## Questions on Elasticity, Paper 3

1. The magnitude of the force developed by raising the temperature from $0{ }^{\circ} \mathrm{C}$ to $100^{\circ} \mathrm{C}$ of the iron bar of 1.00 m long and $1 \mathrm{~cm}^{2}$ cross-section when it is held so that it is not permitted to expand or bend is
( $\alpha=10^{-5} /{ }^{\circ} \mathrm{C}$ and $\mathrm{Y}=10^{11} \mathrm{~N} / \mathrm{m}^{2}$ ) (CPMT 91)
(a) $10^{3} \mathrm{~N}$
(b) $10^{4} \mathrm{~N}$
(c) $10^{5}$
(d) $10^{9} \mathrm{~N}$

## Answer: (b)

2. Theoretical value of Poisson's ratio lies between (AIIMS 85)
(a) -1 to 0.5
(b) -1 to -2
(c) 0.5 to 1
(d) None

Answer: (a)
3. One end of a uniform wire of length $L$ and of weight $W$ is attached rigidly to a point on the roof and a weight $W_{1}$ is suspended from its lower end. If $S$ is the area of cross-section of the wire, the stress in the wire at a height $\frac{3 \mathrm{~L}}{4}$ from its lower end is, (IIT 92)
(a) $\frac{W_{1}}{\mathrm{~S}}$
(b) $\quad\left(W_{1}+\frac{W}{4}\right) S$
(c) $\left(W_{1}+\frac{3 W}{4}\right) S$
(d) $\frac{W_{1}+W}{S}$

Answer: (c)
4. There is no change in the volume of a wire due to change in its length on stretching. The poison's ration of the material of the wire is (MHT-CET 2004)
(a) +.50
(b) -0.50
(c) 0.25
(d) -0.25

Answer: (b)
5. A stretched wire has a Young's modulus $Y$ and energy density $E$. the strain in the stretched wire is
(a) $\sqrt{\frac{2 \mathrm{E}}{\mathrm{Y}}}$
(b) $\frac{2 E}{Y}$
(c) $\frac{4 E}{Y}$
(d) $\sqrt{\frac{E}{Y}}$

Answer: (a)
6. Strain has
(a) No units but only dimensions
(b) Only units but no dimensions
(c) No units, no dimensions but a constant value
(d) No units, no dimensions but a variable value

## Answer: (d)

7. A stretching wire has a Young's modulus $Y$ and energy density E . the strain in a stretching wire is
(MHT-CET-2006)
(a) $\frac{2 E}{Y}$
(b) $\frac{4 E}{Y}$
(c) $\sqrt{\frac{E}{Y}}$
(d) $\sqrt{\frac{2 E}{Y}}$

## Answer: (d)

8. The change in the shape of a regular boy is due to

## (Andhra medical 80)

(a) Bulk strain
(b) Shearing strain
(c) Longitudinal strain (d)
(d) Volume strain

## Answer: (b)

9. When impurities are added to an elastic substance, its elasticity
(a) Increases
(b) Decreases
(c) Becomes zero
(d) May increase or decrease

## Answer: (d)

10. To compress a liquid by $10 \%$ of its original volume, the pressure required is $2 \times 10^{5}$ atmosphere. The bulk modulus of liquid is (MHT-CET-2004)
(a) $2 \times 105 \mathrm{~N} / \mathrm{m}^{2}$
(b) $2 \times 107 \mathrm{~N} / \mathrm{m}^{2}$
(c) $2 \times 104 \mathrm{~N} / \mathrm{m}^{2}$
(d) $2 \times 106 \mathrm{~N} / \mathrm{m}^{2}$

Answer: (d)
11. The upper end of wire 1 m long and 2 mm radius is clamped. The lower end is twisted through an angle of $45^{\circ}$. The angle of shear is
(NCERT 90 PMT MP 90, 96)
(a) $0.09^{\circ}$
(b) $0.9^{\circ}$
(c) $9^{\circ}$
(d) $90^{\circ}$

Answer: (a)
12. Longitudinal strain is possible in the case of
(a) Gases
(b) Liquid
(c) Only solids
(d) Only gases \& liquids

Answer: (c)
13. Which of the following is correct statement from the given graph plotted, for four wires of same material and same thickness (MHT-CET-2001)

(a) A has largest length
(b) D has largest length
(c) C has largest length
(d) B has largest length

Answer: (a)
14. Relation between $\mathrm{y}, \mathrm{n}, \mathrm{k}$ is (MHT-CET-2008)
(a) $\frac{y}{3}=\frac{3}{k}+\frac{1}{\eta}$
(b) $\frac{9}{y}=\frac{\eta}{3}+\frac{1}{k}$
(c) $\frac{3}{y}=\frac{1}{n}+\frac{1}{3 k}$
(d) $\frac{y}{3}=\frac{3}{\eta}+\frac{1}{k}$

## Answer: (c)

15. When the intermolecular distance increases due to tensile force, then
(a) There is no force between the molecules
(b) There is a repulsive force between the molecules
(c) There is an attractive force between the molecules
(d) There is zero resultant force between the molecules
Answer: (c)
16. If a material is heated and annealed, then its elasticity is
(a) Increased
(b) Decreased
(c) Not change
(d) Becomes zero

## Answer: (b)

17. A long string is stretched by 2 cm and the potential energy is V . if the spring is stretched by 10 cm . its potential energy will be (CPMT 76)
(a) $\frac{\mathrm{V}}{25}$
(b) $\frac{V}{5}$
(c) 5 V
(d) 25 V

## Answer: (d)

18. The radii of two wires of a same material are in ratio $2: 1$. if the wires are stretched by equal forces, the stress produced in them will be (MHT CET 2005)
(a) $2: 1$
(b) $4: 1$
(c) $1: 4$
(d) $1: 2$

Answer: (c)
19. The bulk modulus of elasticity of the material of a metal sphere is $2 \times 10^{11} \mathrm{~N} / \mathrm{m}^{2}$. in open air, atmospheric pressure of $10^{5} \mathrm{~N} / \mathrm{m}^{2}$ acts on it. What is the fractional decrease in its volume if it kept in a vacuum chamber?
(a) $2 \times 10^{-7}$
(b) $3 \times 10^{-7}$
(c) $4 \times 10^{-7}$
(d) $5 \times 10^{-7}$

Answer: (d)
20. The Poisson's ratio of the material of a wire is 0.25 . if it is stretched by a force $F$, the longitudinal strain produced in the wire is $5 \times 10^{-4}$. What is the percentage increase in its volume?
(a) 0.2
(b) $2 \times 10^{2}$
(c) Zero
(d) $1.25 \times 10^{-6}$

Answer: (c)
21. The bulk modulus of a gas is $6 \times 10^{3} \mathrm{~N} / \mathrm{m}^{2}$. the additional pressure needed to reduce the volume of the liquid by $\mathbf{1 0 \%}$ is (MHT-CET-2007)
(a) $1200 \mathrm{~N} / \mathrm{m}^{2}$
(b) $600 \mathrm{~N} / \mathrm{m}^{2}$
(c) $2400 \mathrm{~N} / \mathrm{m}^{2}$
(d) $1600 \mathrm{~N} / \mathrm{m}^{2}$

## Answer: (b)

22. Hooke's law essentially defines (PMTMP 88)
(a) Stress
(b) Strain
(c) Yield point
(d) Elastic limit

Answer: (d)
23. Strain energy per unit volume is given by
(MHT-CET 2003)
(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) None of these

## Answer: (a)

24. The Young's modulus for a plastic body is
(a) One
(b) Zero
(c) Infinity
(d) Less then one

## Answer: (b)

25. Four steel wires of the following dimensions are stretched with the same force. Which one of them will have the largest extension?
(a) $\mathrm{L}_{1}=50 \mathrm{~cm}, \mathrm{r}_{1}=0.5 \mathrm{~mm}$
(b) $\mathrm{L}_{2}=100 \mathrm{~cm}, \mathrm{r}_{2}=1 \mathrm{~mm}$
(c) $\mathrm{L}_{3}=200 \mathrm{~cm}, \mathrm{r}_{3}=2 \mathrm{~mm}$
(d) $\mathrm{L}_{4}=300 \mathrm{~cm}, \mathrm{r}_{4}=3 \mathrm{~mm}$

## Answer: (a)

