

Name _____

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

- 1) Which one of the following represents an impossible set of quantum numbers for an electron in an atom? (arranged as n , l , m_l , and m_s) 1) _____
- A) 3, 3, 3, 1/2
 B) 1, 0, 0, 1/2
 C) 5, 4, -3, 1/2
 D) 2, 1, -1, -1/2
 E) 5, 4, -3, -1/2
- 2) Which one of the following is an incorrect subshell notation? 2) _____
- A) 2d B) 3d C) 4f D) 3s E) 2p
- 3) Which set of three quantum numbers (n , l , m_l) corresponds to a 3d orbital? 3) _____
- A) 3, 2, 3 B) 3, 2, 2 C) 2, 3, 3 D) 3, 3, 2 E) 2, 1, 0
- 4) The condensed electron configuration of krypton, element 36, is _____. 4) _____
- A) $[\text{Kr}]4s^23d^8$
 B) $[\text{Ar}]4s^43d^4$
 C) $[\text{Kr}]4s^43d^8$
 D) $[\text{Ar}]4s^4$
 E) $[\text{Ar}]3d^{10}4s^24p^6$
- 5) Which one of the following configurations depicts an excited oxygen atom? 5) _____
- A) $1s^22s^22p^23s^2$
 B) $1s^22s^22p^1$
 C) $1s^22s^22p^2$
 D) $[\text{He}]2s^22p^4$
 E) $1s^22s^22p^4$
- 6) In a p_x orbital, the subscript x denotes the _____ of the electron. 6) _____
- A) size of the orbital
 B) energy
 C) probability of the shell
 D) spin of the electrons
 E) axis along which the orbital is aligned

- 7) The complete electron configuration of argon, element 18, is _____.
- 7) _____
- A) $1s^6 2s^6 2p^2 3s^4$
 B) $1s^2 2s^2 2p^6 3s^2 3p^6$
 C) $1s^4 2s^4 2p^6 3s^4$
 D) $1s^2 2s^2 2p^{10} 3s^2 3p^2$
 E) $1s^4 2s^4 2p^{10}$
- 8) Which one of the following represents an acceptable possible set of quantum numbers (in the order n, l, m_l , m_s) for an electron in an atom? 8) _____
- A) 2, 1, 0, 0
 B) 2, 2, 0, 1/2
 C) 2, 0, 1, -1/2
 D) 2, 0, 2, +1/2
 E) 2, 1, -1, 1/2
- 9) The ground-state electron configuration of _____ is $[Ar]4s^1 3d^5$. 9) _____
- A) V B) K C) Mn D) Cr E) Fe
- 10) Which one of the quantum numbers does not result from the solution of the Schroedinger equation? 10) _____
- A) magnetic
 B) spin
 C) angular momentum
 D) azimuthal
 E) principal
- 11) The condensed electron configuration of silicon, element 14, is _____.
- 11) _____
- A) $[Ne]2p^{10}$
 B) $[He]2s^6 2p^2$
 C) $[He]2s^4$
 D) $[He]2s^4 2p^6$
 E) $[Ne]3s^2 3p^2$

- 12) Which quantum numbers must be the same for the orbitals that they designate to be degenerate in a one-electron system (such as hydrogen)? 12) _____
- A) m_l only
 B) l and m_l
 C) n and l only
 D) n , l , and m_l
 E) n only
- 13) The complete electron configuration of gallium, element 31, is _____. 13) _____
- A) $1s^4 2s^4 2p^6 3s^4 3p^6 4s^4 3d^3$
 B) $1s^2 2s^2 2p^{10} 3s^2 3p^{10} 4s^2 3d^3$
 C) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^1$
 D) $1s^4 2s^4 2p^8 3s^4 3p^8 4s^3$
 E) $1s^4 2s^4 2p^{10} 3s^4 3p^9$
- 14) An electron cannot have the quantum numbers $n =$ _____, $l =$ _____, $m_l =$ _____. 14) _____
- A) 3, 2, 3 B) 1, 0, 0 C) 6, 1, 0 D) 3, 2, 1 E) 3, 2, -2
- 15) The uncertainty principle states that _____. 15) _____
- A) it is impossible to know the exact position and momentum of an electron
 B) it is impossible to know anything with certainty
 C) it is impossible to know how many electrons there are in an atom
 D) there can only be one uncertain digit in a reported number
 E) matter and energy are really the same thing
- 16) Which of the following is a valid set of four quantum numbers? (n , l , m_l , m_s) 16) _____
- A) 2, 1, +2, +1/2
 B) 1, 1, 0, -1/2
 C) 2, 2, 1, -1/2
 D) 1, 0, 1, +1/2
 E) 2, 1, 0, +1/2
- 17) Which one of the following configurations depicts an excited carbon atom? 17) _____
- A) $1s^2 2s^2 2p^3$
 B) $1s^2 2s^2 2p^1$
 C) $1s^2 2s^2 2p^1 3s^1$
 D) $1s^2 2s^2 3s^1$
 E) $1s^2 2s^2 2p^2$

- 18) Which one of the following represents an acceptable set of quantum numbers for an electron in an atom? (arranged as n , l , m_l , and m_s) 18) _____
- A) 3, 3, 3, $-1/2$
 B) 1, 0, 0, $1/2$
 C) 3, 3, 3, $1/2$
 D) 5, 4, -5, $1/2$
 E) 2, 2, -1, $-1/2$
- 19) The ground state electron configuration of Ga is _____. 19) _____
- A) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^1$
 B) $[\text{Ar}] 4s^2 3d^{11}$
 C) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 4d^{10} 4p^1$
 D) $1s^2 2s^2 3s^2 3p^6 3d^{10} 4s^2 4p^1$
 E) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4d^1$
- 20) How many different principal quantum numbers can be found in the ground state electron configuration of nickel? 20) _____
- A) 2 B) 3 C) 4 D) 5 E) 6
- 21) Which one of the following is not a valid value for the magnetic quantum number of an electron in a 5d subshell? 21) _____
- A) 3 B) 0 C) -1 D) 1 E) 2
- 22) The _____ orbital is degenerate with $5p_y$ in a many-electron atom. 22) _____
- A) $4p_y$ B) $5d_{xy}$ C) $5p_x$ D) 5s E) $5d^2$
- 23) According to the Heisenberg Uncertainty Principle, it is impossible to know precisely both the position and the _____ of an electron. 23) _____
- A) color
 B) velocity
 C) mass
 D) momentum
 E) shape
- 24) In which orbital does an electron in a phosphorus atom experience the greatest effective nuclear charge? 24) _____
- A) 1s B) 2s C) 2p D) 3s E) 3p
- 25) Which quantum number determines the energy of an electron in a hydrogen atom? 25) _____
- A) n B) l C) m_l D) E E) n and l

- 26) An electron cannot have the quantum numbers $n = \underline{\hspace{2cm}}$, $l = \underline{\hspace{2cm}}$, $m_l = \underline{\hspace{2cm}}$. 26)
 A) 2, 0, 0 B) 1, 1, 1 C) 2, 1, -1 D) 3, 2, 1 E) 3, 1, -1
- 27) Which of the following is not a valid set of four quantum numbers? (n, l, m_l, m_s) 27)
 A) 1, 1, 0, +1/2
 B) 2, 1, 0, -1/2
 C) 1, 0, 0, +1/2
 D) 2, 0, 0, +1/2
 E) 3, 1, -1, -1/2
- 28) All of the orbitals in a given subshell have the same value of the quantum number. 28)
 A) azimuthal B) principal C) magnetic D) A and B E) B and C
- 29) The ground-state electron configuration of the element is $[\text{Kr}]5s^14d^5$. 29)
 A) Nb B) Tc C) Cr D) Mn E) Mo
- 30) The ground state electron configuration of Fe is . 30)
 A) $1s^22s^22p^63s^23p^63d^64s^2$
 B) $1s^22s^22p^63s^23p^64s^2$
 C) $1s^22s^22p^63s^23p^64s^24d^6$
 D) $1s^22s^23s^23p^63d^6$
 E) $1s^22s^23s^23p^{10}$
- 31) Which one of the following is an incorrect orbital notation? 31)
 A) 4s B) 3f C) 3p_y D) 4d_{xy} E) 2s
- 32) All of the orbitals in a given electron shell have the same value of the quantum number. 32)
 A) spin B) psi C) principal D) magnetic E) azimuthal
- 33) The element that corresponds to the electron configuration $1s^22s^22p^6$ is . 33)
 A) lithium
 B) beryllium
 C) neon
 D) magnesium
 E) sodium

- 34) The wavelength of an electron with a velocity of 6.00×10^6 m/s is _____ m. The mass of the electron is 9.11×10^{-28} g. 34) _____
- A) 8.25×10^9
 - B) 1.21×10^{-10}
 - C) 1.21×10^{-13}
 - D) 8.25×10^{12}
 - E) 1.21×10^{-16}
- 35) Which quantum numbers must be the same for the orbitals that they designate to be degenerate in a many-electron system? 35) _____
- A) n , l , and m_l
 - B) n and l only
 - C) m_s only
 - D) n only
 - E) n , l , m_l , and m_s
- 36) Which of the subshells below do not exist due to the constraints upon the azimuthal quantum number? 36) _____
- A) 4d
 - B) 4s
 - C) 4f
 - D) 4p
 - E) none of the above
- 37) Which of the following elements has a ground-state electron configuration different from the predicted one? 37) _____
- A) Cl B) Cu C) Ti D) Ca E) Xe
- 38) All of the _____ have a valence shell electron configuration ns^1 . 38) _____
- A) chalcogens
 - B) noble gases
 - C) alkaline earth metals
 - D) halogens
 - E) alkali metals

- 39) What is the correct ground-state electron configuration for molybdenum _____? 39) _____
- A) $[\text{Kr}]5s^24d^5$
 B) $[\text{Kr}]5s^14d^{10}$
 C) $[\text{Kr}]5s^24d^9$
 D) $[\text{Kr}]5s^24d^4$
 E) $[\text{Kr}]5s^14d^5$
- 40) Which group in the periodic table contains elements with the valence electron configuration of $ns^2 np^1$ _____? 40) _____
- A) 1A B) 2A C) 3A D) 4A E) 8A
- 41) How many p-orbitals are occupied in a Ne atom _____? 41) _____
- A) 3 B) 6 C) 2 D) 5 E) 1
- 42) The ground state electron configuration for Zn is _____. 42) _____
- A) $[\text{Ar}]4s^13d^{10}$
 B) $[\text{Kr}]3s^23d^{10}$
 C) $[\text{Ar}]4s^23d^{10}$
 D) $[\text{Kr}]4s^23d^{10}$
 E) $[\text{Ar}]3s^23d^{10}$
- 43) In a ground-state manganese atoms, the _____ subshell is partially filled. 43) _____
- A) 4s B) 3d C) 4d D) 3s E) 4p
- 44) $[\text{Ar}]4s^23d^{10}4p^3$ is the electron configuration of a(n) _____ atom. 44) _____
- A) V B) As C) P D) Sb E) Sn
- 45) The electron configuration of a ground-state Ag atom is _____. 45) _____
- A) $[\text{Kr}]5s^24d^{10}$
 B) $[\text{Ar}]4s^24d^9$
 C) $[\text{Kr}]5s^23d^9$
 D) $[\text{Ar}]4s^14d^{10}$
 E) $[\text{Kr}]5s^14d^{10}$
- 46) There are _____ unpaired electrons in a ground state fluorine atom. 46) _____
- A) 0 B) 1 C) 2 D) 3 E) 4
- 47) The largest principal quantum number in the ground state electron configuration of cobalt is _____ 47) _____
- A) 2 B) 3 C) 4 D) 7 E) 9

- 48) The _____ quantum number defines the shape of an orbital. 48) _____
 A) azimuthal B) magnetic C) spin D) principal E) psi
- 49) The largest principal quantum number in the ground state electron configuration of iodine is _____ 49) _____
 A) 1 B) 4 C) 5 D) 6 E) 7
- 50) Elements in group _____ have a np^6 electron configuration in the outer shell. 50) _____
 A) 5A B) 6A C) 4A D) 8A E) 7A
- 51) 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? 51) _____
 A) 3.9×10^{-4}
 B) 6.3
 C) 2.0×10^{12}
 D) 4.1
 E) 1.6×10^{-28}
- 52) There are _____ unpaired electrons in a ground state phosphorus atom. 52) _____
 A) 0 B) 1 C) 2 D) 3 E) 4
- 53) The deBroglie wavelength of a particle is given by _____. 53) _____
 A) $h + mv$ B) hmv C) mv D) h/mv E) mv/c
- 54) In which orbital does an electron in a phosphorus atom experience the greatest shielding _____? 54) _____
 A) 3p B) 1s C) 2s D) 3s E) 2p
- 55) Each p-subshell can accommodate a maximum of _____ electrons. 55) _____
 A) 2 B) 3 C) 10 D) 6 E) 5
- 56) 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. 56) _____
 A) 6.9×10^{-5} B) 8.4×10^6 C) 1.2×10^{-7} D) 8.4×10^{-3} E) 8.4×10^3
- 57) The 3p subshell in the ground state of atomic xenon contains _____ electrons. 57) _____
 A) 2 B) 6 C) 8 D) 10 E) 36
- 58) There are _____ orbitals in the second shell. 58) _____
 A) 1 B) 2 C) 4 D) 8 E) 9

- 59) The principal quantum number for the outermost electrons in a Br atom in the ground state is _____ 59) _____
 A) 3 B) 1 C) 4 D) 2 E) 5
- 60) Which is the correct ground-state electron configuration for silver _____ ? 60) _____
 A) $[\text{Kr}]5s^24d^9$
 B) $[\text{Kr}]5s^14d^{10}$
 C) $[\text{Xe}]5s^14d^{10}$
 D) $[\text{Xe}]5s^24d^9$
 E) $[\text{Kr}]5s^24d^{10}$
- 61) The total number of orbitals in a shell is given by _____. 61) _____
 A) n^2 B) l^2 C) $2n$ D) $2l + 1$ E) $2n + 1$
- 62) How many p-orbitals are occupied in a Ne atom _____? 62) _____
 A) 1 B) 6 C) 2 D) 0 E) 3
- 63) A tin atom has 50 electrons. Electrons in the _____ subshell experience the lowest effective nuclear charge. 63) _____
 A) 3p B) 3d C) 5s D) 1s E) 5p
- 64) The 4d subshell in the ground state of atomic xenon contains _____ electrons. 64) _____
 A) 2 B) 6 C) 8 D) 10 E) 36
- 65) What color of visible light has the highest energy? 65) _____
 A) yellow B) blue C) green D) violet E) red
- 66) The _____ subshell contains only one orbital. 66) _____
 A) 5d B) 4s C) 6f D) 1p E) 3d
- 67) How many quantum numbers are necessary to designate a particular electron in an atom _____? 67) _____
 A) 5 B) 3 C) 2 D) 1 E) 4
- 68) A _____ orbital is degenerate with a $5d_z^2$ in a many-electron atom. 68) _____
 A) $5d_{xy}$ B) $4d_{zz}$ C) $4d_z^2$ D) 5s E) $5p_z$
- 69) The largest principal quantum number in the ground state electron configuration of barium is _____ 69) _____
 A) 1 B) 2 C) 4 D) 5 E) 6

70) The $n = 1$ shell contains _____ p orbitals. All the other shells contain _____ p orbitals. 70) _____
A) 0, 3 B) 0, 6 C) 3, 6 D) 3, 3 E) 6, 2

71) There are _____ orbitals in the third shell. 71) _____
A) 1 B) 25 C) 4 D) 9 E) 16

72) What is the de Broglie wavelength (m) of a 25 g object moving at a speed of 5.0 m/s? 72) _____
A) 5.3×10^{-33}
B) 6.6×10^{-36}
C) 1.9×10^{32}
D) 3.02×10^{45}
E) 3.32×10^{-36}

73) The principal quantum number of the first d subshell is _____. 73) _____
A) 1 B) 2 C) 3 D) 4 E) 0

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

74) Black body radiation is the emission of light from metal surfaces. 74) _____

75) The square of Schrodinger's wave equation is called an orbital. 75) _____

76) The wavelength of radio waves can be longer than a football field. 76) _____

77) The electron density of the 2s orbital is asymmetric. 77) _____

78) If a hydrogen atom electron jumps from the $n=6$ orbit to the $n=2$ orbit, energy is released. 78) _____

Answer Key

Testname: CHAPTER 7 PRACTICE

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

Answer Key

Testname: CHAPTER 7 PRACTICE

- 51) D
- 52) D
- 53) D
- 54) A
- 55) D
- 56) B
- 57) B
- 58) C
- 59) C
- 60) B
- 61) A
- 62) E
- 63) E
- 64) D
- 65) D
- 66) B
- 67) E
- 68) A
- 69) E
- 70) A
- 71) D
- 72) A
- 73) C
- 74) FALSE
- 75) TRUE
- 76) TRUE
- 77) FALSE
- 78) TRUE