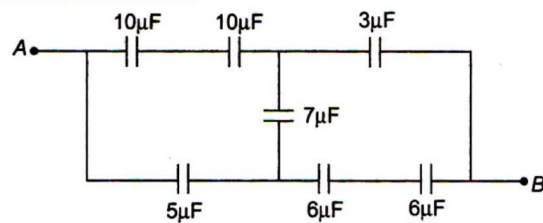


1. A large number of bullets are fired in all directions with same speed v . What is the maximum area on the ground on which these bullets will spread
 - (a) $\pi \frac{V^2}{g}$
 - (b) $\pi \frac{V^2}{g^2}$
 - (c) $\pi^2 \frac{V^4}{g^2}$
 - (d) $\pi^2 \frac{V^2}{g^2}$
2. A force vector applied on a body is given by $\hat{F} = 6\hat{i} - 8\hat{j} + 10\hat{k}$ and acquires an acceleration of 1 m/s^2 . Then the mass of the body is
 - (a) $10\sqrt{2} \text{ kg}$
 - (b) $2\sqrt{10} \text{ kg}$
 - (c) 10kg
 - (d) 20kg
3. A 2 kg block is dropped from a height of 0.4 m on a spring of force constant $k = 1960 \text{ N/m}$. The maximum compression of the spring is
 - (a) 0.1 m
 - (b) 0.2 m
 - (c) 0.3 m
 - (d) 0.4 m
4. A solid sphere of mass 2 kg rolls up a 30° incline with an initial speed 10 m/s . The maximum height reached by the sphere is ($g = 10 \text{ m/s}^2$)
 - (a) 3.5 m
 - (b) 7.0 m
 - (c) 10.5 m
 - (d) 14.0 m
5. The ratio of the adiabatic bulk modulus to the isothermal bulk modulus of a perfect gas is equal to (symbols have their usual meanings)
 - (a) $C_p - C_v$
 - (b) $\frac{C_p}{C_v}$
 - (c) $\frac{C_v}{C_p}$
 - (d) $\sqrt{\frac{C_p}{C_v}}$
6. A simple pendulum has time period T . The pendulum is completely immersed in a non-viscous liquid whose density is one-tenth, of that of the material of the bob. The time period of the pendulum immersed in liquid is
 - (a) T
 - (b) $\sqrt{\frac{9}{10}}T$
 - (c) $\sqrt{\frac{10}{9}}T$
 - (d) $\frac{T}{10}$
7. How many times more intense is a 90 dB sound than a 40 dB sound?
 - (a) 2.5
 - (b) 5
 - (c) 50
 - (d) 10^5
8. If $x = \frac{\epsilon_0 l v}{t}$ where ϵ_0 is the permittivity of free space, v is length, v is potential difference and t is time. The dimensions of X are the same as that of
 - (a) charge
 - (b) resistance
 - (c) voltage
 - (d) current
9. An electric dipole placed in a uniform electric field will have minimum potential energy when the dipole moment is inclined to the field at an angle
 - (a) π
 - (b) $\frac{\pi}{2}$
 - (c) zero
 - (d) $\frac{3\pi}{2}$
10. In the figure, the equivalent capacitance between A and B is

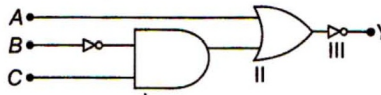


- (a) $3.75 \pi F$ (b) $5.25 \pi F$
(c) $6.5 \pi F$ (d) $10.5 \pi F$

11. If we add impurity to a metal those atoms also deflect electrons. Therefore,
(a) the electrical and thermal conductivities both increase
(b) the electrical and thermal conductivities both decrease
(c) the electrical conductivity increases but thermal conductivity decreases
(d) the electrical conductivity decreases but thermal conductivity increases
12. A toroidal solenoid with an air core has an average radius of 15 cm, area of cross-section 12 cm^2 and 1200 turns. Ignoring the field variation across the cross-section of the toroid, the self-inductance of the toroid is
(a) 4.6 mH (b) 6.9 mH
(c) 2.3 mH (d) 9.2 mH
13. Two plane mirrors are placed perpendicular to each other. A ray strikes one mirror and after reflection from the second mirror will be
(a) perpendicular to the original ray
(b) parallel to the original ray
(c) at 45° to the original ray
(d) can be at any angle to the original ray
14. An electron moving with velocity $2 \times 10^7 \text{ m/s}$ describes a circle in a magnetic field of strength $2 \times 10^{-2} \text{ T}$. If $\left(\frac{e}{m}\right)$ of electron is $1.76 \times 10^{11} \text{ C/kg}$, then the diameter of the circle is nearly
(a) 1.1 cm (b) 1.1 mm
(c) 1.1m (d) 11cm
15. An electron makes transition inside a hydrogen atom. The orbital angular momentum of the electron may change by
(a) h (b) $\frac{h}{3\pi}$

(c) $\frac{h}{2\pi}$ (d) $\frac{h}{4\pi}$

16. The transfer ratio β of a transistor is 50. The input resistance of the transistor when used in the common emitter mode is $1 \text{ K}\Omega$. The peak value of the collector alternating current for an input peak voltage of 0.01V is
(a) $100 \mu \text{ A}$ (b) $500 \mu \text{ A}$
(c) $0.01 \mu \text{ A}$ (d) $0.25 \mu \text{ A}$
17. A combination of convex and concave lenses has power 4 D. If the convex lens has power 5 D, the focal length of the concave lens will be
(a) 100cm (b) 100 cm
(c) -1 cm (d) $\frac{100}{-9} \text{ cm}$
18. A scooter of mass 120 kg is moving with a uniform velocity of 108 km/h. The force required to stop the vehicle in 10 s is
(a) 360 N (b) 720 N
(c) 180 N (d) $120 \times 10.8 \text{ N}$
19. A heat engine absorbs heat at 327°C and exhausts heat at 127°C . The efficiency of engine is η and the maximum amount of work performed by the engine per kilocalorie of heat input is W . Then,
(a) $\eta = 0.38$ (b) $\eta = 0.88$
(c) $W = 1596 \text{ J}$ (d) $W = 1400 \text{ J}$
20. A simple pendulum with length L and mass of the bob is vibrating with an amplitude a . Then the maximum tension in the string is
(a) mg (b) $mg \left[1 + \left(\frac{a}{L} \right)^2 \right]$
(c) $\left[1 + \frac{a}{2L} \right]^2$ (d) $mg \left[1 + \left(\frac{a}{L} \right)^2 \right]$
21. Two charged conducting spheres of radii R_1 and R_2 separated by a large distance are connected by a long wire. The ratio of the charges on them is
(a) $\frac{R_1}{R_2}$ (b) $\frac{R_2}{R_1}$
(c) $\frac{R_1^2}{R_2^2}$ (d) $\frac{R_2^2}{R_1^2}$

22. A proton and an α -particle, accelerated through the same potential difference, enter a region of uniform magnetic field normally. If the radius of the proton orbit is 10 cm, then radius of α -orbit is
 (a) 10 cm (b) $10\sqrt{2}$ cm
 (c) 20 cm (d) $5\sqrt{2}$ cm
23. In a noiseless transformer, an alternating current of 2 A is flowing in the primary coil. The number of turns on the primary and secondary coils are 100 and 20 respectively. The value of the current in the secondary coil is
 (a) 0.08 A (b) 0.4 A
 (c) 5 A (d) 10 A
24. A solenoid 30 cm long is made by winding 2000 loops of wire on an iron rod whose cross-section is 1.5 cm^2 . If the relative permeability of the iron is 6000, what is the self-inductance of the solenoid?
 (a) 1.5 H (b) 2.5 H
 (c) 3.5 H (d) 0.5 H
25. A luminous object is placed 20 cm from surface of a convex mirror and plane mirror is set, so that virtual images formed in two mirrors coincide. If plane mirror is at a distance of 12 cm from object, then focal length of convex mirror is
 (a) 5 cm (b) 10 cm
 (c) 20 cm (d) 40 cm
26. In a shunted ammeter, only 10% of current passes through the galvanometer of resistance G . The resistance of the shunt is
 (a) $9G$ (b) $10G$
 (c) $\frac{G}{9}$ (d) $\frac{G}{10}$
27. The output Y of the logic circuit shown in figure is best represented as

 (a) $\overline{A + B.C}$ (b) $\overline{A + \overline{B}}$
 (c) $\overline{A + B.C}$ (d) $A + \overline{B.C}$
28. A resistor of $6 \text{ k}\Omega$ with tolerance 10% and another of $4 \text{ k}\Omega$ with tolerance 10% are connected in series. The tolerance of combination is about
 (a) 5% (b) 10%
 (c) 12% (d) 15%
29. A stone attached to a rope of length 80 cm is rotated in vertical plane with a speed of 240 rpm. At the moment when the velocity of the stone is directed vertically upwards, the rope ruptures. To what further height does the stone rise? (The air resistance should be neglected)
 (a) 10.3 m (b) 41.2 m
 (c) 20.4 m (d) 24.9 m
30. Two bodies of masses 10 kg and 100 kg are separated by a distance of 2 m. The gravitational potential at the mid-point on the line joining the two is
 (a) $7.3 \times 10^{-7} \text{ J/kg}$ (b) $7.3 \times 10^{-8} \text{ J/kg}$
 (c) $7.3 \times 10^{-9} \text{ J/kg}$ (d) $7.3 \times 10^{-6} \text{ J/kg}$
31. A vessel has 6 g of hydrogen at pressure p and temperature 500 K. A small hole is made in it so, That hydrogen leaks out. How much hydrogen leaks out if the final pressure is $\frac{p}{2}$ and temperature falls to 300 K?
 (a) 2 g (b) 3 g
 (c) 4 g (d) 1 g
32. For an enclosure maintained at 1000 K, the maximum radiation occurs at wavelength λ_m . If the temperature is raised to 2000 K, the peak will shift to
 (a) $\lambda_m / 2$ (b) $2\lambda_m$
 (c) $2^4 \lambda_m$ (d) $2^{-4} \lambda_m$
33. An electron moving in a circular orbit of radius R , with a period T is equivalent to a magnetic dipole of dipole moment
 (a) $\frac{2\pi e R}{T}$ (b) $\frac{\pi e R}{T}$
 (c) $\frac{\pi e R^2}{T}$ (d) $\pi R^2 e T$
34. A coil of area 5 cm^2 and of 20 turns is placed in uniform magnetic field of 10^3 T . The normal to the plane of the coil makes an angle of 60° with the magnetic field. The flux in max well through the coil, is
 (a) 10^5 (b) 5×10^4

(c) 2×10^4 (d) 5×10^3 (d) λ behaviour of λA with time depends on the nature of the activity

35. A coil has an inductance of 0.7 H and is joined in series with a resistance of 220Ω . When an alternating emf of 220 V at 50 cps is applied to it, then the wattless component of the current in the circuit is

(a) 5 A

(b) 0.5 A

(c) 0.7 A

(d) 7 A

36. An electron jumps from the 4th orbit to the 2nd orbit of hydrogen atom. Given the Rydberg's constant $R = 10^5 \text{ cm}^{-1}$, the frequency in Hz of the emitted radiation will be

(a) $\frac{3}{10} \times 10^5$ (b) $\frac{16}{3} \times 10^{15}$ (c) $\frac{9}{16} \times 10^{15}$ (d) $\frac{3}{4} \times 10^{15}$

37. The decay constant K of a radioactive sample is the probability of decay of an atom in unit time. Then,

(a) λ decreases as the atom becomes older(b) λ increases as the age of atoms increases(c) λ independent of the age of atoms

38. If a surface has work function 4.0 eV, what is the maximum velocity of electrons liberated from the surface when it is irradiated with ultraviolet radiation of wavelength $0.2 \mu\text{m}$?

(a) $4.4 \times 10^5 \text{ m/s}$ (b) $8.8 \times 10^7 \text{ m/s}$ (c) $8.8 \times 10^5 \text{ m/s}$ (d) $4.4 \times 10^7 \text{ m/s}$

39. An installation consisting of an electric motor driving a water pump lifts 75 L of water per second to a height of 4.7 m. If the motor consumes a power of 5 kW, then the efficiency of the installation is

(a) 39%

(b) 69%

(c) 93%

(d) 96%

40. The Kepler's second law states that the straight line joining the planet to the sun sweeps out equal areas in equal times. The statement is equivalent to saying that

(a) total acceleration is zero

(b) transverse acceleration is zero

(c) longitudinal acceleration is zero

(d) radial acceleration is zero

Answer – Key

1. b	2. a	3. a	4. b	5. b	6. c	7. d	8. d	9. c	10. a
11. b	12. c	13. b	14. a	15. c	16. b	17. b	18. a	19. d	20. b
21. a	22. b	23. d	24. a	25. a	26. c	27. d	28. b	29. c	30. c
31. d	32. a	33. c	34. b	35. b	36. c	37. c	38. c	39. b	40. c