

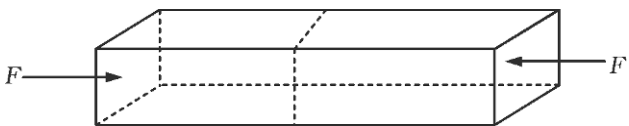
Date Planned : __ / __ / __	Daily Tutorial Sheet - 5	Expected Duration : 90 Min
Actual Date of Attempt : __ / __ / __	Level - 1	Exact Duration : _____
Topics covered: Elasticity		

61. In the figure shown, forces of equal magnitude are applied to the two ends of a uniform rod. Consider A as the cross-sectional area of the rod. For this situation, mark out the incorrect statements.
- (A) The rod is in compressive stress

(B) The numerical value of stress developed in the rod is equal to F/A

(C) The stress is defined as internal force developed at any cross section per unit area

(D) None of the above


62. When a certain weight is suspended from a long uniform wire, its length increases by 1 cm. If the same weight is suspended from another wire of the same material and length but having a diameter half of the first one, the increase in length will be :
- (A) 0.5 cm (B) 2 cm (C) 4 cm (D) 8 cm
63. A wire of length L and radius r is fixed at one end. A force F applied to the other end produced an extension l . The extension produced in another wire of same material of length $2L$ and radius $2r$ by a force $2F$ is :
- (A) l (B) $2l$ (C) $l/2$ (D) $4l$
64. A steel wire is suspended vertically from a rigid support. When loaded with a weight in air, it extends by ℓ_a and when the weight is immersed completely in water the extension is reduced to ℓ_w . Then the relative density of the material of the weight :
- ▶
- (A) $\frac{\ell_a}{\ell_w}$ (B) $\frac{\ell_a}{\ell_a - \ell_w}$ (C) $\frac{\ell_w}{\ell_a - \ell_w}$ (D) $\frac{\ell_w}{\ell_a}$
65. With a rise of temperature, the Young's modulus :
- (A) Increases (B) Decreases
- (C) Remains unchanged (D) Changes erratically
66. A thin rod of negligible mass and area of cross section S is suspended vertically from one end. Length of the rod is L_0 at $T^\circ\text{C}$. A mass m is attached to the lower end of the rod so that when temperature of the rod is reduced to 0°C its length remains L_0 . Y is the Young's modulus of the rod and α is coefficient of linear expansion of rod. Value of m is :
- ▶
- (A) $\frac{SY\alpha T}{g}$ (B) $\frac{SY\alpha T}{2g}$ (C) $\frac{SY\alpha}{2gT}$ (D) $\frac{SY\alpha T}{2gL_0}$
67. In a wire stretched by hanging a weight from its end, the elastic potential energy per unit volume in terms of longitudinal strain s and modulus of elasticity Y is :
- (A) $Y\sigma^2 / 2$ (B) $Y\sigma / 2$ (C) $2Y\sigma^2 / 2$ (D) $Y^2\sigma / 2$

68. A wire suspended vertically is stretched by a 20 kgf applied to its free end. The increase in length of the wire is 2 mm . The energy stored in the wire is ($g = 10 \text{ ms}^{-2}$): 
(A) 0.1 J (B) 0.2 J (C) 0.4 J (D) 5 J
69. The breaking stress for a substance is 10^6 N/m^2 . What length of the wire of this substance should be suspended vertically so that the wire breaks under its own weight? (Given : Density of material of the wire $= 4 \times 10^3 \text{ kg/m}^3$ and $g = 10 \text{ m/s}^2$) 
(A) 10 m (B) 15 m (C) 25 m (D) 34 m
70. Two rods of different materials, having coefficients of linear expansion α_1 and α_2 and Young's moduli, Y_1 and Y_2 , respectively, are fixed between two rigid massive walls. The rods are heated such that they undergo the same increase in temperature. There is no bending of rods. If $\alpha_1/\alpha_2 = 2/3$, then the thermal stresses developed in the two rods are equal, provided Y_1/Y_2 is equal to : 
(A) $2 : 3$ (B) $1 : 1$ (C) $3 : 2$ (D) $4 : 9$
71. A material has normal density ρ and bulk modulus K . The increase in the density of the material when it is subjected to an external pressure P from all sides is :
(A) $P/\rho K$ (B) $K/\rho P$ (C) $\rho P/K$ (D) $\rho K/P$
72. A copper bar of length L and area of cross section A is placed in a chamber at atmospheric pressure. If the chamber is evacuated, the percentage change in its volume will be: (compressibility of copper is $8 \times 10^{-12} \text{ m}^2/\text{N}$, $1 \text{ atm} = 10^5 \text{ N/m}^2$) 
(A) 8×10^{-7} (B) 8×10^{-5} (C) 1.25×10^{-4} (D) 1.25×10^{-5}
73. When a spring is loaded, the strain produced is :
(A) Longitudinal (B) Volumetric (C) Shearing (D) None
74. A cube of side 40 mm has its upper face displaced by 0.1 mm by a tangential force of 8 kN . The shearing modulus of cube is :
(A) $2 \times 10^9 \text{ Nm}^{-2}$ (B) $4 \times 10^9 \text{ Nm}^{-2}$ (C) $8 \times 10^9 \text{ Nm}^{-2}$ (D) $16 \times 10^9 \text{ Nm}^{-2}$
75. The compressibility of water is 4×10^{-5} per unit atmospheric pressure. The decrease in volume of 100 cm^3 of water under a pressure of 100 atmospheres will be :
(A) 0.4 cm^3 (B) $4 \times 10^{-5} \text{ cm}^3$ (C) 0.025 cm^3 (D) 0.04 cm^3