

1011-3rd Exam-1011219

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

1) All of the terms below are quantum numbers EXCEPT:

- A) magnetic
- B) orbital angular momentum
- C) spin
- D) valence
- E) principal

Answer: D

2) The transition elements refer to what group of elements?

- A) lanthanides
- B) *d*-block elements
- C) actinides
- D) *s*-block elements
- E) *p*-block elements

Answer: B

3) The Bohr theory explains that an emission spectral line is:

- A) due to an electron losing energy but keeping the same values of its four quantum numbers
- B) due to an electron losing energy and changing shells
- C) due to an interaction between electrons in two different principal shells
- D) due to an electron gaining energy and changing shells
- E) due to an increase in the principal quantum number n of an electron

Answer: B

4) Which of the following occurs for the representative elements going left to right across the period?

- A) Atomic size increases.
- B) Forces of attraction between electron and nucleus increase because nuclear charge increases.
- C) The outer electrons are held more weakly.
- D) Electronegativity decreases.
- E) none of these

Answer: B

5) Choose the INCORRECT statement concerning electromagnetic radiation.

- A) The speed of ultraviolet light rays is faster than X-rays in a vacuum.
- B) The greater the frequency of the electromagnetic radiation, the greater the energy of the radiation.
- C) A photon with a wavelength of 5000 Angstroms has one-half as much energy as a photon with a wavelength of 2500 Angstroms.
- D) Infrared light has a longer wavelength than ultraviolet light.
- E) Electromagnetic radiation is energy transmission in which electric and magnetic fields are propagated as waves.

Answer: A

- 6) Arrange the following in order of increasing ENERGY:
UV radiation, visible radiation, X-rays, and microwaves.
- A) visible < UV < X-rays < microwave
 - B) UV < X-rays < microwave < visible
 - C) microwave < visible < UV < X-rays
 - D) X-rays < microwave < UV < visible
 - E) X-ray < microwave < visible < UV

Answer: C

- 7) Given the bond enthalpies C—C (348), C=O (707), O=O (498), H—O (464), C—H (414) all in kJ/mol, compute ΔH° kJ/mol for the complete combustion of C_7H_{16} .
- A) $+2.57 \times 10^3$ kJ/mol
 - B) -2.93×10^3 kJ/mol
 - C) -2.43×10^3 kJ/mol
 - D) -3.13×10^3 kJ/mol
 - E) -2.57×10^3 kJ/mol

Answer: D

- 8) What is the general relationship between electron affinity and atomic radii?
- A) Electron affinity becomes more negative as radii decreases.
 - B) Electron affinity becomes more negative as radii increases.
 - C) Electron affinity becomes positive as radii increases.
 - D) Electron affinity becomes positive as radii decreases.
 - E) The two quantities are unrelated

Answer: A

- 9) Which of the following bonds is probably the most polar?
- A) P—H in PH_3
 - B) N—H in NH_3
 - C) C—H in CH_4
 - D) O—H in H_2O
 - E) Se—H in SeH_2

Answer: D

- 10) Which of the following has the largest atomic radius?

A) Rb B) Br C) Mo D) I

Answer: A

- 11) Which of the following is diamagnetic?

A) NO_2 B) N_2 C) O_2^- D) O_2 E) SO_2^+

Answer: B

- 12) Which of the following molecules is nonpolar?

A) HCN B) $HClO_4$ C) $CHCl_3$ D) H_2O E) BCl_3

Answer: E

13) What is the general electronic configuration (where n = principal quantum number) that best describes the halogens as a group?

- A) ns^2np^4 B) ns^2np^3 C) ns^1np^6 D) ns^2np^6 E) ns^2np^5

Answer: E

14) The possible values of the orbital angular momentum quantum number of a $3p$ electron are:

- A) $+1/2, -1/2$ B) 1 C) -1, 0, +1 D) -1 E) 0

Answer: B

15) Valence electrons are:

- A) electrons in the shell of the highest principal quantum number
B) all electrons of the last rare gas configuration
C) electrons in filled orbits
D) paired electrons
E) unpaired electrons

Answer: A

16) Which chloride should have the greatest covalent character?

- A) BaCl_2 B) NaCl C) BeCl_2 D) KCl E) CaCl_2

Answer: C

17) Which of the following species exhibits resonance?

- A) N_2 B) OF_2 C) PCl_5 D) ClO_3^- E) BrF_3

Answer: D

18) The photoelectric effect:

- A) contradicted the view that light energy was dependent upon intensity only
B) was discovered by Max Planck
C) describes the phenomenon of producing light by shining a beam of electrons by on any metal surface
D) results in a beam of electrons which increases in number, but not velocity, as the wavelength of incident light decreases
E) is not the same principle used in modern electric eyes and solar calculators

Answer: A

19) After drawing the Lewis dot structure of CH_2CCl_2 , pick the INCORRECT statement of the following.

- A) The $\text{Cl}-\text{C}$ bonds are single bonds.
B) The $\text{H}-\text{C}$ bonds are single bonds.
C) The $\text{C}-\text{C}$ bond is a double bond.
D) Each chlorine has three lone pairs.
E) Each carbon has a lone pair.

Answer: E

20) Which of the following statements is INCORRECT?

- A) The ionization energy increases from left to right through a period of elements.
B) Cations are larger than the atoms from which they are formed.
C) The atomic radius increases down the periodic table.
D) The metallic character of elements decreases from left to right through a period of elements.
E) The atomic radius decreases from left to right through a period of elements.

Answer: B

- 21) Among the alkali metals, cesium reacts more rapidly than sodium because:
- A) the valence electron of cesium is at a greater average distance from the nucleus
 - B) cesium has more electrons
 - C) cesium has more neutrons
 - D) cesium has a higher atomic weight
 - E) cesium has more protons

Answer: A

- 22) The similar chemical behavior of the elements in a given group in the periodic table is best accounted for by the fact that atoms of these elements have:
- A) the same number of electrons
 - B) the same number of isotopes
 - C) similar nuclear structures
 - D) the same number of protons
 - E) the same number of electrons in the outermost (valence) shell

Answer: E

- 23) Choose the species from which one electron could most easily be removed.

A) Cl B) K^+ C) Ca^+ D) K E) Ar

Answer: D

- 24) Which of the following species contains a triple bond?

A) CO_3^{2-} B) NH_3 C) CN^- D) $HCCl_3$ E) NO_3^-

Answer: C

- 25) Choose the INCORRECT statement.

- A) The rare gas atoms complete the filling of the p orbitals.
- B) The ionization energy of Ca^+ is greater than that for Ca^{++} .
- C) Ba^{2+} is smaller than Ba^+ .
- D) When a metallic element unites with a nonmetallic element, electrons are lost by atoms of the metal and gained by atoms of the nonmetals.
- E) Within a given sublevel, each orbital is usually occupied by a single electron before any orbital has two electrons.

Answer: B

- 26) Which compound would be expected to have the shortest carbon-carbon bond?

A) F_3CCF_3 B) $HCCH$ C) H_2CCH_2 D) H_3CCH_3 E) Cl_2CCCl_2

Answer: B

- 27) The correct electron configuration for Br^- is _____.

- A) $[Br] 4s^2 3d^{10} 4p^5$
- B) $[Ne] 3d^{10} 4s^2 4p^6$
- C) $[Ar] 3d^{10} 4s^2 4p^6$
- D) $[Ar] 3d^{10} 4s^2 4p^5$
- E) $[Br] 3d^{10} 4s^2 4p^6$

Answer: C

28) The first ionization potential for S is lower than the first ionization potential for P because:

- A) Hund's rule is violated
- B) P is below S on the periodic table
- C) P is to the right of S on the periodic table
- D) P has a p^3 configuration
- E) ionization potentials decrease across a representative period

Answer: D

29) Which one of the following set of quantum numbers would not be allowed?

- A) $n = 3, \ell = 3, m_\ell = 1$
- B) $n = 3, \ell = 2, m_\ell = -1$
- C) $n = 3, \ell = 2, m_\ell = 1$
- D) $n = 3, \ell = 0, m_\ell = 0$
- E) $n = 3, \ell = 1, m_\ell = -1$

Answer: A

30) A radiation detector exposed to sunlight records the energy falling on a given area each unit time. If such a detector has a reading of $0.698 \text{ cal cm}^{-2} \text{ min}^{-1}$, how many photons of sunlight are striking each cm^2 in one minute? Assume the average wavelength of sunlight is 460. nm. ($4.184 \text{ J} = 1 \text{ calorie}$; $h = 6.626 \times 10^{-34} \text{ Js/photon}$)

- A) 2.31×10^{18} photons
- B) 6.76×10^{18} photons
- C) 1.62×10^{18} photons
- D) 9.63×10^{19} photons
- E) 4.32×10^{19} photons

Answer: B

31) An atomic orbital represents:

- A) the repulsion of all the electrons among themselves
- B) the shape of an atom
- C) a fixed path that an electron follows around the nucleus of an atom
- D) the region of electron density for a covalent bond
- E) the region of high probability for an electron around the nucleus of an atom

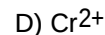
Answer: E

32) Which of the following statements correctly describe the basic concepts and uses of VSEPR theory:

- I) The VSEPR theory is used for estimating bond angles.
 - II) The VSEPR theory is used for predicting electronegativities.
 - III) The VSEPR theory is helpful in predicting polarity.
 - IV) The VSEPR theory states that electron pairs repel each other.
 - V) The VSEPR theory uses valence electron counting for structure prediction.
- A) I), II), III), V)
 - B) II), III), IV), V)
 - C) I), II), III), IV)
 - D) I), II), IV), V)
 - E) I), III), IV), V)

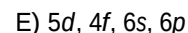
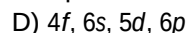
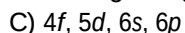
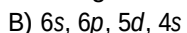
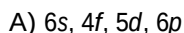
Answer: E

33) Which of the following has the greatest number of unpaired electrons?



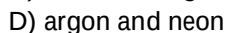
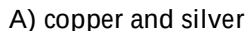
Answer: D

34) Which series of subshells is arranged in order of increasing energy in a multiple-electron atom?



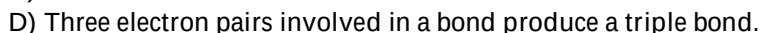
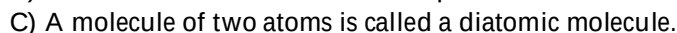
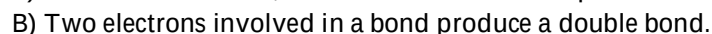
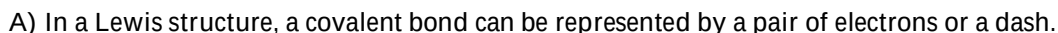
Answer: A

35) Which of the following pairs of elements are classified as metalloids?



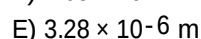
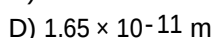
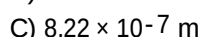
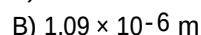
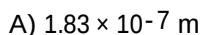
Answer: C

36) Choose the INCORRECT statement.



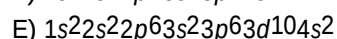
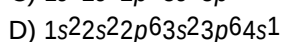
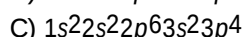
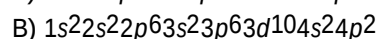
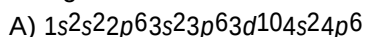
Answer: B

37) Calculate the wavelength in meters of light absorbed by an electron in an atom of hydrogen as it moves from $n = 3$ to $n = 6$. ($R_H = 2.179 \times 10^{-18} \text{ J}$)



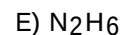
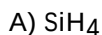
Answer: B

38) Which ground state electronic configuration will most readily produce an ion with a charge of 2+?



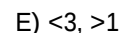
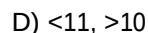
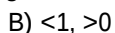
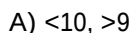
Answer: E

39) As indicated by Lewis structures, which of the following molecules would probably be unstable?



Answer: E

40) The effective nuclear charge for sodium is:



Answer: E