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Chapter : MECHANICAL PROPERTIES OF SOLIDS

Assignment 3

Class 11

DPP
DAILY PRACTICE PROBLEMS

CLASS : XI TH SUBJECT : PHYSICS
DATE : DPP NO. :3

Topic :- MECHANICAL PROPERTIES OF SOLIDS

1. A copper wire 2 m long is stretched by 1 mm. If the energy stored in the stretched wire is converted to heat, calculate the rise in temperature of the wire. (Given, $Y = 12 \times 10^{11}$ dyne cm^{-2}, density of copper= 9 gcm^{-3} and specific heat of copper = 0.1 cal g^{-1}°C^{-1})
a) 252°C b) (1/ 252)°C c) 1000°C d) 2000°C

2. A wire is stretched by 0.01 m by a certain force F. Another wire of same material whose diameter and length are double to the original wire is stretched by the same force. Then its elongation will be
a) 0.005 m b) 0.01 m c) 0.02 m d) 0.002 m

3. A copper wire and a steel wire of the same diameter and length are connected end to end and a force is applied, which stretches their combined length by 1 cm. The two wires will have
a) Different stresses and strains
b) The same stress and strain
c) The same strain but different stresses
d) The same stress but different strains

4. Two identical wires of rubber and iron are stretched by the same weight, then the number of atoms in the iron wire will be
a) Equal to that of rubber
b) Less than that of the rubber
c) More than that of the rubber
d) None of the above

5. A cube of side 10 cm is subjected to a tangential force of 5×10^5 N at the upper face, keeping lower face fixed. The upper face is displaced by 0.001 radian relative to the lower face along the direction of tangential force. The shear modulus of the material of the cube is
a) 5×10^{10} Nm^{-2} b) 5×10^{11} Nm^{-2} c) 5×10^{12} Nm^{-2} d) 5×10^{13} Nm^{-2}

6. If Poisson's ratio σ is $-\frac{1}{2}$ for a material, then the material is
a) Uncompressible b) Elastic fatigue c) Compressible d) None of the above

7. A material has Poisson's ratio 0.50. If a uniform rod of it suffers a longitudinal strain of 2×10^{-3}, then the percentage change in volume is
a) 0.6 b) 0.4 c) 0.2 d) Zero

8. A wire of area of cross-section $10^{-6} m^2$ is increased in length by 0.1%. The tension produced is $1000\ N$. The Young's modulus of wire is
a) $10^{12} N/m^2$ b) $10^{11} N/m^2$ c) $10^{10} N/m^2$ d) $10^{9} N/m^2$

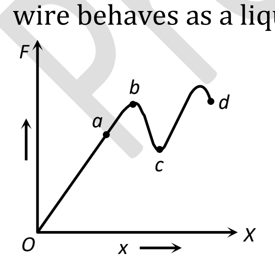
9. To what depth below the surface of sea should a rubber ball be taken as to decrease its volume by 0.1%? [Take : density of sea water $= 1000 kgm^{-3}$, Bulk modulus of rubber $= 9 \times 10^{8} Nm^{-2}$; acceleration due to gravity $= 10\ ms^{-2}$]
a) $9\ m$ b) $18\ m$ c) $180\ m$ d) $90\ m$

10. The radii and Young's modulii of two uniform wires A and B are in the ratio 2:1 and 1:2 respectively. Both wires are subjected to the same longitudinal force. If the increase in length of the wire A is one percent, the percentage increase in length of the wire B is
a) 1.0 b) 1.5 c) 2.0 d) 3.0

11. If a bar is made of copper whose coefficient of linear expansion is one and a half times that of iron, the ratio of the force developed in the copper bar to the iron bar of identical lengths and cross-sections, when heated through the same temperature range (Young's modulus for copper may be taken equal to that of iron) is
a) 3/2 b) 2/3 c) 9/4 d) 4/9

12. The breaking stress of a wire depends upon
a) Length of the wire b) Radius of the wire
c) Material of the wire d) Shape of the cross section

13. The graph is drawn between the applied force F and the strain (x) for a thin uniform wire. The wire behaves as a liquid in the part



a) ab b) bc c) cd d) oa

14. A particle of mass m is under the influence of a force F which varies with the displacement x according to the relation $F = -kx + F_0$ in which k and F_0 are constants. The particle when disturbed will oscillate

a) About $x = 0$, with $\omega \neq \sqrt{k/m}$
b) About $x = 0$, with $\omega = \sqrt{k/m}$
c) About $x = F_0/k$, with $\omega = \sqrt{k/m}$
d) About $x = F_0/k$, with $\omega \neq \sqrt{k/m}$

15. Two wires of copper having the length in the ratio 4:1 and their radii ratio as 1:4 are stretched by the same force. The ratio of longitudinal strain in the two will be

a) 1 : 16
b) 16 : 1
c) 1 : 64
d) 64 : 1

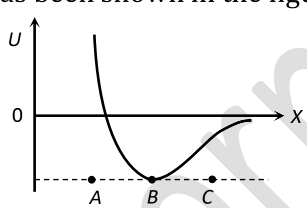
16. A copper bar of length L and area of cross-section A is placed in a chamber at atmospheric pressure. If the chamber is evacuated, the percentage change in its volume will be (compressibility of copper is $8 \times 10^{12} \mathrm{m}^2\ \mathrm{N}^{-1}$ and $1\ \mathrm{atm} = 10^5 \mathrm{N\ m}^2$)

a) 8×10^{-7}
b) 8×10^{-5}
c) 1.25×10^{-4}
d) 1.25×10^{-5}

17. A uniform plank of Young's modulus Y is moved over a smooth horizontal surface by a constant force F. The area of cross section of the plank is A. The compressive strain on the plank in the direction of the force is

a) F/AY
b) $2F/AY$
c) $\frac{1}{2}(F/AY)$
d) $3F/AY$

18. The potential energy U between two molecules as a function of the distance X between them has been shown in the figure. The two molecules are



a) Attracted when x lies between A and B and are repelled when X lies between B and C
b) Attracted when x lies between B and C and are repelled when X lies between A and B
c) Attracted when they reach B
d) Repelled when they reach B

19. Energy stored in stretching a string per unit volume is

a) $\frac{1}{2} \times$ stress $\times$ strain
b) stress $\times$ strain
c) $Y(\text{strain})^2$
d) $\frac{1}{2} Y\ (\text{stress})^2$

20. A student performs an experiment to determine the Young's modulus of a wire, exactly 2 m long, by Searle's method. In a particular reading, the student measures the extension in the length of the wire to be 0.8 mm with an uncertainty of ± 0.05 mm at a load of exactly 1.0 kg. The student also measures the diameter of the wire to be 0.4 mm with an uncertainty of $\pm 0.01 mm$. Take $g = 9.8\ m/s^2$ (exact). The Young's modulus obtained from the reading is

a) $(2.0 \pm 0.3) \times 10^{11} N/m^2$

b) $(2.0 \pm 0.2) \times 10^{11} N/m^2$

c) $(2.0 \pm 0.1) \times 10^{11} N/m^2$

d) $(2.0 \pm 0.05) \times 10^{11} N/m^2$