University of M'sila			2st year CT-NLS
Faculty of Sciences/ CT-NLS			Duration: 15 min
Interrogation of biophysics 2023/2024			
Nom:	First name:	Gr:	Note:

Interrogation of biophysics II

Exercise 1

Consider two compartments (I and II) of equal volume separated by a membrane permeable to hemoglobin molecules with a surface area S=5 cm^2 and a dx=3 cm. Compartment I contains a hemoglobin solution with a concentration of 2×10^{-4} mol/l, while compartment II contains pure water. After 3 minutes of diffusion, the concentration of hemoglobin in compartment I becomes 1.2×10^{-4} mol/L. the diffusion coefficient of hemoglobin as D=6.9×10^{-7} cm^2/s and its molar mass as M= 68×10^3 g/mol.

1. Calculate the mass of hemoglobin that has moved to compartment II in ug.

Exercise 1

Calculation of mass flow

$$\emptyset_{mass} = \frac{dm}{dt} = -DS\frac{\Delta C_p}{\Delta x}$$

After 3 min diffusion $C_{pt}^{I} = 1.2 \times 10^{-4}\ mol/l$ to $C_{pt}^{II} = 2 \times 10^{-4}\ mol/l$ therefore

$$\Delta m = -DS\frac{\Delta C_p}{\Delta x}\Delta t$$

The direction of diffusion C_{pt}^{I} to C_{pt}^{II} , So:

$$\Delta m = -DS\frac{\Delta C_p}{\Delta x}\Delta t = -DS\frac{(C_{pt}^{II}\ (t = 3min) - C_{pt}^{I}\ (t = 3min))}{\Delta x}\Delta t$$

$$\Delta m = -6.9 \times 10^{-7} \times 5 \times \left(\frac{((2 \times 10^{-4} - 1.2 \times 10^{-4}) - (1.2 \times 10^{-4}) \times 68 \times 10^{3} \times 10^{-3}}{3}\right) \times (3 \times 60)$$

$$= 0.558\ \mu g$$