PHYSICS

BOOKS - NIKITA PHYSICS (HINGLISH)

ELASTICITY

Mcq

1. Elasticity is the property of material body by virtue of which a body

A. occupies minimum surface area

B. is in equilibrium

C. opposes its deformation

D. attracts other bodies

Answer: C

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2. Among the glass and rubber which one is more elastic?

A. Rubber

B. Glass

C. Both

D. None of these

Answer: B

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3. Steel is preferred for making springs over copper because

A. steel is cheaper

B. steel does not react with atmosphere

C. elasticity of steel is more

D. steel also has magnetic property

Answer: C

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4. The property of matter by virtue of which it does not regain its original shape and size after the removal of deforming force is called

A. plasticity

B. elastic limit

C. elasticity

D. rigidity

Answer: C

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5. Which one of the following substances possesses the highest elasticity-

A. steel

B. copper

C. rubber

D. aluminium

Answer: A

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6. Steel is preferred for making springs over copper because

A. it is coventional

B. steel is easy available than copper

C. steel is less elastic than copper

D. steel is more elastic than copper

Answer: D

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7. The applied force produces changes in dimensions is a

A. deformation

B. contraction

C. formation

D. alteration

Answer: A

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8. The force which responds to produced deformation is a body is

A. deforming force

B. force

C. restoring force

D. intermolecular force

Answer: A

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9. The deformation produced in an elastic body on the application of some external force is

A. stress

B. Young's modulus

C. strain

D. elastic limit

Answer: C

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10. Glass, rubber, steel copper is order of increasing the property of elasticity

A. copper, glass, rubber, steel

B. steel, copper, glass, rubber

C. rubber, glass copper steel

D. glass, rubber, copper, steel

Answer: C

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11. The property of a body by virtue of which it changes its dimensions permanently is called

A. plasticity

B. elasticity

C. rigidity

D. None of these

Answer: A

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12. Which of the following substance have least elasticity ?

A. rubber

B. glass

C. copper

D. steel

Answer: A

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13. The metal which breaks immediately after elastic limit is

A. brittle

B. ductile

C. malleable

D. elastic

Answer: A

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14. The property of metals which allows to form a thin wires beyond their elastic limit without rupture is

A. ductility

B. malleability

C. elasticity

D. hardness

Answer: A

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15. The modulus of elasticity is dimesionally equivalent to

A. stress

B. strain

C. surface tension

D. elastic fatigue

Answer: A

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16. Within the elastic limit, which of the following graph represents correctly the variation of extension in the length of a wire with the external load ?

A. straight line with positive slope

B. straight line with negative slope

C. straight line with zero slope

D. straight line with infinite slope

Answer: A

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17. A wire is stretched to double its length. The strain is

A. infinity

B. 1

C. zero

D. 0.5

Answer: B

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18. A metal which is used to prepare thin wires or womens's Jewelry is

A. ductile

B. reptile

C. brittle

D. elasticity

Answer: A

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19. The metal which breaks immediately after elastic limit is

A. ductile metal

B. reptile metal

C. brittle metal

D. elastic metal

Answer: C

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20. The metal which do not break beyond elastic limit is

A. ductile

B. brittle

C. both 'a' and 'b'

D. plastic

Answer: A

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21. Which of the following is more elastic ?

A. water

B. steel

C. rubber

D. air

Answer: c

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22. The elasticity of invar

A. increases with temperature rise

B. decrease with temperature rise

C. does not depend on temperature

D. none of the above

Answer: C

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23. After effects of elasticity are maximum for

A. glass

B. quartz

C. rubber

D. metal

Answer: A

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24. In suspended type moving coil galvanometer, quartz suspension is used because

A. it is good conductor of electricity

B. elastic after effects are negligible

C. young's modulus is greater

D. there is no elastic limit

Answer: B

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25. What is the dimensional formula of tensile stress?

A. $\left[L^{-1}M^{1}T^{-2}\right]$

B. $\left[L^{1}M^{-2}T^{-1}\right]$

C. $\left[L^{-2}M^{1}T^{-1}\right]$

D. $\left[L^{-1}M^{-2}T^{1}\right]$

Answer: A

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26. SI units of stress is

A. N/m^2

B. Nm^2

C. m^2/N

D. N^2m

Answer: A

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27. The tensile stress is related to the term change in

A. shape of a body

B. length of a body

C. size of a body

D. volume of a body

Answer: B

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28. SHEARING STRESS AND TANGENTIAL STRESS

A. shape and size of a body

B. length of a body

C. area of a body

D. volume of a body

Answer: A

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29. The internal restoring force acting per unit area of cross-section of the deformed body is called

A. stress

B. applied force

C. strain

D. shear

Answer: A

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30. The change in dimensions per unit original dimensions is

A. stress

B. deformation

C. strain

D. formation

Answer: C

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31. When a spiral spring is stretched by suspending a load on it, the strain produced is called

A. longitudinal

B. shearing

C. volumetric

D. elastic

Answer: B

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32. Within the elastic limit, stress is directly proportional to strain produced in a body is the statement of

A. Robert's law

B. Hooke's law

C. Newton's law

D. Boyle's law

Answer: B

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33. Which of the following quantity is unitless ?

A. Stress

B. Young's modulus

C. Strain

D. Pressure

Answer: C

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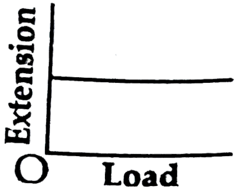
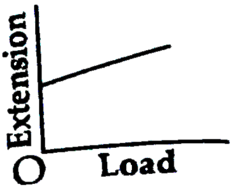
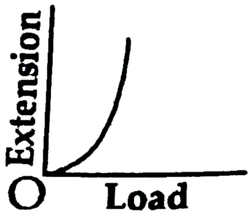
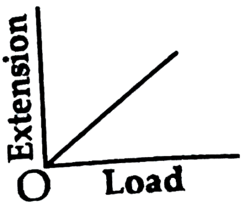
34. Within elastic limit, which of the following graphs correctly represents the variation of extension in the length of wire with the external load?

A. 

B. 

C. 

D. 

Answer: D

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35. Fluids can develop

A. longitudinal and shearing strains

B. longitudinal strain only

C. volume strain only

D. longitudinal, shear and volume strains

Answer: C

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36. According to Hooke's law, the force required to change the length of a wire by $'l'$ is proportional to

A. $1/l^2$

B. $1/l$

C. l

D. l^2

Answer: C

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37. Under elastic limit the stess is

A. independent of strain

B. square root of the strain

C. directly proportional to strain

D. indirectly proportional to strain

Answer: C

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38. Breaking stress does not depend upon

A. area of cross-section of the wire

B. the dimensions of wire

C. the material of the wire

D. all of these

Answer: B

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39. The breaking stress of a wire depends on

A. area of cross section

B. Length of the wire

C. Young's modulus of the material of the wire

D. Density of the wire

Answer: C

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40. The nature of elastic forces by virtue of which a body possess the property of elasticity is

A. electromagnetic

B. gravitational

C. weak

D. all of the above

Answer: A

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41. The breaking stress is

A. the stress just below the elastic limit

B. the stress just above the elastic limit

C. the greatest stress that the material can bear

D. the stress for which the residual strain is 0.0002

Answer: C

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42. The ratio of adiabatic and isothermal bulk modulus of elasticity for a perfect gas is

A. γ

B. γ^2

C. $1/\gamma$

D. $1/\gamma^2$

Answer: A

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43. A metal bar of length L and area of cross-section A is clamped between two rigid supports. For the material of the rod. It Young's modulus is Y and Coefficient if linear expansion is α. If the temperature of the rod is increased by $\Delta t^\circ C$, the force exerted by the rod on the supports is

A. $YL\alpha\Delta\theta$

B. $YA\alpha\Delta\theta$

C. $YL\Delta\theta$

D. $YAL\alpha$

Answer: B

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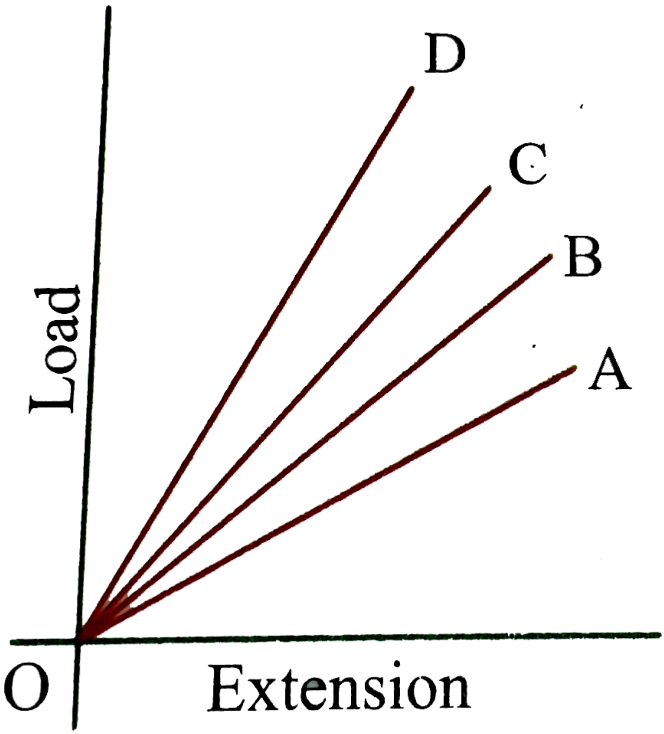
44. The load versus extension graph for four wires of same material is shown.

The thinnest wire is represented by the line



A. OC

B. OA

C. OD

D. OB

Answer: B

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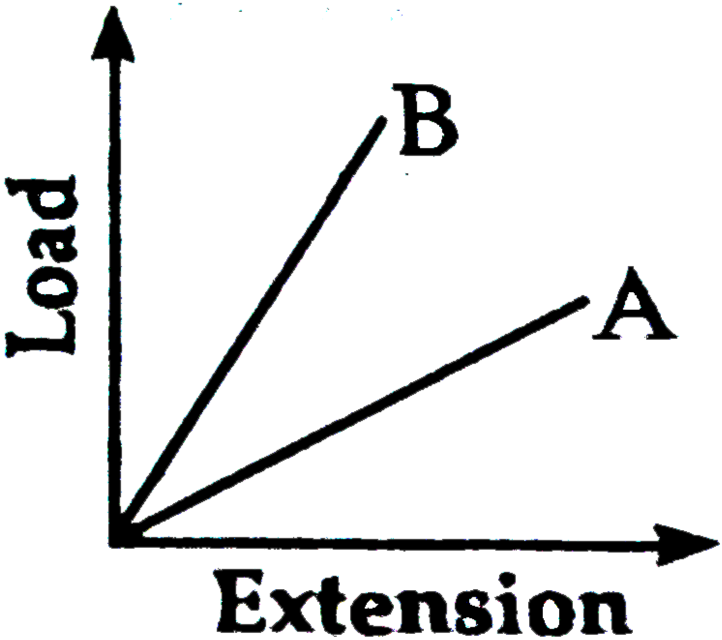
45. The graph is plotted between load and extension of the wires of same dimensions but of different materials. Then the Young's modulus is,



A. greater for B

B. greater for A

C. same for both

D. nothing can be said

Answer: A

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46. A Copper wire and steel of the same diameter and length are connected end to end and a force is applied, which stretches their combined length by 1 cm. The two wires will have

A. different stresses and strains

B. the same stress and strain

C. the same strain but different stresses

D. the same stress but different strains

Answer: D

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47. An iron bar of length l cross section 'A' and young's modulus Y is pulled by a force F from both ends so as to produce an elongation 'e'. Which of the following statements is correct?

A. $e \propto Y$

B. $e \propto A$

C. $e \propto \frac{l}{A}$

D. $e \propto \frac{1}{l}$

Answer: C

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48. Equal stretching force is applied along the length of two identical wires made of different substances A and B. It is observed that the elongation of B is less than A. Then,

A. A is more elastic than B

B. B is more elastic than A

C. A and B are equally elastic

D. A may be more or less elastic than B

Answer: B

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49. The longitudinal extention of any elastic material is very small.In order to have an appericiable change ,the material must be in the form of

A. short and thin wire

B. thick block with any cross section

C. a long thin wire

D. breaking stress must be very small

Answer: C

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50. The force required to punch a hole of diameter 2 mm, will be (If a shearing stress $4 \times 10^8 N / m^2$.)

A. $400\pi N$

B. $1600\pi N$

C. $1800\pi N$

D. $1200\pi N$

Answer: A

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51. What would be the greatest length of a steel wire which when fixed at one end can hang freely without breaking ?

$\left(\rho_{\text{steel}} = 7.8 \times 10^3 kg/m^3 B.\ S._{\text{steel}} = 7.8 \times 10^8 N/m^2\right)$

A. $2.02 \times 10^2 m$

B. $1.02 \times 10^4 m$

C. $3.02 \times 10^3 m$

D. $4.02 \times 10^5 m$

Answer: B

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52. The greatest length of a steel wire that can hang without breaking is 10 km. I the breaking stress for steel is $8.25 \times 10^8 N / m^2$. Then the density of the steel is $(g = 10m / s^2)$

A. $7200kg / m^3$

B. $8250kg / m^3$

C. $6200kg / m^3$

D. $5200kg / m^3$

Answer: B

53. Two wires of same material have same length but their radii are 0.1 cm and 0.2 cm. Then the value of Young's modulus is,

A. higher for thick wire

B. higher for thin wire

C. same for the two wires

D. different for the two wires

Answer: C

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54. The length of a wire increases by 1% on loading 2 kg wt on it. The linear strain in the wire is,

A. 1

B. 0.01

C. 0.1

D. 0.001

Answer: B

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55. If the stress in a wire is $(1/200)^{th}$ of Young's modulus, then the strain produced will be

A. $1/100$

B. $1/200$

C. $1/10$

D. 200

Answer: B

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56. A breaking force for a given wire is 'F'. The breaking force for the wire having double the thickness is

A. 4F

B. 2F

C. 2F

D. $F/2$

Answer: A

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57. The breaking force of wire is 10^4N and radius is 1×10^{-3}m. If the radius is 2×10^{-3}m, then the breaking force will be

A. $4 \times 10^4 N$

B. $40 \times 10^4 N$

C. $0.04 \times 10^4 N$

D. $0.4 \times 10^4 N$

Answer: A

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58. A metal wire can be broken by applying a load of 45 kg wt. Then the force required to break the wire of twice the diameter and the same material is

A. 22.5 kg wt

B. 45 kg wt

C. 90 kg wt

D. 180 kg wt

Answer: D

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59. A cabe breaks if strethced by more than $2mm$. It is cut into two equal parts. By how much eitther part can be streched without breaking

A. 0.25 cm

B. 0.5 mm

C. 1 mm

D. 2 mm

Answer: C

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60. The breaking stress of a wire is $7.2 \times 10^8 N/m^2$ and density is $78 \times 10^2 kg/m^3$. The wire is held vertically to the rigid support. The maximum length so that the wire does not break is

A. $9.94 \times 10^3 m$

B. $9.4 \times 10^3 m$

C. 94×10^3m

D. 940×10^3m

Answer: B

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61. The breaking stress for a wire of unit cross-section is called

A. yield point

B. tensile strength

C. elastic limit

D. Young's modulus

Answer: B

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62. A wire is stretched to double its length. The strain is

A. 2

B. 0.5

C. zero

D. -0.5

Answer: B

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63. Two wires made of the same material and of same area of cross-section are 1 m and 2 m long respectively. If a force required to change the length of 1 m wire by 1 cm is F_1, the the force required to change the length of 2m wire by 1 cm will be

A. $F_1 / 4$

B. $F_1 / 2$

C. F_1

D. $2F_1$

Answer: B

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64. A wire can be broken by applying a load of 20kg wt. Then the force required to break the wire of twice the diameter and same length, same material, is

A. 5 kg wt

B. 160 kg wt

C. 80 kg wt

D. 20 kg wt

Answer: C

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65. If a steel wire of diameter 2 mm has a breaking strength of $4 \times 10^5 N$. Then the breaking strength of similar wire of diameter 1 mm will be

A. $4 \times 10^5 N$

B. $2 \times 10^5 N$

C. $1 \times 10^5 N$

D. $0.5 \times 10^5 N$

Answer: C

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66. A stress of $10^6 N/m^2$ is required for breaking a material. If the density of the material is $3 \times 10^3 Kg/m^3$, then what should be the minimum length of the wire made of the same material so that it breaks by its own weight $(g = 10m/s^2)$

A. 66.6 m

B. 60.0 m

C. 33.3 m

D. 30.0 m

Answer: C

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67. Stress to strain ratio is equivalent to

A. modulus of elasticity

B. plasticity

C. elastic constant

D. both 'a' and 'c'

Answer: D

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68. The maximum stress up to which a body can subjected without permanent deformation is

A. plastic limit

B. stress limit

C. proportionality limit

D. elastic limit

Answer: D

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69. The units of Young's modulus of elasticity are

A. dyne / cm^2

B. cm^2 / dyne

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

D. dyne / cm

Answer: A

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70. Find the dimensions of stress, strain and modulus of elasticity.

A. $[L^0 M^0 T^0]$

B. $\left[L^1M^1T^{-2}\right]$

C. $\left[L^1M^{-2}T^1\right]$

D. $\left[L^2M^1T^{-1}\right]$

Answer: A

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71. If 'S' is stress and 'Y' is young's modulus of material of a wire, the energy stored in the wire per unit volume is

A. $1/2Y\alpha^2\Delta t^2$

B. $1/2Y/\alpha^2$

C. $2\alpha^2$

D. $2\alpha^2/Y$

Answer: A

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72. The bulk modulus of a perfectly rigid body is

A. zero

B. infinite

C. finite

D. unity

Answer: B

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73. Young's modulus of perfectly elastic body is

A. finite

B. zero

C. one

D. infinite

Answer: D

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74. When a wire is twisted, the strain produced in it is

A. shear

B. longitudinal

C. volumetric

D. tensile

Answer: A

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75. The compressibility of a substance is

A. same as bulk modulus

B. reciprocal of bulk modulus

C. same as shear modulus

D. inverse of shear modulus

Answer: B

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76. If the length of a wire is doubled, then its Young's modulus

A. become double

B. become half

C. increases but becomes not exactly double

D. remains unchanged

Answer: D

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77. Young's modulus of a substance depends of

A. its length and area

B. elongation and radius

C. both a' and b'

D. material and temperature

Answer: D

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78. When temperature of a material increases, its Young's modulus

A. increases

B. decrease

C. remains unchanged

D. changes erratically

Answer: B

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79. Shearing strain is expressed by

A. angle of shear

B. decrease in volume

C. angle of twist

D. increase in volume

Answer: A

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80. The dimensional formula for the modulus of rigidity is

A. $\left[L^{-1}M^{1}T^{2}\right]$

B. $\left[L^{1}M^{1}T^{-2}\right]$

C. $\left[L^{-1}M^{1}T^{-2}\right]$

D. $\left[L^{-2}M^{-1}T^{2}\right]$

Answer: C

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81. A gas is filled in a cylinder with initial pressure P, initial volume V. When the pressure is increased by dP and volume reduces by dV. The bulk modulus is

A. $dV.\,(dP/V)$

B. $(V/dP).\,dV$

C. $V.\,(dP/dV)$

D. $(dP/V).\,dV$

Answer: C

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82. Which of the following does not exhibit a shear ?

A. twisting of wire

B. increasing in length of wire

C. wriggling of washed clothes

D. bending of beam

Answer: B

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83. A cube is fixed at base and tangential force 'F' acting on the upper face of area 'A' and θ is shear strain in it, the modulus of rigidity is

A. $A\theta / F$

B. $F\theta / A$

C. $F / A\theta$

D. $A / F\theta$

Answer: C

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84. A wire extends by $'l'$ on the application of load $'mg'$. Then the energy stored in it is

A. Mgl

B. Mgl/2

C. zero

D. 2mgl

Answer: B

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85. If the wire of length 'L' is subjected to an external force 'F' cause to increase in length by 'l', then longitudinal strain is proportional to

A. L/l

B. $l \times L$

C. l/L

D. $l^2 \times L$

Answer: C

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86. The reason for the change in shape of a regular body is

A. bulk strain

B. longitudinal strain

C. shearing strain

D. volume strain

Answer: C

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87. Hooke's law states that,

A. stress and strain are independent of each other

B. stress is inversely proportional to the strain produced in the wire within the elastic limit

C. stress is directly proportional to the strain produced in the wire within the elastic limit

D. strain is inversely proportional to stress produced in the wire

Answer: A

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88. Young's modulus is

A. the ratio of linear strain to normal stress

B. the ratio of normal stress to strain

C. product of linear and normal stress

D. square of the ratio of normal stress to linear strain

Answer: B

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89. The point on the stress-strain curve at which the strain begins to increase even without any increase in the stress is

A. elastic limit point

B. breaking point

C. plasticity limit point

D. yield point

Answer: D

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90. $[L^{-1}M^{1}T^{-2}]$ are the dimensions of

A. modulus of elasticity

B. modulus of rigidity

C. constant of elasticity

D. all of the above

Answer: D

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91. The dimensionless quantity is

A. stress

B. shear stress

C. strain

D. restoring force

Answer: C

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92. Square meter per newton is the SI unit of

A. Bulk modulus

B. compressibility

C. stress

D. strain

Answer: B

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93. The volume stress in a body is equal to

A. change in area

B. change in pressure

C. change in volume

D. change is length

Answer: B

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94. The graph between stress and strain represents the

A. Young's law in elasticity

B. Bulk law in elasticity

C. Hooke's law in elasticity

D. law of modulus rigidity

Answer: C

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95. Young's modulus is defined as

A. the ratio of volume stress to the volume strain

B. the ratio of longitudinal stress to the longitudinal strain

C. the ratio of the shearing stress to the shearing strain

D. the ratio of the tensile strain to the tensile stress

Answer: B

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96. The Young's modulus, bulk modulus and the modulus of rigidity have

A. no dimensions

B. same dimensions

C. different dimensions

D. none of the above

Answer: B

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97. The constant of proportionality of stress and strain is

A. plasticity

B. elasticity

C. modulus of elasticity

D. modulus of plasticity

Answer: C

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98. The elastic body completely regains its original dimensions

A. when deforming forces are applied

B. when deforming forces are constant

C. when deforming forces are removed

D. none of the above

Answer: C

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99. Equal stretching force is applied along the length of two identical wires made of different substances A and B. It is observed that the elongation of B is less than A. Then,

A. P is more elastic than Q

B. Q is more elastic than P

C. P and Q are equally elastic

D. P is elastic and Q is plastic

Answer: B

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100. A stress of $10^6 Nm^{-2}$ is required for breaking a material. If the density of the material is $3 \times 10^3 kgm^{-3}$., then what should be the length of the wire made of this material, so that it breakes under its own weight?

A. 17 m

B. 34 m

C. 22 m

D. 43 m

Answer: B

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101. When a force is applied along the length of the wire

A. the length of the wire increases but its radius remains the same

B. both the ends of its length increases and radius also increases

C. length increases but radius decreases

D. both length and radius decreases

Answer: C

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102. Young's modulus for a perfectly rigid body is

A. unity

B. zero

C. infinite

D. any finite values

Answer: C

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103. Which of the modulus of elasticity is involved in compressing a rod to decreases its length ?

A. modulus of rigidity

B. Bulk modulus

C. Young's modulus

D. volume elasticity

Answer: A

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104. The compressibility of water is $4.5 \times 10^{-10} m^2 / N$. 1 L of water is subjected to pressure of $2 \times 10^7 N / m^2$. The decrease in its volume is

A. 9 cc

B. 4 cc

C. 5 cc

D. 1 cc

Answer: A

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105. Modulus of rigidity of a liquid

A. zero

B. one

C. infinite

D. non zero values

Answer: A

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106. Which of the following is more elastic than air ?

A. water

B. rubber

C. both 'a' and 'b'

D. neither 'a' nor 'b'

Answer: C

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107. The longitudinal extention of any elastic material is very small.In order to have an appericiable change ,the material must be in the form of

A. thin block of any cross section

B. thick block of any cross section

C. long thin wire

D. short thin wire

Answer: C

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108. In MKS system, unit of Young's modulus is

A. N/m

B. N/m^2

C. Nm

D. Nm^2

Answer: B

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109. What are dimensions of Young's modulus of elasticity?

A. $[L^{-1}MT^2]$

B. $[L^{-1}MT^{-2}]$

C. $[LMT^{-2}]$

D. $[L^{-1}M^{-1}T^{2}]$

Answer: B

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110. A steel wire is stretched by $1kgwt$. If the radius of the wire is doubled, its Young's modulus will

A. remains unchanged

B. becomes half

C. becomes double

D. becomes four times

Answer: A

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111. The poisson's ratio cannot have the value

A. 0.7

B. 0.1

C. 0.2

D. 0.5

Answer: A

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112. The Poisson's ratio is defined as

A. the ratio of lateral contraction strains to longitudinal elongation strain

B. the ratio longitudinal elongation strain to lateral contraction strain

C. the ratio of tensile strain to the lateral strain

D. the ratio of normal strain to the lateral strain

Answer: A

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113. The only elastic modulus that applies to fluids is

A. Young's modulus

B. rigidity modulus

C. Bulk modulus

D. all of the above

Answer: C

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114. Two identical wires of substances 'P' and 'Q' are subjected to equal stretching force along the length.

If the elongation of 'Q' is more than that of 'P', then

A. A is more elastic than B

B. A and B are equal elastic

C. B is more elastic than A

D. A and B are equal plastic

Answer: C

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115. A wire of length L and radius r suspended from rigid support of mass M gm be applied its free end, its elongation is l, then its Young's modulus is

A. $MgL / \pi r^2 l$

B. $\pi r^2 l / MgL$

C. $Mg / \pi r^2 L$

D. $ML / \pi r^2 gl$

Answer: A

Watch Video Solution

116. The reason for the change in shape of a regular body is

A. shearing strain

B. bulk strain

C. normal strain

D. longitudinal strain

Answer: A

Watch Video Solution

117. The compressibility of a material is B.A cube of side 'a' is made with this material. If a uniform pressure P is applied on the cube from all the sides the fractional change in its length will be

A. 2P/B

B. PB/3

C. PB

D. B/3P

Answer: B

Watch Video Solution

118. A metal rod undergoes an elastic strain of 0.04% and the Young's modulus of the material is $3.6 \times 10^{10} N/m^2$. The energy per unit volume stored in the rod in Jule/m^3 is

A. 2592

B. 2880

C. 2222

D. 144

Answer: B

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119. A rubber cube of side 10 cm has one side fixed to a horizontal surface. A tangential force of 2000 N is applied on the opposite face. The distance through which the strained side moves will be (Rigidity modulus of the material is $200 \times 10^4 N/m^2, g = 10m/s^2$)

A. 1 cm

B. 10 cm

C. 1.4 cm

D. 20 cm

Answer: A

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120. The Young's modulus of a material is $10^{11} N/m^2$ and its Poisson's ratio is 0.2 . The modulus of rigidity of the material is

A. $0.42 \times 10^{11} N / m^2$

B. $0.56 \times 10^{11} N / m^2$

C. $0.2 \times 10^{11} N / m^2$

D. $5.6 \times 10^{11} N / m^2$

Answer: A

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121. Volume elasticity is possessed by

A. solids only

B. liquids only

C. gases only

D. all of the three states of matter

Answer: D

Watch Video Solution

122. A steel wire of length 2.5 m and area of cross section $1.25mm^2$, when it is stretched by a force of 40 N and Y for steel is $2 \times 10^{11} N / m^2$. The extension produced in a steel wire is

A. 0.4 mm

B. 0.4 cm

C. 4 mm

D. 4 cm

Answer: A

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123. A metal wire is observed to stretch by one part in a million when subjected to a stress of $8 \times 10^4 N/m^2$. The Young's modulus of the metal is

A. $8 \times 10^{10} N/m^2$

B. $80 \times 10^{10} N/m^2$

C. $0.8 \times 10^{10} N/m^2$

D. $80 \times 10^{10} \text{dyne}/cm^2$

Answer: A

Watch Video Solution

124. A metal wire $4m$ long and $2 \times 10^{-7} sq. m$ in cross-section is stretched by a force of $30N$. If the work done in stretching that wire is $4.5 \times 10^{-2} J$ the young's modulus of the wire is

A. $2 \times 10^{11} N/m^2$

B. $4 \times 10^{11} N / m^2$

C. $2 \times 10^{12} N / m^2$

D. $4 \times 10^{12} N / m^2$

Answer: A

Watch Video Solution

125. Two rods of different materials having coefficient of thermal expansion α_1, α_2 and young's modulii Y_1, Y_2 respectively are fixed between two rigid massive walls. The rods are heated such that they undergo the same increase in temperature. There is no bending of rods. If $\alpha_1 : \alpha_2 = 2 : 3$, the thermal stresses developed in the two rods are equal provided $Y_1 : Y_2$ is equal to

A. $2 : 3$

B. $1 : 1$

C. $3 : 2$

D. $4 : 9$

Answer: C

Watch Video Solution

126. The length of a metal wire is l_1 when the tension in it is T_1 and is l_2 when the tension is T_2. Then natural length of the wire is

A. $\frac{(l_1 + l_2)}{2}$

B. $\frac{(l_1 - l_2)}{2}$

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

D. $\frac{l_1 T_2 + l_2 T_1}{T_2 + T_1}$

Answer: C

Watch Video Solution

127. The Young's modulus of steel is $2 \times 10^{11} N/m^2$. If the interatomic spacing of the metal is 2.5 Å. Then the interatomic force constant is,

A. 40 N/m

B. 35 N/m

C. 25 N/m

D. 50 N/m

Answer: D

Watch Video Solution

128. 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, then increase in length will be in the ratio

A. $2:1$

B. $1:8$

C. $1:2$

D. $8:1$

Answer: B

Watch Video Solution

129. With the referece of the above problem, the ratio of the stresses in the wires is

A. $4:1$

B. $1:4$

C. $2:1$

D. $1:2$

Answer: B

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130. With the reference of above problem, the ratio of the strains in the two wires is

A. $3:20$

B. $1:4$

C. $4:1$

D. $3:5$

Answer: B

View Text Solution

131. When the pressure applied to one litre of a liquid in increased by $2 \times 10^{6} N / m^{2}$. It volume decreases by $1 cm^{3}$. The bulk modulus of the liquid is

A. $2 \times 10^{9} N / m^{2}$

B. $2 \times 10^{3} \text{dyne} / cm^{2}$

C. $2 \times 10^{3} N / m^{2}$

D. $0.2 \times 10^{9} \text{dyne} / cm^{2}$

Answer: A

Watch Video Solution

132. A copper wire 8 cm long is stretched to produce an extension of 0.8 cm in it. The lateral strain produced in the wire is , (if σ of copper is 0.2)

A. 0.002

B. 0.02

C. 0.2

D. 2

Answer: B

Watch Video Solution

133. $\sigma = (d/D) \times (L/l)$, where the symbols have their usual meaning. This is equation of

A. Hooke's law

B. Poisson's ratio

C. compressibility

D. Young's modulus

Answer: B

Watch Video Solution

134. There are two wires of same material. Their radii and lengths are both in the ratio $1:2$ If the extensions produced are equal, the ratio of the loads is

A. $1:2$

B. $4:1$

C. $2:1$

D. $1:4$

Answer: A

Watch Video Solution

135. A tangential force 2100 N is applied on a surface area $3 \times 10^{-6} m^2$ which is 0.1 m from a fixed face. If the force produces a shift of 7×10^{-3} m of the upper surface with respect to the bottom. Then the modulus of rigidity of the material will be,

A. $10^8 N/m^2$

B. $10^9 N/m^2$

C. $10^{10} N/m^2$

D. $10^{11} N/m^2$

Answer: C

Watch Video Solution

136. 3 m long copper wire is stretched to increase its length by 0.3 cm. The lateral strain produced in the wire is,

A. 0.26×10^{-2}

B. 0.26×10^{-3}

C. 0.26×10^{-4}

D. 0.26×10^{-5}

Answer: B

Watch Video Solution

137. The pressure required to reduce the given volume of water by 1% is,

(Bulk modulus of water $= 2 \times 10^9 N / m^2$)

A. $2 \times 10^7 N / m^2$

B. $2 \times 10^8 N / m^2$

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

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

Answer: A

Watch Video Solution

138. Which one of the following is equation of the modulus of rigidity?

(Where the symbols have their usual meanings)

A. $\eta = \frac{FL}{Al}$

B. $\eta = \frac{Vdp}{dv}$

C. $\eta = \frac{Fh}{Ax}$

D. $\eta = \frac{d/D}{l/L}$

Answer: C

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139. A uniform steel wire of length 3.14 m and diameter 2×10^{-3} m is fixed at its upper end. When a mass of 10 kg is attached to its lower end, the extension of the wire is 1×10^{-3} m. The Young's modulus of elasticity is,

A. $9.8 \times 10^{8} N/m^{2}$

B. $9.8 \times 10^{9} N/m^{2}$

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

D. $9.8 \times 10^{11} N/m^{2}$

Answer: C

Watch Video Solution

140. A uniform nickel wire of length 3.14 m and radius 10^{-3} hangs vertically. If a mass of 20 kg is attached to its free end. The extension in the wire is,

(Young's modulus of nickel $= 20 \times 10^{10} N/m^2$)

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

B. $9.8 \times 10^{-3} m$

C. $9.8 \times 10^{-4} m$

D. $9.8 \times 10^{-5} m$

Answer: C

Watch Video Solution

141. The length of a wire is increased by $1mm$ on the application of a given load. If a wire of the same material, but of length and radius twice that of the first, on application of the same load, extension is

A. 2 mm

B. 0.5 mm

C. 4 mm

D. 0.25 mm

Answer: B

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142. A wire of length L and radius r is fixed at one end. When a stretching force F is applied at free end, the elongation in the wire is l. When another wire of same material but of length $2L$ and radius $2r$, also fixed at one end is stretched by a force $2F$ applied at free end, then elongation in the second wire will be

A. l

B. $2l$

C. $l/2$

D. $4l$

Answer: A

Watch Video Solution

143. A steel ring of radius r and cross section area A is fitted on to a wooden disc of radius $R(R > r)$. If Young's modulus be R, 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

144. The bulk modulus of water is $2.0 \times 10^9 N / m^2$. The pressure required to increase the density of water by 0.1% is

A. $2 \times 10^9 N / m^2$

B. $2 \times 10^{12} N / m^2$

C. $2 \times 10^6 N / m^2$

D. $2 \times 10^4 N / m^2$

Answer: C

Watch Video Solution

145. If a copper wire of length 0.9 m and cross section $1mm^2$ is stretched by a load of 1 kg then the extension in the wire will be

$\left(Y_c = 1.2 \times 10^{11} N/m^2 \text{ and } g = 10m/s^2\right)$

A. 0.013 mm

B. 0.075 mm

C. 0.11 mm

D. 0.13 mm

Answer: B

Watch Video Solution

146. An area of cross-section of rubber string is $2cm^2$. It length is doubled when stretched with a linear force of 2×10^5 dynes. The Young's modulus of the rubber in dyne/cm^2 will be

A. $4 \times 10^5 \text{dyne} / cm^2$

B. $1 \times 10^5 \text{dyne} / cm^2$

C. $2 \times 10^9 \frac{\text{dyne}}{c} m^2$

D. $1 \times 10^9 \text{dyne} / cm^2$

Answer: B

Watch Video Solution

147. A wire of area of cross-section $10^{-6}m^2$ is increased in length by 0.1 %. The tension produced is 1000 N. The Young's modulus of wire is

A. $10^{12}N/m^2$

B. $10^{11}N/m^2$

C. $10^{7}N/m^2$

D. $10^{5}N/m^2$

Answer: B

Watch Video Solution

148. If a rubber ball is taken to 100 m deep in a lake and its volume changes by 0.1% then the bulk modulus of rubber will be $(g = 10m/s^2)$

A. $1 \times 10^6 N/m^2$

B. $1 \times 10^8 N/m^2$

C. $1 \times 10^7 N/m^2$

D. $1 \times 10^9 N/m^2$

Answer: D

Watch Video Solution

149. A rubber cord of cross-sectional area 2 cm^2 has a length of 1 m. When a tensile force of 10 N is applied, the length of the cord increases by 1 cm. What is the Young's modulus of rubber ?

A. $2 \times 10^6 N/m^2$

B. $5 \times 10^6 N/m^2$

C. $0.5 \times 10^6 N/m^2$

D. $0.2 \times 10^6 N/m^2$

Answer: B

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150. The isothermal Bulk modulus of an ideal gas at pressure P is

A. P

B. P/γ

C. $P\gamma$

D. P^{γ}

Answer: A

151. If breaking stress of a wire of length L and radius of cross-section r is P N/m^2, then breaking stress of wire of same material of length 2 L and radius of cross section (r/2) will be

A. P

B. 2P

C. 4P

D. P/2

Answer: A

152. Length of an elastic string is x then tension 5N is applied and its length will be y when tension 7 N. What will be its original length ?

A. $\frac{2x + y}{2}$

B. $\frac{2y - yx}{2}$

C. $\frac{7x - 5y}{2}$

D. $\frac{7y + 5x}{2}$

Answer: C

Watch Video Solution

153. A cable that can support a load W is cut into two equal parts .T he maximum load that can be supported by either part is

A. W

B. W/2

C. W/4

D. 2W

Answer: A

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154. A steel wire of diameter 1 mm, and length 2 m is stretched by applying a force of 2.2 kg wt. The stress is $\left(g = 10m/s^2, Y = 2 \times 10^{11} N/m^2\right)$

A. $7 \times 10^7 N/m^2$

B. $3 \times 10^6 N/m^2$

C. $21 \times 10^8 N/m^2$

D. $28 \times 10^6 N/m^2$

Answer: D

Watch Video Solution

155. A steel wire of diameter 1 mm, and length 2 m is stretched by applying a force of 2.2 kg wt. the strain is

A. 0.7×10^{-4}

B. 1.4×10^{-4}

C. 1.9×10^{-5}

D. 2.8×10^{-4}

Answer: B

Watch Video Solution

156. A steel wire of diameter 1 mm, and length 2 m is stretched by applying a force of 2.2 kg wt. the extension produced in the wire is

A. $2.8 \times 10^{-4} m$

B. $2.8 \times 10^{-6} m$

C. $1.4 \times 10^{-4} m$

D. $1.4 \times 10^{-6} m$

Answer: A

Watch Video Solution

157. Two wires have diameters in the ratio $2:1$, lengths in the ratio $4:3$ and Young's modulus in the ratio $5:3$. The ratio of elongations produced in the wires when subjected to the same stretching force is

A. $5/9$

B. $4/9$

C. $1/3$

D. $1/5$

Answer: D

Watch Video Solution

158. Two similar wires under the same load yield elongation of $0.1mm$ and $0.05mm$ respectively. If the area of cross-section of the first wire is $4mm^2$, then the area of cross-section of the second wire is

A. $6mm^2$

B. $8mm^2$

C. $10mm^2$

D. $12mm^2$

Answer: B

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159. A liquid of volume 4 litere is subjected to additional pressure of $1.2 \times 10^7 N/m^2$. If the change in its volume is found to be 3 ml, then the bulk modulus of the liquid will be

A. $2.0 \times 10^{10} N/m^2$

B. $1.6 \times 10^{10} N/m^2$

C. $1.4 \times 10^{10} N/m^2$

D. $2.4 \times 10^{10} N/m^2$

Answer: B

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160. The shearing strain produced in a block of metal subjected to a shearing stress of $10^8 N/m^2$ is

(Modulus of rigidity $\eta = 8 \times 10^{10} N/m^2$)

A. 1.1×10^{-3}

B. 1.5×10^{-3}

C. 1.25×10^{-3}

D. $1.6 \times O^{-3}$

Answer: C

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161. A 20 N stone is suspended from a wire and its length changes by 1%. If the Young's modulus of the material of wire is $2 \times 10^{11} N/m^2$, then the area of cross-section of the wire is $2 \times 10^{11} N/m^2$, then the area of cross-section of the wire will be

A. $10^{-3} mm^2$

B. $10^{-2} mm^2$

C. $10^{-1} mm^2$

D. $1 mm^2$

Answer: B

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162. A wire of length 1 m and its area of cross-section is 1 cm^2 and Young's modulus of the wire is $10^{11} N/m^2$. Two forces each equal to F are applied on its two ends in the opposite directions. If the changein length is 1 mm, then the value of F will be

A. $0.5 \times 10^4 N$

B. $10^4 N$

C. $2 \times 10^4 N$

D. $10^8 N$

Answer: B

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163. A metallic rod breaks when strain produced is 0.2%. The Young's modulus of the material of the rod is $7 \times 10^9 N/m^2$. What should be its area of cross-section to support a load of $10^4 N$?

A. $7.1 \times 10^{-8} m^2$

B. $7.1 \times 10^{-6} m^2$

C. $7.1 \times 10^{-4} m^2$

D. $7.1 \times 10^{-2} m^2$

Answer: C

Watch Video Solution

164. If the breaking strength of a rod of diameter 2 cm is $2 \times 10^5 N$ than that for a rod of same material and diameter 1 cm will be

A. $2 \times 10^5 N$

B. $1 \times 10^5 N$

C. $0.5 \times 10^5 N$

D. $0.25 \times 10^5 N$

Answer: C

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165. A spherical ball contracts in volume by 0.02% when subjected to a pressure of 100 atmosphere. Assuming one atmosphere is $10^5 N/m^2$, the bulk modulus of the material of ball is

A. $0.02 \times 10^5 N/m^2$

B. $0.02 \times 10^7 N/m^2$

C. $50 \times 10^7 N/m^2$

D. $50 \times 10^9 N/m^2$

Answer: D

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166. A stress of 1 kg wt/mm^2 is applied to a wire whose Young's modulus is $10^{12}\text{dyne}/cm^2$. The percentage increase in its length is

A. 0.98

B. 98×10^{-4}

C. 9.8×10^{-6}

D. 9.8×10^{-5}

Answer: B

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167. A wire is loaded by a weight of density $9g / cm^3$ and stretched to a length of 98 cm. On immersing the weight in water the length shortens by 2.5 mm. Then the original length of the wire will be

$[\rho_w = 1gm / cm^3]$

A. 95.75 cm

B. 98.75 cm

C. 90. 75 cm

D. 85.75 cm

Answer: A

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168. A solid sphere of radius 0.2 m is subjected to a uniform pressure of $10^5 N/m^2$. If the bulk modulus of the material is $1.6 \times 10^{11} N/m^2$, then the decrease in the volume of the sphere is approximately will be

A. $0.02m^3$

B. $0.3cm^3$

C. $0.4cm^3$

D. $0.5cm^3$

Answer: A

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169. A spherical ball contracts in volume by 0.02% when subjected to a normal uniform pressure of 200 atmospheres. Then Bulk modulus (in N/m^2) of the material of the ball is

(Atomospheric pressure $= 10^5 N/m^2$)

A. 10^9

B. 10^{10}

C. 10^{11}

D. 10^{12}

Answer: B

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170. A steel wire 2 mm is diameter is just stretched between two fixed points at a temperature of $20^\circ C$. If the temperature falls to $10^\circ C$, then the tension in the wire is (Coefficient of linear expansion of steel (α) is $11 \times 10^{-6} / ^\circ C$ and $Y_s = 2.1 \times 10^{11} N / m^2$)

A. 98.56 N

B. 725 N

C. 72.6 N

D. $7.25 \times 10^3 N$

Answer: C

Watch Video Solution

171. The following four wires of length L and radius 'r' are made of the same material which of these will have largest extension ?

A. L = 40 cm, r = 0.02 mm

B. L = 100 cm, r = 0.5 mm

C. L = 200 cm, r = 1 mm

D. L = 300 cm, r = 1.5 mm

Answer: A

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172. The length of a wire is increased by 1 mm due to applied load. The wire of the same material have lengths and radius half that of the first wire, by the application of the same force, then extension produced will be

A. 2 mm

B. 0.5 mm

C. 4 mm

D. 0.25 mm

Answer: A

Watch Video Solution

173. For wires of the the same material are stretched by the same load. The dimensions are given below, which of them will elongate most ?

A. length 100 cm, diameter 1 mm

B. length 200 cm, diameter 2 mm

C. length 300 cm, diameter 3 mm

D. length 400 cm, diameter 0.5 mm

Answer: D

Watch Video Solution

174. Two pieces of wire, A and B of the same material have their lengths in the ratio $1:3$ and their diameters are in the ratio $2:1$. If they are stretched by the same force, their elongations will be in the ratio

A. $2:1$

B. $1:6$

C. $1:12$

D. $8:1$

Answer: C

Watch Video Solution

175. A uniform steel wire of density $7800 kg / m^3$ is 2.5 m long and weighs 15.6×10^{-3}kg. 2.5 m long and weighs 15.6×10^{-3} kg . If extends by 1.25 mm when loaded by 8 kg, then the value of Young's modulus for steel will be

A. $1.96 \times 10^{11} N / m^2$

B. $1.096 \times 10^{11} N/m^2$

C. $0.196 \times 10^{11} N/m^2$

D. $10.96 \times 10^{11} N/m^2$

Answer: A

View Text Solution

176. What should be the weight suspended from the end of a steel wire 2 m in length and w mm in diameter to increase the length by 1 mm ?

$(Y = 19 \times 10^{11} N/m^2)$

A. 30 kg wt

B. 305 kg wt

C. 32 kg wt

D. 33.5 kg wt

Answer: B

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177. A spherical ball contracts in volume by 0.01% when subjected to a normal uniform pressure of 100 atmospheres. Calculate the bulk modulus of the meterial.

A. $10 \times 10^{12} \text{dyne} / cm^2$

B. $1.096 \times 10^{11} N / m^2$

C. $0.196 \times 10^{11} N / m^2$

D. $10.96 \times 10^{11} N / m^2$

Answer: C

Watch Video Solution

178. The constant forces are applied in opposite directions on upper and lower faces of a cube of side 14 cm, shifting the upper face parallel to itself by 0.3 cm. If the sides of the cube were 28 cm, then it displacement will be

A. 0.05 cm

B. 0.60 cm

C. 0.15 cm

D. 0.35 cm

Answer: C

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179. A brass wire of length 5 m and cross section area $10^{-6}m^2$ hung from rigid support with brass weight of volume $10^{-3}m^3$ hanging from other end. Then the decrease in length of the wire when brass weight is completely immersed in water is,

$\left(g = 10m/s^2, Y_{\text{brass}} = 10^{11}N/m^2, \rho_w = 10^3 kg/m^3\right)$

A. $5 \times 10^{-4}m$

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

C. $4 \times 10^{-4}m$

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

Answer: A

View Text Solution

180. An alluminium rod and steel wire of same length and cross-section are attached end to end.

Then compound wire is hung fron a rigid support and load is suspended from the free end. Y for steel is $\left(\frac{20}{7}\right)$ times of aluminium. The ratio of increase in length of steel wire to the aluminium wire is

A. $7:10$

B. $20:7$

C. $10:7$

D. $7:20$

Answer: D

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181. A uniform metal wire has a length of 2m and diameter 2 cm. When it is stretched by 0.5 cm its diameter decrease by 0.015 mm. Then the Poisson's ratio for the metal of the wire is,

A. 0.2

B. 0.4

C. 0.3

D. 0.5

Answer: C

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182. A wire of cross sectional area 3 mm^2 is just stretched between two fixed points at a temperature of $20^\circ C$. Then the tension in the wire when the temperature falls to $10^\circ C$ is,

$(\alpha = 1.2 \times 10^{-5} / {}^\circ C, Y = 2 \times 10^{11} N / m^2)$

A. 80 N

B. 60 N

C. 72 N

D. 50 N

Answer: C

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183. A solid sphere of radius R made of a material of bulk modulus K is surrounded by a liquid in a cylindrical container. A massless pistion of area A floats on the surface of the liquid. When a mass M is placed on the piston to compress the liquid the fractional change in the radius of the sphere, $\delta R / R$, is ....

A. $\frac{Mg}{kA}$

B. $\frac{Mg}{3kA}$

C. $\frac{Mg}{2kA}$

D. $\frac{Mg}{4kA}$

Answer: B

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184. A thick rope of density ρ and length L is hung from a rigid support. The increase in length of the rope due to its own weight is (Y is the Young's modulus)

A. $\frac{\rho g L^2}{4Y}$

B. $\frac{\rho g L^2}{2Y}$

C. $\frac{\rho g L^2}{3Y}$

D. $\frac{\rho g L^2}{Y}$

Answer: B

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185. The forces of 10^6 N each are applied on opposite directions on upper and lower faces of a cube of side 10 cm, shifting and lower faces of a cube of side 10 cm, shifting the upper face parallel to itself by 0.8 cm. If the side of the cube were 20 cm, Then the displacement of the cube will be

A. 0.2 cm

B. 0.8 cm

C. 0.4 cm

D. 0.6 cm

Answer: C

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186. A steel wire of uniform cross-section $1mm^2$ is heated to $70^\circ C$ and stretched by tying it two ends rigidly. Calculate the change in tension on the wire when temperature falls form $70^\circ C$ to $35^\circ C$

A. 55 N

B. 88 N

C. 66 N

D. 77 N

Answer: D

Watch Video Solution

187. The longitudinal stain in a metal bar is 0.05. If the Poison's ratio for this metal is 0.25, then the lateral strain will be

A. 0.25

B. 0.75

C. 0.05

D. 0.0125

Answer: D

Watch Video Solution

188. If the values of Y and η for a material are 2×10^{11} pascal and 8×10^{10} pascal respectively, then the value of Poisson's ratio σ will be

A. 0.52

B. 0.25

C. 1.25

D. -0.25

Answer: B

Watch Video Solution

189. If Y is the Young's modulus of a wire of cross sectional area A, then the force required to increase its length by 0.1% will be

A. AY

B. AY/100

C. AY/1000

D. 1000 AY

Answer: C

Watch Video Solution

190. If stress is 10^{12} times the strain produced in a wire, then its Young's modulus will be

A. 10^{12} units

B. 10^{-12} units

C. 10^{24} units

D. 10^{-24} units

Answer: A

Watch Video Solution

191. A wire of length 10 m and cross-section are $10^{-6}m^2$ is stretched with a force of 20 N. If the elongation is 1 mm, the Young's modulus of material of the wire will be

A. $10^{10}N/m^2$

B. $10^{11}N/m^2$

C. $2\times10^{10}N/m^2$

D. $2 \times 10^{11} N / m^2$

Answer: D

Watch Video Solution

192. If same tensile force is applied on two wires, there will an extension of 1×10^{-3} m in them. The Young's moduli and radii of these wires are $10 \times 10^{10} N / m^2$ and $20 \times 10^{10} N / m^2$ and R_1 and R_2 respectively then R_2 is equal to

A. $\sqrt{2} R_1$

B. $R_1 / \sqrt{2}$

C. $4R_1$

D. $R_1/4$

Answer: B

Watch Video Solution

193. Two person pull a rope towards themselves. Each person exerts a force of 100 N on the rope. Find the Young modulus of the material of the rope if it extends in length by 1 cm. Original length of the rope=2 m and the area of cross section =cm^2.

A. $10^5 N/m^2$

B. $10^6 N / m^2$

C. $10^7 N / m^2$

D. $10^8 N / m^2$

Answer: D

Watch Video Solution

194. The length of a metal wire is l when the tension is F and x l when the tension si y F. Then the natural length of the wire is

A. $\frac{(x-y)l}{(x-1)}$

B. $\dfrac{(y-x)l}{(y-1)}$

C. $\dfrac{(x-y)l}{(x+1)}$

D. $\dfrac{(y-x)l}{(y+1)}$

Answer: B

Watch Video Solution

195. A force of 100 N increases the length of a given wiere by 0.1 mm. Then the force required to increase its length by 0.25 mm is

A. 50 N

B. 150 N

C. 250 N

D. 500 N

Answer: C

Watch Video Solution

196. A mass $'m'kg$ is whirled in a vertical plane by tying it at the end of a flexible wire of length $'L'$ and area of cross-section $'A'$ such that it just completes the vertical circle. When the mass is a its lowest positon, the strain produced in the wire is (Young's modulus of the wire is $'Y'$)

A. $\dfrac{AY}{6mg}$

B. $\dfrac{6mg}{AY}$

C. $\dfrac{5mg}{AY}$

D. $\dfrac{AY}{5mg}$

Answer: B

Watch Video Solution

197. Two wires of the same length l and radius are joined end to end and loaded. If the Young's moduli of the materials of the wires are Y_1 and Y_2, the combination behaves as a single wire of Young's modulus will be

A. $(Y_1 + Y_2)$

B. $\sqrt{Y_1 Y_2}$

C. $\frac{2Y_1 Y_2}{(Y_1 + Y_2)}$

D. $\frac{Y_1 Y_2}{(Y_1 + Y_2)}$

Answer: C

Watch Video Solution

198. One end of a uniform wire of length l and weight W is attached to a point in the roof and a weight W/2 is suspended from the lower end. If A is the area fo cross-section of the wire, then stress of the wire at its midpoint will be

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

B. $\frac{2W}{A}$

C. $\frac{3W}{2A}$

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

Answer: D

Watch Video Solution

199. An elongation of 0.2% in a wire of cross section $10^{-4}m^2$ causes tension 1000 N. Then its young's modulus is

A. $5 \times 10^8 N/m^2$

B. $5 \times 10^9 N/m^2$

C. $10^8 N/m^2$

D. $10^7 N/m^2$

Answer: B

Watch Video Solution

200. A metal wire is suspended vertically from a rigid support. When loaded with a weight in air, it extends by 0.4 mm and when the weight in air, it extends by 0.4 mm and when the weight is immersed completely in water, the extension is reduced to 0.2 mm. Then the relative density of the material of the suspended weight is

A. $1/2$

B. $1/4$

C. 2

D. 4

Answer: C

View Text Solution

201. Two exactly similar wires of steel $\left(y_s = 20 \times 10^{11} \text{dyne} / cm^2\right)$ and copper $\left(y_c = 12 \times 10^{11} \text{dyne} / cm^2\right)$ are stretched by equal forces. If the total elongation is 1 cm, elongation of copper wire is

A. $3/5$ cm

B. $5/3$ cm

C. $3/8$ cm

D. $5/8$ cm

Answer: D

Watch Video Solution

202. On mixing impurities, the elasticity of a material

A. decreases

B. increases

C. sometimes increases and sometimes decreases

D. remains same

Answer: C

Watch Video Solution

203. If young's modulus of steel is $2 \times 10^{11} N / m^2$, then the force required to increase the length of a wire of cross section $1 cm^2$ by 1% will be

A. $10^5 N$

B. $2 \times 10^5 N$

C. $10^4 N$

D. $2 \times 10^4 N$

Answer: B

Watch Video Solution

204. Two wires of different materials each of length l and cross sectional area 'A' are joined in series to form a composite wire. If their young's moduli are Y and 2Y, the total elongation produced by applying a force F to stretch the composite wire will be

A. $\frac{3FA}{2Yl}$

B. $\frac{2FA}{3Yl}$

C. $\frac{2FA}{3AY}$

D. $\frac{3Fl}{2AY}$

Answer: D

Watch Video Solution

205. The length of a wire l_1 when tension is 4 N and l_2 when the tension is 5 N. Then its original length would be

A. $9l_1 - 8l_2$

B. $5l_1 + 4l_2$

C. $5l_1 - 4l_2$

D. $9l_2 - 8l_1$

Answer: B

Watch Video Solution

206. When a metal sphere is suspended at the end of a metal wire, its extension is 0.4 mm. If another metal sphere of the same material with its radius is half of the previous, is suspended then extension would be

A. 0.05 mm

B. 0.02 mm

C. 0.01 mm

D. 0.32 mm

Answer: A

Watch Video Solution

207. Two wires made of the same material have lengths 3 m and 4 m and weight 18 gm and 16 gm respectively. When they are subjected to the same tension, ratio of their elongations is

A. $1:2$

B. $2:1$

C. $57:64$

D. $4:1$

Answer: A

Watch Video Solution

208. Young's modulus for steel is $2 \times 10^{10} N / m^2$. If the interatomic distance for steel is 3 Å, then the interatomic force constant for steel will be

A. $6 \times 10^{-10} N / m$

B. $6 N / m$

C. $6 \times 10^{-8} N / m$

D. $60 N / m$

Answer: B

Watch Video Solution

209. A steel wire of cross-sectional area $0.5 mm^2$ is held between two fixed supports. If the wire is just taut at $20^\circ C$, determine the tension when the temperature falls to $0^\circ C$. Coefficient of linear expansion of steel is $1.2 \times 10^{-5} {}^\circ C(-1)$ and its Young's modulus is $2.0 \times 10^{11} Nm^{-2}$.

A. $10^3 N$

B. $10^4 N$

C. $10^5 N$

D. $10^9 N$

Answer: B

Watch Video Solution

210. Find the greatest length of steel wire that can hang vertically without breaking.Breaking stress of steel $= 8.0 \times 10^8 N/m^2$. Density of steel $= 8.0 \times 10^3 kg/m^3$. Take $g = 10 m/s^2$.

A. $4 \times 10^4 m$

B. $4 \times 10^3 m$

C. 400 m

D. 40 m

Answer: B

Watch Video Solution

211. A wire can support a load Mg without breaking. It is cut into two equal parts. The maximum load that each part an support is

A. Mg/4

B. Mg/2

C. Mg

D. 2 Mg

Answer: C

Watch Video Solution

212. A lift of mass 2000 kg is supported by thick steel ropes . If maximum upward acceleration of the lift be $1.2m/s^2$, and the breaking stress for the ropes be $2.8 \times 10^8 Nm^{-2}$

what should be the minimum diameter of rope ?

A. 10 m

B. $10^{-1}m$

C. $10^{-2}m$

D. $10^{-3}m$

Answer: C

Watch Video Solution

213. A steel rod of length $25cm$ has a cross-sectional area of $0.8cm^2$. The force required to stretch this rod by the same amount as the expansion produced by heating it through $10^\circ C$ is $(\alpha_{steel} = 10^{-5}/^\circ C$ and $Y_{steel} = 2 \times 10^{10} N/m^2)$

A. 40N

B. 80N

C. 120N

D. 160N

Answer: D

Watch Video Solution

Watch Video Solution

214. A steel wire of cross-sectional area $0.5mm^2$ is held between two fixed supports. If the wire is just taut at $20^\circ C$, determine the tension when the temperature falls to $0^\circ C$. Coefficient of linear expansion of steel is $1.2 \times 10^{-5 \circ} C(-1)$ and its Young's modulus is $2.0 \times 10^{11} Nm^{-2}$.

A. 1200 N

B. 2400 N

C. 4800 N

D. 9600 N

Answer: D

Watch Video Solution

215. A metal rope of density 6000kg/m^3 has a breaking stress $9.8 \times 10^8 N/m^2$. This rope is used to measure the depth of the sea. Then the depth of the sea that can be measured without breaking is

A. $10 \times 10^3 m$

B. $16.66 \times 10^3 m$

C. $30 \times 10^3 m$

D. $40 \times 10^{-3} m$

Answer: B

Watch Video Solution

216. A cube is subjected to pressure of $5 \times 10^5 N/m^2$. Each side of the cube is shortened by 1%. Find volumetric strain and bulk modulus of elasticity of cube.

A. $-10 \times 10^{-3} m^3$

B. $-20 \times 10^{-3} m^3$

C. $-30 \times 10^{-3} m^3$

D. $-40 \times 10^{-4} m^3$

Answer: A

Watch Video Solution

217. Estimate the change in the density of water in ocean at a depth of 400 m below the surface. The density of water at the surface $= 1030 kgm^{-3}$ and the bulk modulus of water $= 2x10^9 Nm^{-2}$.

A. $0.5 kg/m^3$

B. $0.5 kg/m^3$

C. $1.5 kg/m^3$

D. $2.0 kg/m^3$

Answer: D

Watch Video Solution

218. A steel plate of face area $4cm^2$ and thickness 0.5 cm is fixed rigidly at the lower surface. A tangential force of 10 N is applied on the upper surface. Find the lateral displacement of the upper surface with respect to the lower surface. Rigidity modulus of steel $= 8.4 \times 10^{10} Nm^{-2}$.

A. $1.5 \times 10^{-6} m$

B. $1.5 \times 10^{-7} m$

C. $1.5 \times 10^{-8} m$

D. $1.5 \times 10^{-9} m$

Answer: D

Watch Video Solution

219. Two parallel forces of 4000 N are applied tangentially in opposite direction to the opposite faces of a metallic cube of side length 0.25 m. The shear modulus of the material is 80×10^{9} Pa. Then the displacement of the upper surface relative to the lower surface is

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

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

C. $2 \times 10^{-7}m$

D. $2 \times 10^{-8}m$

Answer: C

Watch Video Solution

220. A uniform cube is subjected to volume compression. If each side is decreased by 1 % then bulk strain is

A. 0.01

B. 0.03

C. 0.02

D. 0.08

Answer: B

Watch Video Solution

221. Bulk modulus of elasticity of rubber is $10^9 N/m^2$. If it is taken down to a 100 m deep lake, then decrease in its volume will be $(g = 10m/s^2)$

A. 0.1%

B. 0.2%

C. 1%

D. 2%

Answer: A

Watch Video Solution

222. A body of volume $10^{-3}m^3$ is compressed such that its volume decreases by $0.2\times10^{-6}m^3$. If its bulk modulus is $2\times10^{10}N/m^2$, then the pressure applied will be

A. $2 \times 10^6 N / m^2$

B. $3 \times 10^6 N / m^2$

C. $4 \times 10^6 N / m^2$

D. $6 \times 10^6 N / m^2$

Answer: C

Watch Video Solution

223. On a perfect cube of side 10 cm, a shearing force is applied. If its top surface is displaced through 0.3 mm with bottom surface unmoved, magnitude of shearing force applied will be

$$\left[\eta = (100/3) \times 10^6 N/m\right]$$

A. $10^3 N$

B. $10^4 N$

C. $10^5 N$

D. $10^6 N$

Answer: A

Watch Video Solution

224. If a shear force of 3000 N is applied on a cube of side 40 cm, then displacement of the top surface of the cube when bottom surface is fixed, is

$$\left(\eta = 5 \times 10^{10} N / m^2\right)$$

A. 15 mm

B. 150 nm

C. $15 \times 10^{-8} \mu\mu m$

D. $15 \mu m$

Answer: B

Watch Video Solution

225. A material has Poisson's ratio 0.20. If a uniform rod suffers a longitudinal strain 2×10^{-3}, then the percentage change in volume is

A. 0.012

B. 0.28

C. 0.12

D. 0-0.28

Answer: B

Watch Video Solution

226. For which value of Poisson's ratio the volume of a wire does not change when it is subjected to a tension ?

A. -0.5

B. 0.5

C. 0.1

D. 0

Answer: 2

Watch Video Solution

227. A metal wire of coefficient of linear expansion and Young modulus are $1 \times 10^{-5} / {}^{\circ}C$ and $10^{11} N / m^2$ respectively is tied between two points rigidly at a temperature $40^{\circ} C$. If the temperature is decreased to $20^\circ C$ the force required to hold the wire in newton is (the length of the wire is 40 cm and area of cross section is $1cm^2$)

A. 20 N

B. 200 N

C. 2000 N

D. 1000 N

Answer: C

Watch Video Solution

228. A cube at temperature $0^{\circ}C$ is compressed equally from all sides by an external pressure P. By what amount should its temperature be raised to bring it back to the size it had before the external pressure was applied. The bulk modulus of the material of the cube is B and the coefficient of linear expansion is a

A. $\frac{P}{B\alpha}$

B. $\frac{PB}{3\alpha}$

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

D. $\frac{3\alpha}{PB}$

Answer: B

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229. A spring is made of material of Young's modulus $10^{11} N/m^2$. When a weight of 10 kg is suspended vertically the elongation produced in the spring is 4 mm. If the load is reduced to half the elongation in the spring will be

A. 1 mm

B. 4 mm

C. 2 mm

D. 0.2 mm

Answer: C

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230. If young's modulus of iron be $2 \times 10^{11} Nm^{-2}$ and interatomic distance be $3 \times 10^{-10} m^{-2}$, the intertomic force constant will be (in N/m)

A. 60 N

B. 120 N

C. 3 N

D. 180 N

Answer: A

Watch Video Solution

231. The length of an elastic string is a metre when the longitudinal tension is 4 N and b metre when the longitudinal tension is 5 N. The length of the string in metre when the longitudinal tension is 9 N is

A. $9(b-a)$

B. $5b+4a$

C. $5b-4a$

D. $a + b$

Answer: C

Watch Video Solution

232. A wire is of lengths l_1 and l_2 when stretched by a force 4 N and 5 N respectively. Then the length of the wire when stretched by a force 7 N will be

A. $3l_2 - 2l_1$

B. $2l_1 - 3l_2$

C. $7l_1 - 5l_2$

D. $5l_1 - 9l_2$

Answer: A

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233. The relationship between Young's modulus Y, Bulk modulus K and modulus of rigidity η is

A. $\frac{3}{Y} = \frac{1}{K} + \frac{3}{\eta}$

B. $\frac{3}{Y} = \frac{1}{\eta} + \frac{1}{3K}$

C. $\frac{1}{Y} = \frac{3}{\eta} + \frac{1}{K}$

D. $\frac{1}{\eta} = \frac{3}{Y} + \frac{1}{3K}$

Answer: B

Watch Video Solution

234. The relation between Young's modulus (Y) modulus of rigidity (η) and Poisson's ratio (σ) is

A. $Y = 2\eta(1 - \sigma)$

B. $Y = 2\eta(1 + \sigma)$

C. $Y = \eta(1 - 2\sigma)$

D. $Y = 2\eta(1 + 2\sigma)$

Answer: B

View Text Solution

235. Bulk modulus of a material is $2.5 \times 10^{11} \text{dyne} / cm^2$ and Poisson's ratio is 0.4. Then young's modulus for such material ios

A. $3 \times 10^{11} \text{dyne} / cm^2$

B. $4.5 \times 10^{11} \text{dyne} / cm^2$

C. $1.5 \times 10^{11} \text{dyne} / cm^2$

D. $6 \times 10^{11} \text{dyne} / cm^2$

Answer: C

Watch Video Solution

236. For a given material, Young's modulus is 2.4 times that of rigidity modulus. Its Poisson's ratio is

A. 2.4

B. 1.2

C. 0.2

D. 0.4

Answer: C

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237. We spend some energy while stretching a wire. What happens to the energy given to the wire ?

A. converted into heat energy

B. converted into kinetic energy

C. converted into potential energy

D. converted into sound energy

Answer: C

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238. What happens to the potential energy of the molecules when a solid body is compressed ?

A. decreases

B. do not change

C. increases

D. may increase or decrease

Answer: C

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239. When a wire is stretched the potential energy of its molecules will

A. decreases

B. unaffected

C. increase

D. first increase then decrease

Answer: C

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240. The work done per unit volume in stretching the wire is equal to

A. stress $\times$ strain

B. stress / strain

C. $1/2$ strain $\times$ strain

D. strain / stress

Answer: C

Watch Video Solution

241. The strain energy per unit volume of a stretched wire is

A. $1/2 \times$ stress $\times$ strain

B. $1/2 \times (\text{strain})^2 \times Y$

C. $1/2 \times (\text{stress})^2 / Y$

D. all of these

Answer: D

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242. The backlashes error can be elliminated in Searle's experiment, by rotating screw in

A. both the directions

B. not fixed direction

C. one direction

D. first clockwise and then in anticlockwise directions

Answer: C

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243. An elastic material of Young's modulus Y is subjected to a stress S. The elastic energy stored per unit volume of the material is

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

B. $S^2\left(\frac{Y}{2}\right)$

C. $\left(\frac{S^2}{2Y}\right)$

D. $\left(\frac{S}{2Y}\right)$

Answer: C

Watch Video Solution

244. A wire $\left(Y = 1 \times 10^{11} N/m\right)$ has length 1m and area $1mm^2$. The work required to increase its length by 2mm is

A. 0.4 J

B. 0.8 J

C. 4 J

D. 400 J

Answer: A

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245. With the data of the above problem, the strain energy per unit volume stored in the wires is,

A. $4 \times 10^2 J / m^3$

B. $4 \times 10^3 J / m^3$

C. $4 J / m^3$

D. $4 \times 10^5 J / m^3$

Answer: D

View Text Solution

246. The force constant of a wire is k and that of another wire is . 2k When both the wires are stretched through same distance, then the work done

A. $W_2 = 0.5W_1$

B. $W_2 = W_1$

C. $W_2 = 2W_1$

D. $W_2 = 2W_1^2$

Answer: C

Watch Video Solution

247. A steel wire of length 5 m and area of cross-section $4mm^2$ is stretched by 2 mm by the application of a force. If young's modulus of steel is $2 \times 10^{11} N/m^2$, then the energy stored in the wire is

A. 0.64

B. 0.16 J

C. 0.32 J

D. 1.28 J

Answer: C

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248. If a uniform brass wire of length 5 m and radius 10^{-3} m is extended by 10^{-3}m, then the energy stored in the wire will be

(Young's modulus for brass $= 10 \times 10^{10} N / m^2$)

A. $3.14 \times 10^{-2} J$

B. $3.14 \times 10^{-1} J$

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

D. $3.14 \times 10^{-4} J$

Answer: A

Watch Video Solution

249. A wire extends by $'l'$ on the application of load $'mg'$. Then the energy stored in it is

A. Mgl

B. 0

C. $Mgl/2$

D. $2Mgl$

Answer: C

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250. A metallic wire is suspended by attaching some weight to it. If α is the longitudinal strain and Y is Young's modulus, then the ratio of elastic potential energy to the energy density is equal to

A. stress on the wire

B. volume of the wire

C. strain in the wire

D. change in the volume of the wire

Answer: B

Watch Video Solution

251. Identical springs of stecl and copper $(Y_{\text{Steel}} > Y_{\text{copper}})$ are equally stretched.

A. less work is done on steel spring

B. less work is done on copper string

C. equal work is done on both the springs

D. data not complete

Answer: B

Watch Video Solution

252. The potential energy of a stretched spring is proportional to

A. the square of force constant

B. the square of amount of stretch

C. the square of original length

D. none of these

Answer: B

Watch Video Solution

253. When wire is stretched, a work is performed on the wire, This work done on wire is

A. simply wasted

B. lost in the form of heat

C. stored in the form of elastic potential energy

D. used up to overcome the fall in the gravitational potential energy

Answer: C

Watch Video Solution

254. A long elastic spring is stretched by $2cm$ and its potential energy is U. If the spring is stretched by $10cm$, the PE will be

A. U/25

B. 2U

C. 5U

D. 25U

Answer: D

Watch Video Solution

255. A wire suspended vertically from one end is stretched by attaching a weight of 20 N to the lower end. The weight stretches the wire by 1 mm. How much energy is gained by the wire ?

A. 0.01 J

B. 0.02 J

C. 0.04 J

D. 1 J

Answer: A

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256. A uniform metal rod of $2mm^2$ area of cross section is heated from $0^\circ C$ to $20^\circ C$. The coefficient of linear expansion of the rod is $12 \times 10^{-6} / ^\circ C$. Its Young's modulus of elasticity is $10^{11} N / m^2$, then the energy stored per unit volume of rod is,

A. $1440 J / m^3$

B. $2880 J / m^3$

C. $1200 J / m^3$

D. $3880 J / m^3$

Answer: B

Watch Video Solution

257. a long spring is stretched by 4 cm, and its potential energy is 80 J. If the spring is compressed by 2 cm, its potential energy will be

A. 320 J

B. 20 J

C. 120 J

D. 60 J

Answer: B

Watch Video Solution

258. A long wire hangs vertically with its upper end clamped, when a torque of 4.5 Nm is applied to free end through an angle of 10°. Then work done by the twisted wire is,

A. $\pi / 4J$

B. $22.5J$

C. $\pi / 2J$

D. $\pi / 8J$

Answer: D

Watch Video Solution

259. K is the force constant of a spring. The work donein increasing its extension from l_1 to l_2 will be

A. $\frac{k}{2}(l_2 - l_1)$

B. $\frac{k}{2}(l_2^2 - l_1^2)$

C. $k(l_2^2 - l_1^2)$

D. $\frac{k}{2}(l_2^3 - l_1^3)$

Answer: B

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260. If the work done in stretching a wire by 1 mm is 2J, then work necessary for stretching another wire of same material but with double radius of corss-section and half the length by 1 mm is

A. 4

B. 8

C. 2

D. 16

Answer: D

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261. What is the work done per unit volume when a steel wire is stretched by $0.2\,\%$ of its original length ? (Young's modulus of steel is $2 \times 10^{11} N/m^2$)

A. $2 \times 10^5 J/m^3$

B. $4 \times 10^5 J/m^3$

C. $1/2 \times 10^5 J/m^3$

D. $3/4 \times 10^5 J/m^3$

Answer: B

Watch Video Solution

262. A long elastic spring is stretched by 2 cm and its P.E. is 20 J. If the spring is stretched by by 10 cm, then its potential energy will be

A. 100 J

B. 250 J

C. 200 J

D. 500 J

Answer: D

Watch Video Solution

263. The potential energy of a stretched spring is proportional to

A. the square of force constant

B. the square of the stretching length of the wire

C. the square of original length of wire

D. the cube of the stretch of the wire

Answer: B

Watch Video Solution

264. A copper rod 2m long is stretched by 1 mm, the energy stored per unit volume is, $\left(Y = 1.2 \times 10^{11} N / m^2\right)$

A. $10 \times 10^3 J / m^3$

B. $20 \times 10^3 J / m^3$

C. $5 \times 10^3 J / m^3$

D. $15 \times 10^3 J / m^3$

Answer: D

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265. An Indian rubber cord 10 cm long is suspended vertically. How much does it stretch under its own weight ?

$(\rho = 1500 kg/m^3, Y = 5 \times 10^8 N/m^2, g = 10 m/s^2)$

A. $5 \times 10^{-6} mm$

B. $15 \times 10^{-5} mm$

C. $10 \times 10^{-4} mm$

D. $20 \times 10^{-5} mm$

Answer: B

Watch Video Solution

266. A wire is stretched by 2×10^{-2}m due to the force of 10 N. Then the amount of work done to stretch the wire to a displacement of 4×10^{-2}m is

A. 0.04 J

B. 0.4 J

C. 40 J

D. 400 J

Answer: B

View Text Solution

267. The young's modulus of the material of a rod is 20×10^{10} pascal. When the longitudal strain is $0.04\ \%$. The energy stored per unit volume is

A. $16 \times 10^3 J / m^3$

B. $8 \times 10^3 J / m^3$

C. $16 \times 10^2 J / m^3$

D. $0.8 \times 10^3 J / m^3$

Answer: A

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268. The ratio of the lengths of the two wires of same Young's modulus and same diameter is $5:3$. They are stretched by the same force. Then the ratio of the work done on the two wires to stretch is

A. $5:3$

B. $3:5$

C. $8:5$

D. $5:8$

Answer: A

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269. A 2 kg weight is attached to the lower end of a spring which is hanging vertically producing in it an elongation of $4 \times 10^{-2} m$. Then potential energy of the stretched spring is

A. 0.392 J

B. 3.92 J

C. 39.2 J

D. 392 J

Answer: A

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270. A long wire hangs vertically with its upper end clamped, when a torque of 2 Nm is applied to the free end, it is twisted through an angle of 30°. Then the potential energy of the twisted wire is

A. π joules

B. $\pi / 3$ joules

C. $\pi / 6$ joules

D. $\pi / 4$ joules

Answer: C

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271. A wire of area of cross section $1 \times 10^{-6} m^2$ and length 2 m is stretched through $0.1 \times 10^{-3} m$. If the Young's modulus of a wire is $2 \times 10^{11} N/m^2$, then the work done to stretch the wire will be

A. $0.05 \times 10^{-4} J$

B. $0.5 \times 10^{-4} J$

C. $5 \times 10^{-4} J$

D. $50 \times 10^{-4} J$

Answer: C

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272. The work done in stretching a wire by 0.1 mm is 3 J. Then the work done in stretching another wire of the same material but with double the radius and half the length by 0.1 mm is

A. 12 J

B. 18 J

C. 24 J

D. 32 J

Answer: C

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273. A wire $(Y = 1 \times 10^{11} N/m)$ has length 1m and area $1mm^2$. The work required to increase its length by 2mm is

A. $5 \times 10^{-2} J$

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

C. $5 \times 10^{-4} J$

D. $5 \times 10^{-5} J$

Answer: A

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274. The length of a rod is $20 cm$ and area of cross-section $2 cm^2$. The Young's modulus of the material of wire is $1.4 \times 10^{11} N/m^2$. If the rod is compressed by 5 kg-wt along its length, then increase in the energy of the rod in joules will be

A. 0.1 J

B. 0.2 J

C. 0.3 J

D. 0.8 J

Answer: D

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275. If a rod of Young's modulus 20 G Pa undergoes a linear strain of 6×10^{-4}, then increase in its energy density will be

A. $3600 J / m^3$

B. $7200 J / m^3$

C. $1800 J / m^3$

D. $5400 J / m^3$

Answer: A

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276. A metal rod of length 2.5m and area of cross-section $2.5 \times 10^{-4} m^2$ is elongated by 2.5×10^{-3}m by a force of 600N. Then energy stored in the rod is,

A. 75 J

B. 0.75 J

C. 25 J

D. 50 J

Answer: B

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277. The work done to stretch a wire through $1 \times 10^{-3} m$ is 2J. Then the work done to stretch another wire of same material having half length and double the area of the cross section by $1 \times 10^{-3} m$ is,

A. $1/4$ J

B. 4 J

C. 8 J

D. 16 J

Answer: C

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278. The energy stored per unit volume of a strained wire is

A. $\frac{1}{2} \times (\text{load}) \times (\text{extension})$

B. $\frac{1}{2} \frac{Y}{(\text{Strain})^2}$

C. $\frac{1}{2} y(\text{strain})^2$

D. stress $\times$ strain

Answer: C

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279. Which of the following is dimensionless quantity

?

A. stress

B. Young's modulus

C. strain

D. Pressure

Answer: C

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280. The force constant of a wire is k and that of another wire is . 2k When both the wires are stretched through same distance, then the work done

A. $W_2 = 0.5W_1$

B. $W_2 = W_1$

C. $W_2 = 2W_1$

D. $W_2 = 2W_1^2$

Answer: C

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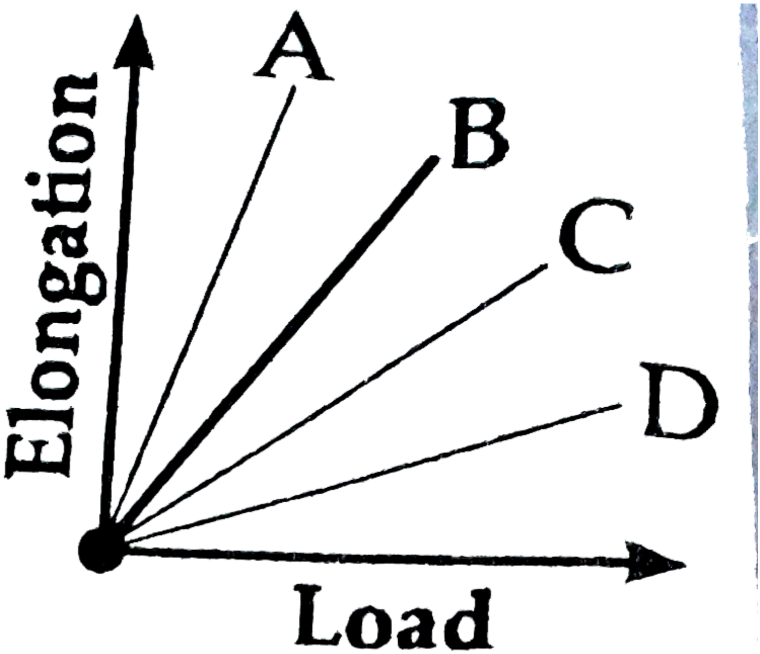
281. Which of the following is correct statement from the given graph plotted, for four wires of same material and same thickness



A. A has largest length

B. D has largest length

C. C has least length

D. B has largest length

Answer: A

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282. The symbols, Y,K and η represent the Young's modulus, bulk modulus and rigidty modulus of the material of a body. If $\eta = 3K$, then

A. $Y = 4.5K$

B. $Y = 3.5K$

C. $Y = (9/5)K$

D. $Y = (18/5)K$

Answer: A

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283. In a wire, when elongation is 2cm, energy stored is E. If it is stretched by 10 cm, then the energy stored will be

A. E

B. 2 E

C. 4 E

D. 5 E

Answer: D

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284. Strain energy per unit volume is given by

A. $\frac{1}{2} \times \frac{(\text{stress})^2}{y}$

B. $\frac{1}{2} \times (\text{stress})^2 y$

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

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

Answer: A

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285. If M=mass of wire, ρ=density of wire, R=radius of wire, r=change in radius, L=original length of wire and l=change in length, then poisson's ratio is given by

A. $\frac{Mr\rho}{\pi R^3 l}$

B. $\frac{Mr}{\pi R^2 l \rho}$

C. $\frac{Mr}{\pi R^3 \rho l}$

D. $\frac{Mr\rho}{\pi r^2 l}$

Answer: C

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286. Energy density of wire is $0.25 J/m^3$, when its extenstion is 0.2 cm. Find energy of wire, when elongation is 1 cm

A. $\frac{25}{4} J/m^3$

B. $\frac{1}{1000} J/m^3$

C. $\frac{5}{4} J/m^3$

D. $\frac{25}{2} J/m^3$

Answer: A

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287. Two wires A and B are of the same length. Their diameters are in the ratio $1:2$ and the Young's modulii are in ratio $2:1$. If they are pulled by the same force, then their elongtions will be in ratio

A. $4:1$

B. $1:4$

C. $1:2$

D. $2:1$

Answer: D

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288. To compress a liquid by 10% of its original volume, the pressure required is $2 \times 10^5 N/m^2$. The bulk modulus of the liquid is

A. $2 \times 10^5 N/m^2$

B. $2 \times 10^7 N/m^2$

C. $2 \times 10^4 N/m^2$

D. $2 \times 10^6 N/m^2$

Answer: D

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289. If a wire having initial diameter of 2 mm produced the longitudinal strain of 0.1%, then the final diameter of wire is $(\sigma = 0.5)$

A. 2.002 mm

B. 1.998 mm

C. 1.999 mm

D. 2.001 mm

Answer: C

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290. The energy stored per unit volume in copper wire, which produces longitudinal strain of 0.1% is

$(Y = 1.1 \times 10^{11} N / m^2)$

A. $11 \times 10^3 J / m^3$

B. $5.5 \times 10^4 J / m^3$

C. $5.5 \times 10^3 J / m^3$

D. $11 \times 10^4 J / m^3$

Answer: B

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291. The Young's modulus of a wire Y. If the energy per unit volume is E, then the strain will be

A. $\frac{2E}{Y}$

B. $\frac{4E}{Y}$

C. $\sqrt{\frac{E}{Y}}$

D. $\sqrt{\frac{2E}{Y}}$

Answer: D

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292. The stress in a wire of diameter 2 mm, if a load of 100 g is applied to a wire, is

A. $3.1 \times 10^5 N/m^2$

B. $6.2 \times 10^5 N/m^2$

C. $1.5 \times 10^5 N/m^2$

D. $12.4 \times 10^5 N/m^2$

Answer: A

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293. The bulk modulus of a gas is $6 \times 10^3 N/m^2$. The additional pressure needed to reduce the volume of the liquid by 10% is

A. $1200N/m^2$

B. $600N/m^2$

C. $2400N/m^2$

D. $1600N/m^2$

Answer: B

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294. Under the action of load F_1, the length of a string is L_1 and that under F_2, is L_2. The original length of the wire is

A. $[L_1F_1 - L_2F_2]/[F_1 + F_2]$

B. $[L_1F_2 - L_2F_1]/[F_1 - F_2]$

C. $[L_1F_2 - L_2F_1]/[F_2 - F_1]$

D. $[L_1F_2 - L_2F_1]/[F_1 + F_2]$

Answer: C

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295. Poisson's ratio of a material is 0.5 percentage change in its length is $0.04\,\%$. What is change in percentage of diameter?

A. $0.04\,\%$

B. $0.03\,\%$

C. $0.02\,\%$

D. $0.01\,\%$

Answer: C

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296. Relation between Y, η and Kis

A. $\frac{y}{3} = \frac{3}{k} + \frac{1}{n}$

B. $\frac{3}{y} = \frac{1}{n} + \frac{1}{3k}$

C. $\frac{9}{y} = \frac{n}{3} + \frac{1}{k}$

D. $\frac{y}{3} = \frac{3}{n} + \frac{1}{k}$

Answer: B

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297. When the load on a wire is increased slowly from 1 kg wt to 2 kg wt the elongation increases from 0.2

mm to 0.3 mm. How much work is done during the extension ? $(g = 9.8m / s^2)$

A. $1.96 \times 10^{-3} J$

B. $19.6 \times 10^{-3} J$

C. $0.196 \times 10^{-3} J$

D. $16 \times 10^{-3} J$

Answer: A

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298. Relation between Y, η and $K is$

A. $\frac{y}{3} = \frac{3}{k} + \frac{1}{\eta}$

B. $\frac{9}{y} = \frac{\eta}{3} + \frac{1}{k}$

C. $\frac{3}{y} = \frac{1}{\eta} + \frac{1}{3k}$

D. $\frac{y}{3} = \frac{3}{\eta} + \frac{1}{k}$

Answer: C

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299. The Poisson's ratio is defined as

A. volume stress

B. shearing strain

C. longitudinal stress

D. longitudinal strain

Answer: D

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300. If M=mass of wire, ρ=density of wire, R=radius of wire, r=change in radius, L=original length of wire and l=change in length, then poisson's ratio is given by

A. $\frac{Mr\rho}{\pi R^3 l}$

B. $\frac{Mr}{\pi R^2 l\rho}$

C. $\frac{Mr}{\pi R^3 \rho l}$

D. $\frac{Mr\rho}{\pi r^2 l}$

Answer: C

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301. The length of a metal wire is l_1 when the tension in it is T_1 and is l_2 when the tension is T_2. Then natural length of the wire is

A. $\frac{(l_1 + l_2)}{2}$

B. $\frac{(l_1 - l_2)}{2}$

C. $\frac{l_1T_2 - l_2T_1}{T_2 - T_1}$

D. $\frac{l_1T_2 + l_2T_1}{T_2 + T_1}$

Answer: C

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302. The work done by surface tension on rising water do height of h in a capillary tube of radius r is

A. $\frac{2\pi T^2}{\rho g}$

B. $\frac{\rho g}{2\pi T^2}$

C. $\frac{\pi T^2}{\rho g}$

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

Answer: A

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303. Two wires of same material and length are stretched by the same force. If the ratio of radii of the two wires in $n:1$ then the ratio of their elongation is

A. $n^2:1$

B. $1:n^2$

C. $1:n$

D. $n:1$

Answer: B

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304. The length of a metal wire is l_1 when the tension in it is T_1 and is l_2 when the tension is T_2. Then natural length of the wire is

A. $\frac{(l_1+l_2)}{2}$

B. $\frac{(l_1-l_2)}{2}$

C. $\frac{l_1T_2-l_2T_1}{T_2-T_1}$

D. $\frac{l_1 T_2 + l_2 T_1}{T_2 + T_1}$

Answer: C

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305. The buckling of a beam is found to be more if

A. the breadth of the beam is large

B. the beam material has large value of Young's modulus

C. the length of the beam is small

D. the depth of the beam is small

Answer: D

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306. A metal rod having coefficient of linear expansion (α) and Young's modulus (Y) is heated to raise the temperature by $\Delta\theta$. The stress exerted by the rod

A. $\dfrac{Y\alpha}{\Delta\theta}$

B. $\dfrac{Y\Delta\theta}{\alpha}$

C. $Y\alpha\Delta\theta$

D. $\dfrac{\alpha\Delta\theta}{Y}$

Answer: C

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307. The Young's modulus of a wire Y. If the energy per unit volume is E, then the strain will be

A. $\sqrt{\frac{Y}{2E}}$

B. $\sqrt{\frac{E}{Y}}$

C. $\sqrt{\frac{2E}{Y}}$

D. $\sqrt{2EY}$

Answer: C

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308. The ratio of diameters of two wires of same material is $n:1$. The length of each wire is $4m$. On applying the same load, the increases in the length of the thin wire will be $(n > 1)$

A. $4^{1/4}$ times

B. $n^{1/2}$ times

C. n times

D. n^2 times

Answer: D

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309. A string of length L and force constant k is stretched to obtain extension l. It is further stretched to obtain extension l_1. The work done in second streching is

A. $\frac{1}{2}Kl_1(2l+l_1)$

B. $\frac{1}{2}Kl_1^2$

C. $\frac{1}{2}K\left(l^2+l_1^2\right)$

D. $\frac{1}{2}K\left(l_1^2-l^2\right)$

Answer: A

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310. The graph between applied force and change in the length of wire within elastic limit is a

A. straight line with positive slope

B. straight line with negative slope

C. curve with positive slope

D. curve with negative slope

Answer: A

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311. Which of the following substance is ductile ?

A. Glass

B. High carbon steel

C. Steel

D. Copper

Answer: D

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312. A metal rod of length l, cross-sectional area A, Young's modulus Y and coefficient of linear expansion α is heated to $t^\circ C$. The work that can be performed by the rod when heated is

A. $\dfrac{YA\alpha Lt^2}{2}$

B. $\dfrac{YA\alpha^2 Lt^2}{2}$

C. $\dfrac{YA\alpha^2 L^2 t^2}{2}$

D. $\dfrac{YA\alpha Lt}{2}$

Answer: B

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313. A rope 1 cm in diameter breaks, if the tension in it exceeds 500 N. The maximum tension that may be given to similar rope of diameter 3 cm is

A. 2000 N

B. 1000 N

C. 500 N

D. 250 N

Answer: A

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314. A and B are two wires. The radius of A is twice that of B. They are stretched by the some load. The the stress on B is

A. four times that of A.

B. two times that of A.

C. three times that of A.

D. same as that of A.

Answer: A

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