

total M.B acc = in - out

$$\frac{dM}{dt} = m_1 - m_2$$

$$\frac{dV}{dt} = F_1 - F_2 = 0$$

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M.B on Salt

$$A \frac{dCA}{dt} = F_1 CA_1 - F_2 CA$$

$$100 \frac{dCA}{dt} = 0.1(2) - 2CA$$

$$100 \frac{dCA}{dt} = 0.2 - 2CA \quad (\text{separable ODE})$$

$$\int \frac{dt}{100} = \int \frac{dCA}{0.2 - 2CA} + K$$

$$\left(\frac{t}{100} = -\frac{1}{2} \ln(0.2 - 2CA) + K \right) \times -2$$

$$e^{-\frac{t}{50}} = \ln(0.2 - 2CA) - K$$

$$K e^{-\frac{t}{50}} = 0.2 - 2CA$$

$$CA = \frac{0.2 - K e^{-t/50}}{2} = 0.1(1 - K e^{-t/50})$$

$$CA_0 = 0.05 = 0.1(1 - K) e^{-\frac{0}{50}}$$

$$K = -0.05 + 1 = 0.95$$

$$CA = 0.1(1 - 0.95 e^{-t/50})$$

$$CA|_{30} = 0.1(1 - 0.95 e^{-30/50})$$

$$\text{Amount of salt} = 100 CA|_{30} \approx 100(0.047) = 4.7 \text{ Kg}$$

initial condition

$$CA_0 = \frac{5}{100} = 0.05$$