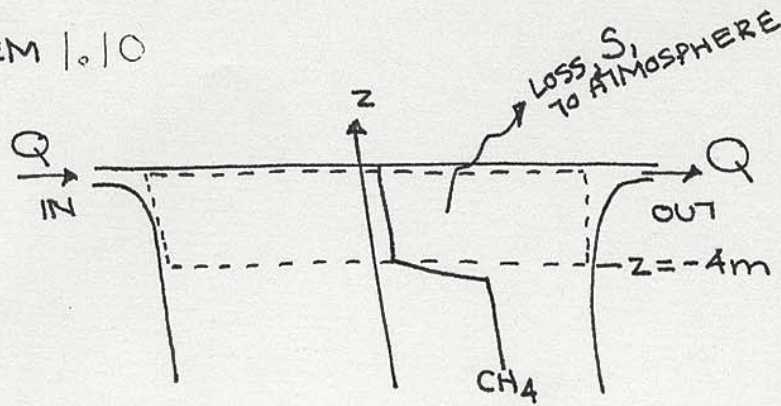


ANS.



DEFINE THE EPILIMNION AS THE CONTROL VOLUME OF INTEREST. THE CONSERVATION OF MASS FOR THIS SYSTEM, ASSUMING STEADY STATE, IS

$$(A) \quad 0 = (QC)_{IN} - (QC)_{OUT} - D_z \frac{\partial C}{\partial z} A - S$$

SIGN CHANGE B/C \vec{n} POINTS IN $-z$ DIRECTION

GIVEN $C_{IN} = 0$.

ASSUME EPILIMNION IS WELL-MIXED $\therefore C_{OUT} = C_{EPI} = C(z=-4m)$

DISCRETIZE CONCENTRATION GRADIENT ACROSS THERMOCLINE

$$\left. \frac{\partial C}{\partial z} \right|_{z=-4} \approx \frac{[C(z=-4) - C(z=-5)]}{[-4 - -5]}$$

THEN SOLVE (A) FOR S

$$(B) \quad S = -QC_{EPI} - D_z A \frac{C_{EPI} - C_{HYPO}}{1m}$$

$$= -(1 \frac{m^3}{s}) (0.4 \frac{mg}{l}) - (2 \times 10^{-6} m^2 s^{-1}) (10^6 m^2) \left[\frac{0.4 - 4 \frac{mg}{l}}{1m} \right]$$

$$= 6.8 \frac{m^3}{s} \frac{mg}{l} * \frac{1000l}{m^3} = \boxed{6.8 g/s}$$