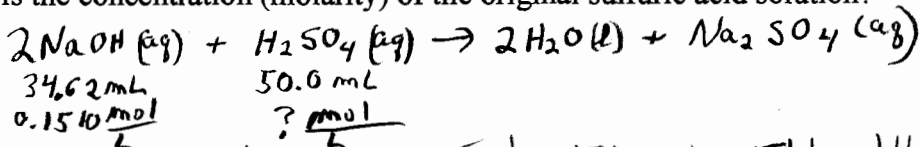


Turn off all cell phones. Show all work to receive credit.

Atomic Masses: H 1.01, O 16.00, K 39.01, C 12.01, Zn 65.39,

1. (5 Pts) 34.62 mL of 0.1510 M NaOH was needed to neutralize 50.0 mL of an H₂SO₄ solution. What is the concentration (molarity) of the original sulfuric acid solution?

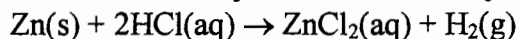


$$\frac{50.0 \times 10^{-3} \text{ L H}_2\text{SO}_4}{34.62 \text{ mL NaOH} \times \frac{0.1510 \text{ mol NaOH}}{1000 \text{ mL NaOH}} \times \frac{1 \text{ mol H}_2\text{SO}_4}{2 \text{ mol NaOH}}} = 0.0523 \frac{\text{mol H}_2\text{SO}_4}{\text{L H}_2\text{SO}_4}$$

2. (5 Pts) What mass of K₂CO₃ is needed to prepare 200. mL of a solution having a potassium ion concentration of 0.150 M?

$$\frac{200 \text{ mL} \times 0.150 \text{ mol K}^+}{1000 \text{ mL}} \times \frac{1 \text{ mol K}_2\text{CO}_3}{2 \text{ mol K}^+} \times 138.03 \text{ g K}_2\text{CO}_3 = 2.07 \text{ g K}_2\text{CO}_3$$

3. (5 Pts) Zinc dissolves in hydrochloric acid to yield hydrogen gas:



What mass of hydrogen gas is produced when a 7.35 g chunk of zinc dissolves in 500. mL of 1.200M HCl?

$$\frac{7.35 \text{ g Zn}}{65.39 \text{ g Zn}} \times \frac{1 \text{ mol H}_2}{1 \text{ mol Zn}} \times 2.02 \text{ g H}_2 = 0.227 \text{ g H}_2$$

$\frac{500 \text{ mL HCl}}{1000 \text{ mL HCl}} \times \frac{1.200 \text{ mol HCl}}{2 \text{ mol HCl}} \times \frac{1 \text{ mol H}_2}{1 \text{ mol HCl}} \times 2.02 \text{ g H}_2 = 0.606 \text{ g H}_2$

$\Rightarrow \text{Zn is limiting reactant}$

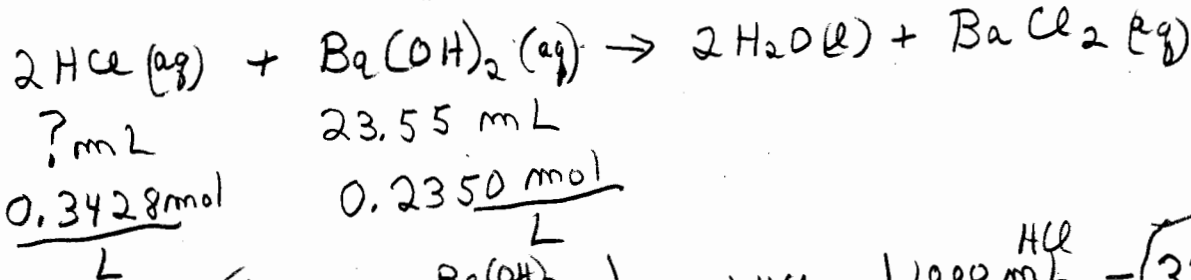
4. (5 Pts) A 20.00 mL sample of 0.1015 M nitric acid is introduced into a flask, and water is added until the volume of the solution reaches 250. mL. What is the concentration of nitric acid in the final solution?

$$M_1 V_1 = M_2 V_2$$

$$(0.1015 \text{ M})(20.00 \text{ mL}) = M_2 (250 \text{ mL})$$

$$M_2 = 0.00812 \text{ M} \text{ or } 8.12 \times 10^{-3} \text{ M}$$

5. (5 Pts) What volume (mL) of a 0.3428 M HCl(aq) solution is required to completely neutralize 23.55 mL of a 0.2350 M Ba(OH)₂(aq) solution?



$$\frac{23.55 \text{ mL Ba(OH)}_2 \times \frac{0.2350 \text{ mol Ba(OH)}_2}{1000 \text{ mL Ba(OH)}_2} \times \frac{2 \text{ mol HCl}}{1 \text{ mol Ba(OH)}_2} \times \frac{1000 \text{ mL HCl}}{0.3428 \text{ mol HCl}} = 32.29 \text{ mL HCl}$$