Name: _____ Class: _____ Date: _____

Instructions: Answer the following questions. Show ALL work for problems to receive full credit. Make sure to include proper units and significant figures for all answers.

[5 pt] 1. Sketch a picture showing how $BaCl_2$ will dissolve in water. Label all IMF's present.

[6 pt] 2. Sketch a picture showing how $AlCl_3$ will dissolve in water. What is the attractive force between the ions and water molecules?

[6 pt] 3. Sketch a picture showing how $HC_2H_3O_2$ will dissolve in water. What is the attractive force between the ions and water molecules?

[4 pt] 4. Sketch a picture showing how CH_2O will dissolve in water. What is the attractive force between the ions and water molecules?

[15 pt] 5. Complete and balance the following reactions. Include the state of the products, and any energy/heat terms where appropriate. If no reaction occurs, write NR for the products.

(a) ___ $HNO_3(aq)$ + ___ $Na(s) \longrightarrow$ 5(a) _____

(b) ___ $Cu(s)$ + ___$HC_2H_3O_2(aq) \longrightarrow$ 5(b) _____

(c) ___$KOH(aq)$ + ___$H_3PO_4(aq) \longrightarrow$ 5(c) _____

(d) ___$H_2SO_4(aq)$ + ___$NH_4OH(aq) \longrightarrow$ 5(d) _____

(e) ___$K_2CO_3(aq)$ + ___$HCl(aq) \longrightarrow$ 5(e) _____

[8 pt] 6. Answer the following questions about acids, bases, and pH. (Recall that pH = -log[H^+], [H^+] = 10^{-pH}, and pH + pOH = 14). Additionally state whether the solution is (A)cidic, (B)asic, or (N)eutral

(a) What is the pH of solution with [H^+] = 3.8×10^{-10} M? 6(a) _____

(b) What is the [H^+] for a solution with pH = 2.36? 6(b) _____

(c) What is the pH for a solution with p0H = 5 ? 6(c) _____

(d) What is the pOH for a solution with [H^+] = 3.80×10^{-11} M? 6(d) _____

[8 pt] 7. Answer the following questions about acids, bases, and pH. (Recall that pH = -log[H^+], [H^+] = 10^{-pH}, and pH + pOH = 14). Additionally state whether the solution is (A)cidic, (B)asic, or (N)eutral

(a) What is the pH of solution with [H^+] = 2.45×10^{-4} M? 7(a) _____

(b) What is the [H^+] for a solution with pH = 8.5? 7(b) _____

(c) What is the pH for a solution with p0H = 12 ? 7(c) _____

(d) What is the [OH^-] for a solution with [H^+] = 3.80×10^{-11} M? 7(d) _____

[8 pt] 8. Answer the following questions about acids, bases, and pH. (Recall that pH = -log[H^+], [H^+] = 10^{-pH}, and pH + pOH = 14). Additionally state whether the solution is (A)cidic, (B)asic, or (N)eutral

(a) What is the pH of solution with [H^+] = 3.5×10^{-4} M? 8(a) _____

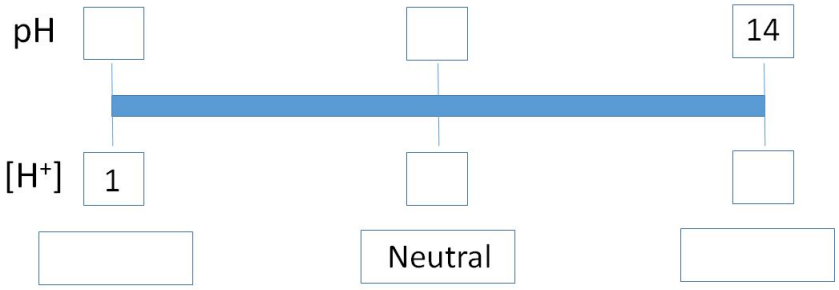
(b) What is the [H^+] for a solution with pH = 9.50? 8(b) _____

(c) What is the [OH^-] for a solution with [H^+] = 2.4×10^{-11} M? 8(c) _____

(d) What is the pOH of a solution with a pH = 3.25? 8(d) _____

(e) What is the [H^+] in a solution with pOH of 5.5? 8(e) _____

[5 pt] 9. Fill in the missing values on the pH scale below.



[4 pt] 10. Fill in the missing values below.

	Acid	**Neutral**	**Base**
pH Scale	pH ___ 7	pH ___ 7	pH ___ 7
Concentration Scale	[H^+] ___ 1×10^{-7} M	[H^+] ___ 1×10^{-7} M	[H^+] ___ 1×10^{-7} M

[5 pt] 11. Calculate the volume (in mL) of 1.25 M HCl required to neutralize 75.0 mL of 4.60 M $Ca(OH)_2$. Write a balanced equation for the reaction and show work to receive full credit. 11. _____

[4 pt] 12. How many grams of NaOH must you dissolve in 250. mL of water to prepare a 7.50 M NaOH solution. Show work to support your answer.

12. _____

[5 pt] 13. Calculate the volume (in mL) of 3.75 M HCl required to neutralize 175.0 mL of 2.60 M $Ca(OH)_2$. Write a balanced equation for the reaction and show work to receive full credit.

13. _____

[5 pt] 14. Calculate the Molarity of an H_2SO_4 solution that requires 175.0 mL to neutralize 83.0 mL of 2.60 M NaOH soution. Write a balanced equation for the reaction and show work to receive full credit.

14. _____

15. 105.0 mL of a KOH solution with unknown molarity neutralized 78.0 mL of a 2.25 M H_3PO_4 solution. What is the molarity of the KOH solution? Write a balanced equation for the reaction and show work to receive full credit.

15. _____

16. Calculate the volume (in mL) of 8.55 M HCl required to neutralize 75.0 mL of 4.60 M $Ca(OH)_2$. Write a balanced equation for the reaction and show work to receive full credit.

16. _____

[10 pt] 17. Complete the following table by calculating the missing value and determining if the solution is (A)cidic, (B)asic, or (N)eutral.

Given	**Calculate the**	**Acid/Base/Neutral**
$[H^+] = 6.25 \times 10^{-9}$ M	pH=	
pH = 2.50	$[H^+]$ =	
$[OH^-] = 1.0 \times 10^{-7}$ M	pH=	
pOH = 6.25	pH =	

[4 pt] 18. Define Acid and Base according to Bronsted-Lowry.

(a) Acid

(b) Base

[10 pt] 19. Calculate the requested values below. Is the resulting solution (A)cidic, B(asic) or (N)eutral?

(a) What is the pH of solution with $[H^+] = 3.5 \times 10^{-4}$ M? 19(a) _____

(b) What is the $[H^+]$ for a solution with pH = 3.5? 19(b) _____

(c) What is the $[OH^-]$ for a solution with $[H^+]$ 2.4×10^{-11} M? 19(c) _____

(d) What is the pOH of a solution with a pH = 3.25? 19(d) _____

(e) What is the $[H^+]$ in a solution with pOH of 5.5? 19(e) _____

[9 pt] 20. Define each of the following terms, list what type of molecules have these properties and give an example compound for each.

	Definition	**Class of Molecules**	**Example**
Strong Electrolyte			
Weak Electrolyte			
Non-Electrolyte			

21. Identify the following substances as a (S)trong, (W)eak, or (N)on electrolyte.

(a) HF 21(a) _____

(b) SF_6 21(b) _____

(c) $NaNO_3$ 21(c) _____

(d) $HClO_4$ 21(d) _____

(e) $BaSO_4$ 21(e) _____

(f) $H_3PO_4(aq)$ 21(f) _____

(g) $SiCl_4(aq)$ 21(g) _____

(h) $C_6H_{12}(aq)$ 21(h) _____

(i) $Ba(OH)_2(aq)$ 21(i) _____

(j) AgCl(s) 21(j) _____

(k) $Fe(NO_3)_3(aq)$ 21(k) _____

(l) $BaCl_2(aq)$ 21(l) _____

(m) HCl(aq) 21(m) _____

(n) $HC_2H_3O_2(aq)$ 21(n) _____

(o) $ZnAsO_4(s)$ 21(o) _____

[4 pt] 22. Write the total ionic equation **AND** the net ionic equation for the following reaction: $Ca(NO_3)_2(aq) + Na_2CO_3(aq) \longrightarrow CaCO_3(s) + 2NaNO_3(aq)$

[4 pt] 23. Write the total ionic equation **AND** the net ionic equation for the following reaction: $NaCl(aq) + AgNO_3(aq) \longrightarrow NaNO_3(aq) + AgCl(s)$

[5 pt] 24. Write the total ionic **AND** net ionic equations for the following reaction:

$$HF(aq) + NaOH \longrightarrow NaF(aq) + H_2O(l)$$

[5 pt] 25. Write the total ionic **AND** net ionic equations for the following reactions: $NH_4OH(aq) + HCl(aq) \longrightarrow NH_4Cl(aq) + H_2O(l)$

[5 pt] 26. Write the total ionic **AND** net ionic equations for the following reaction: $H_2SO_4(aq) + 2NaOH \longrightarrow Na_2SO_4(aq) + 2H_2O(l)$

[5 pt] 27. Write the total ionic **AND** net ionic equations for the following reaction: $2Al(s) + 6HBr(aq) \longrightarrow 2AlBr_3(aq) + 3H_2(g)$