

Young's Modulus Practice Problems

1. A patient's leg was put into traction, stretching the femur from a length of 0.46 m to 0.461 m. The femur has a diameter of 3.05 cm. With the knowledge that bone has a Young's modulus of $\sim 1.6 \times 10^{10}$ in tension, what force was used to stretch the femur? **(include all calculations, units and explain steps)**

$$F = (16000000000 \text{ Pa})(0.1 \text{ cm})/(46 \text{ cm})(9.3025\pi\text{cm}^2)$$

$$2.54 \times 10^8 \text{ N}$$

2. Using the following information on stress and strain, plot a graph in Google Sheets to determine the Young's modulus for an unknown material. The radius of the material is 4 cm. **(Include the graph and a link to the Google Sheets you used to perform the calculations)**

Initial Length (cm)	Final Length (cm)	Change in Length $-\Delta L$ (cm)	Strain $(\Delta L/L_0)$	Mass (g)	Force (N)	Stress (N/cm^2)
25	25.2			100		
25	25.7			200		
25	26.3			300		
25	26.9			400		

$$980 = Y(0.008)(19.49648053)$$