9. Consider that σ_s, k_B, b represent Stefan-Boltzmann constant, Boltzmann constant and Wien's displacement law constant, respectively. The dimension of $\sigma_s k_B^{-1} b$ is :

(1) $[L^{-1}K^{-2}]$ (2) $[L^{-1}T^{-1}K^{-3}]$

(3) $[L^{-1}T^{-1}K^{-4}]$ (4) $[L^{-1}T^{-1}K^{-2}]$

10. For sound waves, if the number of nodes for the 5th harmonic of an open-ended pipe is n and that for the 9th harmonic of the same pipe with one of its ends closed is m, the ratio $\frac{n}{m}$ is :

(1) $\frac{9}{5}$ (2) 1

(3) $\frac{3}{5}$ (4) $\frac{5}{9}$

11. Two infinitely long parallel conducting wires A and B carry currents I and 2I, respectively, in the same direction. The wire A has uniform mass per unit length λ and lies on an insulated floor. The wire B is kept fixed at a height h above the floor. The minimum magnitude of h so that the wire A does not rise from the floor is :

[g is the acceleration due to gravity and μ_0 is the permeability of free space.]

(1) $\frac{\mu_0 I^2}{\pi\lambda g}$ (2) $\frac{2\mu_0 I^2}{\pi\lambda g}$

(3) $\frac{4\mu_0 I^2}{\pi\lambda g}$ (4) $\frac{\mu_0 I^2}{2\pi\lambda g}$

12. An ac voltage $V = 220 \sin(2\times10^3 t)$ Volt is applied to a series LCR circuit. Then the current amplitude in this circuit is :

(Given : L = 10 mH, C = 25μF, R = 100 Ω)

(1) 5.5 A (2) 11.0 A

(3) 22.0 A (4) 2.2 A

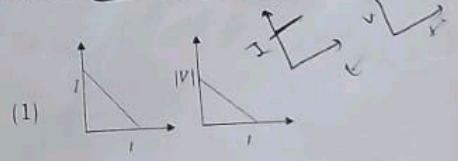
13. Consider a fixed uniformly charged insulating sphere with radius R and total charge +Q. A point charge −q (q<<Q) with mass m is released from rest at a distance of 3R from the centre of the charged sphere. When the point charge reaches the surface of the sphere, its speed is :

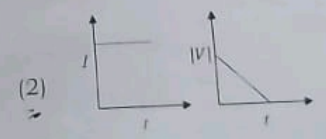
(ϵ_0 is the permittivity of vacuum, neglect gravitational forces).

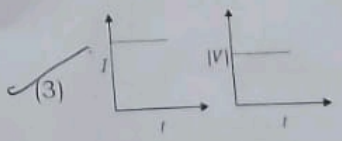
(1) $\sqrt{\frac{2Qq}{3\pi\epsilon_0 mR}}$ (2) $\sqrt{\frac{Qq}{3\pi\epsilon_0 mR}}$

(3) $\sqrt{\frac{Qq}{4\pi\epsilon_0 mR}}$ (4) $\sqrt{\frac{3Qq}{4\pi\epsilon_0 mR}}$

14. A beam of light falls on a metal surface such that photo-electrons are generated. If power of the light source starts to decrease linearly with time t, then variation of the photocurrent I and magnitude of the stopping potential |V| with time is best represented by :

(1) 

(2) 

(3) 

(4)