



# PHYSICS

## BOOKS - SURA PHYSICS (TAMIL ENGLISH)

### PROPERTIES OF MATTER

#### Exercise Questions | 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 2 cm 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  $\Delta l$  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  $\Delta l$ . If  $Y$  represents the Young's modulus, then which of the following graphs is a straight line?

A.  $\Delta l$  versus  $V$

B.  $\Delta l$  versus  $Y$

C.  $\Delta l$  versus  $F$

D.  $\Delta l$  versus  $\frac{1}{l}$

**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 = 1mm

C. length = 200 cm, diameter = 2 mm

D. length = 200 cm, diameter = 3 mm

**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  $1\text{ms}^{-1}$  at a point where the diameter of the pipe is 20 cm. The velocity of water ( $1.5\text{ms}^{-1}$ ) at a point where the diameter of the pipe is (in cm)

- A. 8
- B. 16
- C. 24
- D. 32



**Answer: B**



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## Short Answers

1. Define stress and strain.



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2. State Hooke's law of elasticity.





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3. Define Poisson's ratio.



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4. Explain elasticity using intermolecular forces.



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5. Which one of these is more elastic, steel or rubber ? Why ?



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6. A spring balance shows wrong readings after using for a long time. Why ?



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7. What is effect of temperature on elasticity ?



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8. Write down the expression for the elastic potential energy of a stretched wire .



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9. State Pascal's law in fluids.



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**10.** State Archimedes principle.



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**11.** What do you mean by upthrust or buoyancy ?



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**12.** State the law of floatation.



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**13.** Define coefficient of viscosity of a liquid.



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**14.** Distinguish between streamlined and turbulent flow.



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15. What is Reynold's number ? Give its significance.



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16. Define terminal velocity.



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17. The expression for Stoke's formula \_\_\_\_\_.



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**18.** State Bernoulli's theorem.



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**19.** What are the energies possessed by a liquid ? Write down their equations.



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**20.** Two streamlines cannot cross each other.

Why ?



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**21.** Define surface tension of a liquid. Mention its S.I. unit and dimension.



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**22.** How is surface tension related to surface energy?



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**23.** Define angle of contact for a given pair of solid and liquid.



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**24.** Distinguish between cohesive and adhesive forces.



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**25.** What are the factors affecting the surface tension of a liquid?



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**26.** What happens to the pressure inside a soap bubble when air is blown into it ?



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**27.** What do you mean by capillarity or capillary action ?



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**28.** A drop of oil placed on the surface of water spreads out. But a drop of water placed on oil contracts to a spherical shape. Why?



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**29.** State the principle and usage of Venturimeter.



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1. State Hooke's law and verify it with the help of an experiment.



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2. Explain the different types of modulus of elasticity.



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3. Derive an expression for the elastic energy stored per unit volume of a wire.



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4. Derive an equation for the total pressure at a depth 'h' below the liquid surface.



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5. State and prove Pascal's law in fluids.



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6. State and prove Archimedes principle.



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7. Derive the expression for the terminal velocity of a sphere moving in a high viscous fluid using stokes force.



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**8.** Derive Poiseuille's formula for the volume of a liquid flowing per second through a pipe under streamlined flow.



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**9.** Obtain an expression for the excess of pressure inside a (i) liquid drop (ii) liquid bubble (iii) air bubble.



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**10.** What is capillarity? Obtain an expression for the surface tension of a liquid by capillary rise method.



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**11.** Obtain an equation of continuity for a flow of fluid on the basis of conservation of mass.



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**12.** State and prove Bernoulli's theorem for a flow of incompressible, non-viscous, and streamlined flow or fluid.



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**13.** Describe the construction and working of venturimeter and obtain an equation for the volume of liquid flowing per second through a wider entry of the tube.



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## Iv Numerical Problems

1. A capillary of diameter  $d$  mm is dipped in water such that the water rises to a height of 30 mm. If the radius of the capillary is made  $\left(\frac{2}{3}\right)$  of its previous value, then compute the height up to which water will rise in the new capillary ?



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2. A cylinder of length 1.5 m and diameter 4 cm is fixed at one end. A tangential force of  $4 \times 10^5 N$  is applied at the other end. If the rigidity modulus of the cylinder is  $6 \times 10^{10} Nm^{-2}$  then, calculate the twist produce in the cylinder.



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3. A spherical soap bubble A of radius 2 cm is formed inside another bubble B of radius 4

cm. Show that the radius of a single soap bubble which maintains the same pressure difference as inside the smaller and outside the larger soap bubble is lesser than radius of both soap bubbles A and B.



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4. A block of Ag of mass  $x$  kg hanging from a string is immersed in a liquid of relative density 0.72. If the relative density of Ag is 10

and tension in the string is 37.12 N then compute the mass of Ag block.



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5. The reading of pressure meter attached with a closed pipe is  $5 \times 10^5 \text{ Nm}^{-2}$ . On opening the valve of the pipe, the reading of the pressure meter is  $4.5 \times 10^5 \text{ Nm}^{-2}$ . Calculate the speed of the water flowing in the pipe.



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## V Conceptual Questions

1. Why coffee runs up into a sugar lump (a small cube of sugar) when one corner of the sugar lump is held in the liquid?



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2. Why two holes are made to empty an oil tin ?





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3. We can cut vegetables easily with a sharp knife as compared to a blunt knife. Why?



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4. Why the passengers are advised to remove the ink from their pens while going up to in an aeroplane ?



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5. We use straw to suck soft drinks, why ?



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## Additional Questions | Multiple Choice Questions

1. Define the term sphere of influence.

A. 1 Å

B. 10 Å

C. 100 Å

D.  $0.1\text{\AA}$

**Answer: B**



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2. If a spherical ball contract in volume by 1% under a normal uniform pressure of 200 atmosphere, then the compressibility of the material of the ball is

(1 atmosphere =  $10^5 Nm^{-2}$ )

A.  $20 \times 10^{-10} N^{-1} m^2$

B.  $5 \times 10^{-10} N^{-1} m^2$

C.  $10^{-10} N^{-1} m^2$

D.  $2 \times 10^{-10} N^{-1} m^2$

**Answer: B**



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3. An air bubble of diameter 4 mm rises steadily through a solution of density  $1500 \text{ kg m}^{-3}$  at the rate of  $30 \text{ cm}^{-1}$  the coefficient of viscosity of the solution is

A.  $3.3 \times 10^{-3}$  poise

B.  $2.2 \times 10^{-3}$  poise

C.  $3.3 \times 10^{-3}$  poise

D.  $4.4 \times 10^{-3}$  poise

**Answer: D**



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4. Water rises in a capillary tube to a certain height such that the upward force due to the surface tension is balanced by  $62.84 \times 10^{-5} N$

force due to the weight of the liquid column. If the surface tension of water is  $70 \times 10^{-3} \text{ Nm}$  the radius of the capillary tube is

A.  $1.43 \times 10^{-3} \text{ m}$

B.  $2.835 \times 10^{-3} \text{ m}$

C.  $1.43 \times 10^{-2} \text{ m}$

D.  $2.83 \times 10^{-3} \text{ m}$

**Answer: A**



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5. The work done against surface tension in blowing a soap bubble from a radius of 5 cm to 15 cm is (surface tension of soap solution is  $30 \times 10^{-3} \text{ Nm}^{-1}$ )

A.  $2.4\pi \text{ mJ}$

B.  $4.8\pi \text{ mJ}$

C.  $2.4\pi \text{ J}$

D.  $4.8\pi \text{ J}$

**Answer: A**



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6. A wooden blocks is taken to the bottom of a deep column lake of watre and then released it rises up with a

- A. constant acceleration
- B. decreasing acceleration
- C. constant velocity
- D. decreasing velocity

**Answer: A**



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7. If there were no gravity, which of the following will not be there for a fluid?

A. viscosity

B. surface tension

C. pressure

D. archimedes upwards thrust

**Answer: D**



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8. The rate of flow of liquids in a tube of radius  $r$  length  $l$ , whose ends are maintained at a pressure difference  $p$  is  $V = \frac{\pi Q p r^4}{\eta l}$ , where  $\eta$  is coefficient of viscosity &  $Q$  is

A. 8

B.  $\frac{1}{8}$

C. 16

D.  $\frac{1}{16}$

**Answer: D**



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9. Critical velocity of the liquid

- A. decreases when radius decreases
- B. increases when radius increases
- C. decreases when density increases
- D. increases when density increases

**Answer: C**



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**10.** Select the correct statement of the following statements for the following situation.

When a steel ball is dropped in oil,.....

A. the ball attains constant velocity after some time

B. the ball slopes

C. the speed of ball will escape on increasing

D. none of the above

**Answer: A**



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**11.** An aeroplane gets its upward lift due to phenomenon described by the

A. archimedes principle

B. bernouli's principle

C. buoyancy

D. pascal law

**Answer: B**



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**12.** The rate of flow of liquid through an orifice of a tank does not depend upon

- A. the size of orifice
- B. density of liquid
- C. height of fluid column
- D. acceleration due to gravity

**Answer: D**



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**13.** A rectangular vessel when full of water, takes 10 min to be emptied through an orifice in its bottom. How much time will it take to be emptied when half filled with water?

A. 9 min

B. 7 min

C. 5 min

D. 3 min

**Answer: B**



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**14.** One large soap bubble of diameter  $D$  breaks into 27 bubbles having surface tension  $T$ , the change in surface energy is

A.  $2\pi TD^2$

B.  $4\pi TD^2$



C.  $\pi TD^2$

D.  $8\pi TD^2$

**Answer: B**



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**15.** Two drops of equal radius coalesce to form a bigger drop. What is ratio of surface energy of bigger drop to smaller one ?

A.  $2^{1/2} : 1$

B. 1 : 1

C.  $2^{2/3} : 1$

D. none of these

**Answer: D**



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**16.** If a mercury drop is divided into 8 equal parts, its total energy

A. remains same

B. becomes twice

C. becomes half

D. becomes 4 times

**Answer: B**



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**17.** If a liquid does not wet glass, its angle of contact is

A. zero

B. acute

C. obtuse

D. right angle

**Answer: B**



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**18.** In a capillary tube experiment, a vertical, 30 cm long capillary tube is dipped in water, the water rises upto a height of 10 cm due to capillary action if this experiment is conducted

in a freely falling elevator , the length of the water exists

A. 10 cm

B. 20 cm

C. 30 cm

D. zero

**Answer: C**



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19. Two capillaries of lengths  $L$   $2L$  and of radii  $R$  and  $2R$  are connected in series the net rate of flow of fluid through them will (rate of the flow through single capillary,  $x = \pi R^4 / 8\eta L$ ) be

A.  $\frac{8}{9}\alpha$

B.  $\frac{9}{8}\alpha$

C.  $\frac{5}{7}\alpha$

D.  $\frac{7}{5}\alpha$

**Answer: A**



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20. The rate of flow of water in a capillary tube of length  $l$  & radius  $r$  is  $V$  the rate of flow in another capillary tube of length  $2l$  radius  $2r$  for same pressure difference would be

A.  $16V$

B.  $9V$

C.  $8V$

D.  $2V$

**Answer: C**



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21. The water from a tap of diameter 1.25 cm with a rate of  $5 \times 10^{-5} m^3 s^{-1}$  the density & coefficient of viscosity of water are  $10^3 kgm^{-3}$  &  $10^{-3}$  pascal the flow of water is

- A. steady with Reynold's number 5100
- B. turbulent with Reynold's number 5100
- C. steady with Reynold's number 3900



D. turbulent with Reynold's number 3900

**Answer: B**



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22. The SI unit of stress is \_\_\_\_\_.

A.  $N/m^2$

B.  $N - m^2$

C. J/K

D. J-K

**Answer: A**



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**23.** The CGS unit of stress is \_\_\_\_\_.

A.  $N / m^2$

B.  $J / m^2$

C.  $\text{dynl} / \text{cm}^2$

D.  $N / \text{cm}^2$

**Answer: C**



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24. Which of the following is dynamic viscosity.

A.  $[M^1 L^1 T^{-1}]$

B.  $[M^1 L^{-1} T^{-1}]$

C.  $[M^1 L^{-2} T^{-2}]$

D.  $[M^1 L^{-2} T^{-2}]$

**Answer: A**



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25. The viscous force the relative motion between the adjacent layers of a fluid in motion which one of the following is absolutely fit ?

A. opposes

B. never affects

C. facilitates

D. may effect under certain conditions

**Answer: A**



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26. The viscosity of a fluid in motion is 1 poise.

What will be its viscosity (in poise) when the fluid is at rest ?

A. 0

B. 0.5

C. 1

D. 2

**Answer: C**



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27. Tensile strain is equal to

- A. Force per unit area
- B. Force per unit Volume
- C. Extension per unit length
- D. Force per unit length

**Answer: C**



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**28.** Substances that elongate considerably and undergo plastic deformation before they break are known as

- A. brittle - substances
- B. breakable substances
- C. ductile substances
- D. elastic substance

**Answer: C**



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**29.** What is an ideal fluid ?

- A. A fluid which has no viscosity
- B. A fluid which is incompressible
- C. A fluid which has no surface tension
- D. All the above

**Answer: D**



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30. A liquid can easily change its shape but a solid can not because

A. the density of a liquid is smaller than that of a solid

B. the forces between the molecules is stronger in solid than in liquids

C. the atoms combine to form bigger molecules in a solid

D. the average separation between the molecules is larger in solids.

**Answer: B**



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**31.** A baker contacting a liquid is kept inside a big closed jar if the air inside the jar is continuously pumped out, the pressure in the liquid near the bottom will

A. increase

B. decrease

C. remain constant

D. first decrease and then increase

**Answer: B**



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**32.** Bernoulli theorem is based on conservation of

A. momentum

B. mass

C. energy

D. angular momentum

**Answer: C**



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**33.** Water is flowing through a long horizontal tube. Let  $P_A$  &  $P_B$  be the pressure at two points A & B of the tube

A.  $P_A$  must be equal to  $P_B$

B.  $P_A$  must be greater than  $P_B$

C.  $P_A$  must be smaller than  $P_B$

D.  $P_A = P_B$  only if the cross-sectional area at A & B are equal.

**Answer: D**



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**34.** A solid floats in a liquid in a partially dipped position.

- A. The solid exerts a force equal to its weight on the liquid
- B. The liquid exerts a force of buoyancy on the solid which is equal to the weight of the solid
- C. The weight of the displaced liquid equals the weight of the solid
- D. All of above

**Answer: D**



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**35.** A solid is completely immersed in a liquid  
the force exerted by the liquid on the solid will

A. increase if it is pushed deeper inside the  
liquid

B. change if its orientation is changed

C. increase if it is taken partially out of  
liquid

D. be in the vertically upward direction

**Answer: D**



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**36.** In a streamline flow

A. the speed of a particle always remain  
same

B. the velocity of a particle always remains  
same



C. the kinetic energies of all the particles

arriving at a given point at the same

D. the moments of the particles arriving at

a given point are different

**Answer: C**



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**37.** Water flows through 2 identical tubes A & B,

A volume  $V_0$  of water passes through the tube A

&  $2V_0$  throw B in a given time. Which of the following may be correct ?

- A. Flow in both the tubes are steady
- B. Flow in both the tubes are turbulent
- C. Flow is steady in A but turbulent in B
- D. All the above

**Answer: D**



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**38.** Water is flowing in streamline motion through a tube with its axis horizontal consider two point A & B in the tube at the same horizontal levels

A. the pressure at A & B are equal for any shape of the tube

B. the pressure are never equal

C. the pressure are equal of the tube has a uniform cross section

D. the pressure are equal even in the tube  
has a non-uniform cross section

**Answer: C**



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**39.** There is a small hole near the bottom of an open tank filled with a liquid the speed of water ejected does not depend on

A. area of the hole

B. density of liquid

C. acceleration due to gravity

D. both a & b

**Answer: D**



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**40.** When a metal wire is stretched by a load the fractional change in its volume  $W/V$  is proportional to

A.  $\frac{\Delta l}{l}$

B.  $\left(\frac{\Delta l}{l}\right)^2$

C.  $\sqrt{\frac{\Delta l}{l}}^2$

D. none of these

**Answer: A**



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**41.** When water droplets merge to form a bigger drop

A. energy is liberated

B. energy is absorbed

C. energy is neither liberated nor absorbed

D. energy may either be liberated or absorbed depending on the nature of the liquid.

**Answer: A**



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42. Air is pushed into a soap bubble of radius  $r$  to double its radius, of the surface tension of the soap solution is  $S$ , the work done in process is

A.  $8\pi r^2 S$

B.  $12\pi r^2 S$

C.  $16\pi r^2 S$

D.  $24\pi r^2 S$

**Answer: D**



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**43.** If more air is pushed in a soap bubble, the pressure in it will

- A. decreases
- B. increases
- C. remains same
- D. become zero

**Answer: A**



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44. If two soap bubbles of different radii are connected by a tube, then

A. air flows from bigger to the smaller bubble till the sizes becomes equal

B. air flows bigger bubble to the smaller bubble till the size are interchanged

C. air flows from the smaller bubble to the bigger

D. there is number flow of air

**Answer: C**



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**45.** The excess pressure inside a soap bubble is twice the excess pressure inside a second soap bubble, the volume of the first bubble is  $n$  times the volume of the second where  $n$  is

A. 4

B. 2

C. 1

D. 0.125

**Answer: D**



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**46.** Water rises in a vertical capillary tube upto a length of 10 cm if the tube is inclined at  $45^\circ$ , the length of water risen will be

A. 10 cm

B.  $10\sqrt{2}cm$

C.  $\frac{10}{\sqrt{2cm}}$

D. none of these

**Answer: B**



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**47.** Viscosity is a property of

A. liquids only

B. solid only

C. solids & liquids only

D. liquids & gases only

**Answer: D**



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**48.** The force of viscosity is

A. electro magnetic

B. gravitational

C. nuclear

D. weak

**Answer: A**



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**49.** The viscous force acting between 2 layers of a liquid is given by  $\frac{F}{A} = \eta \frac{dv}{dz}$  = This F/A may be called

- A. pressure
- B. longitudinal stress
- C. tangential stress
- D. volume stress

**Answer: C**



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**50.** A raindrop falls near the surface of the earth with almost uniform velocity because

A. its weight is negligible

B. the force of surface tension balances its weight



C. the force of viscosity of air balances its weight

D. the drops are charged and atmospheric electric field balances its weight

**Answer: C**



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**51.** A piece of wood is taken deep inside a long column of water & released it will move up.

A. with a constant upward acceleration

B. with decreasing upward acceleration

C. with a deceleration

D. there will be uniform velocity

**Answer: B**



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**52.** The rise of a liquid in a capillary tube depends on

A. the material

B. the length

C. the inner radius of the tube

D. All the above

**Answer: A**



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**53.** The contact angle between a solid & a liquid is a property of

A. the material of solid & liquid

B. material of container

C. shape of solid

D. mass of solid

**Answer: A**



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**54.** The properties of a surface are different from those of the bulk liquid because the surface molecules are

A. are smaller than other molecules

B. acquire charge due to collision from air molecules

C. find different type of molecules in their range of influence.

D. feel a net force in different direction

**Answer: C**



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55. When a capillary tube is dipped into a liquid the liquid neither rises nor falls in the capillary

A. the surface tension of liquid must be zero

B. contact angle must be  $90^\circ$

C. surface tension may be one

D. contact angle may be  $90^\circ$  (or) zero

**Answer: D**





56. A liquid is contained in a vertical tube a semicircular cross section the contact angle is zero. The force of surface tension on the curved part & on the flat part are in ratio

A.  $1:1$

B.  $1:2$

C.  $\pi:2$

D.  $2:\pi$

**Answer: C**



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## Additional Questions iii Fill In The Blanks

1. A steel ball is dropped in oil then the ball attains \_\_\_\_\_ after some time.

- A. constant force
- B. constant velocity
- C. varying force



D. varying velocity

**Answer: B**



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2. The CGS unit of stress is \_\_\_\_\_.

A.  $N / m^2$

B.  $N / Cm^2$

C.  $\text{dyne} / m^2$

D.  $\text{dyne} / cm^2$

**Answer: D**



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**3. The Dimensional formula for dynamic viscosity is \_\_\_\_\_.**

A.  $M^{-1}LT^{-1}$

B.  $MLT^{-1}$

C.  $ML^{-1}T^{-1}$

D.  $ML^2T^{-1}$

**Answer: C**



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4. The SI unit of stress is \_\_\_\_\_.

A.  $Nm^2$

B.  $N/m^2$

C. J/kg

D. J/K

**Answer: B**



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5. Energy due to which molecules held at a fixed position vibrate is know as \_\_\_\_\_.

- A. External Energy
- B. Internal Energy
- C. Pressure Energy
- D. Chemical Energy

**Answer: B**



6. The boiling point of Mercury is \_\_\_\_\_.

A.  $157^{\circ} C$

B.  $167^{\circ} C$

C.  $735^{\circ} C$

D.  $357^{\circ} C$

**Answer: D**



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7. The expression for Stoke's formula \_\_\_\_\_.

A.  $\delta a \eta v$

B.  $\frac{6\pi a}{\eta v}$

C.  $6\pi a \eta v$

D.  $\frac{6\pi a \eta}{v}$

**Answer: C**



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8. Tensile strain is equal to

A. Force/Unit Area

B. Force / Unit Volume

C. Extension /Unit Length

D. Force/ Unit Length

**Answer: C**



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9. Bernoulli theorem is based on conservation of

A. Momentum

B. Mass

C. Energy

D. Angular Momentum

**Answer: C**



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10. When water droplets merge to form a bigger drop energy is \_\_\_\_\_.

A. liberated

B. absorbed

C. either liberated or absorbed

D. neither liberated nor absorbed

**Answer: A**



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# Additional Questions Iv Choose The Odd One Out

1. energy supplied to convert unit mass of substance from solid to liquid state at its melting point is called

A. Latent heat of fusion

B. Evaporation

C. Bunsen Burner

D. Acrofoil lift

**Answer: A**



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**2. Choose the odd one out .**

- A. Absorption of ink
- B. Cotton dress
- C. Rise of oil through wick
- D. straw

**Answer: D**



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3. Choose the odd one out .

A. Pressure Energy

B. Kinetic Energy

C. Potential Energy

D. Elastic Potential Energy

**Answer: D**



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## Additional Questions V Choose The Correct Pair

1. Choose the correct pair

A. Stocke's lae - floatation of clouds

B. Hooke's law - Laminar flow

C. Reynold's number - stress-strain relation

- ship

D. Terminal velocity - changing velocity

**Answer: A**



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2. Choose the correct pair

A. Buoyant force - Volume of liquid displaced

B. Sinking of submarine - negative buoyancys

C. Pascal's law - applied for solids to

D. Pressure -  $gh$

**Answer: B**



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## Additional Questions Vi Choose The Incorrect Pair

1. Choose the incorrect pair :

A. Pressure -  $\frac{2T}{R}$

B. Surface Tension -  $\frac{E}{A}$

C. Equation of continuity -  $\frac{a}{v}$

## D. Pressure Energy - PV

**Answer: C**



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**2. Choose the incorrect pair**

A. Viscous force- force between layers of

liquid

B. Adhesive force - sticking force

C. Cohesive force - Water on lotus leaf



D. Surface energy - Tension

**Answer: D**



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## Additional Questions VII Assertion Reason

1. Latent heat of ice is

A. Less than external latent heat of fusion

B. Equal to external latent heat of fusion

C. More than external latent heat of fusion

D. Twice the external latent heat of fusion

**Answer: C**



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2. At a certain temperature, hydrogen molecules have r.m.s. velocity of 3 km/s. what is the r.m.s velocity of the oxygen molecules at the same temperature? \_\_\_\_\_ km/s

A. 0.25

B. 0.5

C. 0.75

D. 6

**Answer: c**



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**Additional Questions Viii Choose The Correct Or  
Incorrec T Statements**

1. (I) Poission's Ratio tells us about the ratio of relative contraction to relative expansion.

(II) Strain has no unit.

Which one is correct statement ?

A. I only

B. II only

C. Both are correct

D. None

**Answer: C**



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2. (I) If a body does not regain its original shape and size after removing the deforming force is called plasticity.

(II) Example for plasticity is wood.

Which one is correct statement ?

A. I only

B. II only

C. Both are correct

D. None

**Answer: A**



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**3. (I) Example for Elasticity is Metals.**

**(II) Liquids have Elastic Property.**

**Which one is incorrect statement ?**

**A. I only**

**B. II only**

**C. Both are correct**

**D. None**

**Answer: B**



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4. (I) For Turbulent flow  $R_c < 2000$ .

(II) Some Insects float on water because of surface tension.

Which one is incorrect statement ?

A. I only

B. II only

C. Both are correct

D. None

**Answer: A**



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**Very Short Answer**

**1. Define compressibility.**



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2. Define Relative density or specific gravity.



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3. In case of emergency, a vacuum brake is used to stop the train. How does this brake work?



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4. On a hot day, a car is left in sunlight with all windows closed. Explain why it is considerably

warmer than outside, after sometime.



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5. What is an ductile materials ?



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6. Is stress a vector quantity ?



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7. The shear modulus for ideal liquid is zero.

Why ?



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8. What is Bulk modulus for a perfectly rigid

body ?



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9. Why does the velocity increase when liquid

flowing in a wider tube enters a narrow tube ?



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**10.** Name the three types of thermal expansion.



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## Short Answer Questions

**1.** How do you differentiate solid, liquid and gas ?



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**2. Write any three applications of viscosity.**



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**3. Which one of these is more elastic, steel or rubber ? Why ?**



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4. A capillary tube is dipped first in cold water and then in hot water. Comment on the capillary rise in the second case.



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5. Stress-Strain curve for two wires of material A and B are as shown in figure.



Which material is more ductile ?



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6. Stress-Strain curve for two wires of material A and B are as shown in figure.



Which material has greater value of young's modulus?

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7. Stress-Strain curve for two wires of material A and B are as shown in figure.



Which of the two is stronger material ?



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**8.** Stress-Strain curve for two wires of material

A and B are as shown in figure.



Which material is more brittle ?



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**9.** Explain why :

a body with large reflectivity is a poor emitter.



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**10.** Explain why :

a brass tumbler feels much colder than wooden tray on a chilly day.



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1. Write the Applications of elasticity.



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2. List few applications of surface tension.



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3. Write any two applications of Bernoulli's Theorem.





4. the temperature at which the r.m.s. velocity of  $H^2$  becomes escape velocity from the earth is,

A.  $10059^\circ C$

B. 10059 K

C.  $10332^\circ C$

D. 10332 K

**Answer: b**



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## Numerical Problems

1. The poisson ratio of a material is 0.5 if a force is applied to a wire of this material, there is a decrease in the cross sectional area by 4% what is the percentage increases in the length.



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2. For a given material, the young's modulus is 2.4 times that of rigidity modulus. What is its poisson's ratio ?



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3. The upper end of a wire of radius 4mm & length 100 cm is clamped and its other end is twisted through an angle of  $30^\circ$  the angle of shear is.



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4. A wire of length  $L$  and cross section  $A$  is made of material of young's modulus  $y$ . It is stretched by an amount  $x$ . What is the work done ?



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5. The average depth of indian ocean is about 3000 m. What is the fractional compression,  $\Delta V / V$  of water at the bottom of ocean ?

(bulk modulus of water =  $2.2 \times 10^9 Nm^{-2}$  &  
 $g = 10ms^{-2}$ )



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6. A piece of solid weight 120 g in air, 80g in water & 60g in liquid find the relative density of solid & liquid.



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7. A body floats in water with 40% of its volume outside water. When the same body floats in oil 60% of its volume remains outside oil. What is the relative density of the oil ?



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8. A soap bubble in vacuum has a radius of 3cm & another soap bubble in vacuum has a radius of 4 cm if the 2 bubbles coalesce under



isothermal conditions then what is radius of the new bubble ?



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9. An air bubble of radius  $r$  in water is at a depth  $h$  below the water surface at some instant if  $P$  is atmospheric pressure and  $d$  &  $T$  are the density and surface tension of water, what is the pressure inside the bubble ?



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10. If a ball of steel (density  $\rho = 7.8 \text{ g cm}^{-3}$ ) attains a terminal velocity of  $10 \text{ cm s}^{-1}$  when falling in a tank of water (coefficient of viscosity) water  $= 8.5 \times 10^{-4} \text{ Pa s}$ . What will the terminal velocity in glycerine ( $\rho = 1.2 \text{ g cm}^{-3}$ ,  $\eta = 13.2 \text{ Pa s}$ ) be ?



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11.  $0.1 \text{ m}^3$  of water at  $80^\circ \text{ C}$  is mixed with  $0.3 \text{ m}^3$  of water at  $60^\circ \text{ C}$ . What is the final temperature of the mixture ?



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**12.** The terminal velocity of a tiny droplet is  $V$ .  $N$  number of such identical droplets combine together forming a bigger drop. Find the terminal velocity of the bigger drop.



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**13.** Two spherical soap bubble coalesce. If  $V$  be the change in volume of the contained air,  $A$  is

the change in total surface area then show that  $3PV + 4AT = 0$  Where T is the surface tension and P is atmospheric pressure.



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## Creative Questions Hots

1. A wire elongates by 1mm when a load  $w$  is hanged from it if the wire goes over a pulley and 2 weights  $w$  each are hung at the 2 ends. What will be the elongation of wire in mm?



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2. A metallic wire is stretched by suspending weight from it if  $\alpha$  is the longitudinal strain &  $y$  is the young's modulus, show that elastic potential energy per unit volume is given by  $\frac{1}{2}y\alpha^2$ .



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3. The graph shows the extension ( $\Delta l$ ) of a wire of length 1m suspended from the top of a

roof at one end with a load  $W$  connected to other end if the cross sectional area of wire is  $10^{-6}m^2$ , calculate the young's modulus of the material of the wire.



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4. A light rod of length 2m is suspended horizontally by means of 2 vertical wires of equal lengths tied to its ends. One of the wire is made of steel & is of cross section  $A_1 = 0.1cm^2$  & other of brass & is of cross

section  $A_2 = 0.2\text{cm}^2$ , find out the position along the rod at which a weight must be suspended to produce (i) equal stresses in both wires, (ii) equal strains in both wires for steel,  $y = 20 \times 10^{10}\text{Nm}^{-2}$  & for brass  $y = 10 \times 10^{10}\text{Nm}^{-2}$ .



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5. A thin rod of negligible mass and area of cross sectional  $4 \times 10^{-6}\text{m}^2$ , suspended vertically from one end has a length of 0.5 at

$100^{\circ}C$  the rod is cooled at  $0^{\circ}C$ , but prevented from contracting by attaching a mass at lower end. Find (i) mass (ii) the energy stored in rod. Given for rod,  $y = 10^{11} Nm^{-2}$ , coefficient of linear expansion  $= 10^{-5} k^{-1}$  &  $g = 10ms^{-2}$ .



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6. What is the nature of intermolecular forces ?



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7. What is the origin of intermolecular force ?



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8. What is the origin of intermolecular force ?



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9. Are the intermolecular force involved the formation of liquid & solids different in nature

? It yes how ?



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**10.** What is a perfectly elastic body ? Give exmample ?



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**11.** What does slope of stress versus strain graph give ?



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**12.** How does young's modulus change with the rise of temperature ?



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**13.** Why are springs made of steel & not of copper ?



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**14.** State the 2 factors on which modulus of elastic depends.



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**15.** Possible to double the length of metallic wire by apply in a force over it ?



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16. A wire fixed at the upper & stretches by length  $l$  by applying a force  $F$ . What is the work done by stretching the wire ?

A.  $2Fl$

B.  $Fl$

C.  $F/2l$

D.  $Fl/2$

**Answer:**



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17. A wire suspended vertically from one of its end is stretched by attaching a weight of 200 N to the lower end. The weight stretches the wire by 1mm. Find the elastic energy in the wire.



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**Value Based Questions**

1. the r.m.s. velocity of the molecules of a certain diatomic gas is found to be 1.6 Km/sec.

the gas is



**Answer: a**



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2. Real gases show mark able deviation from that of ideal gas behavior at

- A. High temperature and low pressure
- B. Low temperature and high pressure
- C. High temperature and high pressure
- D. Low temperature and low pressure

**Answer: b**



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3. The cube of the radius of the orbit of a geostationary satellite will be

A.  $r^2g / w$

B.  $R^2w^2 / g$

C.  $RG w^2$

D.  $R^2g / w^2$

**Answer: d**



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4. A king ordered his Goldsmith to make a crown which should be of pure gold. SO the goldsmith to made a crown of pure gold & brought it to king. but the king was not contended with the crown as he suspected whether it is made of pure gold or not. So he called for Archimedes and asked him to check whether it is a pure gold crowm. Archimedes was serious about this and went his home thinking how to solve this issue. He wanted to take bath, all of a sudden the jumped on to the bath tyb. Water inside the tub had

splashed out of it. An idea struck him suddenly he went running naked straight from his bathroom to the king's palace shouting Eureka Eureka on the road side. From this what do we infer ?

How Archimedes would have solved this problem ?



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Eureka Eureka on the road side. From this what do we infer ?

State Archimedes principle.



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