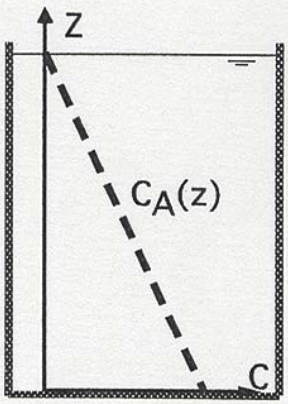
ANSWER. i. ii

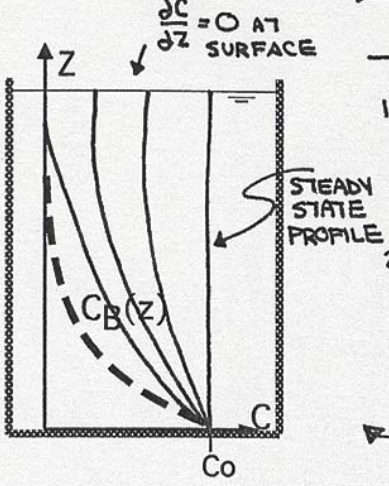
FROM FICK'S LAW, $q_z = -DA\frac{\partial C}{\partial z}$



1) AT $z=0$ AND $z=H$, $\frac{\partial C}{\partial z} < 0 \therefore q_z > 0$
WHICH INDICATES FLUXES IS UPWARD AT BOTH BOUNDARIES.

2) AT STEADY STATE, $\frac{\partial C}{\partial t} = 0$. FROM 1-D CONSERVATION EQUATION,
$\frac{\partial C}{\partial t} = D_z\frac{\partial^2 C}{\partial z^2}$
$\therefore$ AT STEADY STATE, $\frac{\partial^2 C}{\partial z^2} = 0 \therefore \frac{\partial C}{\partial z} =$ CONSTANT

← $\therefore$ LINEAR PROFILE INDICATES THIS SYSTEM IS AT STEADY STATE.



1) $\frac{\partial C}{\partial z} < 0$ AT $z=0 \therefore q_z > 0$, POSITIVE, UPWARD
NO FLUX AT $z=H$

2) SYSTEM IS NOT AT STEADY STATE.
$\frac{\partial}{\partial z}\left(\frac{\partial C}{\partial z}\right) \neq 0 \therefore$ FROM CONSERV. EQ, $\frac{\partial C}{\partial t} \neq 0$
SEE ABOVE

← PROGRESSION OF EVOLVING PROFILES SHOWN. NOTE, BECAUSE CHEMICAL IS NOT VOLATILE, SURFACE ($z=H$) IS A NO FLUX BOUNDARY $\therefore \partial C/\partial z|_{z=H} = 0$ SO THAT $q_z(z=H) = 0$