NEET 2016

(Paper II)

(PHYSICS)

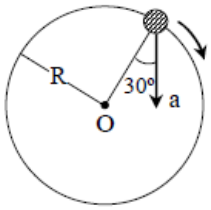
1. Planck's constant (h), speed of light in vacuum (c) and Newton's gravitational constant (G) are three fundamental constants. Which of the following combinations of these has the dimension of length?

(a) $\frac{\sqrt{hG}}{c^{3/2}}$ (b) $\frac{\sqrt{hG}}{c^{5/2}}$ (c) $\sqrt{\frac{hc}{G}}$ (d) $\sqrt{\frac{Gc}{h^{3/2}}}$

2. Two cars P and Q start from a point at the same time in a straight line and their positions are represented by $x_p(t) = at + bt^2$ and $x_Q(t) = ft - t^2$. At what time do the cars have the same velocity?

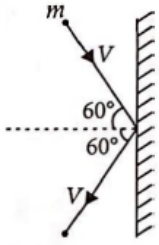
(a) a – t / 1 +b (b) a +t/2(b – 1) (c) a +t/2(1+b) (d) t –a/2(a+b)

3. In the given figure, a = 15m/s^2 represents the total acceleration of a particle moving in the clockwise direction in a circle of radius R = 2.5m at a given instant of time. The speed of the particle is



(a) 4.5m/s (b) 5.0m/s (c) 5.7m/s (d) 6.2m/s

4. A rigid ball of mass m strikes a rigid wall at 60° and gets reflected without loss of speed as shown in the figure. The value of impulse imparted by the wall on the ball will be



(a) mv (b) 2mv (c) mv/2 (d) mv/3

5. A bullet of mass 10g moving horizontal with a velocity of 400m/s strikes a wood block of mass 2kg which is suspended by light inextensible string of length 5m. As result, the centre of gravity of the block found to rise a vertical distance of 10cm. The speed of the bullet after it emerges of horizontally from the block will be

(a) 100m/s (b) 80m/s (c) 120m/s (d) 160m/s

6. Two identical balls A and B having velocities of 0.5m/s and – 0.3 m/s respectively collide elastically in one dimension. The velocities of B and A after collision respectively will be

(a) – 0.5m/s and 0.3m/s (b) 0.5m/s and - 0.3m/s

(c) – 0.3m/s and 0.5m/s (d) 0.3m/s and 0.5m/s

7. A particle moves from a point $(-2\hat{i}+5\hat{j})$ to $(4\hat{i}+3\hat{k})$ when a force of $(4\hat{i}+3\hat{j})$N is applied. How much work has been done by the force?

(a) 8J (b) 11J (c) 5J (d) 2J

8. Two rotating bodies A and B of masses m and 2m with moments of inertia I_A and $I_B(I_B>I_A)$ have equal kinetic energy of rotation. If L_A and L_B be their angular moments respectively. Then

(a) $L_A = L_B/2$ (b) $L_A = 2L_B$ (c) $L_B>L_A$ (d) $L_A>L_B$

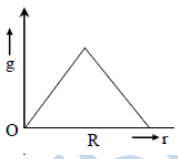
9. A solid sphere of mass ma and radius R is rotating about its diameter. A solid cylinder of the same mass and same radius is also rotating about its geometrical axis with an angular speed twice that of the sphere. The ratio of their kinetic energies of rotation (E_{sphere}/ $E_{cylinder}$) will be

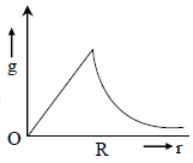
(a) 2:3 (b) 1:5 (c) 1:4 (d) 3:1

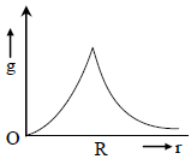
10. A light rod of length l has two masses m_1 and m_2 attached to its two ends. The moment of inertia of the system about an axis perpendicular to the rod and passing through the centre of mass is

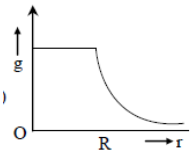
(a) $\frac{m_1m_2}{m_1+m_2}l^2$ (b) $\frac{m_1+m_2}{m_1m_2}l^2$ (c) $(m_1+m_2)l^2$ (d) $\sqrt{m_1+m_2}l^2$

11. Starting from the centre of the earth having radius R, the variation of g (acceleration due to gravity) is shown by

(a) 

(b) 

(c) 

(d) 

12. A satellite of mass m is orbiting the earth (of radius R) at a height h from its surface. The total energy of the satellite in terms of g_0. The value of acceleration due to gravity at the earth's surface is

(a) $\frac{mg_0R^2}{2(R+h)}$ (b) $-\frac{mg_0R^2}{2(R+h)}$ (c) $\frac{2mg_0R^2}{R+h}$ (d) $-\frac{2mg_0R^2}{R+h}$

13. A rectangular film of liquid is extended from (4cm ×2cm) to (5cm ×4cm). If the work done is 3×10^{-4}J, the value of the surface tension of the liquid is

(a) 0.250 Nm^{-1} (b) 0.125 Nm^{-1} (c) 0.2 Nm^{-1} (d) 8.0 Nm^{-1}

14. Three liquids of densities ρ_1, ρ_2 and ρ_3(with $\rho_1>\rho_2>\rho_3$) having the same value of surface tension T, rise to the same height three identical capillaries. The angles of contact θ_1, θ_2 and θ_3 obey

(a) $\pi/2>\theta_1>\theta_2>\theta_3\geq 0$ (b) $0\leq \theta_1<\theta_2<\theta_3<\pi/2$ (c) $\pi/2<\theta_1<\theta_2<\theta_3<\pi$ (d) $\pi>\theta_1>\theta_2>\theta_3>\pi/2$

15. Two identical bodies are made of a material for which the heat capacity increases with temperature. One of these is at 100°C, while the other one is at 0°C. If the two bodies are brought into contact then assuming no heat loss, the final common temperature is
(a) 50°C (b) more than 50°C
(c) less than 50°C but greater than 0°C (d) 0°C

16. A body cools from a temperature 3T to 2T in 10 minutes. The room temperature is T. Assume that Newton's law of cooling is applicable. The temperature of the body at the end of the next 10 minutes will be
(a) 7/4T (b) 3/2T (c) 4/3T (d) T

17. One mole of an ideal monatomic gas undergoes a process described by the equation PV^3 = constant. He heat capacity of the gas during this process is
(a) 3/2R (b) 5/2R (c) 2R (d) R

18. The temperature inside a refrigerator is t_2°C and the room temperature is t_1°C. The amount of heat delivered to the room for each joule of electrical energy consumed ideally will be
(a) $t_1/ t_1 - t_2$ (b) $t_1 + 273/ t_1 - t_2$ (c) $t_2 + 273/ t_1 - t_2$ (d) $t_1 + t_2/t_1 + 273$

19. A given sample of an ideal gas occupies a volume V at a pressure o and absolute temperature T. The mass of each molecule of the gas is m. Which of the following gives the density of the gas?
(a) p/(kT) (b) pm/(kT) (c) p/(kTV) (d) mkT

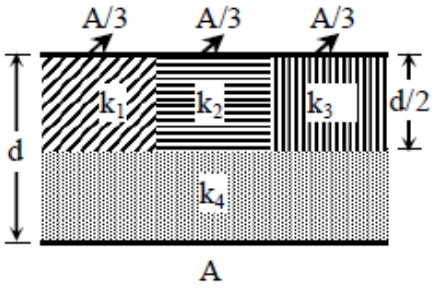
20. A body of mass m is attached to the lower and of a spring whose upper end is fixed. The spring has negligible mass. When the mass m is slightly pulled down and released, it oscillates with a time period of 3s. When the mass m is increased by 1kg, the time period of oscillations becomes 5s. The value of m in kg is
(a) 3/4 (b) 4/3 (c) 16/9 (d) 9/16

21. The second overtone fo an open pipe has the same frequency as the first overtone of a closed pipe L metre long. The length of the open pipe will be
(a) L (b) 2L (c) L/2 (d) 4L

22. Three sound waves of equal amplitudes have frequencies (n – 1), n, (n + 1(. They superimpose to give beats. The number of beats produced per second will be
(a) 1 (b) 4 (c)3 (D) 2

23. An electric dipole is placed at an angle of 30° with an electric field intensity 2×10^5N/C. It experiences a torque equal to 4Nm. The charge on the dipole length is 2cm, is
(a) 8μC (b) 2μC (c) 5μC (d) 7μC

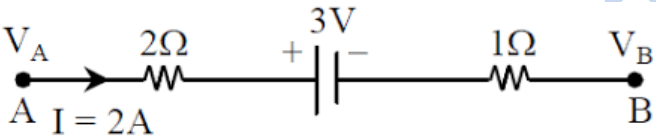
24. A parallel plate capacitor of area A plate separation d and capacitance C filled with four dielectric materials having dielectric constants k_1, k_2, k_3 and k_4 as shown in the figure below. If a single dielectric material is to be used to have the same capacitance C in this capacitor, then its dielectric constant k is given by



(a) $k = k_1+k_2+k_3+3k_4$ (b) $k = 2/3(k_1+k_2+k_3)+2k_4$

(c) $2/k = 3/k_1+k_2+k_3 + 1/k_4$ (d) $1/k = 1/k_1+1/k_2+1/k_3+3/2k_4$

25. The potential difference between (V_A – V_B) between the points A and B in the given figure is



(a) – 3V (b) +3V (c) +6V (d) +9V

26. A filament bulb (500W, 100V) is to be used in a 230V main supply. When a resistance R is connected in series. It works perfectly and the bulb consumes 500W. The value of R is

(a) 230Ω (b) 45 Ω (c) 26 Ω (d) 13 Ω

27. A long wire carrying a steady current is bent into a circular loop of one turn. The magnetic field at the centre of the loop is B. It is then bent into a circular coil of n turns. The magnetic field at the centre of this coil of n turns will be

(a) nB (b) n^2B (c) 2nB (d) $2n^2B$

28. A bar magnet is hung by a thin cotton thread in a uniform horizontal magnetic field and is in equilibrium state. The energy required to rotate it by 60° is W. Now the torque required to keep the magnet in this new position is

(a) W/√3 (b) √3W (c) √3W/2 (d) 2W/√3

29. An electron is moving in a circular path under the influence of a transverse magnetic field of 3.57×10^{-2}T. If the value of e/m is 1.76×10^{11} C/kg, the frequency of revolution of the electron is

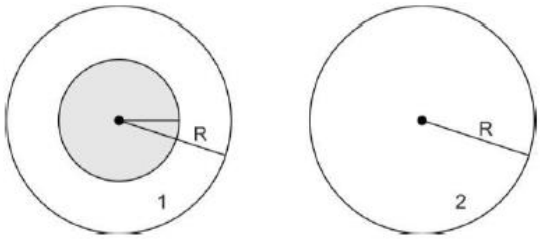
(a) 1 GHz (b) 100 MHz (c) 62.8 MHz (d) 6.28 MHz

30. Which of the following combinations should be selected for better tuning of an LCR circuit used for communication?

(a) R = 20Ω, L = 1.5H, C=35 μF (b) R = 25Ω, L = 2.5H, C=45 μF

(c) R = 15Ω, L = 3.5H, C=30 μF (d) R = 25Ω, L = 1.5H, C=45 μF

31. A uniform magnetic field is restricted within a region of radius r. The magnetic field changes f\with time at a rate dB/dt. Loop 1 of radius R>r encloses the region r and loop 2 of radius R is outside the region of magnetic field as shown in the figure. Then the emf generated is



(a) Zero in loop 1 and zero in loop2 (b) – dB/dt πr^2 in loop 1 and – dB/dt in loop 2
(c)– dB/dt πR^2 in loop 1 and zero in loop2 (d) – dB/dt πr^2 in loop 1 and zero in loop 2

32. The potential differences across the resistance, capacitance and inductance are 80V, 40V and 100V respectively in an LCR circuit. The power factor of this circuit is
(a) 0.4 (b) 0.5 (c) 0.8 (d) 1.0

33. A 100Ω resistance and a capacitor of 100Ω reactance are connected in series across a 220V source. When the capacitor is 50% charged, the peak value of the displacement current is
(a) 2.2A (b) 11A (c) 4.4A (d) $11\sqrt{2}$ A

34. Two identical glass (μ_g = 3/2) equipotential lenses of focal length f each are kept in contact. The space between the two lenses is filled with water (μ_w = 4/3). The focal length of the combination is
(a) f/3 (b) f (c) 4f/3 (d) 3f/4

35. An air bubble in a glass slab with refraction index 1.5 (near normal incidence) is 5cm deep[when viewed from one surface and 3cm deep when viewed from the opposite face. The thickness (in cm) of the slab is
(a) 8 (b) 10 (c) 12 (d) 16

36. The interference pattern is obtained with two coherent light sources of intensity ratio n. In the interference pattern, the ratio $I_{max} - I_{min}/ I_{max} + I_{min}$ will be
(a) $\sqrt{n}/ n+1$ (b) $2\sqrt{n}/ n+1$ (c) $\sqrt{n}(n+1)^2$ (d) $2\sqrt{n}/ (n+1)^2$

37. A person can see clearly objects only when they lie between 50cm and 400 cm from the eyes. In order to increase the maximum distance of distinct vision to infinity., the type and power has to use, will be
(a) convex, +2.25 diopter (b) concave, - 0.25 diopter
(c) concave, - 0.2 diopter (d) convex, +0.15 diopter

38. A linear aperture whose width is 0.02 cm is placed immediately in front of a lens of focal length 60cm. The aperture is illuminated normally by a parallel beam of wavelength 5×10^{-5} cm. The distance of the first dark band of the diffraction pattern from the centre of the screen is
(a) 0.10cm (b) 0.25cm (c) 0.20cm (d) 0.15cm

39. Electrons of mass m with de-Broglie wavelength λ fall on the target in an X ray tube. The cut off wavelength (λ_0) of the emitted X-ray is

(a) $\lambda_0 = \frac{2mc\lambda^2}{h}$ (b) $\lambda_0 = \frac{2h}{mc}$ (c) $\lambda_0 = \frac{2m^2c^2\lambda^2}{h^2}$ (d) $\lambda_0 = \lambda$

40. Photons with energy 5eV are incident on a cathode C in a photoelectric cell. The maximum energy of emitted photoelectrons will reach the anode A, if the stopping potential of A relative to C is

(a) +3V (b) +4V (c) – 1V (d) – 3V

41. In an electron in a hydrogen atom jumps from the 3rd orbit to 2nd orbit , it emits a photon of wavelength λ. When it jumps from the 4th orbit to the 3rd orbit, the corresponding wavelength of the photon will be

(a) 16/25 λ (b)9/16 λ (c) 20/7 λ (d) 20/13 λ

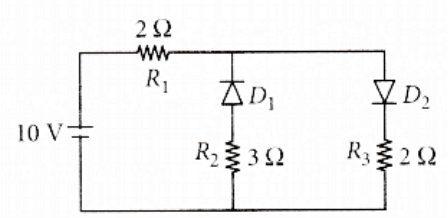
42. The half life of a radioactive substance is 30 minutes. The time (in minutes) taken between 40% decay and 85% decay of the same radioactive substance is

(a) 15 (b) 30 (c) 45 (d) 60

43. For CE transistor amplifier, the audio signal voltage across eh collector resistance of 2kΩ is 4V. If the current amplification factor of the transistor is 100 and the base resistance is 1kΩ, then the input signal voltage is

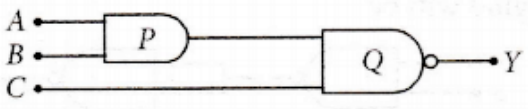
(a) 10 mV (b) 20 mV (c) 30 mV (d) 15 mV

44. The given circuit has two ideal diodes connected as shown in the figure below. The current flowing through the resistance R_1 will be



(a) 2.5A (b) 10.0A (c) 1.43A (d) 3.13A

45. What is the output Y in the following circuit, when all the three inputs A, B, C are first 0 and then 1?



(a) 0, 1 (b) 0, 0 (c) 1, 0 (d) 1, 1