

University of M'sila			2 St year CT-NLS
Faculty of Sciences/ CT-NLS			Duration: 1h30 min
Examination of biophysics 2023/2024			
Nom:	First name:	Gr:	Note:

Exercise 1

A bottle of sulfuric acid (H_2SO_4) supports the following indications: $\rho = 1.83 \text{ g/cm}^3$, the mass percentage of sulfuric acid is 96% and its molar mass is 98.08 g/mol.

1. Calculate the ponderal, molar, and molal concentration of this solution.

Exercise 2

One litre of an aqueous solution contains:

5.85 g NaCl, 3.28 g PO_4Na_3 , 9 g glucose, 0.6 g urea. It is supposed that NaCl and PO_4Na_3 are completely dissociated.

Calculate the molarity, osmolarity, ionic, and equivalent concentration of the solution.

The molar masses of NaCl=58.5, PO_4Na_3 =164, glucose=180, and urea=60 g/mol.

Exercise 3

Two compartments A and B are separated by a membrane permeable to glucose molecules with a $\Delta x = 0.1 \text{ mm}$. Compartments A and B contain glucose solutions at concentrations of 36 g/l and 18 g/l, respectively. It is supposed that glucose molecules are spherical with a radius $r = 3 \text{ \AA}$. The viscosity coefficient of glucose is $\eta = 10^{-3} \text{ poiseuille}$, and its molar mass is 180 g/mol.

1. Calculate the initial mass and molar flux of glucose diffusion at 25 and 0 °C.

Exercise 4

Consider a hemoglobin solution with a concentration of 10^{-4} mol/l which diffuses through a membrane of diffusing surface 20 cm^2 up to a concentration of $1.4 \cdot 10^{-4} \text{ mol/l}$. The diffusion coefficient of hemoglobin as $D = 6.9 \cdot 10^{-7} \text{ cm}^2/\text{s}$ and its molar mass as $M = 68 \cdot 10^3 \text{ g/mol}$.

1. Calculate the mass of hemoglobin that has moved 5cm during 1 min in g.