Abdelhafid Boussouf University Center - Mila **Academic year 2024–2025**

Institute of Natural and Life Sciences

Department of Biotechnology

Module: Biophysics

Series N°: Surface phenomena

Exercise: 1

A square metal frame with a side length of 5 cm is placed in a bath of fuel oil. To separate the frame from the liquid, a force of 7.32×10^{-3} N must be applied. Calculate the surface tension of the fuel oil (it is noted that separating the frame from the liquid creates two surfaces).

Exercise: 2

A liquid has a surface tension coefficient σ =25×10^{-3} N/m. With this liquid, a soap bubble of radius r=3cm is blown.

1. Calculate the overpressure inside this bubble.
2. Calculate the total work done to blow the bubble.

Exercise: 3

1. A liquid that perfectly wets the glass and has a density ρ=1.05×10^{3} kg/m^3 rises to an average height h=1.5 cm in a vertical glass capillary tube with an inner diameter d=1mm. Calculate the surface tension coefficient σ of the liquid.
2. What is the height reached in the same capillary tube if it is vertically immersed in mercury? Given σ_{Hg}=500×10^{-3} N/m, ρ_{Hg}=13600kg/m^3, and θ=135° (contact angle).

Exercise:4

Let there be a tube with an inner diameter d vertically immersed in a liquid with surface tension σ and density ρ. Perfect wetting is assumed, and h represents the height difference of the liquid inside the tube.

With water, we find h_0=92.3mm. Given: ρ_0=0.9973×10^{3} kg/m^3, σ_0=71.93×10^{-3} N/m For benzene, we find h=42.4mm. Deduce the surface tension coefficient σ for benzene, knowing that its density ρ is 0.8840×10^{3} kg/m^3.