



I. Choose the correct answer

[15 × 1 = 15]

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
2. A small sphere of radius 2cm falls from rest in a viscous liquid. Heat is produced due to viscous force. The rate of production of heat when the sphere attains its terminal velocity is proportional to
(a) 2^2 (b) 2^3 (c) 2^4 (d) 2^5
3. 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
4. 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
5. Which of the following is not a scalar?
(a) viscosity (b) surface tension (c) pressure (d) stress
6. 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 = $4 V T \left(\frac{1}{r} - \frac{1}{R} \right)$ is released (b) energy = $3 V T \left(\frac{1}{r} + \frac{1}{R} \right)$ is absorbed
(c) energy = $3 V T \left(\frac{1}{r} - \frac{1}{R} \right)$ is released (d) energy is neither released nor absorbed
7. 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
8. In a horizontal pipe of non-uniform cross section, water flows with a velocity of 1 m s^{-1} at a point where the diameter of the pipe is 20 cm. The velocity of water (1.5 m s^{-1}) at a point where the diameter of the pipe is (in cm)
(a) 8 (b) 16 (c) 24 (d) 32
9. Which among the following is not an application of viscosity?
(a) Hydraulic brakes (b) Blood circulation (c) Lubricant oil (d) Water bugs walk on surface
10. In a container filled with liquid, if the tension $T_{SA} > T_{SL}$, the angle will be
(a) acute (b) obtuse (c) zero (d) none of the above
11. Method of Mixture can be mathematically expressed as
(a) $Q_{\text{gain}} = - Q_{\text{lost}}$ (b) $Q_{\text{gain}} = Q_{\text{lost}}$ (c) $Q_{\text{gain}} = 0$ (d) $Q_{\text{lost}} = 0$
12. The unit of Stefan's constant is _____
(a) $\text{W m}^{-2} \text{K}^{-4}$ (b) $\text{W m}^2 \text{K}^4$ (c) $\text{W}^{-1} \text{m}^2 \text{K}^{-4}$ (d) W m K^{-2}
13. According to Wien's displacement law, $\lambda_m =$ _____
(a) T^{-2} (b) T^{-1} (c) bT^{-1} (d) $\text{b}^{-1} \text{T}$
14. In hot summer after a bath, the body's
(a) internal energy decreases (b) internal energy increases
(c) heat decreases (d) no change in internal energy and heat

15. The formula for final temperature of bodies with different temperature came into contact with each other is

$$(a) T_f = \frac{M_1 S_1 T_1 + M_2 S_2 T_2}{M_1 S_1 + M_2 S_2}$$

$$(b) T_f = \frac{M_1 S_1 T_1 - M_2 S_2 T_2}{M_1 S_1 + M_2 S_2}$$

$$(c) T_f = \frac{M_1 S_1 T_1 + M_2 S_2 T_2}{M_1 S_1 - M_2 S_2}$$

$$(d) T_f = 0$$

II. Answer any 5 of the following questions:

[5 × 2 = 10]

16. State Hooke's law of elasticity.

17. Define coefficient of viscosity of a liquid.

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

19. State the principle and usage of Venturimeter.

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

21. What is Wien's law?

22. What is a black body?

III. Answer any 5 of the following questions:

[5 × 3 = 15]

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

24. Distinguish between streamlined flow and turbulent flow.

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

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

27. How is surface tension related to surface energy?

28. What are the different types of thermodynamic systems?

29. 'An object contains more heat' - is it a right statement? If not why?

IV. Answer the following questions:

[2 × 5 = 10]

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

[OR]

b) State and prove Bernoulli's theorem for a flow of incompressible, non-viscous, and streamlined flow of fluid.

31. a) Explain in detail anomalous expansion of water. How is it helpful in our lives?

[OR]

b) Explain in detail Newton's law of cooling.