BIO 365 Environmental Contaminants Name _____
Review problems.

This is a set of problems that I came up with for you to dust off your chemistry skills. Hopefully, you will have had most (some?) of these types of problems in some form. Work through and answer as many as you can in pencil. We will spend the next class periods solving them as a class. This will be handed in for credit.

1. What is the difference between normality (*N*) and molarity (M)?

2. A 1 M solution of NaOH has how many grams of NaOH in a liter?

3. A 1 *N* solution of H_2SO_4 has how many grams of H_2SO_4 in a liter?

4. How many g of NaCl are needed to make a 20 mM solution in 100 ml water?

5. How many g of nitrogen (N) are in a 0.1 M NH_3 solution?

6. Often, chemical concentrations are written in terms of parts per million (ppm). What is the molarity of a solution that has 100 ppm KCl?

7. How do strong acids and weak acids differ? Strong vs. weak bases?

8. Remember, $p[H^+] = -\log[H^+]$ and $p[OH^-] = -\log[OH^-]$. What do the pH and pOH of a solution always add up to?

9. A 0.1 M solution of HCl (a strong acid) has a pH of what? What about a 0.001 M solution?

10. A 0.1 M solution of H_2SO_4 (another strong acid) has a pH of what?

11. Acetic acid ($C_2H_4O_2$) is a weak acid that partially dissociates in water (hint to no. 7).

$C_2H_4O_2 \leftrightarrow C_2H_3O_2^- + H^+$ $\quad K_a = [H^+]\,[A^-] / [HA]$ $\quad K_a = 10^{-4.75}$

A is any weak acid and in this case the amount of H^+ produced = the amount of A^- produced

Determine the pH of a 0.1 M solution of acetic acid.

Step 1. Solve for $[H^+]$

Step 2. Now determine the pH.

12. A 0.1 M solution of NaOH (a strong base) has a p$[OH^-]$ of what? How about a 0.05 M solution? Determine the pH of the solutions.

13. Ammonia (NH_3) is a weak base that partially dissociates in water.

$NH_3 + H_2O \leftrightarrow NH_4^+ + OH^-$ $K_b = [BH^+]\,[OH^-] / [B]$ $K_b = 10^{-9.25}$

B is any weak base and in this case the amount of OH^- produced = the amount of BH^+ produced

Determine the pH of a 0.1 M solution of ammonia.

Step 1. Solve for $[OH^-]$

Step 2. Now determine the pH.

14. The reaction of pure rainwater with atmospheric CO_2 can be expressed as:

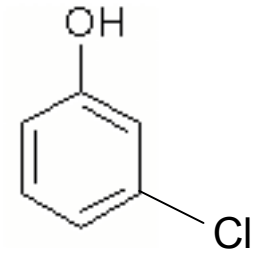
$CO_2 + H_2O = H_2CO_3$

Write the dissociation reaction of H_2CO_3 and the expression for K_a.

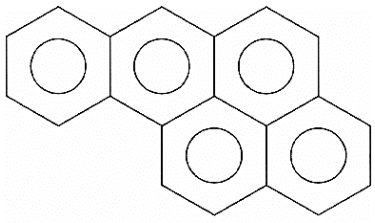
The K_a for this reaction is $10^{-6.4}$, what is the pH of rainwater if the concentration of H_2CO_3 is 10^{-5} M?

15. Write out the molecular weights and chemical formulas for the following organic compounds.

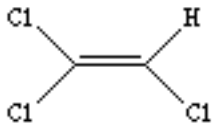
3-chlorophenol



Benzo(a)pyrene



trichloroethylene



16. Define/draw the following functional groups

amine

carboxyl

alcohol

aldehyde