1071-3rd Chem Exam-1080109(A)

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

1) Of the following, _____ has the odor of rotting eggs.
A) NH_3 B) H_2S C) CO D) NO_2 E) HCN

Answer: B

2) Molecular compounds of low molecular weight tend to be gases at room temperature. Which of the following is most likely not a gas at room temperature?
A) Cl_2 B) HCl C) LiCl D) H_2 E) CH_4

Answer: C

3) Which of the following equations shows an incorrect relationship between pressures given in terms of different units?
A) 1.20 atm = 122 kPa
B) 152 mm Hg = 2.03×10^4 Pa
C) 0.760 atm = 578 mm Hg
D) 1.0 torr = 2.00 mm Hg
E) 1.00 atm = 760 torr

Answer: D

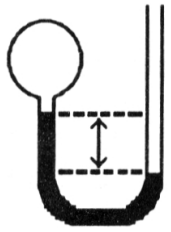
4) Of the following, _____ is a correct statement of Boyle's law.
A) PV = constant
B) $\frac{P}{V}$ = constant
C) $\frac{V}{P}$ = constant
D) $\frac{V}{T}$ = constant
E) $\frac{n}{P}$ = constant

Answer: A

5) A mixture of Xe, Kr, and Ar has a total pressure of 6.70 atm. What is the mole fraction of Kr if the partial pressures of Xe and Ar are 1.60 atm and 2.80 atm, respectively.
A) 0.174 B) 0.256 C) 0.343 D) 0.481 E) 0.570

Answer: C

6) A gas vessel is attached to an open-end manometer containing a nonvolatile liquid of density 0.791 g/mL as shown below.



The difference in heights of the liquid in the two sides of the manometer is 43.4 cm when the atmospheric pressure is 755 mm Hg. Given that the density of mercury is 13.6 g/mL, the pressure of the enclosed gas is _____ atm.

A) 1.03 B) 0.967 C) 0.993 D) 0.990 E) 0.987

Answer: B

7) How many moles of gas are there in a 45.0 L container at 25.0 °C and 500.0 mm Hg?

A) 0.630 B) 6.11 C) 18.4 D) 1.21 E) 207

Answer: D

8) The van der Waals equation for real gases recognizes that _____.

A) gas particles have non-zero volumes and interact with each other
B) molar volumes of gases of different types are different
C) the non-zero volumes of gas particles effectively decrease the amount of "empty space" between them
D) the molecular attractions between particles of gas decreases the pressure exerted by the gas
E) all of the above statements are true

Answer: E

9) The reaction of 50 mL of Cl_2 gas with 50 mL of CH_4 gas via the equation:

$$Cl_2\,(g) + CH_4\,(g) \rightarrow HCl\,(g) + CH_3Cl\,(g)$$

will produce a total of _____ mL of products if pressure and temperature are kept constant.

A) 100 B) 50 C) 200 D) 150 E) 250

Answer: A

10) A tank containing both HF and HBr gases developed a leak. The ratio of the rate of effusion of HF to the rate of effusion of HBr is _____.

A) 4.04 B) 0.247 C) 2.01 D) 0.497 E) 16.3

Answer: C

11) Based on molecular mass and dipole moment of the five compounds in the table below, which should have the highest boiling point?

Substance	Molecular Mass (amu)	Dipole Moment (D)
Propane, $CH_3CH_2CH_3$	44	0.1
Dimethylether, CH_3OCH_3	46	1.3
Methylchloride, CH_3Cl	50	1.9
Acetaldehyde, CH_3CHO	44	2.7
Acetonitrile, CH_3CN	41	3.9

A) $CH_3CH_2CH_3$
B) CH_3OCH_3
C) CH_3Cl
D) CH_3CHO
E) CH_3CN

Answer: E

12) In liquids, the attractive intermolecular forces are _____.
A) very weak compared with kinetic energies of the molecules
B) strong enough to hold molecules relatively close together
C) strong enough to keep the molecules confined to vibrating about their fixed lattice points
D) not strong enough to keep molecules from moving past each other
E) strong enough to hold molecules relatively close together but <u>not</u> strong enough to keep molecules from moving past each other

Answer: E

13) Which statements about viscosity are true?
(i) Viscosity increases as temperature decreases.
(ii) Viscosity increases as molecular weight increases.
(iii) Viscosity increases as intermolecular forces increase.
A) (i) only B) (ii) and (iii) C) (i) and (iii) D) none E) all

Answer: E

14) Of the following substances, only _____ has London dispersion forces as the <u>only</u> intermolecular force.
A) CH_3OH B) NH_3 C) H_2S D) Kr E) HCl

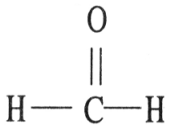
Answer: D

15) Of the following, _____ has the highest boiling point.
A) N_2 B) Br_2 C) H_2 D) Cl_2 E) O_2

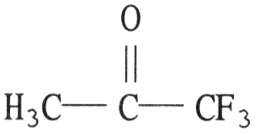
Answer: B

16) Which one of the following substances will have hydrogen bonding as one of its intermolecular forces?

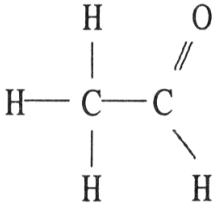
A)



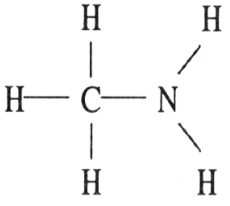
B)



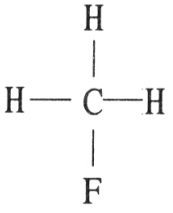
C)



D)



E)



Answer: D

17) Which of the following statements is <u>false</u>?

A) The absolute value of the heat of sublimation is equal to the absolute value of the heat of deposition.
B) The heat of sublimation is equal to the sum of the heat of vaporization and the heat of melting.
C) The heat of sublimation is equal to the sum of the heat of vaporization and the heat of freezing.
D) The absolute value of the heat of sublimation is equal to the absolute value of the sum of the heat of condensation and the heat of freezing.
E) The absolute value of the heat of deposition is equal to sum of the absolute value of the heat of vaporization and the absolute value of the heat of freezing.

Answer: C

18) The enthalpy change for converting 1.00 mol of ice at -50.0 °C to water at 70.0 °C is _____ kJ. The specific heats of ice, water, and steam are 2.09 J/g-K, 4.18 J/g-K, and 1.84 J/g-K, respectively. For H_2O, ΔH_{fus} = 6.01 kJ/mol, and ΔH_{vap} = 40.67 kJ/mol

A) 12.28 B) 6.41 C) 13.16 D) 7154 E) 9.40

Answer: C

19) Which of the following characteristics would prevent liquid crystal behavior?
A) long axial structure
B) ionic configuration
C) carbon-carbon single bonds
D) double bonding
E) polar groups

Answer: B

20) The critical temperature and pressure of CS_2 are 279 °C and 78 atm, respectively. At temperatures above 279°C and pressures above 78 atm, CS_2 can only occur as a _____.
A) solid
B) liquid
C) liquid and gas
D) gas
E) supercritical fluid

Answer: E

21) In counting the electron domains around the central atom in VSEPR theory, a _____ is not included.
A) nonbonding pair of electrons
B) single covalent bond
C) core level electron pair
D) double covalent bond
E) triple covalent bond

Answer: C

22) The central iodine atom in IF_5 has _____ unbonded electron pairs and _____ bonded electron pairs in its valence shell.
A) 1, 5 B) 0, 5 C) 5, 1 D) 4, 1 E) 1, 4

Answer: A

23) For molecules of the general formula AB_n, n can be greater than four _____.
A) for any element A
B) only when A is an element from the third period or below the third period
C) only when A is boron or beryllium
D) only when A is carbon
E) only when A is Xe

Answer: B

24) Of the molecules below, only _____ is nonpolar.
A) CO_2 B) H_2O C) NH_3 D) HCl E) $TeCl_2$

Answer: A

25) Molecular Orbital theory correctly predicts paramagnetism of oxygen gas, O_2. This is because _____.
A) the bond order in O_2 can be shown to be equal to 2.
B) there are more electrons in the bonding orbitals than in the antibonding orbitals.
C) the energy of the π_{2p} MOs is higher than that of the σ_{2p} MO
D) there are two unpaired electrons in the MO electron configuration of O_2
E) the O—O bond distance is relatively short

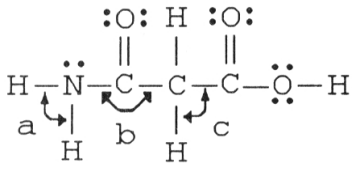
Answer: D

26) The molecular geometry of the BCl_3 molecule is _____, and this molecule is _____.

A) trigonal pyramidal, polar
B) trigonal pyramidal, nonpolar
C) trigonal planar, polar
D) trigonal planar, nonpolar
E) trigonal bipyramidal, polar

Answer: D

27) The bond angles marked a, b, and c in the molecule below are about _____, _____, and _____, respectively.



A) 90°, 90°, 90°
B) 120°, 120°, 90°
C) 120°, 120°, 109.5°
D) 109.5°, 120°, 109.5°
E) 109.5°, 90°, 120°

Answer: D

Consider the following species when answering the following questions:

(i) PCl_3 (ii) CCl_4 (iii) $TeCl_4$ (iv) XeF_4 (v) SF_6

28) In which of the molecules does the central atom utilize d orbitals to form hybrid orbitals?

A) (i) and (ii)
B) (iii) only
C) (i) and (v)
D) (iii), (iv), and (v)
E) (v) only

Answer: D

29) The hybridizations of bromine in BrF_5 and of arsenic in AsF_5 are _____ and _____, respectively.

A) sp^3, sp^3d
B) sp^3d, sp^3d^2
C) sp^3d, sp^3
D) sp^3d^2, sp^3d
E) sp^3d^2, sp^3d^2

Answer: D

30) Based on molecular orbital theory, the bond orders of the H—H bonds in H_2, H_2^+, and H_2^- are _____, respectively

A) 1, 0, and 0
B) 1, 1/2, and 0
C) 1, 0, and 1/2
D) 1, 1/2, and 1/2
E) 1, 2, and 0

Answer: D

31) _____ solids consist of atoms or molecules held together by dipole-dipole forces, London dispersion force and/or hydrogen bonds.

A) Ionic
B) Molecular
C) Metallic
D) Covalent-network
E) Metallic and covalent-network

Answer: B

32) Potassium metal crystallizes in a body-centered cubic structure with a unit cell edge length of 5.31 Å. The radius of a potassium atom is _____ Å.

A) 1.33 B) 1.88 C) 2.30 D) 2.66 E) 5.31

Answer: C

33) The transition metals in group _____ have the highest melting points.

A) 4B B) 3B C) 6B D) 8B E) 2B

Answer: C

34) A category _____ plastic container will generally be the most easily recycled.

A) 1 B) 2 C) 3 D) 4 E) 22

Answer: A

35) Blue LEDs are usually made of _____.

A) GaAs B) GaP C) GaO D) GaS E) GaN

Answer: E

36) NaCl crystallizes in a face-centered cubic cell. What is the total number of ions (Na^+ ions and Cl^- ions) that lie within a unit cell of NaCl?

A) 2 B) 4 C) 8 D) 6 E) 5

Answer: C

37) The process of doping can produce a _____ which can greatly _____ intrinsic conductivity.

A) n-type semiconductor, increase
B) p-type semiconductor, decrease
C) non-metal, increase
D) non-metal, decrease
E) allotrope, diminish

Answer: A

38) 12 karat gold contains _____% gold.

A) 12 B) 25 C) 5.0×10^1 D) 75 E) 1.0×10^2

Answer: C

39) As a polymer becomes more crystalline, _____.

A) its melting point decreases
B) its density decreases
C) its stiffness decreases
D) its yield stress decreases
E) None of the above is correct.

Answer: E

40) CsCl crystallizes in a unit cell that contains the Cs^+ ion at the center of a cube that has a Cl^- at each corner. Each unit cell contains _____ Cs^+ ions and _____ Cl^-, ions, respectively.

A) 1 and 8 B) 2 and 1 C) 1 and 1 D) 2 and 2 E) 2 and 4

Answer: C