HEAT AND THERMODYNAMICS

1. A uniform metal rod is used as a bar pendulum. If the room temperature rises by 10°*C*, and the coefficient of linear expansion of the metal of the rod is 2×10^{-6} per °*C*, the period of the pendulum will have percentage increase of

(a) -2×10^{-3} (b) -1×10^{-3}

(c) 2×10^{-3} (d) 1×10^{-3}

2. When an ideal monoatomic gas is heated at constant pressure, fraction of heat energy supplied which increases the internal energy of gas, is

(a) $\frac{2}{5}$ (b) $\frac{3}{5}$

(c) $\frac{3}{7}$ (d) $\frac{3}{4}$

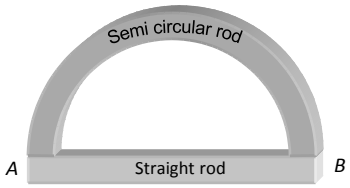
3. Two rods (one semi-circular and other straight) of same material and of same cross-sectional area are joined as shown in the figure. The points *A* and *B* are maintained at different temperature. The ratio of the heat transferred through a cross-section of a semi-circular rod to the heat transferred through a cross section of the straight rod in a given time is

(a) $2 : \pi$

(b) $1 : 2$

(c) $\pi : 2$

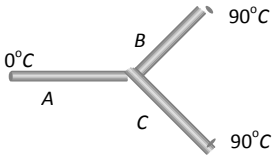
(d) $3 : 2$



4. Three rods made of the same material and having the same cross section have been joined as shown in the figure. Each rod is of the same length. The left and right ends are kept at $0^{o}C$ and $90^{o}C$ respectively. The temperature of the junction of the three rods will be

(a) $45^{o}C$

(b) $60^{o}C$



(c) $30^{o}C$

(d) $20^{o}C$

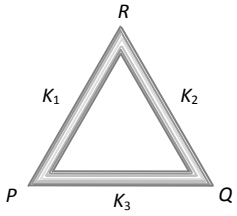
5. Three rods of same dimensions are arranged as shown in figure they have thermal conductivities K_1, K_2 and K_3 The points *P* and *Q* are maintained at different temperatures for the heat to flow at the same rate along *PRQ* and *PQ* then which of the following option is correct

(a) $K_3 = \frac{1}{2}(K_1 + K_2)$

(b) $K_3 = K_1 + K_2$

(c) $K_3 = \frac{K_1 K_2}{K_1 + K_2}$

(d) $K_3 = 2(K_1 + K_2)$



6. If V denotes the potential difference across the plates of a capacitor of capacitance C, the dimensions of CV^2 are

(a)Not expressible in MLT (b) MLT^{-2}

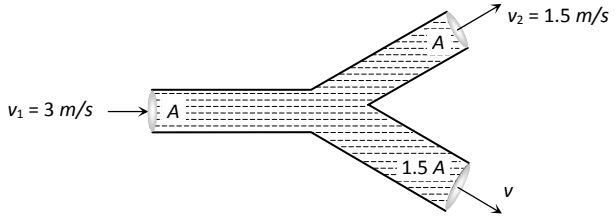
(c) M^2LT^{-1} (d) ML^2T^{-2}

7. Dimensional formula of magnetic flux is

(a) $ML^2T^{-2}A^{-1}$ (b) $ML^0T^{-2}A^{-2}$

(c) $M^0L^{-2}T^{-2}A^{-3}$ (d) $ML^2T^{-2}A^3$

8. An incompressible liquid flows through a horizontal tube as shown in the following fig. Then the velocity *v* of the fluid is



(a) $3.0\ m/s$ (b) $1.5\ m/s$

(c) $1.0\ m/s$* (d) $2.25\ m/s$

9. A cylinder of height 20 *m* is completely filled with water. The velocity of efflux of water (in *m/s*) through a small hole on the side wall of the cylinder near its bottom is

(a) 10 (b) 20

(c) 25.5 (d) 5

10. The Young's modulus of a wire of length *L* and radius *r* is *Y N*/m^2. If the length and radius are reduced to *L*/2 and *r*/2, then its Young's modulus will be

(a) *Y*/2 (b) *Y*

(c) 2*Y* (d) 4*Y*

11. The equation of state of some gases can be expressed as $\left(P+\frac{a}{V^2}\right)(V-b)=RT$. Here P is the pressure, V is the volume, T is the absolute temperature and a, b, R are constants. The dimensions of 'b' are

(a) ML^5T^{-2} (b) $ML^{-1}T^{-2}$

(c) $M^0L^3T^0$ (d) $M^0L^6T^0$

12. The radius of a sphere is (5.3 ± 0.1) *cm*. The percentage error in its volume is

(a) $\frac{0.1}{5.3}\times 100$ (b) $3\times\frac{0.1}{5.3}\times 100$

(c) $\frac{0.1\times 100}{3.53}$ (d) $3+\frac{0.1}{5.3}\times 100$

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