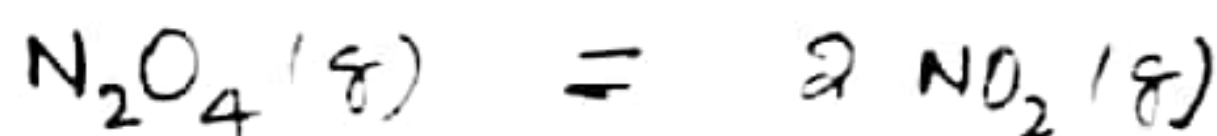


## S-II : Chemical Equilibrium

(1).



300K

1 atm

—

600 K

2 atm

—

$P \propto T (V, n)$

After disso.  $2 - 0.4$   
 $= 1.6 \text{ atm}$

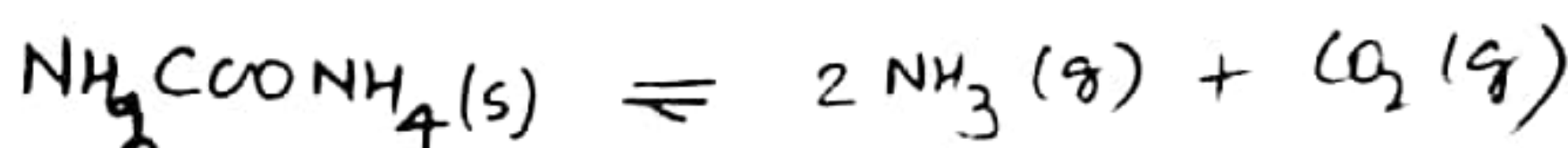
0.8 atm

$P_T = 2.4 \text{ atm}$

Ans

% dissociation = 20%

(2).



In eqm Pr.

—

2P

P

New eqm Pr

—

3P

P-x

$$(2P)^2 P = (3P)^2 (P-x)$$

$$\frac{4}{9} P = P - x$$

$$x = \frac{5}{9} P$$

$$\frac{(P_T)_{\text{New eqm}}}{(P_T)_{\text{Old eqm}}} = \frac{4P-x}{3P} = \frac{4P - \frac{5}{9}P}{3P} = \frac{\frac{31}{9}P}{3P} = \frac{31}{3 \times 9} = \frac{31}{27}$$

Ans

(3).



$t=0$

$0.6$

—

$t=1$

$0.6 - 0.1$

$0.1n = 0.2$

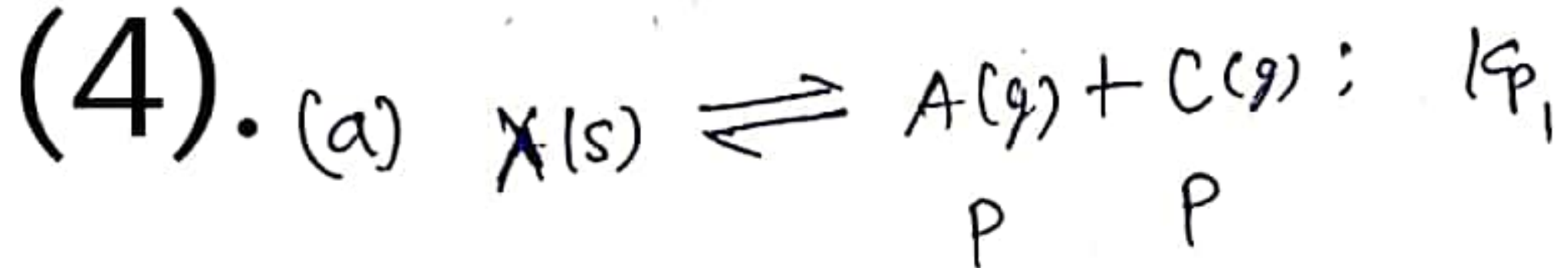
$\Rightarrow \underline{n=2}$

(ii)

$$K = \frac{[B]^2}{[A]} = \frac{0.6^2}{0.3} = 1.2 \text{ M}$$

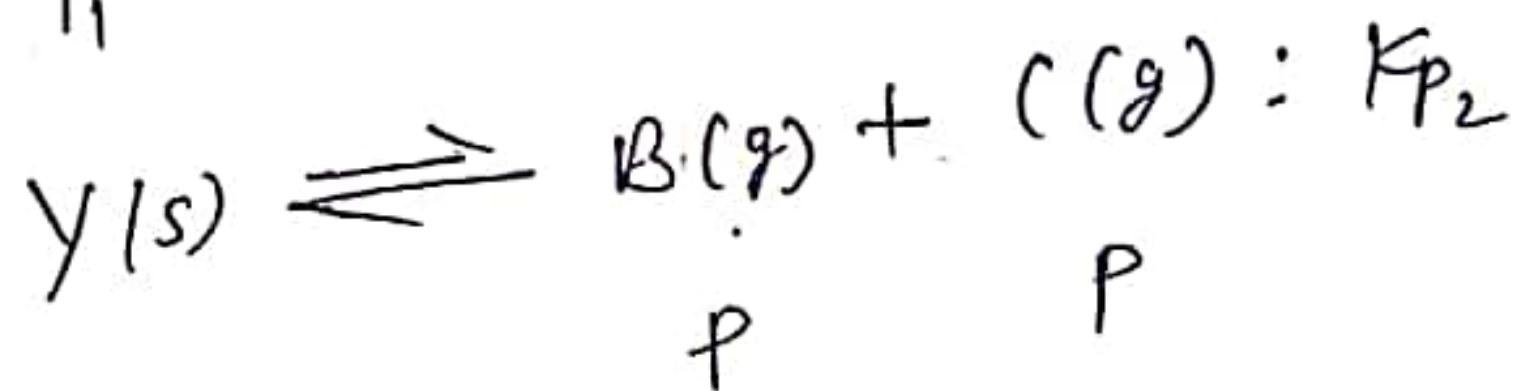
(iii)

$$\left( -\frac{d[A]}{dt} \right)_{0 \text{ to } 1} = \frac{0.1 \text{ M}}{1 \text{ hr}}$$



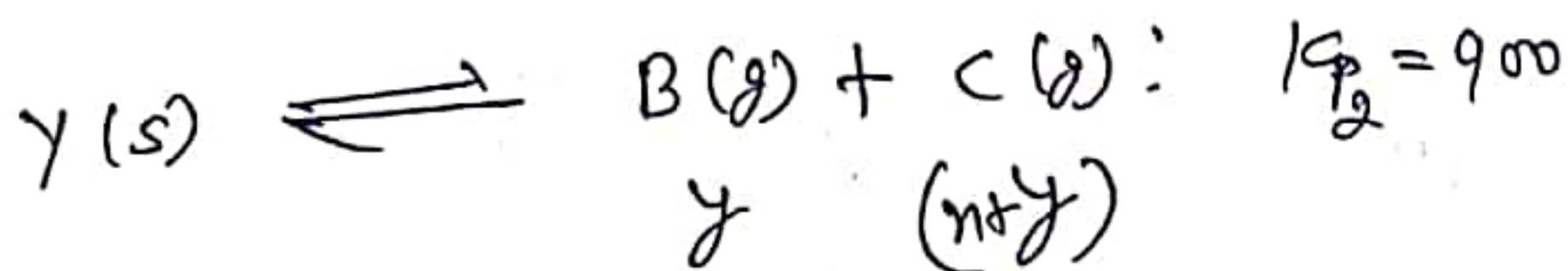
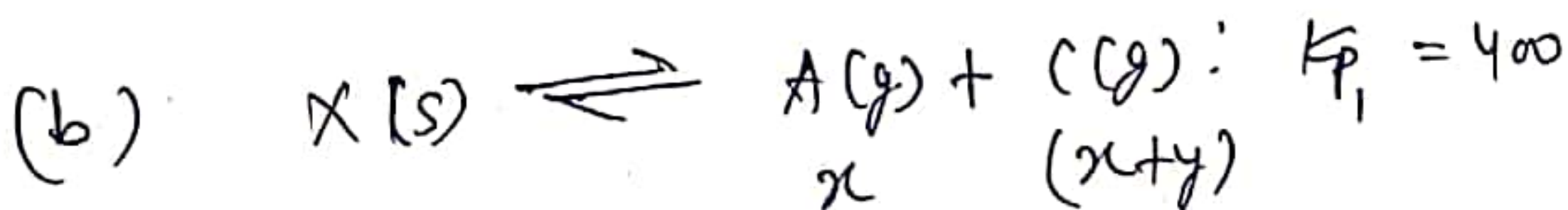
$$2P = 40 \Rightarrow P = 20$$

$$K_{p1} = 20 \times 20 = 400 \text{ mm}^2$$



$$2P = 60 \Rightarrow P = 30$$

$$K_{p2} = 30 \times 30 = 900 \text{ mm}^2$$



$$K_{p1} = x(n+y) = 400 \quad \text{--- ①}$$

$$K_{p2} = y(n+y) = 900 \quad \text{--- ②}$$

or.  $\frac{\text{①}}{\text{②}} \Rightarrow$

$$\frac{x}{y} = \frac{4}{9}$$

(c)

$$\underline{\text{eq. ①} + \text{eq. ②}}$$

$$(n+y)(n+y) = 400 + 900$$

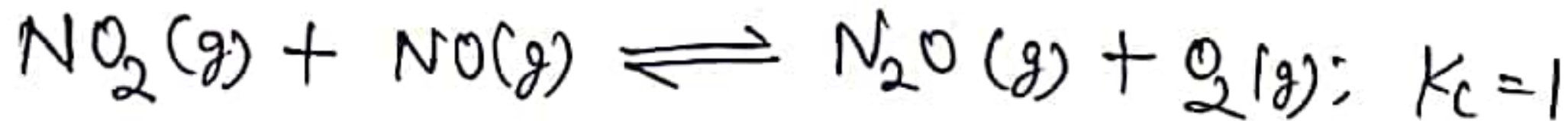
$$(n+y) = \sqrt{1300}$$

$$P_{\text{total}} = P_A + P_B + P_C = 2(n+y)$$

$$= 2 \times \sqrt{1300} = 72.15 \text{ mmHg}$$



(5).



moles  
initially

$a$

$a$

$-$

$-$

at eqm  $a-x$

$a-x$

$x$

$x$

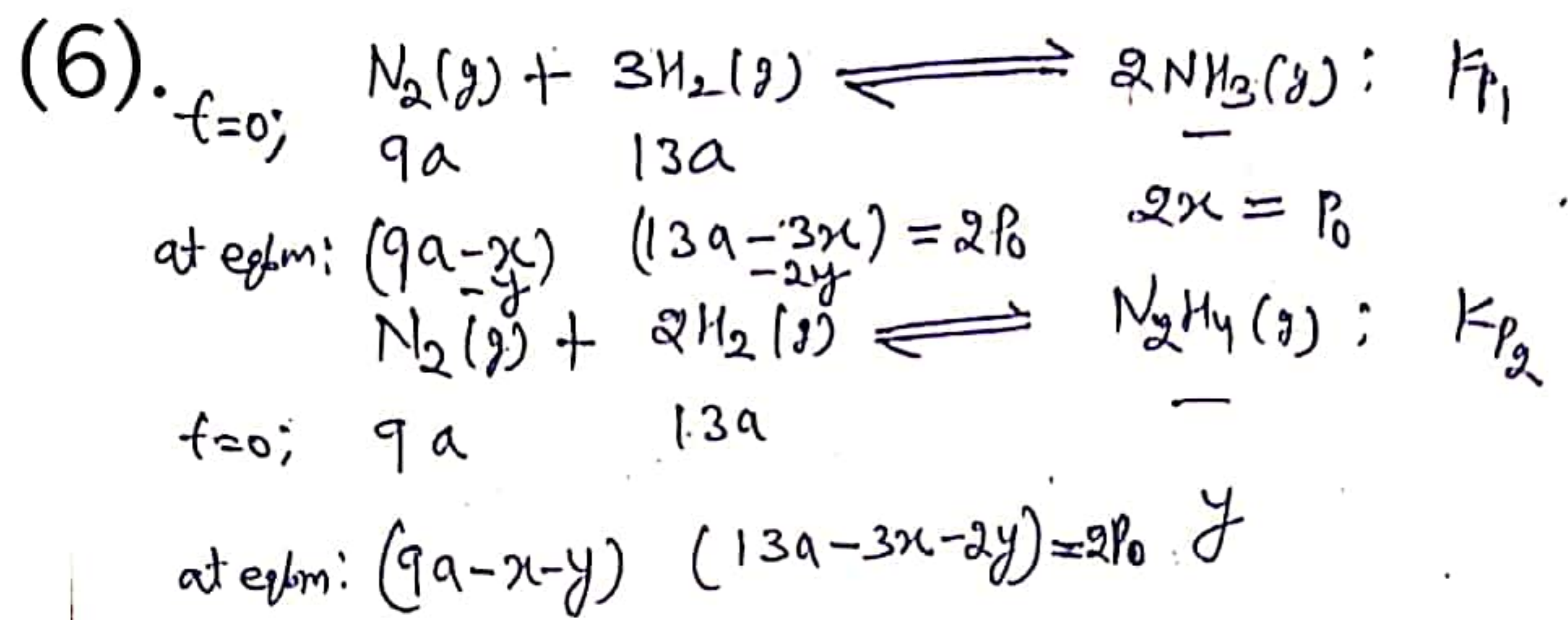
$$K_c = 1 = \frac{x \cdot x}{(a-x)(a-x)}$$

$$\text{also } [\text{N}_2\text{O}] = \frac{x}{5} = 0.5$$

$$x = 2.5$$

$$\Rightarrow 1 = \frac{x}{a-x} \Rightarrow a = 2x = 2 \times 2.5 = 5$$

$$\Rightarrow (\text{NO} + \text{NO}_2)_{\text{initial}} = a + a = 2a = 2 \times 5 = \underline{\underline{10}}$$



at eqbm

$$P_{\text{total}} = P_{\text{N}_2} + P_{\text{H}_2} + P_{\text{NH}_3} + P_{\text{N}_2\text{H}_4}$$

$$7P_0 = (9a - \underbrace{x-y}_{(P_0/2)}) + 2P_0 + P_0 + y$$

$$\Rightarrow \underline{a = 0.5 P_0}$$

$$\text{also } P_{\text{H}_2} = 2P_0 = \underbrace{13a}_{0.5P_0} - \underbrace{3x}_{0.5P_0} - 2y$$

$$\Rightarrow \underline{y = 1.5 P_0}$$

So at eqbm  $\Rightarrow P_{\text{N}_2} = 2.5 P_0 ; P_{\text{N}_2\text{H}_4} = 1.5 P_0$

$$P_{\text{H}_2} = 2P_0 ; P_{\text{NH}_3} = P_0$$

$$K_{p1} = \frac{(P_0)^2}{(2.5P_0)(2P_0)^3} = \frac{1}{20 P_0^2}$$

$$K_{p2} = \frac{(1.5 P_0)}{(2.5 P_0)(2P_0)^2} = \frac{3}{20 P_0^2}$$