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FOR KARNATAKA CLASS 12 PREPARATION

Karnataka 2nd PUC Model Question Paper 2027 for Physics (Paper 5)

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 –5

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 given options for ALL of the following questions: **15 x 1= 15**

1. The dimensional formula for electric flux is:

(a) $[ML^{-3}T^{3}A^{-1}]$ (b) $[ML^{3}T^{-3}A^{-1}]$ (c) $[ML^{3}T^{-3}A]$ (d) $[ML^{-3}T^{3}A]$

2. Consider the following two statements regarding electrostatics of conductors.

Statement – I: **Inside a conductor, electrostatic field is zero.**

Statement – II: **At the surface of a charged conductor, electrostatic field must be normal to the surface at every point.**

Between the two statements:

(a) both the statements are correct. (b) statement–I is correct and statement–II is wrong.

(c) both the statements are wrong. (d) statement–II is correct and statement–I is wrong.

3. Identify the wrong expression for the power dissipated in a current carrying conductor. (Symbols have their usual meanings).

(a) $P = \frac{V^2}{R}$ (b) $P = I^2R$ (c) $P = VI$ (d) $P = V^2R$

4. Physical quantities are listed in column – I and their SI units are listed in column – II. Identify the correct match.

Column - I	Column – II
(i) Magnetic permeability	(p) **tesla**
(ii) Magnetic dipole moment	(q) **T m A^{-1}**
(iii) Magnetic field	(r) **A m^2**

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

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

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5. Identify the wrong statement.

(a) Superconductors exhibit perfect diamagnetism.

(b) At high enough temperature, a ferromagnet becomes a paramagnet.

(c) Paramagnetic materials are strongly magnetised in the direction of external magnetic field.

(d) In soft ferromagnetic materials, the magnetisation disappears on removal of external magnetic field.

6. In electromagnetic induction, the induced e.m.f. in a coil is independent of:

(a) change in the magnetic flux. (b) time taken for change of magnetic flux.

(c) resistance of the circuit. (d) number of turns in the coil.

7. The energy required to build up a current *I* in a coil of inductance *L* is directly proportional to:

(a) I (b) $\frac{1}{I^2}$ (c) I^3 (d) I^2

8. In an AC circuit, the phase difference between current and voltage is 60°. The circuit may be:

(a) pure resistor ac circuit. (b) pure inductor ac circuit.

(c) pure capacitor ac circuit. (d) series LCR ac circuit.

9. Among the following, which electromagnetic waves have highest wavelength?

(a) Microwaves (b) Infrared waves (c) Ultraviolet rays (d) Gamma rays

10. A ray of light is passing through a prism in its minimum deviation position. Then:

(a) the angle of incidence is greater than the angle of emergence.

(b) the angle of refraction at the first face and angle of incidence at the second face are not equal.

(c) the refracted ray inside the prism is parallel to its base.

(d) the angle of incidence is smaller than the angle of emergence.

11. When a light wave undergoes refraction, the physical quantity that remains constant is:

(a) wavelength (b) frequency (c) amplitude (d) speed

12. The process of emission of electrons from a metal surface by heating is called:

(a) thermionic emission (b) photoelectric emission

(c) field emission (d) secondary emission

13. Let *K* be the kinetic energy and *E* be the total energy of electron revolving around the nucleus in a hydrogen atom, then which of the following is correct?

(a) $K = E$ (b) $K = 2E$ (c) $K = -E$ (d) $K = -\frac{E}{2}$

14. The pairs of nuclei $^{198}_{80}Hg$, $^{197}_{79}Au$ and $^{3}_{1}H$, $^{3}_{2}He$ are respectively:

(a) isobars and isotones. (b) isotones and isobars.

(c) isobars and isotopes. (d) isotones and isotopes.

15. The cut-in voltage for a silicon diode is nearly:

(a) 0.2 V (b) 0.7 V (c) 1.1 V (d) 5.4 V

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

[*more, diffraction, photons, magnetic field, magnetisation, focal length*]

16. The ratio of _____ to magnetic intensity is called magnetic susceptibility.

17. In a step-down transformer, the current through secondary coil is _____ than the current through the primary coil.

18. The distance between pole and principal focus of a spherical mirror is called _____.

19. The redistribution of light energy takes place during _____.

20. Electric and magnetic fields cannot deflect _____.

PART – B

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

21. Mention two factors on which electric field at a point due to a point charge depends.

22. The electrostatic potential energy of a system of two like charges decreases with increase in the distance of separation. Explain the statement using suitable expression.

23. State and explain Kirchhoff's loop rule.

24. When is the force on a charged particle moving in a uniform magnetic field is

a) maximum and b) zero?

25. Give the expression for mutual inductance between two co-axial solenoids and explain the terms.

26. Mention two applications of X - rays.

27. Calculate the angular momentum of an electron revolving in the 1^{st} orbit of hydrogen atom.

28. What is meant by energy gap? Give its value for a conductor.

PART – C

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

29. Mention three properties of electric field lines.

30. Derive the relation between electric field and electric potential.

31. Define 'current sensitivity' of a galvanometer. Write two factors on which current sensitivity depends.

32. Obtain the expression for the potential energy of a magnetic needle pivoted in uniform magnetic field.

33. The pedals of the bicycle are attached to a 100-turn coil of area 0.10 m^2. The coil is rotated at half a revolution per second, and it is placed in a uniform magnetic field of 0.01 T which is perpendicular to the axis of rotation of the coil. Calculate the maximum voltage generated in the coil.

34. Draw the ray diagram for the formation of image in case of a refracting telescope. Mention any one advantage of using objective of larger diameter in a refracting telescope.

35. Mention Einstein's photoelectric equation. Using the equation, explain any two experimental results of photoelectric effect.

36. What is meant by radioactive decay? Name any two types of radioactive decay.

PART – D

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

37. State Gauss law in electrostatics. Using it, derive the expression for the electric field at a point due to an infinitely long, straight, uniformly charged wire.

38. What is meant by drift velocity of free electrons in a conductor? Derive an expression for electric current in terms of drift velocity and number density of free electrons.

39. Derive the expression for the magnetic field at a point inside an air cored long current carrying solenoid using Ampere's circuital law.

40. i) Using Huygen's principle, show that the angle of incidence is equal to the angle of reflection during reflection of a plane wavefront at a surface. (3)

ii) Write the conditions for constructive interference and destructive interference in terms of path difference. (2)

41. i) With the help of a figure, explain how a *p*-type semiconductor is obtained from an intrinsic semiconductor. (3)

ii) What happens to the width of depletion layer of a *p-n* junction diode when it is

(a) forward biased and (b) reverse biased? (2)

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

42. Two capacitors of capacitances 3 μF and 6 μF are connected in series and the resulting combination is connected across a 300 V battery. Calculate i) the effective capacitance of the combination; ii) the charge collected by each capacitor and iii) the energy stored in 3 μF capacitor.

43. A wire of length 15 m and uniform cross-section 6.0×10^{-7} m^2 has a resistance of 5.0 Ω at 27 °C. Find the resistivity of the material at that temperature. Also find the resistance of the wire at 0 °C if the temperature co-efficient of resistance of the material of the wire is $1.5 \times 10^{-4} °C^{-1}$.

44. A series combination of a $\frac{1}{12\pi}$ mF capacitor and a 40 Ω resistor is connected to a 200 V, 50 Hz ac supply. Calculate the maximum current in the circuit and the power dissipated by circuit.

45. An object of height 2 cm is placed at 25 cm in front of a concave lens of focal length 20 cm. Find the position, nature and size of the image formed.

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