIC PROPERTY?

135. Which of the following has the highest ionization energy?
a. Ba
b. Ca
c. Mg
d. Sr

ANS: C PTS: 1 TOP: 2.8 - WHAT IS A PERIODIC PROPERTY?

136. Which of the following has the lowest ionization energy?
a. Ba
b. Ca
c. Mg
d. Sr

ANS: A PTS: 1 TOP: 2.8 - WHAT IS A PERIODIC PROPERTY?

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

ANS: A PTS: 1 TOP: 2.8 - WHAT IS A PERIODIC PROPERTY?

138. Which of the chemical elements has the highest ionization energy?
a. F
b. H
c. He
d. U

ANS: C PTS: 1 TOP: 2.8 - WHAT IS A PERIODIC PROPERTY?

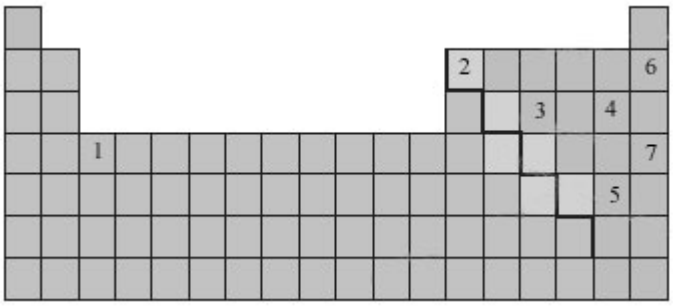
139. Which of the following is true of ionization energies as one moves left to right across a period of the periodic table?
a. They **consistently** decrease.
b. They **consistently** increase.
c. They **generally** decrease, but there are some exceptions.
d. They **generally** increase, but there are some exceptions.

ANS: D PTS: 1 TOP: 2.8 - WHAT IS A PERIODIC PROPERTY?

140. Which of the following correctly describe ionization energies?
a. Ionization energies are always positive, the process is always endothermic.
b. Ionization energies generally increases as we go from top to bottom within a column of the periodic table.
c. both a and b
d. neither a nor b

ANS: A PTS: 1 TOP: 2.8 - WHAT IS A PERIODIC PROPERTY?

Consider the periodic table given below.



141. 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

ANS: H PTS: 1 TOP: 2.5 - WHAT IS THE PERIODIC TABLE?

142. 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

ANS: B PTS: 1 TOP: 2.5 - WHAT IS THE PERIODIC TABLE?

143. 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.

ANS: H PTS: 1 TOP: 2.5 - WHAT IS THE PERIODIC TABLE?

144. 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

ANS: A PTS: 1 TOP: 2.5 - WHAT IS THE PERIODIC TABLE?

145. Which number represents the element with the largest atomic weight?

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

ANS: E PTS: 1 TOP: 2.5 - WHAT IS THE PERIODIC TABLE?

146. Which number represents an element that **not** classified as main-group?

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

ANS: A PTS: 1 TOP: 2.5 - WHAT IS THE PERIODIC TABLE?

147. Which number represents the element with the smallest number of protons?

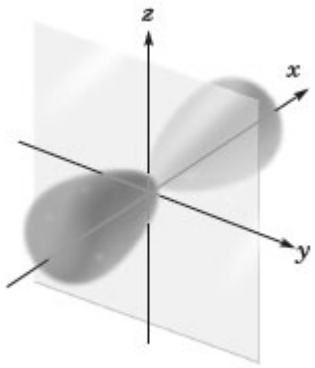
a. 1
b. 2
c. 3
d. 4
e. 5
f. 6
g. 7

ANS: B PTS: 1 TOP: 2.5 - WHAT IS THE PERIODIC TABLE?

148. Of the elements numbered, which number represents the halogen with highest melting point?
a. 1
b. 2
c. 3
d. 4
e. 5
f. 6
g. 7
h. There is only one halogen numbered.

ANS: E PTS: 1 TOP: 2.5 - WHAT IS THE PERIODIC TABLE?

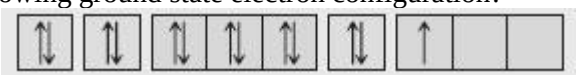
149. Consider the image given below.



Which of the following is the correct designation for this orbital?
a. *s*
b. p_x
c. p_y
d. p_x
e. b, c or d

ANS: B PTS: 1
TOP: 2.6 - HOW ARE THE ELECTRONS IN AN ATOM ARRANGED?

150. Which element has the following ground state electron configuration?



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

ANS: A PTS: 1
TOP: 2.6 - HOW ARE THE ELECTRONS IN AN ATOM ARRANGED?