12 - Std

Time : 1.30 Hrs

ACHIEVEMENT TEST - 2023-24

PHYSICS

EXAM No.

Total Marks :100

1. Which charge configuration produces a uniform electric field?
(a) Point charge (b) Uniform charged infinite line
(c) Uniformly charged infinite plane (d) Uniformly charged spherical shell

2. An electric dipole placed at an alignment angle of 30^0 with an electric field of $2 \times 10^5 NC^{-1}$. It experiences a torque equal to 8 Nm. The charge on the dipole if the dipole length is 1 cm is
(a) 4 mc (b) 8 mc (c) 5 mc (d) 7 mc

3. Two identical conducting balls having positive charges q_1 and q_2 are separated by a centre distance 'r'. if they are made to touch each other and then separated to the same distance, the force them will be
(a) less than before (b) same as before (c) more than before (d) zero

4. An electric field $\vec{E} = 10x\hat{i}$ exists in a certain region of space Then the potential difference $V = V_0 - V_A$, where V_0 is the potential at the origin and V_A is the potential at x = 2m is
(a) 10V (b) - 20V (c) 20 V (d) - 10V

5. Two points A and B are maintained at a potential of 7V and -4V respectively. The work done in moving 50 electrons from A to B is (a) 8.80×10^{-17}J (b) -8.80×10^{-17}J (c) 4.40×10^{-17}J (d) 5.80×10^{-17}J

6. If voltage applied on a capacitor is increased from V to 2V, choose the correct conclusion.
(a) Q remains the same, C is doubled (b) Q is doubled, C doubled
(c) C remains same, Q doubled (d) Both Q and C remain same

7. A parallel plate capacitor stores a charge Q at a voltage V. Suppose the area of the parallel plate capacitor and the distance between the plates are each doubled then which is the quantity that will change?
(a) capacitance (b) charge (c) voltage (d) energy density

8. Two metallic spheres of radii 1 cm and 3 cm are given charges of -1×10^{-2}C and 5×10^{-2} C respectively If there are connected by a conducting wire the final charge on the bigger sphere is
(a) 3×10^{-2}C (b) 4×10^{-2}C (c) 1×10^{-2}C (d) 2×10^{-2}C

9. A toaster operating at 240V has a resistane of 120 Ω . Its power is
(a) 400W (b) 2 W (c) 480W (d) 240 W

10. A carbon resistor of (47 ± 4.7) kΩ to be marked with rings of different colours for its identification. The colour code sequence will be (a) Yellow-Green-Violet-Gold (b) Yellow-Violet-Orange-Silver
(c) Violet-Yellow-Orange-Silver (d) Green-Orange-Violet-Gold

11. Two wires of A and B with circular cross section are made up of the same material with equal lengths. Suppose $R_A = 3R_B$, then what is the ratio of radius of the wire A to B?
(a) 3 (b) $\sqrt{3}$ (c) $1/\sqrt{3}$ (d) 1/3

12. A wire connected to a power supply of 230V has power dissipation P_1 suppose the wire is cut into two equal pieces and connected parallel to the same power supply. In this case power dissipation is P_2. The ratio P_2 / P_1 is (a) 1 (b) 2 (c) 3 (d) 4

13. In India electricity is supplied for domestic use at 220V. It is supplied at 110V in USA. If the resistance of a 60W bulb for use in India is R, the resistance of a 60W bulb for use in USA will be
(a) R (b) 2R (c) R/4 (d) R/2

14. In a large building, there are 15 bulbs of 40W, 5 bulbs of 100W, 5 fans of 80W and 1 heater of 1 KW areconnected. The voltage of electric mains is 220V. The minimum capacity of the main fuse of the building will be (a) 14A (b) 8A (c) 10A (d) 12A

15. The temperature coefficient of resistanc of a wire is 0.00125 per °C. At 300k, its resistance is 1Ω. The resistane of the wire will be 2Ω at (a) 1154k (b) 1100k (c) 1400k (d) 1127k

16. A piece of copper and another of germanium are cooled from room temperature to 80k. The resistance of
(a) each of them increases (b) each of them decreases
(c) copper increases and germanium decreases (d) copper decreases and germanium increases

17. The internal resistance of a 2.1V cell which gives a current of 0.2A through a resistance of 10Ω is
(a) 0.2Ω (b) 0.5Ω (c) 0.8Ω (d) 1.0Ω

18. In Joule's heating law, when I and t are constant, if the H is taken along the y axis and I^2 along the x axis, the graph is (a) straight line (b) parabola (c) circle (d) Ellipse

19. The force experienced by a particle having mass m and charge q accelerated through a potential difference V when it is kept under perpendicular magnetic field $\vec{B}$ is
(a) $\sqrt{\frac{2q^3BV}{m}}$ (b) $\sqrt{\frac{q^3B^2V}{2m}}$ (c) $\sqrt{\frac{2q^3B^2V}{m}}$ (d) $\sqrt{\frac{2q^3BV}{m^3}}$

20. A circular coil of radius 5cm and 50 turns carries a current of 3 ampere. The magnetic dipole moment of the coil is (a) 1.0 amp - m^2 (b) 1.2 amp - m^2 (c) 0.5 amp - m^2 . (d) 0.8 amp - m^2

21. A thin insulated wire forms a plane spiral of N=100 tight turn carrying a current I=8mA. The radii of inside and outside turns are a = 50mm and b = 100mm respectively. The magnetic induction at the centre of the spiral is (a) 5μT (b) 7μT (c) 8μT (d) 10μT

22. Three wires of equal lengths are bent in the form of loops. One of the loops is circle, another is a semi-circle and the third one is square. They are placed in a uniform magnetic field and same electric current is passed through them. Which of the following loop configuration will experience greater torque?
(a) Circle (b) semi-circle (c) square (d) all of them

23. A wire of length l carries current I along the Y direction and magnetic field is given by $\vec{B} = \beta/\sqrt{3}(\hat{i} + \hat{j} + \hat{k})$T. The magnitude of Lorentz force acting on the wire is
(a) $\sqrt{\frac{2}{\sqrt{3}}}\beta Il$ (b) $\sqrt{\frac{1}{\sqrt{3}}}\beta Il$ (c) $\sqrt{2}\,\beta Il$ (d) $\sqrt{\frac{1}{2}}\beta Il$

24. A non-conducting charged ring of charge q, mass m and radius r is rotated with constant angular speed w. Find the ratio of its magnetic moment with angular momentum is
(a) q/m (b) 2q/m (c) q/2m (d) q/4m
25. The vertial component of Earth's magnetic field at a place is equal to the horizontal component. What is the value of angle of dip at this place? (a) 30^0 (b) 45^0 (c) 60^0 (d) 90^0
26. Two short bar magnets have magnetic moments 1.20 AM^2 and 1.00 AM^2 respectively. They are kept on a horizontal table parallel to each other with their north poles pointing towards the south. They have a magnetic equator and are seperated by a distance of 20.0 cm. The value of the resultant horizontal magnetic induction at the mid-point O of the line joining their centers is (Horizontal components of earthy magnetic induction is 3.6×10^{-5} $w6m^{-2}$)
(a) 3.6×10^{-5} $w6m^{-2}$ (b) 3.5×10^{-5} $w6m^{-2}$ (c) 2.56×10^{-4} $w6m^{-2}$ (d) 2.2×10^{-4} $w6m^{-2}$
27. A flat dielectric disc of radius R carries an excess charge on its surface. The surface charge density is σ. The disc rotates about an axis perpendicular to its plane passing through the center with angular velocity ω. Find the magnitude of the torque on the disc if its is placed in a uniform magnetic field whose strength is B which is directed perpendicular to the axis of rotation
(a) $1/4\ \sigma\omega\pi BR$ (b) $1/4\ \sigma\omega\pi BR^2$ (c) $1/4\ \sigma\omega\pi BR^3$ (d) $1/4\ \sigma\omega\pi BR^4$
28. A simple pendulum with charged bob is oscillating with time period T and let θ be the angular displacement. If the uniform magnetic field is switched on in a direction perpendicular to the plane of oscillation then, (a) time period will decrease but θ will remain constant
(b) time period remain constant but θ will decrease
(c) both T and θ will remain same (d) both T and θ will decrease
29. The flux linked with a coil at any instant t is a given by $\phi B = 10t^2 - 50t + 210$ The induced emf at t=3s is
(a) -190V (b) -10V (c) 10V (d) 190V
30. When the current changes from +2A to -2A in 0.05s, an emf of 8V is induced in a coil. The co-efficient of self induction of the coil is (a) 0.2H (b) 0.4H (c) 0.8H (d) 0.01 H
31. A circular coil with a cross-sectional area of 4 cm^2 has 10 turns. It is placed at the centre of a long solenoid that has 15 turns/cm and a cross-sectional area of 10 cm^2. The axis of the coil coincides with the axis of the solenoid what is their mutual inductance?
(a) 7.54 μH (b) 8.54 μH (c) 9.54 μH (d) 10.54 μH
32. In a transformer the number of turns in the primary and the secondary are 410 and 1230 respectively. If the current in primary is 6A, then that in the secondary coil is
(a) 2A (b) 18A (c) 12A (d) 1A
33. A step-down transformer reduces the supply voltage from 220V to 11V and increase the current from 6A to 100A. Then its efficiency is (a) 1.2 (b) 0.83 (c) 0.12 (d) 0.9
34. In an electrical circuit, R, L, C and AC voltage source are all connected in series. When L is removed from the circuit, the phase difference between the voltage and current in the circuit is $\pi/3$. Instead, if C is removed from the circuit, the phase difference is again $\pi/3$. The power factor of the circuit is
(a) 1/2 (b) $1/\sqrt{2}$ (c) 1 (d) $\sqrt{3}/2$
35. In a series RL circuit, the resistance and inductive reactance are the same then the phase difference between the voltage and current in the circuit is (a) $\pi/4$ (b) $\pi/2$ (c) $\pi/6$ (d) Zero
36. In a series resonant RLC circuit, the voltage across 100Ω resistor is 40V. The resonant frequency ω is 250 rad/s. If the value of C is 4 μF. Then the voltage across L is
(a) 600V (b) 4000V (c) 400V (d) 0.67W
37. An inductor 20mH, a capacitor 50μF and a resistor 40Ω are connected in series across a source of emf v=10 sin 340t. The power loss in AC circuit is (a) 0.76W (b) 0.89W (c) 0.46W (d) 0.67W
38. The instanteneous values of alternating current and voltage in a circuit and $i = 1/\sqrt{2}$ sin $(100\pi t)$ A and $V = 1/\sqrt{2}$ sin $(100\ \pi t + \pi/3)$ V. The average power in wants consumed in the circuit is
(a) 1/4 (b) $\sqrt{3}/4$ (c) 1/2 (d) 1/8
39. In an oscillating LC circuit, the maximum charge on the capacitor is Q. The charge on the capacitor when the energy is stored equally between the electric and magnetic fields is
(a) Q/2 (b) $Q/\sqrt{3}$ (c) $Q/\sqrt{2}$ (d) Q
40. The dimension of $1/\mu_0\varepsilon_0$ is (a) $[LT^{-1}]$ (b) $[L^2T^{-2}]$ (c) $[L^{-1}T]$ (d) $[L^{-2}T^{-2}]$
41. If the amplitude of the magnetic field is 3×10^{-6}T, then amplitude of the electric field for a electromagnetic waves is (a) 100 vm^{-1} (b) 300 vm^{-1} (c) 600 vm^{-1} (d) 900 vm^{-1}
42. Which of the following electromagnetic radiation is used for viewing objects through fog
(a) microwave (b) gamma rays (c) X - rays (d) infrared
43. Which of the following are false for electromagnetic waves (a) transverse
(b) mechanical waves (c) congitudinal (d) produced by accelerating charges
44. Consider an oscillator which has a charged particle and oscillates about its mean position with a frequency of 300 MHz. The wavelength of electromagnetic waves produced by this oscilator is
(a) 1 m (b) 10 m (c) 100 m (d) 1000 m
45. In an electromagnetic wave in free space the rms value of the electric field is 3 VM^{-1}. The peak value of the magnetic field is
(a) 1.414×10^{-8}T (b) 1.0×10^{-8}T (c) 2.828×10^{-8}T (d) 2.0×10^{-8}T
46. During the propagation of electromagnetic waves in a medium.
(a) electric energy density is double of the magnetic energy density.
(b) electric energy density is half of the magnetic energy density.
(c) electric energy density is equal to the magnetic energy density.
(d) Both electric and magnetic energy densities are zero.
47. A radiation of energy E falls normally on a perfectly reflecting surface. The momentum transferred to

the surface is (a) E/C (b) 2 E/2 (c) EC (d) E/C^2

48. Which of the following is an electromagnetic wave?
(a) α - rays (b) β - rays (c) γ - rays (d) all of them

49. The electric and magnetic fields of an electromagnetic wave are
(a) in phase and perpendicular to each other (b) out of phase and not perpendicular to each other
(c) in phase and not perpendicular to each other (d) out of phase and perpendicular to each other

50. Let $E = E_0 \sin [10^6 x - wt]$ be the electric field plane electromagnetic wave, the value of w is
(a) 0.3×10^{-14} rad s^{-1} (b) 3×10^{-14} rad s^{-1} (c) 0.3×10^{14} rad s^{-1} (d) 3×10^{14} rad s^{-1}

51. The speed of light in an isotropic medium depends on
(a) its intensity (b) its wave length
(c) the nature of progation (d) the moment of the source w.r.t. medium

52. A rod of length 10 cm lies along the principal axis of a concave mirror of focal length 10 cm in such a way that its end closer to the pole is 20 cm away from the mirror. The length of the image is
(a) 2.5 cm (b) 5 cm (c) 10 cm (d) 15 cm

53. An object is placed in front of a convex mirror of focal length of f and the maximum and minimum distance of an object from the mirror such that the image formed is real and magnified.
(a) 2 f and c (b) c and ∞ (c) f and o (d) none of these

54. For light incident from air on a slab of refractive index 2, the maximum possible angle of refraction is,
(a) 30° (b) 45° (c) 60° (d) 90°

55. If the velocity and wave length of light in air is V_a and λ_a and that in water is V_w and λ_w, then the refractive index of water is (a) V_w / V_a (b) V_a / V_w (c) λ_w / λ_a (d) $V_a \lambda_a / V_w \lambda_w$

56. Stars twinkle due to (a) reflection (b) total internal reflection (c) refraction (d) polariration

57. The radius of curvation of curved surface at a thin planoconves lens is 10 cm and the refractive index is 1.5. If the plane surface is rilvered then the focal length will be
(a) 5 cm (b) 10 cm (c) 15 cm (d) 20 cm

58. An air bubble is glars slab of refractive index 1.5 is 5 cm deep when viewed from one surface and 3 cm deep when viewed from the opposite face. The thickness of the slab is
(a) 8 cm (b) 10 cm (c) 12 cm (d) 16 cm

59. A plane glass is placed over a various coloured letters (Violet, green, yellow, red) The letter which appears to be raised more is (a) red (b) yellow (c) green (d) violet

60. Two point white dots are 1 mm apart on a black paper. They are viewed by eye of pupil diameter 3mm approximately. The maximum distance at which these dots can be resolved by the eye is [take wavelength of light λ = 500 nm] (a) 1 m (b) 5 m (c) 3 m (d) 6 m

61. In a young's double-slit experement the slit seperation is doubled. To maintain the same fringe spacing on the screen the screen-to-slit distance D must be changed to
(a) 2D (b) D/2 (c) $\sqrt{2}D$ (d) $D/\sqrt{2}$

62. Two coherent monochromatic light beams of intensities I and HI are superposed. The maximum and minimum possible intensive in the resulting beam are
(a) 5 I and I (b) 5 I and 3 I (c) 9 I and I (d) 9 I and 3 I

63. When light is incident on a soap film of thickness 5×10^{-5} cm, the wavelength of light reflected maximum in the visible region is 5320 Å. Refractive index of the film will be
(a) 1.22 (b) 1.33 (c) 1.51 (d) 1.83

64. First diffraction minimum due to a single slit of width 1.0×10^{-5} cm is a 30°. Then wavelength of light used to (a) 400 Å (b) 500 Å (c) 600 Å (d) 700 Å

65. A ray of light strikes a glass plate at an angle 60°. If the reflected and refracted rays are perpendicular to each other the refractive index of the glass is (a) √3 (b) 3/2 (c) √3/2 (d) 2

66. The transverse nature of light is shown in
(a) interference (b) diffraction (c) scattering (d) polariration

67. The wavelength λ_e of an electron and λ_p of a photon of same energy E are related by
(a) $\lambda_p \alpha \lambda_e$ (b) $\lambda_p \alpha \sqrt{\lambda_e}$ (c) $\lambda_p \alpha 1/\sqrt{\lambda_e}$ (d) $\lambda_p \alpha \lambda_e^2$

68. In an electron microscope, the elections are accelerated by a voltage of 14 kv. If the voltage is changed to 224 kv, then the de Brogile wavelength associated with the electrons would
(a) increase by 4 times (b) decrease by 2 times (c) decrease by 4 times (d) increase by 4 times

69. The wave associated with a moving particle of mass 3×10^{-6}g has the same wavelength as an electron moving with a velocity $6 \times 10^6 ms^{-1}$. The velocity of the particle is
(a) $1.82 \times 10^{-18} ms^{-1}$ (b) $9 \times 10^{-2} ms^{-1}$ (c) $3 \times 10^{-31} ms^{-1}$ (d) $1.82 \times 10^{-15} ms^{-1}$

70. When a metallic surface is illuminated with radiation of wavelength λ, the stopping potential is V. If the same surface is illuminated with radiation of wavelenth 2λ, the stopping potential is V/4. The threshold wavelength for the metallic surface is (a) 4λ (b) 5λ (c) 5/2 λ (d) 3 λ

71. A photoelectric surface is illuminated successively by monochromatic light of wavelength λ and λ/2. If the maximum kinetic energy of the emitted photoelectrons in the second case is 3 times that in the first case, the work, function of the material is (a) hc/λ (b) 2hc/λ (c) hc/3λ (d) hc/2λ

72. In photoelectric emission, a radiation whose frequency is 4 times threshold frequency of a certain metal is incident on the metal. Then the maximum possible velocity of the emitted electron will be
(a) $\sqrt{hv_0 / m}$ (b) $\sqrt{6hv_0 / m}$ (c) $2\sqrt{hv_0 / m}$ (d) $\sqrt{hv_0 / 2m}$

73. Two radiations with photon energies 0.9 ev and 8.3 ev respectively are falling on a metallic surface successively. If the work function of the metal is 0.6 ev then the ratio of maximum speed of emitted electrons in the two cases will be (a) 1 : 4 (b) 1 : 3 (c) 1 : 1 (d) 1 : 9

74. The threshold wavelength for a metal surface whose photoelectric work function is 3.313 ev is
(a) 4125Å (b) 3750Å (c) 6000Å (d) 2062.5Å

75. The work functions for metals A, B and C are 1.92 eV, 2.0 eV and 5.0 eV respectively. The metal / metals which will emit photoelectrons for a radiation of wavelength 4100Å is/are
(a) A only (b) both A and B (c) all these metals (d) none

76. Emission of electrons by the absorption of heat energy is called _____ emission
(a) photoelectric (b) field (c) thermionic (d) secondary

77. In a hydrogen atom, the electron revoluning in the fouth orbit has angular mementum equal to
(a) h (b) h/π (c) $4h/\pi$ (d) $2h/\pi$

78. Atomic number of H - like atom with Ionization potential 122.4v for n = 1 is
(a) 1 (b) 2 (c) 3 (d) 4

79. The ratio between the radius of first three orbital of hydrogen atom is
(a) 1:2:3 (b) 2:4:6 (c) 1:4:9 (d) 1:3:5

80. The charge of cathode rays particle is

(a) positive (b) negative (c) neutral (d) not defined

81. In J.J.Thomson e/m experiment electrons are accelerated through 2.6 kv enter the region of cosserd electric field and magnetic field of strength $3.0 \times 10^{4} Vm^{-1}$ and 1.0×10^{-37} respectively and pass through it and underflected then the specific charge is
(a) $1.6 \times 10^{10} Ckg^{-1}$ (b) $1.7 \times 10^{11} kg^{-1}$ (c) $1.5 \times 10^{11} Ckg^{-1}$ (d) $1.8 \times 10^{11} Ckg^{-1}$

82. The ratio of the wavelength radiation emitted for the transection from n=2 to n=1 in Li^{++} He^{+} and H is
(a) 1:2:3 (b) 1:4:9 (c) 3:2:1 (d) 4:9:36

83. The elastic potential of an electron is valid is given by $V = V_0$ in $[r/r_0]$, where r_0 is a constant. If Bhro atom model is valid then variation of radius of n^{th} orbit r_n with the principal quantum number n is
(a) $r_n \alpha 1/n$ (b) $r_n \alpha n$ (c) $r_n \alpha 1/n^2$ (d) $r_n \alpha n^2$

84. If the nuclear radius of $^{27}A_1$ is 3.6 fermi, the approximate nuclear radius of ^{64}Cu in fermi is
(a) 2.4 (b) 1.2 (c) 4.8 (d) 3.6

85. The nuclear is approximately spherical in shape. then the surface area of nuclear having mass number A varies as (a) $A^{2/3}$ (b) $A^{4/3}$ (c) $A^{1/3}$ (d) $A^{5/3}$

86. A radiative element has N_0 number of nuclei at t = 0. The number of nuclei remaining after half of a half - life. (that is, at $t = {}^{1}/_{2}T_{1/2}$) (a) $N_0/2$ (b) $N_0/\sqrt{2}$ (c) $N_0/4$ (d) N_0/g

87. The barrier potential of a silicon diode is approximately
(a) 0.7V (b) 2.0 V (c) 0.3 V (d) 2.2 V

88. If a small amount of antimony is added to germanium crystal,
(a) It becomes a p-type semiconductor (b) the anlemony becomes an acceptoratom
(c) there will be more free electrons than hole in the semiconductor (d) its resistance is increased

89. In an unbiased p - n junction. The majorily charge carriers into p - region diffuse into n - region because of (a) the potential difference across the p - n junction
(b) the higher hole concentration in p - region than that in n - region
(c) the attraction of free - electrons of n - region (d) all of the above

90. If a positive half - wave rectified voltage is fed to a lead resistor for whih part of a cycle there will be current flow through the load (a) 10^0 - 90^0 (b) 90^0 - 180^0 (c) 0^0 - 180^0 (d) 0^0 - 360^0

91. The zener diode is primarlly used as
(a) reclifier (b) amplifier (c) oscillator (d) voltage regulator

92. The principle based on which a solar cell operates as
(a) diffusion (b) recombination (c) photovollaic (d) carrier flow

93. If the input to the NOT gate is A = 1011, its output is (a) 0100 (b) 1000 (c) 1100 (d) 0011

94. To obtain sustained oscillation in an oscillator
(a) Feedback should be positive (b) Feedback factor must be unity
(c) phase shift must be 0 or 2π (d) all the above

95. The variation of frequency of carrier wave with respect to the amplitue of the modulating signal is called
(a) amplitude modulation (b) frequency modulation
(c) phase modulation (d) pulse width modulation

96. The frequency range of a 3 MHz to 30 MHz is used for
(a) ground wave propagation (b) space wave propagation
(c) sky wave propagation (d) satillite communication

97. Which one of the following is the natural nanomaterial
(a) peacock feather (b) peacock peak (c) grain of sand (d) skin of the whale

98. The bine print for making ultra durable synthetic material is mimicked from
(a) Lotus leaf (b) Morpho butterfly (c) parrot fish (d) peacock feather

99. The materials used in Roboties are
(a) Aluminium and Silver (b) Silver and Gold (c) Copper and Gold (d) Steel and Aluminium

100. The particle which gives mars to protons and neutrons are
(a) Higgs particle (b) Einstein particle (c) Nano particle (d) Bulk particle