JAIN COLLEGE V V Puram II PUC Mock Paper – II: Jan - 2025	**Course:** II year PUC **Subject:** Physics **Max. Marks:** 70 **Duration:** 3 hours

General Instructions:

(i) All parts are compulsory.

(ii) 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.

(iii) Answers without relevant diagram/figure/circuit wherever necessary will not carry any marks.

(iv) Direct answers to 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 x 1 = 15**

1. Which one of the following charges is NOT possible**?**
   (A) 1.602×10^{-19} C (B) 3.204×10^{-19} C (C) 5.607×10^{-19} C (D) 6.408×10^{-19} C
2. The potential energy of a capacitor is stored in the _____ between the plates of the capacitor**.**
   (A) electric charges (B) electric field (C) magnetic field (D) current
3. When no current is passed through a conductor**,**
   (A) the free electrons do not move
   (B) the average speed of a free electron over a large period of time is not zero
   (C) the average velocity of a free electron over a large period of time is zero
   (D) the average of the velocities of all the free electrons at an instant is non zero
4. Match the physical quantities of Column I with their units in Column II

Colum I	ColumII
i) Current sensitivity	a) Am^{-1}
ii) Intensity of magnetic field	b) Am^2
iii) Magnetic dipole moment	c) div A^{-1}

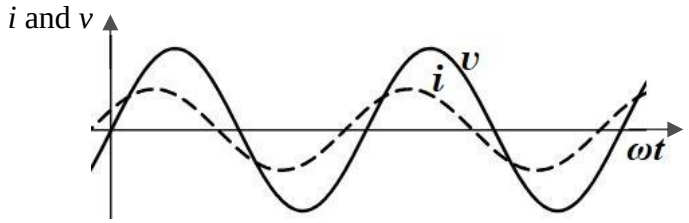
(A) (i)-(c), (ii)-(b), (iii)-(a) (B) (i)-(c), (ii)-(a), (iii)-(b)
(C) (i)-(a), (ii)-(c), (iii)-(b) (D) (i)-(b), (ii)-(a), (iii)-(c)

5. Statement – I: Magnetic field lines do not intersect each other.
   Statement _ II: If the magnetic field lines intersect, the magnetic field would not be unique at the point of intersection.
   With reference to the above statements**:**
   A) both statement - I and statement - II are true and statement - II is the correct explanation of statement - I.
   (B) both statement - I and statement - II are true and statement - II is not the correct explanation of statement - I.
   (C) statement - I is true and statement - II is false.
   (D) both statement – I and statement – II are false

6. If the current flowing through a coil is doubled, the magnetic energy stored by it
   (A) is also doubled (B) is halved
   (C) becomes four times (D) becomes one-fourth the initial value

7. Power factor for a purely resistive circuit is:
   (A) zero (B) unity (C) infinity (D) 0.5

8. The following figure represents the variation of voltage and current of an ac with time. The solid line represents the instantaneous voltage while the dashed line represents the instantaneous current



   From the figure, we can infer that the circuit is
   (A) purely resistive (B) purely inductive.
   (C) a series *LCR* circuit with $X_L > X_C$. (D) a series *LCR* circuit with $X_L < X_C$

9. Which electromagnetic wave is used in long range communication?
   (A) Gamma rays (B) IR-rays (C) Radio waves (D) Micro waves

10. A ray of light is incident on glass-air interface at an angle greater than the critical angle for the pair of media. Then the ray undergoes
   (A) refraction only
   (B) partial reflection and partial refraction
   (C) total internal reflection
   (D) grazes the surface at the interface of the two media

11. Which of the following phenomenon confirms the transverse nature of light waves**?**
   (A) Polarization (B) Diffraction
   (C) Dispersion (D) Refraction

12. Emission of electrons from a metal surface by heating is called
   (A) photoelectric emission (B) thermionic emission
   (C) field emission (D) secondary emission

13. The detector in α-particle scattering experiment is coated with
   (A) silver nitrate (B) phosphorescent (C) barium sulphide (D) zinc sulphide

14. Binding energy of a nucleus is
   (A) energy given to its nucleus during its formation
   (B) total mass of nucleus converted to energy units
   (C) energy required to break a nucleus into constituent nucleons
   (D) total of K.E. and P.E. of the nucleons in the nucleus

15. The diffusion current in a p-n junction is greater than the drift current in magnitude
   (A) if the junction is forward-biased (B) if the junction is reverse-biased
   (C) if the junction is unbiased (D) both (A) and (B)

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

(magnetic dipole, infinity, magnified, zero, mutual inductance, dark)

16. The electric field lines due to a single positive charge end at _____.
17. Current carrying circular coil is equivalent to a _____.
18. The principle of a transformer is _____
19. A microscope is used to produce _____image of small objects
20. Line emission spectrum consists of bright lines on a _____background

PART – B

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

21. State and explain Kirchhoff's junction rule.
22. What is Lorentz force? Write the expression representing this force.
23. Define magnetisation of a magnetic material. Mention its S.I unit
24. Current in a circuit falls from 5.0 A to 0.0 A in 0.1 s. If an average emf of 200 V is induced, find the self-inductance of the circuit..
25. What is displacement current? Write the expression for speed of light in vacuum in terms of permittivity and permeability.
26. Write the conditions for constructive interference in terms of path difference.
27. Write the two limitations of Bohr's atom model.
28. Write the two differences between p type and n type semiconductors.

PART – C

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

29. Derive the expression for the torque experienced by an electric dipole placed in a uniform electric field.
30. Mention the factors on which capacitance of a parallel plate capacitor depends.
31. A current loop of area 20cm² carrying a current 0.2 A is placed at an angle of 60° with a magnetic field of strength 4×10^{-2} T. Calculate the torque exerted on it.
32. Give three properties of diamagnetic materials.
33. Describe the coil and magnet experiment to demonstrate the phenomena of electromagnetic induction..
34. Write any three experimental observations of photo electric effect.
35. Derive Snell's law using Huygen's principle.
36. Write any three properties of nuclear forces.

PART – D

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

37. State Gauss's law in electrostatics. Derive an expression for electric field due to an infinitely long thin charged straight conductor.
38. Derive an expression for conductivity of a conductor in terms of relaxation time.
39. Derive an expression for the force between two infinitely long straight conductors carrying current in same direction and hence define ampere.
40. a) State Malus's law.
    b) Write two differences between interference and diffraction
    c) Write the expression for the fringe width and explain the terms
41. What is half wave rectifier? Explain the working of a half wave rectifier using neat circuit diagram. Also draw input and output wave forms.

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

42. Charges +2 nC, +4 nC, and +8 nC are placed at the corners A, B and C respectively of a square ABCD of side 0.2 m. Calculate the work done to transfer a charge of +2 nC from the corner D to the center O of the square.
43. Two cells of emf 3 V and 4 V and internal resistances 1 Ω and 2 Ω respectively are connected in parallel so as to send the current in the same direction through an external resistance of 10 Ω. Find the potential difference across 10 Ω resistor
44. A sinusoidal voltage of peak value 283 V and frequency 50 Hz is applied to a series LCR circuit in which $R = 3\ \Omega$, $L = 25.48$ mH, and $C = 796$ mF. Find (a) the impedance of the circuit (b) the phase difference (c) resonant frequency.
45. Two lenses of focal lengths 0.2 m and 0.3 m are kept in contact. Find the focal length of the combination. Calculate powers of two lenses and that of the combination.

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