MODEL QUESTION PAPER – 5   BRIKS ACADEMY PADMANABHANAGARA   2023-24
II PUC - PHYSICS (33)
Time: 3 hours 15 min.   Max Marks: 70
General Instructions:
1. All parts are compulsory.
2. 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 numerical problems without detailed solutions will not carry any marks.

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

1)The electrostatic potential and the electrostatic field varies with r as
   a) $1/r$ and $1/r^3$
   b) $1/r$ and $1/r^3$
   c) $1/r$ and $1/r^2$
   d) $1/r$ and $1/r^{-3}$

2)Electric field inside the cavity of a charged conductor is zero, this is known as
   a) charging
   b) electrostatic shielding
   c) grounding
   d) electrostatic induction

3)Device used to store electric charges is
   a) conductor
   b) capacitor
   c) insulator
   d) resistor

4)The magnitude of the drift velocity per unit electric field is
   a) mobility
   b) relaxation time
   c) drift velocity
   d) resistivity

5)The resistance of ideal ammeter is
   a) zero
   b) one
   c) infinity
   d) two

6)The net magnetic flux through any closed surface is zero is in accordance with
   a) Gauss law in magnetism
   b) Gauss's law in electrostatics
   c) Ampere's circuital law
   d) Biot-Savart's law

7)SI unit of mutual inductance of pair of coils is
   a) Henry
   b) Farad
   c) Ohm
   d) Ohm-metre

8)If the number of turns of a solenoid is doubled, the self inductance of the solenoid will
   a) remains unchanged
   b) be halved
   c) be doubled
   d) becomes four times

9)The relation between peak value of current (i_m) and rms value of current (I) is
   a) $I = \frac{I_m}{\sqrt{2}}$
   b) $I = 2I_m$
   c) $I = I_m\sqrt{2}$
   d) $I = \frac{I_m}{2\sqrt{2}}$

10)An accelerating charges produces
   a) electromagnetic waves
   b) electric field
   c) magnetic field
   d) none of these

11)snell's law of refraction invalid at an angle of incidence (i) is
   a) i = 0°
   c) i = 60°

b) i = 40°   d) i = 35°

12) The locus of all the waves meeting at a point is
   a) convergent ray   c) divergent ray
   b) wave front   d) point source

13) Energy acquired by an electron when it is accelerated through a potential difference of one volt is
   a) work function   c) electron-volt
   b) thermionic emission   d) field emission

14) Elements having same atomic number and different mass number is
   a) Isotopes   c) Isobars
   b) Mirror nuclei   d) Isotones

15) Energy gap between the valence band and the conduction band for conductor is
   a) $E_g = 0$ c) $E_g < 0$
   b) $E_g > 3eV$ d) $E_g = 3 \ eV$

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

(energy, electric dipole, critical angle, specific binding energy, doping)

16) A pair of equal and opposite point charges q and –q separated by a distance 2a is an ....

17) Kirchhoff's voltage is based on law of conservation of ....

18) Angle of incidence in denser medium for which angle of refraction is 90° is known as ....

19) Binding energy per mass number is ....

20) The process of adding impurity to semiconductor is ....

PART – B

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

21) On what a factor does the capacitance of a parallel plate capacitor depends?

22) State and explain Ampere's circuital law.

23) Mention any two differences between diamagnetic and paramagnet.

24) State farady's law of electromagnetic induction.

25) What is wattles current?

26) Given any two application of X ray.

27) Draw the image formation in simple microscope.

28) Write any two differences between interference and diffraction.

29) Mention any two differences between intrinsic and extrinsic semiconductor.

PART - C

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

30) Write any three properties of electric field lines.

31) Mention any three limitation of ohm's law.

32) How would you convert a galvanometer into an ammeter? Explain.

33) What is transformer? Mention any two power loss in transformer.

34) Derive the relation between focal length and radius of curvature of a spherical concave mirror.

35) What is interference of light? Show that y = R Sin (ωt + φ) using principle of superposition.

36) Mention any three characteristics of nuclear force?

37) Calculate the mass defect and binding energy of helium nucleus (He_2^4) using the following data in MeV.
   a) Mass of proton= 1.007272 u, b) Mass of neutron= 1.00866 u
   b) Mass of helium nucleus = 4.00260 u

38) Draw the circuit symbol of a) pn junction diode. b) pn junction diode under forward bias and c) pn junction under reverse bias.

PART - D

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

39) State Gauss law in electrostatics. Derive an expression for the electric field at a point due to an infinitely long thin charged straight wire using Gauss's law.

40) Derive the expression for conductivity of a material $\sigma = \dfrac{n\tau e^2}{m}$ where the terms have their usual meaning.

41) I) State and explain Kirchhoff's current law. II) state and explain Kirchhoff's voltage law. III) Mention the significance of Kirchhoff's current law.

42) Arrive at the expression for refractive index of the material of the prism in terms of angle of prism and angle of minimum deviation.

43) a) What is meant by photo electric effect?
   b) Define work function.
   c) Write the three experimental observation of photoelectric effect.

44) a) What is rectification?
   b) Explain the working of full wave rectifier.
   c) Draw the circuit diagram and input-output waveforms of a full wave rectifier.

PART - E

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

45. Charges of 2 μC, 4 μC and 6 μC are placed at the three corners A, B and C respectively of a square ABCD of side X meter. Find the charges that must be placed at the fourth corner so that the total potential at the center of the square is zero.

46. A circular copper coil of mean radius 6.284 cm has 20 turns. If a current of 2A is passed through the coil, find the magnitude of the magnetic field at its center. Also find the magnetic dipole moment of this current coil. Given μ_0 = 4π × 10^{-7} H/m.

47. A sinusoidal voltage of peak value 283 V and frequency 50 Hz is applied to a series LCR circuit in which R= 3 ohm , L = 25. 48 mH and C = 790 μF. Calculate a) Impedence of the circuit b) the phase difference between the voltage across the source and the current.

48. Two narrow slits in Young's double slit experiment are 0.18 mm apart. When they are illuminated by a monochromatic light, fringes of width 2.7 mm are obtained on a screen 0.8 m away. Find the wavelength of light used. If the source is replaced by another source of wavelength 450 nm, find the change in the fringe width.

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