$$PV = nRT \qquad R = 0.08206 \frac{L \cdot atm}{mol \cdot K}$$

1. (2 points) Nomenclature:

(a) N_2O_4 __dinitrogen tetra oxide__   (b) aluminum nitride __AlN__

2. (2 points) When a gas is collected over a liquid, for example, water, in addition to the gas there water in the gas phase. This is also called the __vapor pressure__ of water.

3. (2 points) What temperature and pressure correspond to *STP*?

__273.15 K or 0.0 °C__   __1 atm or 760 mm Hg__

4. (3 points) Calculate the pressure in a 3.0 L can that is filled with 2.0 g of argon, 0.50 grams of hydrogen and 2.0 grams of oxygen at 35.0°C.

$$2.0g \; Ar \times \frac{mol}{39.95g} = 0.050 \; mols$$

$$0.5g \; H_2 \times \frac{mol}{2.02g} = 1.0 \; mols$$

$$2.0 \; gO_2 \times \frac{mol}{32.0g} = 0.063 \; mols$$
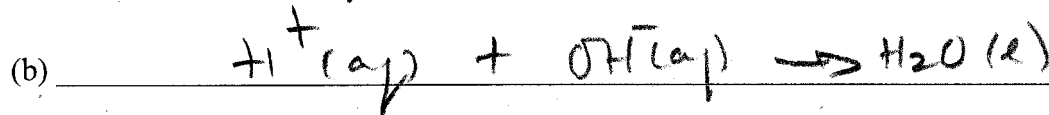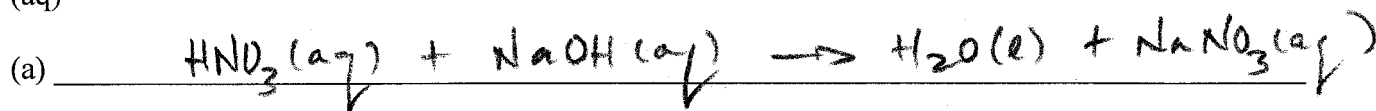
$$\overline{1.1 \; mols}$$
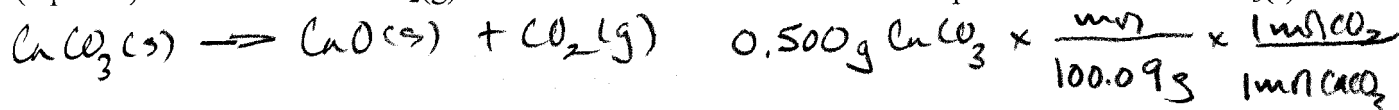
$$PV = nRT$$

$$P = \frac{nRT}{V}$$

$$= \frac{1.1 \times R \times (35.0 + 273.15)}{3.0 \; L}$$

answer: __9.3 atm (2 sf)__

5. (3 points) Solutions of nitric acid and sodium hydroxide are mixed. (a) Write the balance molecular equation for the reaction and (b) write the net ionic equation for the reaction. Show all (s), (*l*), (g) and (aq)

(a) __$HNO_3 (aq) + NaOH (aq) \longrightarrow H_2O (l) + NaNO_3 (aq)$__

(b) __$H^+ (aq) + OH^- (aq) \longrightarrow H_2O (l)$__

6. (3 points) What volume of $CO_2(g)$ at 0.0°C and 1.00 atm from the decomposition of $0.500 CaCO_3(s)$?

$$CaCO_3 (s) \longrightarrow CaO (s) + CO_2 (g) \qquad 0.500g \; CaCO_3 \times \frac{mol}{100.09g} \times \frac{1 mol \, CO_2}{1 mol \, CaCO_3}$$

$$V = \frac{nRT}{P} = \frac{0.00500 mol \times R \times 273.15}{1.00 \; atm}$$

answer: __0.112 atm (3 sf)__