

MODEL QUESTION PAPER FOR 2022-23

II PUC - PHYSICS (33)

Time: 3 hours 15 min.

Max Marks: 70

General Instructions:

1. All parts are compulsory.
2. Part - A questions have to be answered in the first two pages of the answer-booklet. For Part - A questions, first written-answer will be considered for awarding marks.
3. Answers without relevant diagram / figure / circuit wherever necessary will not carry any marks.
4. Direct answers to the numerical problems without 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: $15 \times 1 = 15$

1. For large distances from a short dipole, the electric field due to it depends on the distance from it as:

(A) $\frac{1}{(\text{distance})^2}$

(B) $\frac{1}{(\text{distance})^3}$

(C) $(\text{distance})^3$

(D) $(\text{distance})^2$

2. Which one of the following is the unit of capacitance?

(A) farad (F)

(B) coulomb (C)

(C) volt (V)

(D) tesla (T)

3. An example for polar molecule is:

(A) Oxygen (O_2) molecule

(B) Nitrogen (N_2) molecule

(C) Hydrogen (H_2) molecule

(D) Water (H_2O) molecule

4. The resistance of a carbon resistor is $12 \times 10^5 \pm 10\% \Omega$. The colour of the first band of the resistor is:

(A) Green

(B) Black

(C) Brown

(D) Silver

5. Force on a charged particle moving in a magnetic field is maximum when the angle between the velocity of the charge and the magnetic field is:

(A) 180°

(B) 90°

(C) 45°

(D) 0°

6. Identify the wrong statement among the following options about *magnetic field lines*:

(A) They form closed loops.

(B) The tangent drawn to the magnetic field line at any point gives the direction of magnetic field at that point.

(C) They can intersect each other.

(D) Outside a magnet, they go from north pole to the south pole.

7. The law which gives the polarity of induced emf in electromagnetic induction is:

(A) Gauss's law in magnetism

(B) Ampere's circuital law

(C) Faraday's law

(D) Lenz's law

8. The principle behind the working of AC generator is:
 (A) Electromagnetic induction (B) Eddy currents
 (C) Hysteresis (D) Torque on a current loop
9. In the case of alternating voltage applied to a resistor:
 (A) the current leads the voltage by a phase angle of $\pi/2$
 (B) the current lags behind the voltage by a phase angle of $\pi/2$
 (C) the current and the voltage are in phase
 (D) the current leads the voltage by a phase angle of $\pi/4$
10. Displacement current arises due to:
 (A) time varying electric flux (B) constant electric flux
 (C) change in magnetic flux (D) constant magnetic flux
11. In case of *total internal reflection*:
 (A) light ray must be travelling from rarer medium to denser medium.
 (B) light ray must be travelling from denser medium to rarer medium.
 (C) the angle of incidence must be less than the critical angle.
 (D) angle of refraction is 0° when the angle of incidence is equal to critical angle.
12. The phenomena of bending of light at the corners of an obstacle is called:
 (A) refraction (B) polarization
 (C) interference (D) diffraction
13. Davisson - Germer experiment proved:
 (A) wave nature of electrons (B) particle nature of electrons
 (C) wave nature of light (D) particle nature of light
14. Among the following, which set of nuclei are isotopes?
 (A) ${}^{14}_6C$ and ${}^{14}_7N$ (B) 3_2He and 3_1H
 (C) ${}^{235}_{92}U$ and ${}^{238}_{92}U$ (D) ${}^{28}_{14}Si$ and ${}^{73}_{32}Ge$
15. For an AND gate, which set of inputs A and B give a high output $Y = 1$?
 (A) $A = 0, B = 0$ (B) $A = 0, B = 1$
 (C) $A = 1, B = 0$ (D) $A = 1, B = 1$

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

(Wavelength, Zener diodes, Coulomb's law, Activity, Temperature)

16. Force between two point charges in vacuum is given by _____.
17. The magnetic susceptibility of a paramagnetic substance is inversely proportional to its _____.

18. Resolving power of a microscope can be increased by decreasing the _____ used.
19. SI unit of _____ is becquerel (Bq).
20. _____ are used as voltage regulators.

PART - B

III. Answer any FIVE of the following questions:

5 × 2 = 10

21. What are the factors on which capacitance of a parallel plate capacitor depends?
22. Draw a neat labelled diagram of cyclotron.
23. State and explain Gauss's law in magnetism.
24. What are eddy currents? Mention one of its uses.
25. List any two sources of energy loss in a transformer.
26. Mention any two uses of microwaves.
27. What is a wavefront? What is the shape of wavefront from a point source?
28. Give de Broglie's explanation of Bohr's angular momentum quantisation postulate.
29. Write any two properties of nuclear forces.

PART - C

IV. Answer any FIVE of the following questions:

5 × 3 = 15

30. Mention three basic properties of charges.
31. Derive the expression for drift velocity in terms of electric field and relaxation time.
32. With a circuit diagram, explain how a galvanometer can be converted into a voltmeter?
33. Define the terms (i) Declination (ii) inclination and (iii) horizontal component of earth's magnetic field.
34. Derive an expression for motional emf induced in a rod moving in a magnetic field.
35. Draw ray diagram for the formation of image by a compound microscope. Write the expression for magnification produced by the microscope for image formed at infinity.
36. Arrive at the expression for radius of n^{th} orbit of electron in a hydrogen atom.
37. Calculate the mass defect and binding energy of ${}^{14}_7\text{N}$. Given: The rest masses of nitrogen nucleus, proton and neutron are 14.00307 u, 1.00783 u and 1.00867 u respectively.
38. Write any three differences between p - type and n - type semiconductors.

PART - D

V. Answer any THREE of the following questions:

3 × 5 = 15

39. Derive the expression for the electric field at a point outside a uniformly charged spherical shell. What is the value of the electric field inside the shell?
40. Obtain the condition for balance of a Wheatstone's network using Kirchhoff's laws.

41. Arrive at the expression for the force per unit length between two infinitely long straight parallel current carrying conductors. Hence define ampere.
42. Derive Lens maker's formula.
43. (i) Define threshold frequency for photoelectric emission. (1)
(ii) Write any two experimental observations of photoelectric effect. (2)
(iii) Write Einstein's photoelectric equation and explain the terms. (2)
44. (i) What is rectification? (1)
(ii) Write the circuit diagram and input - output waveforms for a full wave rectifier. (2)
(iii) Explain the working of a full wave rectifier. (2)

VI. Answer any TWO of the following questions:

2 × 5 = 10

45. ABCD is a square of side 2 m. Point charges of $50 \mu\text{C}$, $100 \mu\text{C}$ and $-50 \mu\text{C}$ are placed at corners A, B, C respectively. Calculate the work done in transferring a charge of 0.5 nC from D to the point of intersection of diagonals.
46. Two resistors of resistance 12Ω and 6Ω are connected in parallel with a 12 V , 1Ω cell.
(a) Calculate the equivalent resistance of the combination of resistors.
(b) Obtain the current through the cell.
(c) Find the terminal potential difference across the cell.
47. A series LCR ac circuit has a pure inductor of inductance 5.0 H , a capacitor of capacitance $20 \mu\text{F}$ and a resistor of resistance 40Ω . Find
(a) the frequency of the alternating voltage that drives the circuit into resonance.
(b) Sharpness of resonance and
(c) Bandwidth of resonance.
48. In Young's double slit experiment, the distance of the screen from the double-slit is 2 m . When light of wavelength 550 nm is incident on the double-slit arrangement, fringes of width 2 mm are obtained on the screen. Determine the distance of separation between the slits. Also find the fringe width when the source of light is replaced by a source of light of wavelength 440 nm .
