

## Elasticity Problem Set

1. Young's modulus is defined as:
  - a. the ratio of tensile stress to tensile strain
  - b. the ratio of shear stress to shear strain
  - c. the ratio of tensile strain to tensile stress
  - d. the ratio of shear strain to shear stress
  
2. A woman is stressing a length of thin, gold wire, drawing it out with a pair of pliers. She begins pulling on both ends, steadily increasing the force; the degree to which the wire stretches is proportional to the force she applies. She pulls a little harder and detects a sudden jump in the degree to which the wire stretches. Which of the following describes what has just occurred?
  - I. The woman exceeded the elastic limit for stressing gold wire.
  - II. The woman stressed the wire beyond the breaking point.
  - III. The woman stressed the wire beyond the yield point.
  - a. only I
  - b. only II.
  - c. both I. and II.
  - d. both I. and III.
  
3. A 2 m length of wire ( $1 \text{ mm}^2$  cross-sectional area) supports a load of 100 kg. The wire is stretched 2 cm. What is Young's modulus for the wire?
  - a.  $1 \times 10^{11} \text{ N/m}^2$
  - b.  $1 \times 10^8 \text{ N/m}^2$
  - c.  $1 \times 10^{10} \text{ N/m}^2$
  - d.  $1 \times 10^9 \text{ N/m}^2$
  
4. A cubic piece of synthetic rubber ( $1 \text{ m}^3$ ) floats on water with half of its volume exposed. The bulk modulus for this particular material is  $4 \times 10^5 \text{ N/m}^2$ . If the cube is forcibly submerged, beyond what depth will it not return to the surface when the force is removed?
  - a. 20 m
  - b. 4 m
  - c. 10 m
  - d. 40 m
  
5. A physics student in his university cafeteria accidentally bumps into a table upon which rectangular solid samples of different flavored jello are arranged upon plates. Even though all the jello servings have equal density and spacial dimensions, he notices the lime jello to be jiggling in a sidelong manner at a higher frequency than the orange variety. What does he then conclude?
  - a. that lime jello has a higher shear modulus than the orange variety
  - b. that lime jello has a lower shear modulus than the orange variety
  - c. that lime jello has less density than orange jello
  - d. more than one of the above is correct