

HALF YEARLY EXAMINATION - 2024

Class : XII

PHYSICS

Reg.No

Marks : 70

Time : 3.00 Hours

PART - I

15 × 1 = 15

- Note: (i) Answer all the questions
(ii) Choose the most appropriate answer from the given four alternatives and write the option code and the corresponding answer

- Which charge configuration produces a uniform electric field?
a) point charge b) infinite uniform line charge
c) uniformly charged infinite plane d) uniformly charged spherical shell
- A wire of resistance 2 ohms per meter is bent to form a circle of radius 1m. The equivalent resistance between its two diametrically opposite points, A and B as shown in the figure is 
a) $\pi \Omega$ b) $\frac{\pi}{2} \Omega$ c) $2\pi \Omega$ d) $\frac{\pi}{4} \Omega$
- An object is placed at a distance of 30 cm from a convex mirror and its real image is formed at a distance of 30 cm from the mirror. The focal length of the convex mirror is
a) 15 cm b) 30 cm c) 60 cm d) 45 cm
- A step-down transformer reduces the supply voltage from 220 V to 11 V and increase the current from 6 A to 100 A. Then its efficiency is
a) 1.2 b) 0.83 c) 0.12 d) 0.9
- Fraunhofer lines are an example of _____ spectrum
a) line emission b) line absorption c) band emission d) band absorption
- The radius of $^{64}_{29}\text{Cu}$ nucleus in fermi is
a) 1.2 F b) 4.8 F c) 7.7 F d) 9.6 F
- If the velocity and wavelength 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) $\frac{V_w}{V_a}$ b) $\frac{V_a}{V_w}$ c) $\frac{\lambda_w}{\lambda_a}$ d) $\frac{V_a \lambda_a}{V_w \lambda_w}$
- The momentum of the photon of wavelength 5000 Å will be
a) $1.3 \times 10^{-27} \text{ kg m s}^{-1}$ b) $1.3 \times 10^{-28} \text{ kg m s}^{-1}$ c) $4 \times 10^{-29} \text{ kg m s}^{-1}$ d) $4 \times 10^{-18} \text{ kg m s}^{-1}$
- The transverse nature of light is shown in,
a) interference b) diffraction c) scattering d) polarisation
- The nucleus is approximately spherical in shape. Then the surface area of nucleus having mass number A varies as
a) $A^{2/3}$ b) $A^{4/3}$ c) $A^{1/3}$ d) $A^{5/3}$
- In electromagnetic wave, the phase difference between electric ($\vec{E}$) and magnetic ($\vec{B}$) field vectors is
a) π b) $\pi/2$ c) $\pi/4$ d) zero
- The variation of frequency of carrier wave with respect to the amplitude of the modulating signal is called _____
a) Amplitude modulation b) Frequency modulation
c) Phase modulation d) Pulse width modulation
- The strength of the magnetic field at distance r near a long straight current carrying wire is B. The field at a distance $r/2$ will be
a) $\frac{B}{2}$ b) $\frac{B}{4}$ c) 2B d) 4B
- "Sky wax" is an application of nano product in the field of
a) Medicine b) Textile c) Sports d) Automotive industry
- Three capacitors of capacitances $3\mu\text{F}$ are connected in a circuit. Then, their maximum and minimum capacitances will be
a) $9\mu\text{F}, 0\mu\text{F}$ b) $8\mu\text{F}, 2\mu\text{F}$ c) $9\mu\text{F}, 1\mu\text{F}$ d) $3\mu\text{F}, 2\mu\text{F}$

PART - II**6 × 2 = 12****Answer any six questions. Question no. 24 is compulsory:**

16. Define electric flux.
17. In a meter bridge experiment, the value of resistance in the resistance box connected in the right gap is $10\ \Omega$. The balancing length is $l_1 = 55\text{ cm}$. Find the value of unknown resistance.
18. State Biot-Savart's law.
19. Mention the ways of producing induced emf.
20. Why does sky appear blue?
21. What is bandwidth of interference pattern?
22. Give any two applications of photocell.
23. Give the Barkhausen conditions for sustained oscillations.
24. The radius of the 5^{th} orbit of hydrogen atom is $13.25\ \text{\AA}$. Calculate the de Broglie wavelength of the electron orbiting in the 5^{th} orbit.

PART - III**6 × 3 = 18****Answer any six questions. Question no. 28 is compulsory:**

25. Obtain the expression for energy stored in the parallel plate capacitor.
26. State Kirchhoff's current and voltage rules.
27. Compare the properties of soft and hard ferromagnetic materials.
28. An inverter has inbuilt step-up transformer which converts 12 V AC to 240 V AC . The primary coil has 100 turns and the inverter delivers 50 mA to the external circuit. Find the number of turns in the secondary and the primary current.
29. Write short notes on (a) microwave (b) X-ray
30. Mention the differences between interference and diffraction.
31. A proton and an electron have same de Broglie wavelength. Which of them moves faster and which possesses more kinetic energy?
32. Give the results of Rutherford alpha scattering experiment.
33. State De Morgan's first and second theorem.

PART - IV**5 × 5 = 25****Answer all the questions:**

34. a) How the emf of two cells are compared using potentiometer?
(or)
b) (i) Give an account of magnetic Lorentz force.
(ii) Suppose a cyclotron is operated to accelerate protons with a magnetic field of strength 1 T . Calculate the frequency in which the electric field between two Dees could be reversed.
35. a) Calculate the electric field due to a dipole on its equatorial plane.
(or)
b) Describe the Fizeau's method to determine the speed of light.
36. a) Obtain the law of radioactivity.
(or)
b) Write down Maxwell equations in integral form.
37. a) Show that the mutual inductance between a pair of coils is same ($M_{12} = M_{21}$)
(or)
b) Describe briefly Davisson - Germer experiment which demonstrated the wave nature of electrons.
38. a) Explain the construction and working of a full wave rectifier.
(or)
b) Explain about compound microscope and obtain the equation for the magnification.