

CHM1032 Study Guide for Test 4 (Chapters 9, 10 & 5)
Revised March 30, 2016

This may NOT be a complete list of what will be on the Test. You must also study class notes, the homework, and the textbook. This is just a study guide to help you.
You still have to know everything on Exam 1, 2 & 3. ☹

Know definitions and identify examples of: solution, solute, solvent, electrolytes, types of solutions, hydrogen bonds, polar substance, nonpolar, formation of solutions with ionic compounds = hydration, “like dissolves like”, nonelectrolytes, weak and strong electrolytes, equilibrium, equivalents, solubility, unsaturated solution, saturated solution, effect of temperature on solubility of a solid in a liquid and of a gas in a liquid, Henry’s Law, % (m/m), % (v/v), % (m/v), dilution, semipermeable membrane, concentrations, Molarity, colloids, suspensions, filters, osmosis, dialysis, osmotic pressure, isotonic solution, hypotonic and hypertonic solutions, Arrhenius acid and base, Bronsted-Lowry acid and base, naming acids & bases, writing chemical formulas of acids & bases, neutralization reactions, hydronium ion, conjugate acid & base, strengths of acids, strong & weak acids, strong & weak bases, ionization of water, K_w = ion-product constant of water, define and determine neutral, acidic & basic solutions given pH, $[H^+]$ or $[OH^-]$, buffers, acidosis, alkalosis, equilibrium, natural radioactivity, radioactivity, radiation, radioisotope, alpha (α or ${}^4_2\text{He}$) particle, beta (β or ${}^0_{-1}e$) particle, positron (${}^0_{+1}e$), gamma (γ) ray, radiation protection, nuclear equations, radioactive decay, alpha emitters, exposure to radiation, radiation sickness, half-life, medical applications using radioactivity and MRI, nuclear fission, chain reaction, critical mass, nuclear fusion, meaning of $E = mc^2$.

- 1) Identify which solutes & solvents will be soluble in each other and which solutes will dissolve in water using the given Solubility Table.
- 2) Electrolyte concentration problems, i.e. Sample Problem 7.4.
- 3) Calculations using concentrations: Eq/L, % (m/m), % (v/v), % (m/v), M
- 4) Dilution calculation. Know $C_1V_1 = C_2V_2$
- 5) Calculations of solutions in reactions.
- 6) Problems with osmosis or dialysis.
- 7) Be able to write formulas and names of acids & bases.
- 8) Be able to write the ions that are formed when dissolving acids, bases or ionic compounds in water.
- 9) In a reaction, identify the acid and its conjugate base; and the base and its conjugate acid.
- 10) Calculations using $K_w = [H^+][OH^-] = 1.0 \times 10^{-14}$.
- 11) Calculations using $\text{pH} = -\log[H^+]$.
- 12) Calculate $[H^+]$ or $[OH^-]$ given the pH, using $[H^+] = 10^{-\text{pH}}$.
- 13) Be able to say if a reaction will occur, if yes, write the products and balance the reactions:
 - a) neutralization reactions
 - b) reactions of active metals with acids (producing $\text{H}_2(\text{g})$).
 - c) reactions of carbonate or bicarbonate ions with acids (producing $\text{CO}_2(\text{g})$ and $\text{H}_2\text{O}(\text{l})$)
- 14) Titration calculation or any calculation with reactions and solutions.
- 15) Identify buffer systems.
- 16) Know buffer system in the blood and relationship to CO_2 levels versus $[H^+]$ versus pH; and acidosis and alkalosis.
- 17) Identify shifts in equilibrium systems.

- 18) Write nuclear equations for alpha, beta, and positron emitters.
 19) Know names and abbreviations for units of radiation (don't have to know definitions): curie (Ci), Becquerel (Bq), radiation absorbed dose (rad), gray (Gy), radiation equivalent in humans (rem), sievert (Sv).
 20) Calculations using half-life of a radioisotope.
 21) Study "Health Notes" Sections.
 20) See also, "Key Terms" at the end of Chapters, class notes, and homework problems.

Know:

$$K_w = [H^+][OH^-] = 1.0 \times 10^{-14}$$

$$pH = -\log[H^+]$$

$$[H^+] = 10^{-pH}$$

nonelectrolytes (covalent compounds that aren't acids)

isotonic solutions = 0.90 % (m/v) NaCl and 5.0% m/v glucose

pH of blood = 7.4

Given:

Active metals: potassium, sodium, calcium, magnesium, aluminum, zinc, iron, tin.

Table 10.3 of acids with only chemical formulas (no names given). and Solubility Table:

TABLE 4.1 ■ Solubility Guidelines for Common Ionic Compounds in Water

Soluble Ionic Compounds		Important Exceptions
Compounds containing	NO_3^-	None
	CH_3COO^-	None
	Cl^-	Compounds of Ag^+ , Hg_2^{2+} , and Pb^{2+}
	Br^-	Compounds of Ag^+ , Hg_2^{2+} , and Pb^{2+}
	I^-	Compounds of Ag^+ , Hg_2^{2+} , and Pb^{2+}
SO_4^{2-}	Compounds of Sr^{2+} , Ba^{2+} , Hg_2^{2+} , and Pb^{2+}	
Insoluble Ionic Compounds		Important Exceptions
Compounds containing	S^{2-}	Compounds of NH_4^+ , the alkali metal cations, and Ca^{2+} , Sr^{2+} , and Ba^{2+}
	CO_3^{2-}	Compounds of NH_4^+ and the alkali metal cations
	PO_4^{3-}	Compounds of NH_4^+ and the alkali metal cations
	OH^-	Compounds of the alkali metal cations, and NH_4^+ , Ca^{2+} , Sr^{2+} , and Ba^{2+}