

Chapter 11

1. The number of cubic lattice types which crystals can be formed in is
 - A) 1
 - B) 2
 - C) 3
 - D) 4
 - E) 5

2. The cubic lattice types in which crystals have been known to crystallize are
 - A) simple cubic and body centered cubic, only
 - B) simple cubic and face centered cubic, only
 - C) simple cubic, face centered cubic and body centered cubic, only
 - D) simple cubic, face centered cubic and edge centered cubic, only
 - E) body centered cubic, face centered cubic and edge centered cubic, only

3. The close packed layer arrangements of certain atomic crystals fall into classes called,
 - A) simple cubic close packed and face centered cubic close packed
 - B) simple cubic close packed and hexagonal cubic close packed
 - C) cubic close packed and hexagonal close packed
 - D) cubic close packed and tetrahedral close packed
 - E) hexagonal close packed and tetrahedral close packed

4. How many atoms are there per unit cell in metallic tungsten if it forms a face centered cubic unit cell?
 - A) 2
 - B) 4
 - C) 8
 - D) 9
 - E) 14

5. A unit cell of sodium chloride (face centered cubic) was chosen so that the face centered cube was formed from sodium ions. A certain number of sodium ion lattice points and a certain number of chloride ion lattice points are required. How many chloride ion lattice points are there in the unit cell as described above?
 - A) 1
 - B) 4
 - C) 9
 - D) 12
 - E) 13

6. Which one of the following substances would you expect to form molecular crystals when it solidifies?
- A) KF
 - B) F₂
 - C) AgBr
 - D) SiO₂
 - E) Co
7. Copolymers with ester linkages between the units are linked through a
- A) C—O bond
 - B) C—N bond
 - C) C—C bond
 - D) N—O bond
 - E) N—N bond
8. Boron nitride, which has the empirical formula: BN, melts at _____ and is nearly as hard as diamond. Which category of substance does it most likely fit under?
- A) ionic
 - B) molecular
 - C) metallic
 - D) covalent (network)
 - E) amorphous
9. The term, London forces, is a synonym for
- A) ion-ion forces
 - B) permanent dipole–permanent dipole interactions
 - C) hydrogen bonding
 - D) instantaneous dipole-instantaneous dipole interactions
 - E) instantaneous dipole-induced dipole interactions
10. Which one of the following molecules is most polarizable, and subject to significant instantaneous dipole-induced dipole forces?
- A) H₃C—Br
 - B) H₃C—Cl
 - C) H₃C—F
 - D) H₃C—H
 - E) H₃C—I

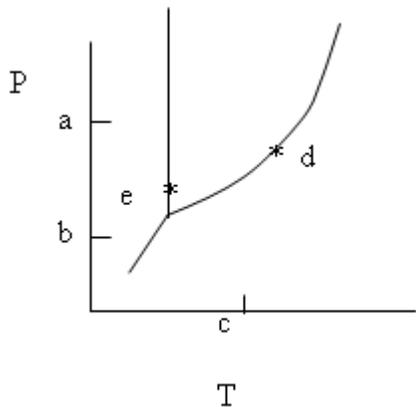
11. For a series of small molecules of comparable molecular weight, which one of the following choices lists the intermolecular forces in the correct increasing order?
- A) hydrogen bonds < dipole–dipole forces < London forces
 - B) dipole–dipole forces < hydrogen bonds < London forces
 - C) London forces < hydrogen bonds < dipole–dipole forces
 - D) hydrogen bonds < London forces < dipole–dipole forces
 - E) London forces < dipole–dipole forces < hydrogen bonds
12. What one of the following covalent compounds will not exhibit hydrogen bonding in the liquid state?
- A) $\text{CH}_3\text{—CH}_2\text{—Br}$
 - B) $\text{CH}_3\text{—CH}_2\text{—NH}_2$
 - C) $\text{CH}_3\text{—CH}_2\text{—CH}_2\text{—OH}$
 - D) $\text{CH}_3\text{—NH—CH}_3$
 - E) $\text{NH}_2\text{—O—H}$
13. Which one of the following covalent compounds will exhibit hydrogen bonding in the liquid state?
- A) CH_2F_2
 - B) Cl_2NH
 - C) H_2PCI
 - D) HBr
 - E) NCl_3
14. Which compound is expected to have the strongest intermolecular forces?
- A) $\text{CH}_3\text{—CH}_2\text{—H}$
 - B) $\text{CH}_3\text{—CH}_2\text{—O—H}$
 - C) $\text{CH}_3\text{—CH}_2\text{—PH}_2$
 - D) $\text{CH}_3\text{—CH}_2\text{—S—H}$
 - E) $\text{CH}_3\text{—CH}_2\text{—Se—H}$
15. Which compound is expected to exhibit hydrogen bonding forces?
- A) $\text{CH}_3\text{—CH}_2\text{—H}$
 - B) $\text{CH}_3\text{—CH}_2\text{—O—H}$
 - C) $\text{CH}_3\text{—CH}_2\text{—PH}_2$
 - D) $\text{CH}_3\text{—CH}_2\text{—S—H}$
 - E) $\text{CH}_3\text{—CH}_2\text{—Se—H}$

16. At 1.0 atm pressure, ice (solid H_2O) floats in water instead of sinking. The reason for this is
- A) when water freezes, it expands instead of contracting
 - B) the fusion process is endothermic, therefore the solid will float
 - C) the triple point has a lower temperature than the freezing point for water
 - D) the critical temperature has a higher temperature than the normal boiling point
 - E) the triple point corresponds to a pressure below 1 standard atmosphere
17. A liquid which is at room temperature is in equilibrium with its vapor, because there is a cover on the container. If the cover is removed, what is the immediate result?
- A) the average kinetic energy increases
 - B) the evaporation rate decreases
 - C) the evaporation rate increases
 - D) the re-condensation rate decreases
 - E) the re-condensation rate increases
18. Which one of the following listed compounds should have the highest vapor pressure at a given temperature at which all these substances are in the liquid state?
- A) $\text{CH}_3\text{—CH}_2\text{—H}$
 - B) $\text{CH}_3\text{—O—CH}_3$
 - C) $\text{CH}_3\text{—CH}_2\text{—CH}_2\text{—CH}_3$
 - D) $\text{CH}_3\text{—CH}_2\text{—CH}_3$
 - E) $\text{CH}_3\text{—CH}_2\text{—S—H}$
19. The vapor pressure of a liquid increases with increasing temperature. The temperature at which this vapor pressure is equal to 760 torr or 101,325 Pa is
- A) the boiling point
 - B) the flash point
 - C) the vaporization point
 - D) $100\text{ }^\circ\text{C}$
 - E) the normal boiling point
20. Which one of the compounds listed below should have the highest boiling point temperature?
- A) $\text{CH}_3\text{—Br}$
 - B) $\text{CH}_3\text{—Cl}$
 - C) $\text{CH}_3\text{—F}$
 - D) $\text{CH}_3\text{—H}$
 - E) $\text{CH}_3\text{—I}$

21. Given the following substances and their normal boiling points, in °C:
 C: 43.8 °C D: 93.7 °C M: 56.7 °C T: 83.5 °C R: 63.6 °C
 Which set below correctly lists some of these liquids in order of **increasing** intermolecular forces at 20 °C?
- A) C < R < D
 B) D < T < R
 C) R < T < C
 D) C < D < M
 E) D < R < M
22. Supercooling is defined as
- A) the extremely rapid cooling of a vapor to form a liquid
 B) the use of extremely cold refrigerants to achieve smaller crystal size when liquids are frozen
 C) the extremely rapid cooling of a liquid to form a softer crystalline solid
 D) the cooling of a liquid to a temperature below its melting point without solidification
 E) the cooling of a substance to absolute zero
23. The triple point of a substance is the temperature and pressure at which
- A) all three physical states cease to exist
 B) sublimation, fusion, and condensation are taking place simultaneously
 C) the solid will always float on the liquid for all substances
 D) the vapor pressure of the liquid is higher than the vapor pressure of the solid
 E) the vapor pressure of the solid is higher than the vapor pressure of the liquid

Use the following to answer question 24:

The following questions refer to the phase diagram immediately below



24. Starting at the temperature and pressure of point c, if the pressure is increased, ultimately
- A) the substance will sublime
 - B) the substance will undergo fusion
 - C) the substance will undergo deposition
 - D) the substance will freeze
 - E) the substance will undergo condensation
25. Arrange, in order of increasing intermolecular attractive forces: CBr_4 , CCl_4 , CF_4 , CH_4 , Cl_4 .

Answer Key

1. C
2. C
3. C
4. B
5. E
6. B
7. A
8. D
9. E
10. E
11. E
12. A
13. B
14. B
15. B
16. A
17. D
18. A
19. E
20. E
21. A
22. D
23. B
24. E
25. $\text{CH}_4 < \text{CF}_4 < \text{CCl}_4 < \text{CBr}_4 < \text{Cl}_4$