1.(a)

by boundary condition

$t=0 \Rightarrow C(x,t) = 100ppm \quad (0 \le x \le l)$

$t>0, \ C(l,t) = 5ppm, \ D\frac{\partial^2 C}{\partial x^2} = \frac{\partial C}{\partial t}$

(b) put $C = T \cdot X + 5$ by PDE's solution may be seperable form differential eq.

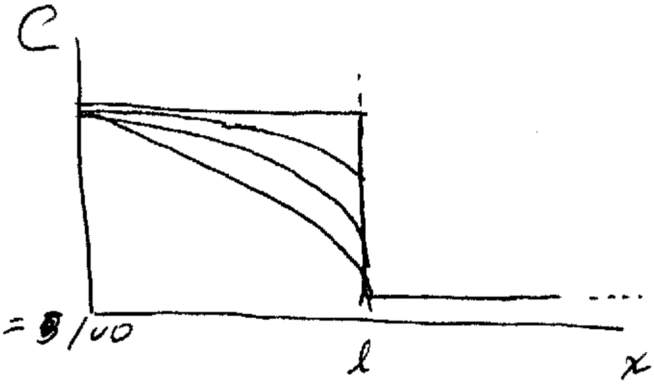
$$\frac{\partial C}{\partial t} = D\frac{\partial^2 C}{\partial x^2}$$

$$X\frac{\partial T}{\partial t} = DT\frac{\partial^2 X}{\partial x^2} = -\lambda_n^2$$

$$X = a_n \sin(\lambda_n x) + b_n \cos(\lambda_n x)$$

$$T = T_0 \exp(-\lambda_n^2 D t)$$

by using boundary condition,



$T=0$ 일 때

$$C_n = a_n \sin(\lambda_n x) + b_n \cos(\lambda_n x) + 5 = 100$$

$T \neq 0$ 일 때 $x=l$ 에서

$$C_n = T \cdot (a_n \sin(\lambda_n l) + b_n \cos(\lambda_n l)) + 5 = 5$$

우측 개편해서 $a_n = 0$

$$\lambda_n = \frac{n\pi + \frac{\pi}{2}}{l} = \frac{\pi}{l}\left(n + \frac{1}{2}\right) \text{ for the integer } n$$