Review Sheet:

The ultimate way to prepare for your assessment is to reflect on why the homework assignments that we completed were done, and to understand the objectives of each assignment. Do you want more practice before your assessment? Look at your homework; ensure you understand how to get the correct answer!

PLEASE study your pH packet for this section, and use chapter 19 in the book**. THIS REVIEW IS NOT COMPREHENSIVE**, it is meant to help clarify the major concepts. Ensure that you can answer all questions and aspects of the assessment rubric, attached to your project description. The in-class review sheet will also help you; ensure you understand these solved problems.

Log Chart Usage: Either you can or you cannnot use the chart at this point. Bring a calculator to perform log and anti-log functions if the chart confuses you. If you like the chart, make a crib-sheet for instructions on how to use the chart if you need help.

The First Homework Assignment: The pH Scale.

-This assignment includes the concept of the log and the antilog. Usage of the log-chart is described above.

-The pH scale describes how acidic or basic something is. Points to remember:

1-Water is the definition of neutrality.
2-a value of 0 on the scale is very acidic, a value of 14 is very basic.
3- pAnything = - log [anything]
4- [ ] means concentration.

The Second Homework Assignment: Calculations involving weak and strong acids.

-Weak and strong acids are explored in this assignment.

-Points to Remember.

1- Concentration is moles / Liters.
2- Strong acids completely ionize in water. Here, we don't use Ka to calculate [H+]
3- Weak acids do not completely ionize in water. Here, we use Ka to calculate [H+]
4- Ka = x^2 / [Acid] , check your notes to ensure you understand WHY.
5- Diprotic strong acids make 2 Molar H+ per 1 Molar Acid, we only considered strong diprotic acids.

The Third Homework Assignment: The ionization Constant for water.

Kw is used in this assignment in order to

-Not reinforced is that pOH = -log [OH-]

-Not reinforced is that 14 = pH + pOH

The Fourth Homework Assignment: Titrations.

-Neturalization happens when the same number of OH- and H+ ions combine.

-Indicators allow us to detect pH change, and to calculate how much acid or base was needed in order to perform a titation.

-One of the acids in this homework was a weak acid, and therefore additional calculations were necessary in order to relate the[H+] to the [Acid]

-One of the bases, and at least one of the acids are diprotic in this assignment. This changes the answers!

Self-Sudy Questions:

A First Homework:

A1. What is the definition of neutrality?
A2. Is pH 2 acidic, basic, very acidic, or very basic?
A3. A solution has a pH of 1. Does this mean the solution contains a strong acid?
A4. Does .5 moles HCl in .5 L H_2O have the same HCl concentration as 2 moles HCl in 2 L H_2O?
A5. What is the pH of 1 M HCl? What is the [H+] of a solution of pH 7 ?

B Second Homework:

B1. How do you know if a strong acid is strong?
B2. How do calculations differ if an acid is strong or weak?

C. Third Homework:

C1. Why is the Arrhenius Definition of Acids and Bases necessary for considering acid strength?

C2. What do you need to know in order to use Kw to calculate the concentration of H+ or OH-?

C3. By the way, since it hasn't been emphasized in this homework, how do you calculate pOH?

C4. How is pOH related to pH?

D. Fourth Homework:

D1. How are monoprotic acids different that diprotic acids? Why is this important when doing acid-base calculations?

D2. What is the equality used when titrating?

D3. Why was an indicator important when titrating our laboratory experiment?

E. Additional.

E1. How do Arrhenius Acids differ in definition from Bronsted Lowry Acids?

E2. Why and how do acids and bases act as electrolytes?

E3. What are Buffers? How are they used? What are natural buffers?

Self-Study Questions Answers:

A1. Water. Water has a pH of 7.0, and dissociates into H+ and OH- very infrequently: 1 Mole of water will have 1 x 10-7 H+ and 1 x 10-7 OH- in it. MEMORIZE that pH = -log [H+].

A2. Very acidic, relatively.

A3. Not necessarily. Remember, pH is defined by Hydrogen ion concentration. Therefore, more H+ means the solution has a lower pH. However, a very concentrated weak acid could generate a lot of H+, even though the acid is not a strong acid. (Practice: What is the pH of 10 M acetic acid? 1 M HCL?)

A4. Yes, both solutions are 1 Molar.

A5. PH 0, and 1 x 10 – 7 (antilog) H+.

B1. Ideally, you can recognize salient acids. However, the Ka chart will also tell you the strength of an acid. Weak acids have small Ka values. Strong acids have large Ka values.

B2. If the acid is strong, we can calculate pH directly from the concentration of acid.
1 M HCL → 1 M H^+ + 1 M Cl^- in water.
However, weak acids require the use of Ka.
1 M $HC_2H_3O_2$ → .01 M H^+ and .01 M $C_2H_3O_2^-$ in water.

C1. The Arrhenius Definition helps us conceptualize why water is needed for acid-base chemistry to occur. See the hydronium ion when you write the Arrhenius definition of an acid out? Water really is important! Without it, acids and bases cannot ioniize into H+ or OH-. Therefore, Kw = 1.0 x 10^{-14}, since water ALWAYS allows only the same multiple of H^+ and OH^- in solution. Therefore, $[H^+]$ x $[OH^-]$ = 1.0 x 10^{-14}, always.

C2. Two things. First, you must remember that Kw = 1.0 x 10^{-14}. Second, you must know or be able to calculate the concentration of [H+] or [OH-]. This latter value will be all the H^+ or OH— that an acid or base contributes, respectively.

C3. Remember that pAnything = -log [anything]. pOH = - log [OH-].

C4. 14 = pOH + pH. This is because both pOH and pH have scales from 0-14. Water has a pH of 7, and a pOH of 7, also. .1 M HCl has a pH of 1 and a pOH of 13. .1 M NaOH has a pH of 13 and a pOH of 1.

D1. Monoprotic acids donate 1 H^+, diprotic donate 2 H^+ per acid molecule. Therefore, 1 M H_2SO_4 has 2 M H+ since it is a strong diprotic acid. Weaker acids may donate 2 or more hydrogens, but remember that Ka is used here (don't worry about this, but each H on the acid has it's own Ka value.).

D2. Molarity Acid X mL Acid = Molarity Base X mL Base. mL could be L or any other volume measurement, as long as the units are the same on both sides (a property of an equality.)

D3. The indicator, phenothalein, allowed us to determine when the solution had just become basic (it turned pink) during our titration. This is the end-point of our titration, meaning that we have added just enough base to neutralize the acid.

E1.

E2.

E3.