1001_3rd Exam_1001214

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

1) Choose the INCORRECT statement.
   A) Heat is energy transferred as a result of a temperature difference.
   B) Potential energy is energy in action.
   C) Pressure volume work is calculated by $w = P \cdot V$.
   D) Heat moves from a warmer body to a colder one.
   E) Kinetic energy is the energy of motion.

   Answer: B

2) What is the final temperature in the bomb calorimeter if 1.785 grams of benzoic acid ($HC_7H_5O_2$) is combusted in a calorimeter with a heat capacity of 5.02 kJ/°C and initial temperature of 24.62 °C? The heat of combustion of benzoic acid is -26.42 kJ/g.
   A) 15.5°C B) 34.0°C C) 51.0°C D) 31.2°C E) 29.8°C

   Answer: B

3) What is the work done in joules by the system when H_2 expands against a constant pressure of 75 atm at 45.3°C? The change in volume is 24.0 L.
   A) 1.8×10^3 J B) -8.2×10^4 J C) 8.2×10^4 J D) 1.8×10^5 J E) -1.8×10^5 J

   Answer: E

4) What is the ground state electron configuration of zinc?
   A) [Ar] $4s^2 4d^{10}$
   B) [Ar] $3s^2 3p^6 4s^2 3d^{10}$
   C) [Ar] $3s^2 3d^{10}$
   D) [Ar] $4s^2 3d^{10}$
   E) [Kr] $3s^2 4p^{10}$

   Answer: D

5) What is the frequency associated with radiation of 4.59×10^{-8} cm wavelength?
   A) 1.53×10^{-8} s^{-1}
   B) 2.18×10^7 s^{-1}
   C) 6.54×10^{15} s^{-1}
   D) 13.8 s^{-1}
   E) 6.54×10^{17} s^{-1}

   Answer: E

6) Which series of subshells is arranged in order of increasing energy in a multiple-electron atom?
   A) 4*f*, 6*s*, 5*d*, 6*p* B) 6*s*, 4*f*, 5*d*, 6*p* C) 6*s*, 6*p*, 5*d*, 4*s* D) 5*d*, 4*f*, 6*s*, 6*p* E) 4*f*, 5*d*, 6*s*, 6*p*

   Answer: B

7) Which of the following subshells is correctly designated?
   A) $3f^2$ B) $3s^3$ C) $4d^{11}$ D) $2p^6$ E) $1p^5$

   Answer: D

8) The quantum numbers of the last electron of arsenic could be:
A) $n = 4, \ell = 3, m_\ell = 1, m_S = 1/2$
B) $n = 4, \ell = 1, m_\ell = 1, m_S = 1/2$
C) $n = 4, \ell = 1, m_\ell = 1/2, m_S = 0$
D) $n = 4, \ell = 2, m_\ell = 1, m_S = 1/2$
E) $n = 3, \ell = 1, m_\ell = 1, m_S = 1/2$

Answer: B

9) The relationship between the frequency of light and the energy of the light was postulated by:
A) Johannes Rydberg
B) Max Planck
C) Robert Bunsen
D) Albert Einstein
E) Johann Balmer

Answer: B

10) Calculate the energy in kJ/mol of light with a wavelength of 360 nm.
A) 5.52×10^{-19} kJ/mol
B) 332 kJ/mol
C) 5.52×10^{-22} kJ/mol
D) 6.63×10^{3} kJ/mol
E) 0.332 kJ/mol

Answer: B

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

Answer: A

12) What is the energy in joules of the 656 nm spectral line of hydrogen?
A) 1.30×10^{-22} J
B) 3.03×10^{-28} J
C) 3.03×10^{-19} J
D) 1.45×10^{-48} J
E) 4.35×10^{-31} J

Answer: C

13) When an electron in an atom goes from a high energy state to a low one, what occurs?
A) Light is given off.
B) This process is not possible.
C) Another electron goes from a low energy state to a high one.
D) Light is absorbed.
E) The atom moves faster.

Answer: A

14) Calculate the deBroglie wavelength of a ball of mass 125 grams and velocity 90 m/s.

A) 5.9×10^{-31} m
B) 5.9×10^{-35} m
C) 590 m
D) 1.7×10^{34} m
E) 0.59 m

Answer: B

15) An atomic orbital represents:

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

Answer: A

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

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

Answer: C

17) Which of the following is not possible?

A) 4*d* B) 3*f* C) 2*p* D) 2*s* E) 5*p*

Answer: B

18) The possible values of the magnetic quantum number, m_ℓ, of a 3*p* electron are:

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

Answer: D

19) Which of the following orbitals have lobes aligned along the *x* axis?

A) d_{xy} B) d_{x2-y2} C) d_{xz} D) *s* E) d_{yz}

Answer: B

20) The actinides refer to what group of elements?

A) *d*-block elements
B) *f*-block elements of atomic number 58 through 71
C) *s*-block elements
D) *f*-block elements of atomic number 90 through 103
E) *p*-block elements

Answer: D

21) Why was Moseley so sure from his X-ray work that there were no other undiscovered elements besides the three that he predicted in the range of atomic numbers 13-79?
A) Mendeleev didn't predict any more.
B) All of the possible atomic weights were assigned.
C) The columns of the periodic table were full.
D) The rows on the periodic table were filled.
E) All of the integer atomic numbers were assigned.

Answer: E

22) 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^1np^6 C) ns^2np^5 D) ns^2np^3 E) ns^2np^6

Answer: No Correct Answer Was Provided.

23) Which of the following has the largest radius?
A) Rb^+ B) Se^{2-} C) Kr D) Br^- E) Y^{3+}

Answer: B

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

Answer: C

25) Which of the following has the largest radius?
A) Sr^{2+} B) Cl^- C) Br D) As^{3-} E) Se^{2-}

Answer: D

26) A is the sequence Na, Mg, Al, Si, and P. B is the sequence He, Ne, Ar, Kr, and Xe. Which statement below is true?
A) The members of B have larger radii than those of A, respectively. That is He > Na, Ne > Mg, etc.
B) All the members of A are isoelectronic.
C) The members of A are decreasing in size.
D) The members of A have larger radii than those of B, respectively.
E) The members of B are decreasing in size.

Answer: C

27) 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) Within a given sublevel, each orbital is usually occupied by a single electron before any orbital has two electrons.
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) Ba^{2+} is smaller than Ba^+.

Answer: B

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

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

Answer: A

29) The first ionization energy for rubidium is +403.0 kJ/mol. How much energy would be required to convert 17.1 g of gaseous rubidium to its gaseous +1 monatomic ion at constant temperature?

A) 80.6 kJ B) 34.5 kJ C) 40.4 kJ D) 68.9 kJ E) 185 kJ

Answer: A

30) Why is the electron affinity so positive for the group 12 elements?

A) The groups 12 elements are diatomic elements.
B) The added electron would have to go into a new shell.
C) The added electron would have to be added into the half-filled p subshell.
D) Electrons can't be added to gases.
E) The added electron would have to be added into the p subshell.

Answer: E

31) Can metal atoms form negative ions in the gaseous state? Explain.

A) Yes, electrons can be removed from a Li half-filled 2s orbital.
B) No, only a liquid can be ionized.
C) Yes, electrons can be added to a Li half-filled 2s orbital.
D) No, the 2s orbital is completely filled.
E) No, an electron cannot be added.

Answer: C

32) Why is the electron affinity so positive for the group 2 elements?

A) The groups 2 elements are diatomic elements.
B) The added electron would have to go into a new shell.
C) The added electron would have to be added into the p subshell.
D) Electrons can't be added to gases.
E) The added electron would have to be added into the half-filled p subshell.

Answer: C

33) Which of the following species is most likely to be diamagnetic?

A) I B) Fe C) Zn^{2+} D) Mn^+ E) W^{3+}

Answer: C

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

A) Co^{2+} B) Ti^{3+} C) Ni D) Cr^{2+}

Answer: D

35) The boiling point for gallium is 2403°C. The boiling point for thallium is 1457°C. Which of the following would be the predicted boiling point for indium?

A) 946°C B) 1930°C C) 1287°C D) 730°C E) 3860°C

Answer: B

36) Which would you expect to have the highest melting point?
A) HBr
B) CF_4
C) HI
D) HCl
E) All have the same melting point.

Answer: C

37) From the following data, what is the estimated boiling point of liquid chlorine?
argon/bp 87 K bromine/bp 332 K fluorine/bp 86 K sulfur/bp 718 K
A) 525 K B) 402 K C) 148 K D) 209 K E) 123 K

Answer: D

38) Choose the INCORRECT statement.
A) An ion written as a Lewis symbol has brackets outside the electrons.
B) In a Lewis symbol, the chemical symbol represents the nucleus of the atom.
C) An ion written as a Lewis symbol has the charge written as a superscript outside the closing bracket.
D) A Lewis structure is a combination of Lewis symbols that represent the transfer or sharing of electrons in a chemical bond.
E) A Lewis symbol consists of a chemical symbol and the outer shell electrons.

Answer: B

39) How many bond pairs ("bp") and how many lone pairs ("lp") should be shown in the Lewis structure for carbon monoxide?
A) 5 bp/0 lp B) 4 bp/1 lp C) 2 bp/3 lp D) 1 bp/4 lp E) 3 bp/2 lp

Answer: E

40) With the representations of "I" for ionic bond, "PC" for polar covalent bond, and "NP" for nonpolar covalent bond, which of the following descriptive combinations is correct?
A) NO/NP B) CsF/PC C) F_2/I D) BrCl/NP E) HCl/PC

Answer: E

41) After drawing the Lewis dot structure of HCN, pick the INCORRECT statement from the following.
A) There are no lone pairs on C.
B) There are no lone pairs on H.
C) The C-H bond is a single bond.
D) The C-N bond is a double bond.
E) There is a lone pair of electrons on N.

Answer: D

42) Which of the following species exhibits resonance?
A) ClO_3^- B) BrF_3 C) PCl_5 D) N_2 E) OF_2

Answer: A

43) Which of the following species is best represented by a resonance hybrid having two contributing structures?
A) nitric acid B) nitride ion C) nitrogen D) nitrate ion E) nitrous acid

Answer: A

44) Choose the INCORRECT statement.
A) Molecules with all paired electrons are diamagnetic.
B) An expanded octet has larger electron clouds.
C) Highly reactive molecular fragments with unpaired electrons are free radicals.
D) Electron pairs repel each other.
E) VSEPR stands for *valence-shell electron pair repulsion*.

Answer: B

45) Which of the following is diamagnetic?
A) CO B) NO_2 C) NO D) CH_3 E) ClO_2

Answer: A

46) Which of the following sets contains only linear molecules?
A) H_2S, CO, CO_2
B) H_2S, HCN, CO_2
C) BF_3, Cl_2, O_2
D) H_2O, CO, Cl_2
E) CO_2, HCN, O_2

Answer: E

47) Choose the INCORRECT statement.
A) The geometrical arrangement of the atomic nuclei is the molecular geometry.
B) A nonpolar molecule can have polar bonds.
C) A dipole moment is the product of the number of atoms and the charge.
D) A polar molecule has a dipole moment.
E) The geometrical distribution of electron groups is the electron-group geometry.

Answer: C

48) Which of the following molecules has both an electron group geometry and a molecular geometry described as trigonal planar?
A) SiH_4 B) BF_3 C) OF_2 D) PF_3 E) CHF_3

Answer: B

49) Which compound would be expected to have the shortest carbon-carbon bond?
A) Cl_2CCCl_2 B) HCCH C) F_3CCF_3 D) H_2CCH_2 E) H_3CCH_3

Answer: B

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

Answer: B