1. The maximum elongation of a steel wire of 1m length if the elastic limit of steel and its Young's modulus, respectively, are $8 \times 10^8 N\,m^{-2}$ and $2 \times 10^{11} N\,m^{-2}$, is: **(2024)**

(a) 0.4 mm (b) 40 mm
(c) 8 mm (d) 4 mm

2. A metallic bar of Young's modulus, $0.5 \times 10^{11} N\,m^{-2}$ and coefficient of linear thermal expansion $10^{-5}\,°C^{-1}$, length 1 m and area of cross-section $10^{-3}\,m^2$ is heated from $0°C$ to $100°C$ without expansion or bending. The compressive force developed in it is. **(2024)**

(a) 50×10^3 N (b) $100 \times 10^3\ N$
(c) $2 \times 10^3\ N$ (d) $5 \times 10^3\ N$

3. Let a wire be suspended from the ceiling (rigid support) and stretched by a weight W attached at its free end. The longitudinal stress at any point of cross-sectional area A of the wire is: **(2023)**

(a) Zero (b) $\frac{2W}{A}$
(c) $\frac{W}{A}$ (d) $\frac{W}{2A}$

4. Given below are two statements. One is labelled as Assertion (A) and the other is labelled as Reason (R).

Assertion (A): The stretching of a spring is determined by the shear modulus of the material of the spring.

Reason (R): A coil spring of copper has more tensile strength than a steel spring of same dimensions.

In the light of the above statements, choose the most appropriate answer from the options given below. **(2022)**

(a) Both (A) and (R) are true and (R) is not the correct explanation of (A)
(b) (A) is true but (R) is false
(c) (A) is false but (R) is true
(d) Both (A) and (R) are true and (R) is the correct explanation of (A).

5. A wire of length L, area of cross section A is hanging from a fixed support. The length of the wire changes to L_1 when mass M is suspended from its free end. The expression for Young's modulus is: **(2020)**

(a) $\frac{Mg(L_1-L)}{AL}$ (b) $\frac{MgL}{AL_1}$
(c) $\frac{MgL}{A(L_1-L)}$ (d) $\frac{MgL_1}{AL}$

6. When a block of mass M is suspended by a long wire of length L, the length of the wire becomes (L + l). The elastic potential energy stored in the extended wire is **(2019)**

(a) Mgl (b) MgL
(c) $\frac{1}{2}Mgl$ (d) $\frac{1}{2}MgL$

7. Two wires are made of the same material and have the same volume. The first wire has cross-sectional area A and the second wire has cross-sectional area 3 A. If the length of the first wire is increased by Δl on applying a force F, how much force is needed to stretch the second wire by the same amount? **(2018)**

(a) 4 F (b) 6 F
(c) 9 F (d) F

8. The bulk modulus of a spherical objects is 'B'. If it is subjected to uniform pressure 'P', the fractional decrease in radius is: **(2017-Delhi)**

(a) $\frac{B}{3P}$ (b) $\frac{3P}{B}$
(c) $\frac{P}{3B}$ (d) $\frac{P}{B}$

9. The density of a metal at normal pressure is ρ. Its density when it is subjected to an excess pressure p is ρ′. If B is Bulk modulus of the metal, the ratio of $\frac{\rho'}{\rho}$ is: **(2017-Gujarat)**

(a) $1+\frac{B}{p}$ (b) $\frac{1}{1-\frac{P}{B}}$
(c) $1+\frac{P}{B}$ (d) $\frac{1}{1+\frac{P}{B}}$

10. The approximate depth of an ocean is 2700 m. The compressibility of water is $45.4 \times 10^{-11} Pa^{-1}$ and density of water is $10^3 kg/m^3$. What fractional compression of water will be obtained at the bottom of the ocean? **(2015)**

(a) 1.0×10^{-2} (b) 1.2×10^{-2}

(c) 1.4×10^{-2} (d) 0.8×10^{-2}

11. Copper of fixed volume V is drawn into wire of length ℓ. When this wire is subjected to a constant force F, the extension produced in the wire is $\Delta\ell$. Which of the following graphs is a straight line? **(2014)**

(a) $\Delta\ell$ versus $1/\ell$ (b) $\Delta\ell$ versus ℓ^2

(c) $\Delta\ell$ versus $1/\ell^2$ (d) $\Delta\ell$ versus ℓ^3

12. The following four wires are made of the same material. Which of these will have the largest extension when the same tension is applied? **(2013)**

(a) Length = 300 cm, diameter = 3 mm

(b) Length = 50 cm, diameter = 0.5 mm

(c) Length = 100 cm, diameter = 1 mm

(d) Length = 200 cm, diameter = 2 mm