

Name _____

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

- 1) A _____ orbital is degenerate with a $5d_{z^2}$ in a many-electron atom. 1) _____
A) $4d_{z^2}$ B) $5p_z$ C) $5s$ D) $4d_{zz}$ E) $5d_{xy}$
- 2) The _____ orbital is degenerate with $5p_y$ in a many-electron atom. 2) _____
A) $5p_x$ B) $5s$ C) $4p_y$ D) $5d^2$ E) $5d_{xy}$
- 3) The lowest orbital energy is reached when the number of electrons with the same spin is maximized. This statement describes _____. 3) _____
A) deBroglie hypothesis
B) Pauli Exclusion Principle
C) Hund's rule
D) Planck's constant
E) Heisenberg Uncertainty Principle
- 4) A spectrum containing only specific wavelengths is called a _____ spectrum. 4) _____
A) continuous
B) visible
C) invariant
D) line
E) Rydberg
- 5) Which of the subshells below do not exist due to the constraints upon the azimuthal quantum number? 5) _____
A) $4d$
B) $4p$
C) $4s$
D) $4f$
E) none of the above
- 6) Which group 6A element is a metal? 6) _____
A) tellurium
B) tellurium and polonium
C) selenium
D) sulfur
E) polonium
- 7) _____ is isoelectronic with argon and _____ is isoelectronic with neon. 7) _____
A) F^+ , F^- B) Ne^- , Ar^+ C) Ne^- , Kr^+ D) Cl^- , Cl^+ E) Cl^- , F^-

- 8) Of the following statements, _____ is not true for oxygen. 8) _____
A) The chemical formula of ozone is O₃.
B) Dry air is about 79% oxygen.
C) Oxygen is a colorless gas at room temperature.
D) Oxygen forms peroxide and superoxide anions.
E) The most stable allotrope of oxygen is O₂.

- 9) Of the following elements, _____ has the most negative electron affinity. 9) _____
A) B B) P C) Si D) Cl E) Al

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

- 10) Which noble gas has the highest first ionization energy? 10) _____

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

- 11) The greater the lattice energy, the greater the charges on the participatory ions and the smaller their radii. 11) _____

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

- 12) Which two bonds are most similar in polarity? 12) _____
A) Cl—Cl and Be—Cl
B) Al—Cl and I—Br
C) I—Br and Si—Cl
D) B—F and Cl—F
E) O—F and Cl—F

- 13) Which of the following has eight valence electrons? 13) _____
A) Ti⁴⁺
B) Na⁺
C) Kr
D) Cl⁻
E) all of the above

- 14) A double bond consists of _____ pairs of electrons shared between two atoms. 14) _____
A) 1 B) 2 C) 3 D) 4 E) 6

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

- 15) When a metal gains an electron, the process is endothermic. 15) _____

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

- 16) The sp² atomic hybrid orbital set accommodates _____ electron domains. 16) _____
A) 2 B) 3 C) 4 D) 5 E) 6

- 17) In order to produce sp³ hybrid orbitals, _____ s atomic orbital(s) and _____ p atomic orbital(s) must be mixed. 17) _____
A) two, three B) one, two C) one, three D) one, one E) two, two

- 18) The order of MO energies in B_2 , C_2 , and N_2 ($\sigma_{2p} > \pi_{2p}$), is different from the order in O_2 , F_2 , and Ne_2 ($\sigma_{2p} < \pi_{2p}$). This is due to _____.
- A) greater 2s-2p interaction in B_2 , C_2 , and N_2
 - B) greater 2s-2p interaction in O_2 , F_2 , and Ne_2
 - C) the more metallic character of boron, carbon and nitrogen as compared to oxygen, fluorine, and neon
 - D) less effective overlap of p orbitals in B_2 , C_2 , and N_2
 - E) less effective overlap of p orbitals in O_2 , F_2 , and Ne_2
- 19) According to VSEPR theory, if there are two electron domains on a central atom, they will be arranged such that the angles between the domains are _____.
- A) 109.5°
 - B) 120°
 - C) 90°
 - D) 180°
 - E) 360°
- 20) The blending of one s atomic orbital and two p atomic orbitals produces _____.
- A) three sp^2 hybrid orbitals
 - B) two sp^2 hybrid orbitals
 - C) two sp^3 hybrid orbitals
 - D) three sp hybrid orbitals
 - E) three sp^3 hybrid orbitals

Name _____

- 1) _____
- 2) _____
- 3) _____
- 4) _____
- 5) _____
- 6) _____
- 7) _____
- 8) _____
- 9) _____
- 10) _____
- 11) _____
- 12) _____
- 13) _____
- 14) _____
- 15) _____
- 16) _____
- 17) _____
- 18) _____
- 19) _____
- 20) _____