Brain International School
Vikas Puri, New Delhi

ASSIGNMENT NO. 4

SUBJECT: PHYSICS CLASS-XI NOVEMBER'2026

CH: 9 MECHANICAL PROPERTIES OF FLUID AND CH 10 THERMAL PROPERTIES OF MATTER

1. **8 mercury drops coalesce to form 1 mercury drop, the energy changes by a factor of**

   a) 1

   b) 6

   c) 4

   d) 2

2. A cylindrical vessel is filled with an equal mass of mercury and water. The overall height of the two layers is 43.8 cm. The relative density of mercury is 13.6. Then the pressure of the liquid on the bottom of the vessel is:

   a) P atm + 16.6 cm of Hg

   b) P atm +6 cm of Hg

   c) P atm +3 cm of Hg

   d) P atm + 1.5 cm of Hg

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

   a) obtuse

   b) acute

   c) right angle

   d) zero

4. The radii of two drops are in the ratio of 3: 2, their terminal velocities are in the ratio

   a) 2: 3

   b) 2: 9

   c) 3: 2

   d) 9: 4

5. The triple point of water is

   a) 273.16^o C

   b) 273.16K

   c) 273.16^o F

   d) 0.15 K

6. Assertion: When the height of a tube is less than the liquid rise in the capillary tube, the liquid does not overflow.

   Reason: Product of radius of meniscus and height of the liquid in capillary tube always remains constant.

7. Water at 20^o C is escaping from a cistern by way of a horizontal capillary tube 10 cm long and 0.4 mm in diameter, at a distance of 50 cm below the free surface of water in the cistern. Calculate the rate at which the water is escaping. The coefficient of the viscosity of water is 0.001 decapoise.

8. State Bernoulli's principle and express it mathematically.

9. Two exactly similar rain drops falling with a terminal velocity of$(2)^{\frac{1}{3}}$ ms $^{-1}$ coalesce to form a bigger drop. Find the new terminal velocity of the bigger drop.

10. A layer of ice 1 cm thick is formed on a pond. The temperature of the air is - 20°C. Calculate how long it will take for the thickness of ice to increase by 1 mm. The density of ice = 1g cm^(-3) . Latent heat of ice = 80 cal g ^(-1) . Conductivity of ice = 0.008 cal s ^(-1) cm ^(-1) °C ^(-1) .

11. Show that if n equal rain droplets falling through air with equal steady velocity of 10 cms^{-1} coalesces, the resultant drop attains a new terminal velocity of 10 $n^{\frac{2}{3}}$ cms $^{-1}$.

12. Derive an expression for the rise of liquid in capillary tube of uniform diameter and sufficient length.

13. A liquid drop of diameter D breaks up into 27 tiny drops. Find the resulting change in energy. Take surface tension of the liquid as σ .

14. What is capillarity? Derive an expression for the height to which a liquid rises in a capillary tube of radius r.

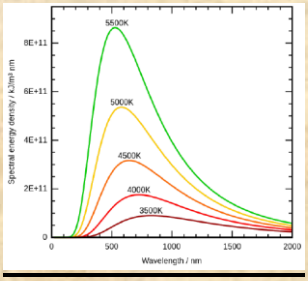
15. Define surface tension and surface energy. Write units and dimensions of surface tension. Also prove that surface energy is numerically equal to the surface tension.

16. Show that the coefficient of area expansion, $\frac{\frac{\Delta A}{A}}{\Delta T}$, of a rectangular sheet of the solid is twice its linear expansivity, α_1 .

17. What is meant by coefficient of linear expansion, superficial expansion and cubical expansion? Derive the relationship between them.

18. A brass wire of length 1.8 m at 27 °C is held tight with little tension between two rigid supports. If the wire is cooled to a temperature of - 39 °C. What is the tension developed in the wire, if its diameter is 2.0 mm? Co - efficient of linear expansion of brass= $2.0 \times 10^{-5}\mathrm{K}^{-1}$; Young's modulus of brass $= 0.91 \times 10^{11}$Pa .

19. The Blackbody radiation is a term used to describe the relationship between an object's temperature, and the wavelength of electromagnetic radiation it emits. A black body is an idealized object that absorbs all electromagnetic radiation it comes in contact with. It then emits thermal radiation in a continuous spectrum according to its temperature.



(A) If a black body is heated from 27^o C to 927 ^o C, find the ratio of the radiation emitted by the body at the two temperatures. (2)

(B) What is the Colour change of black body radiation? (1)

(C) Radiation emitted by a surface is _____ proportional to fourth power of its temperature. (1)