

**[JEE (Main)-2016]**

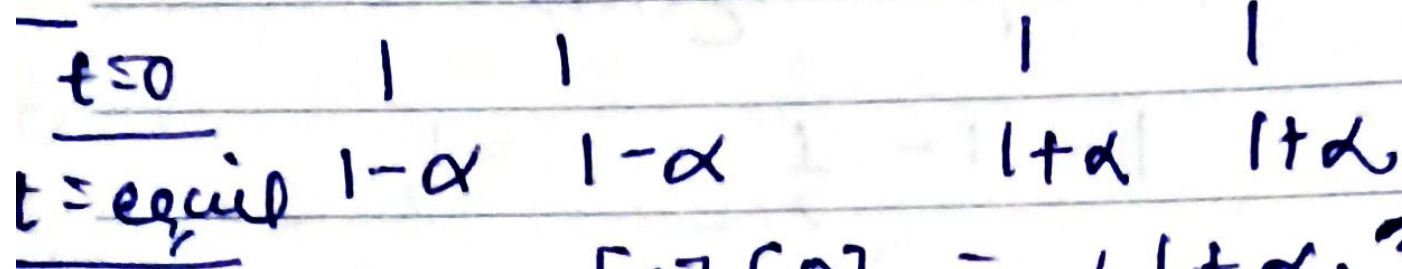
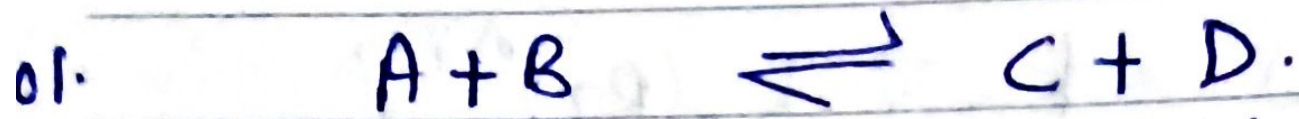
The equilibrium constant at 298 K for a reaction  $A + B \rightleftharpoons C + D$  is 100. If the initial concentration of all the four species were 1 M each, then equilibrium concentration of D (in  $\text{mol L}^{-1}$ ) will be

(1) 0.818

(2) 1.818

(3) 1.182

(4) 0.182



$$K_c = \frac{[C][D]}{[A][B]} = \left( \frac{1+\alpha}{1-\alpha} \right)^2 = 100$$

$$\begin{aligned} \therefore \frac{1+\alpha}{1-\alpha} = 10 &\Rightarrow 1+\alpha = 10 - 10\alpha \\ 11\alpha &= 9 \\ \alpha &= 9/11. \end{aligned}$$

$$[D]_{\text{equil}} = 1+\alpha = 20/11 = \boxed{1.818}$$