Class 11 Physics Chapter 9: Mechanical Properties of Solids

Multiple-Choice Questions I

1. Modulus of rigidity of ideal liquid is

Options:

a) infinity

b) zero

c) unity

d) some finite small non-zero constant value

Answer: b) zero

Explanation: An ideal liquid cannot sustain shear stress, hence its modulus of rigidity (shear modulus) is zero.

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

Options:

a) be doubled

b) be

c)

ad depends on the cross-sectional area and material of the wire.

3. wire is doubled. Young's modulus of elasticity

Options:

a) will also double

b) will become four times

c) will remain the same

d) will decrease

Answer: d) will decrease

Explanation: Young's modulus generally decreases with increase in temperature due to increased atomic vibrations.

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

Options:

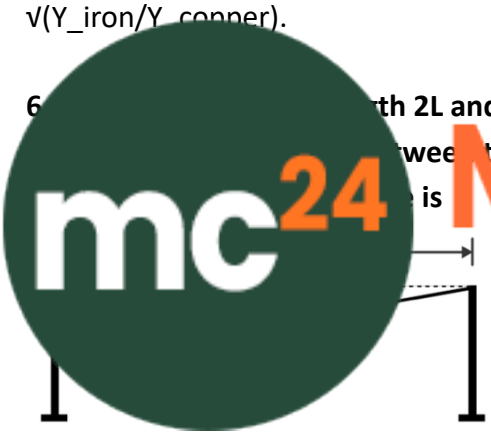
a) volumetric

b) shear

c) longitudinal and shear
d) longitudinal
Answer: c) longitudinal and shear
Explanation: In a helical spring, both longitudinal strain (due to extension) and shear strain (due to twisting of wire) are present.

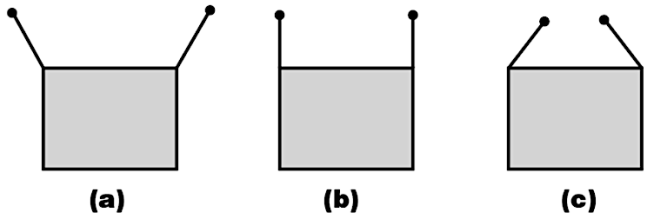
5. A rigid bar of mass M is supported symmetrically by three wires, each of length l. Those at each end are of copper, and the middle one is of iron. The ratio of their diameter, if each is to have the same tension, is equal to
Options:
a) Y_copper/Y_iron
b) √(Y_iron/Y_copper)
c) Y^2_iron/Y^2_copper
d) Y_iron/Y_copper
Answer: b) √(Y_iron/Y_copper)
Explanation: For equal tensions and equal elongations, the ratio of diameters is √(Y_iron/Y_copper).

6. A wire of length 2L and cross-sectional area A is stretched, well within the elastic limit, between two pillars. A mass m is suspended from the mid point of the wire. The strain in the wire is



Options:
a) $x^2/(2L^2)$
b) x/L
c) x^2/L
d) $x^2/(2L)$
Answer: a) $x^2/(2L^2)$
Explanation: When a mass is suspended from the midpoint, the wire forms a V-shape, and the strain is $x^2/(2L^2)$ where x is the vertical displacement.

7. A rectangular frame is to be suspended symmetrically by two strings of equal length on two supports. It can be done in one of the following three ways:



The tension in the strings will be

Options:

a) the same in all cases

b) least in a)

c) least in b)

d) least in c)

Answer: c) least in b)

Explanation: When the frame is suspended vertically (case b), the strings are vertical and tension equals half the weight, which is minimum.

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

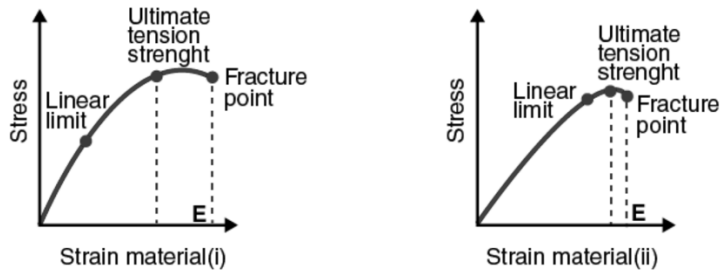
c) , but there shall be no perceptible change in shape and change shape, but the rubber rod will elongate without any perceptible change in shape, but the rubber rod of the bottom edge will change to an ellipse

d) e without any perceptible change in shape, but the rubber rod will e hape of the bottom edge tapered to a tip at the centre

Answer: d) the steel rod will elongate without any perceptible change in shape, but the rubber rod will elongate with the shape of the bottom edge tapered to a tip at the centre

Multiple-Choice Questions II

9. The stress-strain graphs for the two materials are shown in the figure.

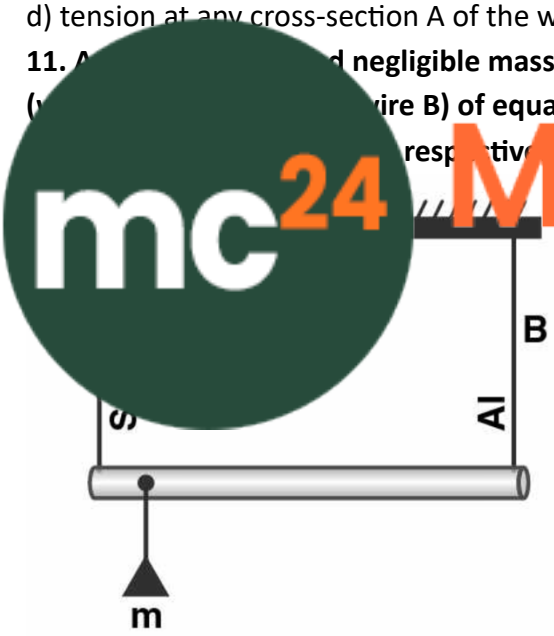


Options:

a) material (ii) is more elastic than material (i) and hence material (ii) is more brittle
b) material (i) and (ii) have the same elasticity and the same brittleness
c) material (ii) is elastic over a larger region of strain as compared to (i)
d) material (ii) is more brittle than material (i)
Answer: c) material (ii) is elastic over a larger region of strain as compared to (i)
d) material (ii) is more brittle than material (i)

10. A wire is suspended from the ceiling and stretched under the action of a weight F suspended from its other end. The force exerted by the ceiling on it is equal and opposite to the weight.
Options:
a) tensile stress at any cross-section A of the wire is F/A
b) tensile stress at any cross-section is zero
c) tensile stress at any cross-section A of the wire is 2F/A
d) tension at any cross-section A of the wire is F
Answer: a) tensile stress at any cross-section A of the wire is F/A
d) tension at any cross-section A of the wire is F

11. A negligible mass is suspended at its two ends by two wires of steel (wire B) of equal lengths. The cross-sectional areas of wires A and respectively.



Options:
a) mass m should be suspended close to wire A to have equal stresses in both the wires
b) mass m should be suspended close to B to have equal stresses in both the wires
c) mass m should be suspended at the middle of the wires to have equal stresses in both the wires
d) mass m should be suspended close to wire A to have equal strain in both wires
Answer: b) mass m should be suspended close to B to have equal stresses in both the wires
d) mass m should be suspended close to wire A to have equal strain in both wires

12. For an ideal liquid

Options:

a) the bulk modulus is infinite

b) the bulk modulus is zero

c) the shear modulus is infinite

d) the shear modulus is zero

Answer: a) the bulk modulus is infinite

d) the shear modulus is zero

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

Options:

a) the same stress

b) different stress

c) the same strain

d) different strain

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d)