

# 1091 Final Exam\_01/13/21\_(A)

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

- 1) Crystalline solids \_\_\_\_\_.
- A) exist only at high temperatures
  - B) have their particles arranged randomly
  - C) exist only at very low temperatures
  - D) have highly ordered structures
  - E) are usually very soft

Answer: D

- 2) Together, liquids and solids constitute \_\_\_\_\_ phases of matter.
- A) all of the
  - B) the fluid
  - C) the disordered
  - D) the compressible
  - E) the condensed

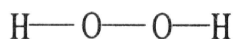
Answer: E

- 3) Which one of the following exhibits dipole-dipole attraction between molecules?
- A)  $\text{CO}_2$                       B)  $\text{Cl}_2$                       C)  $\text{AsH}_3$                       D)  $\text{XeF}_4$                       E)  $\text{BCl}_3$

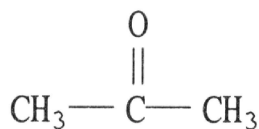
Answer: C

- 4) Which one of the following substances will not have hydrogen bonding as one of its intermolecular forces?

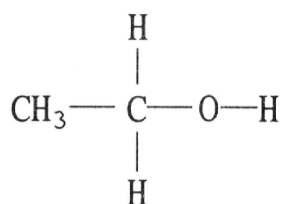
A)



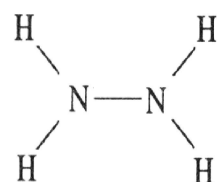
B)



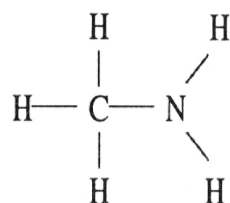
C)



D)



E)



Answer: B

5) Of the following substances, only \_\_\_\_\_ has London dispersion forces as its only intermolecular force.  
A)  $\text{CCl}_4$                       B)  $\text{CH}_3\text{COOH}$                       C)  $\text{PH}_3$                       D)  $\text{H}_2\text{O}$                       E)  $\text{HF}$

Answer: A

6) Which one of the following should have the lowest boiling point?  
A)  $\text{CH}_3\text{OH}$                       B)  $\text{H}_2\text{S}$                       C)  $\text{HCl}$                       D)  $\text{CH}_4$                       E)  $\text{NH}_3$

Answer: D

7) When  $\text{NaCl}$  dissolves in water, aqueous  $\text{Na}^+$  and  $\text{Cl}^-$  ions result. The force of attraction that exists between  $\text{Na}^+$  and  $\text{H}_2\text{O}$  is called a(n) \_\_\_\_\_ interaction.

- A) hydrogen bonding
- B) London dispersion force
- C) ion-ion
- D) ion-dipole
- E) dipole-dipole

Answer: D

8) \_\_\_\_\_ is the energy required to expand the surface area of a liquid by a unit amount of area.

- A) Surface tension
- B) Viscosity
- C) Capillary action
- D) Meniscus
- E) Volatility

Answer: A

9) The critical temperature and pressure of  $\text{CS}_2$  are  $279^\circ\text{C}$  and 78 atm, respectively. At temperatures above  $279^\circ\text{C}$  and pressures above 78 atm,  $\text{CS}_2$  can only occur as a \_\_\_\_\_.

- A) solid
- B) liquid and gas
- C) liquid
- D) supercritical fluid
- E) gas

Answer: D

10) Of the following, \_\_\_\_\_ is an exothermic process.

- A) melting
- B) boiling
- C) subliming
- D) freezing
- E) All of the above are exothermic.

Answer: D

11) Of the following, \_\_\_\_\_ is the least volatile.

- A)  $\text{CF}_4$                       B)  $\text{CH}_4$                       C)  $\text{C}_6\text{H}_{14}$                       D)  $\text{CBr}_4$                       E)  $\text{CCl}_4$

Answer: D

12) The slope of a plot of the natural log of the vapor pressure of a substance versus  $1/T$  is \_\_\_\_\_.

- A)  $\frac{-1}{\Delta H_{\text{vap}}}$                       B)  $\Delta H_{\text{vap}}$                       C)  $\frac{1}{\Delta H_{\text{vap}}}$                       D)  $-\frac{\Delta H_{\text{vap}}}{R}$                       E)  $-\Delta H_{\text{vap}}$

Answer: D

13) Which of the following is not a type of solid?

- A) supercritical
- B) metallic
- C) covalent-network
- D) molecular
- E) ionic

Answer: A

14) The scattering of light waves upon passing through a narrow slit is called \_\_\_\_\_.

- A) diffusion
- B) incidence
- C) adhesion
- D) grating
- E) diffraction

Answer: E

15) CsCl crystallizes in a unit cell that contains a Cs<sup>+</sup> ion at the center of a cube and a Cl<sup>-</sup> ion at each corner.

The unit cell of CsCl is \_\_\_\_\_.

- A) close packed
- B) body-centered cubic
- C) amorphous
- D) primitive cubic
- E) face-centered cubic

Answer: B

16) The process of doping can produce a \_\_\_\_\_ which can greatly \_\_\_\_\_ intrinsic conductivity.

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

Answer: E

17) Inorganic compounds that are semiconductors have an average of \_\_\_\_\_ valence electrons.

- A) 1
- B) 5
- C) 4
- D) 2
- E) 3

Answer: C

18) The formation of a condensation polymer generally involves \_\_\_\_\_.

- A) the vaporization of a plasticizer
- B) the addition of a plasticizer
- C) the formation of significant crosslinking
- D) the mixing of sulfur with an addition polymer
- E) the elimination of a small molecule

Answer: E

19) As a polymer becomes more crystalline, \_\_\_\_\_.

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

Answer: E

20) Which of the following is not classified as a nanomaterial?

- A) carbon nanotubes
- B) isoprene
- C) buckminsterfullerene
- D) graphene
- E) All of the above are classified as nanomaterials

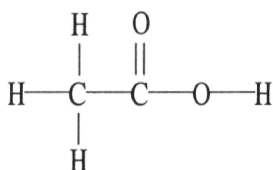
Answer: B

21)  $\text{ClF}_3$  has "T-shaped" geometry. There are \_\_\_\_\_ non-bonding domains in this molecule.

- A) 4
- B) 0
- C) 3
- D) 1
- E) 2

Answer: E

22) The molecular geometry of the left-most carbon atom in the molecule below is \_\_\_\_\_.



- A) trigonal bipyramidal
- B) tetrahedral
- C) T-shaped
- D) octahedral
- E) trigonal planar

Answer: B

23) The electron domain and molecular geometry of  $\text{BrO}_2^-$  is \_\_\_\_\_.

- A) tetrahedral, trigonal planar
- B) tetrahedral, bent
- C) trigonal pyramidal, linear
- D) trigonal pyramidal, seesaw
- E) trigonal planar, trigonal planar

Answer: B

24) Of the following molecules, only \_\_\_\_\_ is polar.

- A)  $\text{BCl}_3$
- B)  $\text{Cl}_2$
- C)  $\text{CCl}_4$
- D)  $\text{NCl}_3$
- E)  $\text{BeCl}_2$

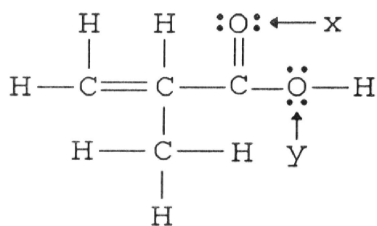
Answer: D

25) Of the following, only \_\_\_\_\_ has  $\text{sp}^2$  hybridization of the central atom.

- A)  $\text{CO}_3^{2-}$
- B)  $\text{ICl}_3$
- C)  $\text{PF}_5$
- D)  $\text{I}_3^-$
- E)  $\text{PH}_3$

Answer: A

- 26) The hybridization of the oxygen atom labeled y in the structure below is \_\_\_\_\_. The C–O–H bond angle is \_\_\_\_\_.



- A)  $sp$ ,  $180^\circ$       B)  $sp^3d^2$ ,  $90^\circ$       C)  $sp^3$ ,  $109.5^\circ$       D)  $sp^2$ ,  $109.5^\circ$       E)  $sp$ ,  $90^\circ$

Answer: C

- 27) There are \_\_\_\_\_  $\sigma$  bonds and \_\_\_\_\_  $\pi$  bonds in  $H_3C-CH_2-CH=CH-CH_2-C\equiv CH$ .

- A) 10, 3      B) 16, 3      C) 13, 2      D) 12, 2      E) 14, 2

Answer: B

- 28) In comparing the same two atoms bonded together, the \_\_\_\_\_ the bond order, the \_\_\_\_\_ the bond length, and the \_\_\_\_\_ the bond energy.

- A) greater, shorter, greater  
 B) greater, longer, greater  
 C) smaller, greater, greater  
 D) greater, greater, smaller  
 E) greater, greater, greater

Answer: A

- 29) Based on molecular orbital theory, there are \_\_\_\_\_ unpaired electrons in the  $OF^+$  ion.

- A) 2      B) 0      C)  $1/2$       D) 3      E) 1

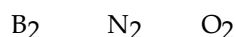
Answer: A

- 30) Based on molecular orbital theory, the bond order of the N–N bond in the  $N_2^{2+}$  ion is \_\_\_\_\_.

- A) 2      B)  $1/2$       C) 3      D) 0      E) 1

Answer: A

- 31) Of the following, \_\_\_\_\_ appear(s) to gain mass in a magnetic field.



- A)  $O_2$  only      B)  $B_2$  and  $O_2$       C)  $N_2$  and  $O_2$       D)  $N_2$  only      E)  $B_2$  and  $N_2$

Answer: B

- 32) Of the following, \_\_\_\_\_ has a slight odor of bitter almonds and is toxic.

- A)  $N_2O$       B) HCN      C)  $CH_4$       D) CO      E)  $NH_3$

Answer: B

- 33) Gaseous mixtures \_\_\_\_\_.

- A) are all homogeneous  
 B) can only contain molecules  
 C) are all heterogeneous  
 D) can only contain isolated atoms  
 E) must contain both isolated atoms and molecules

Answer: A

- 34) If one was told that their blood pressure was 130/80, their systolic pressure was \_\_\_\_\_.  
A) 130 mm Hg      B) 80 mm Hg      C) 130 Pa      D) 80 psi      E) 80 Pa

Answer: A

- 35) "Isothermal" means \_\_\_\_\_.  
A) at constant pressure  
B) that  $\Delta H_{\text{rxn}} = 0$   
C) at variable temperature and pressure conditions  
D) at ideal temperature and pressure conditions  
E) at constant temperature

Answer: E

- 36) Of the following, only \_\_\_\_\_ is impossible for an ideal gas.

A)  $V_1 T_1 = V_2 T_2$

B)  $\frac{V_1}{V_2} = \frac{T_1}{T_2}$

C)  $V_2 = \frac{T_2}{T_1} V_1$

D)  $\frac{V_1}{T_1} = \frac{V_2}{T_2}$

E)  $\frac{V_1}{V_2} = \frac{T_1}{T_2} = 0$

Answer: A

- 37) Standard temperature and pressure (STP), in the context of gases, refers to \_\_\_\_\_.

A) 273.15 K and 1 torr

B) 298.15 K and 1 torr

C) 273.15 K and 1 atm

D) 273.15 K and 1 pascal

E) 298.15 K and 1 atm

Answer: C

- 38) The density of  $\text{NO}_2$  in a 3.50 L tank at 780.0 torr and 37.0 °C is \_\_\_\_\_ g/L.

A) 9.30

B) 1.64

C) 1.86

D) 3.27

E) 2.92

Answer: C

- 39) The average kinetic energy of the particles of a gas is directly proportional to \_\_\_\_\_.

A) the square root of the rms speed

B) the particle mass

C) the square of the rms speed

D) the rms speed

E) the square of the particle mass

Answer: C

- 40) Of the following gases, \_\_\_\_\_ will have the greatest rate of effusion at a given temperature.

A) HBr

B) HCl

C)  $\text{NH}_3$

D) Ar

E)  $\text{CH}_4$

Answer: E