Physical Chemistry Assignment One:
1.4, 1.5, 1.14, 1.17, 1.18, 1.20, 1.26, 1.31, 1.33, 1.34

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1.4

Mass: 1.588g
$n_t = \frac{1.588g}{92.08\frac{g}{molN_2O_4}} = 0.0172\ molN_2O_4$
P: 1.0133 bar $*\frac{10^5 Pa}{bar} = 1.0133 * 10^5 Pa$
T: 298K
V_{tot}: 500 $cm^3 * \frac{m}{100cm}^3 = 5 * 10^{-4} m^3$

Goal: find n_1 and n_2, the mols of N_2O_4 and NO_2, respectively.

$n_1 = n_t - x$
$n_2 = 2x$

$PV_1 = (n_t - x)RT$
$PV_2 = 2xRT$

We add these equations and see that:

$P(V_1 + V_2) = (n_t + x)RT$
$(1.0133 * 10^5 \frac{N}{m^2})(5 * 10^{-4} m^3) = (0.0172mol + x)(8.314\frac{J}{mol*K})(298K)$

From this we can see that $x = 0.00325$

Therefore we end up with 0.01395 mol N_2O_4 and 0.00325 mol NO_2.

Mole fractions: 0.81 and 0.19.

Percent dissociated: 19%.

1.5

$Z = \frac{dZ}{dP} =$

1.14

1.17

$$\alpha = \frac{1}{V}(\frac{\partial V}{\partial T})_P \tag{1}$$
$$= \frac{1}{V}(\frac{\partial \frac{nRT}{P}}{\partial T})_P \tag{2}$$
$$= \frac{nR}{VP} \tag{3}$$

$$\kappa = \frac{-1}{V}(\frac{\partial \frac{nRT}{P}}{\partial P})_T \tag{4}$$

$$= \frac{nRT}{VP^2} \tag{5}$$