AP Chem Chapter 13 Homework

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

____ 1. Which one of the following statements does **not** describe the general properties of liquids accurately?
a. Liquids have characteristic volumes that do not change greatly with changes in temperature. (Assuming that the liquid is not vaporized.)
b. Liquids have characteristic volumes that do not change greatly with changes in pressure.
c. Liquids diffuse only very slowly when compared to solids.
d. The liquid state is highly disordered compared to the solid state.
e. Liquids have high densities compared to gases.

____ 2. Identify which property liquids do not have in common with solids.
a. rigid shape
b. volumes do not change significantly with pressure
c. hydrogen bonding forces can be significant
d. practically incompressible
e. volumes do not change significantly with temperature

____ 3. Which one of the following statements does **not** describe the general properties of solids accurately?
a. Solids have characteristic volumes that do not change greatly with changes in temperature.
b. Solids have characteristic volumes that do not change greatly with changes in pressure.
c. Solids diffuse only very slowly when compared to liquids and gases.
d. Solids are not fluid.
e. Most solids have high vapor pressures at room temperature.

____ 4. Which of the following interactions are the strongest?
a. hydrogen bonding force
b. ion-ion interactions
c. permanent dipole force
d. dispersion force
e. London force

____ 5. The boiling points of the halogens increase in the order $F_2 < Cl_2 < Br_2 < I_2$ due to the resulting increasing _____ interactions.
a. ion-dipole
b. hydrogen-bonding
c. ion-ion
d. dispersion forces
e. permanent dipole-dipole

____ 6. For which of the following would permanent dipole-dipole interactions play an important role in determining physical properties in the liquid state?
a. BF_3
b. ClF
c. $BeCl_2$
d. F_2
e. CCl_4

____ 7. For which of the following would dispersion forces be the most important factor in determining physical properties in the liquid state?

a. H_2O
b. NaCl
c. F_2
d. HF
e. NH_4Cl

____ 8. Which response correctly identifies all the interactions that might affect the properties of BrI?
a. dispersion force, ion-ion interaction
b. hydrogen bonding force, dispersion force
c. permanent dipole force
d. permanent dipole force, dispersion force
e. dispersion force

____ 9. Which response correctly identifies all the interactions that might affect the properties of BF_3?
a. dispersion force, ion-ion interaction
b. hydrogen bonding force, dispersion force
c. permanent dipole force
d. permanent dipole force, dispersion force
e. dispersion force

____ 10. In which of the following would dispersion forces be the **only significant** factors in determining boiling point?

I. Ar
II. Li_2SO_4
III. SiF_4
IV. Br_2
V. NH_3

a. I, II, and III
b. II, IV, and V
c. I, III, and IV
d. I, IV and V
e. II and V

____ 11. Which response includes all of the following substances that can exhibit hydrogen bonding, and no others?

I. H_2
II. CH_4
III. NH_3
IV. SiH_4
V. HF

a. II and V
b. I, II, and III
c. III, IV, and V
d. III and V
e. I, III, and IV

____ 12. Which liquid would have the highest viscosity at room temperature?
a. $C_8H_{17}NH_2$
b. C_7H_{14}

c. C_9H_{18}
d. C_5H_{12}
e. CH_3NH_2

____ 13. Which liquid would evaporate most quickly at room temperature?
a. H_2O, 18 g/mol
b. Gasoline, C_8H_{18}, 114 g/mol
c. Vegetable oil, 895 g/mol
d. Mineral oil, $C_{12}H_{26}$, 170 g/mol
e. Ethylene glycol, $HO\text{-}CH_2\text{-}CH_2\text{-}OH$, 62 g/mol

____ 14. Which property is not affected by strength of intermolecular forces?
a. viscosity
b. boiling point
c. density
d. vapor pressure
e. molar heat of vaporization

____ 15. Which of the following boils at the **highest** temperature?
a. C_2H_6
b. C_3H_8
c. C_4H_{10}
d. C_5H_{12}
e. C_6H_{14}

____ 16. Which one of the following would have the highest molar heat of vaporization?
a. CH_3NH_2
b. CH_4
c. C_2H_6
d. SiH_4
e. H_2S

____ 17. Which statement is **false**?
a. In the absence of a phase change, the viscosity of a liquid increases as temperature decreases.
b. All other factors being equal, if adhesive forces are strong, capillary action is likely to occur less readily than if adhesive forces are weak.
c. The shape of a meniscus depends on the difference between the strengths of cohesive forces and adhesive forces.
d. Liquids with strong cohesive forces have high heats of vaporization.
e. Vaporization of liquids can occur below their normal boiling points at one atmosphere pressure.

____ 18. Which one of the following statements does **not** describe the general properties of liquids accurately?
a. In the liquid state the close spacing of molecules leads to large intermolecular forces that are strongly dependent on the nature of the molecules involved.
b. Liquids are practically incompressible.
c. As the temperature of a liquid is increased, the vapor pressure of the liquid decreases.
d. The normal boiling point of a liquid is the temperature at which the vapor pressure of the liquid becomes equal to exactly 760 torr.
e. Vapor pressures of liquids at a given temperature differ greatly, and these differences in vapor pressure are due to the nature of the molecules in different liquids.

____ 19. Using the Clausius-Clapeyron equation determine the vapor pressure of water at 50.0°C. The molar heat of vaporization of water is 40.7 kJ/mol.

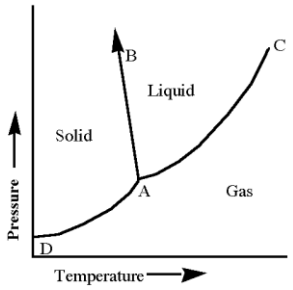
$$\ln\left(\frac{P_2}{P_1}\right) = \frac{\Delta H_{vap}}{R}\left(\frac{1}{T_1} - \frac{1}{T_2}\right)$$

a. 700 torr
b. 450 torr
c. 100 torr
d. 80 torr
e. 55 torr

____ 20. Which substance would be expected to have the **highest** heat of vaporization?
a. F_2
b. CCl_4
c. C_2H_6
d. CH_3OCH_3
e. CH_2OHCH_2OH

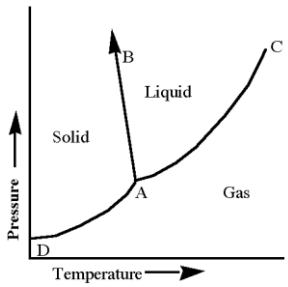
____ 21. Some solids can be converted directly to the vapor phase by heating. The process is called _____.
a. fusion
b. sublimation
c. vaporization
d. condensation
e. distillation

____ 22. A sketch of the phase diagram (not to scale) of water is given below.



Which statement is **false**?
a. Line AD is the sublimation curve - solid and vapor are in equilibrium.
b. Point A is the triple point - solid, liquid, and vapor are at equilibrium.
c. Line AC is the vapor pressure curve - liquid and gas (vapor) are in equilibrium.
d. Line AB is the melting curve - solid and liquid are in equilibrium.
e. The slope of line AB is negative showing that as the liquid is cooled, the molecules get closer and closer together as they solidify.

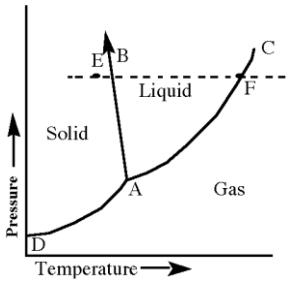
____ 23. A sketch of a phase diagram is given below.



Which statement about this diagram is <u>not true</u>?

a. Increasing pressure at constant temperature can melt the solid.
b. Increasing temperature at constant pressure can cause the solid to sublime.
c. Increasing temperature at constant pressure can cause the liquid to vaporize.
d. Increasing pressure at constant temperature can cause deposition of solid from gas.
e. Increasing pressure at constant temperature can cause liquid to freeze.

____ 24. A sketch of the phase diagram (not to scale) of water is given below.



Which statement concerning the path (broken line) is **false**?

a. At point E the water is all solid (ice).
b. If heat is added to the ice at point E, the temperature of the ice increases until line AB is reached, then the temperature remains constant until all of the ice is melted into liquid.
c. Once all the ice has melted (at the intersection of the broken line and line AB) the temperature of the water increases as heat is added until point F is reached.
d. If more heat is added upon reaching point F, the temperature will remain constant as the liquid water vaporizes.
e. Another way to vaporize all of the liquid water at point F is to increase the pressure.

____ 25. In a body-centered cubic lattice, how many atoms are contained in a unit cell?

a. one
b. two
c. three
d. four
e. five

____ 26. Which one of the following statements is **not** applicable to **metallic** solids?

a. The units that occupy the lattice points are positive ions.
b. The binding forces in metallic solids are shared electron pairs.
c. The melting points of metallic solids vary over a large range.
d. The hardness of metallic solids varies from quite soft to quite hard.
e. Metallic solids conduct electric current well.

____ 27. Which one of the following statements is **not** applicable to **molecular** solids?
a. The units that occupy the lattice points are molecules.
b. The binding forces in molecular solids are dispersion forces or dispersion forces and dipole-dipole interactions.
c. Molecular solids have relatively low melting points.
d. Molecular solids are usually excellent conductors of electric current.
e. Molecular solids are soft compared to covalent solids.

____ 28. Which one of the following is a covalent solid?
a. sulfur trioxide
b. nickel
c. ammonium chloride
d. silicon carbide, SiC
e. sucrose, $C_{12}H_{22}O_{11}$

____ 29. Which one of the following is an ionic solid?
a. graphite
b. nickel
c. ammonium chloride
d. silicon carbide, SiC
e. sucrose, $C_{12}H_{22}O_{11}$

____ 30. Which one of the following is a metallic solid?
a. graphite
b. sulfur
c. nickel
d. iodine
e. neon

____ 31. Which type of solid is expected for SO_2?
a. covalent
b. ionic
c. metallic
d. molecular
e. hypersaturated

____ 32. Which one of the following is classified as a covalent solid?
a. K_2SO_4
b. Cr
c. CO_2
d. C
e. CH_4

____ 33. Which of the following, in the solid state, would be an example of a molecular crystal?
a. diamond
b. copper
c. phosphorus trichloride
d. magnesium fluoride
e. sodium chloride

____ 34. Which one of the following substances is **incorrectly** matched with the kind of solid it forms?

Substance	Kind of Solid

a. sulfur dioxide molecular
b. graphite covalent
c. calcium bromide ionic
d. lithium ionic
e. methane molecular

____ 35. Which statement is **false**?
a. Molecular solids generally have lower melting points than covalent solids.
b. Metallic solids exhibit a wide range of melting points.
c. The lattice of a metallic solid is defined by the position of the metal nuclei, and the valence electrons are distributed over the lattice as a whole.
d. Most molecular solids melt at lower temperatures than metallic solids.
e. The interactions among the molecules in molecular solids are generally stronger than those among the particles that define either covalent or ionic lattices.

____ 36. Substances have properties that are related to their structures. Which of the following statements regarding properties of solids is **not** expected to be correct?
a. Molten KBr should be a good conductor of electricity.
b. Diamond should have a high melting point.
c. Solid sodium should be a good conductor of electricity.
d. Solid CaF_2 should have a low melting point.
e. Silicon carbide, SiC, should not sublime readily.

____ 37. Which of the following compounds would be expected to have the highest melting point?
a. BaF_2
b. $BaCl_2$
c. $BaBr_2$
d. BaI_2
e. NaF

____ 38. Arrange the following **ionic** compounds in order of increasing melting points.

NaF, MgF_2, AlF_3, NaBr, NaI

Increasing Melting Points →

a. NaF < NaBr < NaI < MgF_2 < AlF_3
b. NaBr < NaI < NaF < AlF_3 < MgF_2
c. MgF_2 < AlF_3 < NaF < NaI < NaBr
d. AlF_3 < MgF_2 < NaF < NaBr < NaI
e. NaI < NaBr < NaF < MgF_2 < AlF_3

____ 39. Arrange the following in order of increasing melting points.

KCl, He, H_2O, HF

a. He < H_2O < HF < KCl
b. H_2O < HF < He < KCl
c. KCl < H_2O < HF < He
d. He < HF < H_2O < KCl
e. H_2O < He < KCl < HF

____ 40. The conduction band of magnesium is thought to result from the combination of molecular orbitals resulting from overlap of _____ atomic orbitals.

a. 3*s* and 3*p*
b. 3*s* and 3*d*
c. 3*d* and 4*s*
d. 3*p* and 3*d*
e. 3*s* and 4*s*

AP Chem Chapter 13 Homework
Answer Section

MULTIPLE CHOICE

1.	ANS: C	PTS: 1	TOP:	Kinetic-Molecular Description of Liquids and Solids
2.	ANS: A	PTS: 1	TOP:	Kinetic-Molecular Description of Liquids and Solids
3.	ANS: E	PTS: 1	TOP:	Kinetic-Molecular Description of Liquids and Solids
4.	ANS: B	PTS: 1	TOP:	Intermolecular Attractions and Phase Changes
5.	ANS: D	PTS: 1	TOP:	Intermolecular Attractions and Phase Changes
6.	ANS: B	PTS: 1	TOP:	Intermolecular Attractions and Phase Changes
7.	ANS: C	PTS: 1	TOP:	Intermolecular Attractions and Phase Changes
8.	ANS: D	PTS: 1	TOP:	Intermolecular Attractions and Phase Changes
9.	ANS: E	PTS: 1	TOP:	Intermolecular Attractions and Phase Changes
10.	ANS: C	PTS: 1	TOP:	Intermolecular Attractions and Phase Changes
11.	ANS: D	PTS: 1	TOP:	Intermolecular Attractions and Phase Changes
12.	ANS: A	PTS: 1	TOP:	Intermolecular Attractions and Phase Changes
13.	ANS: B	PTS: 1	TOP:	Intermolecular Attractions and Phase Changes
14.	ANS: C	PTS: 1	TOP:	Intermolecular Attractions and Phase Changes
15.	ANS: E	PTS: 1	TOP:	Intermolecular Attractions and Phase Changes
16.	ANS: A	PTS: 1	TOP:	Intermolecular Attractions and Phase Changes
17.	ANS: B	PTS: 1	TOP:	The Liquid State
18.	ANS: C	PTS: 1	TOP:	The Liquid State
19.	ANS: C	PTS: 1	TOP:	Heat Transfer Involving Liquids
20.	ANS: E	PTS: 1	TOP:	Heat Transfer Involving Liquids
21.	ANS: B	PTS: 1	TOP:	Sublimation
22.	ANS: E	PTS: 1	TOP:	Phase Diagrams (P vs. T)
23.	ANS: E	PTS: 1	TOP:	Phase Diagrams (P vs. T)
24.	ANS: E	PTS: 1	TOP:	Phase Diagrams (P vs. T)
25.	ANS: B	PTS: 1	TOP:	Structures of Crystals
26.	ANS: B	PTS: 1	TOP:	Bonding in Solids
27.	ANS: D	PTS: 1	TOP:	Bonding in Solids
28.	ANS: D	PTS: 1	TOP:	Bonding in Solids
29.	ANS: C	PTS: 1	TOP:	Bonding in Solids
30.	ANS: C	PTS: 1	TOP:	Bonding in Solids
31.	ANS: D	PTS: 1	TOP:	Bonding in Solids
32.	ANS: D	PTS: 1	TOP:	Bonding in Solids
33.	ANS: C	PTS: 1	TOP:	Bonding in Solids
34.	ANS: D	PTS: 1	TOP:	Bonding in Solids
35.	ANS: E	PTS: 1	TOP:	Bonding in Solids
36.	ANS: D	PTS: 1	TOP:	Bonding in Solids
37.	ANS: A	PTS: 1	TOP:	Bonding in Solids
38.	ANS: E	PTS: 1	TOP:	Bonding in Solids
39.	ANS: D	PTS: 1	TOP:	Bonding in Solids
40.	ANS: A	PTS: 1	TOP:	Band Theory of Metals