

SHOW WORK TO RECEIVE CREDIT

INFORMATION: **molar** masses: H = 1.008, N = 14.007, O = 16.00, Na = 23.00,
Cl = 35.45, P = 31.00, Ca = 40.08, K = 39.10

1. (5 Pts) What is the molar concentration of chloride ions in a solution prepared by mixing 100 mL of 2.0 M KCl with 50 mL of a 1.5 M CaCl₂ solution?

$$\frac{100 \text{ mL KCl}}{1000 \text{ mL KCl}} \times \frac{2.0 \text{ mol KCl}}{1 \text{ mol KCl}} = 0.20 \text{ mol Cl}^-$$

$$\frac{50 \text{ mL CaCl}_2}{1000 \text{ mL CaCl}_2} \times \frac{1.5 \text{ mol CaCl}_2}{1 \text{ mol CaCl}_2} \times \frac{2 \text{ mol Cl}^-}{1 \text{ mol CaCl}_2} = 0.15 \text{ mol Cl}^-$$

$$\frac{0.20 \text{ mol Cl}^- + 0.15 \text{ mol Cl}^-}{0.150 \text{ L}} = 2.33 \text{ M Cl}^-$$

2. (5 Pts) What volume of concentrated nitric acid (15.0 M) is required to make 100 mL of a 3.0 M nitric acid solution?

$$M_1 V_1 = M_2 V_2$$

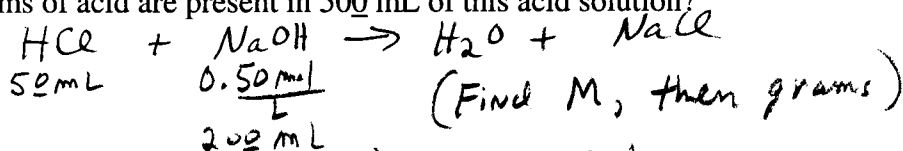
$$(15.0 \text{ M})(V_1) = (3.0 \text{ M})(100 \text{ mL})$$

$$V_1 = 20 \text{ mL}$$

3. (5 Pts) If 145 grams of potassium nitrate were added to water to make 1,500 mL of solution, what would be the molarity of the resulting solution?

$$\frac{145 \text{ g KNO}_3}{101.1 \text{ g}} \times \frac{1 \text{ mol}}{1.500 \text{ L}} = 0.956 \frac{\text{mol KNO}_3}{\text{L}}$$

4. (7 Pts) During a titration the following data were collected. A 50 mL portion of an HCl solution was titrated with 0.50 M NaOH. It required 200 mL of the base to neutralize the sample. How many grams of acid are present in 500 mL of this acid solution?



Conc HCl:

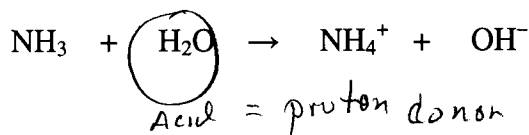
$$\frac{200 \text{ mL NaOH}}{1000 \text{ mL NaOH}} \times \frac{0.50 \text{ mol NaOH}}{1 \text{ mol NaOH}} = 0.10 \text{ mol HCl}$$

$$\frac{0.10 \text{ mol HCl}}{50 \times 10^{-3} \text{ L HCl}} = 2.0 \text{ mol/L HCl}$$

then:

$$\frac{500 \text{ mL}}{1000 \text{ mL}} \times \frac{2.0 \text{ mol HCl}}{1 \text{ mol HCl}} = 36.46 \text{ g HCl}$$

5. (3 Pts) Identify the Brønsted acid in the following reaction.



SHOW WORK TO RECEIVE CREDIT

INFORMATION: molar masses: H = 1.008, N = 14.007, O = 16.00, Na = 23.00, Cl = 35.45, P = 31.00, Ca = 40.08, K = 39.10

1. (5 Pts) What is the molar concentration of chloride ions in a solution prepared by mixing 110 mL of 2.0 M KCl with 50 mL of a 1.6 M CaCl₂ solution?

110 mL KCl	2.0 mol KCl	1 mol Cl⁻	= 0.22 mol Cl⁻
	1000 mL KCl	1 mol KCl	
50 mL CaCl ₂	1.6 mol CaCl ₂	2 mol Cl ⁻	= 0.16 mol Cl ⁻
	1000 mL CaCl₂	1 mol CaCl₂	

0.38 mol Cl⁻ total

$$\frac{0.38 \text{ mol Cl}^-}{0.160 \text{ L}} = 2.375$$

2. (5 Pts) What volume of concentrated nitric acid (15.0 M) is required to make 100 mL of a 5.0 M nitric acid solution?

$$M_1 V_1 = M_2 V_2$$

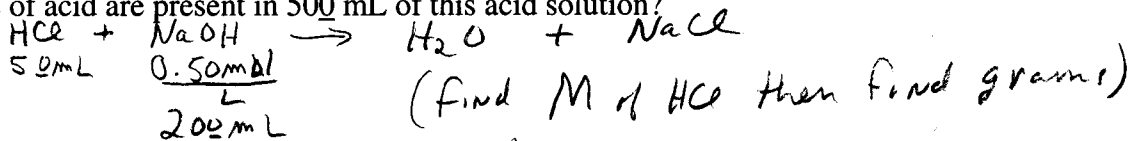
$$(15.0 \text{ M})(V_1) = (5.0 \text{ M})(100 \text{ mL})$$

$$V_1 = \underline{33.3 \text{ mL}}$$

3. (5 Pts) If 165 grams of potassium nitrate were added to water to make 1,500 mL of solution, what would be the molarity of the resulting solution?

$$\frac{165 \text{ g KNO}_3}{101.1 \text{ g/mol}} \div 1.500 \text{ L} = \frac{1.09 \text{ mol KNO}_3}{\text{L}}$$

4. (7 Pts) During a titration the following data were collected. A 50 mL portion of an HCl solution was titrated with 0.50 M NaOH. It required 200 mL of the base to neutralize the sample. How many grams of acid are present in 500 mL of this acid solution?



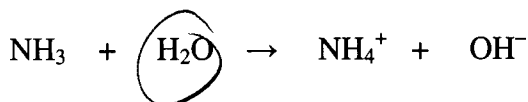
Conc. of HCl:

50 x 10⁻³ L HCl	200 mL NaOH	0.50 mol NaOH	1 mol HCl	= 0.20 mol HCl
	1000 mL NaOH	1 mol NaOH	1 mol NaOH	L_{HCl}

then:

500 mL	0.20 mol HCl	36.46 g	= 36.46 g HCl
	1000 mL HCl	mol	

5. (3 Pts) Identify the Brønsted acid in the following reaction.



Acid = proton donor