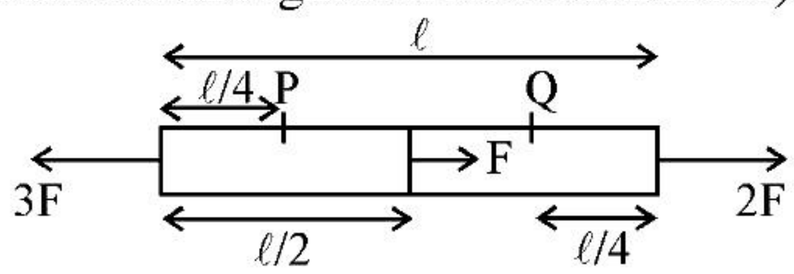
PROPERTIES OF MATTER (ELASTICITY)

1. In a Searle's experiment for determination of Young's Modulus, when a load of 50 kg is added to a 3 meter long wire micrometer screw having pitch 1 mm needs to be given a quarter turn in order to restore the horizontal position of spirit level. Young's modulus of the wire if its cross sectional area is 10^{-5} m^2 is

(A) $6\times 10^{11} N/m^2$ (B) 1.5×10^{11} N/m^2 (C) 3×10^{11} N/m^2 (D) None

2. In the figure shown a rod is kept on floor and applied some forces. The area of cross-section is A and Young's modulus is Y (Assume all forces are applied uniformly distributed throughout cross section of rod)



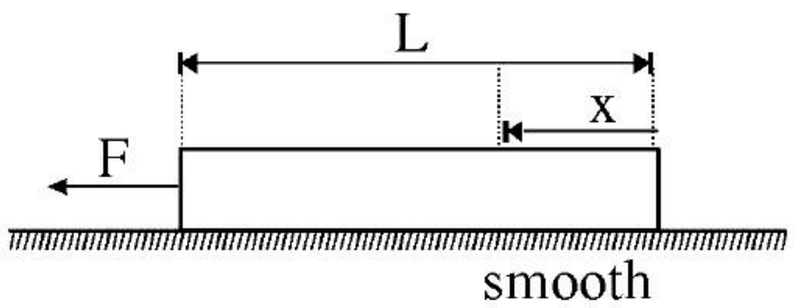
(A) Stress at P & Q are equal

(B) Stress at P is $\frac{3}{2}$ times stress at Q

(C) Elongation of rod under the forces is $\frac{5}{2}\frac{F\ell}{AY}$

(D) Strain at Q is $\frac{2F}{AY}$

3. A rod of mass m, uniform cross sectional area A and length L is accelerated by applying force F as shown in figure on a smooth surface. If Young's modulus of elasticity of the material of rod is Y. (Consider x as measured from the right end)



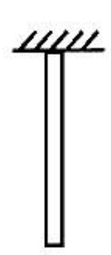
(A) Tension in rod as a function of distance x is $\frac{Fx}{2L}$

(B) Strain in rod is $\frac{F}{2AY}$

(C) Elastic potential energy stored in the rod is $\frac{F^2L}{8AY}$

(D) There is no stress in rod.

4. A uniform steel wire hangs from the ceiling and elongates due to its own weight. The ratio of elongation of the upper half of the wire to the elongation of the lower half of wire is

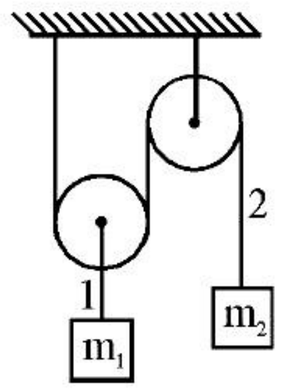


(A) 4 : 1 (B) 3 : 1 (C) 3 : 2 (D) None

5. A dress made of cloth will hang nicely, conforming to the shape of the body beneath, because cloth has both

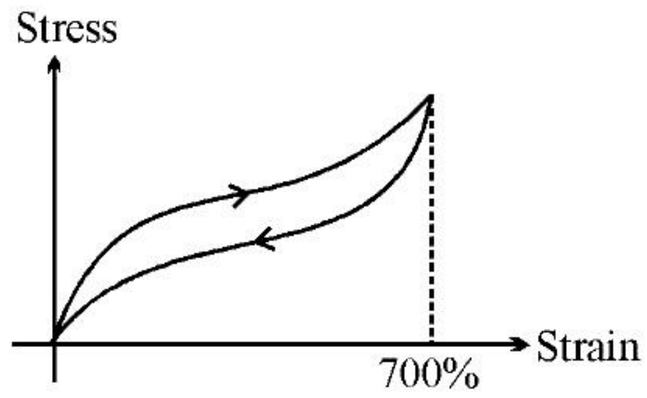
(A) a large Young's modulus and a low bulk modulus
(B) a low shear modulus and a low Young's modulus
(C) a large Young's modulus and a low shear modulus
(D) a low bulk modulus and a high shear modulus

6. In the figure shown the system is in equilibrium. In this system we have used two wires 1 and 2. The Young's modulus and radius of the wire 1 are two times and $2^{1/4}$ times respectively that of wire 2, then.



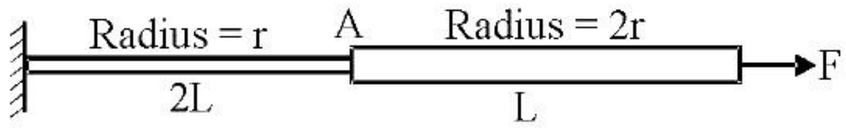
(A) Elastic energy density in wire 1 is equal to that of in wire 2
(B) Elastic energy density in wire 1 is greater than that of in wire 2
(C) Elastic energy density in wire 1 is less than that of in wire 2
(D) Stress in wire 1 is greater than stress in wire 2.

7. For a vulcanized rubber stress-strain curve is shown. The rubber is used as vibration absorbers. Choose the correct statement(s).



(A) After one complete cycle, compression in rubber is zero.
(B) The associated forces are non-conservative
(C) Work done by external agent in one full cycle is transformed into internal energy.
(D) The temperature of rubber rises.

8. Two steel wires of radii r and 2r are connected together end to end and tied to a wall as shown. The force stretches the combination by $\frac{27}{4}$ mm. How far does the junction point A move. (in mm)



9. A liquid of volumetric thermal expansion coefficient 200×10^{-6} /°C and bulk modulus = 1.2×10^9 Pa is filled in a spherical tank of negligible heat expansion coefficient. Its radius is 25 cm and wall thickness is 2 mm. When the temperature of the liquid is raised by 20 °C, find the tensile stress developed (in MPa) in the wall of the tank?

ANSWER KEY			PROPERTIES OF MATTER (ELASTICITY)	
1. (A)	**2. (B, C, D)**	**3. (B)**	**4. (B)**	
5. (C)	**6. (A,D)**	**7. (A, B, C, D)**	**8. (6)**	**9. (300)**