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FOR KARNATAKA CLASS 12 PREPARATION

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

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 – 2

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 × 1 = 15**

1. If a body contains n_1 protons and n_2 electrons, then the net charge of the body is:

(a) $(n_1 + n_2)e$ (b) $(n_1 - n_2)e$ (c) $(n_2 - n_1)e$ (d) $(n_1 n_2)e$

2. The electric potential at a point due to a point charge varies with distance from it as:

(a) $\frac{1}{\text{distance}}$ (b) $\frac{1}{(\text{distance})^2}$ (c) $\frac{1}{(\text{distance})^3}$ (d) $\frac{1}{\sqrt{\text{distance}}}$

3. Kirchoff's junction rule is based on the conservation of:

(a) mass (b) momentum (c) energy (d) charge

4. The trajectory of a charged particle moving perpendicular to a uniform magnetic field is:

(a) circle (b) straight line (c) helix (d) ellipse

5. Based on the magnetic properties, materials are listed in column – I and values of magnetic susceptibilities are listed in column – II. Identify the correct match.

Column – I	Column – II
(i) Diamagnetic	(p) small and positive
(ii) Paramagnetic	(q) large and positive
(iii) Ferromagnetic	(r) small and negative

(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)

6. A straight thin conductor of length '*l*' is moving with a velocity '*v*' perpendicular to a uniform magnetic field '*B*'. The magnitude of the induced emf across the ends of the conductor is:

(a) Blv (b) $\frac{Blv}{2}$ (c) 0 (d) $2Blv$

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7. When an alternating voltage is applied to a resistor, which of the following statements is wrong?

(a) The average current over a complete cycle is zero.

(b) The average voltage over a complete cycle is zero.

(c) The average power dissipated by the resistor over a complete cycle is zero.

(d) The phase difference between the voltage and current is zero.

8. Which of the following electromagnetic waves are used to kill germs in water purifiers?

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

9. The angle of minimum deviation of a prism depends on

(i) refractive index of the material of the prism

(ii) refractive index of surrounding medium

(iii) refracting angle of the prism

(a) only option (i) (b) only option (ii)

(c) only option (iii) (d) all (i), (ii) and (iii)

10. Image of a real object formed by a simple microscope when the object is placed at a distance less than one focal length is:

(a) real, inverted and magnified (b) virtual, erect and magnified

(c) virtual, erect and diminished (d) virtual, inverted and magnified

11. Consider the following two statements regarding diffraction of light.

Statement – I: **We do not easily encounter diffraction effects of light in everyday observation.**

Statement – II: **The wavelength of light is much smaller than the dimensions of most of the obstacles.**

Choose the correct option from the following:

(a) Both the statements are correct and statement–II is the correct explanation for statement–I.

(b) Both the statements are correct and statement–II is not the correct explanation of statement–I.

(c) Statement–I is correct and statement–II is wrong

(d) Both the statements are wrong.

12. The process of emission of electrons from a metal surface by applying high electric field is called:

(a) thermionic emission (b) photoelectric emission

(c) field emission (d) secondary emission

13. Let *K* be the kinetic energy, *U* be the potential 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) $K > 0, U > 0, E > 0$ (b) $K > 0, U < 0, E < 0$

(c) $K > 0, U > 0, E < 0$ (d) $K < 0, U < 0, E < 0$

14. Among the following, which set of nuclei are isotones?

(a) ${}^{12}_{6}C, {}^{13}_{6}C$ (b) ${}^{2}_{1}H, {}^{3}_{2}He$ (c) ${}^{14}_{6}C, {}^{14}_{7}N$ (d) ${}^{3}_{1}H, {}^{3}_{2}He$

15. Carbon, silicon and germanium have four valence electrons each. These are characterised by valence and conduction bands separated by energy band gap equal to $(E_g)_C$, $(E_g)_{Si}$ and $(E_g)_{Ge}$ respectively. Which of the following comparison of energy band gaps is correct?

(a) $(E_g)_{Si} < (E_g)_{Ge} < (E_g)_C$ (b) $(E_g)_C < (E_g)_{Ge} > (E_g)_{Si}$
(c) $(E_g)_C > (E_g)_{Si} > (E_g)_{Ge}$ (d) $(E_g)_C = (E_g)_{Si} = (E_g)_{Ge}$

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

[*transformer, polarization, intensity, interference, solenoid, AC generator*]

16. A current carrying _____ is equivalent to a bar magnet.
17. A/an _____ converts mechanical energy into electrical energy.
18. Alternating voltages can be varied using a/an _____.
19. The phenomenon of _____ confirms the transverse nature of light waves.
20. During photoelectric emission, the number of photoelectrons emitted per second is directly proportional to _____of the incident light.

PART – B

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

21. Sketch the electric field lines for (a) a positive point charge and (b) an electric dipole.
22. What are polar molecules? Give an example.
23. State and explain Ohm's law.
24. A current loop of magnetic dipole moment 10 A m^2 is suspended freely in a uniform magnetic field of magnitude 5×10^{-3} T. The plane of the coil is present in the direction of magnetic field. Calculate the torque on the current loop.
25. Mention two factors on which self-inductance of a solenoid depends.
26. What is displacement current? Write the mathematical form of Ampere-Maxwell law.
27. Define impact parameter. What is the value of angle of scattering for minimum impact parameter?
28. Give any two differences between intrinsic and extrinsic semiconductors.

PART – C

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

29. Give Coulomb's law in vector form and explain the terms. Define SI unit of charge using Coulomb's law.
30. Mention any three important results regarding electrostatics of conductors.
31. What is Lorentz force? Write the expression representing this force and explain the terms.
32. State and explain Gauss's law in magnetism. Give its significance.
33. Derive the expression for the magnetic energy stored in a coil, $U = \frac{1}{2} LI^2$.
34. Give the Cartesian sign convention used to measure distances and heights in spherical mirrors.
35. Write three properties of photon.
36. Calculate the binding energy of an alpha (α) particle in MeV from the following data.

Mass of α-particle = 4. 002603 u; mass of neutron = 1.008665 u; Mass of proton = 1.007825 u.

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PART – D

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

37. Using Gauss's law, arrive at the expression for electric field at a point outside a uniformly charged spherical shell. Also write the expression for the electric field at a point on the surface of the charged spherical shell.

38. Obtain the expressions for equivalent emf and equivalent internal resistance of two cells of different emfs and different internal resistances connected in series.

39. Derive the expression for force per unit length on two infinitely long straight parallel conductors carrying currents. Hence define 'ampere'.

40. (i) Two coherent waves of same amplitude and constant phase difference undergo interference. Obtain an expression for resultant displacement. (3)

(ii) Mention two uses of polaroids. (2)

41. What is meant by rectification? Explain the working of a p - n junction diode as a full-wave rectifier, with the help of relevant circuit diagram and input-output waveforms.

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

42. A parallel plate capacitor has air between the plates. The area of the plates is 4 cm^2 and the distance between the them is of 2 mm.

(a) Calculate the capacitance of the capacitor.

(b) If this capacitor is connected to a 100 V supply, find the magnitude of the charge on each plate and the energy stored in the capacitor. Given: $\varepsilon_0 = 8.854 \times 10^{-12}$ F m^{-1}.

43. A copper wire of length 50 cm and diameter 1.0 mm carries a current of 3.0 A. The number density of free electrons in copper is 8.5×10^{28} m^{-3}. Calculate

(a) the current density,

(b) the drift velocity of free electrons and

(c) the time taken by the electrons to drift from one end of the wire to the other end.

[Given: $e = 1.6 \times 10^{-19}$ C]

44. A resistor, an inductor and a capacitor are connected in series with a 110 V, 100 Hz AC source. In the circuit, the voltage leads the current by 35°. If the resistance of the resistor is 10 Ω and the sum of inductive reactance and capacitive reactance is 17 Ω, calculate the self-inductance of the inductor.

45. Find the effective focal length and effective power of combination of a convex lens of focal length 25 cm in contact with a concave lens of focal length 20 cm. Does the combination act like a converging lens or a diverging lens? Ignore the thickness of the lenses.

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