Name:
Score: 0 / 29 points (0%) [2 open-ended questions not graded]

Chapter 11 Practice

Multiple Choice

Identify the choice that best completes the statement or answers the question.

___ 1. Of the following substances, only _____ has London dispersion forces as its only intermolecular force.
a. CH_3OH
b. NH_3
c. H_2S
d. CH_4
e. HCl

ANSWER: D
POINTS: 0 / 1

___ 2. Which one of the following should have the lowest boiling point?
a. PH_3
b. H_2S
c. HCl
d. SiH_4
e. H_2O

ANSWER: D
POINTS: 0 / 1

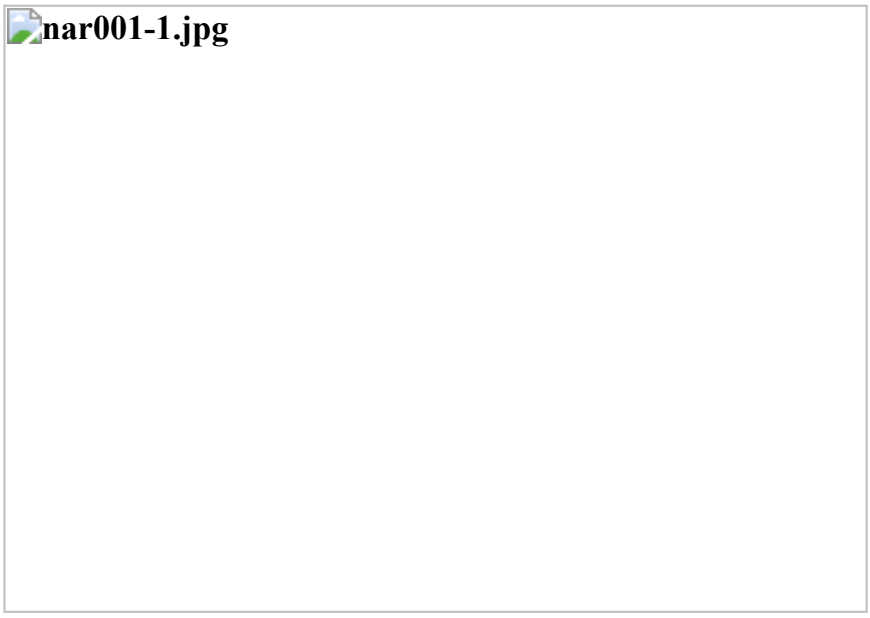
___ 3. In which of the following molecules is hydrogen bonding likely to be the most significant component of the total intermolecular forces?
a. CH_4
b. $C_5H_{11}OH$
c. $C_6H_{13}NH_2$
d. CH_3OH
e. CO_2

ANSWER: D
POINTS: 0 / 1

___ 4. Of the following, _____ is an exothermic process.
a. melting
b. subliming

c. freezing
d. boiling
e. All of the above are exothermic.

ANSWER: C
POINTS: 0 / 1



___ 5. The heating curve shown was generated by measuring the heat flow and temperature for a solid as it was heated. The slope of the _____ segment corresponds to the heat capacity of the liquid of the substance.
a. AB
b. BC
c. CD
d. DE
e. EF

ANSWER: C
POINTS: 0 / 1

___ 6. The heating curve shown was generated by measuring the heat flow and temperature of a solid as it was heated. The heat flow into the sample in the segment _____ will yield the value of the ΔH_{fusion} of this substance.
a. AB
b. BC
c. CD
d. DE
e. EF

ANSWER: B
POINTS: 0 / 1

___ 7. Of the following, _____ is the most volatile.

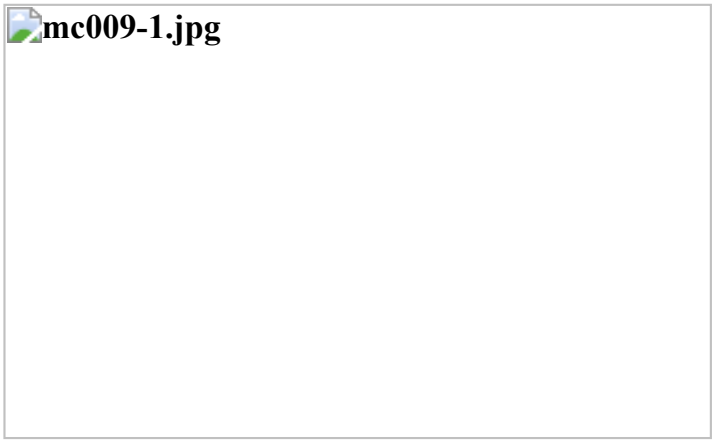
a. CBr_4
b. CCl_4
c. CF_4
d. CH_4
e. C_6H_{14}

ANSWER: D
POINTS: 0 / 1

___ 8. On the phase diagram shown above, segment _____ corresponds to the conditions of temperature and pressure under which the solid and the gas of the substance are in equilibrium.
a. AB
b. AC
c. AD
d. CD
e. BC

ANSWER: B
POINTS: 0 / 1

___ 9.



The phase diagram of a substance is given above. The region that corresponds to the solid phase is _____.
a. w
b. x
c. y
d. z
e. x and y

ANSWER: A
POINTS: 0 / 1

___ 10. 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
POINTS: 0 / 1

___ 11. Which of the following is <u>not</u> a type of solid?

ionic
molecular
supercritical
metallic
covalent-network
a. ionic
b. molecular
c. supercritical
d. metallic
e. covalent-network

ANSWER: C
POINTS: 0 / 1

___ 12. Crystalline solids _____.
a. have their particles arranged randomly
b. have highly ordered structures
c. are usually very soft
d. exist only at high temperatures
e. exist only at very low temperatures

ANSWER: B
POINTS: 0 / 1

___ 13. Together, liquids and solids constitute _____ phases of matter.
a. the compressible
b. the fluid
c. the condensed
d. all of the
e. the disordered

ANSWER: C
POINTS: 0 / 1

___ 14. Which statement is true about liquids but not true about solids?
a. They flow and are highly ordered.
b. They are highly ordered and not compressible.
c. They flow and are compressible.
d. They assume both the volume and the shape of their containers.
e. They flow and are not compressible.

ANSWER: E
POINTS: 0 / 1

___ 15. Which one of the following exhibits dipole-dipole attraction between molecules?
a. XeF_4
b. AsH_3
c. CO_2
d. BCl_3
e. Cl_2

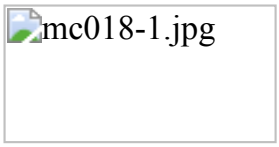
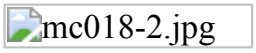
ANSWER: B
POINTS: 0 / 1

___ 16. _____ are particularly polarizable.
a. Small nonpolar molecules
b. Small polar molecules
c. Large nonpolar molecules
d. Large polar molecules
e. Large molecules, regardless of their polarity,

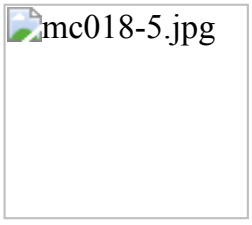
ANSWER: E
POINTS: 0 / 1

___ 17. Which one of the following derivatives of ethane has the highest boiling point?
a. C_2Br_6
b. C_2F_6
c. C_2I_6
d. C_2Cl_6
e. C_2H_6

ANSWER: C
POINTS: 0 / 1

___ 18. Which one of the following substances will not have hydrogen bonding as one of its intermolecular forces?
a.

b.

c.

d.

e.


ANSWER: A
POINTS: 0 / 1

___ 19. The shape of a liquid's meniscus is determined by _____.
a. the viscosity of the liquid
b. the type of material the container is made of

c. the relative magnitudes of cohesive forces in the liquid and adhesive forces between the liquid and its container
d. the amount of hydrogen bonding in the liquid
e. the volume of the liquid

ANSWER: C
POINTS: 0 / 1

___ 20. Viscosity is _____.
a. the "skin" on a liquid surface caused by intermolecular attraction
b. the resistance to flow
c. the same as density
d. inversely proportional to molar mass
e. unaffected by temperature

ANSWER: B
POINTS: 0 / 1

___ 21. The property responsible for the "beading up" of water is _____.
a. density
b. viscosity
c. vapor pressure
d. surface tension
e. hydrogen bonding

ANSWER: D
POINTS: 0 / 1

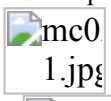
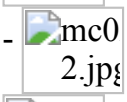
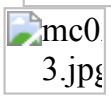
___ 22. A substance that expands to fill its container yet has a density approaching that of a liquid, and that can behave as a solvent is called a(n) _____.
a. plasma
b. gas
c. liquid
d. amorphous solid
e. supercritical fluid and gas

ANSWER: E
POINTS: 0 / 1

___ 23. A volatile liquid is one that _____.
a. is highly flammable
b. is highly viscous
c. is highly hydrogen-bonded
d. is highly cohesive
e. readily evaporates

ANSWER: E
POINTS: 0 / 1

___ 24. The slope of a plot of the natural log of the vapor pressure of a substance versus 1/T is _____.

a. ΔH_{vap}
b. $-\Delta H_{vap}$
c. 
d. - 
e. 

ANSWER: D
POINTS: 0 / 1

___ 25. Diethyl ether is a volatile organic compound. The vapor pressure of diethyl ether is 401 mm Hg at 18°C and the ΔH_{vap} = 26.0 kJ/mol. Calculate the vapor pressure of diethyl ether at 25°C.

a. 401 mm Hg
b. 500 mm Hg
c. 517 mm Hg
d. 598 mm Hg
e. 605 mm Hg

ANSWER: C
POINTS: 0 / 1

___ 26.

The phase diagram of a substance is given above. This substance is a _____ at 25°C and 1.0 atm.

a. solid
b. liquid
c. gas
d. supercritical fluid

e. crystal

ANSWER: B
POINTS: 0 / 1

___ 27. When the phase diagram for a substance has a solid-liquid phase boundary line that has a negative slope (leans to the left), the substance _____.
a. can go from solid to liquid, within a small temperature range, via the application of pressure
b. sublimes rather than melts under ordinary conditions
c. cannot go from solid to liquid by application of pressure at any temperature
d. cannot be liquefied above its triple point
e. melts rather than sublimes under ordinary conditions

ANSWER: A
POINTS: 0 / 1

___ 28. What fraction of the volume of each corner atom is actually within the volume of a face-centered cubic unit cell?
a. 1
b. 
c. 
d. 
e. 

ANSWER: D
POINTS: 0 / 1

___ 29. A solid has a very high melting point, great hardness, and poor electrical conduction. This is a(n) _____ solid.
a. ionic
b. molecular
c. metallic
d. covalent network
e. metallic and covalent network

ANSWER: D
POINTS: 0 / 1

Free Response

30. Answer the following questions about water using principles of solids, liquids, gases, and intermolecular forces:

a. Why does water boil at a lower temperature in Denver, CO than in NYC?

b. For substances of similar molar mass, why does water have unusually high values for boiling point, heat of vaporization, and surface tension?

c. What structural features of ice cause it to float on liquid water?

d. Why does calcium chloride dissolve exothermically in water?

RESPONSE:

ANSWER: a. Boiling point is the temperature at which the vapor pressure of a liquid equals the atmospheric pressure. Vapor pressure increases with increasing temperature. Due to its relatively high elevation above sea level, the atmospheric pressure in Denver is lower than that in NYC. Consequently, a lower temperature is required to reach the vapor pressure equal to the lower pressure in Denver.

b. Water forms very storng hydrogen bonds among its molecules which hold the molecules together in the liquid phase much more than liquids having the relatively weak dipole-dipole or dispersion forces.

c. The hydrogen bonding in water causes ice to form a relatively open hexagonal structure that is less dense (greater volume) than the liquid.

d. The process of dissolving an ionic substance in water breaks the ion-ion bonds (always endothermic to break bonds) and forms ion-dipole interactions (always exothermic to make bonds) with water. The fact that calcium chloride dissolves exothermically means that the ion-dipole interactions formed in the solution are stronger than the ion-ion interactions of the solid ion matter.

POINTS: -- / 1

31.

Process	ΔH (kJ/mol_{rxn})
$Br_2(l) \ddagger Br_2(g)$	30.91
$I_2(s) \ddagger I_2(g)$	62.44

At 298 K and 1 atm, the standard state of Br_2 is liquid, whereas the standard state of I_2 is solid. The enthalpy changes for the formation of $Br_2(g)$ and $I_2(g)$ from these elemental forms at 298 K and 1 atm are given in the table above.

a. Explain why ΔH for the formation of $I_2(g)$ from $I_2(s)$ is larger than the ΔH for the formation of $Br_2(g)$ from $Br_2(l)$. In your explanation identify the type of particle interactions involved and a reason for the difference in magnitude of

those interactions.

b. $I_2(s)$ and $Br_2(l)$ can react to form the compound IBr(l). Predict which would have the greater molar enthalpy of vaporization, IBr(l) or $Br_2(l)$. Justify your prediction.

RESPONSE:

ANSWER: a. London dispersion forces, the only intermolecular forces involved for both of these nonpolar molecules, will be stronger in I_2 because of its greater number of elctrons and larger size. The ΔH of sublimation is approximately that of ΔH of fusion plus ΔH of vaporization. I_2 should have a larger ΔH of formation since it involves sublimation, whereas Br_2 formation involves only vaporization.

b. IBr(l). IBr is polar, and dipole-dipole forces would tend to increase the enthalpy of vaporization. IBr should have stronger LDF becasue of the great number of electrons in the larger IBr molecule.

POINTS: -- / 1

Retake Test