

29. Concentrated

30. Molarity

31. Colligative properties

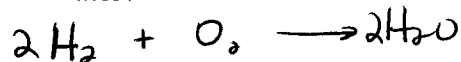
32. Neutralization

33. Acids

34. Bases

Problems:

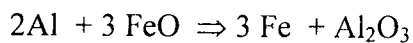
1. How many liters of Hydrogen are required to react completely with 2.4 liters of Oxygen to form water?



$$\frac{1 \text{ L O}_2}{2 \text{ L H}_2} = \frac{2.4 \text{ L O}_2}{x}$$

$$\boxed{4.8 \text{ L H}_2}$$

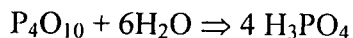
2. How many moles of FeO are needed to react completely with 1.8 moles of aluminum?



$$\frac{3 \text{ mole FeO}}{2 \text{ mole Al}} = \frac{x}{1.8 \text{ m Al}}$$

$$\boxed{2.7 \text{ m Al}}$$

3. How many moles of H_3PO_4 are produced when 50 grams of P_4O_{10} reacts completely with H_2O ?



$$50 \text{ g P}_4\text{O}_{10} \left| \frac{1 \text{ mole}}{284 \text{ g}} \right. = 0.18 \text{ m P}_4\text{O}_{10}$$

$$\frac{1 \text{ mole P}_4\text{O}_{10}}{4 \text{ H}_3\text{PO}_4} = \frac{0.18 \text{ m}}{x}$$

$$\boxed{0.70 \text{ m H}_3\text{PO}_4}$$

4. A gas occupies a volume of .5 L at 8.2 kPa. What volume will the gas occupy at 95 kPa?

$$P_1 V_1 = P_2 V_2 \quad (8.2 \text{ kPa})(.5 \text{ L}) = (95 \text{ kPa})(x)$$

$$\boxed{0.04 \text{ L}}$$

5. A sample of gas occupies 60 mL at 120°C. What volume will the gas occupy at 25°C?

$$\frac{T_1}{T_2} = \frac{V_1}{V_2} \quad \frac{120+273}{25+273} = \frac{60 \text{ mL}}{x}$$

$$\boxed{x = 41.7 \text{ mL}}$$

6. What is the maximum amount of KCl that can dissolve in 300 g of water?
(solubility of KCl is 34g/ 100 g water at 20° C).

$$\frac{34 \text{ g KCl}}{100 \text{ g H}_2\text{O}} = \frac{x}{300 \text{ g H}_2\text{O}}$$

$$\boxed{102 \text{ g KCl}}$$

7. What is the molarity of a solution containing 5.0 moles of solute in 250 mL of solution?

$$M = \frac{5.0 \text{ mol}}{.250 \text{ L}}$$

$$\boxed{20 \text{ M}}$$

8. What is the number of moles of solute in 150 mL of a .2 M solution?

$$0.2 \text{ M} = \frac{x}{.150 \text{ L}}$$

$$\boxed{x = 0.03 \text{ mol}}$$

9. What is the molarity of a solution containing 10 grams of solute in 100 mL of solution?

(formula mass of solute = 24 g/mol)

$$\frac{10 \text{ g}}{24 \text{ g}} = 0.42 \text{ mol}$$

$$M = \frac{0.42 \text{ mol}}{.100 \text{ L}}$$

$$\boxed{M = 4.2 \text{ M}}$$

10. What is the mass of HCl needed to make 2.5 L of a 6.0 M solution?

$$2.5 \text{ L} \times \frac{6.0 \text{ mol}}{\text{L}} = 15 \text{ mol}$$

$$15 \text{ mol} \times \frac{18 \text{ g}}{\text{mol}}$$

$$\boxed{270 \text{ g}}$$

11. If the percent by volume is 2.0% and the volume of solution is 500 mL, what is the volume of solute?

$$2.0\% = \frac{x}{500 \text{ mL}} \times 100$$

$$\boxed{x = 10 \text{ mL}}$$

12. If the percent by mass for the solute is 6% and the volume of the solution is 250 mL, what is the mass of solute in solution?

$$6\% = \frac{x}{250 \text{ mL}} \times 100 \quad \boxed{15g = x}$$

13. If the $[H^+]$ in a solution is $1 \times 10^{-5} \text{ M}$, is the solution acidic, alkaline, or neutral.

$$\text{pH} = 5 \quad \text{acidic}$$

14. If the $[H^+]$ in a solution is $1 \times 10^{-3} \text{ M}$, what is the $[OH^-]$?

$$\text{pH} = 3 \quad \text{pOH} = 11 \quad [OH^-] = 1 \times 10^{-11} \text{ M}$$

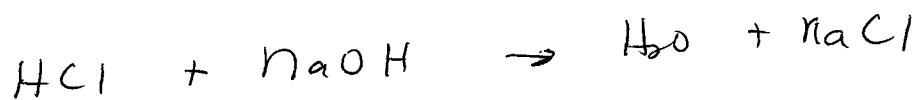
15. If the hydrogen ion concentration is 10^{-5} , what is the pH of the solution?

$$\text{pH} = 5$$

16. If the pH is 8, what is the concentration of hydrogen ion?

$$1 \times 10^{-8} \text{ M}$$

17. What is the concentration of HCl if 50 mL of acid is neutralized by 10 mL of .1 M sodium hydroxide?



$$.010 \text{ L} \times 0.1 \frac{\text{M}}{\text{L}} = 0.001 \text{ mole of NaOH used}$$

0.001 mol NaOH would react with 0.001 mol HCl

0.001 mol HCl were in 50 mL of solution

$$\text{SO} \quad \frac{0.001 \text{ mol}}{.050 \text{ L}} = 0.02 \text{ M}$$