

## CHEM 1100 Chapter 11 Study Guide

### Outline

#### I. Intermolecular interactions (or forces)

##### A. Ion-Ion interactions

##### B. Dipole-Dipole interactions

##### C. Dispersion (or London) Forces

##### D. Hydrogen Bonding

#### II. Properties of Liquids

##### A. Boiling Point and Freezing Point

###### 1. Definition

###### 2. Effect of intermolecular interaction

##### B. Viscosity

###### 1. Definition

###### 2. Effect of intermolecular interaction

##### C. Surface tension

###### 1. Definition

###### 2. Effect of intermolecular interaction

#### III. Phase diagrams

##### A. Various parts of a phase diagram

###### 1. Vaporization Curve

###### 2. Fusion Curve

###### 3. Sublimation Curve

###### 4. Triple Point

###### 5. Critical Point

##### B. Definitions

###### 1. Isotherm

2. Isobar
3. Isochor
4. Heat of Vaporization
5. Heat of sublimation
6. Heat of fusion

#### IV. Solids

##### A. Based on Structure

1. Amorphous
2. Crystalline
  - a. Kinds of crystals
  - b. Unit cell
  - c. Lattice point
  - d. Coordination number
  - e. Closest packed
  - f. Electron Diffraction and Calculation of Density

##### B. Based on Interactions

1. Ionic
2. Molecular
3. Covalent network
4. Metallic

#### V. Metallic Bonding

##### A. Properties of Metals

1. Malleable
2. Ductile
3. Conductive

##### B. Electron Sea Theory

C. Band Theory

1. Valence Band

2. Conduction Band

3. Band Gap

D. Alloys

E. Semi Conductors

F. Polymers

Practice Problems

1. The temperature at which the vapor pressure of a liquid is equal to 1.00 atmosphere is called the
  - a. critical point
  - b. triple point
  - c. normal sublimation point
  - d. normal boiling point
2. A constant pressure line on a phase diagram is called a(n)
  - a. isobar
  - b. isochor
  - c. isotherm
  - d. isopleth
3. Which of the following will have the lowest vapor pressure at the same temperature?
  - a. O<sub>2</sub>
  - b. N<sub>2</sub>
  - c. H<sub>2</sub>S
  - d. H<sub>2</sub>O
4. Which of the following has the highest melting point?
  - a. O<sub>2</sub>
  - b. Na<sub>2</sub>O
  - c. MgO
  - d. H<sub>2</sub>O
5. When the cohesive forces of a liquid are greater than the adhesive forces of the liquid for a capillary, the meniscus will be positive or negative? (circle one)

6. The resistance of a liquid to flow is called
- capillary action
  - resistivity
  - surface tension
  - viscosity
7. The number of atoms in a face centered cubic cell is
- 1
  - 2
  - 4
  - 12
  - none of the above
8. The number of nearest neighbor atoms is referred to as the
- coordination number
  - lattice point
  - packing efficiency
  - unit cell number
9. The point of a one component phase diagram where the solid, liquid and gas are all in equilibrium is called the
- critical point
  - triple point
  - standard boiling point
  - normal boiling point
10. The energy required to convert one mole of liquid to one mole of gas at constant pressure is called what?
11. A solid is soft and has a low melting point (below 100 C). The solid, its melt, and a solution containing the substance are all nonconductors of electricity. Classify the solid.
- covalent network solid
  - ionic solid
  - metallic solid
  - molecular solid
12. Distinct crystal structures of a single element are called \_\_\_\_\_.
13. The small molecule that is linked together to form a polymer is called a \_\_\_\_\_.
14. What element is added to a silicon chip to form a p-type semiconductor?
15. When a different metal is inserted in the gaps in a metal crystal it is referred to as what kind of alloy?

16. 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

17. Chromium crystallizes in a body-centered cubic unit cell. There are \_\_\_\_\_ chromium atoms per unit cell.

- a. 1
- b. 2
- c. 4
- d. 8
- e. 12

18. What classification of a solid conducts and its melt also conducts?

- a. covalent network solid
- b. ionic solid
- c. metallic solid
- d. molecular solid

19. The normal boiling point occurs when the

- a. vapor pressure of the liquid equals the external pressure
- b. vapor pressure of a pure liquid equals an external pressure of one atmosphere
- c. intermolecular forces within the liquid phase are broken
- d. temperature of the pure liquid equals the external temperature

20. Which of the following has the lowest boiling point?

- a. CO
- b. CH<sub>3</sub>F
- c. HCl
- d. N<sub>2</sub>

21. Which of the following is most likely to have the highest viscosity at 25 C?

- a. N<sub>2</sub>
- b. H<sub>2</sub>O
- c. HBr
- d. CO<sub>2</sub>