DPP
DAILY PRACTICE PROBLEMS

CLASS : XITH
DATE :

Solutions

SUBJECT : PHYSICS
DPP NO. : 8

Topic :- MECHANICAL PROPERTIES OF SOLIDS

1 **(b)**

$Y = \frac{F}{A} \times \frac{L}{l}$ or $l = \frac{FL}{AY}$ or $l \propto 1/A$

2 **(d)**

Compressibility, $K = \frac{1}{B} = \frac{\Delta V}{V \Delta P}$

$\therefore \quad 5 \times 10^{-10} = \frac{\Delta V}{100 \times 10^{-3} \times 15 \times 10^{6}}$

$\Rightarrow \Delta V = 5 \times 10^{-10} \times 100 \times 10^{-3} \times 15 \times 10^{6}$

=0.175 mL

Since, pressure increases, so volume will decrease.

3 **(d)**

When no weight is placed in pan, and T^2 shows some value, it means, the pan is not weightless and hence, the mass of the pan cannot be neglected.

4 **(c)**

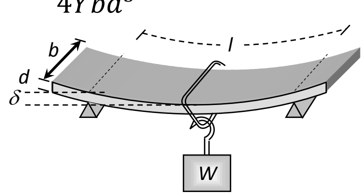
$l = \frac{FL}{AY} = \frac{FL^2}{(AL)Y} = \frac{FL^2}{VY}$

If volume is fixed then $l \propto L^2$

5 **(c)**

Depression in beam

$\delta = \frac{WL^3}{4Ybd^3}$



$\therefore \delta \propto \frac{1}{Y}$

6 **(d)**

Breaking force = Breaking stress $\times$ Area of cross section of wire

$\therefore$ Breaking force $\propto r^2$ (Breaking stress is constant)

If radius becomes doubled then breaking force will become 4 times *i.e.* $40 \times 4 = 160\ kg\ wt$

7 **(d)**

Attraction will be minimum when the distance between the molecule is maximum

Attraction will be maximum at that point where the positive slope is maximum because $F = -\frac{dU}{dx}$

8 **(d)**

Here, $k_Q = \frac{k_p}{2}$

According to Hooke's law

$\therefore F_p = -k_p x_p$

$F_Q = -k_Q x_Q \Rightarrow \frac{F_p}{F_Q} = \frac{k_p}{k_Q} \frac{x_p}{x_Q}$

$F_p = F_Q$ [Given]

$\therefore \frac{x_p}{x_Q} = \frac{k_Q}{k_p}$ ....(i)

Energy stored in a spring is $U = \frac{1}{2}kx^2$

$$\therefore \frac{U_P}{U_Q} = \frac{k_p x_p^2}{k_Q x_Q^2} = \frac{k_p}{k_Q} \times \frac{k_Q^2}{k_p^2} = \frac{1}{2} \quad \left[\because k_Q = \frac{k_p}{2}\right]$$

$$\Rightarrow U_p = \frac{U_Q}{2} = \frac{E}{2} \quad [\because U_Q = E]$$

10 **(b)**

Energy per unit volume = $\frac{1}{2}$ × stress × strain

$$= \frac{1}{2} \times \text{stress} \times \frac{\text{strain}}{Y} \qquad | \; Y = \frac{\text{stress}}{\text{strain}} = \frac{S^2}{2Y}$$

11 **(a)**

Energy stored per unit volume $= \frac{1}{2}\left(\frac{F}{A}\right)\left(\frac{l}{L}\right) = \frac{Fl}{2AL}$

12 **(a)**

Here, $p = 20{,}000$ Ncm^{-2} $= 2 \times 10^8$ Nm^{-2}

$K = \frac{pV}{\Delta V}$

$\Delta V = \frac{pV}{k}$

$= \frac{2 \times 10^8 \times V}{8 \times 10^9} = \frac{V}{40}$

New volume of the metal,

$V' = V - \Delta V = V - \frac{V}{40} = \frac{39V}{40}$

New mass of the metal

$= V' \times \rho = \frac{39V}{40}\rho' = V \times 11$

Or $\rho' = \frac{440}{39}$ gcm^{-3}

13 **(b)**

$$Y = \frac{mg \times 4 \times l}{\pi D^2 \times \Delta l} \text{ or } \Delta l \propto \frac{1}{D^2}$$

When D is doubled, Δl becomes on- fourth, *ie*, $\frac{1}{4} \times 2.4$ cm, *ie*, 0.6 cm.

14 **(c)**

$Y = \frac{w}{A} \times \frac{L}{l}$ or $l = \frac{wL}{YA}$

When wire goes over a pulley and weight w is attached each free ad end of wire, then the tension in the wire is doubled, but the original length of wire is reduced to half, so extension in the wire is

$l' = \frac{2w \times (L/2)}{YA} = \frac{wL}{YA} = l$

15 **(c)**

$$Y = \frac{\frac{F}{A}}{\frac{l}{L}} = \frac{F \times L}{A \times l}$$

(where Y is Young's modulus of elasticity Since, Y, L and A remain same.

$F \propto l$

$$\frac{F_1}{F_2} = \frac{l_1}{l_2}$$

$$\Longrightarrow \frac{F}{F_2} = \frac{2 \times 10^{-3}}{4 \times 10^{-3}}$$

$F_2 = 2F$

16 **(b)**

$$F = \frac{YA\Delta l}{l}$$

$= 9 \times 10^{10} \times \frac{22}{7} \times \frac{(0.6 \times 10^{-3})^2}{4} \times \frac{0.2}{100} \text{N} \approx 51 \text{ N}$

17 **(d)**

$$Y = \frac{F/A}{\text{Breaking strain}}$$

Or $a = \frac{F}{Y \times \text{Breaking strain}} = \frac{10^4 \times 100}{7 \times 10 \times 0.2}$

$= 0.71 \times 10^{-3} = 7.1 \times 10^{-4}$

19 **(c)**

$$l = \frac{MgL}{YA} = \frac{1 \times 10 \times 1}{2 \times 10^{11} \times 10^{-6}} = 0.05\ mm$$

ANSWER-KEY										
Q.	1	2	3	4	5	6	7	8	9	10
A.	B	D	D	C	C	D	D	D	D	B
Q.	11	12	13	14	15	16	17	18	19	20
A.	A	A	B	C	C	B	D	C	C	C