Chemistry Exam Review Part IV

Acids/Bases

1. Characterize if (a) acid or (b) base or (c) both
   a. electrolytes c
   b. Ammonia dissolves in water it forms a(n) b
   c. Compound that gains a proton b
   d. Compound that loses a proton a
   e. $Cu(OH)_2$ is a b
   f. H_2SO_4 a
2. Distinguish between (a) Arrhenius acids and (b) bases and Bronsted-Lowry (c0 acids and (d)ba
   a. Proton acceptor theory B-L base
   b. Compounds that donate a hydrogen ion Arrhenius acid forms H^+ when put in water
   c. Conjugate acid forms from B-L base
   d. Conjugate base forms from B-L acid
3. How many grams of HCl must be added to water in order to make 12.0 L of 0.250 M HCl.

$$M = \frac{mol}{L} \qquad 0.250M = \frac{mol}{12.0L} \qquad \frac{3.0mol}{1} \left| \frac{36.5g}{1mol} \right. = 109.5g$$

4. Determine the volume of 0.250 M HCl that can be made using 150.0 ml of 1.00 M HCl stock solution.

$$M_1V_1 = M_2V_2$$
$$1.00M \cdot 150.0mL = 0.250M \cdot V_2$$
$$V_2 = 600\ mL$$

5. Which acid is stronger 0.350 M HCl or 0.500 M HF? Circle correct ans. strong acid
6. Use pH scale to identify acids and bases. Circle correct ans.
   a. pH = 3.5 acid or base
   b. pOH = 6.5 acid or base pH = 7.5
   c. pOH = 2.5 acid or base pH = 11.5
   d. pH = 10.5 acid or base
7. Interpret pH scale in terms of the exponential nature of pH values in terms of concentration Determine the hydronium ion concentration give the pH.
   a. pH = 3.0 10^{-3} M
   b. pH = 10.0 10^{-10} M
   c. pH = 6.5 3.16×10^{-7} M

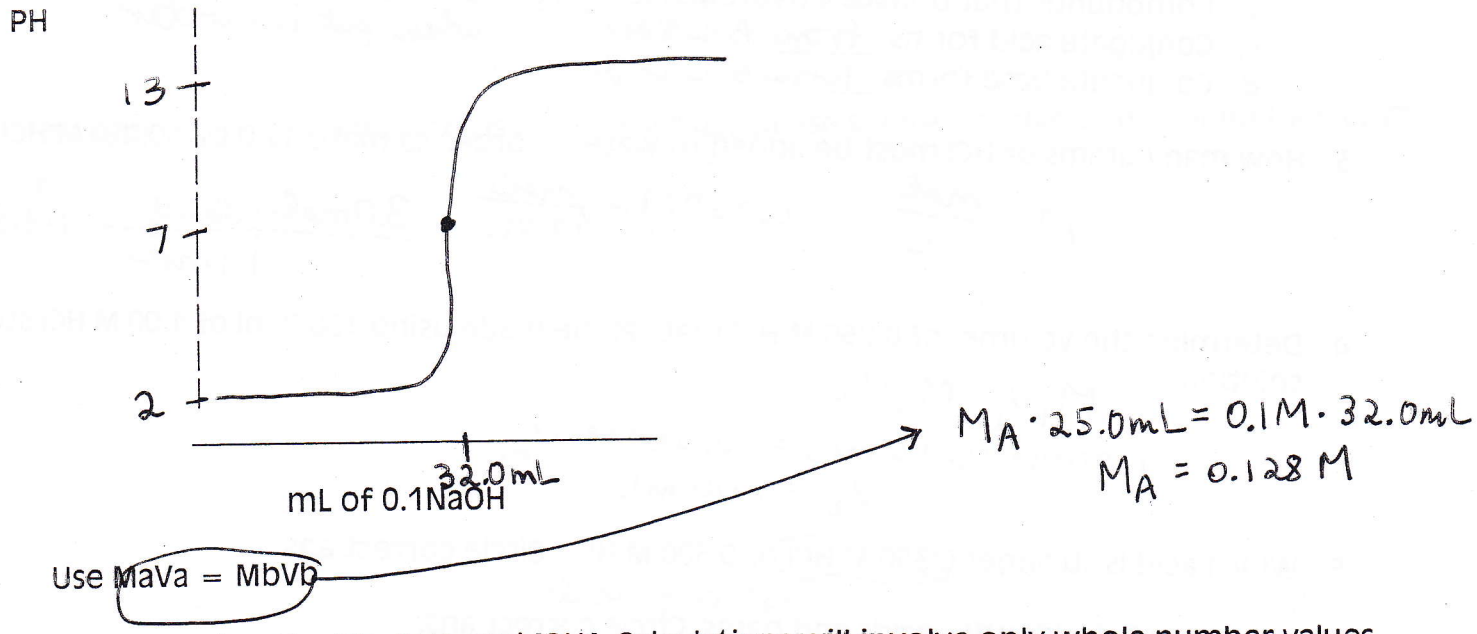
$$10^{-pH} = [H_3O^+]$$

8. Relate the color of indicator to pH using pH ranges provided in a table. Range should involve various values of pH (for example: 3.3 or 10.8). Using the table below answer the following questions.
   a. If an acid base titration is to be performed with the equivalence point at a pH of 8.3, which indicator would you use. phenolphthalein (or thymol blue)
   b. If an acid base titration is to be performed with the equivalence point at a pH of 4.5, which indicator would you use. methyl orange

Indicator	pH Range	Acid	Base
Methyl orange	3.1-4.4	red	orange
Bromphenol blue	6.2-7.6	yellow	blue
Thymol blue	8.0-9.6	yellow	blue
Phenolphthalein	8.0-10.0	colorless	red

9. Determine the concentration of an acid or base using titration. Interpret titration curve for strong acid/strong base.

Draw and label the titration curve below for 25.0 mL of unknown concentration of HCl that required 32.0 ml of 0.1 M NaOH to neutralize the acid at its endpoint. _____



10. Compute pH, pOH, $[H^+]$, and $[OH^-]$. Calculations will involve only whole number values (for example: pH or pOH values such as 3, 5, 8. and $[H^+]$ and $[OH^-]$ values such as $1x10^{-4}$ or $1x10^{-10}$).

pH	$[H_3O^+]$	pOH	$[OH^-]$	Acid/Base
2.0	10^{-2}	12	10^{-12}	acid
6	$1x\ 10^{-6}$	8	10^{-8}	acid
11	10^{-11}	3.0	10^{-3}	base
8	10^{-8}	6	$1x\ 10^{-6}$	base

Physical Properties and Solutions

Using the reference tables, identify the unknown:

a) An inorganic substance with a density greater than that of sulfur dioxide.

chlorine

b) An unknown metal is heated until it melts at 420 °C.

zinc

c) A student observed an unknown inorganic solvent evaporating boiling at 69 °C.

hexane

An unknown metal placed in a graduated cylinder displaces the water from 10.0 mL to 18.3 mL. The mass is measured at 14.5 g. What is the identity of this metal?

$\frac{14.5\,g}{8.3\,mL} = D \qquad D = 1.75\ g/mL$ magnesium

What mass of pure mercury would one need to fill a container with a volume of 5.0 mL?

$D = \frac{m}{V} \qquad 13.6\ g/mL = \frac{mass}{5.0\,mL} \qquad mass = 68\,g$

Which block is more dense?

A	Mass = 500 g

B	Mass = 500 g

$\frac{500\,g}{10\,mL} = 50\ g/mL \qquad \frac{500\,g}{100\,mL} = 5\ g/mL$

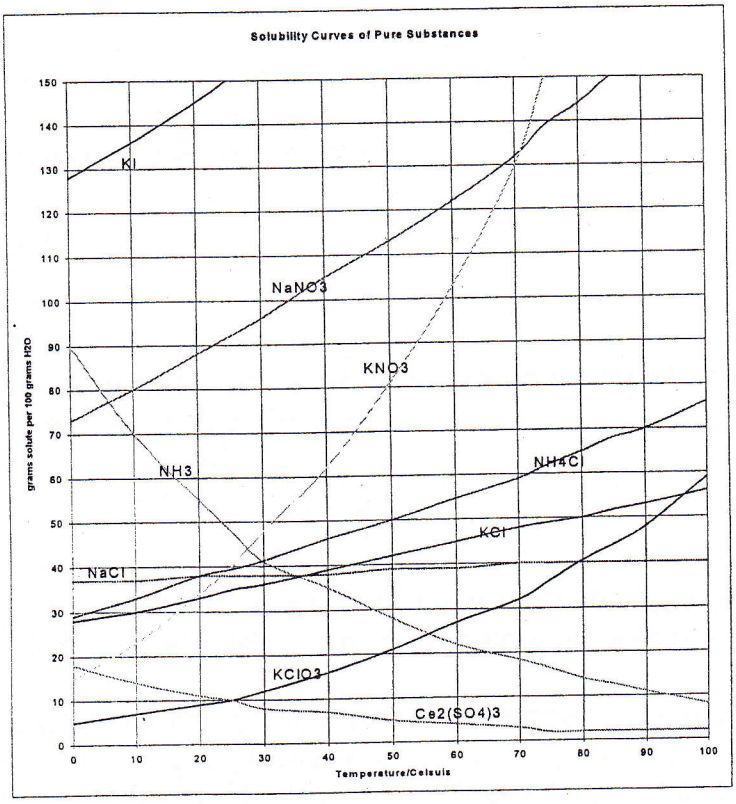
For which type of reaction are the "Solubility Rules" necessary?

double replacement

Write the equation for a reaction between aqueous iron III chloride and aqueous silver nitrate. Predict the products and include state symbols for all species.

$FeCl_3(aq) + 3\,AgNO_3(aq) \longrightarrow 3\,AgCl(s) + Fe(NO_3)_3$

- Use graph of solubility vs. temperature to identify a substance based on solubility at a particular temperature. Use graph to relate the degree of saturation of solutions to temperature. Use graph to make simple calculations about solutions.



1. How many grams of $NaNO_3$ will dissolve in 100 g of water at 20°C?

88 g

2. Ninety grams of $NaNO_3$ is added to 100 g of water at 0°C. With constant stirring, to what temperature must the solution be raised to produce a saturated solution with no solid sodium nitrate remaining?

22°C

3. A saturated solution of $KClO_3$ was made using 300 g of water at 40°C. How much $KClO_3$ could be recovered by evaporating the solution to dryness?

$16g \times 3 = 48g$

4. Which compound is most soluble at 30°C? Least soluble at 30°C?

KI ? or $NaNO_3$ $Ce_2(SO_4)_3$

5. Which of the compounds is obviously a gas phase solute dissolved into a liquid solvent?

NH_3