Test 1
General Chemistry CH115
UMass Boston
Fall 2007

Name_____

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

1) Electromagnetic radiation travels through vacuum at a speed of _____ m/s. 1) _____

A) 3.00×10^{8}

B) 10,000

C) 125

D) 186,000

E) It depends on wavelength.

2) The wavelength of light that has a frequency of $1.20 \times 10^{13} s^{-1}$ is _____ m. 2) _____

A) 12.0

B) 2.50×10^{-5}

C) 25.0

D) 2.5

E) 0.0400

3) Ham radio operators often broadcast on the 6-meter band. The frequency of this electromagnetic radiation is _____ MHz. 3) _____

A) 200 B) 20 C) 50 D) 500 E) 2.0

4) What is the frequency (s^{-1}) of electromagnetic radiation that has a wavelength of 0.53 m _____? 4) _____

A) 1.6×10^{8}

B) 1.3×10^{-33}

C) 1.8×10^{-9}

D) 1.3×10^{33}

E) 5.7×10^{8}

5) The energy of a photon of light is _____ proportional to its frequency and _____ proportional to its wavelength. 5) _____

A) directly, inversely

B) directly, directly

C) inversely, directly

D) indirectly, not

E) inversely, inversely

6) Of the following, _____ radiation has the shortest wavelength. 6) _____

A) ultraviolet

B) microwave

C) radio

D) X-ray

E) infrared

7) What is the frequency of light (s^{-1}) that has a wavelength of 1.23×10^{-6} cm _____? 7) _____

A) 2.44×10^{16}

B) 1.04×10^{-13}

C) 9.62×10^{12}

D) 3.69

E) 4.10×10^{-17}

8) What is the frequency of light (s^{-1}) that has a wavelength of 3.12×10^{-3} cm _____? 8) _____

A) 1.04×10^{-13}

B) 3.69

C) 2.44×10^{16}

D) 4.10×10^{-17}

E) 9.62×10^{12}

9) What is the wavelength of light (nm) that has a frequency of 3.22×10^{14} s^{-1} _____? 9) _____

A) 9.32×10^{-7}

B) 649

C) 1.07×10^{6}

D) 932

E) 9.66×10^{22}

10) What is the wavelength of light (nm) that has a frequency 4.62×10^{14} s^{-1} _____? 10) _____

A) 649

B) 1.07×10^{6}

C) 1.39×10^{23}

D) 1.54×10^{-3}

E) 932

11) The wavelength of a photon that has an energy of 5.25×10^{-19} J is _____ m. 11) _____

A) 2.64×10^{6}

B) 2.38×10^{23}

C) 3.79×10^{-7}

D) 3.79×10^{7}

E) 4.21×10^{-24}

12) The energy of a photon that has a wavelength of 9.0 m is _____ J. 12) _____

A) 4.5×10^{25}

B) 4.5×10^{-25}

C) 6.0×10^{-23}

D) 2.2×10^{-26}

E) 2.7×10^{9}

13) The frequency of a photon that has an energy of 3.7×10^{-18} J is _____ s^{-1}. 13) _____

A) 5.6×10^{15}

B) 1.8×10^{-16}

C) 2.5×10^{15}

D) 5.4×10^{-8}

E) 2.5×10^{-15}

14) The energy of a photon that has a wavelength of 12.3 nm is _____ J. 14) _____

A) 1.99×10^{-25}

B) 2.72×10^{-50}

C) 4.42×10^{-23}

D) 1.62×10^{-17}

E) 1.51×10^{-17}

15) The energy of a photon that has a wavelength of 13.2 nm is _____ J. 15) _____

A) 1.51×10^{-17}

B) 1.62×10^{-17}

C) 9.55×10^{-25}

D) 1.99×10^{-25}

E) 4.42×10^{-23}

16) The energy of a photon that has a frequency of $8.21 \times 10^{15}\ s^{-1}$ is _____ J. 16) _____

A) 1.99×10^{-25}

B) 8.08×10^{-50}

C) 5.44×10^{-18}

D) 1.26×10^{-19}

E) 1.24×10^{49}

17) The energy of a photon that has a frequency of $18.21 \times 10^{15}\ s^{-1}$ is _____ J. 17) _____

A) 1.99×10^{-25}

B) 5.44×10^{-18}

C) 3.49×10^{-48}

D) 5.44×10^{-18}

E) 1.21×10^{-17}

18) What is the frequency (s^{-1}) of a photon that has an energy of 4.38×10^{-18}J? 18) _____

A) 1.45×10^{-16}

B) 436

C) 1.31×10^{-9}

D) 6.61×10^{15}

E) 2.30×10^{7}

19) What is the wavelength (angstroms) of a photon that has an energy of 4.38×10^{-18}J _____ ? 19) _____

A) 2.30×10^{7}

B) 6.89×10^{15}

C) 1.31×10^{-9}

D) 454

E) 1.45×10^{-16}

20) A mole of red photons of wavelength 725 nm has _____ kJ of energy. 20) _____

A) 4.56×10^{-46}

B) 6.05×10^{-3}

C) 165

D) 2.74×10^{-19}

E) 227

21) A mole of yellow photons of wavelength 527 nm has _____ kJ of energy. 21) _____

A) 4.56×10^{-46}

B) 2.74×10^{-19}

C) 6.05×10^{-3}

D) 227

E) 165

22) It takes 254 kJ/mol to eject electrons from a certain metal surface. What is the longest wavelength of light (nm) that can be used to eject electrons from the surface of this metal via the photoelectric effect _____ ? 22) _____

A) 233 B) 165 C) 552 D) 725 E) 472

23) Of the following, _____ radiation has the longest wavelength and _____ radiation has the greatest energy. 23) _____

gamma ultraviolet visible

A) gamma, visible

B) ultraviolet, gamma

C) gamma, gamma

D) visible, gamma

E) visible, ultraviolet

24) What color of visible light has the longest wavelength _____ ? 24) _____

A) green B) red C) yellow D) violet E) blue

25) Of the following, _____ radiation has the shortest wavelength and _____ radiation has the greatest energy. 25) _____

gamma ultraviolet visible

A) gamma, visible

B) ultraviolet, gamma

C) visible, gamma

D) gamma, gamma

E) visible, ultraviolet

26) What color of visible light has the highest energy? 26) _____

A) yellow B) violet C) blue D) red E) green

27) Which one of the following is considered to be ionizing radiation _____? 27) _____

A) microwaves

B) X-rays

C) radio waves

D) infrared radiation

E) visible light

28) Of the following transitions in the Bohr hydrogen atom, the _____ transition results in the emission of the highest-energy photon. 28) _____

A) $n = 6 \rightarrow n = 3$

B) $n = 6 \rightarrow n = 1$

C) $n = 1 \rightarrow n = 4$

D) $n = 3 \rightarrow n = 6$

E) $n = 1 \rightarrow n = 6$

29) Using Bohr's equation for the energy levels of the electron in the hydrogen atom, determine the energy (J) of an electron in the n = 4 level. _____ . 29) _____

A) $+1.84 \times 10^{-29}$

B) -5.45×10^{-19}

C) -1.84×10^{-29}

D) -1.36×10^{-19}

E) -7.34×10^{18}

30) An electron in a Bohr hydrogen atom has an energy of -1.362×10^{-19} J. The value of n for this electron is _____. 30) _____

A) 1 B) 2 C) 3 D) 4 E) 5

31) The energy (J) required for an electronic transition in a Bohr hydrogen atom from n = 2 to n = 3 is _____ J. 31) _____

A) 3.0×10^{-19}

B) -3.0×10^{-19}

C) -7.9×10^{-19}

D) 4.0×10^{-19}

E) 4.6×10^{14}

32) Calculate the energy (J) change associated with an electron transition from n = 2 to n = 5 in a Bohr hydrogen atom _____. 32) _____

A) 6.5×10^{-19}

B) 8.7×10^{-20}

C) 5.5×10^{-19}

D) 5.8×10^{-53}

E) 4.6×10^{-19}

33) The frequency of electromagnetic radiation required to promote an electron from n = 2 to n = 4 in a Bohr hydrogen atom is _____ Hz. 33) _____

A) 4.1×10^{19}

B) 4.1×10^{-19}

C) 5.4×10^{-19}

D) 8.2×10^{14}

E) 6.2×10^{14}

34) A spectrum containing only specific wavelengths is called a _____ spectrum. 34) _____

A) line

B) continuous

C) visible

D) invariant

E) Rydberg

35) When the electron in a hydrogen atom moves from n = 6 to n = 2, light with a wavelength of _____ nm is emitted. 35) _____

A) 434 B) 487 C) 657 D) 411 E) 93.8

36) When the electron in a hydrogen atom moves from n = 6 to n = 1, light with a wavelength of _____ nm is emitted. 36) _____

A) 93.8 B) 657 C) 411 D) 434 E) 487

37) When the electron in a hydrogen atom moves from n = 8 to n = 2 light with a wavelength of _____ nm is emitted. 37) _____

A) 389 B) 93.8 C) 487 D) 411 E) 657

38) The n = 2 to n = 6 transition in the Bohr hydrogen atom corresponds to the _____ of a photon with a wavelength of _____ nm. 38) _____

A) absorption, 411

B) emission, 389

C) emission, 411

D) emission, 93.8

E) absorption, 657

39) The n = 5 to n = 3 transition in the Bohr hydrogen atom corresponds to the _____ of a photon with a wavelength of _____ nm. 39) _____

A) emission, 389

B) absorption, 657

C) absorption, 1280

D) emission, 657

E) emission, 1280

40) The n = 8 to n = 4 transition in the Bohr hydrogen atom occurs in the _____ region of the electromagnetic spectrum. 40) _____

A) visible

B) ultraviolet

C) infrared

D) X-ray

E) microwave

41) The n = 8 to n = 2 transition in the Bohr hydrogen atom occurs in the _____ region of the electromagnetic spectrum. 41) _____

A) microwave

B) radio

C) ultraviolet

D) X-ray

E) infrared

42) The deBroglie wavelength of a particle is given by _____. 42) _____

A) hmv B) h/mv C) $h + mv$ D) mv/c E) mv

43) What is the de Broglie wavelength (m) of a 2.0 kg object moving at a speed of 50 m/s _____? 43) _____

A) 3.8×10^{34}

B) 1.5×10^{35}

C) 6.6×10^{-36}

D) 2.6×10^{-35}

E) 5.3×10^{-33}

44) What is the de Broglie wavelength (m) of a 25 g object moving at a speed of 5.0 m/s? 44) _____

A) 3.02×10^{45}

B) 5.3×10^{-33}

C) 1.9×10^{32}

D) 6.6×10^{-36}

E) 3.32×10^{-36}

45) At what speed (m/s) must a 10 mg object be moving to have a de Broglie wavelength of 3.3×10^{-41} m _____? 45) _____

A) 3.3×10^{-42}

B) 1.9×10^{-11}

C) 4.1

D) 2.0×10^{12}

E) 1.9×10^{13}

46) At what speed (m/s) must a 3.0 mg object be moving in order to have a de Broglie wavelength of 5.4×10^{-29} m? 46) _____

A) 4.1

B) 3.9×10^{-4}

C) 1.6×10^{-28}

D) 6.3

E) 2.0×10^{12}

47) The de Broglie wavelength of an electron is 8.7×10^{-11} m. The mass of an electron is 9.1×10^{-31} kg. The velocity of this electron is _____ m/s. 47) _____

A) 8.4×10^{3} B) 1.2×10^{-7} C) 8.4×10^{6} D) 8.4×10^{-3} E) 6.9×10^{-5}

48) The de Broglie wavelength of a bullet (7.5g) traveling at 700 m/s is _____ m. 48) _____

A) 6.2×10^{-29}

B) 1.3×10^{-23}

C) 7.7×10^{33}

D) 1.3×10^{-34}

E) 1.3×10^{-27}

49) The de Broglie wavelength of a car (1.0×10^{3} kg) traveling at 75 km/hr is _____ m. 49) _____

A) 1.4×10^{-35}

B) 8.8×10^{-39}

C) 3.2×10^{-38}

D) 3.2×10^{-35}

E) 1.4×10^{35}

50) The wavelength of an electron whose velocity is 1.7×10^{4} m/s and whose mass is 9.1×10^{-28} g is _____ m. 50) _____

A) 12

B) 2.3×10^{7}

C) 4.3×10^{-8}

D) 2.3×10^{-7}

E) 4.3×10^{-11}

51) The _____ quantum number defines the shape of an orbital. 51) _____

A) principal B) magnetic C) psi D) spin E) azimuthal

52) There are _____ orbitals in the third shell. 52) _____

A) 16 B) 25 C) 9 D) 1 E) 4

53) The _____ subshell contains only one orbital. 53) _____

A) 5d B) 4s C) 1p D) 3d E) 6f

54) There are _____ orbitals in the second shell. 54) _____

A) 1 B) 2 C) 4 D) 8 E) 9

55) The azimuthal quantum number is 3 in _____ orbitals. 55) _____

A) d B) s C) a D) p E) f

56) The n = 1 shell contains _____ p orbitals. All the other shells contain _____ p orbitals. 56) _____

A) 3, 6 B) 3, 3 C) 0, 6 D) 0, 3 E) 6, 2

57) The lowest energy shell that contains f orbitals is the shell with n = _____. 57) _____

A) 3 B) 2 C) 4 D) 5 E) 1

58) The principal quantum number of the first d subshell is _____. 58) _____

A) 1 B) 2 C) 3 D) 4 E) 0

59) The total number of orbitals in a shell is given by _____. 59) _____

A) 2n B) 2l + 1 C) n^2 D) l^2 E) 2n + 1

60) In a hydrogen atom, an electron in a _____ orbital can absorb a photon, but cannot emit a photon. 60) _____

A) 2s B) 1s C) 3f D) 3p E) 3s

61) _____-orbitals are spherically symmetrical. 61) _____

A) s B) p C) g D) d E) f

62) How many p-orbitals are occupied in a Ne atom _____? 62) _____

A) 0 B) 6 C) 3 D) 1 E) 2

63) How many p-orbitals are occupied in a Ne atom _____ ? 63) _____

A) 5 B) 3 C) 1 D) 6 E) 2

64) Each p-subshell can accommodate a maximum of _____ electrons. 64) _____

A) 6 B) 10 C) 3 D) 2 E) 5

65) An electron in a(n) _____ subshell experiences the greatest effective nuclear charge in a many-electron atom. 65) _____

A) 3f B) 3s C) 4s D) 3p E) 3d

66) A tin atom has 50 electrons. Electrons in the _____ subshell experience the lowest effective nuclear charge. 66) _____

A) 3p B) 5s C) 5p D) 1s E) 3d

67) A _____ orbital is degenerate with a $5d_z^2$ in a many-electron atom. 67) _____

A) $5p_z$ B) $5d_{xy}$ C) $4d_{zz}$ D) 5s E) $4d_z^2$

68) How many quantum numbers are necessary to designate a particular electron in an atom _____? 68) _____

A) 1 B) 5 C) 4 D) 2 E) 3

69) In which orbital does an electron in a phosphorus atom experience the greatest shielding _____? 69) _____

A) 3p B) 2s C) 2p D) 3s E) 1s

70) The 3p subshell in the ground state of atomic xenon contains _____ electrons. 70) _____

A) 2 B) 6 C) 8 D) 10 E) 36

71) The second shell in the ground state of atomic argon contains _____ electrons. 71) _____

A) 2 B) 6 C) 8 D) 18 E) 36

72) The 4d subshell in the ground state of atomic xenon contains _____ electrons. 72) _____

A) 2 B) 6 C) 8 D) 10 E) 36

73) $[Ar]4s^2 3d^{10} 4p^3$ is the electron configuration of a(n) _____ atom. 73) _____

A) V B) Sb C) Sn D) P E) As

74) The electron configuration of a ground-state Ag atom is _____. 74) _____

A) $[Kr]5s^2 4d^{10}$

B) $[Ar]4s^2 4d^9$

C) $[Kr]5s^1 4d^{10}$

D) $[Ar]4s^1 4d^{10}$

E) $[Kr]5s^2 3d^9$

75) The ground state electron configuration for Zn is _____. 75) _____

A) $[Ar]4s^2 3d^{10}$

B) $[Kr]3s^2 3d^{10}$

C) $[Kr]4s^2 3d^{10}$

D) $[Ar]3s^2 3d^{10}$

E) $[Ar]4s^1 3d^{10}$

76) The principal quantum number for the outermost electrons in a Br atom in the ground state is _____. 76) _____

A) 2 B) 4 C) 5 D) 3 E) 1

77) The azimuthal quantum number for the outermost electrons in a nitrogen atom in the ground state is _____. 77) _____

A) 0 B) 1 C) 2 D) 3 E) -1

78) Which is the correct ground-state electron configuration for silver _____ ? 78) _____

A) $[Kr]5s^1 4d^{10}$

B) $[Kr]5s^2 4d^{10}$

C) $[Xe]5s^1 4d^{10}$

D) $[Xe]5s^2 4d^9$

E) $[Kr]5s^2 4d^9$

79) What is the correct ground-state electron configuration for molybdenum _____? 79) _____

A) $[Kr]5s^1 4d^{10}$

B) $[Kr]5s^2 4d^9$

C) $[Kr]5s^1 4d^5$

D) $[Kr]5s^2 4d^5$

E) $[Kr]5s^2 4d^4$

80) All of the _____ have a valence shell electron configuration ns^1. 80) _____

A) halogens

B) noble gases

C) alkaline earth metals

D) chalcogens

E) alkali metals

81) The elements in the _____ period of the periodic table have a core-electron configuration that is the same as the electron configuration of neon. 81) _____

A) first B) second C) third D) fourth E) fifth

82) The largest principal quantum number in the ground state electron configuration of iodine is _____. 82) _____

A) 1 B) 4 C) 5 D) 6 E) 7

83) The largest principal quantum number in the ground state electron configuration of barium is _____. 83) _____

A) 1 B) 2 C) 4 D) 5 E) 6

84) The largest principal quantum number in the ground state electron configuration of cobalt is _____. 84) _____

A) 2 B) 3 C) 4 D) 7 E) 9

85) Elements in group _____ have a np^6 electron configuration in the outer shell. 85) _____

A) 7A B) 8A C) 5A D) 6A E) 4A

86) Which group in the periodic table contains elements with the valence electron configuration of $ns^2 np^1$ _____? 86) _____

A) 1A B) 2A C) 3A D) 4A E) 8A

87) There are _____ unpaired electrons in a ground state phosphorus atom. 87) _____

A) 0 B) 1 C) 2 D) 3 E) 4

88) There are _____ unpaired electrons in a ground state fluorine atom. 88) _____

A) 0 B) 1 C) 2 D) 3 E) 4

89) In a ground-state manganese atoms, the _____ subshell is partially filled. 89) _____

A) 4p B) 3s C) 4d D) 3d E) 4s

Answer Key
Testname: SAMPLE QUESTIONS CHAPTER 6

1) A
2) B
3) C
4) E
5) A
6) D
7) A
8) E
9) D
10) A
11) C
12) D
13) A
14) D
15) A
16) C
17) E
18) D
19) D
20) C
21) D
22) E
23) D
24) B
25) D
26) B
27) B
28) B
29) D
30) D
31) A
32) E
33) E
34) A
35) D
36) A
37) A
38) A
39) E
40) C
41) C
42) B
43) C
44) B
45) D
46) A
47) C
48) D
49) C
50) C

51) E
52) C
53) B
54) C
55) E
56) D
57) C
58) C
59) C
60) B
61) A
62) C
63) E
64) A
65) B
66) C
67) B
68) C
69) A
70) B
71) C
72) D
73) E
74) C
75) A
76) B
77) B
78) A
79) C
80) E
81) C
82) C
83) E
84) C
85) B
86) C
87) D
88) B
89) D