**Unit 5 Guide: Liquids and Solutions**

January 7th – January 24th (14 days)

AP Chemistry

**Week 1 objectives Reading (for homework):** Chapter 11 in B&L (pgs. 425 – 452)

By the end of week 1, you will be able to….

* Identify five types of intermolecular forces: dispersion forces, dipole-dipole forces, hydrogen bonds, and ion-dipole forces) (section 11.2, pgs. 428 – 436)

Explain each of the four forces here:

Dispersion forces: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Dipole-dipole forces: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Hydrogen bonds: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Ion-dipole forces: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Ionic bonds: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* Rank intermolecular forces by strength (see above)
* Compare and contrast intermolecular forces with Van der Waals forces:

What do intermolecular forces have in common?

What makes a Van der Waals force different from other intermolecular forces?

* Understand and be able to describe the following properties of liquids:

Viscosity (pg. 437): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

What affects viscosity? How can you know whether or not a liquid will be viscous?

Surface tension (pg. 437): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

What affects surface tension? How can you predict whether a liquid will have high or low surface tension?

Volatility (pg. 443): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

What affects volatility? How can you know whether or not a liquid will be volatile?

* Explain the meaning of the term “vapor pressure”

Vapor pressure is…

* Explain how vapor pressure is a type of dynamic equilibrium.

Dynamic equilibrium is:

How is vapor pressure a type of dynamic equilibrium?

* Be able to explain the relationship between vapor pressure and boiling point.

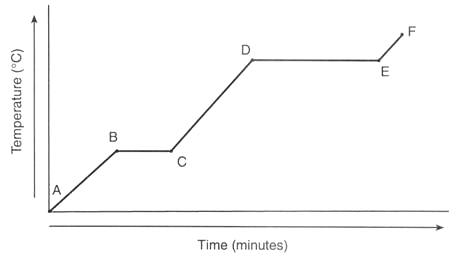
As vapor pressure increases, boiling point \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

* Draw diagrams of intermolecular forces using Lewis dot diagrams and dotted lines

**Week 2: Properties of Solutions**

By the end of week 2, you will be able to…

* Explain how intermolecular forces relate to: boiling point, freezing point, solubility. (11.3 – 11.4)
* Use knowledge of intermolecular forces to predict the relative boiling points, freezing points, or solubility of different compounds. (11.3 – 11.4)
* Predict the relative boiling points of different substances based on intermolecular forces. (LAB)



* Interpret a heating curve for a substance. (see diagram🡪)

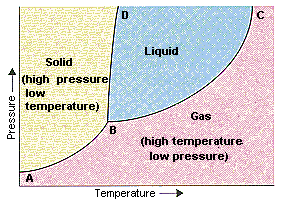
Label the heating curve to the right with the following terms: melting, vaporization, ice, liquid water, steam, melting point, boiling point

* Explain how each of the following is related to phase changes:

Heat of fusion/enthalpy of fusion (Δ*H*fus):

Heat of vaporization/enthalpy of vaporization (Δ*H*vap):

Heat of sublimation/enthalpy of sublimation (Δ*H*sub):

* Be able to interpret a phase diagram (pgs. 445 – 448, see right)

Label the phase diagram with the triple point, and show where the substance would become a supercritical fluid.

* Interpret a phase diagram for a given substance. (11.6)

**Assigned reading and problems from Brown and Lemay:**

**Chapter 8,** all sections (pgs. 289 – 320)

**Problems:** 8.1 – 8.13 odds, 8.17, 8.21, 8.23, 8.24, 8.25, 8.31, 8.33, 8.34, 8.41, 8.45, 8.47, 8.51, 8.53, 8.57, 8.58

**Chapter 9,** all sections\* (pgs. 331 – 372)

\*NOTE: we will BRIEFLY cover these topics. Use the problems to review, but you do not have to know this chapter in detail.

**Problems:** 9.11, 9.13, 9.19, 9.21, 9.25, 9.29, 9.30, 9.31, 9.47, 9.51, 9.55, 9.63, 9.67

**Chapter 11,** sections 11.1 – 11.4, 11.6 (pgs. 425 – 442, 445 – 448)

**Problems:** 11.9, 11.11, 11.12, 11.15, 11.16, 11.19, 11.20, 11.21, 11.23, 11.25, 11.37, 11.57, 11.61, 11.62

**Chapter 12,** sections 12.1 – 12.8 (pgs. 463 – 496)

Problems: 12.43, 12.47, 12.49, 12.63, 12.65

**Labs:**

**Week 1: Thin Layer Chromatography Lab**

**Description:** You will use your knowledge of polarity and intermolecular forces to design an experiment to identify an unknown painkiller using Thin Layer Chromatography (TLC).

**Phase changes and Intermolecular Forces lab**

**Description:** You will compare the relative boiling points of different compounds, and rank them by the strength of their intermolecular forces.