

### **Chapter Eight. Gases, Liquids, and Solids**

Intermolecular forces of attraction: London dispersion, dipole-dipole, and hydrogen bonding. Changes of state. Energetics of fusion (Experiment 6 – Heat of Fusion of Candle Wax) and boiling. See Figure 8.24. Liquid-vapor equilibria. Definition of ‘normal boiling point’ vs ‘boiling point’. Vapor pressure (partial pressure). Water – a unique liquid.

Gas laws. Kinetic-molecular theory of gases. Review ‘Gas Law Group Exercise’. STP. Dalton’s law. Avogadro’s Law: Equal volumes of gases under the same conditions of T and P contain equal numbers of molecules or moles.

### **Chapter Nine. Solutions**

Review Group Exercise on Solutions. What are differences between mixtures and solutions? Homogeneous and heterogeneous mixtures? See Figure 9.1.

Solubility – another application of the equilibrium concept and LeChatelier’s principle. Solvent, solute, solution. Henry’s Law. Units of concentration. Strong electrolyte, weak electrolyte, nonelectrolyte. Colligative properties and concept of osmolarity. Bp elevation, fp depression and osmosis.

### **Chapter Ten. Acids and Bases**

Review Group Exercise on Acids and Bases. Common acids and bases: know them (p.292). Brønsted-Lowry theory:  $SA + SB \rightarrow WA + WB$ . Conjugate acid, conjugate base. Polyprotic acids and bases. Carbon dioxide: an example of a weak Lewis acid. Relative strengths: Table 10.1. Acid dissociation constant. Self-dissociation of water. Be able to interconvert pH and hydrogen ion concentration. Buffer solutions. Henderson-Hasselbalch equation. Titration (see Experiment 25 – Titration of Vinegar). 10.14 – Acidity and basicity of salt solutions. Hydrolysis.

Be able to give an example of the following: Brønsted acid. Brønsted base. Amphoterism. Buffer solution.

### **Chapter Eleven. Nuclear Chemistry**

Nuclear reactions induced by nuclear bombardment (high-energy protons, neutrons). Natural radioactivity and nuclear decay or disintegration. Particles: protons, neutrons,  $\alpha$ -particles,  $\beta$ -particles, gamma rays. What is a positron? Modes of decay:  $\alpha$  and  $\beta$  emission, electron capture. Review Group Exercise on Nuclear Chemistry. Radioactive half-life. Ionizing radiation. Nuclear fission and nuclear fusion.

### **Organic Chemistry**

See handout. Review Group Exercise. Be able to name simple substituted alkanes. Be able to count numbers of carbon and hydrogen atoms in an organic compound whose structure is given in condensed form. Give an example of the following functional groups: alcohol, carboxylic acid. Universal reaction of organic molecules: combustion. Other organic reactions to know: photosynthesis; fermentation of sugar. Organic bases are mostly derivatives containing nitrogen: methylamine, dimethylamine, trimethylamine, etc.