PHYSICS

BOOKS - BITSAT GUIDE PHYSICS (HINGLISH)

ELASTICITY

Parctice Exercise

1. Calcuate the stress for one litre of perfeect gas, at a pressure of 72 cm of hg. When it is compressed isothermally to a volume of 900 cc.

A. $9.88 \times 10^3 N/m^2$

B. $10.88 \times 10^3 N/m^2$

C. $1.088 \times 10^3 n/m^2$

D. $2 \times 10^3 N/m^2$

Answer: B

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2. If a metal wire of length L, having area of cross-section A and young' s modulus Y . Behave as a spring of spring constant K. The value of K is

A. $\frac{YA}{L}$

B. $\frac{YA}{2L}$

C. $\frac{2YA}{L}$

D. $\frac{YL}{A}$

Answer: A

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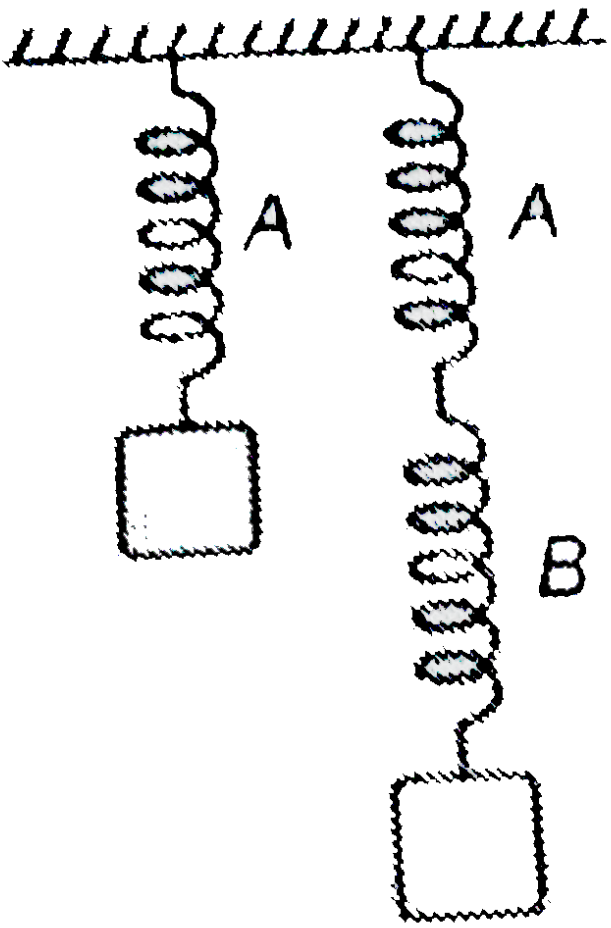
3. In the figure three indentical spring are shown . From spring A, mass of 4 k is hung and spring shows elonagation of 1 cm. But when a weight of 6 kg is

hung on B, the Hooke's descends



A. 1 cm

B. 2 cm

C. 3 cm

D. 4 cm

Answer: C

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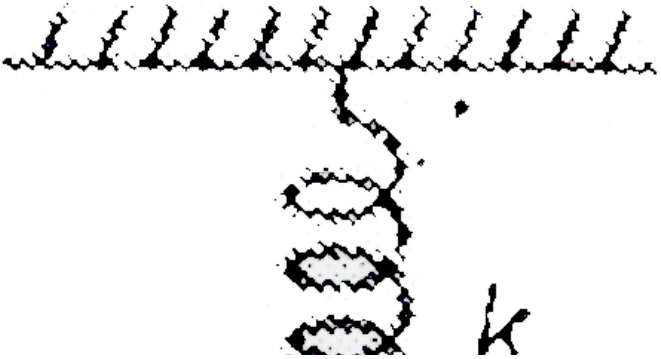
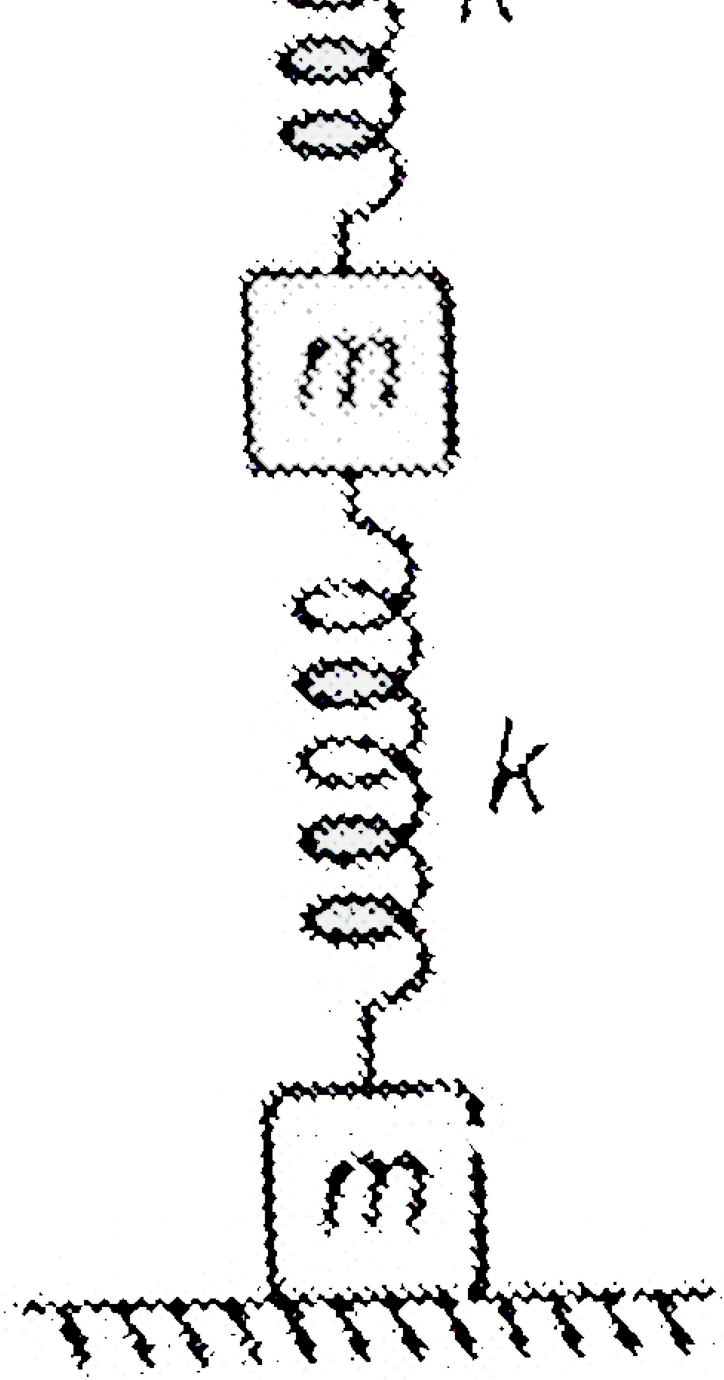
4. A system consists of two spring and a mass m = 1 kg as shown in figure . If mass m is dispalced slightly along vertical and vertical and released. The system oscillates with a period of 2 s .Then , the spring canstant K is




m
K
m

A. $\frac{\pi^2}{4}$

B. $\frac{\pi^2}{6}$

C. $\frac{\pi^2}{8}$

D. $\frac{\pi^2}{2}$

Answer: D

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5. A spring of constant K is cut into two parts of length in the ratio $2:3$. The spring constant of large spring is

A. $\frac{5}{3}K$

B. $\frac{2}{3}K$

C. k

D. $\frac{3}{5}k$

Answer: A

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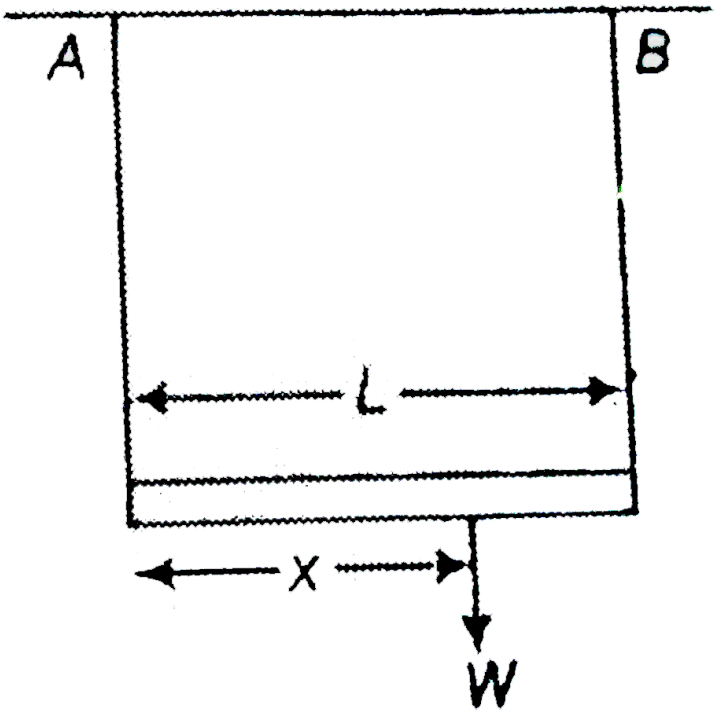
6. A light rod of length L is suspended from a support horizonatlly by means of two vertical wires A and B of equal lengths as show in the figure . Cross-section area of A is half that of B and Young's modulus of A is double than that of B. A weight W is hung on the rod as shown. The value of x, so that the stress In A is

same as that in B,is



A. $\frac{L}{3}$

B. $\frac{L}{2}$

C. $\frac{2L}{3}$

D. $\frac{3L}{4}$

Answer: C

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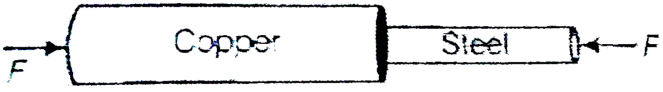
7. Two wires, one made of capper and other of steel are joined end to end. (as show in figure). The area of cross-section of copper wire is twice that of steel wire, They ae placed under compressive force of magnitude F. Find the ratio of their lenghts such that change in lenght of both wire are same $\left(Y_S = 2 \times 10^{11} N/m^2 \text{ and } Y_C = 1.1 \times 10^{11} N/m^2\right)$



A. 2.1

B. 1.1

C. 1.2

D. 2

Answer: B

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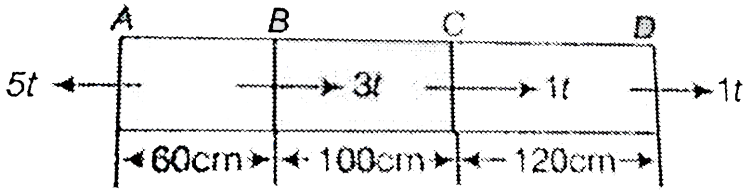
8. Find the total elongation of the bar, if the bar is subjected to axical froces as shown in figure . The cross-section area of bar is $10cm^2$.

$[TakeE = 8 \times 10^2 \text{dyne}/cm^2]$



A. 0.01 cm

B. 0.5 cm

C. 0.0675 cm

D. 0.775 cm

Answer: C

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9. When the tension in a metal wire is T_1, its length is I_1. When the tension is T_2, its length is I_2. The natural length of wire is

A. $\sqrt{l_1 l_2}$

B. $\frac{l_1 + l_2}{2}$

C. $\frac{(l_1 T_2 - l_2 T_1)}{T_2 - T_1}$

D. $\frac{l_1 T_2 - l_1 T_2}{T_1 - T_2}$

Answer: C

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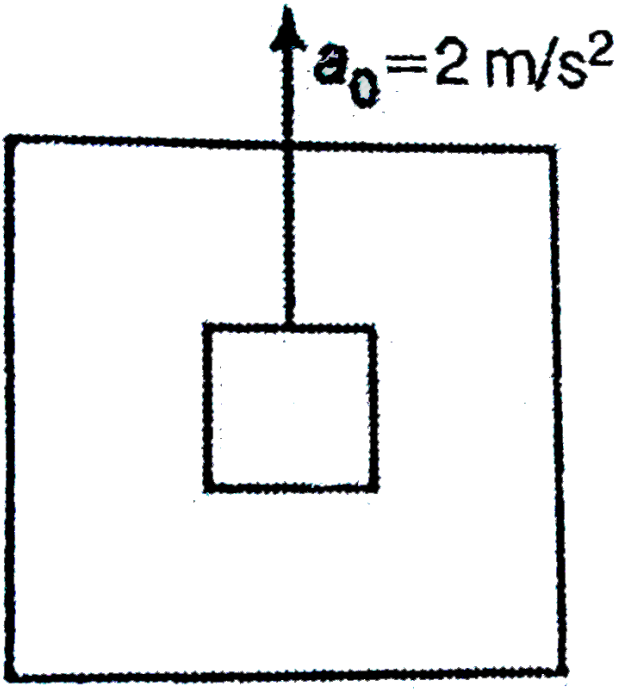
10. One end of a steel wire is fixed to celling of an elevator moving up load of 10 g hange from other end. Area of cross-section of the wire Is $2cm^2$.Find the longitudinal strain in the wire $\left(Takeg = 10m/s^2 \text{ and } Y = 2 \times 10^{11} N/m^2\right)$



A. 4×10^{11}

B. 3×10^{-6}

C. 8×10^{-6}

D. 2×10^{-6}

Answer: B

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11. Two wires one of copper and other of steel having same cross-sectionl area end to end and strecteched by a load M. Ifcopper wire Is stretched by 1 mm, the total extnsion of the combined wire is

(Givwen, Young's are

$Y_{\text{copper}} = 1 \times 10^{11} N/m^2$, and $Y_{\text{steel}} = 2 \times 10^{11} N/m^2$)

A. 1.125 cm

B. 0.2 cm

C. 0.120 cm

D. 0.25 cm

Answer: A

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12. A body of mass 1 kg is fastened to one end of a steel wire of cross- section area $3 \times 10^{-6} m^2$ and is

rotated in horizantal circle of radius 20 cm with a constant speed $2m/s$. Find the elongation of the wire $(Y = 2 \times 10^{11} N/m^2)$

A. $0.33 \times 10^{-5} m$

B. $0.67 \times 10^{-5} m$

C. $2 \times 10^{-5} m$

D. 4×10^{-5}

Answer: B

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13. If a conical wire is streatched by two forces F applied parallel to its length and in opposite direction . Normal to end faces . The length of wire is L and its end radius are r_1 and r_2 . Find out the extension produced .

(Given , Y= Young's moleulus of wire)

A. $\frac{FL}{\pi r_1^2 Y}$

B. $\frac{FL}{\pi r_1 Y}$

C. $\frac{FL}{\pi r_1 r^2 Y}$

D. $\frac{FL}{\pi r_1 r^2}$

Answer: C

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14. If for a material , Y and B are young's modulus and Bulk 's modulus , them .

A. $Y < 3B$

B. $Y = 3B$

C. $Y > 3B$

D. $3Y = B$

Answer: A

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15. When a sphere is taken to bottom of sea 1 km deep, it constants by $0.01\,\%$. Find the bulk modulus of elzsticity of the material of sphere .(Given , density of water $= 1g/cm^3$)

A. $9.8 \times 10^{10} N/m^2$

B. $10.2 \times 10^{10} N/m^2$

C. $0.98 \times 10^{10} N/m^2$

D. $8.4 \times 10^{10} N/m^2$

Answer: A

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16. The young 's modulus of brass and steel are $1.0 \times 10^{11} Nm^{-2}$ and $2.0 \times 10^{11} N/m^2$. Respectively . A brass wire and steel wire of the same length extend by 1 mm, each under the same forece . It radii of brass and steel wires are R_B and R_S respectively, them

A. $R_s = \sqrt{2} R_B$

B. $R_s = \frac{R_B}{\sqrt{2}}$

C. $R_s = 4R_B$

D. $R_S = \frac{R_B}{2}$

Answer: B

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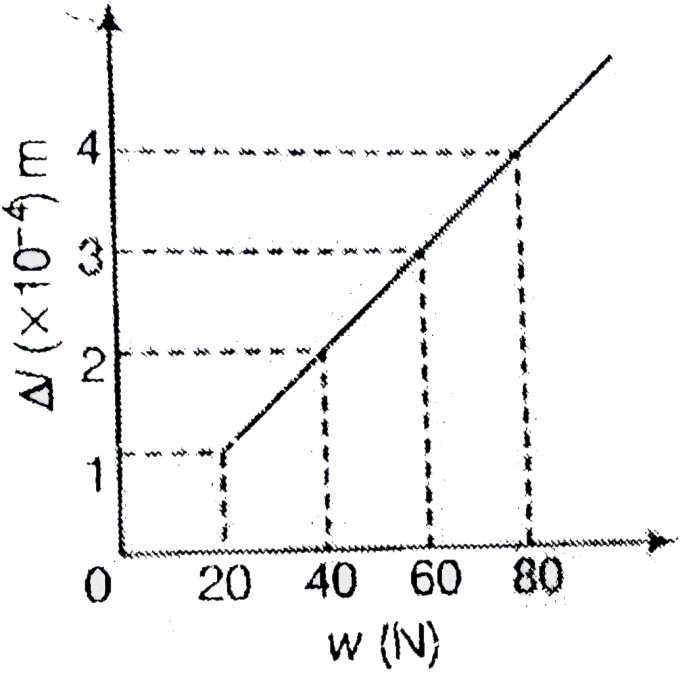
17. The adjacent graph shows the extension Δl of a wire of length 1m, suspended from the f top of a roof at one end and with a loaf w connected to the other end. If the cross-sectional area of the wire is $10^6 m^2$ calculate the young's modulus of the material of the wire .



A. $2 \times 10^{11} Nm^{-2}$

B. $2 \times 10^{-11} Nm^{-2}$

C. $3 \times 10^{-12} Nm^{2}$

D. $2 \times 10^{-13} Nm^{2}$

Answer: A

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18. A wire of mass m and length l is suspended from a ceiling. Due to its own wieght it elongates, consider cross-section are of wire as A ans Young's modulus of material of wire as Y. Th eelongation in the wire is

A. $\frac{2mg}{3YA}$

B. $\frac{mgl}{YA}$

C. $\frac{mgl}{2YA}$

D. cannot be calcuated

Answer: C

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19. A body of mass m = 0 kg is attached to a wire of length 0.3 m. Calculate the maximum angular velcoity with wicch it can be rotated in a horizontal circle

(Breaking stress of wire $= 4.8x10^7 N/m^2$ and area of cross-section of wire = $10^{-6} m^2$)

A. $4rad/s$

B. $8rad/s$

C. $1rad/s$

D. $2rad/s$

Answer: A

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20. A light rod of length L is suspended from a support horizonatlly by means of two vertical wires A

and B of equal lengths as show in the figure . Cross-section area of A is half that of B and Young's modulus of A is double than that

A. $20m/s$

B. $25m/s$

C. $22m/s$

D. $18m/s$

Answer: A

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21. A rubber cord catapult has cross-sectional area $25mm^2$ and initial length of rubber cord is $10cm$. It is stretched to $5cm$. And then released to protect a missle of mass $5gm$ Taking $Y_{\text{nibber}} = 5 \times 10^7 N/m^2$ velocity of projected missle is

A. $20ms^{-1}$

B. $100ms^{-1}$

C. $250ms^{-1}$

D. $200ms^{-1}$

Answer: C

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22. One end of a wire 2 m long and dameter 2 mm is fixed in a celling . A naughty boy of mass 10 kg jumps to catch the free end and stays, there. The chamge is length of wire is $(Taker = 10m/s^2, Y = 2 \times 10^{11} N/m^2)$

A. 3.185×10^{-5}

B. 2 mm

C. 3 mm

D. 4mm

Answer: A

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23. In above problem, if Poiddon's ratio is $\sigma = 0.1$ .Find the change in diameter.

A. 31.84×10^{-5}

B. $31.84 \times 10^{-5} m$

C. $3.184 \times 10^{-8} m$

D. $3.184 \times 10^{-8} m$

Answer: C

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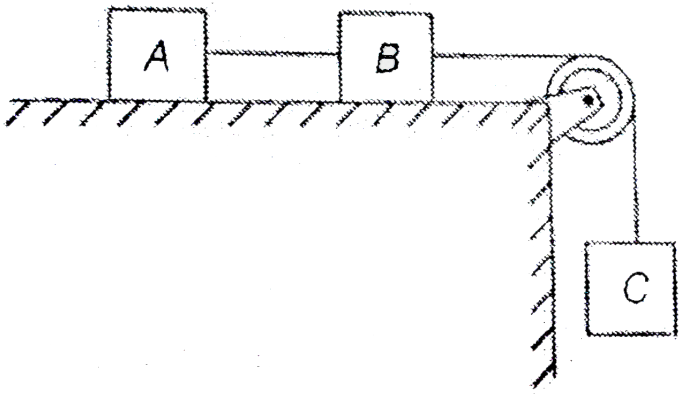
24. Each of three blocks shows in figure has a mass 3 kg. The wire connecting blocks A and B has area of cross-section $0.005cm^2$ and Young's modulus of elasticity $Y = 2 \times 10^{11} N/m^2$. Neglect friction. Find the elasticity potential energy stored per unit volume in wire connecting blocks A and B in steady state.

$(Takeng = 10m/s^2)$



A. $500J/m^3$

B. $1000J/m^3$

C. $2000J/m^3$

D. $3000J/m^3$

Answer: B

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25. A steekl rod of Young's modulus $2 \times 10^{11} N/m^2$ undergoes an elastic strain of 0.05% .The energy per unit voulme stored in J/m^3 is

A. 125000

B. 5000

C. 10000

D. 25000

Answer: D

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26. If F is the force applied to an elastic bar to produce an extension of Δl. Then, the energy lost in the process is

A. $F.\ \Delta l$

B. $\frac{F.\ \Delta l}{2}$

C. zero

D. $\frac{3F.\Delta l}{2}$

Answer: B

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27. If the work done in stretching a wire by 1 mm is W. Then , the work required to stretch another wire of same material but with half the radius of cross-section and doubble the length by 2 mm is

A. 4W

B. W

C. $\frac{1}{4}W$

D. $\frac{1}{2}W$

Answer: C

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28. Which of the following correctly gives the elastic energy stored in the metal bar ? `(sigma= "stress,"" " epsi= "strain"," "Y=Young's" " "modulus," "L= lenght", " "Deltal = "extension, " " F= load", " "A= "cross -sectionl" "area").

A. $\frac{1}{2}\sigma^2 Y$

B. $\frac{1}{2}\frac{\sigma^2}{Y}$

C. $\frac{1}{2}\varepsilon^2 Y.(AL)$

D. $\frac{1}{2}\sigma^2 Y.(AL)$

Answer: C

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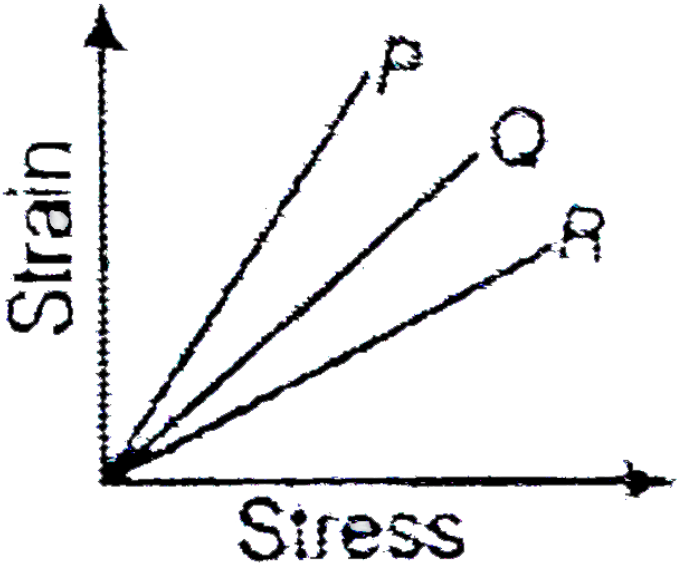
Bitsat Archives

1. The stain-stress curves of three wires of different material are showm in the figure P,Q,R are the elastic

limits of the wires, the figure shows that



A. elasticity of wire P is maximum

B. elasitcity of wire R is maximum

C. tensile strenght of R is maximum

D. None the above

Answer: B

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2. A steel wire of length 4.87 mm and cross-section $3.0 \times 10^{-5} m^2$ stretches by the same amout as a copper wire of length 3.5 m and cross -section $4.0 \times 10^{-5} m^2$ under a given load . White is the ratio of the Young's modulus of steel so that of copper ?

A. 1.5 : 2

B. 1.8 : 2

C. 1.5 : 1

D. 1.8 : 1

Answer: D

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3. The average depth of India Ocean is about 3000 m. Bulk modulus of water is $2.2 \times 10^4 N/m^2$, $g = 10m/s^2$, then fractional compression $\frac{\Delta V}{V}$ of water at the bottom of the India Ocean will be

A. $1.36\ \%$

B. $20.6\ \%$

C. $13.9\ \%$

D. $0.52\ \%$

Answer: A

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4. One end of steel wire is fixed ti ceiling of an elevator moving up with an acceleration $2m/s^2$ amd a load of 10 kg hangs from other end. Area of cross-section of the wire is $2cm^2$ .The longitudinal strain in the wire is $\left(g = 10m/s^2 \text{ and } Y = 2 \times 10^{11} Nm^2\right)$.

A. 4×10^{10}

B. 3×10^{-6}

C. 8×10^{-6}

D. 2×10^{-6}

Answer: B

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5. Two wires are made of the same material and have the same volume. However wire 1 has cross-section area A and wire 2 has cross-section area 3A. If length of wire 1 increased by

A. 4F

B. 6F

C. 9F

D. F

Answer: C

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6. The Poisson's ratio of a material is 0.5 . If a force is applied to wire of this material, there is a decrease in the cross-section area by 4%. The perecentage increase in the length is

A. 0.01

B. 0.02

C. 2.5%

D. 4%

Answer: D

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7. A load o f 1 kg weight is a attached to one end of a steel wire o f area of cross-section $3mm^2$ and Young's modulus $10^{11}N/m^2$. The other end is suspended vertically from a hook on a wall , then the load is pulled horizontally and released .When the load passes through its lowest position the fraction al change in lenght is $(Takeg = 10m/s^2)$

A. 0.3×10^{-4}

B. 0.3×10^{-3}

C. 0.3×10^{3}

D. 0.3×10^{4}

Answer: A

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8. There is same change in length when a 33000 N tensile force is applied on a steel rod of area of cross-section $10^{-3}m^2$. The change of temperature required to produce the same elongation, if the steel rod is heated , if (The modulus of elasticity is $3 \times 10^{11} N/m^2$ and the coefficient of linear expansion of steel is $11 \times 10^{-5}/^{\circ} C$).

A. 20°

B. 15°

C. 10°

D. 0°

Answer:

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9. Which one the following is not a unit of Young's modulus ?

A. Nm^{-1}

B. Nm^{-2}

C. $\text{dyne}cm^{-2}$

D. mega pascal

Answer: A

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