	INDIAN SCHOOL AL WADI AL KABIR	
Class: XI	**Department: SCIENCE 2022 - 23** **SUBJECT: PHYSICS**	**Date of submission: 19.01.2023**
Worksheet with answers	**CHAPTER: PROPERTIES OF SOLIDS**	**Note:**
NAME OF THE STUDENT	**CLASS & SEC:**	**ROLL NO.**

OBJECTIVE TYPE QUESTIONS

[1] 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

[2] 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] $1/Y^2$

[3]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]o.5cm [b]2cm [c]4cm [d]8cm

[4][Hook's law defines

[a] stress [b] strain [c] modulus of elasticity [d] elastic limit

[5] 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 inversely proportional to its area A

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

[6] 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] ℓ/L [c] ℓxL [d] L^2

ANSWER KEY

[1]a [2] c [3] c [4]c [5] c [6]b

SHORT ANSWER QUESTIONS

[1]State Hook's law
[2]What is elastic limit
[3] Steel is more elastic than rubber.Why?
[4]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]

stress[constant for a given material] does not depends on length = $\frac{load}{area}$, same
[5] What is dimensional formula of shear modulus

[6] What is poisons ratio

[7] Write the expression to find the energy stored in terms of stress and strain

LONG ANSWER QUESTIONS [revision questions]

[1]Derive the expression for [i] Young's modulus [ii]bulk modulus [iii]rigidity modulus
[2] Explain the stress – strain curve for a metal wire, when it is subjected to an external force within the elastic limit
[3]A rubber cube of side 10cm has one side fixed, while a tangential force equal to 5000 dyne is applied to the opposite face. Find the shearing strain produced and the distance through which the strained side moves[rigidity modulus G = 2 x 10^7 dynes/cm^2]Ans. X = ɵ x 10 = 2.5x10^{-5} cm
Young's modulus 'Y' = linear stress/ linear strain= FL/Al
[4]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? [2 x 10^{-3} m][g = 10m/s^2

[5] 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?

$$Y = \frac{FL}{\pi r^2 \ell} \quad \text{or } \ell 1 = \ell \text{ [same]}$$

[6]Two pieces of wires A and B of the same material have their lengths in the ratio 1:2 and diameters are in the ratio 2:1.If they are stretched by same force ,what will be the ratio of their elongation ?

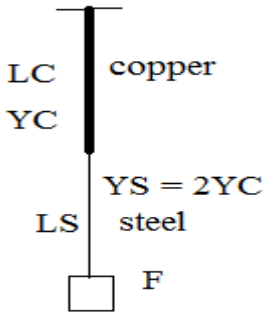
$Y = \frac{FL1}{\pi r1^2 \ell 1}$ ---[a]

And $Y = \frac{FL2}{\pi r2^2 \ell 2}$ ---[b]

[1:8]

[7]A piece of copper wire has twice the radius of a piece of steel wire. One end of the copper wire is joined to one end of the steel wire so that both can be subjected to the same longitudinal force. Find the percentage increase in the steel wire, when the length of the copper wire has increased by 1% ['Y' for steel is twice that of copper]

$\frac{\Delta \ell_c}{\ell_c}$



$$Y = \frac{F/A}{\Delta l/l}$$

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

$$\frac{\Delta l_c}{l_c} = \frac{F}{Y_c A_c} = \frac{F}{Y_c \pi (r_c)^2} \quad \text{-----(1)}$$

$$\frac{\Delta l_s}{l_s} = \frac{F}{Y_s A_s} = \frac{F}{Y_s \pi (r_s)^2} \quad \text{-----(2)}$$

Dividing (1) by (2)

$$\frac{\Delta l_c / l_c}{\Delta l_s / l_s} = \frac{Y_s (r_s)^2}{Y_c (r_c)^2} = \frac{Y_s}{Y_c} \times \left(\frac{r_s}{r_c}\right)^2 = (2) \times (\tfrac{1}{2})^2$$

$$\Rightarrow \frac{\Delta l_c / l_c}{\Delta l_s / l_s} = \frac{1}{2}$$

$\frac{\Delta \ell_s}{\ell_s} = 2 \frac{\Delta \ell_c}{\ell_c}$ = 2x1% = 2%

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