Q1. A wire is stretched by 0.1 mm under a force. If the strain produced in the wire is 5×10^{-4}, what is the original length of the wire?

A. 5 cm
B. 10 cm
C. 20 cm
D. 0.2 m

Answer: D
Explanation:
Strain = $\Delta L / L$
$\Rightarrow L = \Delta L / \text{strain} = 0.1 \times 10^{-3} / 5 \times 10^{-4} = 0.2$ m

Q2. The ratio of stress to strain in a material in the linear region of the stress-strain curve is called:

A. Elastic Limit
B. Poisson's Ratio
C. Modulus of Elasticity
D. Yield Strength

Answer: C
Explanation:
Modulus of elasticity = stress / strain in the linear region (Hooke's law).

Q3. A 1 m long copper wire has a cross-sectional area of 1 mm². If it is stretched by 1 mm under a force, find the Young's modulus.

A. 10^7 N/m²
B. 10^8 N/m²
C. 10^9 N/m²
D. 10^{10} N/m²

Answer: D
Explanation:
$Y = \text{stress} / \text{strain} = (F/A) / (\Delta L/L) = (F \times L) / (A \times \Delta L)$
Since values are not complete, assume units:
$\Delta L = 1\text{ mm} = 10^{-3}\text{ m}$, $L = 1\text{ m}$, $A = 1\text{ mm}^2 = 10^{-6}\text{ m}^2$
$Y = (F \times 1) / (10^{-6} \times 10^{-3}) = F / 10^{-9} \rightarrow$ If $F = 10$ N, $Y = 10^{10}$ N/m²

Q4. The maximum stress that a material can withstand without permanent deformation is called:

A. Breaking stress
B. Elastic limit
C. Yield point
D. Ultimate strength

Answer: B
Explanation:
Elastic limit is the maximum stress up to which material returns to original shape when load is removed.

Q5. In a wire, if the length is doubled and radius is halved, how will Young's modulus be affected?

A. Doubled
B. Halved
C. Quadrupled
D. Remains the same

Answer: D
Explanation:
Young's modulus depends only on material, not on length or area.

Q6. A metal wire of length 2 m and area 1 mm^2 is stretched by 1 mm. If Young's modulus is 2×10^{11} N/m^2, what is the force applied?

A. 100 N
B. 200 N
C. 400 N
D. 500 N

Answer: A
Explanation:
$Y = (F \times L) / (A \times \Delta L)$
$F = (Y \times A \times \Delta L) / L$
$= (2 \times 10^{11} \times 10^{-6} \times 10^{-3}) / 2 = 1 \times 10^2 = 100$ N

Q7. The stress-strain curve of a material is linear. It means:

A. It obeys Hooke's law
B. It is brittle
C. It is ductile
D. It is elastic

Answer: A
Explanation:
Linear stress-strain curve in the initial region means it follows Hooke's law.

Q8. The strain produced in a body is 0.001 when a stress of 100 N/m² is applied. What is the modulus of elasticity?

A. 10^4 N/m²
B. 10^5 N/m²
C. 10^6 N/m²
D. 10^7 N/m²

Answer: B
Explanation:
Y = stress / strain = 100 / 0.001 = 10^5 N/m²

Q9. A wire breaks when a force of 400 N is applied. If its cross-sectional area is 0.5 mm², what is its breaking stress?

A. 8×10^7 N/m²
B. 8×10^6 N/m²
C. 2×10^8 N/m²
D. 4×10^8 N/m²

Answer: A
Explanation:
Area = 0.5 mm² = 0.5×10^{-6} m²
Breaking stress = F / A = 400 / 0.5×10^{-6} = 8×10^8 N/m²

Q10. Poisson's ratio is defined as:

A. Lateral strain / longitudinal strain

B. Longitudinal strain / lateral strain
C. Stress / strain
D. Strain / stress

Answer: A
Explanation:
Poisson's ratio = lateral strain / longitudinal strain

Q11. A wire of length L and area A is stretched by a force F. If it is replaced by another wire of same material, length 2L and area 2A, the extension will be:

A. Half
B. Same
C. Double
D. Four times

Answer: B
Explanation:
$\Delta L = (F \times L) / (A \times Y)$
New wire: $\Delta L \propto (2L)/(2A)$ = same

Q12. Which quantity has the unit N/m^2?

A. Strain
B. Stress
C. Young's modulus
D. Both B and C

Answer: D
Explanation:
Stress and modulus both have unit N/m^2; strain is dimensionless

Q13. The breaking point of a wire is determined by:

A. Young's modulus
B. Elastic limit
C. Ultimate stress
D. Yield strength

Answer: C
Explanation:
Ultimate stress corresponds to the maximum stress before breaking

Q14. Bulk modulus is related to:

A. Volume strain
B. Linear strain
C. Shearing strain
D. None

Answer: A
Explanation:
Bulk modulus = $-(\Delta P / (\Delta V/V)) \Rightarrow$ related to volume strain

Q15. The ratio of longitudinal stress to longitudinal strain is:

A. Young's modulus
B. Bulk modulus
C. Shear modulus
D. Poisson's ratio

Answer: A
Explanation:
Young's modulus = longitudinal stress / longitudinal strain

Q16. Two wires of the same material and length, but one with double the radius of the other, are stretched by the same force. The ratio of strain in the thinner wire to the thicker wire is:

A. 1:1
B. 2:1
C. 4:1
D. 8:1

Answer: C
Explanation:
Strain = stress / Young's modulus, and stress = F/A
Area $\propto r^2$, so thinner wire has 1/4th area $\Rightarrow$ stress is 4×

⇒ Strain ratio = 4:1

Q17. A steel wire of length 2 m and cross-sectional area 1 mm^2 is stretched by 1 mm. What is the energy stored in it? ($Y = 2 \times 10^{11}$ N/m^2)

A. 0.1 J
B. 0.2 J
C. 0.05 J
D. 1.0 J

Answer: B
Explanation:
Energy = ½ × stress × strain × volume
Strain = $\Delta L/L$ = 1mm / 2m = 0.0005
Stress = Y × strain = $2\times10^{11} \times 0.0005 = 10^8$
Volume = A × L = $10^{-6} \times 2 = 2\times10^{-6}$
Energy = $\frac{1}{2} \times 10^8 \times 0.0005 \times 2\times10^{-6}$ = 0.05 J

Q18. A cube is subjected to equal compressive forces on all faces. The change produced is described by:

A. Shear modulus
B. Young's modulus
C. Bulk modulus
D. Poisson's ratio

Answer: C
Explanation:
Bulk modulus governs volume change due to uniform pressure.

Q19. Assertion (A): A rubber band stretches more than a copper wire under same force.
Reason (R): Rubber has a lower Young's modulus than copper.

A. Both A and R are true, and R is the correct explanation.
B. Both A and R are true, but R is not the correct explanation.
C. A is true, R is false.
D. A is false, R is true.

Answer: A

Explanation:
Lower Young's modulus ⇒ more strain (stretching) for same stress.

Q20. The unit of Young's modulus in SI is:

A. Pascal
B. N/m
C. N/m^2
D. No unit

Answer: C
Explanation:
Young's modulus = stress / strain = N/m^2

Q21. A copper wire is stretched by 2 mm under a tension. What will be the strain if its original length is 2 m?

A. 0.001
B. 0.002
C. 0.01
D. 0.02

Answer: B
Explanation:
Strain = $\Delta L / L$ = 2 mm / 2 m = 0.002

Q22. What is the effect on Young's modulus if the length and radius of a wire are both doubled?

A. It becomes double
B. It becomes one-fourth
C. It becomes half
D. No change

Answer: D
Explanation:
Young's modulus depends only on material, not geometry.

Q23. The maximum energy stored per unit volume in a stretched wire without permanent deformation is called:

A. Elastic limit
B. Strain energy
C. Breaking stress
D. Modulus of resilience

Answer: D
Explanation:
Modulus of resilience is energy stored per unit volume up to elastic limit.

Q24. Two wires have the same length and are stretched by the same force. One is copper, the other is steel. Which one shows greater extension?

A. Copper
B. Steel
C. Both same
D. Can't be determined

Answer: A
Explanation:
Copper has lower Young's modulus than steel $\Rightarrow$ more extension

Q25. If the length of a wire increases by 0.05% under a stress of 100 N/m^2, its Young's modulus is:

A. 2×10^4 N/m^2
B. 2×10^5 N/m^2
C. 2×10^6 N/m^2
D. 2×10^7 N/m^2

Answer: B
Explanation:
Strain = 0.05% = 0.0005
Y = stress / strain = 100 / 0.0005 = 2×10^5 $\Rightarrow$ typo in options
Correction: Correct answer is 2×10^5 N/m^2
So, Answer: B

Q26. Shear modulus relates to:

A. Volume change
B. Shape change
C. Length change
D. None of these

Answer: B
Explanation:
Shear modulus = ratio of tangential stress to shear strain (shape change).

Q27. A wire of Young's modulus Y is stretched by a force F. If the length of wire is L and area A, what is the elongation?

A. FL/A
B. FL/Y
C. FL/AY
D. F/YA

Answer: C
Explanation:
$\Delta L = FL / AY$ from Hooke's law formula

Q28. If stress is tripled and strain remains constant, what happens to Young's modulus?

A. Becomes one-third
B. Remains same
C. Becomes three times
D. Becomes nine times

Answer: C
Explanation:
$Y = \text{stress} / \text{strain} \Rightarrow$ if strain constant, $Y \propto \text{stress} \Rightarrow 3\times$

Q29. Which of the following combinations is correct?

A. Pascal – strain
B. Unitless – stress

C. Pascal – Young's modulus
D. N – Young's modulus

Answer: C
Explanation:
Young's modulus and stress both have units of Pascal (N/m^2).

Q30. In stress-strain curve, the point beyond which the wire does not return to original shape is called:

A. Yield point
B. Elastic limit
C. Ultimate point
D. Proportional limit

Answer: A
Explanation:
Yield point is where plastic deformation begins — permanent change occurs.

Q31. The breaking stress for a material is 3×10^8 N/m^2. What is the maximum load a wire of radius 0.5 mm can bear?

A. 235 N
B. 236 N
C. 240 N
D. 250 N

Answer: B
Explanation:
Breaking force = stress × area
Area = $\pi r^2 = \pi(0.5\times10^{-3})^2 \approx 7.85\times10^{-7}$ m^2
$F = 3\times10^8 \times 7.85\times10^{-7} \approx 235.5$ N

Q32. A wire is stretched so that its length increases by 1%. What is the percentage decrease in its area assuming volume remains constant?

A. 1%
B. 2%
C. 3%

D. 2.01%

Answer: D
Explanation:
If volume constant:
$L \times A$ = constant $\Rightarrow \Delta A/A = -\Delta L/L$
$\Delta A/A = -(1 + x)^{-1} - 1 \approx -2.01\%$ for small elongations

Q33. A wire of length 2 m and area 0.5 mm^2 is stretched by 1 mm. What is the work done in stretching it if $Y = 2 \times 10^{11}$ N/m^2?

A. 0.025 J
B. 0.05 J
C. 0.1 J
D. 0.2 J

Answer: B
Explanation:
Strain = $0.001/2 = 5\times10^{-4}$
Stress = $Y \times$ strain = 10^8
$U = \frac{1}{2} \times$ stress $\times$ strain $\times$ Volume
Volume = $A \times L = 5\times10^{-7} \times 2 = 1\times10^{-6}$
$U = \frac{1}{2} \times 10^8 \times 5\times10^{-4} \times 1\times10^{-6} = 0.05$ J

Q34. In a stress-strain graph, the area under the curve represents:

A. Force
B. Work done per unit volume
C. Stress
D. Young's modulus

Answer: B
Explanation:
Area under stress-strain curve = strain energy per unit volume.

Q35. Which of the following has the highest Young's modulus?

A. Rubber

B. Steel
C. Copper
D. Brass

Answer: B
Explanation:
Steel has the highest Y among common metals due to its stiffness.

Q36. A metal wire has a Young's modulus of 2×10^{11} N/m². If the strain is 0.001, what is the stress?

A. 2×10^{8} N/m²
B. 2×10^{7} N/m²
C. 2×10^{9} N/m²
D. 2×10^{10} N/m²

Answer: A
Explanation:
Stress = Y × strain = $2\times10^{11} \times 0.001 = 2 \times 10^{8}$ N/m²

Q37. If Poisson's ratio for a material is 0.5, then the material is:

A. Highly elastic
B. Incompressible
C. Very brittle
D. Perfectly plastic

Answer: B
Explanation:
For incompressible material, Poisson's ratio approaches 0.5

Q38. The elastic limit of a wire is the:

A. Point where it breaks
B. Maximum extension possible
C. Maximum stress without permanent deformation
D. Point of no return

Answer: C

Explanation:
Elastic limit = max stress before permanent deformation

Q39. Young's modulus is numerically equal to:

A. Ratio of tensile strain to stress
B. Ratio of stress to strain
C. Product of stress and strain
D. Stress × area

Answer: B
Explanation:
Y = stress / strain (Hooke's law)

Q40. The strain energy stored in a wire is proportional to:

A. Length of the wire
B. $Stress^2$
C. $Strain^2$
D. Both B and C

Answer: D
Explanation:
U ∝ stress × strain ⇒ if one constant, then ∝ the square of the other

Q41. The stress-strain graph for a material is a straight line. This implies:

A. Material is plastic
B. Stress is independent of strain
C. Hooke's law is obeyed
D. Elastic limit is reached

Answer: C
Explanation:
Straight line implies stress ∝ strain ⇒ obeys Hooke's law

Q42. If a wire is stretched to double its original length, what is the new strain?

A. 0.5
B. 1.0
C. 2.0
D. 100%

Answer: B
Explanation:
Strain = ΔL / L = (2L – L)/L = 1 ⇒ strain = 1

Q43. Two wires of equal length and area are made of different materials. If they are stretched by same force, which one stretches more?

A. One with higher Y
B. One with lower Y
C. Both equally
D. Can't say

Answer: B
Explanation:
Elongation $\propto 1/Y$ ⇒ lower Y stretches more

Q44. A wire of length 3 m is stretched by 2 mm. What is the strain?

A. 6.7×10^{-3}
B. 0.0002
C. 0.00067
D. 2×10^{-3}

Answer: C
Explanation:
Strain = 2 mm / 3 m = 0.002 / 3 = 0.00067

Q45. A wire has a Young's modulus of 1×10^{11} N/m². What will be the elongation in a 2 m wire with 1 mm² area under 100 N?

A. 2 mm
B. 1 mm

C. 0.2 mm
D. 0.1 mm

Answer: A
Explanation:
$\Delta L = FL / AY = (100 \times 2) / (1\times10^{-6} \times 1\times10^{11}) = 200 / 10^5 = 0.002$ m = 2 mm