Shiksha Classes, Bhandara

Physics

Subject : Physics **Topic : Properties of Matter** **M.M. : 180**

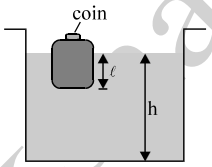
Marking Scheme:
(i) Each question is allotted 4 (four) marks for each correct response.
(ii) ¼ (one fourth) marks will be deducted for indicating incorrect response of each question. No deduction from the total score will be made if no response is indicated for an item in the answer sheet.

Q.1 A mass of 0.5 kg is suspended from wire, then length of wire increase by 3 mm then work done:-
(1) 4.5×10^{-3} Joule (2) 7.3×10^{-3} Joule
(3) 9.3×10^{-2} Joule (4) $2.5 \times$ Joule

Q.2 How much force is required to produce an increase of 0.2% in the length of a brass wire of diameter 0.6mm ?
[Young's modulus for brass = 0.9×10^{11} N/m^2]
(1) Nearly 17 N (2) Nearly 34 N
(3) Nearly 51 N (4) Nearly 68 N

Q.3 If the interatomic spacing in a steel wire is 2.8×10^{-10} m. and $Y_{steel} = 2 \times 10^{11}$ N/m^2, then force constant in N/m is –
(1) 5.6 (2) 56
(3) 0.56 (4) 560

Q.4 A wooden block, with a coin placed on its top, floats in water as shown in figure. The distance ℓ and h are shown there. After sometime the coin falls into the water. Then



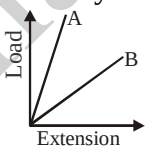
(1) ℓ decreases and h increases
(2) ℓ increases and h decreases
(3) both ℓ and h increases
(4) both ℓ and h decreases

Q.5 An increases in pressure required to decreases the 200 litres volume of a liquid by 0.004% in container is :
(Bulk modulus of the liquid = 2100 MPa)
(1) 188 kPa (2) 8.4 kPa
(3) 18.8 kPa (4) 84 kPa

Q.6 If 'S' is stress and 'Y' is Young's modulus of material of a wire, the energy stored in the wire per unit volume is
(1) S / 2Y (2) 2Y / S^2
(3) S^2 / 2Y (4) 2S^2 Y

Q.7 If the density of the material increase, the value of Young's modulus
(1) increases (2) decreases
(3) first increases, then decreases
(4) first decreases, then increases

Q.8 The dimensions of two wires A and B are the same. But their materials are different. Their load-extension graphs are shown. If Y_A and Y_B are the values of Young's modulus of elasticity of A and B respectively then



(1) $Y_A > Y_B$ (2) $Y_A < Y_B$
(3) $Y_A = Y_B$ (4) $Y_B = 2Y_A$

Q.9 Two wires of the same material and length but diameters in the ratio 1 : 2 are stretched by the same force. The potential energy per unit volume for the two wires when stretched will be in the ratio.
(1) 16 : 1 (2) 4 : 1
(3) 2 : 1 (4) 1 : 1

Q.10 One end of uniform wire of length L and of weight W is attached rigidly to a point in 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 stress in the wire at a height (L/4) from its lower end is
(1) $\frac{W_1}{s}$ (2) $\frac{\left[W_1 + \frac{W}{4}\right]}{s}$
(3) $\frac{\left[W_1 + \frac{3W}{4}\right]}{s}$ (4) $\frac{W_1 + W}{4}$

Q.11 The Young's modulus of a rubber string 8 cm long and density 1.5 kg/m^3 is 5×10^8 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

Q.12 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) 19.6×10^8 N/m^2 (2) 19.6×10^{-10} N/m^2
(3) 19.6×10^{10} N/m^2 (4) 19.6×10^{-8} N/m^2

Q.13 A fixed volume of iron is drawn into a wire of length ℓ. The extension produced in this wire by a constant force F is proportional to -

(1) $1 / \ell^2$ (2) $1 / \ell$
(3) ℓ^2 (4) ℓ

Q.14 A soap bubble in vacuum has a radius of 3 cm and another soap bubble in vacuum has a radius of 4cm. If the two bubbles coalesce under isothermal condition, then the radius of the new bubble is :

(1) 2.3 cm (2) 4.5 cm
(3) 5 cm (4) 7 cm

Q.15 In a capillary tube, water rises by 1.2 mm. The height of water that will rise in another capillary tube having half the radius of the first, is :

(1) 1.2 mm (2) 2.4 mm
(3) 0.6 mm (4) 0.4 mm

Q.16 Water rises to a height h in a capillary at the surface of earth. On the surface of the moon the height of water column in the same capillary will be :

(1) 6h (2) 1/6 h
(3) h (4) Zero

Q.17 If the difference between pressure inside and outside of a soap bubble is 6 mm of water and its radius is 8mm. What is the surface tension in dynes per cm.

(1) 117.6 (2) 256
(3) 378 (4) 450

Q.18 Two capillary tubes of same diameter are put vertically one each in two liquids whose relative densities are 0.8 and 0.6 and surface tensions are 60 dyne/cm and 50 dyne/cm respectively. Ratio of heights of liquids in the two tubes h_1/h_2 is :

(1) 10/9 (2) 3/10
(3) 10/3 (4) 9/10

Q.19 An air bubble is lying just below the surface of water. The surface tension of water is 70×10^{-3} Nm^{-1} and atmospheric pressure is 1.013×10^5 Nm^{-2}. If the radius of bubble is 1mm, then the pressure inside the bubble will be –

(1) 1.0270×10^5 Pa (2) 1.0160×10^5 Pa
(3) 1.0144×10^5 Pa (4) 1.0131×10^5 Pa

Q.20 Surface tension of a liquid is 5 N/m. If its thin film is made in a ring of area 0.02 m^2, then its surface energy will be –

(1) 5×10^{-2} Joule (2) 2.5×10^{-2} Joule
(3) 3×10^{-1} Joule (4) 2×10^{-1} Joule

Q.21 The radius of a soap bubble is r. The surface tension of soap solution is T. Keeping temperature constant, the radius of the soap bubble is doubled, the energy necessary for this will be

(1) $24 \pi r^2 T$ (2) $8 \pi r^2 T$
(3) $12 \pi r^2 T$ (4) $16 \pi r^2 T$

Q.22 Radius of a capillary is 2×10^{-3} m. A liquid of weight 6.2×10^{-4} N may remain in the capillary. Then surface tension of liquid will be

(1) 5×10^{-3} N/m (2) 5×10^{-2} N/m
(3) 5 N/m (4) 50 N/m

Q.23 Two small drops of mercury, each of radius R, coalesce to form a single large drop. The ratio of the total surface energies before and after the change is :

(1) $1 : 2^{1/3}$ (2) $2^{1/3} : 1$
(3) 2 : 1 (4) 1 : 2

Q.24 Which one of the following will make its way most easily through the tiny space between the fiber of the clothing –

(1) Glycerene at 20°C (2) Water at 20°C
(3) Soap water at 20°C (4) Water at 100°C

Q.25 Inside a drop excess pressure is maximum in

(1) 0.200 μm diameter (2) 20.0 μm diameter
(3) 200 μm diameter (4) 2.0 μm diameter

Q.26 The diameter of one drop of water is 0.2 cm. The work done in breaking one drop into 1000 equal droplets will be :-

(Surface tension of water = 7×10^{-2} N/m)

(1) 7.9×10^{-6} J (2) 5.92×10^{-6} J
(3) 2.92×10^{-6} J (4) 1.92×10^{-6} J

Q.27 In a U-tube diameter of two limbs are 0.5 cm and 1cm respectively. and tube has filled with water (T = 72 dyne/cm) then liquid level difference between two limbs will be
(1) 0.5 cm (2) 0.25 cm
(3) 0.293 cm (4) None of these

Q.28 The surface tension of which of the following liquid is maximum ?
(1) H_2O (2) C_6H_6
(3) CH_3OH (4) C_2H_5OH

Q.29 When a large bubble rises from the bottom of a lake to the surface, its radius doubles. If atmospheric pressure is equal to that of column of water height H, then the depth of lake is :
(1) H (2) 2H
(3) 7H (4) 8H

Q.30 A sample of metal weights 210 gram in air, 180gram in water and 120 gram in an unknown liquid. Then
(1) the density of metal is 3 g/cm^3
(2) the density of metal is 7 g/cm^3
(3) density of metal is 4 times the density of the unknown liquid
(4) the metal will float in water

Q.31 A wooden cube just floats inside water when a 200g mass is placed on it. When the mass is removed the cube is 2 cm above water level. The side of cube is
(1) 5 cm (2) 10 cm
(3) 15 cm (4) 20 cm

Q.32 Water stands upto a height h behind the vertical wall of a dam. What is the net horizontal force pushing the dam down by the stream, if width of the dam is σ ? (ρ = density of water)
(1) $2h\sigma g$ (2) $\frac{h^2\sigma\rho g}{2}$
(3) $\frac{h^2\sigma\rho g}{4}$ (4) $\frac{h\sigma\rho g}{4}$

Q.33 A U-tube is partially filled with water. Oil which does not mix with water is next poured into one side, until water rises by 25 cm on the other side. If the density of the oil is 0.8 g/cc, the oil level will stand higher than the water level by
(1) 6.25 cm (2) 12.50 cm
(3) 18.75 cm (4) 25.00

Q.34 A body measures 5 N in air and 2 N when put in water. The buoyant force is
(1) 7 N (2) 9 N
(3) 3 N (4) None of these

Q.35 An incompressible fluid flows steadily through a cylindrical pipe which has radius 2 R at point A and radius R at point B farther along the flow direction. If the velocity at point A is v, its velocity at point B is
(1) 2v (2) v
(3) v/2 (4) 4v

Q.36 An aeroplane of mass 3×10^4 kg and total wing area of 120 m^2 is in a level flight at some height. The difference in pressure between the upper and lower surfaces of its wings in kilopascals is
(g = 10 m/s^2)
(1) 2.5 (2) 5.0
(3) 10.0 (4) 12.5

Q.37 A hole is there in the bottom of the tank having water. If total pressure at bottom is 3atm (1 atm = 10^5 N/m^2), then velocity of water flowing from hole is
(1) $\sqrt{400}$ ms^{-1} (2) $\sqrt{600}$ ms^{-1}
(3) $\sqrt{60}$ ms^{-1} (4) none of these

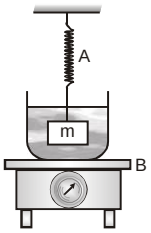
Q.38 The velocity of water flowing in a non-uniform tube is 20 cm/s at a point where the tube radius is 0.2 cm. The velocity at another point, where the radius is 0.1 cm is
(1) 80 cm/s (2) 40cm/s
(3) 20 cm/s (4) 5cm/s

Q.39 Speed of 2 cm radius ball in a viscous liquid is 20cm/s. Then the speed of 1 cm radius ball in the same liquid is
(1) 5 cm/s (2) 10 cm/s
(3) 40 cm/s (4) 80 cm/s

Q.40 Two rain drops falling through air have radii in the ratio 1:2. They will have terminal velocity in the ratio.
(1) 4 : 1 (2) 1 : 4
(3) 2 : 1 (4) 1 : 2

Q.41 A piece of ice is floating in a jar containing water. When the ice melts, the temperature of water falls from 4^0 C to 1°C. Then the level of water :-
(1) Rises (2) Falls
(3) Remains unchanged (4) Changes erratically

Q.42 The spring balance A read 2 kg. with a block m suspended from it. A balance B reads 5 kg. when a beaker with liquid is put on the pan of the balance. The two balances are now so arranged that the hanging mass is inside the liquid in the beaker as shown in fig. In this situation :–



(1) The balance A will read more than 2 kg.
(2) The balance B will read more than 5 kg.
(3) The balance A will read less than 2 kg. and B will read more than 5 kg.
(4) The balance A and B will read 2 kg. and 5 kg respectively.

Q.43 A boat having a length of 3 metre and breadth 2 metre is floating on a lake. The boat sinks by one cm when a man gets on it. The mass of the man is

(1) 60 kg (2) 62 kg
(3) 72 kg (4) 128 kg

Q.44 A tank of height 5 m is full of water. There is a hole of cross sectional area 1 cm^2 in its bottom. The initial volume of water that will come out from this hole per second is

(1) 10^{-3} m^3/s (2) 10^{-4} m^3/s
(3) 10 m^3/s (4) 10^{-2} m^3/s.

Q.45 The cylindrical tube of a spray pump has a radius R, one end of which has n fine holes, each of radius r. If the speed of flow of the liquid in the tube is v, the speed of ejection of the liquid through the hole is :

(1) $\frac{v}{n}\left(\frac{R}{r}\right)$ (2) $\frac{v}{n}\left(\frac{R}{r}\right)^{1/2}$

(3) $\frac{v}{n}\left(\frac{R}{r}\right)^{3/2}$ (4) $\frac{v}{n}\left(\frac{R}{r}\right)^{2}$