RK VISION ACADEMY

PHYSICS

XI –MECHANICAL PROPERTIES OF SOLIDS

SECTION A

1. **Hook's law defines**
   (1) Stress
   (2) Strain
   (3) Modulus of elasticity
   (4) Elastic limit

2. **The area of cross-section of a wire of length 1.1 metre is 1 mm^2. It is loaded with 1 kg. If Young's modulus of copper is 1.1×10^{11} N/m^2, then the increase in length will be (If g=10m/^{2})**
   (1) 0.01 mm
   (2) 0.075 mm
   (3) 0.1 mm
   (4) 0. 15 mm

3. **On increasing the length by 0.5 mm in a steel wire of length 2 m and area of cross-section 2mm^2, the force required is [Y for steel=2.2×10^{11} N/m^2]]**
   (1) 1.1×10^5 N
   (2) 1.1×10^4 N
   (3) 1.1×10^3 N
   (4) 1.1×10^2 N

4. **If Young's modulus of iron is 2×10^{11} N/m^2 and the interatomic spacing between two molecules is 3×10^{-10} metre, the interatomic force constant is**
   (1) 60 N/m
   (2) 120 N/m
   (3) 30 N/m
   (4) 180 N/m

5. **The material which practically does not show elastic after effect is**
   (1) Copper
   (2) Rubber
   (3) Steel
   (4) Quartz

6. **If the temperature increases, the modulus of elasticity**
   (1) Decreases
   (2) Increases
   (3) Remains constant
   (4) Becomes zero

7. **The relationship between Young's modulus Y, Bulk modulus K and modulus of rigidity η is**
   (1) $Y=\frac{9\eta K}{\eta+3K}$
   (2) $Y=\frac{9YK}{Y+3K}$
   (3) $Y=\frac{9\eta K}{3+K}$
   (4) $Y=\frac{3\eta K}{9\eta+K}$

8. **If x longitudinal strain is produced in a wire of Young's modulus y, then energy stored in the material of the wire per unit volume is**
   (1) yx^2

(2) $2yx^2$

(3) $\frac{1}{2}y^2x$

(4) $\frac{1}{2}yx^2$

9. **The Young's modulus of a rubber string 8 cm long and density $1.5 kg/m^3$ is $5 \times 10^8 N/m^2$, is suspended on the ceiling in a room. The increase in length due to its own weight will be**

(1) 9.6×10^{-5}m

(2) 9.6×10^{-11}m

(3) 9.6×10^{-3}m

(4) 9.6 m

10. **If the length of a wire is reduced to half, then it can hold the .... load**

(1) Half

(2) Same

(3) Double

(4) One fourth

11. **The spring balance does not read properly after its long use, because**

(1) The elasticity of spring increases

(2) The elasticity decreases

(3) Its plastic power decreases

(4) Its plastic power increases

12. **Why the spring is made up of steel in comparison of copper**

(1) Copper is more costly than steel

(2) Copper is more elastic than steel

(3) Steel is more elastic than copper

(4) None of the above

13. **Increase in length of a wire is 1 mm when suspended by a weight. If the same weight is suspended on a wire of double its length and double its radius, the increase in length will be**

(1) 2 mm

(2) 0.5 mm

(3) 4 mm

(4) 0.25 mm

14. **A rod of length l and area of cross-section A is heated from 0°C to 100°C. The rod is so placed that it is not allowed to increase in length, then the force developed is proportional to**

(1) l

(2) l^{-1}

(3) A

(4) A^{-1}

15. **If a load of 9 kg is suspended on a wire, the increase in length is 4.5 mm. The force constant of the wire is**

(1) $0.49 \times 10^4 N/m$

(2) $1.96 \times 10^4 N/m$

(3) $4.9 \times 10^4 N/m$

(4) $0.196 \times 10^4 N/m$

16. **Longitudinal stress of $1 kg/mm^2$ is applied on a wire. The percentage increase in length is $(Y = 10^{11} N/m^2)$**

(1) 0.002

(2) 0.001

(3) 0.003

(4) 0.01

17. The force constant of a wire does not depend on

(1) Nature of the material

(2) Radius of the wire

(3) Length of the wire

(4) None of the above

18. Liquids have no Poisson's ratio, because

(1) It has no definite shape

(2) It has greater volume

(3) It has lesser density than solid

(4) None of the above

19. In which case there is maximum extension in the wire, if same force is applied on each wire

(1) L = 500 cm, d = 0.05 mm

(2) L = 200 cm, d = 0.02 mm

(3) L = 300 cm, d = 0.03 mm

(4) L = 400 cm, d = 0.01 mm

20. The breaking stress of a wire depends upon

(1) Length of the wire

(2) Radius of the wire

(3) Material of the wire

(4) Shape of the cross section

21. A rubber cord 10 m long is suspended vertically. How much does it stretch under its own weight (Density of rubber is 1500 kg/m^3, Y = 5×10^8 N/m^2, g = 10 m/s^2)

(1) 15×10^{-4} m

(2) 7.5×10^{-4} m

(3) 12×10^{-4} m

(4) 25×10^{-4} m

22. The value of Poisson's ratio lies between

(1) -1 to $\frac{1}{2}$

(2) $-\frac{3}{4}$ to $-\frac{1}{2}$

(3) $-\frac{1}{2}$ to 1

(4) 1 to 2

23. If the volume of the given mass of a gas is increased four times, the temperature is raised from 27°C to 127°C. The elasticity will become

(1) 4 times

(2) 1/4 times

(3) 3 times

(4) 1/3 times

24. When a pressure of 100 atmosphere is applied on a spherical ball, then its volume reduces to 0.01%. The bulk modulus of the material of the rubber in $\mathrm{dyne/cm^2}$ is

(1) 10×10^{12}

(2) 100×10^{12}

(3) 1×10^{12}

(4) 20×10^{12}

25. In the three states of matter, the elastic coefficient can be

(1) Young's modulus

(2) Coefficient of volume elasticity

(3) Modulus of rigidity

(4) Poisson's ratio

26. For a constant hydraulic stress on an object, the fractional change in the object's volume $\left(\frac{\Delta V}{V}\right)$ and its bulk modulus (2) are related as

(1) $\frac{\Delta V}{V} \propto B$

(2) $\frac{\Delta V}{V} \propto \frac{1}{B}$

(3) $\frac{\Delta V}{V} \propto B^2$

(4) $\frac{\Delta v}{v} \propto B^{-2}$

27. A ball falling in a lake of depth 200 m shows 0.1% decrease in its volume at the bottom. What is the bulk modulus of the material of the ball

(1) $19.6 \times 10^8 N/m^2$

(2) $19.6 \times 10^{-10} N/m^2$

(3) $19.6 \times 10^{10} N/m^2$

(4) $19.6 \times 10^{-8} N/m^2$

28. The ratio of lengths of two rods A and B of same material is 1 : 2 and the ratio of their radii is 2 : 1, then the ratio of modulus of rigidity of A and B will be

(1) 4 : 1

(2) 16 : 1

(3) 8 : 1

(4) 1 : 1

29. Which of the following relations is true

(1) $3Y = K(1 - \sigma)$

(2) $K = \frac{9\eta Y}{Y + \eta}$

(3) $\sigma = (6K + \eta)Y$

(4) $\sigma = \frac{0.5Y - \eta}{\eta}$

30. The work done in stretching an elastic wire per unit volume is or strain energy in a stretched string is

(1) Stress $\times$ Strain

(2) $\frac{1}{2} \times$Stress $\times$ Strain

(3) $2 \times$ strain $\times$ stress

(4) Stress/Strain

31. Two wires of same diameter of the same material having the length l and 2l. If the force F is applied on each, the ratio of the work done in the two wires will be

(1) 1 : 2

(2) 1 : 4

(3) 2 : 1

(4) 1 : 1

32. If the tension on a wire is removed at once, then

(1) It will break

(2) Its temperature will reduce

(3) There will be no change in its temperature

(4) Its temperature increase

33. On stretching a wire, the elastic energy

stored per unit volume is

(1) $Fl/2AL$

(2) $FA/2L$

(3) $FL/2A$

(4) $FL/2$

34. When a force is applied on a wire of uniform cross-sectional area $3 \times 10^{-6} m^2$ and length 4m, the increase in length is 1 mm. Energy stored in it will be ($Y = 2 \times 10^{11} N/m^2$)

(1) 6250 J

(2) 0.177 J

(3) 0.075 J

(4) 0.150 J

35. A wire of length 50 cm and cross sectional area of 1 sq. mm is extended by 1 mm. The required work will be ($Y = 2 \times 10^{10} Nm^{-2}$)

(1) $6 \times 10^{-2} J$

(2) $4 \times 10^{-2} J$

(3) $2 \times 10^{-2} J$

(4) $1 \times 10^{-2} J$

SECTION B

36. When load of 5kg is hung on a wire then extension of 3m takes place, then work done will be

(1) 75 joule

(2) 60 joule

(3) 50 joule

(4) 100 joule

37. K is the force constant of a spring. The work done in increasing its extension from l_1 to l_2 will be

(1) $K(l_2 - l_1)$

(2) $\frac{K}{2}(l_2 + l_1)$

(3) $K(l_2^2 - l_1^2)$

(4) $\frac{K}{2}(l_2^2 - l_1^2)$

38. To break a wire, a force of $10^6 N/m^2$ is required. If the density of the material is $3 \times 10^3 kg/m^3$, then the length of the wire which will break by its own weight will be

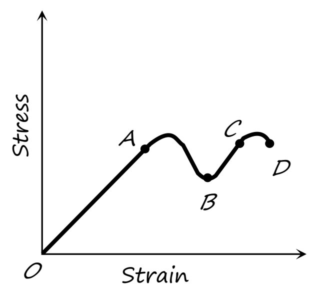
(1) 34 m

(2) 30 m

(3) 300 m

(4) 3 m

39. A graph is shown between stress and strain for a metal. The part in which Hooke's law holds good is



(1) OA

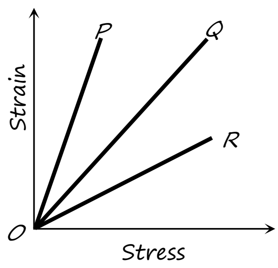
(2) AB

(3) BC

(4) CD

40. The strain-stress curves of three wires of different materials are shown in the figure. P, Q and R are the elastic limits of the

wires. The figure shows that



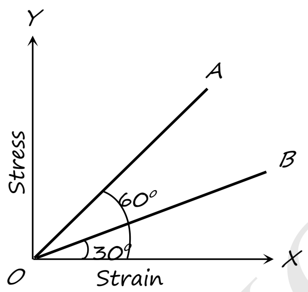
(1) Elasticity of wire P is maximum

(2) Elasticity of wire Q is maximum

(3) Tensile strength of R is maximum

(4) None of the above is true

41. The stress versus strain graphs for wires of two materials A and B are as shown in the figure. If Y_A and Y_B are the Young 's modulii of the materials, then



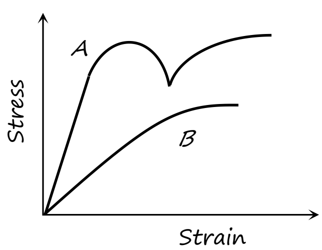
(1) $Y_B = 2Y_A$

(2) $Y_A = Y_B$

(3) $Y_B = 3Y_A$

(4) $Y_A = 3Y_B$

42. The diagram shows stress v/s strain curve for the materials A and B. From the curves we infer that



(1) A is brittle but B is ductile

(2) A is ductile and B is brittle

(3) Both A and B are ductile

(4) Both A and B are brittle

43. Assertion: The stretching of a coil is determined by its shear modulus.
Reason: Shear modulus change only shape of a body keeping its dimensions unchanged.

(1) If both assertion and reason are true and the reason is the correct explanation of the assertion

(2) If both assertion and reason are true but reason is not the correct explanation of the assertion.

(3) If assertion is true but reason is false.

(4) If the assertion and reason both are false.

44. A copper wire and a steel wire of the same diameter and length are connected end to end and a force is applied, which stretches their combined length by 1 cm. The two wires will have

(1) different stresses and strains

(2) the same stress and strain

(3) the same strain but different stresses

(4) the same stress but different strains

45. A substance breaks down by a stress of 10^6 N/m^2. If density of the material of the wire is 3×10^3 kg/m^3, then the length of the wire of the substance which will break under its own weight when suspended vertically, is

(1) 66.6 m

(2) 60.0 m

(3) 33.3 m

(4) 30.0 m

46. Statement-I: Elastic restoring forces may be conservative

Statement-II: The value of strain for same stress are different while increasing the load and decreasing the load.

(1) Both statement-l and statement-2 are True.

(2) Both statement-1 and statement-2 are False.

(3) Statement-l is True but Statement- 2 is False

(dStatement-1 is False but Statement-2 is True.

47. An elevator cable can have a maximum stress of 7×10^7 N/m^2 for appropriate safety factors. Its maximum upward acceleration is 1.5 m/s^2. If the cable has to support the total weight of 2000 kg of a loaded elevator, the minimum area of cross-section of the cable should be ($g = 10$ m/s²)

(1) 3.28 cm²

(2) 2.38 cm²

(3) 0.328 cm²

(4) 8.23 cm²

48. Statement-I: A material having greater Young's modulus also possesses greater bulk modulus.

Statement-II: The elastic moduli are due to intermolecular forces existing in the material.

(1) Both statement-l and statement-2 are True.

(2) Both statement-1 and statement-2 are False.

(3) Statement-l is True but Statement- 2 is False

(4) Statement-1 is False but Statement-2 is True.

49. The upper end of a wire of radius 4 mm and length 100 cm is clamped and its other end is twisted through an angle of 30°. The angle of shear is

(1) 12°

(2) 0.12°

(3) 1.2°

(4) 0.012°

50. A wire elongates by 1 mm when a load W is hanged from it. If the wire goes over a pulley and two weights W each are hung at the two ends, the elongation of the wire will be (in mm)

(1) zero

(2) l/2

(3) l

(4) 2l

RK VISION ACADEMY

PHYSICS

XI –MECHANICAL PROPERTIES OF SOLIDS

SECTION A

1. 3
2. 3
3. 4
4. 1
5. 4
6. 1
7. 1
8. 4
9. 2
10. 2
11. 2
12. 3
13. 2
14. 3
15. 2
16. 2
17. 4
18. 1
19. 4
20. 3
21. 1
22. 1
23. 4
24. 3
25. 2
26. 2
27. 1
28. 4
29. 4
30. 2
31. 1
32. 4
33. 1
34. 3
35. 3

SECTION B

36. 1
37. 4
38. 1
39. 1
40. 4
41. 4
42. 2
43. 4
44. 4
45. 3
46. 1
47. 1
48. 1
49. 2
50. 3