V2

Exercise #6_revised
MB&B 361/562.
Due: before class on Tuesday, February 27, 2023
Please upload it to the Canvas Box (title: 'LastnameFirstname_Exercise2'). You can scan handwritten parts.

1. For a hair bundle of height 10 μm and stiffness $\kappa = 1$ mN/m
(i) calculate

$$\frac{4\kappa m}{\gamma^2}$$

Assume that the hair bundle is a sphere of radius 5 μm to calculate m and γ as was done on pages 4 of the 09_2024_Mechanobiology notes using density and viscosity of water.
(ii) what does this tell you about the type of motion that the hair bundle will undergo if displaced from its resting position?

2. For the same hair handle undergoing sinusoidal oscillations of amplitude ±50 nm and frequency 1000 Hz,
(i) calculate the Reynolds number as on pages 4 and 5 (take the characteristic length as 5 μm).
(ii) what does this tell you about the ratio of inertial to viscous forces?

3. Why is it thought that there must be an active process in the ear?