ANSWER 1.+

APPLY THE INTEGRAL FORM OF MASS CONSERVATION TO THE CONTROL VOLUME INDICATED BY DASHES.

(A) $$\frac{d}{dt}\int_{CV} C\,dV = -\int_{CS} C\,\vec{V}\cdot\vec{n}\,dA + \int_{CS} D_n \frac{\partial C}{\partial n}\,dA + S$$

- $\frac{d}{dt}\int_{CV} C\,dV$: Ø, b/c WE ASSUME steady state
- $\int_{CS} C\,\vec{V}\cdot\vec{n}\,dA$: EVALUATE AT SURFACE SECTIONS ①, ②
- $\int_{CS} D_n \frac{\partial C}{\partial n}\,dA$: Ø, b/c WE PLACE SURFACES ① & ② WHERE $\partial C/\partial n = 0$
- $S$: given

(B) $$0 = u_1 C_1 A_1 - u_2 C_2 A_2 + S$$

$C_1 = 0$

NOTE: FROM CONTINUITY, $u_2 = u_1$, BECAUSE $A_2 = A_1$

(C) $$C_2 = \frac{S}{u_2 A_2} = \frac{S}{u_1 A_1} = \frac{5\,g/s}{(10\,\frac{cm}{s})(10\,cm^2)} = 50\,mg/cm^3$$