



PHYSICS

BOOKS - PREMIERS PUBLISHERS

PROPERTIES OF MATTER

Evaluation Textbook Questions Answers 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. The load-elongation graph of three wires of the same material are shown in figure. Which of the following wire is the thickest?



A. wire 1

B. wire 2

C. wire 3

D. all of them have same thickness

Answer: A



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4. 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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5. 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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6. 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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7. 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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8. 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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9. Which of the following is not a scalar?

A. viscosity

B. surface tension

C. pressure

D. stress

Answer: D



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10. 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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11. 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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12. 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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13. 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 mm

Answer: A



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14. 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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15. 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 (ms^{-1}) at a point where the diameter of the pipe 10 cm is:

A. 0.0025 m/s

B. 0.25 m/s

C. 0.025 m

D. 0.5 m/s

Answer: B



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D. 2^5

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C. 8

D. 16

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Answer: C



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C. 0.5

D. infinity

Answer: D



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C. pressure

D. stress

Answer: D



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

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Answer: C



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B. length = 200 cm, diameter = 1 mm

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D. length = 200 cm, diameter = 3 mm

Answer: A



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

A. viscosity

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C. density

D. angle of contact between the surface
and the liquid

Answer: D



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30. 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 (ms^{-1}) at a point where the diameter of the pipe 10 cm is:

A. 0.0025 m/s

B. 0.25 m/s

C. 0.025 m

D. 0.5 m/s

Answer: B



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**Evaluation Textbook Questions Answers Short
Answer Questions**

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 the 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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30. Define stress and strain.



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Watch Video Solution

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



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45. Define terminal velocity.



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46. Write down the expression for the Stoke's force and explain the symbols involved in it.



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47. State Bernoulli's theorem.



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



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49. Two streamlines cannot cross each other.

Why ?



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[Watch Video Solution](#)

51. How is surface tension related to surface energy?



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



Watch Video Solution

53. Distinguish between cohesive and adhesive forces.



Watch Video Solution

54. What are the factors affecting the rate of enzyme reaction?



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



Watch Video Solution

56. What do you mean by capillarity or capillary action ?



Watch Video Solution

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Evaluation Textbook Questions Answers Long Answer Question

1. State Hooke's law of elasticity.



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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 expression 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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14. State Hooke's law and verify it with the help of an experiment.



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15. Explain the different types of modulus of elasticity.



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



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17. Derive an expression for excess of pressure in a liquid drop.



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18. State Pascal's law in fluids.



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19. State and prove Archimedes principle.



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



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21. Derive by the method of dimensions, an expression for the volume of a liquid flowing out per second through a narrow pipe. Assume that the rate of flow of liquid depends on

(i) the coefficient of viscosity η of the liquid

(ii) the radius 'r' of the pipe and

(iii) the pressure gradient $\frac{P}{l}$ along the pipe.

Take $K = \frac{\pi}{8}$.



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22. Deduce expressions for the excess pressure inside a :

(i) liquid drop, (ii) soap bubble.



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23. What is capillarity? Derive an expression for the ascent of liquid in a capillary.



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



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25. State and prove Bernoulli's theorem.



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26. The velocity of liquid flowing through a tube at certain distance from the axis of tube



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[Questions](#)

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[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 less than radius of both 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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6. 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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7. Why two holes are made to empty an oil tin ?



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



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



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



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Other Important Question Answers Multiple Choice Questions

1. In solids interatomic forces are:

A. totally repulsive

B. totally attractive

C. both (a) and (b)

D. none of these

Answer: C



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2. Two wires A and B are of same material. Their lengths are in the ratio 1:2 and diameters are in the ratio 2:1. When stretched by forces F_A and F_B respectively, they get equal increase in their lengths. Then the ratio F_A / F_B should be:

A. 1:1

B. 1:2

C. 8:1

D. 2:1

Answer: C



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3. There are two wires of same material and same length while the diameter of second wire is two times the diameter of first wire, then the ratio of extension produced in the wire by applying same load will be:

A. 2 : 1

B. 1 : 2

C. 1:1

D. 4:1

Answer: D



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4. The breaking force for a wire of diameter D of a material is F . The breaking force for a wire of the same material of radius D is:

A. F

B. $4F$

C. $2F$

D. $F/4$

Answer: B



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5. Match the physical quantities given in column I and column II.

| Column I | Column II |
|-----------------|------------------------------------------------|
| 1. Plastic body | (i) $ML^{-1}T^{-2}$ |
| 2. Elastic body | (ii) Stress \propto strain |
| 3. Stress | (iii) Stress $\propto \frac{1}{\text{strain}}$ |
| 4. Hooke's Law | (iv) Steel rope |
| | (v) Glass |
| | (vi) ML^2T^{-2} |

A. 1-(i), 2-(iii), 3-(iv), 4-(ii)

B. 1-(iii), 2-(vi), 3-(i), 4-(v)

C. 1-(vi), 2-(iv), 3-(i), 4-(iv)

D. 1-(v), 2-(iv), 3-(i), 4-(ii)

Answer: D



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6. The relation between Young's modulus (Y) bulk modulus (K) and modulus of elasticity (η)

is:

A. $\frac{1}{Y} = \frac{1}{K} = \frac{3}{\eta}$

B. $\frac{3}{Y} = \frac{1}{\eta} + \frac{1}{3K}$

C. $\frac{1}{\eta} = \frac{3}{Y} + \frac{1}{3K}$

D. $\frac{1}{Y} = \frac{3}{\eta} + \frac{1}{3K}$

Answer: B



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7. According to Hooke's law of elasticity, if stress is increased, the ratio of stress to strain:

A. increases

B. decreases

C. become zero

D. remains constant

Answer: D





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8. Select the odd man out from the following physical quantities.

A. Stress

B. Young's modulus

C. Capillarity

D. Strain

Answer: C



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9. A stretched rubber has:

- A. increased potential energy
- B. increased kinetic energy
- C. decreased potential energy
- D. decreased kinetic energy

Answer: A



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10. Which of the following affects the elasticity of a substances?

- A. change in temperature
- B. impurity in substance
- C. hammering and annealing
- D. all of these

Answer: D



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11. The length of a metal wire is l_1 when the tension in it is T_1 and is l_2 when the tension is T_2 . The natural length of the wire is:

A. $\sqrt{l_1 l_2}$

B. $\frac{l_1 + l_2}{2}$

C. $\frac{l_1 T_2 - l_2 T_1}{T_2 - T_1}$

D. $\frac{l_1 T_2 + l_2 T_1}{T_1 + T_2}$

Answer: C



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12. Assertion: The size of a hydrogen balloon increases as it rises in air.

Reason: The material of the balloon can be easily stretched.

Choose the correct option:

A. Both assertion and reason are true and reason explains assertions correctly.

B. Both assertion and reason are true and reason does not explain assertion correctly.

C. Assertion is true but reason is false.

D. Assertion is false but reason is true.

Answer: B



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13. A man is sitting in a boat, which is floating on a pond. If the man drinks some water from the pond, the level of water in the pond:

A. increases

B. decreases

C. remains unchanged

D. may increase or decrease depending on
the weight of the man.

Answer: C



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14. A thin liquid film formed between a U-shaped wire and a light slider supports a weight of $1.5 \times 10^{-2} N$. The length of the

slider is 30 cm and its weight is negligible. The surface tension of the liquid film is:



A. a) 0.0125 Nm^{-1}

B. b) 0.025 Nm^{-1}

C. c) 0.1 Nm^{-1}

D. d) 0.05 Nm^{-1}

Answer: B



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15. An object is flowing through the liquid. The viscous damping force acting on it is proportional to the velocity.

Select the correct statement of the following.

A. Dimension of constant of proportionality are $ML^{-2}T^2$

B. Dimension of constant of proportionality are MLT^{-1}

C. Dimension of constant of proportionality are ML^0T^{-1}

D. Dimension of constant of

proportionality are $M^0 LT^{-1}$

Answer: C

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16. From the following figures, the correct observation is:



A



B

- A. the pressure on the bottom of the tank A is smaller than that at the bottom of B
- B. the pressure on the bottom of tank A is greater than that at the bottom of B
- C. the pressure depends on the shape of the container
- D. the pressure on the bottoms of A and B is the same.

Answer: D



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

A. Viscosity

B. Pressure

C. Surface tension

D. Archimede's upward thrust

Answer: D



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18. Which one of the following pairs of physical quantities do not have the same dimensions?

A. Work and energy

B. Strain and angle

C. Stress and pressure

D. Tension and surface tension.

Answer: D



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19. Which one is not a dimensional number?

A. Acceleration due to gravity

B. Velocity of light

C. Surface tension of water

D. Reynold's number

Answer: D



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20. Select the correct statement of the following statements.

The Reynold's number for fluid flow in a pipe is:

- A. independent of the velocity of the fluid
- B. dependent of the viscosity of the fluid
- C. not depending on the length of the pipe
- D. independent of the diameter of the pipe

Answer: C



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21. Which one of the following statements is a correct statement?

A. Critical velocity of the liquid decreases

when density increases

B. Critical velocity of the liquid increases

when density increases

C. Critical velocity of the liquid decreases

when radius decreases

D. Critical velocity of the liquid increases
when radius increases

Answer: A



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22. The approximate depth of an ocean is 2700m. The compressibility of water is 45.4×10^{-11} Pa and density of water is 10^3 kg. What fractional compression of water will be obtained the bottom of the ocean?

A. 1.22×10^{-2}

B. 1.4×10^{-2}

C. 0.8×10^{-2}

D. 1×10^{-2}

Answer: A



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23. Two rain drops falling through air have radii in the ratio 1:2, They will have terminal velocity in the ratio:

A. 4:1

B. 1:4

C. 2:1

D. 1:2

Answer: B



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24. Two capillaries of radii r_1 and r_2 and lengths l_1 and l_2 respectively are in series. A liquid of viscosity η is flowing through the

combination under a pressure difference P .

What is the rate of volume flow of liquid?

A. $\frac{8\pi P}{\eta} \left(\frac{l_1}{r_1^4} + \frac{l_2}{r_2^4} \right)$

B. $\frac{\pi P}{8\eta} \left(\frac{r_1^4}{l_1} + \frac{r_2^4}{l_2} \right)^{-1}$

C. $\frac{8\pi P}{\eta} \left(\frac{l_1}{r_1^4} + \frac{l_2}{r_2^4} \right)^{-1}$

D. $\frac{\pi P}{8\eta} \left(\frac{l_1}{r_1^4} + \frac{l_2}{r_2^4} \right)^{-1}$

Answer: D



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25. Assertion: The parts of a machine are jammed in winter.

Reason: The viscosity of lubricants used in machines increases at low temperature.

Select the correct statement of the following statements.

A. Both assertion and reason are true.

B. Both assertion and reason are true and reason explains assertion correctly.

C. Both assertion and reason are true and reason does not explain assertion

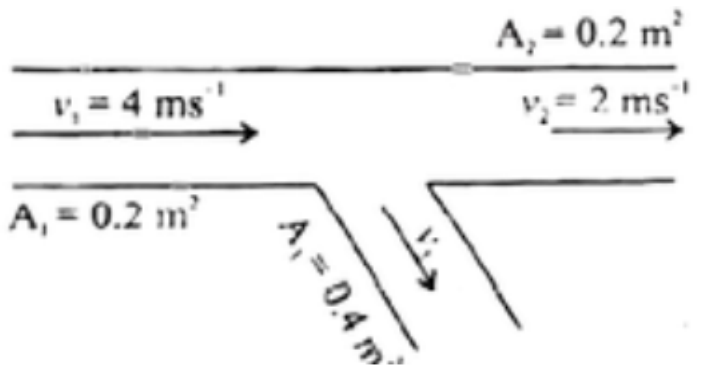
correctly.

D. Both assertion and reason are false.

Answer: B

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26. In the figure, the velocity v_3 will be:



A. zero

B. 4 ms^{-1}

C. 1 ms^{-1}

D. 3 ms^{-1}

Answer: C



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27. Blood is flowing at the rate of $200 \text{ cm}^3 \text{ s}^{-1}$ in a capillary of cross sectional area 0.5 m^2 .

The velocity of flow in mm s^{-1} is:

A. 0.1

B. 0.2

C. 0.3

D. 0.4

Answer: D



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28. The system shown in figure allowed to fall freely under gravity. The upthrust on the

immersed body is:



A. zero

B. infinite

C. equal to weight of liquid displaced

D. greater than the weight of liquid
displaced

Answer: A



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29. A lead shot of 1 mm diameter falls through a long column of glycerin. The variation of its velocity v with distance covered s is represented by:

A. 

B. 

C. 

D. 

Answer: A



Watch Video Solution

30. 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. 2.4π

B. 4.8π

C. 1.2π

D. 7.2π

Answer: B



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31. Which one of the following is not a dimensional number?

A. Surface tension of water

B. Velocity of height

C. Reynold's number

D. Acceleration due to gravity.

Answer: C



32. Select the incorrect statement of the following statements.

A. Reynold's number is used to find the nature of flow of liquid.

B. Poisson's ratio has no dimensions

C. Strain has no units.

D. Scent sprayer works on the basis of Pascal's law.

Answer: D



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33. A spherical ball is dropped in a long column of viscous liquid, which of the following graphs represent the variation of:

(i) gravitational force with time

(ii) viscous force with time

(iii) net force acting on the ball with time?



A. Q, R, P

B. R, Q, P

C. P, Q, R

D. R, P, Q

Answer: C



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34. Select the correct pair of reasons for the following statements.

Critical velocity of liquid decreases when:

- A. Density of liquid increases and diameter of the pipe increases
- B. Density of liquid decreases and diameter of the pipe increases.
- C. Volume of liquid decreases and diameter of the pipe decreases.
- D. Velocity of liquid decreases and radius of the pipe increases.

Answer: A



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35. Spherical balls of radius 'R' are falling in a viscous fluid of viscosity ' η ' with a velocity 'v'. The retarding viscous force acting on the spherical ball is:

- A. inversely proportional to both radius 'R' and velocity 'v'
- B. directly proportional to both radius 'R' and velocity 'v'

C. directly proportional to 'R' but inversely proportional to 'v'

D. inversely proportional to 'R' but directly proportional to velocity 'v'.

Answer: B



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36. The relative velocity of two parallel layers of water is 8 cm/sec. If the perpendicular

distance between the layers is 0.1cm. The velocity gradient will be:

A. 80/sec

B. 60/sec

C. 50/sec

D. 40/sec

Answer: A



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37. Choose the odd law from the following laws, equation and theorem.

A. Stoke's law

B. Hooke's law

C. Poiseuille's equation

D. Bernoulli's theorem

Answer: B



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38. Water rises in a capillary tube to a height of 2.0 cm. In another capillary tube whose radius is one third of it, how much the water will rise?

A. 3 cm

B. 5 cm

C. 9 cm

D. 6 cm

Answer: D



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39. Select the correct statement of the following statements for the following situation.

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

A. the ball stops.

B. the speed of the ball will increase.

C. the speed of the ball will become zero.

D. the ball attains a constant velocity after sometime.

Answer: D



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40. A uniform cube is subjected to volume compression. If each side is decreased by 1%, then bulk strain is:

- A. 0.01
- B. 0.02
- C. 0.06
- D. 0.03

Answer: D



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41. Assertion: The shape of an automobile is so designed that its front resembles the streamline pattern of the fluid through which it moves.

Reason: The resistance offered by the fluid is maximum.

Select the correct option from the following options.

A. Both assertion and reason are true and reason explains assertions correctly.

B. Both assertion and reason are true and reason does not explain assertion correctly.

C. Both assertion and reason are false.

D. Both assertion and reason are true.

Answer: C



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

A. acute

B. zero

C. right angle

D. obtuse

Answer: D



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43. Assertion: Soap bubble is larger than a water drop.

Reason: Surface tension of soap bubble is less than that of water.

Choose the correct choice of the following choices.

A. Both assertion and reason are true and reason explains assertions correctly.

B. Both assertion and reason are true and reason does not explain assertion correctly.

C. Both assertion and reason are true.

D. Both assertion and reason are false.

Answer: A



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44. Surface tension of water is 0.072 Nm^{-1} .

The excess pressure inside a water drop of diameter 1.2 mm is:

A. 240 Nm^{-1}

B. 72 Nm^{-1}

C. 60 Nm^{-1}

D. 120 Nm^{-1}

Answer: A



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

A. temperature of the liquid

B. viscosity of the liquid

C. thickness of the container

D. diameter of container

Answer: A



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46. A drop of liquid of diameter 2.8 mm breaks up into 125 identical drops. The change in energy is nearly ($s = 75$ dyne/cm).

A. 19 erg

B. zero

C. 74 erg

D. 46 erg

Answer: C



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47. Angle of contact of a liquid with a solid depends on:

A. solid only

B. liquid only

C. both solid and liquid only

D. orientation of the solid surface in liquid

Answer: C



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48. Select the correct reason for,

Small droplets of a liquid are usually more

spherical in shape than larger drops of the same liquid because:

A. force of surface tension is equal and opposite to the force of gravity.

B. force of surface tension predominates the force of gravity.

C. force of gravity and force of surface tension act in the same direction and are equal.

D. force of gravity predominates the force of surface tension.

Answer: B



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49. A thread is tied slightly loose to a wire frame as in Figure and the frame is dipped into a soap solution and taken out. The frame is completely covered with the film.

Which of the following is correct with

reference to the following situation.

When the portion A is punctured with a pin, the thread:



- A. becomes convex towards A
- B. becomes concave towards A
- C. remains in the initial position
- D. either (a) or (b) depending on the size of A with respect to B.

Answer: B





50. In a capillary tube, water rises to 3 mm. The height of water that will rise in another capillary tube having one-third radius of the first is:

A. 1 mm

B. 9 mm

C. 3 mm

D. 6 mm

Answer: B



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51. The amount of the work done in blowing a soap bubble of radius r and surface tension σ , is:

A. $4\pi r^2 \sigma$

B. $6\pi r^2 \sigma$

C. $8\pi r^2 \sigma$

D. σ

Answer: C



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

- A. Archimede's principle
- B. Bernoulli's principle
- C. Buoyancy principle
- D. Pascal law

Answer: B



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53. In old age arteries carrying blood in the human body become narrow resulting in an increase in the blood pressure. This follows from:

- A. Pascal's law
- B. Bernoulli's principle
- C. Archimede's principle

D. Stoke's law

Answer: B



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54. Bernoulli's equation for steady, non-viscous, incompressible flow expresses the:

A. conservation of density

B. conservation of momentum

C. conservation of energy

D. conservation of angular momentum

Answer: C



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55. Water flows steadily through a horizontal pipe of variable cross-section. If the pressure of water is P at a point where flow speed is v , the pressure at another point where the flow speed is $2v$, is (Take density of water as ρ):

A. $P - \frac{\rho v^2}{2}$

B. $P = \frac{3\rho v^2}{2}$

C. $P = \rho v^2$

D. $P = \frac{3\rho v^2}{4}$

Answer: B



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56. Calculate the force required to separate the glass plate of area of 10cm^2 with a film of water 0.05 mm. (Surface tension of water is $70 \times 10^{-3} \text{N/m}$)

A. 14 N

B. 28 N

C. 56 N

D. 72 N

Answer: B



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57. A cylinder of height 20 m is completely filled with water. The velocity of efflux of water

(in ms^{-1}) through a small hole on the side of the cylinder near its bottom is: $[g = 10m / s^2]$

- A. 10 m/s
- B. 20 m/s
- C. 40 m/s
- D. 5 m/s

Answer: B



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58. A wind with speed 40 m/s blows parallel to the roof of a house. The area of the roof is 250 m^2 . Assuming that the pressure inside the house is atmospheric pressure, the force exerted by the wind on the roof and the direction of the force will be:

$$(\rho_{\text{air}} = 1.2 \text{ kg/m}^3)$$

A. $2.4 \times 10^5 \text{ N}$, upwards

B. $2.4 \times 10^5 \text{ N}$, downwards

C. $4.8 \times 10^5 \text{ N}$, downwards

D. $4.8 \times 10^5 N$, upwards

Answer: A



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59. Four wires of the same material are stretched by the same load. The dimensions are given below. Which one of them will elongate the most?

A. Length 100 cm, diameter 1 cm

B. Length 200 cm, diameter 2 cm

C. Length 300 cm, diameter 3 cm

D. Length 400 cm, diameter 0.5 cm

Answer: D



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60. Water is flowing through a tube of radius r with velocity v . If the tube is connected to another tube of radius $\frac{r}{2}$. Then select a

correct statement from the following statements.

A. Velocity of water in the second tube is v .

B. Velocity of water in the second tube is $2v$.

C. Velocity of water in the second tube is $\frac{v}{2}$.

D. Velocity of water in the second tube is $4v$.

Answer: D



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61. Which one of the following statements is wrong?

A. Young's modulus for a perfectly rigid body is zero.

B. Bulk modulus is relevant for solids, liquids and gases.

C. Rubber is less elastic than steel.

D. The Young's modulus and shear modulus
are relevant for solids.

Answer: A



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62. The increase in length of a wire on stretching is 0.025%. If its poisson's ratio is 0.4, then the percentage decrease in diameter is:

A. 0.01

B. 0.02

C. 0.03

D. 0.04

Answer: A



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63. A metallic wire is stretched by suspending weight from it if α is the longitudinal strain & y is the young's modulus, show that elastic

potential energy per unit volume is given by

$$\frac{1}{2}y\alpha^2.$$

A. $Y\alpha^2$

B. $\frac{1}{2}Y\alpha^2$

C. $\frac{3}{2}Y\alpha^2$

D. $\frac{Y}{\alpha^2}$

Answer: B



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64. A copper wire of length 2.2 m and a steel wire of length 1.6m, both of diameter 3mm are connected end to end. When stretched by a load, the net elongation is found to be 0.70 mm. Obtain the load applied.

$$(Y_s = 2.0 \times 10^{11} Nm^{-2})$$

$$(Y_c = 1.1 \times 10^{11} Nm^{-2})$$

A. $1.8 \times 10^2 N$

B. $1.2 \times 10^2 N$

C. $3.2 \times 10^4 N$

$$D. 2.4 \times 10^2 N$$

Answer: A



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65. The stress-strain curve for materials A and B are shown in figure.



Select the correct statement from the following:

A. Young's modulus of A is greater than that of B.

B. Young's modulus of B is greater than that of A.

C. The proportional limit of A is greater than that of B.

D. A is more brittle compared to B.

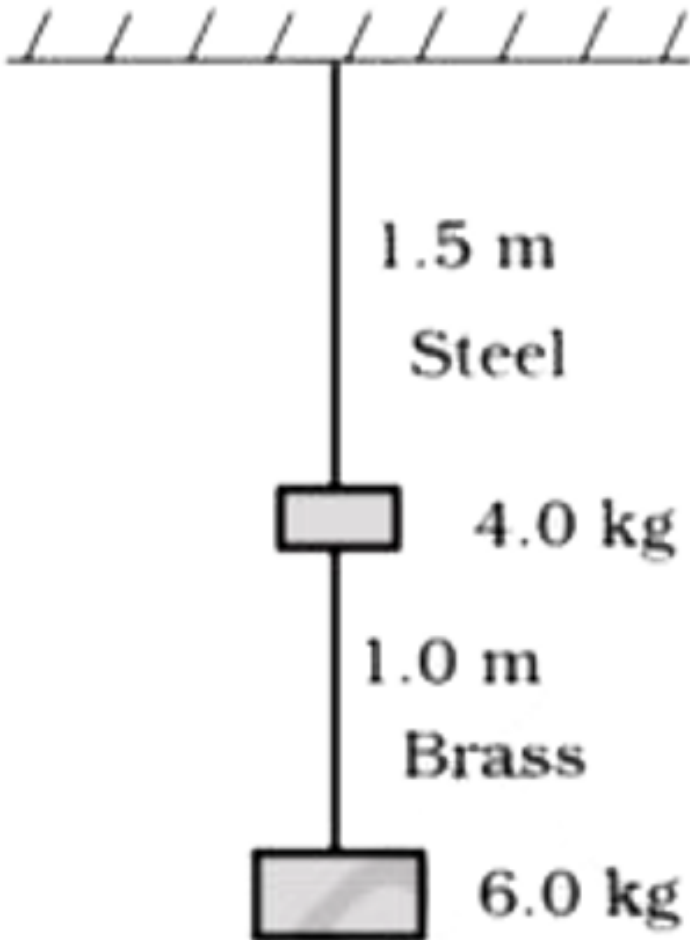
Answer: A



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66. Two wires of diameter 0.25 cm, one made of steel and the other made of brass are loaded as shown in Fig. 9.13. The unloaded length of steel wire is 1.5 m and that of brass wire is 1.0 m. Compute the elongations of the

steel and the brass wires.



A. $1.1 \times 10^{-4} m$

B. $1.8 \times 10^{-4} m$

C. $1.3 \times 10^{-4}m$

D. $1.5 \times 10^{-4}m$

Answer: C



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67. The length of an iron wire is L and area of cross-section is A . The increase in length is l on applying the force F on its two ends. Which of the statement is correct?

A. Increase in length is proportional to area of cross-section.

B. Increase in length is inversely proportional to its length.

C. Increase in length is inversely proportional to area of cross-section.

D. Increase in length is proportional to Young's modulus.

Answer: C



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

A. $\frac{k}{2}(l_2 + l_1)$

B. $\frac{k}{2}(l_2^2 - l_1^2)$

C. $k(l_2^2 - l_1^2)$

D. $k(l_2 - l_1)$

Answer: B



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69. Assertion: If a liquid in a vessel is stirred and left to itself, the motion disappears after sometime.

Reason: The moving liquid exerts equal and opposite reaction force.

A. a) Both assertion and reason are true and reason explains assertions correctly.

B. b) Both assertion and reason are true and reason does not explain assertion

correctly.

C. c) Assertion is true but reason is false.

D. d) Assertion is false but reason is true.

Answer: C



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70. 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 . Which of the following graphs is a straight line?

A. Δl versus l^2

B. Δl versus l

C. Δl versus $\frac{1}{l}$

D. Δl versus $\frac{1}{l^2}$

Answer: A



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71. In plotting stress versus strain curves for two materials P and Q, a student by mistake puts strain on the Y-axis and stress on the X-axis as shown in the figure. Then select the correct statement(s) is/are:



- A. P is more ductile than Q
- B. P has more tensile strength than Q
- C. The Young's modulus of P is more than that of Q

D. P is more brittle than Q

Answer: A::B



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72. In solids interatomic forces are:

- A. totally repulsive
- B. totally attractive
- C. both (a) and (b)
- D. none of these

Answer: C



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73. Two wires A and B are of same material. Their lengths are in the ratio 1:2 and diameters are in the ratio 2:1. When stretched by forces F_A and F_B respectively, they get equal increase in their lengths. Then the ratio F_A / F_B should be:

A. 1:1

B. 1 : 2

C. 8 : 1

D. 2 : 1

Answer: C



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74. There are two wires of same material and same length while the diameter of second wire is two times the diameter of first wire, then

the ratio of extension produced in the wire by applying same load will be:

A. 2:1

B. 1:2

C. 1:1

D. 4:1

Answer: D



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75. The breaking force for a wire of diameter D of a material is F . The breaking force for a wire of the same material of radius D is:

- A. F
- B. $4F$
- C. $2F$
- D. $F/4$

Answer: B



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76. Match the physical quantities given in column I and column II.

| Column I | Column II |
|-----------------|------------------------------------------------|
| 1. Plastic body | (i) $ML^{-1}T^{-2}$ |
| 2. Elastic body | (ii) Stress \propto strain |
| 3. Stress | (iii) Stress $\propto \frac{1}{\text{strain}}$ |
| 4. Hooke's Law | (iv) Steel rope |
| | (v) Glass |
| | (vi) ML^2T^{-2} |

A. 1-(i), 2-(iii), 3-(iv), 4-(ii)

B. 1-(iii), 2-(vi), 3-(i), 4-(v)

C. 1-(vi), 2-(iv), 3-(i), 4-(iv)

D. 1-(v), 2-(iv), 3-(i), 4-(ii)

Answer: D



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77. The relation between Young's modulus (Y) bulk modulus (K) and modulus of elasticity (η) is:

A. $\frac{1}{Y} = \frac{1}{K} = \frac{3}{\eta}$

B. $\frac{3}{Y} = \frac{1}{\eta} + \frac{3}{K}$

C. $\frac{1}{\eta} = \frac{3}{Y} + \frac{1}{3K}$

D. $\frac{1}{Y} = \frac{3}{\eta} + \frac{1}{3K}$

Answer: B



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78. According to Hooke's law of elasticity, if stress is increased, the ratio of stress to strain:

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

Answer: D



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79. Select the odd man out from the following physical quantities.

A. Stress

B. Young's modulus

C. Capillarity

D. Strain

Answer: C



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80. A stretched rubber has:

- A. increased potential energy
- B. increased kinetic energy
- C. decreased potential energy
- D. decreased kinetic energy

Answer: A



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81. Which of the following affects the elasticity of a substances?

- A. change in temperature
- B. impurity in substance
- C. hammering and annealing
- D. all of these

Answer: D



82. The length of a metal wire is l_1 when the tension in it is T_1 and is l_2 when the tension is T_2 . The natural length of the wire is:

A. $\sqrt{l_1 l_2}$

B. $\frac{l_1 + l_2}{2}$

C. $\frac{l_1 T_2 - l_2 T_1}{T_2 - T_1}$

D. $\frac{l_1 T_2 + l_2 T_1}{T_1 + T_2}$

Answer: C



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83. Assertion: The size of a hydrogen balloon increases as it rises in air.

Reason: The material of the balloon can be easily stretched.

Choose the correct option:

A. Both assertion and reason are true and reason explains assertions correctly.

B. Both assertion and reason are true and reason does not explain assertion

correctly.

C. Assertion is true but reason is false.

D. Assertion is false but reason is true.

Answer: B



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84. A man is sitting in a boat, which is floating on a pond. If the man drinks some water from the pond, the level of water in the pond:

A. increases

B. decreases

C. remains unchanged

D. may increase or decrease depending on
the weight of the man.

Answer: C



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85. A thin liquid film formed between a U-shaped wire and a light slider supports a weight of $1.5 \times 10^{-2} N$. The length of the slider is 30 cm and its weight is negligible. The surface tension of the liquid film is:



A. 0.0125 Nm^{-1}

B. 0.025 Nm^{-1}

C. 0.1 Nm^{-1}

D. 0.05 Nm^{-1}

Answer: B



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86. An object is flowing through the liquid. The viscous damping force acting on it is proportional to the velocity.

Select the correct statement of the following.

A. Dimension of constant of

proportionality are $ML^{-2}T^2$

B. Dimension of constant of proportionality are MLT^{-1}

C. Dimension of constant of proportionality are ML^0T^{-1}

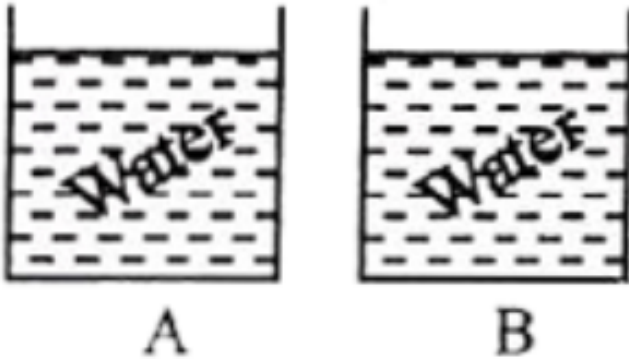
D. Dimension of constant of proportionality are M^0LT^{-1}

Answer: C



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87. From the following figures, the correct observation is:



- A. the pressure on the bottom of the tank
A is smaller than that at the bottom of B
- B. the pressure on the bottom of tank A is
greater than that at the bottom of B

C. the pressure depends on the shape of
the container

D. the pressure on the bottoms of A and B
is the same.

Answer: D



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

A. Viscosity

B. Pressure

C. Surface tension

D. Archimede's upward thrust

Answer: D



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89. Which one of the following pairs of physical quantities do not have the same dimensions?

A. Work and energy

B. Strain and angle

C. Stress and pressure

D. Tension and surface tension.

Answer: D



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90. Which one is not a dimensional number?

A. Acceleration due to gravity

B. Velocity of light

C. Surface tension of water

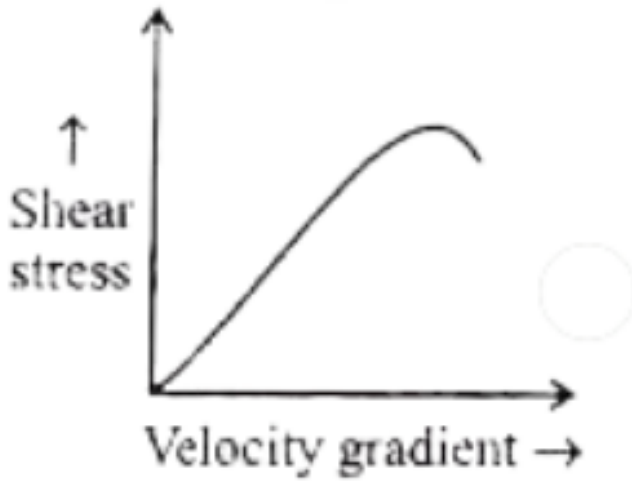
D. Reynold's number

Answer: D



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91. Which one of the following liquids is represented by the curve given below?



- A. Ideal fluid
- B. Newtonian fluid
- C. Non-newtonian fluid
- D. Pilastic fluid

Answer: C



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92. Select the correct statement of the following statements.

The Reynold's number for fluid flow in a pipe is:

- A. independent of the velocity of the fluid
- B. independent of the viscosity of the fluid
- C. not depending on the length of the pipe
- D. independent of the diameter of the pipe

Answer: C



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93. Which one of the following statements is a correct statement?

A. Critical velocity of the liquid decreases
when density increases

B. Critical velocity of the liquid increases
when density increases

C. Critical velocity of the liquid decreases
when radius decreases

D. Critical velocity of the liquid increases
when radius increases

Answer: A



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94. The approximate depth of an ocean is 2700m. The compressibility of water is 45.4×10^{-11} Pa and density of water is 10^3 kg. What fractional compression of water will be obtained the bottom of the ocean?

A. 1.22×10^{-2}

B. 1.4×10^{-2}

C. 0.8×10^{-2}

D. 1×10^{-2}

Answer: A



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95. Two rain drops falling through air have radii in the ratio 1:2, They will have terminal velocity in the ratio:

A. 4:1

B. 1:4

C. 2:1

D. 1:2

Answer: B



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96. Two capillaries of radii r_1 and r_2 and lengths l_1 and l_2 respectively are in series. A liquid of viscosity η is flowing through the

combination under a pressure difference P .

What is the rate of volume flow of liquid?

A. $\frac{8\pi P}{\eta} \left(\frac{l_1}{r_1^4} + \frac{l_2}{r_2^4} \right)$

B. $\frac{\pi P}{8\eta} \left(\frac{r_1^4}{l_1} + \frac{r_2^4}{l_2} \right)^{-1}$

C. $\frac{8\pi P}{\eta} \left(\frac{l_1}{r_1^4} + \frac{l_2}{r_2^4} \right)^{-1}$

D. $\frac{\pi P}{8\eta} \left(\frac{l_1}{r_1^4} + \frac{l_2}{r_2^4} \right)^{-1}$

Answer: D



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97. Assertion: The parts of a machine are jammed in winter.

Reason: The viscosity of lubricants used in machines increases at low temperature.

Select the correct statement of the following statements.

A. Both assertion and reason are true.

B. Both assertion and reason are true and reason explains assertion correctly.

C. Both assertion and reason are true and reason does not explain assertion

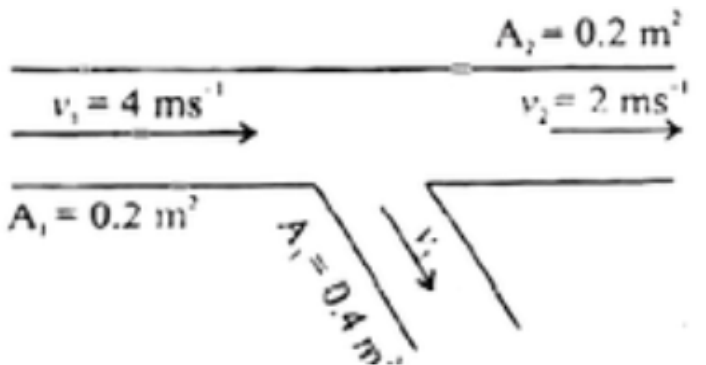
correctly.

D. Both assertion and reason are false.

Answer: B

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98. In the figure, the velocity v_3 will be:



A. zero

B. 4 ms^{-1}

C. 1 ms^{-1}

D. 3 ms^{-1}

Answer: C



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99. Blood is flowing at the rate of $200 \text{ cm}^3 \text{ s}^{-1}$
in a capillary of cross sectional area 0.5 m^2 .

The velocity of flow in mm s^{-1} is:

A. 0.1

B. 0.2

C. 0.3

D. 0.4

Answer: D



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100. The system shown in figure allowed to fall freely under gravity. The upthrust on the

immersed body is:



A. zero

B. infinite

C. equal to weight of liquid displaced

D. greater than the weight of liquid
displaced

Answer: A



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101. A lead shot of 1 mm diameter falls through a long column of glycerine. The variation of the velocity v with distance covered (s) is represented by

A. 

B. 

C. 

D. 

Answer: A



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102. 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. 2.4π

B. 4.8π

C. 1.2π

D. 7.2π

Answer: B



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103. Which one of the following is not a dimensional number?

- A. Surface tension of water
- B. Velocity of height
- C. Reynold's number
- D. Acceleration due to gravity.

Answer: C



104. Select the incorrect statement of the following statements.

A. Reynold's number is used to find the nature of flow of liquid.

B. Poisson's ratio has no dimensions

C. Strain has no units.

D. Scent sprayer works on the basis of Pascal's law.

Answer: D



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105. A spherical ball is dropped in a long column of viscous liquid, which of the following graphs represent the variation of:

(i) gravitational force with time

(ii) viscous force with time

(iii) net force acting on the ball with time?



A. Q, R, P

B. R, Q, P

C. P, Q, R

D. R, P, Q

Answer: C



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106. Select the correct pair of reasons for the following statements.

Critical velocity of liquid decreases when:

- A. Density of liquid increases and diameter of the pipe increases
- B. Density of liquid decreases and diameter of the pipe increases.
- C. Volume of liquid decreases and diameter of the pipe decreases.
- D. Velocity of liquid decreases and radius of the pipe increases.

Answer: A



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107. Spherical balls of radius 'R' are falling in a viscous fluid of viscosity ' η ' with a velocity 'v'. The retarding viscous force acting on the spherical ball is:

- A. inversely proportional to both radius 'R' and velocity 'v'
- B. directly proportional to both radius 'R' and velocity 'v'

C. directly proportional to 'R' but inversely proportional to 'v'

D. inversely proportional to 'R' but directly proportional to velocity 'v'.

Answer: B



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108. The relative velocity of two parallel layers of water is 8 cm/sec. If the perpendicular

distance between the layers is 0.1cm. The velocity gradient will be:

A. 80/sec

B. 60/sec

C. 50/sec

D. 40/sec

Answer: A



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109. Choose the odd law from the following laws, equation and theorem.

A. Stoke's law

B. Hooke's law

C. Poiseuille's equation

D. Bernoulli's theorem

Answer: B



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110. Water rises in a capillary tube to a height of 2.0 cm. In another capillary tube whose radius is one third of it, how much the water will rise?

A. 3 cm

B. 5 cm

C. 9 cm

D. 6 cm

Answer: D



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111. Select the correct statement of the following statements for the following situation.

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

A. the ball stops.

B. the speed of the ball will increase.

C. the speed of the ball will become zero.

D. the ball attains a constant velocity after sometime.

Answer: D



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112. A uniform cube is subjected to volume compression. If each side is decreased by 1%, then bulk strain is:

- A. 0.01
- B. 0.02
- C. 0.06
- D. 0.03

Answer: D



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113. Assertion: The shape of an automobile is so designed that its front resembles the streamline pattern of the fluid through which it moves.

Reason: The resistance offered by the fluid is maximum.

Select the correct option from the following options.

A. Both assertion and reason are true and reason explains assertions correctly.

B. Both assertion and reason are true and reason does not explain assertion correctly.

C. Both assertion and reason are false.

D. Both assertion and reason are true.

Answer: C



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

A. acute

B. zero

C. right angle

D. obtuse

Answer: D



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115. Assertion: Soap bubble is larger than a water drop.

Reason: Surface tension of soap bubble is less than that of water.

Choose the correct choice of the following choices.

A. Both assertion and reason are true and reason explains assertions correctly.

B. Both assertion and reason are true and reason does not explain assertion correctly.

C. Both assertion and reason are true.

D. Both assertion and reason are false.

Answer: A



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116. Surface tension of water is 0.072 Nm^{-1} .

The excess pressure inside a water drop of diameter 1.2 mm is:

A. 240 Nm^{-1}

B. 72 Nm^{-1}

C. 60 Nm^{-1}

D. 120 Nm^{-1}

Answer: A



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117. The surface tension of liquid decreases with a rise in:

A. temperature of the liquid

B. viscosity of the liquid

C. thickness of the container

D. diameter of container

Answer: A



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118. A drop of liquid of diameter 2.8 mm breaks up into 125 identical drops. The change in energy is nearly ($s = 75$ dyne/cm).

A. 19 erg

B. zero

C. 74 erg

D. 46 erg

Answer: C



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119. Angle of contact of a liquid with a solid depends on:

A. solid only

B. liquid only

C. both solid and liquid only

D. orientation of the solid surface in liquid

Answer: C



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120. Select the correct reason for,

Small droplets of a liquid are usually more

spherical in shape than larger drops of the same liquid because:

A. force of surface tension is equal and opposite to the force of gravity.

B. force of surface tension predominates the force of gravity.

C. force of gravity and force of surface tension act in the same direction and are equal.

D. force of gravity predominates the force of surface tension.

Answer: B



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121. A thread is tied slightly loose to a wire frame as in Figure and the frame is dipped into a soap solution and taken out. The frame is completely covered with the film.

Which of the following is correct with

reference to the following situation.

When the portion A is punctured with a pin, the thread:



- A. becomes convex towards A
- B. becomes concave towards A
- C. remains in the initial position
- D. either (a) or (b) depending on the size of A with respect to B.

Answer: B





122. In a capillary tube, water rises to 3 mm. The height of water that will rise in another capillary tube having one-third radius of the first is:

- A. 1 mm
- B. 9 mm
- C. 3 mm
- D. 6 mm

Answer: B



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123. The amount of the work done in blowing a soap bubble of radius r and surface tension σ , is:

A. $4\pi r^2 \sigma$

B. $6\pi r^2 \sigma$

C. $8\pi r^2 \sigma$

D. σ

Answer: C



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

- A. Archimede's principle
- B. Bernoulli's principle
- C. Buoyancy principle
- D. Pascal law

Answer: B



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125. In old age arteries carrying blood in the human body become narrow resulting in an increase in the blood pressure, this follows from

- A. Pascal's law
- B. Bernoulli's principle
- C. Archimede's principle

D. Stoke's law

Answer: B



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126. Bernoulli's equation for steady, non-viscous, incompressible flow expresses the:

A. conservation of density

B. conservation of momentum

C. conservation of energy

D. conservation of angular momentum

Answer: C



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127. Water flows steadily through a horizontal pipe of variable cross-section. If the pressure of water is P at a point where flow speed is v , the pressure at another point where the flow speed is $2v$, is (Take density of water as ρ):

A. $P - \frac{\rho v^2}{2}$

B. $P = \frac{3\rho v^2}{2}$

C. $P = \rho v^2$

D. $P = \frac{3\rho v^2}{4}$

Answer: B



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128. Calculate the force required to separate the glass plate of area of 10cm^2 with a film of water 0.05 mm. (Surface tension of water is $70 \times 10^{-3} \text{N/m}$)

A. 14 N

B. 28 N

C. 56 N

D. 72 N

Answer: B



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129. A cylinder of height 20 m is completely filled with water. The velocity of efflux of water

(in ms^{-1}) through a small hole on the side of the cylinder near its bottom is: $[g = 10m / s^2]$

- A. 10 m/s
- B. 20 m/s
- C. 40 m/s
- D. 5 m/s

Answer: B



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130. A wind with speed 40 m/s blows parallel to the roof of a house. The area of the roof is 250 m^2 . Assuming that the pressure inside the house is atmospheric pressure, the force exerted by the wind on the roof and the direction of the force will be:

$$(\rho_{\text{air}} = 1.2 \text{ kg/m}^3)$$

- A. $2.4 \times 10^5 \text{ N}$, upwards
- B. $2.4 \times 10^5 \text{ N}$, downwards
- C. $4.8 \times 10^5 \text{ N}$, downwards

D. $4.8 \times 10^5 N$, upwards

Answer: A



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131. Four wires of the same material are stretched by the same load. The dimensions are given below. Which one of them will elongate the most?

A. Length 100 cm, diameter 1 cm

B. Length 200 cm, diameter 2 cm

C. Length 300 cm, diameter 3 cm

D. Length 400 cm, diameter 0.5 cm

Answer: D



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132. Water is flowing through a tube of radius r with velocity v . If the tube is connected to another tube of radius $\frac{r}{2}$. Then select a

correct statement from the following statements.

A. Velocity of water in the second tube is v .

B. Velocity of water in the second tube is $2v$.

C. Velocity of water in the second tube is $\frac{v}{2}$.

D. Velocity of water in the second tube is $4v$.

Answer: D



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133. Which one of the following statements is wrong?

A. Young's modulus for a perfectly rigid body is zero.

B. Bulk modulus is relevant for solids, liquids and gases.

C. Rubber is less elastic than steel.

D. The Young's modulus and shear modulus
are relevant for solids.

Answer: A



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134. The increase in length of a wire on stretching is 0.025%. If its poisson's ratio is 0.4, then the percentage decrease in diameter is:

A. 0.0001

B. 0.0002

C. 0.0003

D. 0.0004

Answer: A



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135. A metallic wire is stretched by suspending weight from it if α is the longitudinal strain & y is the young's modulus, show that elastic

potential energy per unit volume is given by

$$\frac{1}{2}y\alpha^2.$$

A. $Y\alpha^2$

B. $\frac{1}{2}Y\alpha^2$

C. $\frac{3}{2}Y\alpha^2$

D. $\frac{Y}{\alpha^2}$

Answer: B



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136. A copper wire of length 2.2 m and a steel wire of length 1.6m, both of diameter 3mm are connected end to end. When stretched by a load, the net elongation is found to be 0.70 mm. Obtain the load applied.

$$(Y_s = 2.0 \times 10^{11} Nm^{-2})$$

$$(Y_c = 1.1 \times 10^{11} Nm^{-2})$$

A. $1.8 \times 10^2 N$

B. $1.2 \times 10^2 N$

C. $3.2 \times 10^4 N$

$$D. 2.4 \times 10^2 N$$

Answer: A



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137. The stress-strain curve for materials A and B are shown in figure.



Select the correct statement from the following:

A. Young's modulus of A is greater than that of B.

B. Young's modulus of B is greater than that of A.

C. The proportional limit of A is greater than that of B.

D. A is more brittle compared to B.

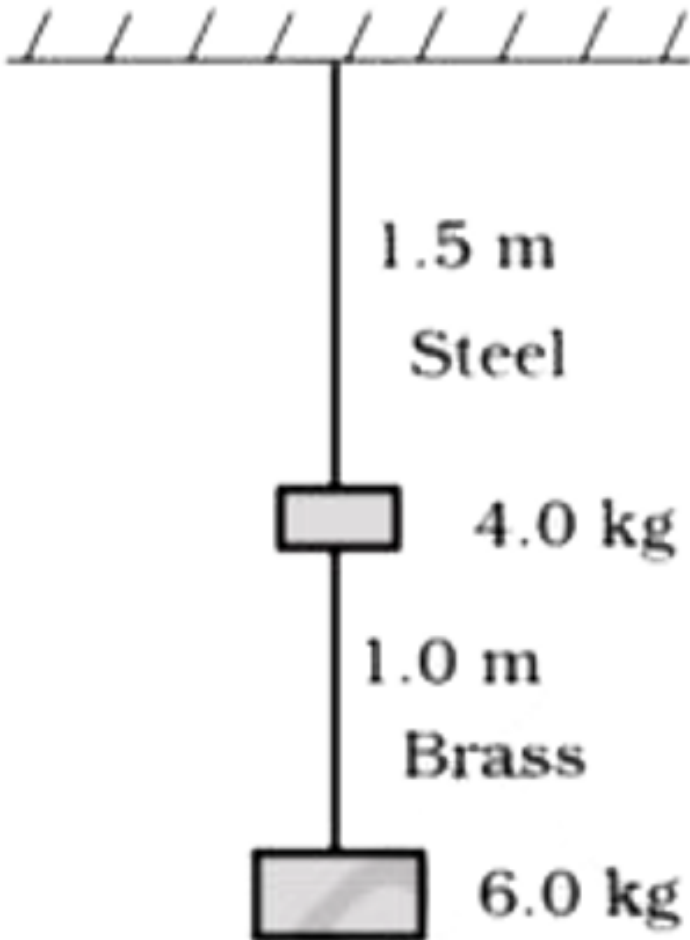
Answer: A



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138. Two wires of diameter 0.25 cm, one made of steel and the other made of brass are loaded as shown in Fig. 9.13. The unloaded length of steel wire is 1.5 m and that of brass wire is 1.0 m. Compute the elongations of the

steel and the brass wires.



A. $1.1 \times 10^{-4} m$

B. $1.8 \times 10^{-4} m$

C. $1.3 \times 10^{-4}m$

D. $1.5 \times 10^{-4}m$

Answer: C



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139. The length of an iron wire is L and area of cross-section is A . The increase in length is l on applying the force F on its two ends. Which of the statement is correct?

A. Increase in length is proportional to area of cross-section.

B. Increase in length is inversely proportional to its length.

C. Increase in length is inversely proportional to area of cross-section.

D. Increase in length is proportional to Young's modulus.

Answer: C



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

A. $\frac{k}{2}(l_2 + l_1)$

B. $\frac{k}{2}(l_2^2 - l_1^2)$

C. $k(l_2^2 - l_1^2)$

D. $k(l_2 - l_1)$

Answer: B



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141. If a liquid in a vessel is stirred and left to itself, the motion disappears after few minutes.

A. Both assertion and reason are true and reason explains assertions correctly.

B. Both assertion and reason are true and reason does not explain assertion correctly.

C. Assertion is true but reason is false.

D. Assertion is false but reason is true.

Answer: C



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142. 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 . Which of the following graphs is a straight line?

A. Δl versus l^2

B. Δl versus l

C. Δl versus $\frac{1}{l}$

D. Δl versus $\frac{1}{l^2}$

Answer: A



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143. In plotting stress versus strain curves for two materials P and Q, a student by mistake puts strain on the Y-axis and stress on the X-axis as shown in the figure. Then select the

correct statement(s) is/are:



A. P is more ductile than Q

B. P has more tensile strength than Q

C. The Young's modulus of P is more than
that of Q

D. P is more brittle than Q

Answer: A::B



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Other Important Question Answers Very Short Answer Questions

1. What is a deforming force?



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2. Define volume stress.



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3. What is meant by the term elastic limit?



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4. What is the limitation of Hooke's law?



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5. What is the value of bulk modulus for an incompressible liquid?



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6. What is the volume of modulus of rigidity for an incompressible liquid?



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7. What is breaking stress for a wire of unit cross section called?



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8. A spiral spring is stretched by a force. What type of strain is produced in it?



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9. If the length of a wire increases by 1mm under 1kgwt. Then what will be the nature of the wire under 100kgwt.?



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10. What are fluids?



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



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12. What is indicated by sudden fall in barometric height?



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13. In which case, weight of body will be maximum

(i) in air

(ii) vacuum

(iii) in water



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14. What does gradual increase of atmospheric pressure indicate?



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15. What is the reciprocal of viscosity?



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16. Which law forms the basis of equation of continuity?



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17. State Bernoulli's theorem.



[Watch Video Solution](#)

18. What is the value of surface tension at the critical temperature?



[Watch Video Solution](#)

19. What is a deforming force?



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Watch Video Solution

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26. A spiral spring is stretched by a force. What type of strain is produced in it?



[Watch Video Solution](#)

27. The length of wire increase by 1 mm under 1 kgf. What will be increase in length under (i) 2 kgf? (ii) under 100 kgf?



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28. What are fluids?



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29. What will be the potential energy of a stretched wire?



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30. What is indicated by sudden fall in barometric height?



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33. What is the reciprocal of viscosity?



Watch Video Solution

34. Which law forms the basis of equation of continuity?



Watch Video Solution

35. Bernoulli theorem is based on conservation of



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36. The value of surface tension of a liquid at critical temperature



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Other Important Question Answers Short Answer Questions

1. What do you know about restoring force?



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2. Define the term plasticity. Give example.



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3. Define yield point.



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4. What is meant by elastic fatigue?



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5. What is elastic hysteresis?



[Watch Video Solution](#)

6. Define longitudinal strain.



[Watch Video Solution](#)

7. What are the different types of longitudinal strain?



[Watch Video Solution](#)

8. Define compressibility.



[Watch Video Solution](#)

9. Define density. Is it a scalar or vector quantity? Give its unit and dimension?



Watch Video Solution

10. Define pressure. Give its units.



Watch Video Solution

11. State the factors on which the atmospheric pressure at a place depends.



Watch Video Solution

12. What is viscosity ? Explain its causes.



Watch Video Solution

13. Define kinematic viscosity.



Watch Video Solution

14. How does the viscosity of gases depend on temperature?



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15. What should be the properties of a liquid to satisfy Bernoulli's theorem?



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16. Define coefficient of viscosity of a liquid.



Watch Video Solution

17. What are the factors on which the angle of contact of a liquid depend on?



Watch Video Solution

18. Give two points of similarity between viscous force and solid friction?



Watch Video Solution

19. What is streamline flow?



Watch Video Solution

20. What is turbulent flow?



Watch Video Solution

21. Define the term sphere of influence.



Watch Video Solution

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



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23. Give three examples of floating bodies.



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24. List some applications of capillarity from daily life.



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Other Important Question Answers Long Answer Questions

1. Describe the relationship between stress applied to a body and strain developed in it using graphical method?



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2. Why there is an excess pressure on the concave side of a liquid surface?



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3. Explain surface tension on the basis of molecular theory.



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4. Mention some applications of viscosity in daily life.



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5. Illustrate the existence of surface tension with example.



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6. List few applications of surface tension.



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7. Why are the roofs of some houses blown off during a wind storm?



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8. Explain the lift of an aircraft wing using Bernoulli's principle.



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9. Describe the working of Bunsen burner on the basis of Bernoulli's principle.



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10. Derive an expression for the kinetic energy, potential energy and pressure energy per unit mass of a liquid in a steady flow.



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11. Describe the mutual relationship between the fig and wasp and comment on the phenomenon that operates in this relationship.



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12. किसी द्रव पृष्ठ के अवतल भाग की ओर का दाब उत्तल भाग की ओर के दाब से अधिक क्यों होता है ? समझाइए ।



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13. Explain surface tension on the basis of molecular theory.



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14. Mention some applications of viscosity in daily life.



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15. Give any two illustrations of surface tension.



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16. APPLICATION OF SURFACE TENSION



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17. Why are the roofs of some houses blown off during a wind storm?



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18. Bernoulli's Principle



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19. Bernoulli's Principle



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20. Derive an expression for the kinetic energy, potential energy and pressure energy per unit mass of a liquid in a steady flow.



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Other Important Question Answers Conceptual Questions

1. Among solids, liquids and gases, which can have all the three modulus of elasticity?



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2. Write copper, steel, glass and rubber in the order of increasing coefficient of elasticity.



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3. Which is more elastic -water or air?



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4. Why are springs made of steel & not of copper ?



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5. Following are the graphs of elastic materials which one corresponds to that of brittle material?



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6. It is difficult to stop bleeding from a cut in human body at high altitude why?



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7. In soldering, addition of flux makes soldering easily why?



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8. Which type of strain is there, when a spiral spring is stretched by a force?



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9. When bits of camphor are dropped on water, they move erratically. Why?



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10. What will be the effect on the angle of contact of a liquid if the temperature increases?



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



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12. Why water is not used in barometers?



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13. The dams of water reservoir are made thick near the bottom. Why?



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14. A man is sitting in a boat, which is floating on a pond. If the man drinks some water from

the pond, the level of water in the pond:



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15. Why is it easier to swim in sea water than in river water?



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16. Stirred liquid comes to rest after some time. Why?



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17. Why machine parts are not jammed in the summer?



Watch Video Solution

18. Which fall faster-big rain drops or small rain drops?



Watch Video Solution

19. Why does a flag flutter, when strong winds are blowing on a certain day?



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20. Why hot soup tastes better than cold soup?



Watch Video Solution

21. Why new earthen pots keep water cooler than the old one?



Watch Video Solution

22. Explain why some oils spread on water, when others float as drops.



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23. Out of friction force and viscous force which depends upon velocity.



Watch Video Solution

24. What will be the velocity of water when it passes from narrow tube to wider tube?



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[Watch Video Solution](#)

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36. Oil calms the stormy waves on the sea.

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37. Explain why sand is drier than clay.



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38. Two streamlines cannot cross each other.

Why ?



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Watch Video Solution

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Other Important Question Answers Numerical Problems

1. A material breaks up under a stress of $20 \times 10^5 \text{ N/m}^2$. If the density of the material is $2.5 \times 10^3 \text{ kg/m}^3$, calculate the length may break under its own weight. (Take $g = 10 \text{ m/s}^2$)



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2. Within the elastic limit, stress of brass is $3.5 \times 10^{10} \text{ N/m}^2$. Find the maximum load that can be applied to a brass wire of 0.75 mm diameter without exceeding the elastic limit.



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3. The radii of two rods of the same length and same material are in the ratio of 1:2. If these rods are twisted by applying the same

torsional torque, then find the ratio of the angle of twist produced in the two rods.



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4. The poisson's ratio for a materia is 0.1. If longitudinal strain of a rod of this material is 1×10^{-3} , then calculate the percentage change in the volume of the rod.



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5. Determine the poisson's ratio of the material of a wire whose volume remains constant under an external normal stress.



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6. A material has poisson's ratio 0.5. If a uniform rod of its suffers a longitudinal strain of 2×10^{-3} , what is the percentage increase in volume?



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7. One litre of ideal gas is compressed isothermal at 0.72 m of Hg-column so that its volume becomes 0.9 litre. Find its stress, if the density of mercury is $13.6 \times 10^3 \text{ kg/m}^3$.



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8. Two wires A and B of length l , radius r and length $2l$, radius $2r$ having same Young's modulus Y are hung with a weight mg . What is the net elongation in the two wires?



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9. A square lead slab of side 50 cm and thickness 10.0 cm is subjected to a shearing force (on its narrow face) of magnitude $9.0 \times 10^4 N$. The lower edge is riveted to the floor. How much is the upper edge displaced, if the shear modulus of lead is $5.6 \times 10^9 \text{ Pa}$?



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10. A wire of radius r stretched without tension along a straight line is tightly fixed at A and B. What is the tension in the wire when it is pulled in the shape ACB? Assume Young's modulus of material of the wire to be Y .



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12. A barometer kept an elevator accelerating upwards reads 76cm of Hg. If the elevator is accelerated upwards at $4.9ms^{-2}$, then calculate the air pressure in the elevator?



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13. A body of mass 6 kg is floating in a liquid with $\frac{2}{3}$ of its volume inside the liquid. Find

(i) buoyant force acting on the body and

(ii) ratio between the density of the body and density of liquid. [Take $g = 10m / s^2$].



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14. The excess pressure inside a soap bubble is thrice the excess pressure inside a second soap bubble. What is the ratio between the volume of the first and the second bubble.?



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15. A drum of 40 cm radius has a capacity of 440 dm^3 of water. It contains 396 dm^3 of water and is placed on a solid block of exactly the same size as of drum. If a small hole is made at lower end of the drum perpendicular to its length, find the horizontal range of water on the ground in the beginning. Given $g = 10 \text{ m} / \text{s}^2$



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16. The force on a phonograph needle is 1.2 N. The point has a circular cross-section whose radius is 0.1 mm. Find the pressure (in atm) it exerts on the records.

Given: $1 \text{ atm} = 1.013 \times 10^5 \text{ Pa}$



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17. The angle of contact of mercury with soda lime glass is 140° . A capillary tube of radius 1.0 mm is dipped in a trough containing mercury.

By what amount does the mercury dip down in the tube relative to the liquid surface outside?

$$\text{Surface tension of mercury} = 0.465 \text{ Nm}^{-1}$$

$$\text{Density of mercury} = 13.6 \times 10^3 \text{ kgm}^{-3}$$



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18. The neck and bottom of a bottle are 2 cm and 10 cm in diameter respectively. If the cork is pressed with a force of 1.2 kg f in the neck of the bottle, calculate the force exerted on the bottom of the bottle.



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19. What is the pressure on a swimmer 10 m below the surface of a lake?



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20. How much will a body of 70 N weigh in water if it displaces 200 ml of water?



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21. A metal plate of area 0.10 m^2 is connected to a 0.01 kg mass via a string that passes over an ideal pulley (considered massless and frictionless), A liquid with a film thickness of 0.3 mm is placed between the plate and the table. When released the plate moves to the right with a constant speed of 0.085 m s^{-1} . Find the coefficient of viscosity of the liquid.



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22. A liquid flows through a pipe of 1.0 mm radius and 10 cm length under a pressure 10^4 dyne cm^{-2} . Calculate the rate of flow and the speed of the liquid coming out of the tube. The coefficient of viscosity of the liquid is 1.25 centipoise.



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23. Three capillary tubes of the same radius r but of lengths l_1, l_2 and l_3 are fitted

horizontally to the bottom of a tall vessel containing a liquid at constant head and flowing through these tubes. Calculate the length of a single outflow tube of the same radius r which can replace the three capillaries.



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24. What should be the average velocity of water in a tube of radius 0.005 m. So that the

flow is just turbulent? The viscosity of water is $0.001 \text{ Pa}\cdot\text{s}$.



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25. Water flows through a horizontal pipe whose internal diameter is 2.0 cm , at a speed of $1.0 \text{ m}\cdot\text{s}^{-1}$. What should be the diameter of the nozzle, if the water is to emerge at a speed of $4.0 \text{ m}\cdot\text{s}^{-1}$?



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26. A horizontal pipe line carries water in a streamline flow. At a point along the pipe where the cross-sectional area is 10cm^2 the velocity of water is 1ms^{-1} and pressure is 2000 Pa. What is the pressure at another point. Where the cross-sectional area is 5cm^2 ?



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27. An aeronautical engineer observes that on the upper and the lower surface of the wing of an aeroplane the speeds of the air are 120

$m s^{-1}$ and $90 m s^{-1}$ respectively during flight.

What is the lift on the wing of aeroplane if its area is $3.2 m^2$? Given density of air is $1.29 kg / m^3$.



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Density of mercury = $13.6 \times 10^3 \text{kgm}^{-3}$ [Take $g = 9.8 \text{m} / \text{s}^2$].



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29. A material breaks up under a stress of $20 \times 10^5 \text{N} / \text{m}^2$. If the density of the material is $2.5 \times 10^3 \text{kg} / \text{m}^3$, calculate the length may break under its own weight. (Take $g = 10 \text{m} / \text{s}^2$)



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30. Within the elastic limit, stress of brass is $3.5 \times 10^{10} \text{ N/m}^2$. Find the maximum load that can be applied to a brass wire of 0.75 mm diameter without exceeding the elastic limit.



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31. The radii of two rods of the same length and same material are in the ratio of 1:2. If these rods are twisted by applying the same torsional torque, then find the ratio of the angle of twist produced in the two rods.



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32. The poisson's ratio for a materia is 0.1. If longitudinal strain of a rod of this material is 1×10^{-3} , then calculate the percentage change in the volume of the rod.



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33. Determine the poisson's ratio of the material of a wire whose volume remains

constant under an external normal stress.



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34. A material has poisson's ratio 0.5. If a uniform rod of its suffers a longitudinal strain of 2×10^{-3} , what is the percentage increase in volume?



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