Daily Tutorial Sheet-7	Level-2

86.(A) $H_2(g) + CO_2(g) \rightleftharpoons CO(g) + H_2O(g)$

	$H_2(g)$	$CO_2(g)$	$CO(g)$	$H_2O(g)$
Initial	1	1	0	0
	$1-x$	$1-x$	x	x

$$K_p = \frac{x^2}{(1-x)^2}$$

87.(B) $2H_2S(g) \rightleftharpoons 2H_2(g) + S_2(g)$

At eq $\quad 0.1-x \quad x \quad x/2$

$V = 0.4\,L$

$$k_c = \frac{[H_2]^2[S_2]}{[H_2S]^2} = \frac{[x/V]^2[x/2V]}{[[0.1-x]/v]^2}$$

$$k_c = \frac{x^3}{2V(0.1)^2} = 1.0\times10^{-6}$$

$$x^3 = 1.0\times10^{-6}\times2\times0.4\times0.1\times0.1 = 8\times10^{-9}$$

$$x = 2\times10^{-3}$$

$$\%\text{ dissociation } = \frac{2\times10^{-3}\times100}{0.1} = 2\%$$

88.(A) $N_2O_4(g) \rightleftharpoons 2NO_2(g) \quad \Rightarrow \quad K_c = \frac{[NO_2]^2}{[N_2O_4]}$

89.(B) $N_2(g)+O_2(g) \rightleftharpoons 2NO(g) \qquad K_1$

$NO \rightleftharpoons \frac{1}{2}N_2 + \frac{1}{2}O_2 \qquad K_2$

$$K_1 = \frac{1}{K_2^{1/2}}$$

90.(A) $CO_2(g) + C(s) \rightleftharpoons 2CO(g)$

	$CO_2(g)$	$C(s)$	$2CO(g)$
Initial	$0.5\,atm$		
At Eqm.	$(0.5-p)$		$2p\,atm$

This is case of heterogeneous equilibrium.

C(s) being solid is not considered

Total pressure of CO_2 and CO gases.

$$p_{CO_2} + p_{CO} = p_{total}$$

$$0.5 - p + 2p = 0.8$$

$$P = 0.3\text{ atm}$$

$\therefore \quad p_{CO_2} = 0.5-0.3 = 0.2\,atm$

$$p_{CO} = 2p = 0.6\,atm$$

$$K_p = \frac{p_{CO}^2}{p_{CO_2}} = \frac{0.6\times0.6}{0.2} = 1.8\text{ atm}$$

91.(D) $2NO_2(g) \rightleftharpoons 2NO(g) + O_2(g)$

$K_c = 1.8 \times 10^{-6}$ at $184^\circ C$ (= 457 K)

$R = 0.00831$ kJ mol^{-1} K^{-1}

$K_p = K_c (RT)^{\Delta n_g}$ where, Δn_g = (gaseous product – gaseous reactants) $= 3 - 2 = 1$

$\therefore$ $K_p = 1.8 \times 10^{-6} \times 0.00831 \times 457 = 6.836 \times 10^{-6} > 1.8 \times 10^{-6}$. Thus, $K_p > K_c$

92.(B) $4NH_3 + 5O_2 \rightleftharpoons 4NO + 6H_2O$

$$K_c = \frac{[NO]^4 [H_2O]^6}{[NH_3]^4 [O_2]^5}$$

Hence, units of K_c = conc.$^{+1}$

93.(A) For this reaction $I_2(g) \rightleftharpoons 2I(g)$

	$I_2(g)$	$2I(g)$
	1	0
	$1-x$	$2x$

$$k_c = \frac{[I]^2}{[I_2]} = \frac{(2x)^2}{1-x}$$

As degree of dissociation is 5%

$x = 0.05$

$$k_c = \frac{(2 \times 0.05)^2}{1 - 0.05} = \frac{0.01}{0.95} = 0.0105$$

94.(C) As equation IV can be obtained by adding equation I and equation II and subtracting from equation III.

95.(B) $N_2O_4 \rightleftharpoons 2NO_2$

0.1

$0.1 - x$ $2x$

$$k_p = \frac{(2x)^2}{(0.1-x)} \times [p/(0.1+x)]$$

$$k_p = \frac{40 \times x^2}{(0.1-x)}$$

$x = 0.017$

$NO_2 = 0.017 \times 2 = 0.034$ mole