Calculation:

Bone has a Young's modulus of about 18 GPa. Under compression, it can

withstand a stress of about 1.60x108 Pa before breaking. Assume that a femur

(thigh-bone) is 46 cm long, and calculate the amount of compression this bone can

withstand before breaking. (4.09 mm)

To stretch a relaxed biceps muscle 3 cm requires a force of 25 N. To do the same stretch of a contracted muscle at its maximal tension requires a force of 500 N. Find the Young's modulus for both relaxed and tense muscle tissue. Assume the biceps is a uniform cylinder of length 20 cm and diameter 6 cm. (59 kPa, 1.18 MPa)

Collagen fiber is stressed with 12 N force. The cross-sectional area of the fiber is 3 mm2, its coefficient of elasticity is 500 MPa. Give the percentage of relative extension. (0.8 %)

The length of an elastic thread used in orthodontics is 6 cm, its cross-sectional area is 1 mm2, its coefficient of elasticity is 5 MPa. We extend the thread with 40 %. How large is the retracting force and what is the amount of elastic energy stored in the thread? (F = 2 N, E = 24 mJ)