PHYSICS

BOOKS - KUMAR PRAKASHAN KENDRA PHYSICS (GUJRATI ENGLISH)

MACHANICAL PROPERTIES OF SOLIDS

Section A

1. What is a rigid body ? Explain the differences between rigid body and solid body.

Watch Video Solution

2. What is elasticity ? What is plastic body and plasticity?

Watch Video Solution

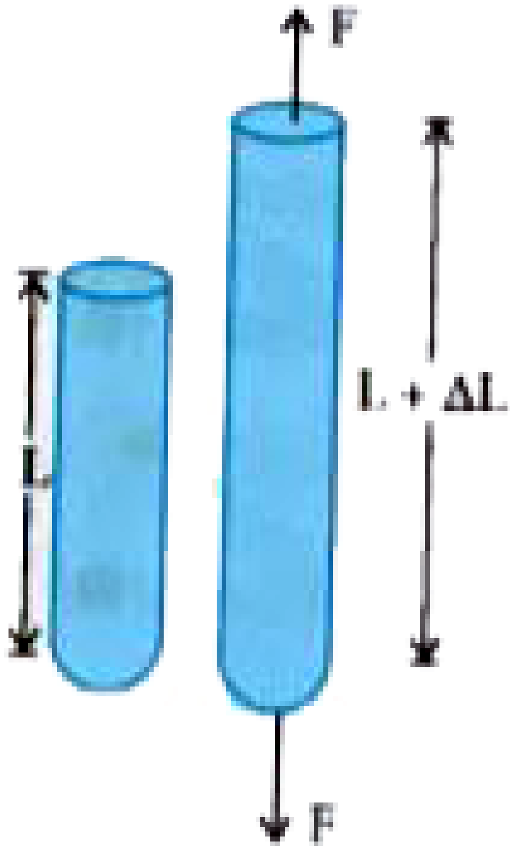
3. Explain spring ball model of elastic behaviour of solids.

Watch Video Solution

4. Explain what is stress ? Write its unit and dimensional formula.

Watch Video Solution

5. Explain longitudinal stress.

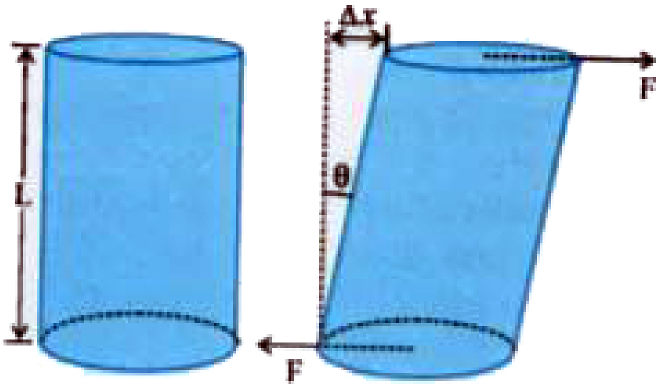


Watch Video Solution

6. What is strain ? Explain longitudinal strain (ε).

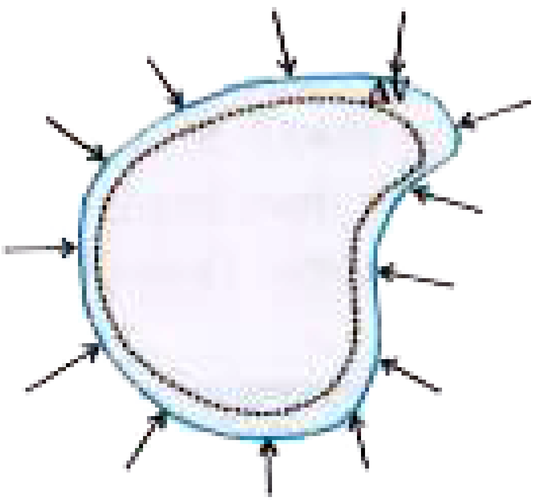
Watch Video Solution

7. Explain tangential or shearing stress and shearing strain



Watch Video Solution

8. Explain hydraulic stress, volume stress and volume strain



Watch Video Solution

Watch Video Solution

9. Explain Hooke's Law.

Watch Video Solution

10. Plot a stress $\rightarrow$ strain curve for a metal and explain.

Watch Video Solution

11. What is an elastomer's ? Plot stress $\rightarrow$ strain curve for it and explain.

Watch Video Solution

12. What is Elastic Moduli?

Watch Video Solution

13. What is Young's modulus ? Explain.

Watch Video Solution

14. Explain experimental determination of Young's modulus.

Watch Video Solution

15. Explain Shear Modulus.

Watch Video Solution

16. Explain Bulk Modulus.

Watch Video Solution

17. What is compressibility ? Write its formula, unit and dimensional formula.

Watch Video Solution

18. Explain Poisson's Ratio.

Watch Video Solution

19. Explain Poisson's Ratio.

Watch Video Solution

20. Determine the elastic potrntial energy stored in stretched wire.

Watch Video Solution

21. Explain with illustration cranes regarding the applications of elastic behaviour of materials.

Watch Video Solution

22. What is bending ? How bending problems prevents and what is buckling ?

Watch Video Solution

23. What should be the shape of the pillars or column in building and bridge ?

Watch Video Solution

24. Why is the maximum height of mountain about ~ 10 km on earth ?

Watch Video Solution

Section A Try Yourself Vsqs

1. What are solid bodies composed ?

Watch Video Solution

2. Why do solid bodies stay in stable equilibrium position?

Watch Video Solution

3. For what references the elastic behaviour of the solid body be explained ?

Watch Video Solution

4. Explain what is stress ? Write its unit and dimensional formula.

Watch Video Solution

5. Define longitudinal stress.

Watch Video Solution

6. Explain tensile stress and compressive stress.

Watch Video Solution

7. What is hydraulic stress?

Watch Video Solution

8. What is shearing (tangential) stress?

Watch Video Solution

9. What is volume stress?

Watch Video Solution

10. What is strain ? Give its units.

Watch Video Solution

11. Define longitudinal strain and write it formula.

Watch Video Solution

12. Define shear strain and write its formula.

Watch Video Solution

13. What is the magnitude of hydraulic stress?

Watch Video Solution

14. Write Hooke's law.

Watch Video Solution

15. Write the unit and dimensional formula of modulus of elasticity.

Watch Video Solution

16. What is a yield point ?

Watch Video Solution

17. What is a yield strength ?

Watch Video Solution

18. What is called plastic deformation ?

Watch Video Solution

19. What is tensile strength ?

Watch Video Solution

20. What is called brittle material ?

Watch Video Solution

21. What is called ductile material ?

Watch Video Solution

22. What are elastomers ?

Watch Video Solution

23. Give the examples of elastomers.

Watch Video Solution

24. What is Young's modulus ? Write its unit and dimensional formula.

Watch Video Solution

25. Which one has more Young's modulus : Copper or Steel?

Watch Video Solution

26. What is called shear modulus ? Write its formula and unit.

Watch Video Solution

27. Write relation between the magnitudes of shear modulus and Young's modulus.

Watch Video Solution

28. What is called bulk modulus ? Write its formula and dimensional formula.

Watch Video Solution

29. Explain with the basis of bulk modulus that solids are more compressive and gases are least compressive.

Watch Video Solution

30. How much times gases are more compressive compare to solids ?

Watch Video Solution

31. What is compressibility ? Write its formula, unit and dimensional formula.

Watch Video Solution

32. What is called lateral strain ?

Watch Video Solution

33. What is Poisson's ratio ? On which its magnitude depends?

Watch Video Solution

34. What is called elastic potential energy ? Write its different formulas.

Watch Video Solution

35. What is called elastic energy density ? Write its formula and dimensional formula.

Watch Video Solution

36. What is bending?

Watch Video Solution

37. Write the equation of bending in rod.

Watch Video Solution

38. What is buckling?

Watch Video Solution

39. What should be the shape of rod for preventing buckling ?

Watch Video Solution

40. Write the unit of bending, write its dimensional formula.

Watch Video Solution

Section B

1. A structural steel rod has a radius of 10 mm and a length of 1.0 m. A 100 KN force stretches it along its length. Calculate a stress, (b) elongation and (c) strain on the rod. Young's modulus of structural steel is $2.0 \times 10^{11} Nm^{-2}$.

Watch Video Solution

2. A structural steel rod has a radius 10 mm and a length of $2.0m$. A force 100 KN stretches it along its length. Calculate (a) Stress (b) Elongation and (c) Strain on the rod. Young's modulus of structural steel is $2.0 \times 10^{11} Nm^{-2}$.

Watch Video Solution

3. A structural steel rod has a radius 10 mm and a larngth of $2.0m$. A force of 10 KN stretches it along its length. Calculate (a) Stress (b) Elongation and (c) Strain on the rod. Young's modulus of structural steel is $2.0 \times 10^{11} Nm^{-2}$.

Watch Video Solution

4. A copper wire of length 2.2 m and a steel wire of length 1.6 m, both of diameter 3.0 mm, are connected end to end. When stretched by a load, the net elongation is found to be 0.70 mm. Obtain the load applied.

Young's modulus of copper

$Y_C = 1.1 \times 10^{11} Nm^{-2}$

Young's modulus of steel $Y_S = 2.0 \times 10^{11} Nm^{-2}$.

Watch Video Solution

5. Aluminium wire of length 2.2 m and a Iron wire of length 1.6 m, both of diameter 3.0 mm, are connected end to end. When stretched by a load, the net elongation is found to be 0.70 mm. Obtain the load applied.

Young's modulus of aluminium

$Y_{Al} = 70 \times 10^9 Nm^{-2}$

Young's modulus of iron $Y_F = 120 \times 10^9 Nm^{-2}$

Watch Video Solution

6. In a human pyramid in a circus, the entire weight of the balanced group is supported by the legs of a performer who is lying on his back. The combined mass of all the persons performing the act, and the tables, plaques etc. involved is 280 kg. The mass of the performer lying on his back at the bottom of the pyramid is 60 kg. Each thighbone (femur) of this performer has a length of 50 cm and an effective radius of 2.0 cm. Determine the amount by which each thighbone gets compressed under the extra load. $(g = 9.8ms^{-2})$ Young's Modulus for bone $Y = 9.4 \times 10^9 Nm^{-2}$.

Watch Video Solution

7. In a human pyramid in a circus, the entire weight of the balanced group is supported by the legs of a performer who is lying on his back. The combined mass of all the persons performing the act, and the tables, plaques etc. involved is 280 kg. The mass of the performer lying on his back at the bottom of the pyramid is 80 kg. Each thighbone (femur) of this performer has a length of 50 cm and an effective radius of 2.0 cm. Determine the amount by which each thighbone gets compressed under the extra load. $(g = 9.8ms^{-2})$

Young's Modulus for bone $Y = 9.4 \times 10^9 Nm^{-2}$

Watch Video Solution

8. A square lead slab of side 50 cm and thickness 10 cm is subject to a shearing force on its narrow face) of $9.0 \times 10^4 N$. The lower edge is riveted to the floor. How much will the upper edge be displaced ? Shear modulus of lead $G = 5.8 \times 10^9 N/m^2$

Watch Video Solution

9. A square lead slab of side 40 cm and thickness 10 cm is subject to a shearing force (on its narrow face) of $9.0 \times 10^4 N$. The lower edge is riveted to the floor. How much will the upper edge be displaced ? Shear modulus of lead $G = 5.6 \times 10^9 N/m^2$

Watch Video Solution

10. A square Nickel slab of side 50 cm and thickness 10 cm is subject to a shearing force (on its narrow face) of $9.0 \times 10^4 N$. The lower edge is riveted to the floor. How much will the upper edge be displaced ? Shear modulus of Nickel $G = 77 \times 10^9 Nm^{-2}$

Watch Video Solution

Watch Video Solution

11. The average depth of Indian Ocean is about 3000 m. Calculate the fractional compression, ΔV of water at the bottom of the ocean, given that the bulk modulus of water is$2.2 \times 10^9 Nm^{-2} \left(\text{Take} g = 10 ms^{-2}\right)$

Watch Video Solution

12. The average depth of Indian Ocean is about 5 km. Calculate the fractional compression,$\frac{\Delta V}{V}$of water at the bottom of the ocean, given that the bulk modulus of water is $2.2 \times 10^9 Nm^{-2}$ (Take $g = 10 ms^{-2}$)

Watch Video Solution

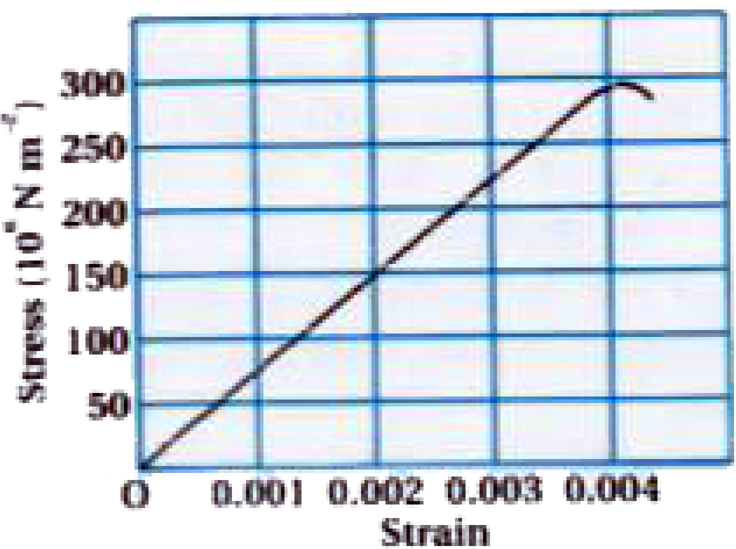
13. The average depth of Indian Ocean is about 5 km. Calculate the fractional compression,$\frac{\Delta V}{V}$of water at the bottom of the ocean, given that the bulk modulus of water is $2.2 \times 10^9 Nm^{-2}$ (Take $g = 10 ms^{-2}$)

Watch Video Solution

14. A steel wire of length 4.7 m and cross-sectional area $3.0 \times 10^{-5} m^2$ stretches by the same amount as a copper wire of length 3.5 m and cross-sectional area of $4.0 \times 10^{-5} m^2$ under a given load. What is the ratio of the Young's modulus of steel to that of copper ?

Watch Video Solution

15. Figure shows the strain-stress curve for a given material. What are (a) Young's modulus and (b) approximate yield strength for this material ?



Watch Video Solution

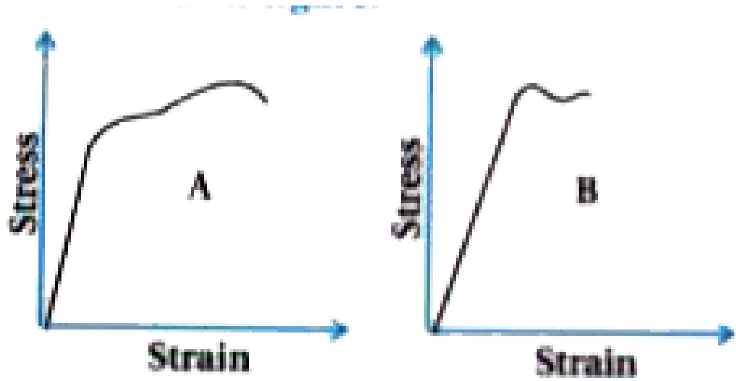
Watch Video Solution

16. The stress-strain graphs for materials A and B

The graphs are drawn to the same scale.

(a) Which of the materials has the greater Young's modulus ?

(b) Which of the two is the stronger material ?



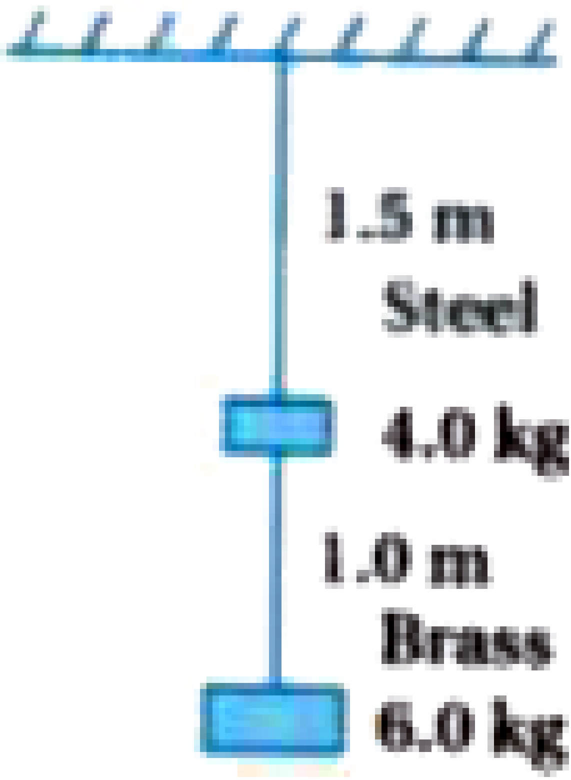
Watch Video Solution

17. Read the following two statements below carefully and state, with reasons, if it is true or false,

(a) The Young's modulus of rubber is greater than that of steel,

Watch Video Solution

18. Two wires of diameter 0.25 cm, one made of steel and the other made of brass are loaded as shown in figure. The unloaded length of steel wire is 1.5 m and that of brass wire is 1.0 m. Compute the elongations of the steel and the brass wires.



Watch Video Solution

19. The edge of an aluminium cube is 10 cm long. One face of the cube is firmly fixed to a vertical wall. A mass of 100 kg is then attached to the opposite face of the cube. The shear modulus of aluminium is 25 GPa. What is the vertical deflection of this face ?

Watch Video Solution

20. Four identical hollow cylindrical columns of mild steel support a big structure of mass 50,000 kg. The inner and outer radii of each column are 30 and 60 cm respectively. Assuming the load distribution to be uniform, calculate the compressional strain of each column.

Watch Video Solution

21. A piece of copper having a rectangular cross section of 15.2 mm x 19.1 mm is pulled in tension with 44,500 N force, producing only elastic deformation. Calculate the resulting strain.$Y_{Cu} = 1.2 \times 10^{11} N/m^2$.

Watch Video Solution

Watch Video Solution

22. A steel cable with a radius of 1.5 cm supports a chairlift at a ski area. If the maximum stress is not to exceed $108Nm^{-2}$, what is the maximum load the cable can support?

Watch Video Solution

23. A rigid bar of mass 15 kg is supported symmetrically by three wires each 2.0 m long. Those at each end are of copper and the middle one is of iron. Determine the ratios of their diameters if each is to have the same tension. $Y_{Cu} = 1.2 \times 10^{11} Nm^{-2}, Y_{Fe} = 1.9 \times 10^{11} N,^{-2}$

Watch Video Solution

24. A 14.5 kg mass, fastened to the end of a steel wire of unstretched length 1.0 m, is whirled in a vertical circle with an angular velocity of 2 rev/s at the bottom of the circle. The crosssectional area of the wire is

0.065 cm. Calculate the elongation of the wire when the mass is at the lowest point of its path. $\left[Y_{\text{Steel}} = 2 \times 10^{11} N, m^{-2}\right]$

Watch Video Solution

25. Compute the bulk modulus of water from the following data: Initial volume = 100.0 litre, Pressure increase = 100.0 atm $\left(1atm = 1.013 \times 10^{5} Pa\right)$, Final volume = 100.5 litre. Compare the bulk modulus of water with that of air (at constant temperature). Explain in simple terms why the ratio is so large.

Watch Video Solution

26. What is the density of water at a depth where pressure is 80.0 atm, given that its density at the surface is $1.03 \times 10^{3} kgm^{-3}$? Compressibility of water $45.810^{-11} Pa^{-1}$, $\left[1Pa = 1Nm^{-2}\right]$

Watch Video Solution

27. Compute the fractional change in volume of a glass slab, when subjected to a hydraulic pressure of 10 atm.

Watch Video Solution

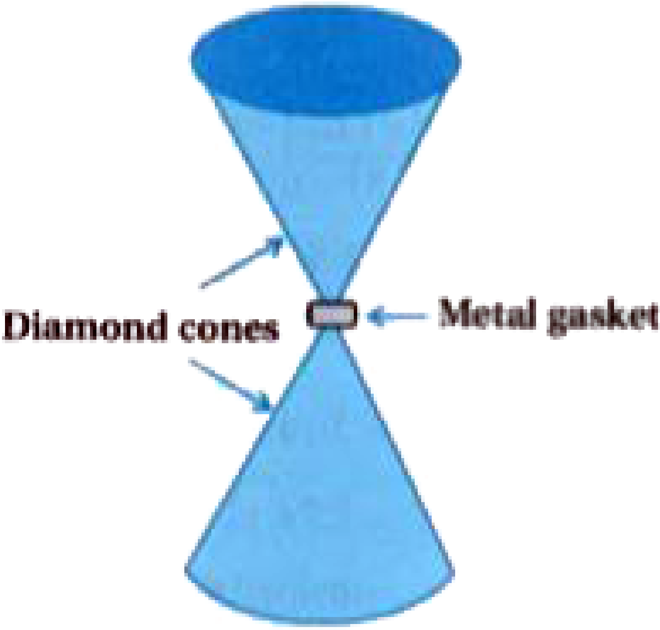
28. Determine the volume contraction of a solid copper cube, 10 cm on an edge, when subjected to a hydraulic pressure of 7.0×10^6 Pa. (Bulk Modulus $B = 1.4 \times 10^{11}$)

Watch Video Solution

29. How much should the pressure on a litre of water be changed to compress it by 0.10 % ? $\left(B = 2.2 \times 10^9 N/m^2\right)$

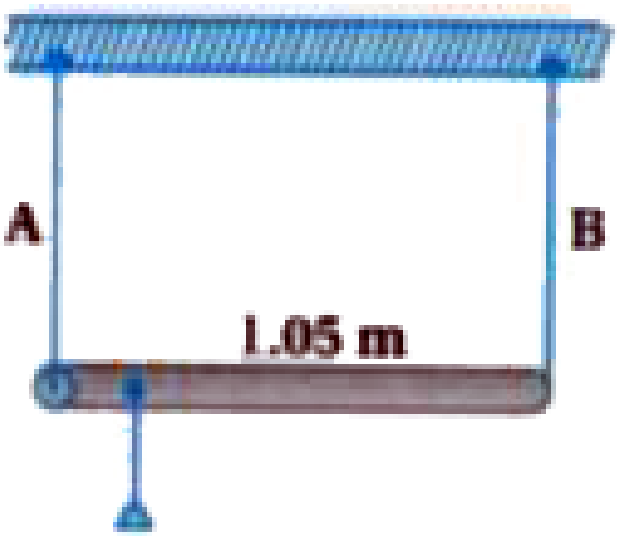
Watch Video Solution

30. Anvils made of single crystals of diamond, with the shape as shown in figure, are used to investigate behaviour of materials under very high pressures. Flat faces at the narrow end of the anvil have a diameter of 0.50 mm, and the wide ends are subjected to a compressional force of 50,000 N. What is the pressure at the tip of the anvil ?



Watch Video Solution

31. A rod of length 1.05 m having negligible mass is supported at its ends by two wires of steel (wire A) and aluminium (wire B) of equal lengths as shown in figure. The cross-sectional areas of wires A and B are 1.0 mm^2 and 2.0 mm^2, respectively. At what point along the rod should a mass m be suspended in order to produce (a) equal stresses and (b) equal strains in both steel and aluminium wires.



Watch Video Solution

32. A mild steel wire of length 1.0 m and cross sectional area $0.50 \times 10^{-2} cm^2$ is stretched, well within its elastic limit, horizontally between two pillars. A mass of 100 g is suspended from the mid-point of the wire. Calculate the depression at the midpoint.

Watch Video Solution

33. Two strips of metal are riveted together at their ends by four rivets, each of diameter 6.0 mm. What is the maximum tension that can be exerted by the riveted strip if the shearing stress on the rivet is not to exceed 6.9×10^7 Pa ? Assume that each rivet is to carry one quarter of the load.

Watch Video Solution

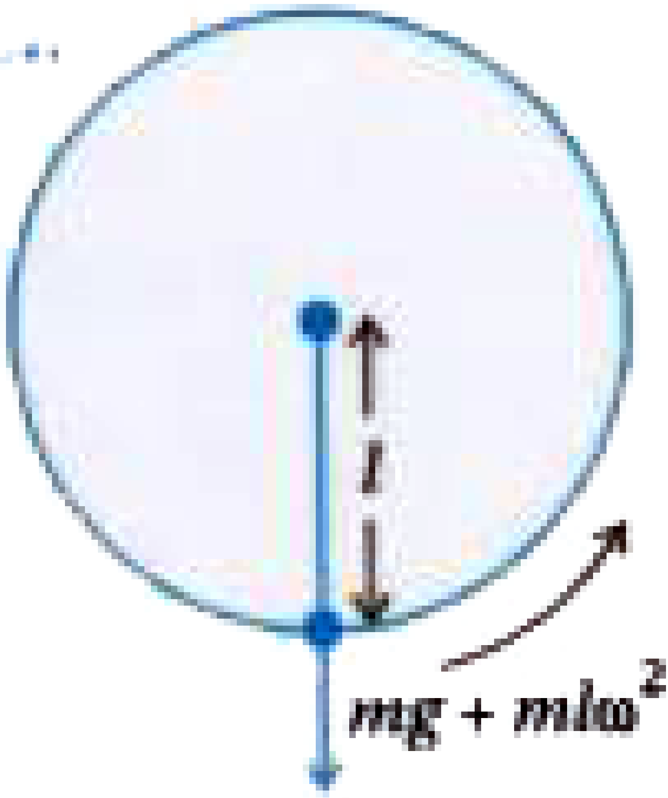
34. The Marina trench is located in the Pacific Ocean, and at one place it is nearly eleven km beneath the surface of water. The water pressure at the bottom of the trench is about 1.1×10^8 Pa. A steel ball of initial volume $0.32m^3$ is dropped into the ocean and falls to the bottom of the trench. What is the change in the volume of the ball when it reaches to the bottom ?

Watch Video Solution

35. A steel wire of length 5 m and diameter 10^{-3} m is hanged vertically from a ceiling of 5.22 m height. A sphere of radius 0.1 m and mass 8tt kg is tied to the free end of the wire. When this sphere is oscillated like a simple pendulum, it touches the floor of the room in its velocity of the sphere in its lower most position. Calculate the velocity of the sphere in its lower Young's modulus for in its lower most position. Young's modulus for steel $= 1.994 \times 10^{11} Nm^{-2}$.

Watch Video Solution

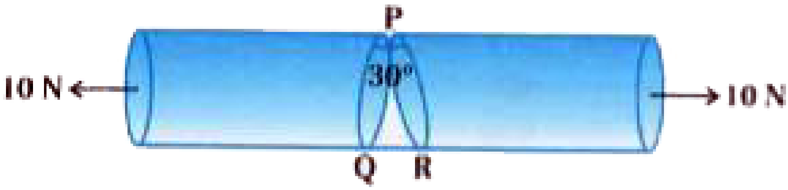
36. A mass of 15 kg is tied at the end of a steel wire of the length lm. It is whirled in a vertical plane with angular velocity 1 rad/s. Cross sectional area of the wire is $0.06 cm^2$. Calculate the elongation of the wire when the mass is at its lowest position. $Y_{steel}" = 2 \times 10^{11} Nm^{-2}$



Watch Video Solution

37. As shown in figure 10 N force is applied at two ends of a rod. Calculate tensile stress and searing stress for section PR, Area of cross section PQ is

10 cm^2.



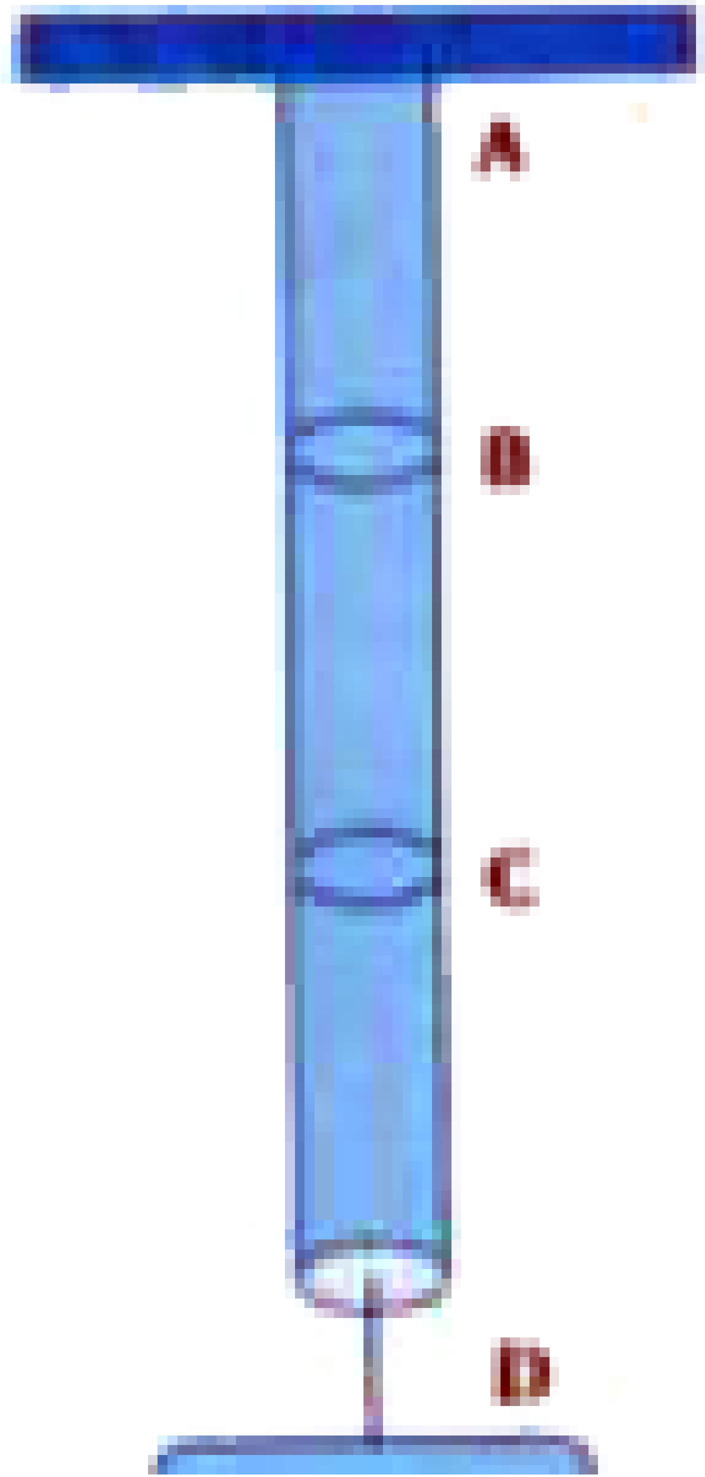
Watch Video Solution

38. Length and cross sectional area of a wire are 5 m and $2.5mm^2$. Calculate work required to be done to increase its length by 1 mm. Young's modulus of material of wire $= 2 \times 10^{11} Nm^{-2}$

Watch Video Solution

39. Figure shows a composite rod of cross-sectional area $10^{-4}m^2$ made by joining three rods AB, BC and CD of different materials end to end. The composite rod is suspended vertically and an object of 10 kg is hung by it. $L_{AB} = 0.1m,_{BC} = 0.2m$ and $L_{CD} = 0.15m$.

Calculate displacement of B, C and $DY_{AB} = 2.5 \times 10^{10} Pa, Y_{BC} = 4 \times 10^{10} Pa$ and $Y_{CD} = 1 \times 10^{10}$.

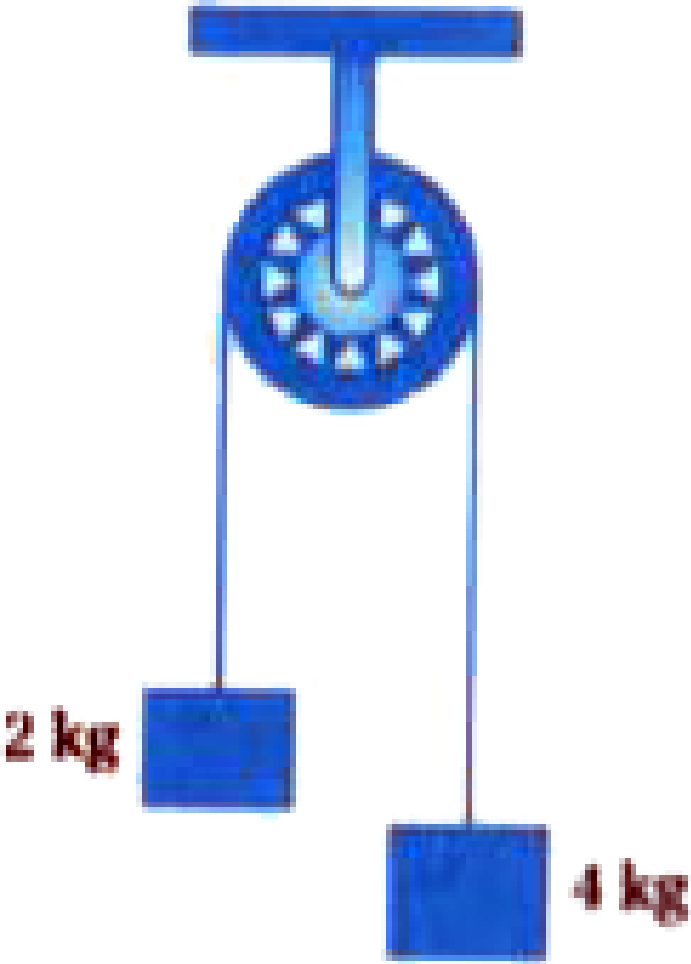

A
B
C
D

Watch Video Solution

40. A wire of length L and cross section area A is kept on a horizontal surface and one of its end is fixed at point 0. A ball of mass m is tied to its other end and the system is rotated with angular velocity ω. Show that increase in its length. $\Delta l = \frac{m\omega^2 L^2}{AY}$. Y is young's modulus.

Watch Video Solution

41. As shown in figure, masses of 2 kg and 4kg are tied to two ends of a wire passed over a pulley. Cross-sectional area of wire is $2cm^2$. Calculate longitudinal strain produced in wire. $\left(g = 10ms^{-2}Y = 2 \times 10^{11}Pa\right.$

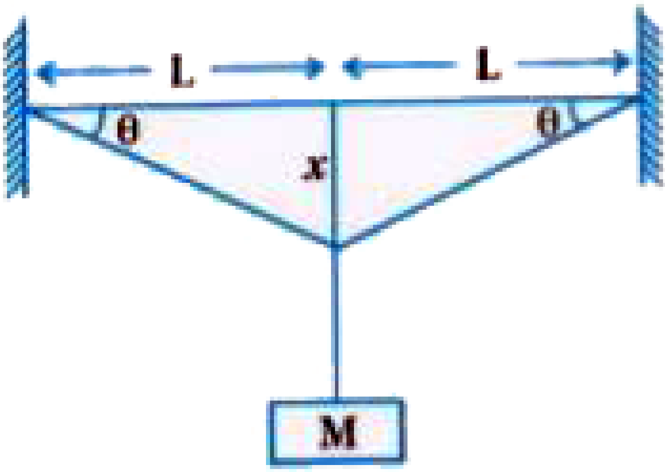


Watch Video Solution

42. A steel wire of cross section 1 mm2 is heated at 60° C and tied between two ends family. Calculate change in tension when temperature becomes $30^{\circ} C$ coefficient of linear expansion for steel is $\alpha = 1.1 \times 10^{-5},{}^{\circ} C^{-1}, Y = 2 \times 10^{11} Pa.$ (Change in length of wire due to change in temperature $(\Delta t) is \Delta l = \alpha l \Delta t)$

Watch Video Solution

43. Figure shows a wire of length 2L and crosssectional area A, stretched horizontally between two clamps. When an object of mass M is suspended from the mid point of the wire, the downward displacement of the young's modulus of the material of the wire is x. Shown that $M = \frac{Y A x^3}{g L^3}$ (where θ is small)



Watch Video Solution

44. An object of mass 5 kg is suspended by a copper wire of length 2 m and diameter 5 mm. Calculate the increase in the length of the wire. In order not to exceed the elastic limit, what should be the minimum diameter of the wire ? For copper, elastic limit $= 1.5 \times 10^9 \text{dyne}/cm^2$, $(Y) = 1.1 \times 10^{12} \text{dyne}/cm^2$.

Watch Video Solution

45. Derive an expression for elastic potential energy per unit volume stored for the wire is

$\frac{1}{2} \times$ stress $\times$ strain.

Watch Video Solution

Section C

1. What is elasticity ? What is plastic body and plasticity?

Watch Video Solution

2. What is a perfectly plastic body?

Watch Video Solution

3. What is a perfectly plastic body?

Watch Video Solution

4. Which is more elastic ? Rubber or steel?

Watch Video Solution

5. Why is only rubber used to make cycle seat instead of wood or iron ?

Watch Video Solution

6. Why do spring balances show wrong readings of weight after they have been used for a long time?

Watch Video Solution

7. Give three properties which have different magnitudes and also have different direction.

Watch Video Solution

8. If under the external force, the chain in length Δl occur in rod of length l then write the formula for longitudinal strain.

Watch Video Solution

9. What is stress ? Give its two definations.

Watch Video Solution

10. Write the formula and unit of volume stress.

Watch Video Solution

11. Can volume stress be a pressure ?

Watch Video Solution

12. Define shearing stress and write its formula.

Watch Video Solution

13. Pressure and stress having same unit (and dimension) although they are not a same physical quantity, why ?

Watch Video Solution

14. What is the bulk modulus of a perfectly rigid body?

Watch Video Solution

15. What is the shape of graph of stress $\rightarrow$ strain upto elastic limit?

Watch Video Solution

16. What is the slope of graph of stress $\rightarrow$ strain upto elastic limit?

Watch Video Solution

17. Write copper, steel, glass and rubber in the order of increasing coefficient of elasticity.

Watch Video Solution

18. Give an example of pure shear.

Watch Video Solution

19. Give difference between charge and mass.

Watch Video Solution

20. What is shear modulus for liquid ?

Watch Video Solution

21. Why strain has no unit?

Watch Video Solution

22. Which type of elastic modulus is there in liquid and gas ?

Watch Video Solution

23. $0.1Pa = \ldots\ldots Nm^{-2} = \ldots\ldots \text{dyne}cm^{-2}$.

Watch Video Solution

24. At every point of rest liquid, the tangential stress is zero. Explain with reason.

Watch Video Solution

25. Which one is more elastic, steel or plastic ? Why ?

Watch Video Solution

26. Why water is more elastic than air ?

Watch Video Solution

27. Give the value of shear modulus of sulfuric acid.

Watch Video Solution

28. A wire is hanged from the ceiling without any weight below it, would there any stress in the wire ?

Watch Video Solution

29. Which of the following bulk modulus is possible in solid, liquid and gaseous ?

Watch Video Solution

30. A solid sphere of radius 10 cm is subjected to a pressure of $5 \times 10^{8} Nm^{-2}$, then determine the change in its volume. Bulk modulus of material of sphere is $3.14 \times 10^{11} Nm^{\equiv 2}$.

Watch Video Solution

31. The length of metallic wire is l. The tensin in the wire is T_1 for length l_1 and tension in the wire is T_2 for length l_2. Find the original length.

Watch Video Solution

32. What is the effect of change in temperature on the Young's modulus ?

Watch Video Solution

33. Does the energy stored in a spring changes when it stretched or compressed ?

Watch Video Solution

34. Is stress is a vector or scalar or tensor ?

Watch Video Solution

35. When the heavy weight suspended and removed from the metal wire, it cannot get original length. Why?

Watch Video Solution

36. Name the property which opposes the deformation.

Watch Video Solution

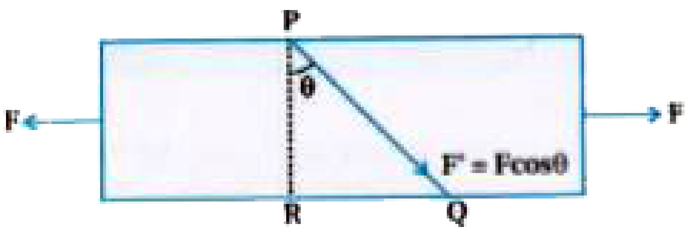
37. Write the limitation of Hooke's law.

Watch Video Solution

38. What are the factors on which modulus of elasticity depends ?

Watch Video Solution

39. Two force are equal and opposite in direction exerted on a bar (rod) as shown in figure. Hence plane PQ makes an angle θ with the cross-section 'a'. Find the tensile stress on PQ.



Watch Video Solution

40. Weight is suspended to the end of elastic spring its increaed length depends upon what ?

Watch Video Solution

41. What is the bulk modulus of a perfectly rigid body?

Watch Video Solution

42. Why do rail tracks have a 'I shaped girder ?

Watch Video Solution

43. Is it possible to double the length of a metallic wire by applying force over it ?

Watch Video Solution

44. A cable is cut to half of its original length. What will be the effect on the increase in its length under a given load ?

Watch Video Solution

45. When a stress of $10^8 Nm^{-2}$ is applied to a suspended wire its length increases by 1 mm.

Calculate Young's modulus of wire.

Watch Video Solution

46. A metallic rod having area of cross section A, Young's modulus Y, coefficient of linar expansion α and length L tied with two strong pillars. If the rod is heated through a temperature $t^\circ C$ then how much force is produced in rod ?

Watch Video Solution

47. The magnitude of Young's modulus proportonal to the increase in length.

Watch Video Solution

48. Breaking stress is known as elasticity.

Watch Video Solution

49. Quartxz is almost elastic body.

Watch Video Solution

50. What is shear modulus for liquid ?

Watch Video Solution

51. For a given load (external force) steel is more deformed than rubber.

Watch Video Solution

52. When solid body beated, roled, heated or cooled its elastic properties affected.

Watch Video Solution

53. Young's modulus of rigid body is ....

Watch Video Solution

54. A wire increase by 10^{-6} times its original length when a stress of $10^{8} Nm^{-2}$ is applied to it, calculate its Young's modulus.

Watch Video Solution

55. The value of Poisson's ratio for steel is ....

Watch Video Solution

56. If a body breaks immediately after the elastic limit then this body is known as......

Watch Video Solution

57. An elastic body which can be stretched to cause arge strains are called .....

Watch Video Solution

58. Column-II is related to Column-I. join them appropriately :

Column-I		Column-II	
(a)	When temperature raised Young's modulus of body	(i)	Zero
(b)	Young's modulus for air	(ii)	Infinite
		(iii)	Decreases
		(iv)	Increases

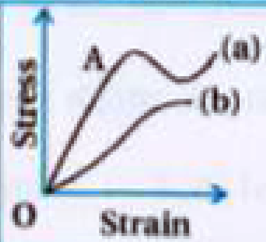
Watch Video Solution

59. Join details of Column-II with given information in Column-I appropriately :

Column-I		Column-II	
(a)	Stress is proportional to strain.	(i)	Elastic limit
(b)	When the load of the wire is removed, the body does regain its original dimension.	(ii)	Limit of proportionality
		(iii)	Plastic deformation

Watch Video Solution

60. In column-I there are two graphs and in Column-II whose graph is for this are given . Joun them appropriately :

Column-I		Column-II	
(a)		(i)	A is ductile
(b)		(ii)	A is brittle
		(iii)	B is ductile
		(iv)	B is brittle

Watch Video Solution

61. Join the relation of physical quantities in Column-I to the details given in Column-II appropriately:

Column-I		Column-II	
(a)	Stress = Strain	(i)	$M^1 L^{-1} T^{-2}$
(b)	Dimensional formula for compressibility	(ii)	$M^{-1} L^1 T^{-2}$
		(iii)	Poisson's ratio
		(iv)	Hooke's law

Watch Video Solution

62. A: Two wire A and B having equal cross sections made from the same material. The length of A is twice to the length of B, hence the increase in length of A is twice to the increase in length of B for a given same weight.

R: Increase in length of wire proportional to its length for a given same length.

A. Both are true and the reason is the correct explanation of the assertion.

B. Both are true but the reason is not correct explanation of the assertion.

C. Assertion is true, but the reason is false.

D. Both assertion and reason are false.

Answer: A

Watch Video Solution

63. A: The stretching of a coil is determined by the shear modulus.

R: Share modulus change only shape of a body keeping its volume unchanged.

A. Both are true and the reason is the correct explanation of the assertion.

B. Both are true but the reason is not correct explanation of the assertion.

C. Assertion is true, but the reason is false.

D. Both assertion and reason are false.

Answer: A

Watch Video Solution

64. A: Rubber is less elastic than steel.

R: Under given deforming force, steel is deformed less than ruber.

A. Both are true and the reason is the correct explanation of the assertion.

B. Both are true but the reason is not correct explanation of the assertion.

C. Assertion is true, but the reason is false.

D. Both assertion and reason are false.

Answer: A

Watch Video Solution

65. A: The bridges declared unsafe after a long use.

R: Elastic strength of bridges increase with time.

A. Both are true and the reason is the correct explanation of the assertion.

B. Both are true but the reason is not correct explanation of the assertion.

C. Assertion is true, but the reason is false.

D. Both assertion and reason are false.

Answer: C

Watch Video Solution

66. A: A thread of length L is streatched by a force of 5N, its length increases by a and stretched by force of 6N its length increases by b, now if it is stretched by force of 11 N its length increases by $(a+b-L)$.

R: Increasing the length of elastic thread is proportional to its initial length.

A. Both are true and the reason is the correct explanation of the assertion.

B. Both are true but the reason is not correct explanation of the assertion.

C. Assertion is true, but the reason is false.

D. Both assertion and reason are false.

Answer: D

Watch Video Solution

Section D

1. Modulus of rigidity of an ideal liquid is ......

A. infinity

B. zero

C. unity

D. some finite small non-zero constant vlaue

Answer: B

Watch Video Solution

2. The maximum load a wire can withstand without breaking when its length is reduced to half of its original length, will ....

A. be doube

B. be half

C. be four times

D. remain same

Answer: D

Watch Video Solution

3. If the temperature of a wire is doubled then Young's modulus of elasticity ......

A. will also double.

B. will become four times.

C. reamin same.

D. decreases.

Answer: D

Watch Video Solution

4. A spring is stretched by applying a load to its free end. The strain produced in the spring is ......

A. volumetric

B. shear

C. longitudinal and shear

D. longitudinal

Answer: C

Watch Video Solution

5. A rigid bar of mass M is supported symmetrically by three wires each of length 1. Those at each end are of copper and the middle one is of iron. The ratio of their diameters, if each is to have the same tension, is equal to ......

A. $\frac{Y_{\text{Copper}}}{Y_{\text{iron}}}$

B. $\sqrt{\frac{Y_{\text{Iron}}}{Y_{\text{Copper}}}}$

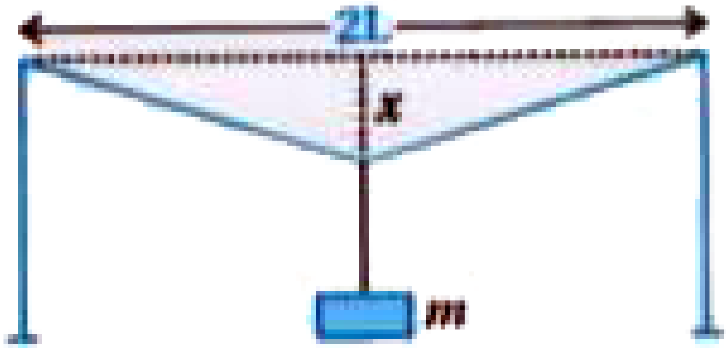
C. $\frac{Y^2 \quad \text{Iron}}{Y^2 \text{Copper}}$

D. $\frac{Y_{\text{Iron}}}{Y_{\text{Copper}}}$

Answer: B

Watch Video Solution

6. A mild steel wire of length 2L and crosssectional area A is stretched, well within elastic limit, horizontally between two pillars as shown in figure. A mass m is suspended from the mid point of the wire, the mid point lower by distance x. Then strain in the wire is ......



A. $\frac{x^2}{2L^2}$

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

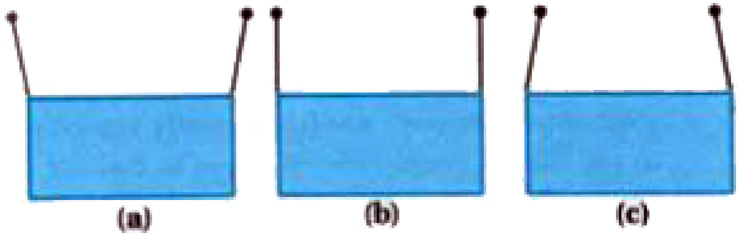
C. $\frac{x^2}{L}$

D. $\frac{x^2}{2L}$

Answer: A

Watch Video Solution

7. A rectangular frame is to be suspended symmetrically by two strings of equal length on two supports as shown in figure. It can be done in one of the following three ways, The tension in the strings will be



A. the same in al cases.

B. least in (a) .

C. least in (b).

D. least in (c).

Answer: C

Watch Video Solution

8. Consider two cylindrical rods of identical dimensions, one of rubber and the other of steel. Both the rods are fixed rigidly at one end to the roof. A mass M is attached to each of the free ends at the centre of the rods.

A. Both the rods will elongate but there shall be no perceptible change in shape.

B. The steel rod will elongate and change shape but the rubber rod will only elongate.

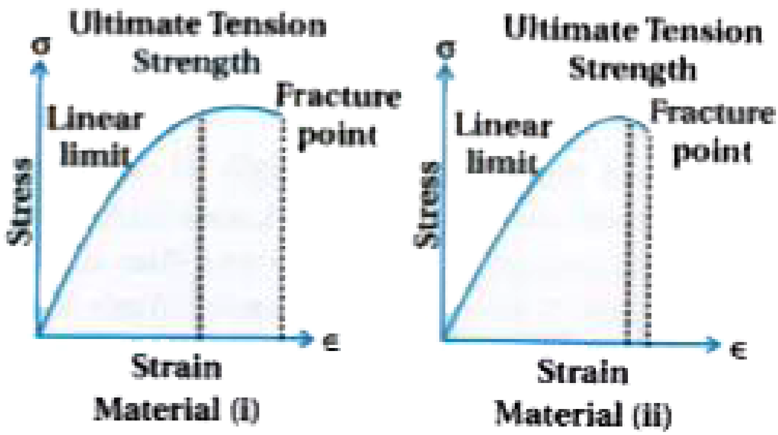
C. The steel rod will elongate without any perceptible change in shape, but the rubber rod will elongate and the shape of the bottom edge will change to an ellipse.

D. The steel rod will elongate, without any perceptible change in shape, but the rubber rod will elongate with the shape of the bottom edge tapered to a tip at the centre.

Answer: D

Watch Video Solution

9. The stress-strain graphs for two materials are shown in figure. (Assume same scale).



A. Material (ii) is more elastic than material (i) and hence material (ii) is more brittle.

B. Material (i) and (ii) have the same elasticity and the same brittleness.

C. Material (ii) is elastic over a larger region of strain as compared to (i).

D. Material (ii) is more brittle thn material (i).

Answer: C::D

Watch Video Solution

10. A wire is suspended from the ceiling and stretched under the action of a weight F suspended from its other end. The force exerted by the ceiling on it is equal and opposite to the weight.

A. Tensile stress at any cross section A of the wire is $\frac{F}{A}$

B. Tensile stress at any cross section is zero.

C. Tensile stress at any cross section A of the wire is $\frac{2F}{A}$

D. Tension at any cross section A of the wire is F.

Answer: A::D

Watch Video Solution

11. A rod of length 1 and negligible mass is suspended at its two ends by two wires of steel (wire A) and aluminium (wire B) of equal lengths as shown in figure. The cross-sectional areas of wires A and B are

$1.0mm^2$ and $2.0mm^2$ respectively.

$Y_{steel")} = 200 xx 10 ^(9) Nm ^(-2) and Y_(au min ium" = 70 \times 10^9 Nm^{-2}$

A. Mass m should be suspended close to wire A to have equal stresses in both the wires.

B. Mass m should be suspended close to B to have equal stresses in both the wires.

C. Mass m should be suspended at the middle of the wires to have equal stresses in both the wires.

D. Mass m should be suspended close to wire A to have equal strain in both wires.

Answer: B::D

Watch Video Solution

12. For an ideal liquid

A. the bulk modulus is infinite

B. the bulk modulus is zero

C. the shear modulus is infinite

D. the shear modulus is zero

Answer: A::D

Watch Video Solution

13. A copper and a steel wire of the same diameter are connected end to end. A deforming force Fis applied to this composite wire which causes a total elongation of 1 cm. The two wires will have

A. the same stress

B. different stress

C. the same strain

D. different strain

Answer: A::D

Watch Video Solution

14. The Young's modulus for steel is much more than that for rubber. For the same longitudinal strain, which one will have greater tensile stress ?

Watch Video Solution

15. The Young's modulus for steel is much more than that for rubber. For the same longitudinal strain, which one will have greater tensile stress ?

Watch Video Solution

16. Identical springs of steel and copper are equally stretched. On which more work will have to be done?

Watch Video Solution

17. What is the Young's modulus for a perfect rigid body?

Watch Video Solution

18. What is the bulk modulus of a perfectly rigid body?

Watch Video Solution

19. A wire of length L and radius r is clamped rigidly at one end. When the other end of the wire is pulled by a force f its length increases by l. Another wire of the same material of length 2L and radius 2r is pulled by a force 2f. Then find the increase in length of this wire.

Watch Video Solution

20. A steel rod of length 1 m and area of cross section $1cm^2$ is heated from $0^\circ C$ to$200^\circ C$ without being allowed to extend or bend. Find the tension produced in the rod $(Y = 2.0 \times 10^{11} Nm^{-1}, \alpha = 10^{-5}\hat{}(\circ)C^{-1})$

Watch Video Solution

21. To what depth must a rubber ball be taken in deep sea so that its volume is decreased by 0.1% (The bulk modulus of rubber is $9.8 \times 10^8 N/m^2$and density of sea water is $10^3 kgm^{-3}$)

Watch Video Solution

22. A truck is pulling a car out of a ditch by means of a steel cable that is 9.1 m long and has a radius of 5 mm, when the car just begins to move the tension in the cable is 800 N. How much has the cable stretched ? (Young's modulus for steel is $2 \times 10^{11} Nm^{-2}$)

Watch Video Solution

23. Two identical solid balls, one of ivory and the other of wet-clay are dropped from the same height on the floor. Which one will rise to a greater height after striking the floor and why?

Watch Video Solution

24. Consider a long steel bar under a tensile stress due to force F acting at the edges along the length of the bar (as shown in figure). Consider a plane making an angle with the length. What are the tensile and shearing stresses on this plane?

(a) For what angle is the tensile stress a maximum ?

(b) For what angle is the shearing stress a maximum ?

Watch Video Solution

25. (a) A steel wire of mass u per unit length with a circular cross section has a radius of 0.1 cm. The wire is of length 10 m when measured lying horizontal and hangs from a hook on the wall. A mass of 25 kg is hung from the free end of the wire. Assuming the wire to be uniform an lateral strains $< <$ longitudinal strains find the extension in the length of the wire. The density of steel is 7860 kgm^{-3} and Young's modulus $= 2 \times 10^{11} Nm^{-2}$

(b) If the yield strength of steel is $2.5 \times 10^8 Nm^{-2}$,

what is the maximum weight that can be hung at the lower end of the wire ?

Watch Video Solution

Watch Video Solution

26. A steel uniform rod of length 2L cross sectional area A and mass Mis set rotating in a horizontal plane about an axis passing through the centre. If Y is the Young's modulus for steel, find the extension in the length of the rod.

Watch Video Solution

27. An equilateral triangle ABC is formed by two copper rods AB and BC and one is aluminium rod which heated in such a way that temperature of each rod increases by ΔT. Find change in the angle $\angle ABC$. (Coefficient of linear expansion for copper is α_1. and for aluminium is $\alpha 2$.).

Watch Video Solution

28. In nature the failure of structural members usually result from large torque because of twisting or bending rather than due to tensile or compressive strains. This process of structural breakdown is called buckling and in cases of tall cylindrical structures like trees, the torque is caused by its own weight bending the structure. Thus, the vertical through the centre of gravity does not fall within the base. The elastic torque caused because of this bending about the central axis of the tree is given by $\frac{Y\pi r^2}{4R} Y$ is the Young's modulus, r is the radius 4R of the trunk and R is the radius of curvature of the bent surface along the height of the tree containing the centre of gravity (the neutral surface). Estimate the critical height of a tree for a given radius of the trunk.

Watch Video Solution

29. A stone is tied to an elastic string of negligible mass and spring constant k. The unstretched length of the string is L and has negligible mass. The other end of the string is fixed to a nail at a point P. Initially the stone is at the same level as the point P. The stone is dropped vertically from point P.

(a) Find the distance 'y' from the top when the mass comes to rest for an instant, for the first time.

(b) What is the maximum velocity attained by the stone in this drop ?

(c) What shall be the nature of the motion after the stone has reached its lowest point ?

Watch Video Solution

Section E

1. Two wires A and B are of the same material their lengths are in the ratio 1 : 2 and the diameter are in the ratio 2 : 1. If they are pulled by the same force, their increase in length will be in the ratio ....

A. $2:1$

B. $1:4$

C. $1:8$

D. $8:1$

Answer: C

Watch Video Solution

2. When an elastic material with Young's modulus Y is subjected to stretching stress S, elastic energy stored per unit volume of the material is :

A. $\frac{YS}{2}$

B. $\frac{S^2Y}{2}$

C. $\frac{S^2}{2Y}$

D. $\frac{S}{2Y}$

Answer: C

Watch Video Solution

3. The compressibility of water is 4×10^{-5} per unit atmospheric pressure. The decrease in volume of $100cm^3$ of water under a pressure of 100 atmosphere will be ....

A. $0.4cm^3$

B. $4 \times 10^{-5}cm^3$

C. $0.025cm^3$

D. $0.004cm^3$

Answer: A

Watch Video Solution

4. A thick rope of density $1.5 \times 10^3 kgm^{-3}$ and Young's modulus $5 \times 10^6 Nm^{-2}$, 8 m in length when hung from the ceiling of room the increase in its length due to its own weight is .... $(g = 10ms^{-2})$

A. $9.6 \times 10^{-5}m$

B. $19.2 \times 10^{-7}m$

C. $9.6m$

D. $9.6 \times 10^{-2}m$

Answer: D

Watch Video Solution

5. Which of the following physical quantity is dimensionless?

A. Strain

B. Angular velocity

C. Momentum

D. Angular momentum

Answer: A

Watch Video Solution

6. A stretched rubber has ....

A. increased kinetic energy

B. increased potential energy

C. decreased kinetic energy

D. decreased potential energy

Answer: B

Watch Video Solution

7. Which of the following affects the elasticity of a substance ?

A. Change in temperature

B. Impurity of substance

C. Hammering and annealing

D. All of these

Answer: D

Watch Video Solution

8. A steel ring of radius r and cross-sectional area A is fitted onto a wooden disc of radius R $(R > r)$. If the Young's modulus of steel is Y, then the force with which the steel ring is expanded is ....

A. $AY\frac{R}{r}$

B. $AY\left[\frac{R-r}{r}\right]$

C. $\frac{Y}{A}\left[\frac{R-r}{r}\right]$

D. $\frac{Yr}{AR}$

Answer: B

Watch Video Solution

9. The compressibility of water is 4×10^{-5} per unit atmospheric pressure. The decrease in volume of $100cm^3$ of water under a pressure of 100 atmosphere will be ....

A. $0.4cm^3$

B. $0.004cm^3$

C. $4 \times 10^8 cm^3$

D. $0.025cm^3$

Answer: C

Watch Video Solution

10. If x longitudinal strain is produced in a wire of Young's modulus Y, then potential energy stored in a material of the wire per unit volume is ....

A. Yx^2

B. $2Yx^2$

C. $\frac{Y^2x}{2}$

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

Answer: D

Watch Video Solution

11. According to Hooke's law of elasticity, if stress is increased, the ratio of stress to strain will be...........

A. increases

B. decreses

C. becomes zero

D. remains constnat

Answer: D

Watch Video Solution

12. The diameter of a brass rod is 4 mm and Young's modulus of brass is $9 \times 10^9 Nm^{-2}$, What will be the force required to stretch by 0.1% of its length ?

A. $36\pi N$

B. $36N$

C. $36\pi \times 10^5 N$

D. $144\pi \times 10^3 N$

Answer: A

Watch Video Solution

13. For a constant hydraullic stress on an object the fractional change in the object's volume $\frac{\Delta V}{V}$ and bulk modulus (B) are related as ....

A. $\frac{\Delta V}{V} \propto B$

B. $\frac{\Delta V}{V} \propto \frac{1}{B}$

C. $\frac{\Delta V}{V} \propto B^2$

D. $\frac{\Delta V}{V} \propto (1)\left(B^2\right)$

Answer: B

Watch Video Solution

14. Shear modulus is zero for ....

A. solids

B. liquids

C. gases

D. liquids and gases

Answer: C

Watch Video Solution

15. If a wire is extended to a new length l, the work done is ....

A. $\frac{YA(l-l')}{l}$

B. $\frac{YA(l-l')^2}{l}$

C. $\frac{1}{2}\frac{YA}{l}(l-l')^2$

D. $2\frac{YA}{l}(l-l')^2$

Answer: C

Watch Video Solution

16. A cylindrical wire is twisted with an angle θ, what is torsion produced in it?

A. $\frac{C}{\theta}$

B. $C\theta$

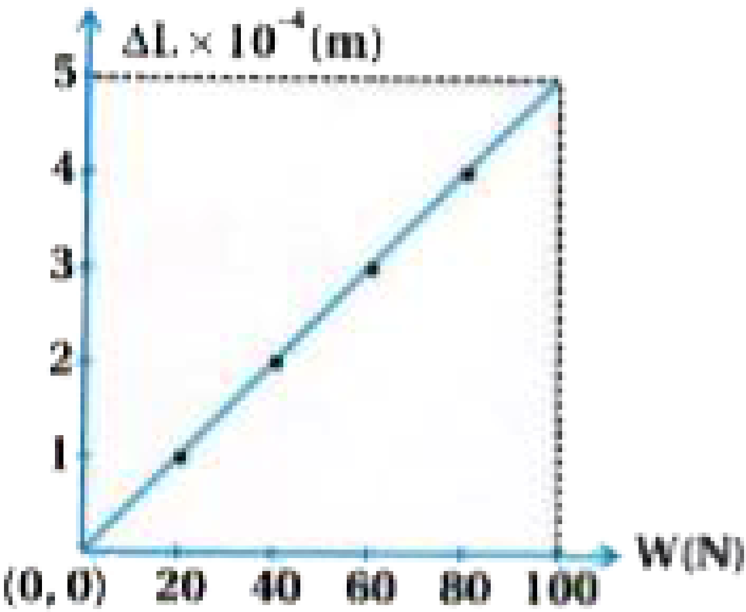
C. $\frac{C}{\theta^2}$

D. $C\theta^{\frac{3}{2}}$

Answer: B

Watch Video Solution

17. The adjacent graph shows the extension (ΔI) of a wire of length 1 m suspended from the top of a roof at one end with a load 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 is ....



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

B. $5 \times 10^6 Nm^{-2}$

C. $2 \times 10^6 Nm^{-2}$

D. $5 \times 10^{11} Nm^{-2}$

Answer: A

Watch Video Solution

18. A wire of length L and radius r is clamped rigidly at one end. When the other end of the wire is pulled by a force f its length increases by l. Another wire of the same material of length 2L and radius 2r is pulled by a force 2f. Then find the increase in length of this wire.

A. $\frac{l}{2}$

B. l

C. $2l$

D. $4l$

Answer: B

Watch Video Solution

19. A pendulum made of a uniform wire of cross sectional area A has time period T. When an additional mass M is added to its bob, the time period changes to T_M. If the Young's modulus of the material of the wire is Y then $\frac{1}{Y}$ is equal to: (g = gravitational acceleration)

A. $\left[\left(\frac{T_M}{R}\right)^2 - 1\right]\frac{A}{Mg}$

B. $\left[\left(\frac{T_M}{R}\right)^2 - 1\right]\frac{Mg}{A}$

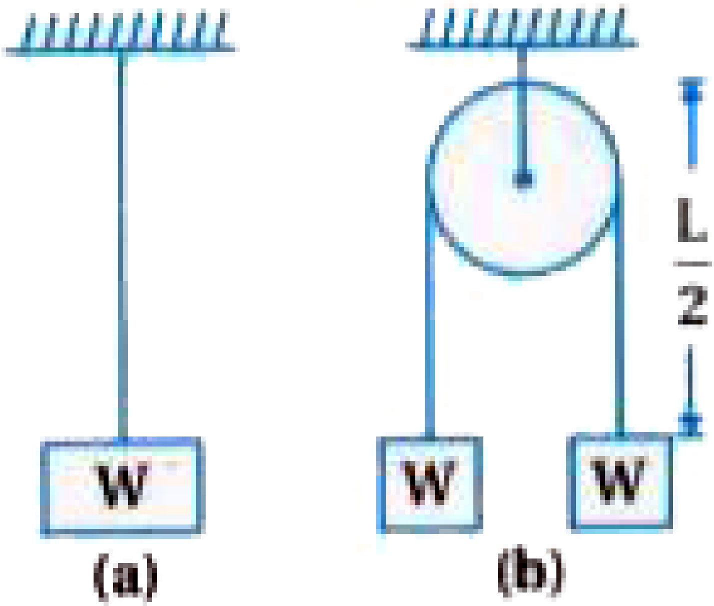
C. $\left[-1 + \left(\frac{T_M}{T}\right)^2\right]\frac{A}{Mg}$

D. $\left[-1 + \left(\frac{T}{T_M}\right)^2\right]\frac{A}{Mg}$

Answer: A

Watch Video Solution

20. A wire of length L is fixed at one end. It is elongates by l when a load W is hanged from other end. If the wire goes over a pulley and two weights W each are hung at the two ends, the elongation of the wire will be ......



A. $\frac{l}{2}$

B. l

C. 2l

D. 4l

Answer: B

Watch Video Solution

21. A metal rod of Young's modulus and coefficient of thermal expansion α is held at its two ends such that its length remains invariant. If its temperature is raised by $t^\circ C,$ the linear stress developed it its is .....

A. $\frac{\alpha t}{F}$

B. $\frac{Y}{\alpha t}$

C. $Y \propto t$

D. $\frac{1}{Y \propto t}$

Answer: C

Watch Video Solution

22. The Young's modulus of brass and steel are $10^{11} Nm^{-2}$ and $2 \times 10^{11} Nm^{-2}$ respectively. A brass wire and a steel wire of the same length extend by 1 mm, each under the same force. If radii of brass and steel wires are R_B and R_S respectively, then .. .

A. $R_S = \frac{R_B}{\sqrt{2}}$

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

C. $R_S = \sqrt{2} R_B$

D. $R_S = 4R_B$

Answer: A

Watch Video Solution

23. Copper of fixed volume V is drawn into wire of length l. When this wire is subjected to a constant force F, the extension produced in the wire is $\Delta l l$. Which of the following graphs is a straight line ?

A. Δl versus $\frac{1}{l}$

B. Δl versus l^2

C. Δl versus $\frac{1}{l^2}$

D. Δl versus l

Answer: B

Watch Video Solution

24. The Young's modulus of steel is twice that of brass. Two wires of same length and of same area of cross section, one of steel and another of brass are suspended from the same roof. If we want the lower ends of the wires to be at the same level, then the weights added to the steel and brass wires must be in the ratio of:

A. $1:1$

B. $1:2$

C. $2:1$

D. $4:1$

Answer: C

Watch Video Solution

25. The approximate depth of an ocean is 2700 m. The compressibility of water is $45.4 \times 10^{-11} Pa^{-1}$ and density of water is $10^3 kg/m^3$. What fractional compression $\frac{\Delta V}{V}$ of water will be obtained at the bottom of the ocean? (Take $g = 10 ms^{-2}$)

A. 1.2×10^{-2}

B. 1.4×10^{-2}

C. 0.8×10^{-2}

D. 1.0×10^{-2}

Answer: A

Watch Video Solution

26. The value of coefficient of volume expansion of glycerin is $5 \times 10^{-4} K^{-1}$. The fractional change in the density of glycerin for a rise of 40° C in its temperature is _____

A. 0.025

B. 0.010

C. 0.015

D. 0.020

Answer: D

Watch Video Solution

27. An external pressure P is applied on a cube atm $0^{\circ} C$ so that it is equally compressed from all sides. K is the bulk modulus of the material of the cube and α is its coefficient of linear expansion. Suppose we want to bring the cube to its original size by heating. The temperature should be raised by ......

A. $\frac{3\alpha}{PK}$

B. $3PK\alpha$

C. $\frac{P}{3\alpha K}$

D. $\frac{P}{\alpha K}$

Answer: C

Watch Video Solution

28. A solid sphere of radius r made of a soft material of bulk modulus K is surrounded by a liquid in a cylindrical container. A massless piston of area a floats on the surface of the liquid, covering entire cross section of cylindrical container. When a mass m is placed on the surface of the piston to compress the liquid, the fractional decrement in the radius of the sphere, $\left(\frac{dr}{r}\right)$, is.....

A. $\frac{Ka}{mg}$

B. $\frac{Ka}{3mg}$

C. $\frac{mg}{3Ka}$

D. $\frac{mg}{Ka}$

Answer: C

Watch Video Solution

Section F

1. Two wires are made of the same material and have the same volume. The first wire has cross sectional area A and the second wire has cross sectional area 3A. If the length of the first wire is increased by Δl on applying a force F, how much force needed to stretch the second wire by the same amount ?

A. F

B. 9F

C. 4F

D. 6F

Answer: B

Watch Video Solution

2. Y_g and Y_r denotes the Young's modulus of glass and rubber respectively. Glass is more elastic than rubber hence ....

A. $Y_g = Y_r$

B. $Y_g < Y_r$

C. $Y_g > Y_r$

D. $\frac{Y_g}{Y_r} = 0$

Answer: C

Watch Video Solution

3. A metal wire of uniform cross-sectional area A and length L, has mass m. It is suspended vertically from a ceiling. If its Young's modulus is Y, then the elongation Δl of wire due to its own weight will be ....

A. zero

B. $\frac{mgL}{2AY}$

C. $\frac{mgL}{AY}$

D. $\frac{2mgL}{AY}$

Answer: B

Watch Video Solution

4. A wire of length L and radius r fixed at one end and a force Fapplied to the other end produces an extension l. The extension produced in another wire or the same material of length 2L and radius 2r by a force 2F is ....

A. $\frac{l}{2}$

B. l

C. 2l

D. 4l

Answer: B

Watch Video Solution

5. Work done in stretching a wire of length 1 m and of cross-sectional area $1mm^2$ through 2 mm if Young's modulus of the material of the wire is $2 \times 10^{11} N/m^2$ is ....

A. 400 J

B. 40 J

C. 4 J

D. 0.4 J

Answer: D

Watch Video Solution

6. When an elastic material with Young's modulus Y is subjected to stretching stress S, elastic energy stored per unit volume of the material is :

A. $\frac{YS}{2}$

B. $\frac{S^2Y}{2}$

C. $\frac{S^2}{2Y}$

D. $\frac{S}{2Y}$

Answer: C

Watch Video Solution

7. A cube is subjected to a uniform volume compression from all side. If the side of the cube decreases by 1%, the bulk strain $\left(\frac{\Delta V}{V}\right)$ is ......

A. 0.01

B. 0.02

C. `0.03

D. 0.06

Answer: C

Watch Video Solution

8. A polyester fibre rope of diameter 3 cm has a breaking strength of 150 kN. If it is required to have 600 kN breaking strength. What should be the diameter of similar rope ?

A. 12 cm

B. 6 cm

C. 3 cm

D. $1.5cm$

Answer: B

Watch Video Solution

9. Shear modulus is zero for ....

A. solids object

B. liquids object

C. gases

D. liquids and gases

Answer: D

Watch Video Solution

10. A metal rod of Young's modulus $2 \times 10^{10} Nm^{-2}$, undergoes longitudinal strain of 1%, the potential energy per unit volume stored in rod is .... Jm^{-3}.

A. 10^6

B. 10^8

C. 2×10^6

D. 2×10^8

Answer: A

Watch Video Solution

11. Two wires of the same material and same length but diameters in the ratio (1 : 2) are stretched by the same force. The potential energy per unit volume of the two wires will be in the ratio ....

A. $1 : 2$

B. $4:1$

C. $1:1$

D. $16:1$

Answer: D

Watch Video Solution

Question Paper

1. What is called brittle material ?

Watch Video Solution

2. Write Hooke's law.

Watch Video Solution

3. What is effect of tensile force on lateral dimensions ?

Watch Video Solution

4. What is buckling?

Watch Video Solution

5. What is compressibility ? Write its formula, unit and dimensional formula.

Watch Video Solution

6. Why are the springs made of steel and not of copper ?

Watch Video Solution

7. Clarify the difference between stress and pressure.

Watch Video Solution

8. Derive an expression for elastic potential energy per unit volume stored for the wire is $\frac{1}{2}$x stress x strain.

Watch Video Solution

9. A rigid bar of mass 15 kg is supported symmetrically by three wires each 2.0 m long. Those at each end are of copper and the middle one is of iron. Determine the ratios of their diameters if each is to have the same tension. $Y_{Cu} = 1.2 \times 10^{11} Nm^{-2}, Y_{Fe} = 1.9 \times 10^{11} N,^{-2}$

Watch Video Solution

10. What is the density of water at a depth where pressure is 80.0 atm, given that its density at the surface is $1.03 \times 10^3 kgm^{-3}$? Compressibility of water $45.810^{-11} Pa^{-1}, \left[1Pa = 1Nm^{-2}\right]$

Watch Video Solution

Watch Video Solution

11. Two strips of metal are riveted together at their ends by four rivets, each of diameter 6.0 mm. What is the maximum tension that can be exerted by the riveted strip if the shearing stress on the rivet is not to exceed 6.9×10^7 Pa ? Assume that each rivet is to carry one quarter of the load.

Watch Video Solution