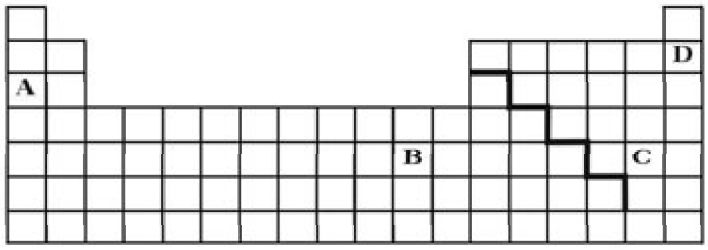
Name: _____ **Class:** _____ **Date:** _____ **ID: A**

Electron and Periodic Table Practice Test

Multiple Choice
Identify the choice that best completes the statement or answers the question.

____ 1. Within the *p*-block elements, the elements at the top of the table, compared with those at the bottom,
a. have larger radii.
b. are more metallic.
c. have lower ionization energies.
d. are less metallic.



____ 2. Which element is the most metallic?
a. A
b. B
c. C
d. D

____ 3. Which element has an electron configuration that ends in the fourth energy level?
a. A
b. B
c. C
d. D

CONTENT REVIEW

____ 4. Which of the following equations represents the relationship between energy and frequency of radiation?
a. $\nu = Eh$
b. $E = h/\nu$
c. $E = h\nu$
d. $E = h - \nu$

____ 5. Which of the following is not a form of electromagnetic radiation?
a. X-rays
b. gamma rays
c. sound waves
d. visible light

____ 6. Which of the following is represented by the abbreviated electron configuration of an atom of an element?
a. the valence electrons only
b. the innermost electrons only
c. the valence electrons of the preceding noble gas electrons
d. the electron configuration of the preceding noble gas and the valence electrons of the element

____ 7. A systematic variation in the properties of elements going down a group or across a period is called a
a. block characteristic.
b. periodic law.
c. periodic trend.
d. triad configuration.

____ 8. When an atom becomes a negative ion, it
a. loses protons.
b. remains the same size.
c. becomes larger.
d. becomes smaller.

____ 9. Wavelength is defined as the distance between
a. the trough and crest of a wave.
b. the beginning and ends of two successive waves.
c. the crest of one wave and the trough of another.
d. successive crests of a wave.

____ 10. The element with electron configuration $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^2$ is
a. Mg ($Z = 12$).
b. C ($Z = 6$).
c. S ($Z = 16$).
d. Si ($Z = 14$).

CONCEPT MASTERY

Use the diagrams to answer the questions or complete the statements.

Properties of X Group Elements

Element	Atomic mass (amu)	Density (g/cm^3)	Melting point (ºC)	Boiling point (ºC)
X	10	3		600
Y		4	200	800
Z	20		300	

Figure 5-1

____ 11. Imagine that a new element, R, is discovered. It has an atomic mass of 5 amu, a density of 2 g/cm^3, a melting point of 0°C, and a boiling point of 400°C. Where in the X group of elements in Figure 5-1 does it belong?
a. above element X
b. between elements Y and Z
c. below element Z
d. It does not belong in the X group.

____ 12. In Figure 5-1, what is the approximate density of element Z?
a. 2 g/cm^3
b. 5 g/cm^3
c. 10 g/cm^3
d. 12 g/cm^3

____ 13. In Figure 5-1, what is the approximate atomic mass of element Y?
a. 5
b. 10
c. 15
d. 25

____ 14. In Figure 5-1, what is the approximate melting point of element X?
a. 100°C
b. 190°C
c. 250°C
d. 400°C

____ 15. In Figure 5-1, what is the approximate boiling point of element Z?
a. 700°C
b. 750°C
c. 850°C
d. 1000°C

____ 16. Imagine that a new element, Q, of higher atomic mass than element Z in Figure 5-1, is discovered. If the density of the new element is 2 g/cm^{3,} where does it belong in the X group of elements?
a. above element X
b. between elements Y and Z
c. below element Z
d. It does not belong in the X group.

____ 17. Elements in a group or column in the periodic table can be expected to have similar
a. atomic masses.
b. atomic numbers.
c. numbers of neutrons.
d. properties.

____ 18. The ionization energies required to remove successive electrons from one mole of calcium atoms are 590 kJ/mol, 1145 kJ/mol, 4912 kJ/mol, and 6474 kJ/mol. The most common ion of calcium is probably
a. Ca^{+}.
b. Ca^{2+}.
c. Ca^{3+}.
d. Ca^{4+}.

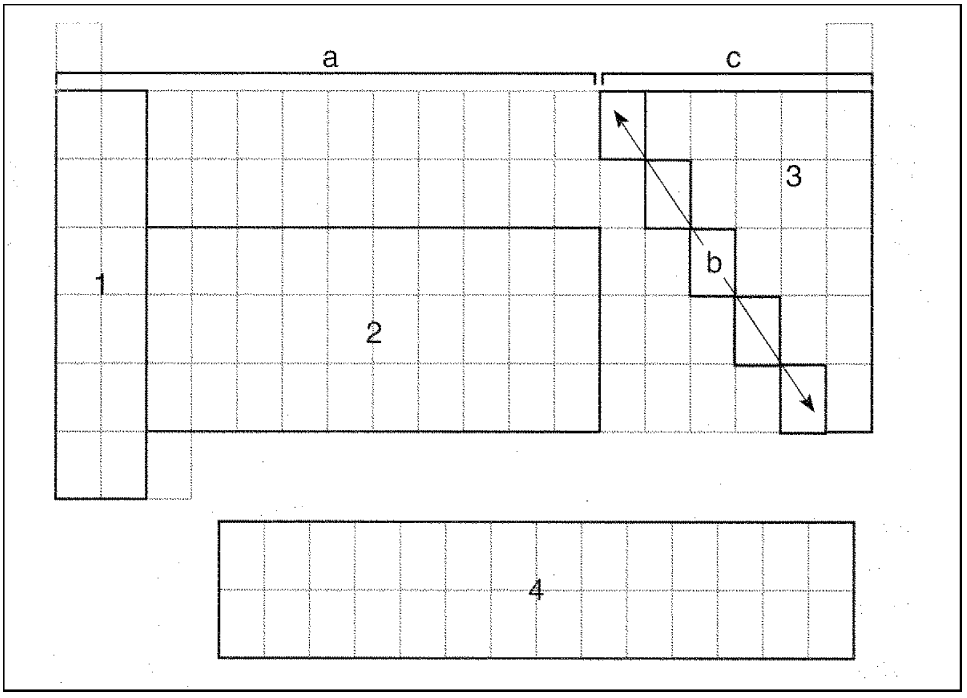


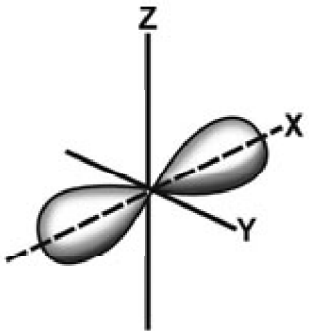
Figure 5-3

____ 19. Which numbered region in Figure 5-3 represents the *s*-block of elements?
a. 1
b. 2
c. 3
d. 4

____ 20. Which numbered regions in Figure 5-3 contain the representative elements?
a. 1 and 2
b. 2 and 3
c. 1 and 3
d. 1, 2, and 3

____ 21. Which numbered region in Figure 5-3 represents the *f*-block of elements?
a. 1
b. 2
c. 3
d. 4

____ 22. Which type of orbital is shown?



a. s
b. p
c. d
d. f

____ 23. The sequence in which energy sublevels are filled is specified by
a. the Pauli exclusion principle.
b. the orbital rule.
c. Lyman's series.
d. the Aufbau principle.

____ 24. The set of orbitals that are dumbbell shaped and directed along the *x*, *y*, and *z* axes are called
a. *d* orbitals.
b. *p* orbitals.
c. *f* orbitals.
d. *s* orbitals.

____ 25. Mendeleev noticed that properties of elements usually repeated at regular intervals when the elements were arranged in order of increasing
a. atomic number.
b. density.
c. reactivity.
d. atomic mass.

____ 26. As you move down Group 14 in the periodic table from carbon through lead, atomic radii
a. generally increase.
b. generally decrease.
c. do not change.
d. vary unpredictably.

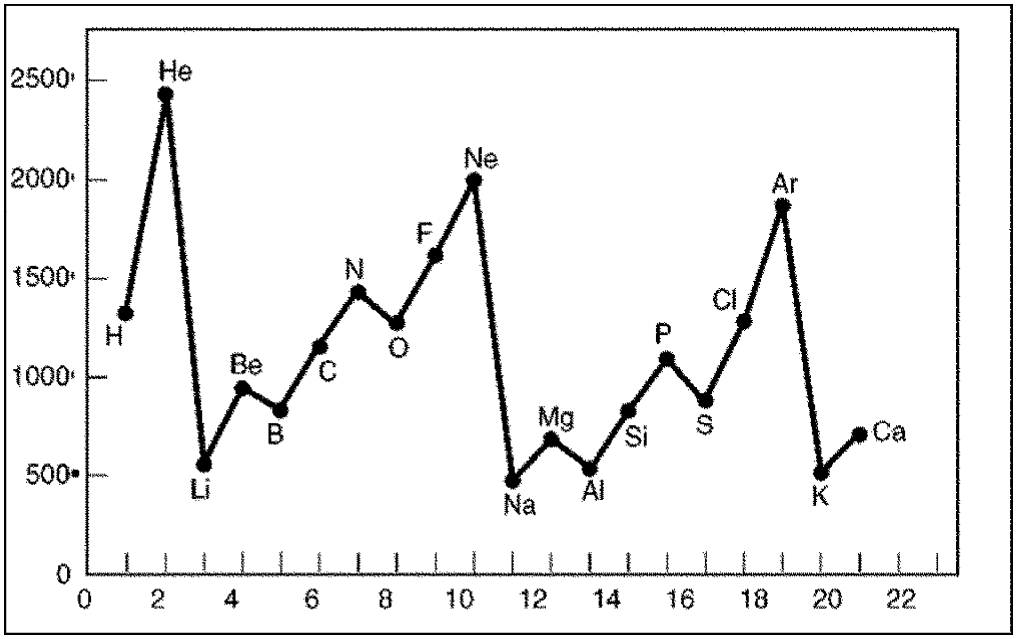


Figure 5-4

____ 27. Based on Figure 5-4, what general trend exists for first ionization energy across a period, from left to right?
a. Ionization energy increases.
b. Ionization energy decreases.
c. Ionization energy remains fairly constant.
d. Ionization energy first increases, then decreases.

____ 28. Based on Figure 5-4, what general trend exists for first ionization energy down a group?
a. Ionization energy increases.
b. Ionization energy decreases.
c. Ionization energy remains fairly constant.
d. Ionization energy first increases, then decreases.

____ 29. According to the particle model of light, certain kinds of light cannot eject electrons from metals because
a. the mass of the light is too low.
b. the frequency of the light is too high.
c. the energy of the light is too low.
d. the wavelength of the light is too short.

____ 30. The energy required to remove an electron from an atom is the atom's
a. electron affinity.
b. electron energy.
c. electronegativity.
d. ionization energy.

____ 31. The electron configuration of an element is [Kr] $4d^6\ 5s^1$. To what group does this element belong?
a. Group 4
b. Group 5
c. Group 7
d. Group 9

____ 32. Visible light, X rays, infrared radiation, and radio waves all have the same
a. energy.
b. wavelength.
c. speed.
d. frequency.

____ 33. A spherical electron cloud surrounding an atomic nucleus would best represent
a. an *s* orbital.
b. a p_x orbital.
c. a combination of p_x and p_y orbitals.
d. a combination of an *s* and a p_x orbital.

____ 34. The Pauli exclusion principle states that no two electrons in the same atom can
a. occupy the same orbital.
b. have the same spin quantum numbers.
c. have the same set of quantum numbers.
d. be at the same main energy level.

____ 35. Because excited hydrogen atoms always produce the same line-emission spectrum, scientists concluded that hydrogen
a. had no electrons.
b. did not release photons.
c. released photons of only certain energies.
d. could only exist in the ground state.

____ 36. The person whose work led to a periodic table based on increasing atomic number was
a. Moseley.
b. Mendeleev.
c. Rutherford.
d. Cannizzaro.

____ 37. Both the Heisenberg uncertainty principle and the Schrödinger wave equation
a. are based on Bohr's theory.
b. treat electrons as particles.
c. led to locating an electron in an atom.
d. led to the concept of atomic orbitals.

____ 38. The element that has the greatest electronegativity is
a. oxygen.
b. sodium.
c. chlorine.
d. fluorine.

____ 39. The discovery of what elements added a new column to Mendeleev's periodic table?
a. noble gases
b. radioactive elements
c. transition elements
d. metalloids

____ 40. A line spectrum is produced when an electron moves from one energy level
a. to a higher energy level.
b. to a lower energy level.
c. into the nucleus.
d. to another position in the same sublevel.

____ 41. Louis de Broglie's research suggested that
a. frequencies of electron waves do not correspond to specific energies.
b. electrons usually behave like particles and rarely like waves.
c. electrons should be considered as waves confined to the space around an atomic nucleus.
d. electron waves exist at random frequencies.

____ 42. The major difference between a 1*s* orbital and a 2*s* orbital is that
a. the 2*s* orbital can hold more electrons.
b. the 2*s* orbital has a slightly different shape.
c. the 2*s* orbital is at a higher energy level.
d. the 1*s* orbital can have only one electron.

____ 43. A measure of the ability of an atom in a chemical compound to attract electrons from another atom in the compound is called
a. electron affinity.
b. electron configuration.
c. electronegativity.
d. ionization potential.

____ 44. The electron configuration of aluminum, atomic number 13, is [Ne] $3s^2$ $3p^1$. Aluminum is in Period
a. 2.
b. 3.
c. 6.
d. 13.

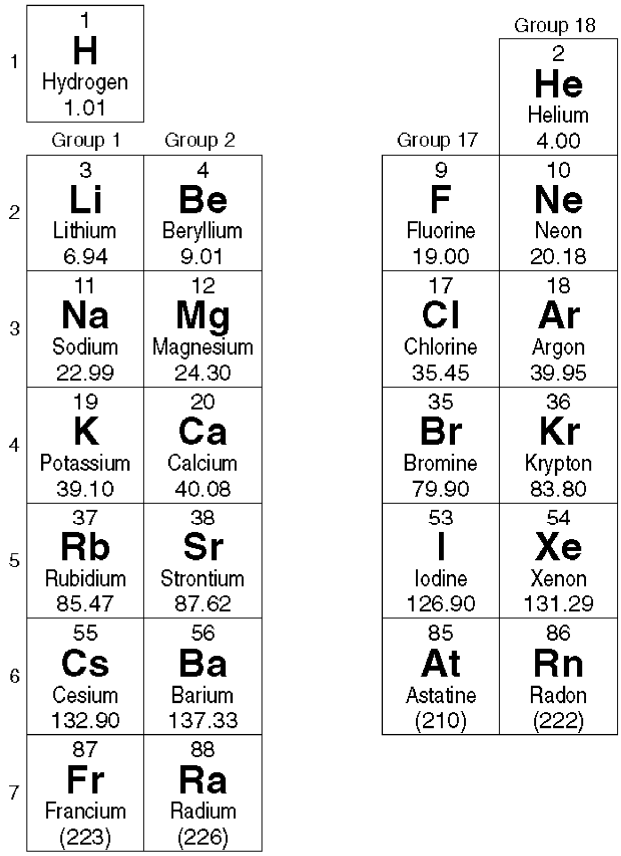
____ 45. What is removed when the ionization energy is supplied to an atom of an element?
a. the electron cloud
b. the nucleus
c. an electron
d. an ion

____ 46. Refer to the figure above. Potassium and bromine belong to
a. Period 4.
b. Group 4.
c. Period 1.
d. Group 1.

____ 47. The elements whose electron configurations end with s^2 p^5 in the highest occupied energy level belong to Group
a. 3.
b. 7.
c. 10.
d. 17.

____ 48. The main energy level that can hold only two electrons is the
a. first.
b. second.
c. third.
d. fourth.

____ 49. Refer to the figure below. To which group do fluorine and chlorine belong?



a. alkaline-earth metals
b. transition elements
c. halogens
d. actinides

____ 50. One-half the distance between the nuclei of identical atoms that are bonded together is called the
a. atomic radius.
b. atomic diameter.
c. atomic volume.
d. electron cloud.

____ 51. The *total* number of orbitals that can exist at the second main energy level is
a. 2.
b. 3.
c. 4.
d. 8.

____ 52. The frequency of electromagnetic radiation is measured in waves/second, or
a. nanometers.
b. quanta.
c. hertz.
d. joules.

____ 53. Strontium's highest occupied energy level is $5s^2$. To what group does strontium belong?
a. Group 2
b. Group 5
c. Group 6
d. Group 8

____ 54. When the pink-colored light of glowing hydrogen gas passes through a prism, it is possible to see
a. all the colors of the rainbow.
b. only lavender-colored lines.
c. four lines of different colors.
d. black light.

____ 55. The letter designations for the first four sublevels with the maximum number of electrons that can be accommodated in each sublevel are
a. *s*:2, *p*:4, *d*:6, and *f*:8.
b. *s*:1, *p*:3, *d*:5, and *f*:7.
c. *s*:2, *p*:6, *d*:10, and *f*:14.
d. *s*:1, *p*:2, *d*:3, and *f*:4.

____ 56. Which is the correct electron configuration for the element Molybdenum (Mo)?
a. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^4$
b. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^6$
c. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 4d^{10} 4p^6 5s^2 5d^4$
d. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^4$

____ 57. The size and shape of an electron cloud are most closely related to the electron's
a. charge.
b. mass.
c. spin.
d. energy.

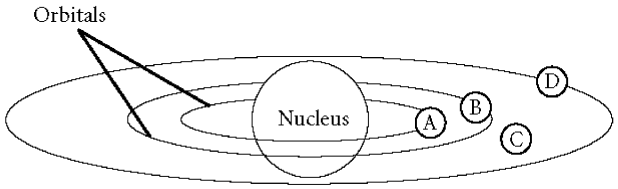
____ 58. If electromagnetic radiation A has a lower frequency than electromagnetic radiation B, then compared to B, the wavelength of A is
a. longer.
b. shorter.
c. equal.
d. exactly half the length of B's wavelength.

____ 59. In the electron configuration for scandium (atomic number 21), what is the notation for the three highest-energy electrons?
a. $3d^1\ 4s^2$
b. $4s^3$
c. $3d^3$
d. $4s^2\ 4p^1$

____ 60. A horizontal row of blocks in the periodic table is called a(n)
a. group.
b. period.
c. family.
d. octet.

____ 61. The force of attraction by Group 1 metals for their valence electrons is
a. weak.
b. zero.
c. strong.
d. greater than that for inner shell electrons.

____ 62. According to Bohr, electrons cannot reside at ____ in the figure below.



a. point A
b. point B
c. point C
d. point D

____ 63. How many electrons can occupy the *s* orbitals at each energy level?
a. two, if they have opposite spins
b. two, if they have the same spin
c. one
d. no more than eight

____ 64. The number of valence electrons in Group 1 elements is
a. 1.
b. 2.
c. 8.
d. equal to the period number.

____ 65. If the *s* and *p* orbitals of the highest main energy level of an atom are filled with electrons, the atom has a(n)
a. electron pair.
b. octet.
c. empty *d* orbital.
d. electron in an excited state.

____ 66. Which model of the atom explains the orbitals of electrons as waves?
a. the Bohr model
b. the quantum model
c. Rutherford's model
d. Planck's theory

____ 67. Mendeleev left spaces in his periodic table and predicted the existence of three elements and their
a. atomic numbers.
b. colors.
c. properties.
d. radioactivity.

____ 68. The region outside the nucleus where an electron can most probably be found is the
a. electron configuration.
b. quantum.
c. *s* sublevel.
d. electron cloud.

____ 69. A quantum of electromagnetic energy is called a(n)
a. photon.
b. electron.
c. excited atom.
d. orbital.

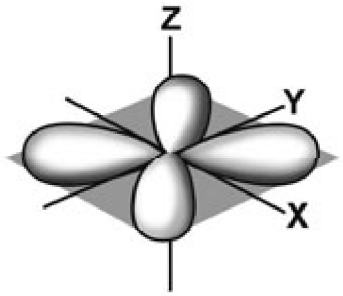
____ 70. For an electron in an atom to change from the ground state to an excited state,
a. energy must be released.
b. energy must be absorbed.
c. radiation must be emitted.
d. the electron must make a transition from a higher to a lower energy level.

____ 71. The change of an atom from an excited state to the ground state always requires
a. absorption of energy.
b. emission of electromagnetic radiation.
c. release of visible light.
d. an increase in electron energy.

____ 72. Which of these elements has 5 valence electrons?
a. Boron (B)
b. Rubidium (Rb)
c. Vanadium (V)
d. Arsenic (As)

____ 73. As it travels through space, electromagnetic radiation
a. exhibits wavelike behavior.
b. loses energy.
c. varies in speed.
d. releases photons.

____ 74. Which type of orbital is shown?



a. s
b. p
c. d
d. f

Electron and Periodic Table Practice Test
Answer Section

MULTIPLE CHOICE

1. ANS: D PTS: 1 DIF: I REF: 2
   OBJ: 2
2. ANS: A PTS: 1 DIF: Bloom's Level 2
   NAT: UCP.2 | B.1 | B.2 STA: SC-HS-1.1.1
3. ANS: B PTS: 1 DIF: Bloom's Level 4
   NAT: UCP.2 STA: SC-HS-1.1.1
4. ANS: C PTS: 1 OBJ: 4D 4.d
5. ANS: C PTS: 1 OBJ: 4D 4.b
6. ANS: D PTS: 1 OBJ: 5E 5.d
7. ANS: C PTS: 1 OBJ: 5E 5.e
8. ANS: C PTS: 1 OBJ: 5E 5.f
9. ANS: D PTS: 1 OBJ: 4D 4.a
10. ANS: D PTS: 1 DIF: II REF: 3
    OBJ: 3
11. ANS: A PTS: 1 OBJ: 5E 5.a
12. ANS: B PTS: 1 OBJ: 5E 5.a
13. ANS: C PTS: 1 OBJ: 5E 5.a
14. ANS: A PTS: 1 OBJ: 5E 5.a
15. ANS: D PTS: 1 OBJ: 5E 5.a
16. ANS: D PTS: 1 OBJ: 5E 5.a
17. ANS: D PTS: 1 DIF: I REF: 1
    OBJ: 4
18. ANS: B PTS: 1 DIF: III REF: 3
    OBJ: 2
19. ANS: A PTS: 1 OBJ: 5E 5.d
20. ANS: C PTS: 1 OBJ: 5E 5.d
21. ANS: D PTS: 1 OBJ: 5E 5.d
22. ANS: B PTS: 1 DIF: Bloom's Level 1
    NAT: UCP.2 | B.1 STA: SC-HS-4.6.3 | SC-HS-1.1.2
23. ANS: D PTS: 1 DIF: I REF: 3
    OBJ: 2
24. ANS: B PTS: 1 DIF: I REF: 2
    OBJ: 5
25. ANS: D PTS: 1 DIF: I REF: 1
    OBJ: 1
26. ANS: A PTS: 1 DIF: II REF: 3
    OBJ: 2
27. ANS: A PTS: 1 OBJ: 5E 5.f
28. ANS: B PTS: 1 OBJ: 5E 5.f

29. ANS: C PTS: 1 DIF: I REF: 1
OBJ: 2
30. ANS: D PTS: 1 DIF: I REF: 3
OBJ: 1
31. ANS: C PTS: 1 DIF: II REF: 2
OBJ: 3
32. ANS: C PTS: 1 DIF: I REF: 1
OBJ: 1
33. ANS: A PTS: 1 DIF: II REF: 2
OBJ: 5
34. ANS: C PTS: 1 DIF: I REF: 3
OBJ: 2
35. ANS: C PTS: 1 DIF: II REF: 1
OBJ: 3
36. ANS: A PTS: 1 DIF: I REF: 1
OBJ: 1
37. ANS: D PTS: 1 DIF: I REF: 2
OBJ: 3
38. ANS: D PTS: 1 DIF: II REF: 3
OBJ: 2
39. ANS: A PTS: 1 DIF: I REF: 1
OBJ: 2
40. ANS: B PTS: 1 DIF: II REF: 1
OBJ: 3
41. ANS: C PTS: 1 DIF: I REF: 2
OBJ: 1
42. ANS: C PTS: 1 DIF: II REF: 2
OBJ: 5
43. ANS: C PTS: 1 DIF: I REF: 3
OBJ: 1
44. ANS: B PTS: 1 DIF: I REF: 2
OBJ: 1
45. ANS: C PTS: 1 DIF: I REF: 3
OBJ: 1
46. ANS: A PTS: 1 DIF: I REF: 1
OBJ: 4
47. ANS: D PTS: 1 DIF: II REF: 2
OBJ: 3
48. ANS: A PTS: 1 DIF: I REF: 3
OBJ: 1
49. ANS: C PTS: 1 DIF: I REF: 1
OBJ: 4
50. ANS: A PTS: 1 DIF: I REF: 3
OBJ: 1
51. ANS: C PTS: 1 DIF: II REF: 2
OBJ: 5

52. ANS: C PTS: 1 DIF: I REF: 1
OBJ: 1
53. ANS: A PTS: 1 DIF: II REF: 2
OBJ: 3
54. ANS: C PTS: 1 DIF: II REF: 1
OBJ: 3
55. ANS: C PTS: 1 DIF: II REF: 2
OBJ: 5
56. ANS: D PTS: 1 DIF: Bloom's Level 3
NAT: UCP.2 | B.1 STA: SC-HS-4.6.3 | SC-HS-1.1.2
57. ANS: D PTS: 1 DIF: I REF: 2
OBJ: 2
58. ANS: A PTS: 1 DIF: II REF: 1
OBJ: 2
59. ANS: A PTS: 1 DIF: III REF: 3
OBJ: 3
60. ANS: B PTS: 1 DIF: I REF: 1
OBJ: 4
61. ANS: A PTS: 1 DIF: I REF: 3
OBJ: 3
62. ANS: C PTS: 1 DIF: III REF: 1
OBJ: 4
63. ANS: A PTS: 1 DIF: II REF: 2
OBJ: 5
64. ANS: A PTS: 1 DIF: I REF: 3
OBJ: 3
65. ANS: B PTS: 1 DIF: II REF: 3
OBJ: 3
66. ANS: B PTS: 1 DIF: I REF: 2
OBJ: 2
67. ANS: C PTS: 1 DIF: I REF: 1
OBJ: 1
68. ANS: D PTS: 1 DIF: I REF: 2
OBJ: 2
69. ANS: A PTS: 1 DIF: I REF: 1
OBJ: 3
70. ANS: B PTS: 1 DIF: II REF: 1
OBJ: 4
71. ANS: B PTS: 1 DIF: II REF: 1
OBJ: 4
72. ANS: D PTS: 1 DIF: Bloom's Level 4
NAT: UCP.2 | B.1 STA: SC-HS-4.6.3 | SC-HS-1.1.2
73. ANS: A PTS: 1 DIF: I REF: 1
OBJ: 2
74. ANS: C PTS: 1 DIF: Bloom's Level 1
NAT: UCP.2 | B.1 STA: SC-HS-4.6.3 | SC-HS-1.1.2