CHEM 3423 001 Spring 2024 **Name:**
ID:

Worksheet #10 (Total number of points you can get is 3 pts)

1. Assume a reaction $2A \Leftrightarrow Y + 2Z$. Initially, 5 mol of pure A are contained in a volume of 10 l. One mol of A remains at equilibrium in this volume. What is the equilibrium constant K_c?

start → equil: $\Delta n_A = -4\,mol \Rightarrow \Delta n_Z = 4\,mol$, $\Delta n_Y = 2\,mol$

$\Rightarrow [A]_{eq} = \frac{1}{10}\frac{mol}{l}$; $[Y]_{eq} = \frac{2}{10}\frac{mol}{l}$; $[Z]_{eq} = \frac{4}{10}\frac{mol}{l}$

$\Rightarrow K_c = \frac{[Y][Z]^2}{[A]^2} = \frac{2}{10}\cdot\frac{16}{100}\Big/\frac{1}{100}\ \frac{mol}{l}$

$= \frac{16}{5}\frac{mol}{l}$

$= 3.2\frac{mol}{l} = 3.2\frac{mol}{(dm)^3}$

2. Assume dissociation of chlorine into atoms according to $Cl_2 \Leftrightarrow 2Cl$. How does the degree of dissociation changes if the volume is doubled ? Why?

$K_c = const = \frac{[Cl]^2}{[Cl_2]} = \frac{n_{Cl}^2}{n_{Cl_2}}\cdot\frac{1}{V} \Rightarrow V\uparrow \Rightarrow \frac{n_{Cl}^2}{n_{Cl_2}}\uparrow$

degree of dissociation doubles

3. The equilibrium constant for a reaction $A + B \leftrightarrow Y + Z$ is 0.4. What amount of A must be mixed with 6 mol of B to yield, at equilibrium, 4 mol of Y?

• initially: x mol of A, 6 mol of B, 0 mol of Y and Z

• in equilibrium: x − 4 mol of A, 2 mol of B, 4 mol of Y and Z

$\Rightarrow K_c = \frac{4\cdot 4}{(x-4)\cdot 2} = 0.4 \Rightarrow 0.8x - 0.4\cdot 8 = 16$

$\Rightarrow x = \frac{16 + 0.4\cdot 8}{0.8}$

$= 24\,mol$