

Name _____

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

- 1) The wavelength of light that has a frequency of $1.20 \times 10^{13} \text{s}^{-1}$ is _____ m. 1) _____
- A) 12.0
B) 0.0400
C) 2.50×10^{-5}
D) 25.0
E) 2.5
- 2) The energy of a photon of light is _____ proportional to its frequency and _____ proportional to its wavelength. 2) _____
- A) directly, inversely
B) directly, directly
C) indirectly, not
D) inversely, inversely
E) inversely, directly
- 3) What is the frequency of light (s^{-1}) that has a wavelength of $3.12 \times 10^{-3} \text{ cm}$ _____? 3) _____
- A) 2.44×10^{16}
B) 1.04×10^{-13}
C) 4.10×10^{-17}
D) 9.62×10^{12}
E) 3.69
- 4) The energy of a photon that has a frequency of $18.21 \times 10^{15} \text{s}^{-1}$ is _____ J. 4) _____
- A) 1.99×10^{-25}
B) 3.49×10^{-48}
C) 5.44×10^{-18}
D) 1.21×10^{-17}
E) 5.44×10^{-18}

- 5) Of the following transitions in the Bohr hydrogen atom, the _____ transition results in the emission of the highest-energy photon. 5) _____
- A) $n = 3 \rightarrow n = 6$
B) $n = 1 \rightarrow n = 6$
C) $n = 6 \rightarrow n = 1$
D) $n = 6 \rightarrow n = 3$
E) $n = 1 \rightarrow n = 4$
- 6) There are _____ orbitals in the second shell. 6) _____
- A) 1 B) 2 C) 4 D) 8 E) 9
- 7) Each p-subshell can accommodate a maximum of _____ electrons. 7) _____
- A) 5 B) 2 C) 10 D) 3 E) 6
- 8) An electron in a(n) _____ subshell experiences the greatest effective nuclear charge in a many-electron atom. 8) _____
- A) 4s B) 3d C) 3s D) 3p E) 3f
- 9) The electron configuration of a ground-state Ag atom is _____. 9) _____
- A) $[\text{Kr}]5s^23d^9$
B) $[\text{Kr}]5s^24d^{10}$
C) $[\text{Kr}]5s^14d^{10}$
D) $[\text{Ar}]4s^24d^9$
E) $[\text{Ar}]4s^14d^{10}$
- 10) Which of the subshells below do not exist due to the constraints upon the azimuthal quantum number? 10) _____
- A) 2p
B) 2s
C) 2d
D) all of the above
E) none of the above

- 11) 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? 11) _____
- A) 2, 0, 1, -1/2
 - B) 2, 2, 0, 1/2
 - C) 2, 0, 2, +1/2
 - D) 2, 1, -1, 1/2
 - E) 2, 1, 0, 0
- 12) Which of the following is not a valid set of four quantum numbers? (n, l, m_l, m_s) 12) _____
- A) 2, 1, 0, -1/2
 - B) 3, 1, -1, -1/2
 - C) 1, 1, 0, +1/2
 - D) 1, 0, 0, +1/2
 - E) 2, 0, 0, +1/2
- 13) The first ionization energies of the elements _____ as you go from left to right across a period of the periodic table, and _____ as you go from the bottom to the top of a group in the table. 13) _____
- A) increase, increase
 - B) increase, decrease
 - C) decrease, increase
 - D) decrease, decrease
 - E) are completely unpredictable
- 14) Element M reacts with chlorine to form a compound with the formula MCl_2 . Element M is more reactive than magnesium and has a smaller radius than barium. This element is _____. 14) _____
- A) Na B) Ra C) K D) Sr E) Be
- 15) Atomic radius generally increases as we move _____. 15) _____
- A) up a group and from left to right across a period
 - B) down a group; the period position has no effect
 - C) down a group and from right to left across a period
 - D) down a group and from left to right across a period
 - E) up a group and from right to left across a period

- 16) Screening by the valence electrons in atoms is _____. 16) _____
- A) more efficient than that by core electrons
 - B) essentially identical to that by core electrons
 - C) responsible for a general increase in atomic radius going across a period
 - D) less efficient than that by core electrons
 - E) both more efficient than that by core electrons and responsible for a general increase in atomic radius going across a period
- 17) Which one of the following atoms has the largest radius? 17) _____
- A) O B) Cl C) S D) F E) Ne
- 18) In which of the following atoms is the 2s orbital closest to the nucleus? 18) _____
- A) Cl
 - B) Si
 - C) P
 - D) S
 - E) The 2s orbitals are the same distance from the nucleus in all of these atoms.
- 19) Of the following elements, which has the largest first ionization energy? 19) _____
- A) K B) Sr C) Ba D) Rb E) Ca
- 20) Which of the following has the largest second ionization energy? 20) _____
- A) Na B) Si C) P D) Mg E) Al
- 21) Which one of the following compounds would produce an acidic solution when dissolved in water? 21) _____
- A) CO₂ B) SrO C) CaO D) Na₂O E) MgO
- 22) When two elements combine to form a compound, the greater the difference in metallic character between the two elements, the greater the likelihood that the compound will be _____. 22) _____
- A) a gas at room temperature
 - B) a liquid at room temperature
 - C) nonmetallic
 - D) a solid at room temperature
 - E) metallic

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

- 23) Write the balanced equation for the reaction of elemental chlorine with liquid water. 23) _____

24) As successive electrons are removed from an element , the ionization energy _____. 24) _____

25) Write the balanced reaction between zinc oxide and sulfuric acid. 25) _____