Question #80937, Physics / Other

What couple must be applied to a 1m long wire with 1mm diameter in order to twist one end of it through 90˚, the other end remains fixed? Given: rigidity modulus of the wire is 2.8 x 1010 N/m2

Solution

$$C = \frac{\pi N r^4}{2l}\theta$$

$$\theta = 90^\circ = \frac{\pi}{2}.$$

So,

$$C = \frac{\pi^2 N r^4}{4l} = \frac{\pi^2 (2.8 \cdot 10^{10})(0.0005)^4}{4(1)} = 4.3 \cdot 10^{-3} Nm.$$

Answer: $4.3 \cdot 10^{-3} Nm$.