

20. How many mL of 0.152 M HNO<sub>3</sub> would be needed to titrate 11.21 mL of 0.254 M KOH?

$$NV = NV \quad (1)(0.152)(V) = (1)(0.254)(11.21) \quad V = 18.7 \text{ mL}$$

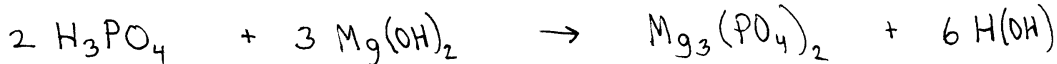
21. A HCl solution has a pH = 2.55. What will be the molarity of the solution?

$$[H^+] = 10^{-2.55} = 0.0028 \text{ M} \quad HCl \rightarrow H^+ + Cl^-$$

22. How many ml of 0.152 M H<sub>3</sub>PO<sub>4</sub> would be needed to titrate 11.21 mL of 0.254 M Mg(OH)<sub>2</sub>?

$$NV = NV \quad (3)(0.152)(V) = (2)(0.254)(11.21) \quad V = 12.5 \text{ mL}$$

23. Write the balanced equation for the reaction in #22.



24. 15.0 g of nitrous acid (a weak acid) is dissolved into 750. mL of solution.

What is the pH of this solution? (look up K<sub>a</sub> on WS 10.9)

$$HNO_2 \rightleftharpoons H^+ + NO_2^- \quad K_a = \frac{[H^+][NO_2^-]}{[HNO_2]}$$

Start: 0.425 M  $\rightleftharpoons$  0 M + 0 M

equilibrium: 0.425 - x  $\rightleftharpoons$  x + x

$$4.5 \times 10^{-4} = \frac{(x)(x)}{(0.425-x)}$$

$$1.91 \times 10^{-4} - 4.5 \times 10^{-4}x = x^2$$

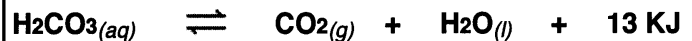
$$x^2 + 4.5 \times 10^{-4}x - 1.91 \times 10^{-4} = 0$$

$$x = 1.36 \times 10^{-2} \text{ M}$$

pH = -log [H<sup>+</sup>] = -log [1.36 × 10<sup>-2</sup>] = 1.9

15.0 g ×  $\frac{1 \text{ mol}}{47 \text{ g}}$  = 0.319 mol

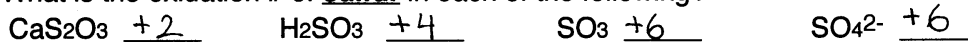
M =  $\frac{\text{mol}}{L} = \frac{0.319 \text{ mol}}{0.750 \text{ L}} = 0.425 \text{ M}$



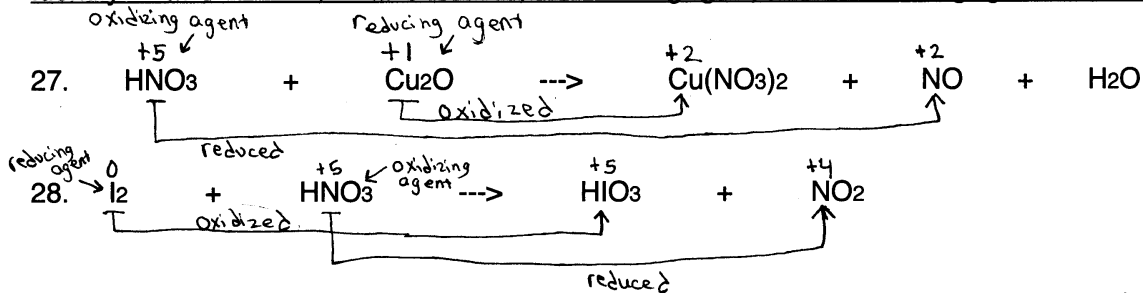
25. List 5 ways to increase the amount of water produced by the above reaction.

- remove H<sub>2</sub>O as it's produced.
- remove heat (cool down)
- remove CO<sub>2</sub>
- add H<sub>2</sub>CO<sub>3</sub>
- decrease pressure

26. What is the oxidation # of **sulfur** in each of the following?



Identify what is oxidized, what is reduced, the oxidizing agent, and the reducing agent for each:



29. Consider a voltaic cell containing Ag in a solution of AgCl and Pb in a solution of PbCl<sub>2</sub>.

a. Write the half-reaction for the anode (oxidation):  $Pb \rightarrow 2e^- + Pb^{+2}$

b. Write the half-reaction for the cathode (reduction):  $Ag^+ + 1e^- \rightarrow Ag$

c. Use the shorthand method to represent this cell:  $Pb | Pb^{+2} || Ag^+ | Ag$

d. Calculate the cell potential: cathode - anode

$$0.80 - (-0.13) = 0.93 \text{ V}$$