INDIAN SCHOOL AL WADI AL KABIR

Class: XI	**Department: SCIENCE 2020 -21** **SUBJECT: PHYSICS**	**DATE: 02.11.2020**
Worksheet No:9 **WITH ANSWERS**	**Topic:** **PROPERTIES OF SOLIDS**	**Note:** **A4 FILE FORMAT**

MULTIPLE CHOICE QUESTIONS,

[1] Hook's law defines

[a] modulus of elasticity

[b] elastic limit

[c] stress

[d] strain

Answer[a]

[2]The increase in length is $'\ell'$ of a wire of length 'L' by the longitudinal stress. Then the stress is proportional to

[a] ℓ/L [b] ℓxL [c] L^2 [d] L/ℓ

Answer[a]

[3]The Young's modulus of a wire of length L and radius r is Y N/m^2. If the length and radius are reduced to L/2 and r/2 , then its Young's modulus will be

[a] Y [b] 2Y[c] 4Y [d] Y/2

Answer[a]

[4] A beam of metal of Young's modulus 'Y' supported at the two ends

is loaded at the centre .The depression at the centre is proportional to

[a] Y^2 [b]Y[c] 1/Y [d] $1/Y^2$

Answer[c]

[5]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 then the increase in length will be

[a]0.5cm

[b] 2cm

[c]4cm

[d]8cm

Answer[c]

[6]The length of an iron wire is L and area of cross section is A. The increase in length is ℓ on applying the force F on its two ends. Which of the statement is correct.

[a] increase in length is proportional to area A

[b] increase in length is inversely proportional to its length L

[c] increase in length is proportional to Young's modulus

[d] increase in length is inversely proportional to its area A

Answer[d]

SHORT ANSWER TYPE QUESTIONS

[1] Differentiate Brittle and ductile based on stress- strain curve

[2] Why the bridges are declared unsafe after long use?

Due to the repeated stress and strain, the material of the bridge loses its elastic strength and ultimately collapsed.

[3] Girders are in the form of letter I.Why?

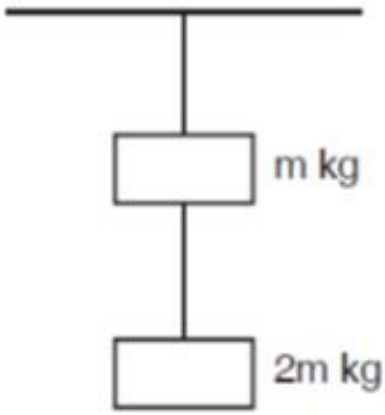
To minimize buckling and to reduce the cost of construction of beams

[4]State Hook's law

[5]A cable is cut to half of its original length .What will be the maximum load that it can support?

[stress =load/area. Ans. same]

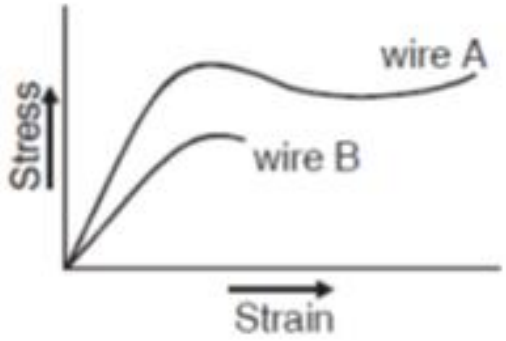
[6] Two wires P and Q of same diameter are loaded as shown in the figure. The length of wire P is L m and its young's modulus is Y N/m² while length of wire a is twice that of P and its material has young's modulus half that of P. Compute the ratio of their elongation.



[6] $\Delta l_P = \frac{3mg}{A} \times \frac{L}{Y}$ $\Delta l_Q = \frac{2mg}{A} \cdot \frac{2L}{Y/2} = \frac{8mg}{A}\frac{L}{Y}$

$\therefore \frac{\Delta l_P}{\Delta l_Q} = \frac{3}{8}$

[7] Stress strain curve for two wires of material A and B are as shown in Fig.



(a) which material in more ductile?

(b) which material has greater value of young modulus?

(c) which of the two is stronger material?

(d) which material is more brittle?

[7] (a) Wire with larger plastic region is more ductile material A

(b) Young's modulus is $\frac{\text{Stress}}{\text{Strain}}$

$\therefore Y_A > Y_B$

(c) For given strain, larger stress is required for A than that for B.

$\therefore$ A is stronger than B.

(d) Material with smaller plastic region is more brittle, therefore B is more brittle than A.

LONG ANSWER TYPE QUESTION

1. An aluminium wire 1m in length and radius 1mm is loaded with a mass of 40 kg hanging vertically. Young's modulus of Al is 7.0×10^{-10} N/m^2 Calculate (a) tensile stress (b) change in length (c) tensile strain and (d) the force constant of such a wire.

1. (a) $\text{Stress} = \frac{F}{A} = \frac{mg}{\pi r^2} = \frac{40 \times 10}{\pi \times \left(1 \times 10^{-3}\right)^2} = 1.27 \times 10^8 \text{N / m}^2$

(b) $\Delta L = \frac{FL}{AY} = \frac{40 \times 10 \times 1}{\pi \times \left(1 \times 10^{-3}\right)^2 \times 7 \times 10^{10}} = 1.8 \times 10^{-3} \text{m}$

(c) $\text{Strain} = \frac{\Delta L}{L} = \frac{1.8 \times 10^{-3}}{1} = 1.8 \times 10^{-3}$

(d) $F = Kx = K\Delta L$ K = Force constant

$K = \frac{F}{\Delta L} = \frac{40 \times 10}{1.8 \times 10^{-3}} = 2.2 \times 10^5 \text{N / m}$

[2]Derive the expression for [i] Young's modulus [ii]bulk modulus

[3] Explain the stress – strain curve for a metal wire, when it is subjected to an external force. In the curve, label – the elastic limit, elastic region, plastic region , fracture point, tensile strength and permanent set

[4] Explain how we can find the maximum height of a mountain using the knowledge of modulus of elasticity

[5]The length of a wire increases 8mm when a weight of 5kg is hung. If the conditions are the same, but the radius of the wire is doubled, what will be the increase in its length?

Y = FL/Al

R = 2r, Y = same

Ans. [2 x 10^{-3} m]

[6] When a wire is stretched by a certain force ,its elongation is 'x'. If the second wire of the same material has four times the length and double the radius of the first wire and is stretched by the same force as before, find its elongation?

Y = FL/Al

F = same

L = 4L, R = 2r,

Ans: $\ell 1 = \ell$