PHYSICS

NCERT - FULL MARKS PHYSICS(TAMIL)

PROPERTIES OF MATTER

Example

1. Within the elastic limit, the stretching strain produced in wires A, B, and C due to stress is shown in the figure. Assume the load applied

are the same and discuss the elastic property of the material.

Write down the elastic modulus in ascending order.

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2. A wire 10 m long has a cross-sectional area $1.25 \times 10^{-4} m^2$. It is subjected to a load of 5 kg. If Young's modulus of the material is $4 \times 10^{10} Nm^{-2}$, calculate the elongation

produced in the wire.

Take $g = 10ms^{-2}$

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3. A metallic cube of side 100 cm is subjected to a uniform force acting normal to the whole surface of the cube. The pressure is 106 pascal. If the volume changes by $1.5 \times 10^{-5}m^3$, calculate the bulk modulus of the material.

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4. A metal cube of side 0.20 m is subjected to a shearing force of 4000 N. The top surface is displaced through 0.50 cm with respect to the bottom. Calculate the shear modulus of elasticity of the metal.

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5. A wire of length 2 m with the area of cross-section $10^{-6}m^2$ is used to suspend a load of 980 N. Calculate i) the stress developed in the wire ii) the strain and iii) the energy stored. Given: $Y = 12x \times 10^{10} Nm^{-2}$.

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6. A solid sphere has a radius of 1.5 cm and a mass of 0.038 kg. Calculate the specific gravity or relative density of the sphere.

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7. Two pistons of a hydraulic lift have diameters of 60 cm and 5 cm. What is the force exerted by the larger piston when 50 N is placed on the smaller piston?

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8. A cube of wood fl oating in water supports a 300 g mass at the centre of its top face. When the mass is removed, the cube rises by 3 cm. Determine the volume of the cube.

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9. A metal plate of area $2.5 \times 10^{-4} m^2$ is placed on a $0.25 \times 10^{-3} m$ thick layer of castor oil. If a force of 2.5 N is needed to move the plate with a

velocity $3 \times 10^{-2} ms^{-1}$, calculate the coeffi cient of viscosity of castor oil.

Given

$A = 2.5 \times 10^{-4} m^2, dx = 0.25 \times 10^3 m, F = 2.5N$ and $dv = 3 \times 10^{-2} ms^{-1}$

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10. Let $2.4 \times 10^{-4} J$ of work is done to increase the area of a fi lm of soap bubble from $50 cm^2$ to $100 cm^2$. Calculate the value of surface tension of soap solution.

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11. If excess pressure is balanced by a column of oil (with specific gravity 0.8) 4 mm high, where R = 2.0 cm, find the surface tension of the soap bubble.

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12. Water rises in a capillary tube to a height of 2.0cm. How much will the water rise through another capillary tube whose radius is one-third of the first tube

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13. Mercury has an angle of contact equal to 140° with soda lime glass. A narrow tube of radius 2 mm, made of this glass is dipped in a trough containing mercury. By what amount does the mercury dip down in the tube relative to the liquid surface outside?. Surface tension of mercury $T = 0.456Nm^{-1}$, Density of mercury $\rho = 13.6 \times 10^3 kgm^{-3}$

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14. In a normal adult, the average speed of the blood through the aorta (radius r = 0.8 cm) is $0.33ms^{-1}$. From the aorta, the blood goes into major arteries, which are 30 in number, each of radius 0.4 cm. Calculate the speed of the blood through the arteries.

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Evaluation Multiple Choice Questions

1. Consider two wires X and Y. The radius of wire X is 3 times the radius of Y. If they are stretched by the same load then the stress on Y is

A. equal to that on X

B. thrice that on X

C. nine times that on X

D. Half that on X

Answer: C

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2. If a wire is stretched to double of its original length, then the strain in the wire is

A. 1

B. 2

C. 3

D. 4

Answer: A

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3. For a given material, the rigidity modulus is $\left(\frac{1}{3}\right)^{rd}$ of Young's modulus. Its Poisson's ratio is

A. 0

B. 0.25

C. 0.3

D. 0.5

Answer: D

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4. A small sphere of radius 2cm falls from rest in a viscous liquid. Heat is produced due to viscous force. The rate of production of heat when the sphere attains its terminal velocity is proportional to

A. 2^2

B. 2^3

C. 2^4

D. 2^5

Answer: D

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5. Two wires are made of the same material and have the same volume.The area of cross sections of the first and the second wires are A and 2A respectively. 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?

A. 2

B. 4

C. 8

D. 16

Answer: B

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6. With an increase in temperature, the viscosity of liquid and gas, respectively will

A. increase and increase

B. increase and decrease

C. decrease and increase

D. decrease and decrease

Answer: C

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7. The Young's modulus for a perfect rigid body is

A. 0

B. 1

C. 0.5

D. infinity

Answer: D

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8. Which of the following is not a scalar?

A. viscosity

B. surface tension

C. pressure

D. stress

Answer: D

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9. If the temperature of the wire is increased, then the Young's modulus will

A. remain the same

B. decrease

C. increase rapidly

D. increase by very a small amount

Answer: B

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10. Copper of fixed volume V is drawn into a wire of length l. When this wire is subjected to a constant force F, the extension produced in the wire is Δl

If Y represents the Young's modulus, then which of the following graphs is a straight line?

A. Δl verses V

B. Δl verses Y

C. Δl verses F

D. Δl verses $\frac{1}{l}$

Answer: C

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11. A certain number of spherical drops of a liquid of radius R coalesce to form a single drop

of radius R and volume V. If T is the surface tension of the liquid, then

A. energy $= 4VT\left(\frac{1}{r} - \frac{1}{R}\right)$ is released

B. energy $= 3VT\left(\frac{1}{r} + \frac{1}{R}\right)$ is absorbed

C. energy $= 3VT\left(\frac{1}{r} - \frac{1}{R}\right)$ is released

D. energy is neither released nor absorbed

Answer: C

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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?

A. length = 200 cm, diameter = 0.5 mm

B. length= 200 cm, diameter = 1 mm

C. length = 200 cm, diameter = 2 mm

D. length= 200 cm, diameter = 3 m

Answer: A

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13. The wettability of a surface by a liquid depends primarily on

A. viscosity

B. surface tension

C. density

D. angle of contact between the surface and the liquid

Answer: D

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14. In a horizontal pipe of non-uniform cross section, water flows with a velocity of $1ms^{-1}$ at a point where the diameter of the pipe is 20 cm. The velocity of water $\left(ms^{-1}\right)$ at a point where the diameter of the pipe is

A. 8

B. 16

C. 24

D. 32

Answer: B

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