KCET

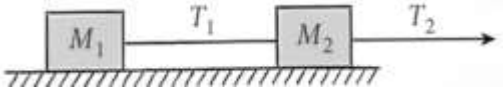
TOP 200 QUESTIONS

Physics

1. The instantaneous voltage through a device of impedance 20Ω is $e = 80\sin 100\pi t$. The effective value of the current is

(A) 3 A (B) 2.828 A
(C) 1.732 A (D) 4 A

2. Two masses M_1 and M_2 are accelerated uniformly on a frictionless surface as shown in figure. The ratio of the tensions T_1/T_2 is



(A) $\frac{M_1}{M_2}$ (B) $\frac{M_2}{M_1}$
(C) $\frac{(M_1+M_2)}{M_2}$ (D) $\frac{M_1}{(M_1+M_2)}$

3. The correct order of arrangement of electromagnetic waves according to their wavelength is

(A) Gamma rays < Micro waves < AM radio waves < FM radio waves
(B) Micro waves < AM radio waves < FM radio wave < Gamma rays
(C) Gamma rays < AM radio waves < FM radio wave < Micro waves
(D) Gamma rays < Micro waves < FM radio waves < AM radio waves

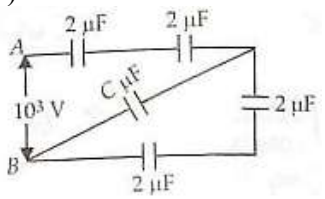
4. The refracting angle of a glass prism is 30°. A ray is incident on one of the faces perpendicular to it. The angle of deviation δ between the incident ray and that leaves the prism is (Refractive index of glass =1.5) (sin30° = 0.5,sin (48.6)° = 0.75)

(A) 17° (B) (18.6)°
(C) (12.6)° (D) 16°

5. Of the following quantities which one has the dimensions different from the remaining three?

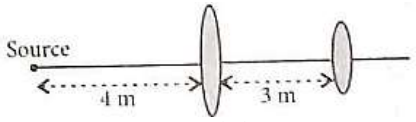
(A) Energy density
(B) Force per unit area
(C) Product of charge per unit volume and voltage
(D) Angular momentum per unit mass

6. When a potential difference of 103 V is applied between A and B, a charge of 0.75 mC is stored in the system of capacitors as shown. The value of C is (in μF)



(A) 1/2 (B) 2
(C) 2.5 (D) 3

7. An object is located 4 m from the first of two thin converging lenses of focal lengths 2 m and 1 m respectively. The lenses are separated by 3 m . The final image formed by the second lens is located from the source at a distance of



(A) 8.0 m (B) 7.5 m
(C) 6.0 m (D) 6.5 m

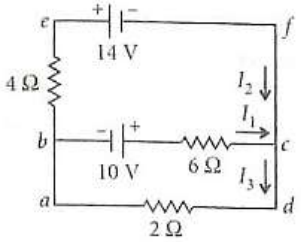
8. A certain simple harmonic vibrator of mass 0.1 kg has a total energy of 10 J . Its displacement from the mean position is 1 cm when it has equal kinetic and potential energies. The amplitude A and frequency v of vibration of the vibrator are

(A) $A=\sqrt{2}cm, v=\frac{500}{\pi}Hz$
(B) $A=\sqrt{2}cm, v=\frac{1000}{\pi}Hz$
(C) $A=\frac{1}{\sqrt{2}}cm, v=\frac{500}{\pi}Hz$
(D) $A=\frac{1}{\sqrt{2}}cm, v=\frac{1000}{\pi}Hz$

9. The electrical conductivity of a metal is

(A) directly proportional to the mean free path
(B) directly proportional to the mass of electron
(C) inversely proportional to the relaxation time
(D) inversely proportional to the mean free path

10. The values of the currents I_1, I_2, and I_3 flowing through the circuit given below is



(A) I_1= –3 A, I_2= 2 A, I_3 = –1 A
(B) I_1 = 2 A, I_2= –3 A, I_3 = –1 A
(C) I_1 = 3 A, I_2 = –1 A, I_3 = –2 A
(D) I_1= 1A, I_2 = –3 A, I_3= –2 A

11. A wooden block is dropped from the top of a cliff 100 m high and simultaneously a bullet of mass 10 g is fired from the foot of the cliff upwards with a velocity of 100 m/s. The bullet and wooden block will meet each other after a time
(A) 10 s (B) 0.5 s
(C) 1 s (D) 7 s

12. The number of electrons in one coloumb of charges is
(A) 6.25×10^{18} (B) 6.25×10^{1}
(C) 6.25×10^{10} (D) 6.25×10^{12}

13. The net electric force on a charge of +3μC at the mid-point on the line joining two charges of magnitude +2μC and -2μC separated by the distance of 6 mm , is
(A) 6000 N (B) 500 N
(C) 60 N (D) zero

14. A fighter aircraft is looping in a vertical plane. The minimum velocity at the highest point is (given r= radius of the loop)
(A) $\sqrt{\frac{1}{2}gr}$ (B) $\sqrt{2gr}$
(C) $\sqrt{gr}$ (D) $\sqrt{3gr}$

15. A 0.1 m long conductor carrying a current of 50 A is held perpendicular to a magnetic field of 1.25 mT. The mechanical power required to move the conductor with a speed of 1 ms^{-1} is
(A) 62.5 mW (B) 625 W
(C) 6.25 mW (D) 12.5 mW

16. Two coils P and S are kept very close to each other. When the current in P changes by 10 A, the magnetic flux in S changes by 1.5 weber. The mutual inductance of the coils is
(A) 1.5 H (B) 2.5 H
(C) 0.15 H (D) 0.8 H

17. The co-ordinates of a moving particle are $x = at^2$, $y = bt^2$ where a and b are constants. The velocity of the particle at any moment is
(A) $2t\sqrt{a^2+b^2}$ (B) $2t\sqrt{a+b}$
(C) $2t\sqrt{a^2-b^2}$ (D) $2t\sqrt{a^2+b^2}$

18. When 100 V DC flows in a solenoid, the current is 1.0 A . When 100 V AC flows, the current drops to 0.5 A . If the frequency of AC be 50 Hz , then the impedance and the inductance of the solenoid are
(A) 200Ω,0.55H
(B) 100Ω,0.86H
(C) 200Ω,1.0H
(D) 100Ω,0.93H

19. In an electromagnetic wave in free space the root mean square value of the electric field is $E_{rms} = 6Vm^{-1}$. The peak value of the magnetic field is
(A) $2.83 \times 10^{-8}\ T$
(B) $0.70 \times 10^{-8}\ T$
(C) $4.23 \times 10^{-8}\ T$
(D) $1.41 \times 10^{-8}\ T$

20. In YDSE if the screen is moved away from the plane of the slits, the fringe width of interference fringes will
(A) increase (B) decrease
(C) remain same (D) none of these

21. Light of wavelength 6328"Å" is incident normally on a slit of width 0.2 mm. Calculate the angular width of central maximum on a screen distance 9 m.
(A) 0.56 rad (B) 0.46 rad
(C) 0.36 rad (D) 0.26 rad

22. Starting with the same initial conditions, an ideal gas expands from volume V_1 to V_2 in three different ways. The work done by the gas is W_1 if the process is purely isothermal, W_2 if purely isobaric and W_3 if purely adiabatic. Then
(A) $W_2 > W_1 > W_3$
(B) $W_2 > W_3 > W_1$
(C) $W_1 > W_2 > W_3$
(D) $W_1 > W_3 > W_2$

23. A metal wire of circular cross-section has a resistance R1. The wire is now stretched without breaking so that its length is doubled and the density is assumed to remain the same. If the resistance of the wire now becomes R_2 then R_2: R_1 is
(A) 1:1 (B) 1:2
(C) 4:1 (D) 1:4

24. An electric bulb marked as 50 W, 200 V is connected across a 100 V supply. The power consumed by the bulb at present is
(A) 37.5 W (B) 25 W
(C) 12.5 W (D) 10 W

25. A tuning fork of frequency 340 Hz is vibrated just above the tube of 120 cm height. What is the minimum height of water necessary for the resonance?
(Speed of sound in the air = 340 ms^{-1})
(A) 15 cm (B) 25 cm
(C) 30 cm (D) 45 cm

26. In a region, the intensity of an electric field is given by $\vec{E} = 2\hat{\imath} + 3\hat{\jmath} + \hat{k}$ in NC^{-1}. The electric flux through a surface $\vec{S} = 10\hat{\imath}m^2$ in the region is
(A) 5 $Nm^2\ C^{-1}$
(B) 10 $Nm^2\ C^{-1}$
(C) 15 $Nm^2\ C^{-1}$
(D) 20 $Nm^2\ C^{-1}$

27. The direction of electric field intensity $\left(\vec{E}\right)$ at a point on the equatorial line of an electric dipole of dipole moment $\left(\vec{p}\right)$ is
(A) along the equatorial line towards the dipole
(B) along the equatorial line away from the dipole
(C) perpendicular to the equatorial line and opposite to $\left(\vec{p}\right)$
(D) perpendicular to the equatorial line and parallel to $\left(\vec{p}\right)$.

28. A microscope is focused at a point at the bottom of a beaker containing water. The microscope is then raised through 3 cm . To what height water must be added into the beaker to bring the point again in focus?
(A) 15 cm
(B) 12 cm
(C) 10 cm
(D) 8 cm

29. Two plane wavefronts of light, one incident on a thin convex lens and another on the refracting face of a thin prism. After refraction at them, the emerging wavefronts respectively become
(A) plane wavefront and plane Wavefront
(B) plane wavefront and spherical Wavefront
(C) spherical wavefront and plane Wavefront
(D) spherical wavefront and spherical Wavefront

30. If the ratio of the intensities of two waves producing interference is 49:16, then the ratio of the resultant maximum intensity to minimum intensity will be
(A) 11:3 (B) 49:16
(C) 121:9 (D) 7:4

31. A metre stick is balanced on a knife edge at its centre. When two coins, each of mass 5 g are put one on top of the other at the 12.0 cm mark, the stick is found to be balanced at 45.0 cm . What is the mass of the metre stick?
(A) 56 g (B) 66 g
(C) 76 g (D) 86 g

32. In a certain region of space, the potential is given by $V = k(2x^2 - y^2 + z^2)$. Find the magnitude of electric field at the point (1,1,1).
(A) $4k\sqrt{5}$ (B) $2k\sqrt{6}$
(C) $k\sqrt{6}$ (D) $\frac{k}{2}\sqrt{3}$

33. The electric field in a region is radially outward with magnitude $E = Ar_0$. The charge contained in a sphere of radius r_0 centred at the origin is
(A) $\frac{Ar_0^3}{4\pi\varepsilon_o}$ (B) $\frac{4\pi\varepsilon_o A}{r_0}$
(C) $4\pi\varepsilon_o Ae_0^3$ (D) $\frac{A}{4\pi r^3\varepsilon_o}$

34. If the gap between the plates of a parallel plate capacitor is filled with medium of dielectric constant $k = 2$, then the field between them
(A) Increases by a factor 2
(B) Increases by a factor $\sqrt{2}$
(C) Decreased by a factor $\sqrt{2}$
(D) Decreased by a factor ½

35. How high can a man jump on the surface of a planet of radius 320 km, having density same as that of the earth if he jumps 5 m on the surface of the earth? (Radius of earth =6400 km)
(A) 60 m
(B) 80 m
(C) 100 m
(D) 120 m

36. Magnetic field intensity H at the centre of a circular loop of radius r carrying current I e.m.u. is
(A) r/I oersted (B) $\frac{2\pi I}{r}$ oersted
(C) $\frac{I}{2\pi r}$ oersted (D) $\frac{2\pi r}{I}$ oersted.

37. An electron is moving with a velocity $\left(2\hat{i}+2\hat{j}\right)$ m/s in an electric field of intensity $\vec{E}=\hat{i}+2\hat{j}-8\hat{k}$ V/m and a magnetic field of $\vec{B}=\left(2\hat{j}+3\hat{k}\right)$ tesla. The magnitude of force on the electron is
(A) 14.4×10^{-19} N (B) 9×10^{-19} N
(C) 11.2×10^{-19} N
(D) 6.4×10^{-19} N

38. Two parallel wires in free space are 10 cm apart and each carries a current of 10 A in the same direction. The force exerted by one wire on the other, per metre length is
(A) 2×10^{-4} N, repulsive
(B) 2×10^{-7} N, repulsive
(C) 2×10^{-4} N, attractive
(D) 2×10^{-7} N, attractive.

39. A running man has the same kinetic energy as that of a boy of half his mass. The man speeds up by 2 ms^{-1} and the boy changes his speed by x ms^{-1} so that the kinetic energies of the boy and the man are again equal. Then x in ms^{-1} i
(A) $1\sqrt{2}$
(B) $2\sqrt{2}$
(C) $\sqrt{2}$
(D) 2

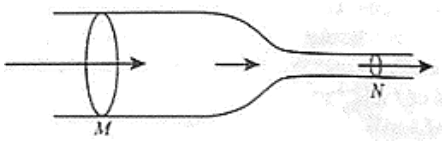
40. The pole strength of 12 cm long bar magnet is 20 A m. The magnetic induction at a potm 10 cm away from the centre of the magnet on its axial line is $\left[\frac{\mu_o}{4\pi}=10^{-7}\,Hm^{-1}\right]$
(A) $1.17\times10^{-3}\,T$
(B) 2.20×10^{-3} T
(C) $1.17\times10^{-2}\,T$
(D) $2.20\times10^{-2}\,T$

41. The range of magnetic susceptibility and relative magnetic permeability for diamagnetic substances are
(A) $-1\geq\chi>0,\ 0\leq\mu_r<1$
(B) $-1\leq\chi>0,\ 0\geq\mu_r<1$
(C) $-1\geq\chi>1,\ 0\leq\mu_r<1$
(D) $-1\leq\chi<0,\ 0\leq\mu_r<1$

42. The photoelectric current in photoelectric effect increases if
(A) the exposure time is decreased.
(B) the exposure time is increased.
(C) the intensity of the source is increased.
(D) the intensity of the source is decreased.

43. A nucleus of mass M initially at rest split into two fragments of masses M'/5 and 2M'/5(M>M'). Calculate the ratio of de-Broglie wavelength of the two fragments.
(A) 5:3 (B) 3:2
(C) 1:1 (D) 2:1

44. Horizontal tube of non-uniform cross-section has radii of 0.1 m and 0.05 m respectively at *M* and *N*. For a streamline flow of liquid the rate of liquid flow is



(A) continuously changes with time
(B) greater at *M* than at *N*
(C) greater at *N* than at *M*
(D) same at *M* and *N*

45. An object is placed 16 cm in front of a mirror. If the image is formed at 4 cm to the right of the mirror, calculate its focal length and radius of curvature of the mirror?
(A) 5.33 cm,10.66 cm
(B) 4.23 cm,9.08 cm
(C) 5.67 cm,10.02 cm
(D) 10.02 cm,9.06 cm

46. If the focal length of the eye piece of a telescope is doubled, its magnifying power (m) will be
(A) $2m$ (B) $3m$
(C) $m/2$ (D) $4m$

47. If the electron in a hydrogen atom jumps from an orbit with level $n_1 = 2$ to an orbit with level $n_2 = 1$ the emitted radiation has a wavelength given by
(A) $\lambda=\frac{5}{3R}$
(B) $\lambda=\frac{4}{3R}$
(C) $\lambda=\frac{R}{4}$
(D) $\lambda=\frac{3R}{4}$

48. How many gram of ice at –14° *C* is needed to cool 200 g of water from 25° *C* to 10° *C*? (specific heat of ice =0.5cal/g° C and latent heat of fusion of fice =80cal/*g*)
(A) 11 *g*
(B) 21 *g*
(C) 31 *g*
(D) 41 *g*

49. A circular ring of diameter 20 cm has a resistance of 0.01Ω. The charge that will flow through the ring if it is turned from a position perpdendicular to a uniform magnetic field of 2 T to a position parallel to the field is about
(A) 63 *C* (B) 0.63 *C*
(C) 6.3 *C* (D) 0.63 *C*

50. Carbon, silicon and germanium have four valence electrons each. At room temperature which one of the following statements is most appropriate?
(A) The number of free electrons for conduction is significant only in Si and Ge but small in *C*,
(B) The number of free conduction electrons is significant in C but small in Si and Ge.
(C) The number of free conduction electrons is negligibly small in all the three.
(D) The number of free electrons for conduction is significant in all the three.

51. Which of the following statements is correct?
(A) The rest mass of a stable nucleus is less than the sum of the rest masses of its separated nucleons.
(B) The rest mass of a stable nucleus is greater than the sum of the rest masses of its separated nucleons.
(C) In nuclear fission, energy is released by fusion of two nuclei of medium mass (approximately 100 amu)
(D) In nuclear fission, energy is released by fragmentation of a very low nucleus.

52. The length of a wire is L_1 when the tension in it is T_1 and is L_2 when the tension is T_2. The original length of the wire is
(A) $\frac{L_1 + L_2}{2}$ (B) $\frac{L_1T_2 + L_2T_1}{T_1 + T_2}$
(C) $\frac{L_1T_2 - L_2T_1}{T_2 - T_1}$ (D) $\sqrt{T_1T_2L_2L_2}$

53. A Wheatstone network is balanced with respective resistors 5Ω,10Ω,20Ω and 40Ω in the *P*, *Q*, *R* and *S* arms. If a 40Ω resistor is connected across *S* arm, then the bridge is again balanced by connecting
(A) 10Ω across *R* (B) 10Ω across *P*
(C) 20Ω across *Q* (D) 10Ω across *Q*

54. An equiconvex lens has power *P*. It is cut into two symmetrical halves by a plane containing the principal axis. The power of one part will be
(A) 0 (B) *P*/2
(C) *P*/4 (D) *P*

55. If a hydrogen atom emits a photon of energy 12.1 *eV* , its orbital angular momentum changes by Δ*L*. Then, Δ*L* equals
(A) 1.05×10^{-34} J s (B) 2.11×10^{-34} J s
(C) 3.16×10^{-34} J s (D) 4.22×10^{-34} J s

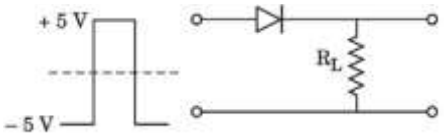
56. Experimental investigations show that the intensity of solar radiation is maximum for a wavelength 480 nm in the visible region. Estimate the surface temperature of sun. Given Wien's constant $b = 2.88 \times 10^{-3}$ *m K*.
(A) 4000 *K* (B) 6000 *K*
(C) 8000 *K* (D) 106 *K*

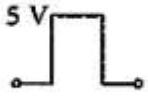
57. What is the ratio of output frequencies of full wave rectifier and a half wave rectifier, when an input of frequency 50 Hz is fed at input?
(A) 1:2 (B) 2:1
(C) 4:1 (D) 1:4

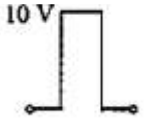
58. The deflection in a moving coil galvanometer is reduced to half when it is shunted with a 40Ω coil. The resistance of the galvanometer is
(A) 80Ω (B) 40Ω
(C) 20Ω (D) 15Ω

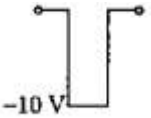
59. If M_0 is the mass of an oxygen isotope ${}_8O^{17}$ and MP and *MN* are the masses of proton and neutron respectively, then the nuclear binding energy of the isotope is
(A) $M_0\, C_2$ (B) $(M_0 - 8MP)\, c^2$
(C) $(M_0 - 17MN)\, c^2$ (D) $(M_0 - 8MP - 9MN)\, c^2$

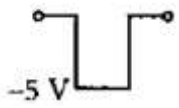
60. If in a *p-n* junction diode, a square input signal of 10 *V* is applied as shown. Then the output signal across *RL* will be



(A) 

(B) 

(C) 

(D) 

61. In a double slit experiment, instead of taking slits of equal widths, one slit is made twice as wide as the other. Then, in the interference pattern
(A) The intensities of both maxima and the minima increase
(B) The intensity of the maxima increases and the minima has zero intensity
(C) The intensity of the maxima decreases and that of the minima increases
(D) The intensity of the maxima decreases and the minima has zero intensity.

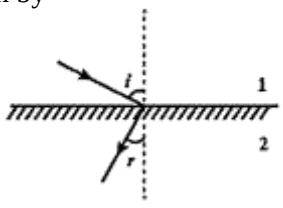
62. A ball of mass m performs uniform circular motion in a circle of radius *R*. Linear momentum is represented by *p*. The radial force acting on the particle is
(A) mRp^2
(B) $\frac{mp^2}{R}$
(C) $\frac{p^2}{mR}$
(D) $\frac{p^2R}{m}$

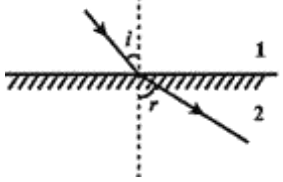
63. An astronomical refractive telescope has an objective of focal length 20 m and an eyepiece of focal length 2 cm. Then,
(A) The length of the telescope tube is 20.02 m.
(B) The magnification is 1800.
(C) The image formed is real.
(D) An objective of a larger aperture will increase the brightness and reduce chromatic aberration of the image.

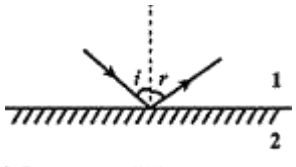
64. If 3.8×10^{-6} is added to 4.2×10^{-5} giving due regard to significant figures, then the result will be
(A) 4.58×10^{-5}
(B) 4.6×10^{-5}
(C) 4.6×10^{-5}
(D) None of these

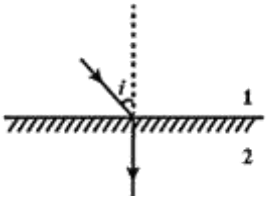
65. The focal length of an equi-concave lens is 3/4 times of radius of curvature of its surfaces. Find the refractive index of the material of the lens.
(A) 1
(B) 4/3
(C) 3/2
(D) 5/3

66. There are certain material developed in laboratories which have a negative refractive index. A ray incident from air (medium 1) into such a medium (medium 2) shall follow a path given by

(A) 

(B) 

(C) 

(D) 

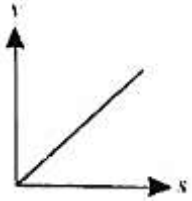
67. A transverse wave is represented by the equation
$y = y_o \sin \frac{2\pi}{\lambda}(vt - x)$
For what value of λ, is the maximum particle velocity equal to two times the wave velocity?
(A) $\lambda = \frac{\pi y_o}{2}$ (B) $\lambda = \frac{\pi y_o}{3}$
(C) $\lambda = 2\pi y_o$ (D) $\lambda = \pi y_o$

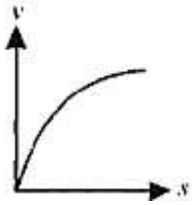
68. Calculate the minimum angle of incidence (in degree) so that a ray travelling from glass (μ = 3/2) to water (μ = 4 /3) does not emerge out in water.
(A) 52.7° (B) 62.7°
(C) 67.2° (D) 72.7°

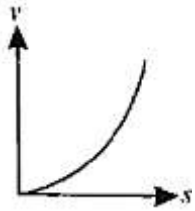
69. The angle of minimum deviation for prism of angle π/3 is π/6. Find the velocity of light in material of prism, if the velocity of light in vacuum is 3×10^8 m/s.
(A) 1.12×10^8 m/s
(B) 1.5×10^8 m/s
(C) 2.0×10^8 m/s
(D) 2.12×10^8 m/s

70. A body starting from rest moves along a straight line with a constant acceleration. The variation of speed (v) with distance (s) is represented by the graph

(A) 

(B) 

(C) 

(D) 

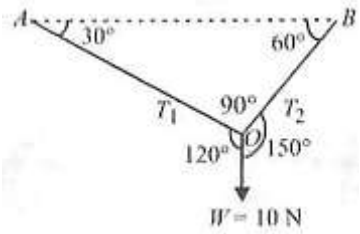
71. In a region, where electric field intensity is 5 N/C,50 electric lines of force are crossing per sq. metre. The number of electric lines of force crossing per sq. metre where electric field intensity is 20 N/C, will be

(A) 50 (B) 100
(C) 200 (D) 150

72. An electric dipole is placed at an angle of 30° with an electric field intensity 2×10^5 NC^{-1}. It experiences a torque equal to 4 *Nm*. The charge on the dipole, if the dipole length is 2 cm, is

(A) 8 *mC* (B) 2 *mC*
(C) 5 *mC* (D) 7 *mC*

73. A ball of mass 1 kg hangs in equilibrium from two strings *OA* and *OB* as shown in figure. What are the tensions in strings *OA* and *OB*? (Taking g = 10 m/s^2)



(A) 5 *N*, zero (B) zero, $5\sqrt{3}$ *N*
(C) 5" " N,$5\sqrt{3}$ *N* (D) $5\sqrt{3}$ *N*, 5*N*

74. A galvanometer has a resistance of 25Ω and a maximum of 0.01 A current can be passed through it. In order to change it into an ammeter of range 10 A , the shunt resistance required is

(A) $\frac{5}{999}\Omega$ (B) $\frac{10}{999}\Omega$
(C) $\frac{15}{999}\Omega$ (D) $\frac{25}{999}\Omega$

75. Coherent light is incident on two fine parallel slits S_1 and S_2 as shown is figure. If a dark fringe occurs at P, which of the following gives possible phase differences for the light waves arriving at *P* from S_1 and S_2?

(A) $2\pi,4\pi,6\pi,\ldots$
(B) $(1/2)\pi,(5/2)\pi,(9/2)\pi,\ldots..$
(C) $\pi,3\pi,5\pi,\ldots$
(D) $(1/2)\pi,(3/2)\pi,(5/2)\pi,\ldots\ldots$

76. For what distance is ray optics is good approximation when the aperture is 4 mm and the wavelength of light is 400 nm?

(A) 24 *m* (B) 40 *m*
(C) 18 *m* (D) 30 *m*

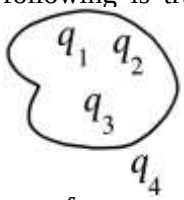
77. Spherical wave fronts, emanating from a point source, strike a plane reflecting surface. What will happen to these wave fronts, immediately after reflection?

(A) They will remain spherical with the same curvature, both in magnitude and sign.
(B) They will become plane wave fronts.
(C) They will remain spherical, with the same curvature, but sign of curvature reversed.
(D) They will remain spherical, but with different curvature, both in magnitude and sign.

78. Three identical metal balls, each of the radius r are placed touching each other on a horizontal surface such that an equilateral triangle is formed when centres of three balls are joined. The centre of the mass of the system is located at

(A) line joining centres of any two balls
(B) Centre of one of the balls
(C) Horizontal surface
(D) Point of intersection of the medians.

79. q_1,q_2,q_3 and q_4 are point charges located at given points as shown in figure and *S* is the spherical Gaussian surface of radius *R*. Which of the following is true according to the Gauss's law?



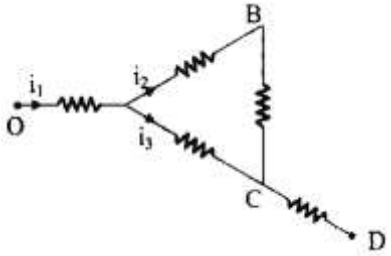
(A) $\oint (E_1+E_2+E_3)\cdot dA = (q_1 + q_2 + q_3)/\varepsilon_0$
(B) $\oint (E_1 +E_2 + E_3)\cdot dA = (q_1 + q_2 + q_3 + q_4)/\varepsilon_0$
(C) $\oint (E_1 + E_2 + E_3)\cdot dA = (q_1 + q_2 + q_3)/2\varepsilon_0$
(D) None of the above.

80. A spherical conductor of radius 10 m possesses a charge of 62.8 *C*. Find the surface charge density.
(A) $2 \times 10^{-2}\ C/m^2$
(B) $5 \times 10^{-2}\ C/m^2$
(C) $5 \times 10^{2}\ C/m^2$
(D) $2 \times 10^{2}\ C/m^2$

81. A spherical ball contracts in volume by 0.01% when subjected to a normal uniform pressure of 100 atmosphere. The bulk modulus of its material in dyne/ cm^2 is
(A) 10×10^{12}
(B) 100×10^{2}
(C) 1×10^{12}
(D) 2.0×10^{11}

82. A copper wire is stretched to make it 0.1% longer. The percentage increase in resistance will be
(A) 0.2 (B) 2
(C) 1 (D) 0.1

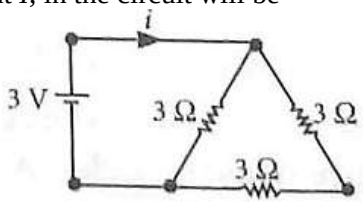
83. The current in the arm CD of the network in is



(A) i_1+i_2 (B) $i_2 + i_3$
(C) $i_1 + i_3$ (D) $i_1 - i_2 + i_3$

84. We are able to obtain fairly large currents in a conductor because
(A) The electron drift speed is usually very large
(B) The number density of free electrons is very high and this can compensate for the low values of the electron drift speed and the very small magnitude of the electron charge
(C) The number density of free electrons as well as the electron drift speeds are very large and these compensate for the very small magnitude of the electron charge
(D) The very small magnitude of the electron charge has to be divided by the still smaller product of the number density and drift speed to get the electric current.

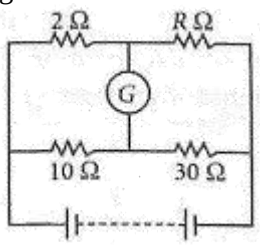
85. A 3 V battery with negligible internal resistance is connected in a circuit as shown in the figure. The current *I*, in the circuit will be



(A) 1 *A* (B) 1.5 *A*
(C) 2 *A* (D) (1/3)*A*

86. A particle moves in the *x*-*y* plane with velocity $vx = 8t - 2$ and $vy = 2$. If it passes through the point $x = 14$ and $y = 4$ at $t = 2$s, then the equation of the path is
(A) $x = y^3 - y^2 + 2$ (B) $x = y^2 - y + 2$
(C) $x = y^2 - 3y + 2$ (D) $x = y^3 - 2y^2 + 2$

87. In the figure there is no deflection in the galvanometer. Then R is equal to



(A) 2Ω (B) 30Ω
(C) 6Ω (D) 2/3 Ω

88. An electron and a proton enter a magnetic field perpendicularly. Both have same kinetic energy. Which of the following is true?
(A) Trajectory of electron is less curved
(B) Trajectory of proton is less curved
(C) Both trajectories are equally curved
(D) Both move on straight line path.

89. A proton beam is going from north to south and an electron beam is going from south to north. Neglecting the earth's magnetic field, the electron beam will be deflected
(A) towards the proton beam
(B) away from the proton beam
(C) upwards
(D) downwards.

90. If the earth were to suddenly contract to 1/*n* th of its present radius without any change in its mass, the duration of the new day will be nearly
(A) $\frac{24}{n}hr$ (B) $24nhr$
(C) $\frac{24}{n^2}hr$ (D) $24n^2hr$

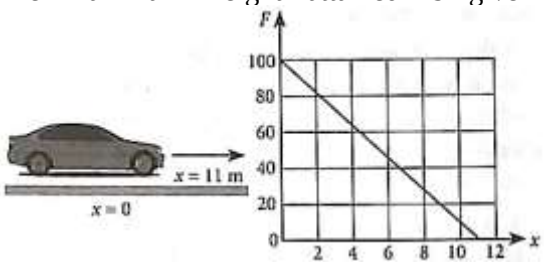
91. The electromagnetic wave having the shortest wavelength is
(A) X –rays
(B) γ-rays
(C) infrared rays
(D) microwaves.

92. An electromagnetic wave travels in *xy* plane making an angle θ with *x*-axis. Then the equation of the wave is
(A) $E = E_0 \sin(\omega t - kx\cos\theta - ky\sin\theta)$
(B) $E = E_0 \sin(\omega t - kx\sin\theta - ky\cos\theta)$
(C) $E = E_0 \sin(\omega t + kx\cos\theta + ky\sin\theta)$
(D) $E = E_0 \sin(\omega t + kx\sin\theta + ky\cos\theta)$

93. An ultraviolet light of wavelength 2000 Å irradiates a photocell made of molybdenum metal. If the stopping potential is –1.5 V, what is the work function of the metal? (Planck's constant = 6.6×10^{-34} Js)
(A) 2.5×10^{-19} *J*
(B) 5.0×10^{-19} *J*
(C) 7.5×10^{-19} *J*
(D) 1×10^{-18} *J*

94. The minimum light intensity that can be perceived by eye is about 10^{-10} Wm^{-2}. The number of photons of wavelength 5.6×10^{-7} m that must enter the pupil of area 10^{-6} m^2 per second for vision is approximately (Take $h = 6.6 \times 10^{-34}$ Js^{-1})
(A) 3×10^2 (B) 3×10^3
(C) 3×10^4 (D) 3×10^5

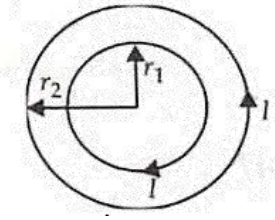
95. A toy car of mass 5 kg moves up a ramp under the influence of force F plotted against displacement x. The maximum height attained is given by



(A) 20 *m* (B) 15 *m*
(C) 11 *m* (D) 5 *m*

96. A wire in the form of a circular loop of one turn carrying a current produces a magnetic field B at the centre. If the same wire is looped into a coil of two turns and carries the same current, the new value of magnetic induction at the centre is
(A) 3 *B* (B) 5 *B*
(C) 4 *B* (D) 2 *B*

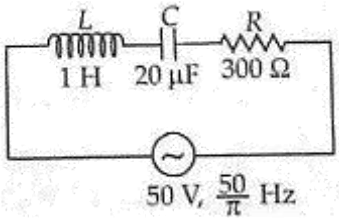
97. Two circular concentric loops of radii r_1 = 20 cm and r_2 = 30 cm are placed in the *XY* plane as shown in the figure. A current *I* = 7amp is flowing through them. The magnetic moment of this loop system is



(A) $+0.4\hat{k}\left(Am^2\right)$
(B) $-1.5\hat{k}\left(Am^2\right)$
(C) $+1.1\hat{k}\left(Am^2\right)$
(D) $+1.3\hat{j}\left(Am^2\right)$

98. A simple pendulum has a time period T_1 when on the earth's surface and T_2 when taken to a height *R* above the earth's surface where *R* is the radius of the earth. The value of T_2 / T_1 is
(A) 1 (B) $\sqrt{2}$
(C) 4 (D) 2

99. In the series LCR circuit shown, the impedance is



(A) 200Ω (B) 100Ω
(C) 300Ω (D) 500Ω

100. A power transmission line feeds input power at 2300 V to a step down transformer, with its primary windings having 4000 turns. What should be the number of turns in the secondary windings in order to get output power at 230 V?
(A) 200 (B) 400
(C) 600 (D) 800

101. The magnetic needle has magnetic moment 8.7×10^{-2} Am^2 and moment of inertia 11.5×10^{-6} kg m^2. It performs 10 complete oscillations in 6.70 s, what is the magnitude of the magnetic field?
(A) 0.012 *T*
(B) 0.120 *T*
(C) 1.200 *T*
(D) 2.10 *T*

102. Which one of the following characteristics is not associated with a paramagnetic material?
(A) It is weakly magnetised in the direction of the magnetising field, in which it is placed.
(B) Its magnetic permeability is greater than one.
(C) Its magnetic susceptibility is positive.
(D) Its magnetic susceptibility increases with rise in temperature.

103. A fluid is flowing through a tube of length L. The radius of the tube is r and the velocity of the fluid is v. If the radius of the tube is increased to $2r$, then what will be the new velocity?
(A) $4v$ (B) $v/4$
(C) $v/2$ (D) $2v$

104. The shortest wavelength of the Brackett series of hydrogen like atom (atomic number Z) is the same as the shortest wavelength of the Balmer series of hydrogen atom. The value of Z is
(A) 2
(B) 3
(C) 4
(D) 5

105. The ratio of radii of nuclei of two atoms of elements of atomic mass numbers 27 and 64 is
(A) 3:4 (B) 4:3
(C) 9:16 (D) 16:9

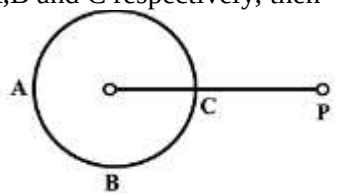
106. The ratio of the de-Broglie wavelengths of an electron of energy 10 eV to that of person of mass 66 kg travelling at a speed of 100 km/h is of the order of
(A) 10^{34}
(B) 10^{27}
(C) 10^{17}
(D) 10^{-10}

107. With an ac input from 50 Hz power line, the ripple frequency is
(A) 50 Hz in the dc output of half wave as well as full wave rectifier
(B) 100 Hz in the dc output of half wave as well as full wave rectifier
(C) 50 Hz in the dc output of half wave and 100 Hz in dc output of full wave rectifier
(D) 100 Hz in the dc output of half wave and 50 Hz in the dc output of full wave rectifier.

108. When the water is heated from 0° C to 10° C, its volume
(A) Increases
(B) Decreases
(C) Does not change
(D) First decreases and then increases.

109. The electric field intensity at a point P due to point charge q kept at point Q is 24 NC^{-1} and the electric potential at point P due to same charge is 12 JC^{-1}. The order of magnitude of charge q is
(A) 10^{-6} C (B) 10^{-7} C
(C) 10^{-10} C (D) 10^{-9} C

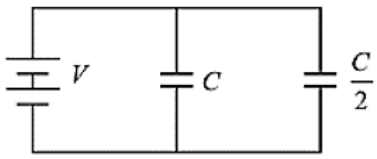
110. A hollow conducting sphere is placed in an electric field produced by a point charge placed at P as shown in figure. Let V_A, V_B, V_C be the potential at point A,B and C respectively, then



(A) $V_C > V_B$
(B) $V_A > V_{11}$
(C) $V_B > V_C$
(D) $V_A = V_C$

111. Due to polarisation, the electric field inside a dielectric
(A) is decreased
(B) is increased
(C) remains same
(D) may increase or may decrease depending upon the material.

112. Two condensers, one of capacity C and the other of capacity $C/2$, are connected to a V volt battery as shown. The work done in fully charging both the ondensers is



(A) $2CV^2$ (B) $\frac{1}{4}CV^2$
(C) $\frac{3}{4}CV^2$ (D) $\frac{1}{2}CV^2$

113. In an isobaric process,
$\Delta Q = \frac{K\gamma}{\gamma - 1}$ *where* $\gamma = C_p / C_V$. What is K ?
(A) Pressure
(B) Volume
(C) ΔU
(D) ΔW

114. The magnetic flux linked with a stationary loop of resistance R varies with respect to time during the time period T as follows : $\phi = at(T - t)$ The amount of heat generated in the loop during that time (inductance of the coil is negligible) is

(A) $\frac{aT}{3R}$

(B) $\frac{a^2T^2}{3R}$

(C) $\frac{a^2T^2}{R}$

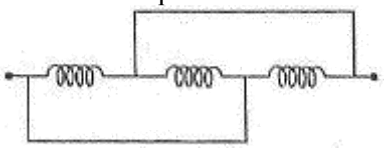
(D) $\frac{a^2T^3}{3R}$

115. A 0.1 m long conductor carrying a current of 50 A is perpendicular to a magnetic field of 1.21 *mT*. The mechanical power to move the conductor with a speed of 1 ms^{-1} is

(A) 0.25 *mW* (B) 6.25 *mW*

(C) 0.625 *W* (D) 1 *W*

116. Pure inductance of 3.0 H is connected as shown below. The equivalent inductance of the circuit is



(A) 1 H

(B) 2 H

(C) 3 H

(D) 9 H

117. At what temperature will the rms speed of air molecules be double that of NTP ?

(A) 519°C

(B) 619°C

(C) 719°C

(D) 819°C

118. The electron energy states in a solid are shown in terms of bands (not sharp levels, as for atoms). In a semiconductor we have electrons in conduction band, inner bands, and valence band. Now which of the following is incorrect?

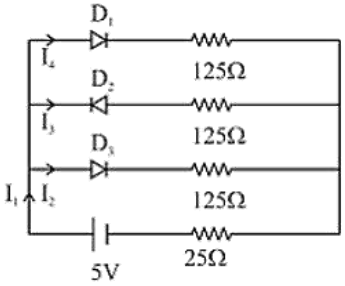
(A) The uppermost band is the conduction band

(B) All semiconductors are electrically neutral

(C) With increase of temperature the resistivity of a semiconductor decreases

(D) Addition of a small amount of impurity of III or V group element to a pure semiconductor increases its resistivity.

119. If each diode has a forward bias resistance of 25Ω in the below circuit, which of the following option is correct?



(A) $\frac{I_3}{I_4} = 1$ (B) $\frac{I_1}{I_2} = 1$

(C) $\frac{I_1}{I_2} = 2$ (D) $\frac{I_2}{I_3} = 1$

120. Which of the following postulates of the Bohr model led to the quantization of energy of the hydrogen atom?

(A) The electron goes around the nucleus in circular orbits.

(B) The angular momentum of the electron can only be an integral multiple of $h/2\pi$.

(C) The magnitude of the linear momentum of the electron is quantized.

(D) Quantization of energy is itself a postulate of the Bohr model.

121. Position of a body with acceleration a is given by $x = Ka^m t^n$. Here t is time. Find the dimension of m and *n*.

(A) $m = 1, n = 1$ (B) $m = 1, n = 2$

(C) $m = 2, n = 1$ (D) $m = 2, n = 2$

122. If e/m of electron is 1.76×10^{11} *C* kg^{-1} and the stopping potential is 0.71 *V*, then the maximum velocity of the photoelectron is

(A) 150 km s^{-1} (B) 200 km s^{-1}

(C) 500 km s^{-1} (D) 250 km s^{-1}

123. The linear momentum of an electron, initially at rest, accelerated through a potential difference of 100 *V* is

(A) 9.1×10^{-24} kg ms^{-1}

(B) 6.5×10^{-24} kg ms^{-1}

(C) 5.4×10^{-24} kg ms^{-1}

(D) 1.6×10^{-24} kg ms^{-1}

124. Rutherford's atomic model could account for

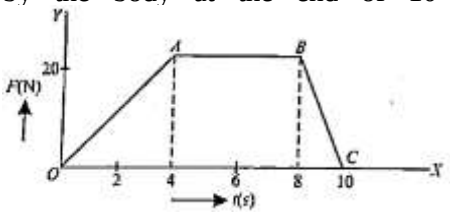
(A) Stability of atoms

(B) Origin of spectra

(C) The positively charged central core of an atom

(D) Concept of stationary orbits

125. A body of mass 5 kg is acted on by a net force F which varies with time t as shown in the given figure. Then the net momentum in S.I. units gained by the body at the end of 10 seconds is



(A) 0 (B) 100
(C) 140 (D) 200

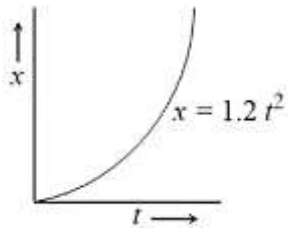
126. The nucleus which has radius one-third of the radius of Os189 is
(A) Be^9 (B) Li^7
(C) $F1^9$ (D) C^{12}

127. What is the ratio of output frequencies of full wave rectifier and a half wave rectifier, when an input, of frequency 50 Hz is fed at input?
(A) 1 : 2 (B) 2 : 1
(C) 4 : 1 (D) 1 : 4

128. For a perfectly black body, the absorptive power is
(A) 1 (B) 0.5
(C) Zero (D) Infinity

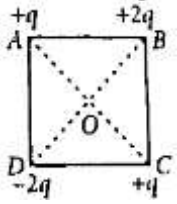
129. A luminous object is placed 20 cm from the surface of a convex mirror. A plane mirror is set so that the virtual images formed in the two mirrors coincide. If the plane mirror is at a distance of 12 cm from the object, then the focal length of the convex mirror is
(A) 10 cm
(B) 5 cm
(C) 20 cm
(D) 40 cm

130. Given figure shows the distance-time graph of the motion of a car. It follows from the graph that the car is



(A) At rest
(B) In uniform motion
(C) In non-uniform acceleration
(D) Uniformly accelerated

131. Four charges are arranged at the corners of a square ABCD as shown in the figure. The force on the positive charge kept at the centre O is



(A) Zero
(B) Alogn the diagonal AC
(C) Alogn the diagonal BD
(D) Perpendicular to side AB

132. The electric field that can balance an electron of mass 3.2×10^{-27} kg is
(A) 19.6×10^{-8} NC^{-1}
(B) 20×10^{-6} NC^{-1}
(C) 19.6×10^{8} NC^{-1}
(D) 20×10^{6} NC^{-1}

133. The electric field in a region is given by $\vec{E} = a\hat{\imath} + b\hat{\jmath}$ where a and b are constants. The net electric flux passing through a square area of side l parallel to *y*-*z* plane is
(A) $a^2 I^2$ (B) al^2
(C) $b^2 l^2$ (D) bl^2

134. A body is projected from the ground with a velocity $\vec{v} = \left(3\hat{I} + 10\hat{J}\right) ms^{-1}$. The maximum height attained and the range of the body respectively are (given g = 10 m s^{-2})
(A) 5 *m* and 6 *m*
(B) 3 *m* and 10 *m*
(C) 6 *m* and 5 *m*
(D) 3 *m* and 5 *m*

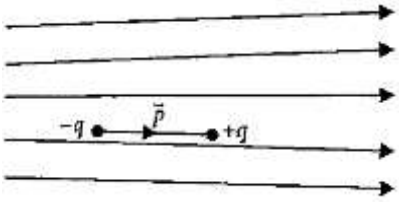
135. *A*, *B* and *C* are three optical media of respective critical angles C_1, C_2, and C_3. Total internal reflection of light can occur from *A* to *B* and also from *B* to *C* but from *C* to *A*. Then the correct relation between the critical angles is
(A) $C_1 < C_2 < C_3$
(B) $C_3 > C_1 > C_2$
(C) $C_1 = C_2 = C_3$
(D) $C_1 > C_2 > C_3$

136. In a thin prism of glass (refractive index 1.5), which of the following relations between the angle of minimum deviations δm and angle of refraction *r* will be correct?
(A) $\delta_m = r$
(B) $\delta_m = 1.5\ r$
(C) $\delta_m = 2r$
(D) $\delta_m = r/2$

137. A convex lens *A* of focal length 20 cm and a concave lens *B* of focal length 5 cm are kept along the same axis with the distance d between them. If a parallel beam of light falling on *A* leaves *B* as a parallel beam, then distance d in cm will be
(A) 25 (B) 15
(C) 30 (D) 50

138. A mountaineer standing on the edge of a cliff 441 m above the ground throws a stone horizontally with an initial speed of 20 m s-1. What is the speed with which the stone reaches the ground?
(A) 90 ms^{-1} (B) 95 ms^{-1}
(C) 85 ms^{-1} (D) 92 ms^{-1}

139. Figure shows electric field lines in which an electric dipole p is placed as shown. Which of the following statements is correct?



(A) The dipole will not experience any force.
(B) The dipole will experience a force towards right.
(C) The dipole will experience a force towards left.
(D) The dipole will experience a force upwards

140. A spherical conducting shell of inner radius r_1 and outer radius r_2 has a charge Q. A charge $-q$ is placed at the centre of the shell. The surface charge density on the inner and outer surfaces of the shell will be
(A) $\frac{q}{4\pi r_1^2}$ *and* $\frac{Q}{4\pi r_2^2}$
(B) $\frac{-q}{4\pi r_1^2}$ *and* $\frac{Q+q}{4\pi r_2^2}$
(C) $\frac{q}{4\pi r_1^2}$ *and* $\frac{Q-q}{4\pi r_2^2}$
(D) 0 *and* $\frac{Q-q}{4\pi r_2^2}$

141. A plane wavefront is incident on a plane reflecting surface at an angle of 45°. What angle will the reflected rays make with the reflecting surface?
(A) 45°
(B) 90°
(C) 60°
(D) 135°

142. Light waves from two coherent sources having intensities *I* and 2 *I* cross each other at a point with a phase difference of 60°. What is the resultant intensity at the point? If the sources were incoherent, what would be the resultant intensity?
(A) *I* (B) 2*I*
(C) 4*I* (D) 3*I*

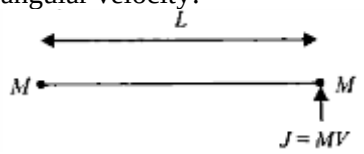
143. A sphere of mass '*m*' moving with velocity '*v*' collides head-on another sphere of same mass which is at rest. The ratio of final velocity of second sphere to the initial velocity of the first sphere is (*e* is coefficient of restitution and collision is inelastic)
(A) $\frac{e-1}{2}$ (B) $\frac{e}{2}$
(C) $\frac{e+1}{2}$ (D) *e*

144. In a single slit diffraction pattern, the distance between the first minimum on the left and the first minimum on the right is 5 mm. The screen on which the diffraction pattern is displayed is at a distance of 80 cm from the slit. The wavelength is 6000 Å. The slit width (in mm) is about
(A) 0.576 (B) 0.348
(C) 0.192 (D) 0.096

145. According to photon theory of light which of the following physical quantities, associated with a photon, do not/does not change as it collides with an electron in vacuum
(A) Speed and momentum
(B) Speed only
(C) Energy and momentum
(D) Energy only

146. An astronomical telescope consists of an objective of focal length 60 cm and an eye-piece of focal length 5 cm. It is focused on a distant object such that the rays emerging from the eye-lens are parallel. The object subtends an angle of 2° at the objective. The angular width of the image is
(A) 10° (B) 24°
(C) 48° (D) 54°

147. Consider a body, shown in figure, consisting of two identical balls, each of mass *M* connected by a light rigid rod. If an impulse $J = MV$ is imparted to the body at one of its ends, what would be its angular velocity?

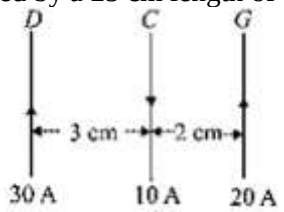


(A) *V/L* (B) 2 *V/L*
(C) *V*/3*L* (D) *V*/4*L*

148. A closely wound solenoid 80 cm long has 5 layers of winding of 400 turns each. The diameter of the solenoid is 1.8 cm. If the current carried is 8.0 A, the magnitude of $\vec{B}$ inside the solenoid near its centre will be
(A) $8\pi\times10^{-3}\ T$
(B) $6\pi\times10^{-3}\ T$
(C) $4\pi\times10^{-3}\ T$
(D) $3\pi\times10^{-3}\ T$

149. Electrons moving with different speeds enter a uniform magnetic field in a direction perpendicular to the field. They will move along circular paths
(A) Of the same radius
(B) With larger radii for the faster electrons
(C) With smaller radii for the faster electrons
(D) Either (B) or (C) depending on the magntidue of the magnetic field.

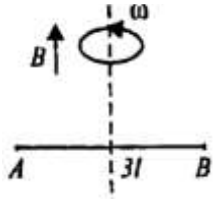
150. Three long, straight parallel wires, carrying current, are arranged as shown in figure. The force experienced by a 25 cm length of wire C is



(A) $10^{-3}\ N$ (B) $2.5\times10^{-3}\ N$
(C) Zero (D) $1.5\times10^{-3}\ N$

151. If the gravitational force between two objects were proportional to $1/R$ (and not as $1/R^2$), where R is the distance between them, then a particle in a circular path (under such a force) would have its orbital speed v, proportional to
(A) R
(B) R_0 (independent of R)
(C) $1/R^2$
(D) $1/R$

152. A conducting rod of length 2l is rotating with constant angular speed ω about its perpendicular bisector. A uniform magnetic field $\vec{B}$ exists parallel to the axis of rotation. The e.m.f. induced between two ends of the rod is



(A) $\frac{1}{2}B\omega l^2$ (B) $\frac{1}{8}B\omega l^2$
(C) Zero (D) $B\omega l^2$

153. An average induced e.m.f. of 1 V appears in a coil when the current in it is changed from 10 A in one direction to 10 A in opposite direction in 0.5 sec. Self inductance of the coil is
(A) 50 mH (B) 25 mH
(C) 100 mH (D) 75 mH

154. An electromagnetic wave of frequency ν =3.0 MHz passes from vacuum into a dielectric medium with relative permittivity ε =4.0. Then
(A) Wavelength is doubled and frequency becomes half.
(B) Wavelength is halved and frequency remains unchanged.
(C) Wavelength and frequency both remain unchanged.
(D) Wavelength is doubled and frequency remains unchaged.

155. A perfect gas goes from state A to state B by absorbing 8×10^5 J of heat and doing 6.5×10^5 J of external work. It is now transferred between the same two states in another process in which it absorbs 10^5 J of heat. In the second process,
(A) Work done on gas is 10^5 J
(B) Work done on gas is 0.5×10^5 J
(C) Work done by gas is 10^5 J
(D) Work done by gas is 0.5×10^5 J

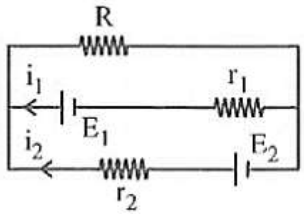
156. The work done in moving a point charge of 10μC through a distance of 3 cm along the equatorial axis of an electric dipole is
(A) $10\times10^{-6}\ J$ (B) $30\times10^{-6}\ J$
(C) $20\times10^{-6}\ J$ (D) Zero

157. Five equal point charges with charge Q = 10 nC are located at x = 2, 4, 5, 10 and 20 m. If $\varepsilon_0=[10^{-9}/36\varepsilon]$ F m–1, then the potential at the origin (x = 0) is
(A) 9.9 V (B) 11.1 V
(C) 90 V (D) 99 V

158. Three charges $-q$, $+Q$ and $-q$ are placed at equal distances along a straight line. If the total P.E. of the system is zero, the ratio Q/q becomes
(A) 1/8 (B) 1/6
(C) 1/4 (D) ½

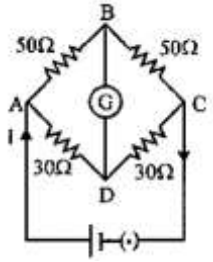
159. The average energy of molecules in a sample of oxygen gas at 300 K are $6.21\times10^{-21}\ J$. The corresponding values at 600 K are
(A) $12.12\times10^{-21}\ J$
(B) $8.78\times10^{-21}\ J$
(C) $6.21\times10^{-21}\ J$
(D) $12.42\times10^{-21}\ J$

160. Which one of the following equation is the correct equation for the electrical circuit shown in the figure?



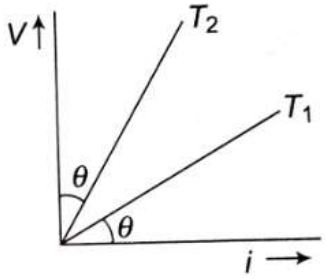
(A) $E_1\ 0\ (i_1+i_2)\ R + i_1\ r_1 = 0$
(B) $E_1\ 0\ (i_1 + i_2)R - i_1\ r_1 = 0$
(C) $E_2 - i_2\ r_2 - E_1 - i_1\ r_1 = 0$
(D) $E_2 - (i_1 + i_2)R + i_2\ R_2 = 0$

161. In the given circuit, the currentin the arm BD is



(A) $I/2$ (B) Zero
(C) $2I$ (D) $I/3$

162. The *V-i* graph for a conductor at temperature | T_1 and T_2 are as shown in the figure. The term $(T_2 - T_1)$ is proportional to



(A) cos 2θ (B) sin 2θ
(C) cot 2θ (D) tan 2θ

163. Two concentric circular coils of ten turns each are situated in the same plane. Their radii are 20 cm and 40 cm and they carry currents 0.2 A and 0.3 A respectively in opposite directions. The magnetic field in tesla at the centre is
(A) $35\ \mu_0/4$
(B) $\mu_0/80$
(C) $7\mu_0/80$
(D) $5\mu_0/4$

164. A stress of 1 kg/mm^2 is applied on a wire. If the modulus of elasticity of the wire is 1010 dyne/cm^2, then the percentage increase in the length of the wire will be
(A) 0.0098% (B) 0.98%
(C) 9.8% (D) 98%

165. The region between the parallel plates of a capacitor is filled with parallel layers of air and paper (of dielectric constant 4). The space between the plates is 1 mm and the thickness of paper is 0.75 mm. The ratio of the voltages across air and paper is
(A) 1/2 (B) 3/4
(C) 4/3 (D) 1/3

166. A galvanometer having resistance of 50 Ω, gives a full scale deflection for a current of 0.05 A. The length in metre of a resistance wire of area of cross section 2.97×10^{-2} cm^2 that can be used to convert the galvanometer into an ammeter which can read a maximum of 5 A current is (Specific resistance of the wire $=5\times10^{-7}$ Ω m)
(A) 9 (B) 6
(C) 3 (D) 1.5

167. Needles N_1 and N_2 are made of a ferromagnetic and paramagnetic substance respectively. A magnet when brought close to them will
(A) Attract N_1 and N_2 strongly
(B) Attract N_1 strongly, N_2 weakly
(C) Attract N_1 strongly, but repel N_2
(D) Attract both of them

168. A planar coil having 12 turns carries 15 A current. The coil is oriented with respect to the uniform magnetic field $\vec{B} = 0.2\hat{i}T$ such that its directed area is $\vec{A} = -0.04\hat{i}m^2$. The potential energy of the coil in the given orientation is
(A) 0 (B) + 0.72 J
(C) + 1.44 J (D) – 1.44 J

169. The amount of work done in blowing a soap bubble such that its diameter increases from d to D is (T = surface tension of liquid)
(A) $2\pi(D^2 - d^2)\ T$ (B) $2\pi(D-d)\ T$
(C) $2\pi(D-d)\ T^2$ (D) $2\pi(D+d)\ T^2$

170. A step-up transformer operates on a 230 V line and supplies a load of 2 ampere. The ratio of the primary and secondary windings is 1 : 25. The current in the primary is
(A) 15 A (B) 50 A
(C) 25 A (D) 12.5 A

171. A 120 V, 60 Hz AC is connected across a non-inductive resistance of 400 Ω and an unknown capacitor joined in series. The voltage drop across resistance is 66.3 V. The voltage drop across capacitor is
(A) 120 V (B) 66.3 V
(C) 53.7 V (D) 100 V

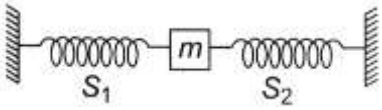
172. A parallel plate capacitor has circular plates each of radius 6 cm. It is charged such that the electric field in the gap between its plates rises constantly at the rate of 1010 *V/cm* s^{-1}. What is the displacement current?

(A) 0.2 A (B) 0.3 A
(C) 0.1 A (D) 0.4 A

173. For which of the following dependences of drift velocity v_d on electric field *E*, is Ohm's law obeyed?

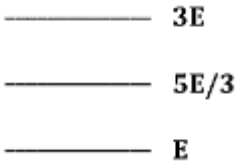
(A) $v_d \propto E$ (B) $v_d \propto E^2$
(C) $v_d \propto \sqrt{E}$ (D) $v_d \propto \frac{1}{E}$

174. In the figure S_1 and S_2 are identical springs. The oscillation frequency of the mass m is f. If one spring is removed, the frequency will become



(A) f (B) $f/\sqrt{2}$
(C) $f \times 2$ (D) $f \times \sqrt{2}$

175. The figure shows the energy levels of certain atom. When the electron de-excites from 3*E* to *E*, an electromagnetic wave of wavelength λ is emitted. What is the wavelength of the electromagnetic wave emitted, when the electron de-excites from 5*E*/3 to *E*?



(A) 3λ (B) 2λ
(C) 5λ (D) 3λ/5

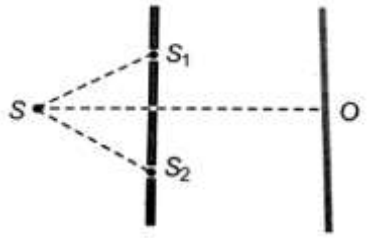
176. In which of the following statements, the obtained impure semiconductor is of *p*-type?

(A) Germanium is doped with bismuth.
(B) Silicon is doped with antimony.
(C) Germanium is doped with gallium.
(D) Silicon is doped with phosphorus.

177. Two turning forks of frequencies n_1 and n_2 produces n beats per second. If n2 and n are known, n_1 may be given by

(A) $\frac{n_2}{2} + n_2$ (B) $n_2 n$
(C) $n_2 \pm n$ (D) $\frac{n_2}{n} + n_2$

178. In the setup shown in figure, the two slits, S_1 and S_2 are not equidistant from the slit S. The central fringe at O is, then

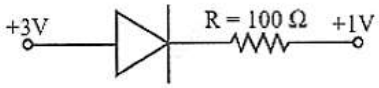


(A) Always bright
(B) Always dark
(C) Either dark on bright depending on the position of slits
(D) Neither dark nor bright

179. When a slow neutron is captured by a (92235)U nucleus, a fission energy releasing 200 MeV. If power of nuclear reactor is 100 W then rate of nuclear fission is

(A) 3.6×10^6 s^{-1}
(B) 3.1×10^{12} s^{-1}
(C) 1.8×10^4 s^{-1}
(D) 4.1×10^6 s^{-1}

180. Assuming that the junction diode is ideal, the current in the arrangement shown in figure is



(A) 30 mA
(B) 40 mA
(C) 20 mA
(D) 10 mA

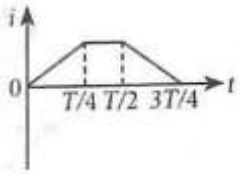
181. A screw gauge has least count of 0.01 mm and there are 50 divisions in its circular scale. The pith of the screw gauge is

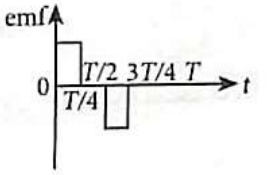
(A) 0.01 mm
(B) 0.25 mm
(C) 0.5 mm
(D) 1.0 mm

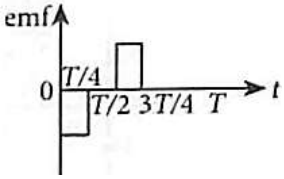
182. Two copper wires, one of length 1 *m* and the other of length 9 m have the same resistance. The diameters are in the ratio

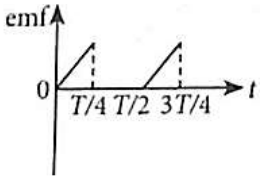
(A) 3 : 1
(B) 1 : 3
(C) 9 : 1
(D) 1 : 9

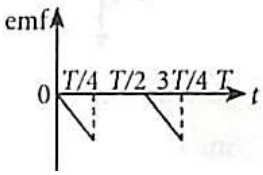
183. The current i in a coil varies with time as shown in the figure. The variation of induced emf with time would be



(A)


(B)


(C)


(D)


184. The rms speed of oxygen is v at a particular temperature. If the temperature is doubled and oxygen molecules dissociate into oxygen atoms, the rms speed becomes

(A) v (B) $\sqrt{2}v$
(C) $2v$ (D) $4v$

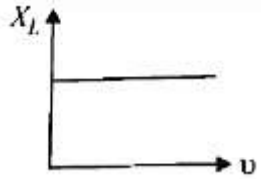
185. If the maximum kinetic energy of emitted photo electrons from a metal surface of work function 2.5 eV , is 1.7 eV . If wavelength of incident radiation is halved, then stopping potential will be

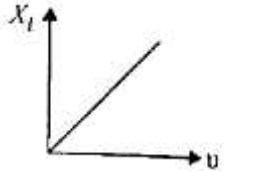
(A) 2.5 V (B) 6.7 V
(C) 5 V (D) 1.1 V

186. When a current of (2.5±0.5) A flows through a wire, it develops a potential difference of (20±1)V, the resistance of the wire is

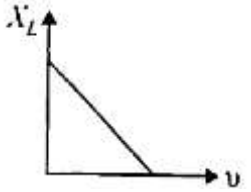
(A) (8±2)Ω
(B) (8±1.6)Ω
(C) (8±1.5)Ω
(D) (8±3)Ω

187. Which of the following graphs represents the correct variation of inductive reactance XL with frequency v?

(A)


(B)


(C)


(D)


188. The height at which the weight of a body becomes (1/16)th , its weight on the surface of earth (radius R), is

(A) 5R
(B) 15R
(C) 3R
(D) 4R

189. A conducting sphere of radius 5 cm has an unknown charge. The electric field at 10 cm from the centre of the sphere is 1.8×10^3 N/C and points radially inward. What is the net charge on the sphere?

(A) 1.8 nC
(B) 2 nC
(C) 1 nC
(D) 1.5 nC

190. When a biconvex lens of glass having refractive index 1.47 is dipped in a liquid, it acts as a plane sheet of glass. This implies that the liquid must have refractive index

(A) Equal to that of glass
(B) Less than one
(C) Greater than that of glass
(D) Less than that of glass

191. The equation of state of a gas is given by $\left(P+\frac{a}{V^2}\right)\left(V-b^2\right)=cT$, where P,V,T are pressure, volume and temperature respectively, and a,b,c are constants. The dimensions of a and b are respectively

(A) $\left[ML^8T^{-2}\right]$ and $\left[L^{3/2}\right]$

(B) $\left[ML^5T^{-2}\right]$ and $\left[L^3\right]$

(C) $\left[ML^5T^{-2}\right]$ and $\left[L^6\right]$

(D) $\left[ML^6T^{-2}\right]$ and $\left[L^{3/2}\right]$

192. A and B are isotopes , B and C are isobars . if d_A, d_B and d_C are the densities of nucleiA,B and C respectively then,

(A) $d_A > d_B > d_C$

(B) $d_A < d_B < d_C$

(C) $d_A = d_B = d_C$

(D) $d_A = d_B < d_C$

193. Three masses are placed on the *x*-axis : 300 g at origin, 500 g at *x* = 40 cm and 400 g at *x* = 70 cm. The distance of the centre of mass from the origin is

(A) 40 cm

(B) 45 cm

(C) 50 cm

(D) 30 cm

194. Which of the following spectral series of hydrogen atom is lying in visible range of electromagnetic wave ?

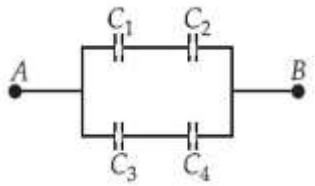
(A) Lyman series

(B) Paschen series

(C) Balmer series

(D) Pfund series

195. Find out the effective capacitance between points A and B as shown in the figure. Here $C_1 = C_2 = 20\mu F$ and $C_3 = C_4 = 10\mu F$



(A) 10 μF (B) 15 μF

(C) 20 μF (D) 25 μF

196. A bullet on penetrating 30 cm into its target loses its velocity by 50%. What additional distance will it penetrate into the target before it comes to rest?

(A) 30 cm

(B) 20 cm

(C) 10 cm

(D) 5 cm

197. The polarizing angle of glass is 57°. A ray of light which is incident at this angle will have an angle of refraction as

(A) 33° (B) 38°

(C) 25° (D) 43°

198. A pump on the ground floor of a building can pump up water to fill the tank of 30 m3 in 15 min . If the tank is 40 m above the ground, and the efficiency of the pump is 30%, the power consumed by the pump is (g = 10 ms^{-2})

(A) 4.4 kW (B) 44 kW

(C) 440 kW (D) 0.44 kW

199. The de-Broglie wavelength of a neutron in thermal equilibrium with heavy water at a temperature *T* (Kelvin) and mass m, is $h\sqrt{xmkT}$, find x.

(A) 3 (B) 2

(C) 4 (D) 6

200. A body is projected vertically upwards with a velocity of 10 ms^{-1}. It reaches maximum height *h* at time t. In time t/2, the height covered is

(A) $\frac{h}{2}$ (B) $\frac{2}{5}h$

(C) $\frac{3}{4}h$ (D) $\frac{5}{8}h$

Answer Key

1.	(B)	27.	(C)
2.	(D)	28.	(B)
3.	(D)	29.	(C)
4.	(B)	30.	(C)
5.	(D)	31.	(B)
6.	(B)	32.	(B)
7.	(B)	33.	(C)
8.	(A)	34.	(D)
9.	(A)	35.	(C)
10.	(B)	36.	(B)
11.	(C)	37.	(A)
12.	(A)	38.	(C)
13.	(D)	39.	(B)
14.	(C)	40.	(A)
15.	(C)	41.	(D)
16.	(C)	42.	(C)
17.	(A)	43.	(C)
18.	(A)	44.	(D)
19.	(A)	45.	(A)
20.	(A)	46.	(C)
21.	(C)	47.	(B)
22.	(A)	48.	(C)
23.	(C)	49.	(C)
24.	(C)	50.	(A)
25.	(D)	51.	(A)
26.	(D)	52.	(C)

53. **(A)**
54. **(D)**
55. **(B)**
56. **(B)**
57. **(B)**
58. **(B)**
59. **(D)**
60. **(A)**
61. **(A)**
62. **(C)**
63. **(A)**
64. **(B)**
65. **(D)**
66. **(A)**
67. **(D)**
68. **(B)**
69. **(D)**
70. **(C)**
71. **(C)**
72. **(B)**
73. **(C)**
74. **(D)**
75. **(C)**
76. **(B)**
77. **(C)**
78. **(D)**
79. **(A)**
80. **(B)**
81. **(C)**
82. **(A)**
83. **(B)**
84. **(B)**
85. **(B)**
86. **(B)**
87. **(C)**
88. **(B)**
89. **(A)**
90. **(C)**
91. **(B)**
92. **(A)**
93. **(C)**
94. **(A)**
95. **(C)**
96. **(C)**
97. **(C)**
98. **(D)**
99. **(D)**
100. **(B)**
101. **(A)**
102. **(D)**
103. **(B)**
104. **(A)**
105. **(A)**
106. **(B)**
107. **(C)**
108. **(D)**

109. (D)
110. (D)
111. (A)
112. (C)
113. (D)
114. (D)
115. (B)
116. (A)
117. (D)
118. (D)
119. (C)
120. (B)
121. (B)
122. (C)
123. (C)
124. (C)
125. (C)
126. (B)
127. (B)
128. (A)
129. (B)
130. (D)
131. (C)
132. (A)
133. (B)
134. (A)
135. (A)
136. (A)
137. (B)
138. (B)
139. (C)
140. (C)
141. (D)
142. (D)
143. (C)
144. (C)
145. (B)
146. (B)
147. (A)
148. (A)
149. (B)
150. (C)
151. (B)
152. (C)
153. (B)
154. (B)
155. (B)
156. (D)
157. (D)
158. (C)
159. (D)
160. (B)
161. (B)
162. (C)
163. (D)
164. (B)

165. (C)

166. (C)

167. (B)

168. (C)

169. (A)

170. (B)

171. (D)

172. (C)

173. (A)

174. (B)

175. (A)

176. (C)

177. (C)

178. (C)

179. (B)

180. (C)

181. (C)

182. (B)

183. (B)

184. (C)

185. (B)

186. (A)

187. (B)

188. (C)

189. (B)

190. (A)

191. (A)

192. (C)

193. (A)

194. (C)

195. (B)

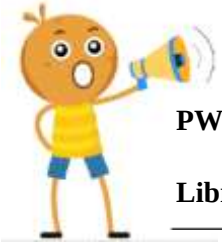
196. (C)

197. (A)

198. (B)

199. (A)

200. (C)



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