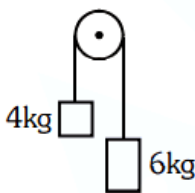


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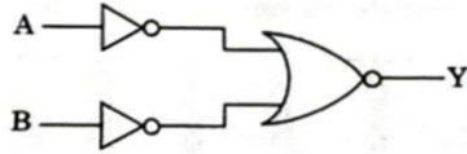
(PHYSICS)

- The phase difference between displacement and acceleration of a particle in a simple harmonic motion is
(a) $3\pi/2$ rad (b) $\pi/2$ rad (c) zero (d) π rad
- A long solenoid of 50cm length having 100 turns carries a current of 2.5A. The magnetic field at the centre of solenoid is
(a) 3.14×10^{-4} T (b) 6.28×10^{-5} T (c) 3.14×10^{-5} T (d) 6.28×10^{-4} T
- Two bodies of mass 4kg and 6kg are tied to the ends of massless string. The string passes over a pulley which is frictionless (see fig). The acceleration of the system in terms of acceleration due to gravity g is



- (a) $g/2$ (b) $g/5$ (c) $g/10$ (d) g
- The ratio of contributions made by the electric field and magnetic field components to the intensity of an electromagnetic wave is (where c = speed of electromagnetic waves)
(a) 1:1 (b) 1:c (c) 1:c² (d) c:1
- In a certain region of space with volume 0.2m³ the electric potential is found to be 5V throughout. The magnitude of electric field in this region is
(a) 0.5N/C (b) 1N/C (c) 5N/C (d) zero
- The average thermal energy for a monoatomic gas is (where k_B is Boltzmann constant and T is absolute temperature)
(a) $3/2 k_B T$ (b) $5/2 k_B T$ (c) $7/2 k_B T$ (d) $1/2 k_B T$
- Find the torque about the origin when a force of $3 \hat{j}$ N acts on the particle whose position vector is $2 \hat{k}$ m.
(a) $6 \hat{j}$ N-m (b) $-6 \hat{i}$ N-m (c) $6 \hat{k}$ N-m (d) $6 \hat{i}$ N-m
- The mean free path λ for a gas with molecular diameter d and number density n can be expressed as
(a) $\frac{1}{\sqrt{2}n\pi d^2}$ (b) $\frac{1}{\sqrt{2}n^2\pi d^2}$ (c) $\frac{1}{\sqrt{2}n^2\pi^2 d^2}$ (d) $\frac{1}{\sqrt{2}n\pi d}$
- The energy equivalent of 0.5g of a substance is
(a) 4.5×10^{13} J (b) 1.5×10^{13} J (c) 0.5×10^{13} J (d) 4.5×10^{16} J
- A screw gauge has least count of 0.01mm and there are 50 divisions in its circular scale. The pitch of the screw gauge is
(a) 0.25mm (b) 0.5mm (c) 1.0mm (d) 0.01mm

11. Two cylinders A and B of equal capacity are connected to each other via a stop cock. A contains an ideal gas at standard temperature and pressure. B is completely evacuated. The entire system is thermally insulated. The stop cock is suddenly opened. The process is
 (a) adiabatic (b) isochoric (c) isobaric (d) isothermal
12. A cylinder contains hydrogen gas at pressure of 249 kPa and temperature 27°C. Its density is ($R = 8.3\text{J mol}^{-1}\text{K}^{-1}$)
 (a) 0.2 kg/m^3 (b) 0.1 kg/m^3 (c) 0.02 kg/m^3 (d) 0.5 kg/m^3
13. When a uranium isotope ${}_{92}^{235}\text{U}$ is bombarded with a neutron, it generates ${}_{36}^{89}\text{Kr}$, three neutrons and
 (a) ${}_{40}^{91}\text{Zr}$ (b) ${}_{36}^{101}\text{Kr}$ (c) ${}_{36}^{103}\text{Kr}$ (d) ${}_{56}^{144}\text{Ba}$
14. A charged particle having drift velocity of $7.5 \times 10^{-4}\text{ ms}^{-1}$ in an electric field of $3 \times 10^{-10}\text{ Vm}^{-1}$, has a mobility (in $\text{m}^2\text{V}^{-1}\text{s}^{-1}$) of
 (a) 2.5×10^6 (b) 2.5×10^{-6} (c) 2.25×10^{-15} (d) 2.25×10^{15}
15. Taking into account of the significant figures, what is the value of $9.99\text{m} - 0.0099\text{m}$?
 (a) 9.98m (b) 9.980m (c) 9.9m (d) 9.9801m
16. An iron rod of susceptibility 599 is subjected to a magnetizing field of 1200 Am^{-1} . The permeability of the material of the rod is (take $\mu_0 = 4\pi \times 10^{-7}\text{ TmA}^{-1}$)
 (a) $8.0 \times 10^{-5}\text{ TmA}^{-1}$ (b) $2.4\pi \times 10^{-5}\text{ TmA}^{-1}$ (c) $2.4\pi \times 10^{-7}\text{ TmA}^{-1}$ (d) $2.4\pi \times 10^{-4}\text{ TmA}^{-1}$
17. A spherical conductor of radius 10cm has a charge of $3.2 \times 10^{-7}\text{C}$ distributed uniformly. What is the magnitude of electric field at a point 15cm from the centre of the sphere? (Take $1/4\pi\epsilon_0 = 9 \times 10^9\text{ Nm}^2\text{C}^{-2}$)
 (a) $1.28 \times 10^5\text{N/C}$ (b) $1.25 \times 10^6\text{N/C}$ (c) $1.28 \times 10^8\text{N/C}$ (d) $1.28 \times 10^4\text{N/C}$
18. A series LCR circuit is connected to an AC voltage source. When L is removed from the circuit, the phase difference between current and voltage is $\pi/3$. If instead C is removed from the circuit, the phase difference is again $\pi/3$ between current and voltage. The power factor of the circuit is
 (a) 0.5 (b) 1.0 (c) -1.0 (d) zero
19. A capillary tube of radius r is immersed in water and water rises in it to a height h. The mass of the water in the capillary tube is 5g. Another capillary tube of radius 2r is immersed in water. The mass of water that will rise in this tube is
 (a) 5.0g (b) 10.0g (c) 20.0g (d) 2.5g
20. In Young's double slit experiment, if the separation between coherent sources is halved and the distance of the screen from the coherent sources is doubled, then the fringe width becomes
 (a) half (b) four times (c) one-fourth (d) double
21. For the logic circuit shown, the truth table is



	A	B	Y		A	B	Y
	0	0	1	(a)	0	0	0
	0	1	0		0	1	0
	1	0	0		1	0	0
	1	1	0	(b)	1	1	1
	A	B	Y		A	B	Y
	0	0	0		0	0	1
	0	1	1		0	1	1
	1	0	1		1	0	1
(c)	1	1	1	(d)	1	1	0

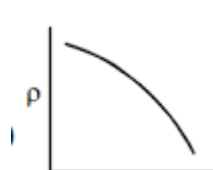
22. The color code of a resistance is given below:



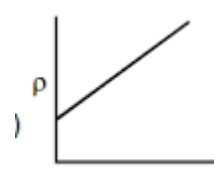
The values of resistance and tolerance respectively are

- (a) $47\text{k}\Omega$, 10% (b) $4.7\text{k}\Omega$, 5% (c) 470Ω , 5% (d) $470\text{k}\Omega$, 5%
23. The capacitance of a parallel plate capacitor with air as medium is $6\mu\text{F}$. With the introduction of a dielectric medium, the capacitance becomes $30\mu\text{F}$. The permittivity of the medium is ($\epsilon_0 = 8.85 \times 10^{-12} \text{C}^2\text{N}^{-1}\text{m}^{-2}$)
- (a) $1.77 \times 10^{-12} \text{C}^2\text{N}^{-1}\text{m}^{-2}$ (b) $0.44 \times 10^{-10} \text{C}^2\text{N}^{-1}\text{m}^{-2}$
(c) $500 \text{C}^2\text{N}^{-1}\text{m}^{-2}$ (d) $0.44 \times 10^{-13} \text{C}^2\text{N}^{-1}\text{m}^{-2}$
24. A ball is thrown vertically downward with a velocity of 20 m/s from the top of a tower. It hits the ground after sometime with a velocity of 80 m/s. The height of the tower is ($g = 10 \text{ m/s}^2$)
- (a) 340m (b) 320m (c) 300m (d) 360m
25. A body weighs 72N on the surface of the earth. What is the gravitational force on it, at a height equal to half of radius of the earth?
- (a) 32N (b) 30N (c) 24N (d) 48N
26. Two particles of mass 5kg and 10kg respectively are attached to the two ends of a rigid rod of length 1m with negligible mass. The centre of mass of the system from the 5kg particle is nearly at a distance of
- (a) 50cm (b) 67cm (c) 80cm (d) 33cm
27. The increase in the width of the depletion region in a pn junction diode is due to
- (a) reverse bias only (b) both forward and reverse bias
(c) increase in forward current (d) forward bias only

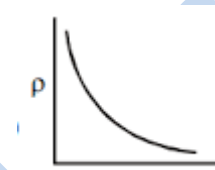
28. Light of frequency 1.5 times the threshold frequency is incident on a photosensitive material. What will be the photoelectric current if the frequency is halved and intensity is doubled?
 (a) four times (b) one-fourth (c) zero (d) doubled
29. Assume that light of wavelength 600nm is coming from a star. The limit of resolution of telescope whose objective has a diameter of 2m is
 (a) 1.83×10^{-7} rad (b) 7.32×10^{-7} rad (c) 6.00×10^{-7} rad (d) 3.66×10^{-7} rad
30. A resistance wire connected in the left gap of a metre bridge balances a 10Ω resistance in the right gap at a point which divides the bridge wire in the ratio 3:2. If the length of the resistance wire is 1.5m. Then the length of 1Ω of the resistance wire is
 (a) 10×10^{-1} m (b) 1.5×10^{-1} m (c) 1.5×10^{-2} m (d) 1.0×10^{-2} m
31. Light with an average flux of $20\text{W}/\text{cm}^2$ falls on a non reflecting surface at normal incidence having surface area 20cm^2 . The energy received by the surface during time span of 1 min is
 (a) 12×10^3 J (b) 24×10^3 J (c) 48×10^3 J (d) 10×10^3 J
32. A ray is incident at an angle of incidence i on one surface of a small angle prism (with angle of prism A) and emerges normally from the opposite surface. If the refractive index of the material of the prism is μ , then the angle of incidence is nearly equal to
 (a) $2A/\mu$ (b) μA (c) $\mu A/2$ (d) $A/2\mu$
33. A $40\mu\text{F}$ capacitor is connected to a 200V, 50HZ AC supply. The rms value of the current in the circuit is, nearly
 (a) 2.05A (b) 2.5A (c) 25.1A (d) 1.7A
34. Dimensions of stress are
 (a) $[\text{ML}^2 \text{T}^{-2}]$ (b) $[\text{ML}^0 \text{T}^{-2}]$ (c) $[\text{ML}^{-1} \text{T}^{-2}]$ (d) $[\text{MLT}^{-2}]$
35. The Brewster's angle i_b for an interface should be
 (a) $30^\circ < i_b < 45^\circ$ (b) $45^\circ < i_b < 90^\circ$ (c) $i_b = 90^\circ$ (d) $0^\circ < i_b < 30^\circ$
36. A wire of length L , area of cross section A is hanging from a fixed support. The length of the wire change to L_1 when mass M is suspended from its free end. The expression for Young's modulus is
 (a) $\frac{Mg(L_1 - L)}{AL}$ (b) $\frac{MgL}{AL_1}$ (c) $\frac{MgL}{A(L_1 - L)}$ (d) $\frac{MgL_1}{AL}$
37. A short electric dipole has a dipole moment of $16 \times 10^{-9} \text{C}\cdot\text{m}$. The electric potential due to the dipole at a point at a distance of 0.6m from the centre of the dipole situated on a line making an angle of 60° with the dipole axis is ($1/4 \pi \epsilon_0 = 9 \times 10^9 \text{Nm}^2\text{C}^{-2}$)
 (a) 200V (b) 536V (c) 537V (d) 523V
38. In a guitar, two strings A and B made of same material are slightly out of tune and produce beats of frequency 6Hz. When the tension in B is slightly decreased the beat frequency increases to 7Hz. If the frequency of A is 530Hz, the original frequency f_0 of B will be
 (a) 524Hz (b) 536Hz (c) 537Hz (d) 523Hz

39. An electron is accelerated from rest through a potential difference of V volt. If the de-Broglie wavelength of the electron is $1.227 \times 10^{-2} \text{ nm}$, the potential difference is
 (a) 10^2 V (b) 10^3 V (c) 10^4 V (d) 10 V
40. The solids which have the negative temperature coefficient of resistance are
 (a) insulator only (b) semiconductors only
 (c) insulators and semiconductors only (d) metals
41. The energy required to break one bond in DNA is 10^{-20} J . This value (in eV) is nearly
 (a) 0.6 (b) 0.06 (c) 0.006 (d) 6
42. The quantities of heat required to raise the temperature of two solid copper spheres of radii r_1 and r_2 ($r_1 = 1.5r_2$) through 1 K are in the ratio
 (a) $9/4$ (b) $3/2$ (c) $5/3$ (d) $27/8$
43. Which of the following graph represents the variation of resistivity (ρ) with temperature (T) for copper?
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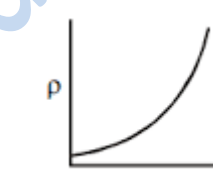
(a)



(b)



(c)



(d)
44. For transistor action, which of the following statements is correct?
 (a) base, emitter and collector regions should have the same size
 (b) both emitter junction as well as the collector junctions are forward biased
 (c) the region must be very thin and lightly doped
 (d) base, emitter and collector regions should have same doping concentrations
45. For which one of the following, Bohr model is not valid?
 (a) single ionized helium atom (He^+) (b) Deuteron atom
 (c) Singly ionized neon atom (Ne^+) (d) Hydrogen atom