

## 1331 – CHAPTER 11 QUESTIONS

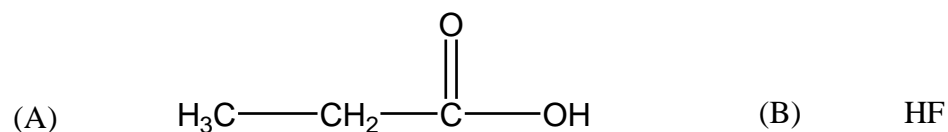
IGNORE QUESTIONS 3, 10, 37 onwards

### Intermolecular Forces

- The stronger the intermolecular forces in a substance
  - the higher the boiling point.
  - the lower the boiling point.
  - the higher the vapor pressure.
  - the smaller the deviation from ideal gas behavior.
- Which substance has the highest boiling point?
  - CH<sub>4</sub>
  - He
  - HF
  - Cl<sub>2</sub>
- Which one of these solid substances has a crystal structure containing discrete molecules?
  - dry ice
  - quartz
  - graphite
  - silver bromide
- Which group of substances is arranged in order from the highest to the lowest melting point?
  - HF>H<sub>2</sub>>NaF
  - NaF>H<sub>2</sub>>HF
  - HF>NaF>H<sub>2</sub>
  - NaF>HF>H<sub>2</sub>
- Which has the highest boiling point?
  - Ar
  - Kr
  - Xe
  - Ne
- Arrange KCl, NH<sub>3</sub>, and CH<sub>4</sub> in order of increasing boiling point.
  - CH<sub>4</sub><KCl<NH<sub>3</sub>
  - NH<sub>3</sub><KCl<CH<sub>4</sub>
  - CH<sub>4</sub><NH<sub>3</sub><KCl
  - NH<sub>3</sub><CH<sub>4</sub><KCl
- Which has the highest molar heat of vaporization?
  - S<sub>8</sub>
  - H<sub>2</sub>O
  - Ar
  - BaF<sub>2</sub>
- Which of the following properties does not increase with increasing intermolecular forces
  - viscosity
  - heat of vaporization
  - melting point
  - vapor pressure
- When liquid bromine is cooled to form a solid, which of the following types of solid would it form?
  - atomic
  - metallic
  - molecular
  - ionic
  - covalent network
- Which one of the following substances does not exist in the indicated solid type?
  - graphite – network covalent
  - Na – metallic
  - SiO<sub>2</sub> - molecular
  - NaCl – ionic
  - diamond – network covalent
- Neon condenses due to

- (A) dipole-dipole forces                      (B) London dispersion forces  
(C) hydrogen bonding                         (D) covalent bonding

12. Which of the following molecules will not form hydrogen bonds?



13. Ammonia's unusually high melting point is the result of

- (A) dipole-dipole forces                      (B) London dispersion forces  
(C) hydrogen bonding                         (D) covalent bonding

14. Octane is a component of fuel used in internal combustion engines. The dominant intermolecular forces in octane are

- (A) dipole-dipole forces                      (B) London dispersion forces  
(C) hydrogen bonding                         (D) covalent bonding

15. In hydrogen iodide \_\_\_\_\_ are the most important intermolecular forces.

- (A) dipole-dipole forces                      (B) London dispersion forces  
(C) hydrogen bonding                         (D) covalent bonding

16. When the electron cloud of a molecule is easily distorted, the molecule has a high \_\_\_\_\_.

- (A) polarity    (B) polarizability    (C) dipole moment    (D) van der Waals radius

17. Which of the following atoms should have the greatest polarizability?

- (A) F    (B) Br    (C) Po    (D) Pb

18. Which of the following atoms should have the smallest polarizability?

- (A) Si    (B) S    (C) Te    (D) Bi

19. The strongest intermolecular interactions between pentane ( $C_5H_{12}$ ) molecules arise from
- (A) dipole-dipole forces                      (B) London dispersion forces  
(C) hydrogen bonding                         (D) covalent bonding
20. The strongest intermolecular interactions between ethyl alcohol ( $CH_3CH_2OH$ ) molecules arise from
- (A) dipole-dipole forces                      (B) London dispersion forces  
(C) hydrogen bonding                         (D) covalent bonding
21. The strongest intermolecular interactions between hydrogen sulfide ( $H_2S$ ) molecules arise from
- (A) dipole-dipole forces                      (B) London dispersion forces  
(C) hydrogen bonding                         (D) covalent bonding
22. The strongest intermolecular interactions between hydrogen fluoride ( $HF$ ) molecules arise from
- (A) dipole-dipole forces                      (B) London dispersion forces  
(C) hydrogen bonding                         (D) covalent bonding
23. Which of the following will form hydrogen bonds between molecules?
- (A)  $(CH_3)_3N$                                   (B)  $CH_3-O-CH_3$   
(C)  $CH_3CH_2-OH$                               (D)  $CH_3CH_2-F$
24. Which of the following pairs is arranged with the particle of higher polarizability listed first?
- (A)  $Se^{2-}, S^{2-}$                                   (B)  $I, I^-$     (C)  $Mg^{2+}, Mg$                                   (D)  $Br, I$
25. Which of the following pairs is arranged with the particle of higher polarizability listed first?
- (A)  $CCl_4, Cl_4$                                   (B)  $H_2O, H_2Se$                                   (C)  $C_6H_{14}, C_4H_{10}$                                   (D)  $NH_3, NF_3$
26. Which of the following should have the highest boiling point?
- (A)  $CF_4$     (B)  $CCl_4$     (C)  $CBr_4$     (D)  $Cl_4$
27. Which of the following should have the lowest boiling point?
- (A)  $C_5H_{12}$     (B)  $C_6H_{14}$     (C)  $C_8H_{18}$     (D)  $C_{10}H_{22}$
28. Which of the following has a boiling point which does not fit the general trend?
- (A)  $NH_3$     (B)  $PH_3$     (C)  $AsH_3$     (D)  $SbH_3$

29. Select the pair of compounds in which the substance with the higher vapor pressure at a given temperature is listed first.
- (A)  $C_7H_{16}$ ,  $C_5H_{12}$                       (B)  $CCl_4$ ,  $CBr_4$   
 (C)  $H_2O$ ,  $H_2S$                               (D)  $CH_3CH_2OH$ ,  $CH_3-O-CH_3$
30. Which of the following should have the highest surface tension at a given temperature?
- (A)  $CF_4$               (B)  $CCl_4$               (C)  $CBr_4$               (D)  $Cl_4$
31. The energy needed to increase the surface area of a liquid by one square meter is
- (A) capillary action                      (B) surface tension  
 (C) viscosity                              (D) cohesion
32. When the adhesive forces between a liquid and the walls of a capillary tube are greater than the cohesive forces within the liquid
- (A) the liquid level in a capillary tube will rise above the surrounding liquid and the surface in the capillary tube will have a convex meniscus  
 (B) the liquid level in a capillary tube will rise above the surrounding liquid and the surface in the capillary tube will have a concave meniscus  
 (C) the liquid level in a capillary tube will drop below the surrounding liquid and the surface in the capillary tube will have a convex meniscus  
 (D) the liquid level in a capillary tube will drop below the surrounding liquid and the surface in the capillary tube will have a concave meniscus
33. The resistance of a liquid to flow is
- (A) surface tension              (B) capillary action              (C) viscosity              (D) adhesion
34. Which of the following factors contributes to a low viscosity for a liquid?
- (A) low temperature                      (B) spherical molecular shape  
 (C) hydrogen bonding                      (D) high molecular weight
35. Which of the following liquid substances would you expect to have the lowest surface tension?
- (A) Pb    (B)  $CH_3OCH_3$     (C)  $HOCH_2CH_2OH$     (D)  $H_2O$     (E)  $CH_3CH_2OH$
36. Which of the following liquids is likely to have the highest surface tension?
- (A)  $Br_2$     (B)  $C_8H_{18}$               (C)  $CH_3OCH_3$               (D) Pb    (E)  $CH_3OH$

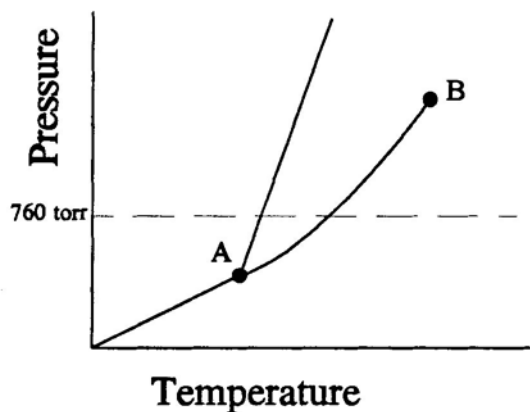
## Phase Changes

37. How much energy is released when 100.0 g of diethylether is cooled from 53.0 °C to 10.0 °C?

Boiling point = 34.5 °C;  $\Delta H_{\text{vap}} = 351 \text{ J/g}$ ; specific heat of liquid = 3.74 J/g K; specific heat of gas = 2.35 J/g K

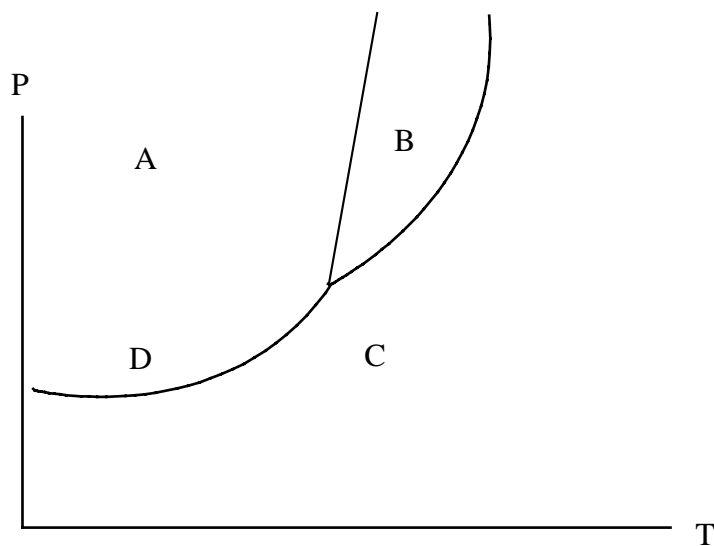
- (A) 10.1 kJ      (B) 13.1 kJ      (C) 16.1 kJ      (D) 48.6 kJ

38. Examine the following phase diagram and identify the feature represented by point A.



- A. melting point    B. critical point    C. triple point    D. sublimation point

39. What are the changes in phase going from points A to B to C to D



- A. melting, vaporization, deposition    B. vaporization, freezing, sublimation  
 C. sublimation, freezing, melting    D. freezing, sublimation, vaporization  
 E. melting, sublimation, deposition

**Answers:**    A C A D C | C D D C C | B C C B A | B D B B C | A C C A C | D A A B D | B B C B B |  
 D D C A