JGi JAIN COLLEGE V V Puram **II PUC Mock Paper I – January - 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.

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PART – A

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I.   Pick the correct option among the four given options for ALL of the following questions

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15 x 1 = 15

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1.   A charge q is enclosed by a spherical gaussian surface of radius R. If the radius is doubled the net electric flux through the surface

  A) $\dfrac{2q}{\varepsilon_0}$ B) zero   C) $\dfrac{qR^2}{\varepsilon_0}$ D) $\dfrac{q}{\varepsilon_0}$

2.   The values of electric field (E)and electric potential (V) at any point on the equatorial plane of an electric dipole are such that

  A) E=0,V=0   B) E=0, V$\neq$0   C) E$\neq$0,V=0   D) E$\neq$0, V$\neq$0

3.   If the area of cross section of a wire is doubled keeping its length same, then its resistance

   A) is halved   B) is doubled   C) is quadrupled   D) remains same

4.   A charged particle is moving in a uniform magnetic field. The angle between the velocity ($\vec{V}$) of charged particle and magnetic field ($\vec{B}$) is θ. The trajectory of the charged particle varies with angle θ. Match the following table by choosing the appropriate trajectory traced by the charged particle for different possible values of angle θ

Angle	Trajectory
i) θ=0^0	a) circle
ii) θ=45^0	b) straight line
iii) θ=90^0	c) helix

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

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

5.   The ferromagnetic material among the following is

  A) copper   B) nickel   C) lead   D) calcium

6.   The potential energy of a magnetic dipole is zero when angle between dipole and magnetic field is

  A) 90^0 B) 180^0 C) 360^0 D) zero

7.   The following are the statements related to self inductance :

  i) The self inductance of a coil depends on its geometry and on the permeability of medium inside it.

  ii) The self inductance opposes the constant current in the coil

  A) Both statements are wrong

  B) Both statements are correct

  C) Statement (i) is correct and statement (ii) is wrong

  D) Statement (i) is wrong and statement (ii) is correct

8. Energy dissipated in LCR circuit is
    A) only in L   B) only in R   C) only in C   D) in all L, R and C

9. The correct arrangement of colors in descending order of their wavelengths is
    A) yellow, violet , green , orange   B) orange, yellow, green, violet
    C) violet, green , yellow , orange   D) orange , green, violet, yellow

10. An astronomical telescope with its objective lens of focal length f_o and eyepiece of focal length f_e, in normal mode has a tube length of

    A) $f_o + f_e$ B) $f_o - f_e$ C) $\dfrac{f_0}{f_e}$ D) $2f_o + f_e$

11. The shape of wave front due to a linear source of light at finite distance is
    A) spherical   B) plane   C) cylindrical   D) elliptical

12. A particle is dropped from a height H . The de Broglie wavelength of the particle
    A) decreases   B) increases
    C) remains same   D) first increases , then decreases

13. According Bohr's model of hydrogen atom , radius of the orbit is proportional to
    (n is principal quantum number)

    A) n^2 B) n C) $\dfrac{1}{n^2}$ D) $\dfrac{1}{n}$

14. Two nuclei have their mass numbers in the ratio 1:3. The ratio of their nuclear densities is
    A) 3:1   B) 1:3   C) $3^{1/3}$:1   D) 1:1

15. When reverse bias is applied to p-n junction , it
    A) lowers the potential barrier   B) reduces the minority carrier current
    C) raises the potential barrier   D) lowers the width of depletion region

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

(virtual, real, increases, zero, eddy current, inductnce)

16. The electric field inside a charged spherical shell is………..

17. The ratio of the magnetic flux linkage to the current in the coil is called ………

18. The power loss in a transformer is due to ………………

19. A convex mirror always produces a …………….. image of an object

20. When slit width decreases , width of central maxima ……………..

PART – B

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

21. Name two non ohmic devices

22. When does a current carrying conductor placed in a uniform magnetic field experience
    i) maximum force?   ii) minimum force?

23. Define magnetic susceptibility. How it is related to relative permeability.

24. A coil of 100 turns and area $0.2 m^2$ is rotating with a frequency of 60 Hz, in a uniform magnetic field of 0.01T.What is the maximum voltage induced in it ?

25. How X- rays are produced ?. Give one application of X-ray.

26. What is the shape of the emergent wave front when a plane wave front is incident on
    i) prism   ii) convex lens.

27. Mention the region of a electromagnetic spectrum corresponding to spectral lines of
    i) Lyman series   ii) Pfund series

28. Write the two differences between intrinsic and extrinsic semiconductors.

PART – C

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

29. Sketch the electric lines of force around
    i) an isolated positive point charge ii) an isolated point negative charge iii) an electric dipole.

30. Write three properties of equipotential surfaces.

31. State and explain Ampere's circuital law.

32. Give three differences between the ferromagnetic and diamagnetic substances.

33. Derive an expression for motional emf.

34. An object is placed at a distance of 10cm in front of a concave mirror of radius of curvature 15 cm. Find the position and nature of the image.

35. Using Huygen's principle show that angle of reflection is equal to angle of incidence when a plane wave front is reflected by plane surface.

36. Distinguish between nuclear fission and nuclear fusion.

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 at a point due to uniformly charged infinite plane sheet.

38. Derive an expression for equivalent emf and equivalent internal resistance when two cells are connected in
    parallel.

39. Using Biot Savart's law arrive at the expression for magnetic field at a point on the axis of a circular current loop.

40. a) Define power of a lens.
    b) Mention the SI unit of power of lens.
    c) Obtain an expression for equivalent focal length of two thin lenses in contact.

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. A 400pF capacitor charged by a 100 V dc supply is disconnected from the supply and connected to another uncharged 400pF capacitor. Calculate loss of energy.

43. The number density of free electrons in a copper conductor is 8.5×10^{28} m^{-3}. How long does an electron take to drift from one end of copper wire 3m long to its other end ?. Diameter of the wire is 1.6mm and it carries a current of 2A.

44. A circuit has 50Ω resistor , 0.3 H inductor and 40μF capacitor all in series and connected to 220v 50Hz AC supply. Calculate i) impedance ii) peak value of current iii) power factor.

45. The work function of copper is 4.57eV. If a radiation $2500 \, \overset{\text{o}}{\text{A}}$ is incident on copper, calculate the maximum velocity of emitted photoelectrons.

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