Questions on Elasticity, Paper 3

1. The magnitude of the force developed by raising the temperature from 0 °C to 100 °C of the iron bar of 1.00 m long and 1 cm² cross-section when it is held so that it is not permitted to expand or bend is

 $(\alpha = 10^{-5})^{\circ}$ C and Y = 10¹¹ N/m²) (CPMT 91) (a) 10^3 N 10⁴ N

(b) 10⁹ N (c) 10⁵ (d)

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

					3L			
stress	in the	wire a	it a	height	— from	its	lower	end
				0	4			

is, (IIT 92)

(a)	$\frac{W_1}{S}$	(b)	$(W_1 + \frac{W}{4})S$
(c)	$(W_1 + \frac{3W}{4})S$	(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)

A stretched wire has a Young's modulus Y and 5. energy density E. the strain in the stretched wire is

Y

(a)
$$\sqrt{\frac{2E}{Y}}$$
 (b) $\frac{2E}{Y}$
(c) $\frac{4E}{Y}$ (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)
$$\frac{2E}{Y}$$
 (b) $\frac{4E}{Y}$ (c) $\sqrt{\frac{E}{Y}}$ (d) $\sqrt{\frac{2E}{Y}}$

Answer: (d)

- 8. The change in the shape of a regular boy is due to (Andhra medical 80)
 - (a) Bulk strain (b) Shearing strain
 - Longitudinal strain (d) Volume strain (c)

Answer: (b)

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

Answer: (d)

10. To compress a liquid by 10% of its original volume, the pressure required is 2×10^5 atmosphere. The bulk modulus of liquid is (MHT-CET-2004)

(a)
$$2 \times 105 \text{ N/m}^2$$
 (b)

 $2 \times 107 \text{ N/m}^2$ $2 \times 104 \text{ N/m}^2$ $2 \times 106 \text{ N/m}^2$ (c) (d)

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°. The angle of shear is (NCERT 90 PMT MP 90, 96)

(a)	0.09°	(b)	0.9°	(c) 9°	(d)	90°
· · /		· · /			· · /	

Answer: (a)

- 12. Longitudinal strain is possible in the case of
 - (a) Gases

(1)

- (c) Only solids (d) Only gases & liquids

(b)

Liquid

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
- D has largest length (b)
- C has largest length (c) (d) B has largest length

Answer: (a)

C

14. Relation between y, n, 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)	$\frac{3}{v} = \frac{1}{n} + \frac{1}{3k}$	(d)	$\frac{y}{3} = \frac{3}{n} + \frac{1}{k}$

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)	$\frac{V}{25}$	(b)	<u>V</u> 5
(c)	5V	(d)	25V

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

(a)	2.1	(0)	4.1
(c)	1:4	(d)	1:2

Answer: (c)

19. The bulk modulus of elasticity of the material of a metal sphere is 2×10^{11} N/m². in open air, atmospheric pressure of 10^5 N/m² acts on it. What is the fractional decrease in its volume if it kept in a vacuum chamber? (a) 2×10^{-7} (b) 3×10^{-7}

(a)	2 × 10	(u)	3×10
(c)	4×10^{-7}	(d)	5×10^{-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 5×10^{-4} . What is the percentage increase in its volume?

Ans	wer: (c)		
(c)	Zero	(d)	1.25 × 10 ⁻⁶
(a)	0.2	(b)	2 × 10 ²

- 21. The bulk modulus of a gas is 6×10^3 N/m². the additional pressure needed to reduce the volume of the liquid by 10% is (MHT-CET-2007) (a) 1200 N/m² 600 N/m² (b) 1600 N/m² (c) 2400 N/m² (d) Answer: (b) Hooke's law essentially defines (PMTMP 88) 22. (a) Stress Strain (b) (c) Yield point (d) Elastic limit Answer: (d) Strain energy per unit volume is given by 23. (MHT-CET 2003) $\frac{1}{2} \times \frac{(\text{Stress})^2}{\sqrt{2}}$ $\frac{1}{2}$ × (Stress)² Y (a) (b) $\frac{1}{2} \times \frac{\text{Strain}}{\text{Stress}}$ (c) (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) $L_1 = 50 \text{ cm}, r_1 = 0.5 \text{ mm}$ (b) $L_2 = 100 \text{ cm}, r_2 = 1 \text{ mm}$ (c) $L_3 = 200 \text{ cm}, r_3 = 2 \text{ mm}$ (d) $L_4 = 300 \text{ cm}, r_4 = 3 \text{ mm}$
 - Answer: (a)