Chemistry 12 Unit IV: Acids & Bases Learning Log

The following table contains all the prescribed learning outcomes for the Solubility unit of Chemistry 12. Use this table to help you stay organized and on track throughout the unit. Use it along with the Solubility Study Guide to determine your level of competence and understanding of each learning outcome. Once you are confident that you completely understand each learning outcome, place a check mark in the square provided.

Essential Learning Goals	Achievement Indicators	Practice	Evidence	Study Guide Equivalent	Status
D1: Identify acids and bases through experimentation.	List general properties of acids and bases	Problem Set #1 Hebden p. 110-114 IV.1 #1-4 IV.2 #5-9		J2	☐
	Write the names and formulae of some common household acids and bases			J5	☐
	Write balanced equations representing the neutralization of acids by bases in solution			J3	☐
	Outline some of the uses and commercial names of common household acids and bases			J5	☐
D2: Identify various models for representing acids and bases.	Define Arrhenius acids and bases			J4	☐
	Define Bronsted-Lowry acids and bases	Problem Set #2 Hebden p. 115-121 IV.3 #10 IV.4 #11-14 IV.5 #15-19		J6	☐
D3: Analyse balanced equations representing the reaction of acids or bases with water.	Identify Bronsted-Lowry acids and bases in an equation			J7	☐
	Define conjugate acid-base pair			J10	☐
	Identify the conjugate of a given acid or base			J11	☐
	Show that in any Bronsted-Lowry acid-base equation there are two conjugate pairs present			J12	☐
	Identify H_3O^+ as a protonated H_2O molecule that can be represented in shortened form as H^+			J9	☐
D4: Classify an acid or a base in solution as either weak or strong	Relate electrical conductivity in a solution to the total concentration of ions			K1	☐
	Define and give several examples for the following terms: strong acid, strong base, weak acid, weak base			K3, K4	☐
	Write equations to show what happens when strong and weak acids and bases are dissolved in water			K5	☐

D5: Analyse the equilibria that exist in weak acid systems.	Compare the relative strengths of acids or bases by using a table or relative acid strengths			K6	☐
	Predict whether products or reactants are favoured in an acid-base equilibrium by comparing the strength of the two acids (or two bases)			K8	☐
	Compare the relative concentrations of H_3O^+ (or OH^-) between two acids (or two bases) using their relative positions on an acid strength table			K9	☐
D6: Identify chemical species that are amphiprotic	Define amphiprotic			K10, K11	☐
	Describe situations in which H_2O would act as an acid or base			K12	☐
E1: Analyse the equilibrium that exists in water.	Write equations representing the ionization of water using either H_3O^+ and OH^- or H^+ and OH^-			L1	☐
	Predict the effect of the addition of an acid or a base to the equilibrium system: $2H_2O \rightleftharpoons H_3O^+ + OH^-$			L3	☐
	State the relative concentrations of H_3O^+ and OH^- in acid, base, and neutral solutions			L4	☐
	Write the equilibrium expression for Kw and state the value of Kw and 25°C			L2	☐
	State the value of Kw at 25°C			L5	☐
	Describe and explain the variation in the value of Kw with temperature			L6	☐
	Calculate the concentration of H_3O^+ or OH^- using Kw			L7	☐
E2: Perform calculations relating pH, pOH, [H3O+], and [OH-]	Define pH and pOH			L9	☐
	Define pKw, give its value at 25°C, and its relation to pH and pOH			L10	☐
	Calculate $[H_3O^+]$ or $[OH^-]$ from pH and pOH			L11, L12	☐
	Describe the pH scale with reference to everyday solutions			L8	☐
E3: Explain the significance of the Ka and Kb equilibrium expressions	Write Ka and Kb equilibrium expressions for weak acids or weak bases			M1	☐
	Relate the magnitude of Ka or Kb to the strength of the acid or base			M2	☐
MID Unit Test (includes all above Learning Goals)					

F4: Describe the hydrolysis of ions in salt solutions	Write a dissociation equation for a salt in water			N1	☐
	Write net ionic equations representing the hydrolysis of ions in solution			N2	☐
F5: Analyse the extent of hydrolysis in salt solutions	Predict whether a salt solution would be acidic, basic, or neutral (compare Ka and Kb values where necessary)			N3	☐
	Determine whether an amphiprotic ion with act as a base or an acid in solution (compare Ka and Kb values where necessary)			N4	☐
	Calculate the pH of a salt solution from relevant data, assuming the predominant hydrolysis reaction is the only reaction determining the pH			N/A	☐
E4: Perform calculations involving Ka and Kb	Given the Ka, Kb, and initial concentration, calculate any of the following: [H3O+], [OH-], pH, pOH			M3	☐
	Calculate the value of Kb for a base given the value of Ka for its conjugate acid (or vice versa)			M4	☐
	Calculate the initial concentration of acid or base, given the appropriate Ka, Kb, pH, or pOH values			N/A	☐
	Calculate the value of Ka or Kb given the pH and the initial concentration			M5	☐
F1: Demonstrate an ability to design, perform, and analyse a titration experiment involving the following: primary standards, standardized solutions, titration curves, appropriate indicators	Write formulae, complete ionic equations, and net ionic equations for: a strong acid reacting with a strong base, a weak acid reacting with a strong base, a strong acid reacting with a weak base			P4	☐
	Demonstrate proper titration technique when performing a titration experiment			N/A	☐
	Explain the difference between the equivalence point of a strong acid-strong base titration and the equivalence point of a titration involving a weak acid-strong base or strong acid-weak base			P6	☐
	Interpret titration curves plotted from experimental data			N/A	☐
	Select indicators whose transition point coincides with the equivalence point of the titration reaction			N/A	☐
	Calculate the concentration of an acid or base using titration data or similar data			P2	☐
	Calculate the volume of an acid or base with known molarity needed to completely react with a given amount of base or acid			P3	☐
	Calculate the pH of a solution formed when a strong acid is mixed with a strong base			P5	☐

F2: Describe an indicator as an equilibrium system	Describe an indicator as a mixture of a weak acid and its conjugate base, each with distinguishing colours			O1	☐
	Describe the term transition point of an indicator, including the conditions that exist in the equilibrium system			O2	☐
	Describe the shift in equilibrium and resulting colour changes as an acid or a base is added to an indicator			O3	☐
F3: Perform and interpret calculations involving the pH in a solution and Ka for an indicator	Predict the approximate pH at the transition point using the Ka value of an indicator			O4	☐
	Predict the approximate Ka value for an indicator given the approximate pH range of the colour change			O5	☐
	Match an indicator's colour in solution with an approximate pH, using a table of indicators			N/A	☐
F6: Describe buffers as equilibrium systems	Describe the tendency of buffer solutions to resist changes in pH			Q1	☐
	Describe the composition of an acidic buffer and a basic buffer			Q2	☐
	Describe qualitatively how the buffer equilibrium shifts as small quantities of acid or base are added to the buffer; the stress being the change in the concentration of the stronger acid or base			Q5	☐
	Describe in detail a common buffer system (ex/ the blood buffer system)			Q6	☐
F7: Describe the preparation of buffer systems	Outline a procedure to prepare a buffer solution			Q3	☐
	Identify the limitations in buffering action			Q4	☐
F8: Predict what will happen when oxides dissolve in rain water	Write equations representing the formation of acidic solutions or basic solutions from non-metal and metal oxides			R1	☐
	Describe the pH conditions required for rain to be called acid rain (pH 5.0 and lower)			R2	☐
	Relate the pH of normal rain water to the presence of dissolved CO2			R3	☐
	Describe sources of NOx (automobile engines) and SOx (fuels containing sulphur and smelters of sulphide ores)			R4	☐
	Discuss general environmental problems associated with acid rain			R5	☐
END of Unit Test					

Note: The Chemistry 12 Study Guides are based on OLD PLO's. Use the "Study Guide Equivalent" column to match up old PLO's to the new ones.
For example, essential learning goal C1: "Determine the solubility of a compound in aqueous solution" matches up to G1-G4 on study cards and review questions.