

Name: \_\_\_\_\_

Student Number: \_\_\_\_\_

**In-Class Assessment 1**

**September 27, 2016**

(a) A mixture of NO(g) and O<sub>2</sub>(g) in a 5.0L vessel at 25°C has a total pressure of 5 bar and a mass of O<sub>2</sub> of 21.89g. How many moles of NO(g) are in the vessel?

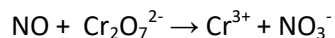
$$m = 21.89\text{g}/32.00\text{g/mol} = n = 0.684\text{mol}, P(\text{O}_2) = nRT/V = 0.684 \times 0.08314 \times 298/5.0 = 3.389\text{bar}$$

$$P(\text{NO}) = 5 - 3.39 = 1.61 \text{ bar}, \text{moles} = PV/RT = (1.61 \times 5.0)/(0.08314 \times 298) = 0.325 \text{ moles NO}$$

(b) Potassium dichromate, K<sub>2</sub>(Cr<sub>2</sub>O<sub>7</sub>), dissociates into K<sup>+</sup> and Cr<sub>2</sub>O<sub>7</sub><sup>2-</sup> ions in aqueous solution. If 67.67g of K<sub>2</sub>(Cr<sub>2</sub>O<sub>7</sub>) was dissolved in 100mL of water, what is the concentration of dichromate?

$$67.67\text{g} \times 1/294.2\text{g/mol} = 0.230, 0.230\text{mol}/0.1\text{L} = 2.30\text{M}$$

(c) Balance the following reaction in aqueous acid solution



(d) Given this data what is the theoretical yield in grams of NO<sub>3</sub><sup>-</sup>?

Stoichiometric ratio NO/Cr<sub>2</sub>O<sub>7</sub><sup>2-</sup> = 2/1 or course they could also use Cr<sub>2</sub>O<sub>7</sub><sup>2-</sup>/NO = 1/2

The limiting reagent is NO (0.325/0.230 = 1.41 < 2)

$$0.325 \text{ mol NO} \times (2\text{mol NO}_3^-/2 \text{ mole NO}) = 0.325 \text{ mol NO}_3^- \times 62.01\text{g/mol} = 20.15 \text{ g}$$