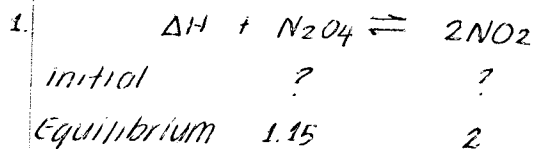


UNIT 5

EQUILIBRIUM

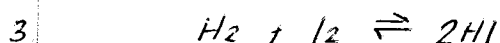
ANSWERS

Equilibrium ProblemsSolutions

$$K_{eq} = \frac{[NO_2]^2}{[N_2O_4]} = \frac{2^2}{1.15} = \frac{4}{1.15} = 3.478 \text{ mol/L}$$

\therefore The equilibrium constant is 3.478 mol/L

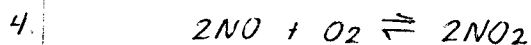
2. a) An increase in pressure will force the system to the left
 b) An increase in temperature will force the system to the right.
 c) An addition of a catalyst will have no change.



$$K_{eq} = \frac{[HI]^2}{[H_2][I_2]} = 64 = \frac{x^2}{(0.2)^2}$$

$$x^2 = 2.56$$

$$x = 1.6 \text{ mol/L}$$

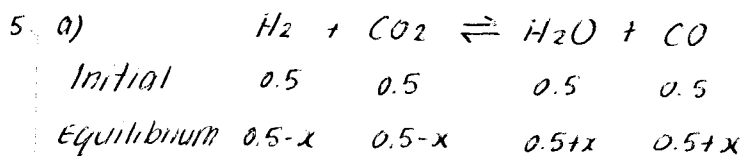


$$K_{eq} = \frac{[NO_2]^2}{[NO]^2 [O_2]} = 6.45 \times 10^5 = \frac{(0.12)^2}{x^2 (0.666)}$$

$$x^2 = \frac{(0.12)^2}{(6.45 \times 10^5)(0.666)}$$

$$x^2 = 4.236 \times 10^{-8}$$

$$x = 3.04 \times 10^{-4} \text{ moles}$$



$$K_{eq} = 1.6 = \frac{(0.5+x)^2}{(0.5-x)^2}$$

$$1.265 = \frac{0.5+x}{0.5-x}$$

$$0.6325 - 1.265x = 0.5+x$$

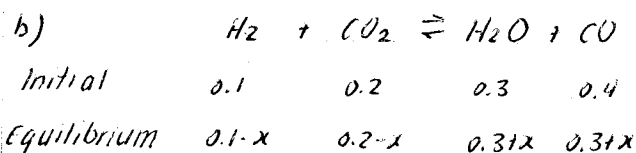
$$x = 0.058$$

$$[\text{H}_2] = 0.5 - 0.058 = 0.44$$

$$[\text{CO}_2] = 0.5 - 0.058 = 0.44$$

$$[\text{H}_2\text{O}] = 0.5 + 0.058 = 0.56$$

$$[\text{CO}] = 0.5 + 0.058 = 0.56$$



$$K_{eq} = 1.6 = \frac{(0.3+x)(0.4+x)}{(0.1-x)(0.2-x)} = \frac{0.12 + 0.7x + x^2}{0.02 - 0.3x + x^2}$$

$$0.12 + 0.7x + x^2 = 0.032 - 0.48x + 1.6x^2$$

$$0 = -0.088 - 1.18x + 0.6x^2$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{1.18 \pm \sqrt{(1.18)^2 - 4(0.6)(-0.088)}}{2(0.6)}$$

$$x = 2.039 \text{ or } x = -0.076$$

$$[\text{H}_2] = 0.1717$$

$$[\text{CO}_2] = 0.2717$$

$$[\text{H}_2\text{O}] = 0.228$$

$$[\text{CO}] = 0.328$$