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FOR KARNATAKA CLASS 12 PREPARATION

Karnataka 2nd PUC Model Question Paper 2027 for Physics (Paper 3)

EXAM	YEAR	TYPE	SUBJECT
Karnataka Class 12	2027	Sample Paper	Physics

GOVERNMENT OF KARNATAKA
KARNATAKA SCHOOL EXAMINATION AND ASSESSMENT BOARD
6TH CROSS, MALLESHWARAM, BENGALURU - 560003
2026-27 II PUC MODEL QUESTION PAPER-3

SUBJECT: PHYSICS (33) **MAXIMUM MARKS: 70**

TIME: 3 HOURS **NUMBER OF QUESTIONS: 45**

General Instructions:

1. *All parts (A TO D) are compulsory.*
2. *For Part – A questions, only first written-answer will be considered for evaluation.*
3. *Answers without relevant diagram / figure / circuit wherever necessary will not carry any marks.*
4. *Direct answers to numerical problems without relevant formula and detailed solutions will not carry any marks.*

PART – A

I. Pick the correct option among the four given options for ALL of the following questions: 15 × 1 = 15

1. The electrostatic force between a pair of unlike charges and a pair of like charges respectively are:

(a) repulsive, attractive (b) attractive, repulsive

(c) repulsive, repulsive (d) attractive, attractive

2. The electric potential on the surface of a conducting charged spherical shell of radius 10 cm is 20 V. The electric potential at the centre of the shell is:

(a) zero (b) 10 V (c) 20 V (d) 30 V

3. As the temperature increases, the resistivity of:

(a) metals increases and semiconductors decreases.

(b) metals decreases and semiconductors increases.

(c) both metals and semiconductors increases.

(d) metals remains constant but semiconductors decreases.

4. A charged particle is moving in a circular path in a uniform magnetic field. Then choose the wrong statement among the following:

(a) Radius of the circular path varies directly with its velocity.

(b) Radius of the circular path varies inversely with the magnetic field.

(c) Frequency of revolution varies directly with the charge.

(d) Frequency of revolution varies directly with the kinetic energy of charge.

5. A magnetic dipole of magnetic moment $\vec{m}$ is placed in a uniform magnetic field $\vec{B}$ such that the angle between $\vec{m}$ and $\vec{B}$ is θ. If the magnetic dipole is in stable equilibrium position, then:

(a) $\theta = 0°$ (b) $\theta = 90°$ (c) $\theta = 180°$ (d) $\theta = 45°$

6. The dimensional formula of inductance is:

(a) $[M\,L^2\,T^{-2}\,A^{-2}]$ (b) $[M^2\,L\,T^{-2}\,A^{-2}]$ (c) $[M\,L^2\,T^{-2}\,A]$ (d) $[M\,L^2\,T^{-1}\,A^{-2}]$

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7. Different devices connected to an AC source are listed in the first column and different phase relations of electric current with the voltage are listed in the second column. Choose the correct match:

AC source connected to	Electric Current
(i) resistor	(p) lags behind the voltage by $\frac{\pi}{2}$
(ii) inductor	(q) is in phase with voltage
(iii) capacitor	(r) leads the voltage by $\frac{\pi}{2}$

(a) (i) → (p); (ii) → (q); (iii) → (r)
(b) (i) → (r); (ii) → (p); (iii) → (q)
(c) (i) → (q); (ii) → (p); (iii) → (r)
(d) (i) → (q); (ii) → (r); (iii) → (p)

8. Expression for displacement current is given by (symbols have usual meanings):

(a) $i_d = \epsilon_o \frac{d\phi_E}{dt}$
(b) $i_d = \mu_o \frac{d\phi_E}{dt}$
(c) $i_d = \mu_o \epsilon_o \frac{d\phi_E}{dt}$
(d) $i_d = \frac{d\phi_E}{dt}$

9. The objective lens of a refracting telescope is a _____ and the magnifying power of the telescope for normal adjustment is _____.

(a) convex lens of large aperture; $m = \frac{f_e}{f_0}$.
(b) convex lens of small aperture; $m = \frac{f_e}{f_0}$.
(c) convex lens of large aperture; $m = \frac{f_0}{f_e}$.
(d) convex lens of small aperture; $m = \frac{f_0}{f_e}$.

10. Among the given two statements:

Statement-I: Wavefront is the surface of constant phase.

Statement-II: When a plane wavefront is passed through a thin prism, it emerges out as a spherical wavefront.

(a) Both the statements are correct
(b) Both the statements are wrong
(c) I is correct but II is wrong
(d) I is wrong but II is correct

11. In photoelectric effect experiment, the graph of a physical quantity '*y*' v/s a physical quantity '*x*' is a straight line passing through origin. Then:

(a) *y* is photoelectric current and *x* is collector plate potential.
(b) *y* is photoelectric current and *x* is frequency of incident radiation.
(c) *y* is stopping potential and *x* is frequency of incident radiation.
(d) *y* is photoelectric current and *x* is intensity of incident radiation.

12. An α - particle, a proton, an electron and a neutron are moving with same speed. Then the particle having longest de Broglie wavelength is:

(a) proton (b) electron (c) neutron (d) α - particle

13. Rutherford's nuclear model of atom fails to explain:

(a) large angle scattering of α – particles.
(b) charge distribution in an atom.
(c) energy of electrons revolving round the nucleus.
(d) origin of line spectra of hydrogen atom.

14. **Nuclear binding energy per nucleon is (A is the mass number of the nucleus):**

(a) more for heavy nuclei ($A > 170$). (b) more for lighter nuclei ($A < 30$).

(c) less for both light and heavy nuclei. (d) independent of mass number.

15. **If n_e and n_h are the number of free electrons and holes in a semiconductor respectively, then in case of an intrinsic semiconductor:**

(a) $n_e = n_h$ (b) $n_e < n_h$ (c) $n_e > n_h$ (d) $n_e >> n_h$

II. Fill in the blanks by choosing appropriate answer given in the bracket for ALL the following questions: 5 × 1 = 5

(*magnetic susceptibility, diffraction, electric field, magnetic field, equal to unity, total internal reflection*)

16. An example for dimensionless quantity is _____.

17. A current carrying coil stores energy in the form of _____.

18. The power factor of a series *LCR* circuit at resonance is _____.

19. The principle of optical fibre is _____.

20. The bending of light around the corners and entering into geometrical shadow region is called _____.

PART – B

III. Answer any FIVE of the following questions: 5 × 2 = 10

21. Define electric flux through an area element. Mention its SI unit.

22. What is meant by equipotential surface? Draw equipotential surfaces for an electric dipole.

23. Write two limitations of Ohm's law.

24. Give the vector form of Biot-Savart law and explain the terms.

25. What is AC generator? What is its working principle?

26. List two uses of microwaves.

27. The radius of the innermost electron orbit of a hydrogen atom is 5.3×10^{-11} m. Determine the radius of the $n = 2$ orbit.

28. Mention two differences between half wave rectifier and full wave rectifier.

PART – C

IV. Answer any FIVE of the following questions: 5 × 3 = 15

29. Define linear charge density. Mention the expression for electric field at a point due to an infinitely long uniformly charged wire and explain the terms.

30. Obtain the expression for equivalent capacitance of two capacitors connected in series.

31. Explain the conversion of galvanometer into an ammeter using relevant circuit diagram and expression.

32. Write three differences between diamagnetic and paramagnetic materials.

33. Derive the expression for the motional emf induced in a conducting rod moving perpendicular to a uniform magnetic field.

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34. Show that the focal length of spherical mirror is equal to half of its radius of curvature.

35. The work function of caesium is 2.14 eV. Calculate the threshold frequency for caesium.

36. Mention three features of nuclear force.

PART – D

V. Answer any THREE of the following questions: **3 × 5 = 15**

37. Derive an expression for the electric field at a point on the axis of an electric dipole.

38. Using Kirchhoff's laws, arrive at the balancing condition of Wheatstone network.

39. i) State Ampere's circuital law. (1)

ii) Using Ampere's circuital law, derive the expression for the magnetic field at a point due to an infinitely long current carrying straight wire. (4)

40. Derive the expression for refractive index of the material of a prism in terms of angle of the prism and angle of minimum deviation.

41. i) Explain the formation of energy bands in solids. (2)

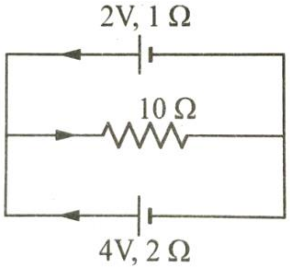
ii) On the basis of energy bands, distinguish between a conductor, a semiconductor and an insulator. (3)

VI. Answer any TWO of the following questions: **2 × 5 = 10**

42. Three point charges 3 nC, – 2 nC and 4 nC are placed at the vertices A, B and C of an equilateral triangle ABC of sides 0.2 m. Calculate the potential energy of the system. Also calculate the amount of work required to place the same charges at the vertices of an equilateral triangle of side 0.1 m.

(Take: $\frac{1}{4\pi\varepsilon_o} = 9 \times 10^9$ N m^2 C^{-2}).

43. Calculate the power dissipated in the 10 Ω resistor in the given circuit.



44. An inductor and a resistor are connected in series with 200 V, 50 Hz ac source. The current in the circuit is 2 A and voltage leads the current by $\frac{\pi}{3}$. Calculate the inductance of the inductor.

45. In Young's double slit experiment, the slits are separated by a distance of 0.5 mm and the screen is at a distance of 1.5 m from the slits. If the distance of 9th bright fringe from the central maximum is 1.3 cm, calculate the wavelength of light used. Also calculate the distance of 5th dark fringe from the central maximum.

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