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

Institute of Natural and Life Sciences

Department of Biotechnology

Module: Biophysics

Series 5: Study of viscosity

Exercise: 1

A viscous Newtonian liquid with a dynamic viscosity coefficient of η =1mPa·s, and a density of 1000 kg/m³, flows through a pipe with a diameter of 1 cm. What is the flow rate in liters per minute required to transition from laminar flow to turbulent flow?

Exercise: 2

In the aorta of a normal subject, the systolic velocity $vs$is twice the average velocity v_S, and the diastolic velocity v_d is half the average velocity. Determine the flow regimes in the aorta at the beginning of diastole and systole.

Given: aorta radius of 1 cm and volumetric flow rate Qv=5.4 liters/min.

Exercise: 3

A spherical particle with a radius r=30 nm, a density d=1.3, is released with no initial velocity in a medium with a viscosity η=0.2mPa.s and a density ρ_0 =1g/cm^3.

1- Calculate the diffusion coefficient D at T=27 °C.

2- Derive the expression for the terminal velocity of sedimentation. Calculate its value.