II PUC PHYSICS IMPORTANT QUESTIONS FOR ANNUAL EXAMINATION:

RATIONALISED SYLLABUS : (ACCORDING TO NEW BLUE PRINT-2024)

CHAPTER – 1: ELECTRICAL CHARGES AND FIELDS

2 OR 3 MARKS QUESTIONS

1. State and explain Coulomb's Law. Give the vector form of Coulomb's Law. Define '1coulomb'.
2. Using superposition principle, obtain the expression for resultant force on a charge due to multiple charges.
3. Give any three properties of electric charge. [Ans.: Conservation of charge, quantisation of charge, additivity of charge]
4. Give any three properties of electric field lines.
5. Define electric dipole moment and give its SI unit.
6. Define the following and give their SI units
   (i) Linear charge density (ii) Surface charge density (iii) Volume charge density.
7. Derive the expression for torque on an electric dipole placed in a uniform external electric field.

5 MARKS QUESTIONS:

1. Derive the expression of electric field due to a dipole at any point on its axis.
2. Derive the expression of electric field due to a dipole at any point on its equatorial plane.
3. State Gauss's law. Using Gauss's law in electrostatics, obtain the expression for electric field due to infinitely long straight charged wire.
4. State Gauss's law. Using Gauss's law in electrostatics, obtain the expression for electric field due to a uniformly charged thin spherical shell at a point. (i) Outside the shell and (ii) Inside the shell

CHAPTER – 2: ELECTROSTATIC POTENTIAL AND CAPACITANCE

2 OR 3 MARKS QUESTIONS

1. Define electrostatic potential. Mention the expression for electric potential due to an isolated point charge.
2. Mention the expression for electric potential energy stored in an electric dipole when placed in an external uniform external electric field.
3. When will be electric potential energy stored in an electric dipole in an external uniform external electric field be (a) maximum (b) minimum (c) zero ? [Ans.: (a) $\theta=180^\circ$ (b) $\theta=0^\circ$ (c) $\theta=90^\circ$]
4. Define equipotential surface. Give an example.
5. Draw equipotential surface for (i) a point charge and (ii) uniform electric field.
6. Mention the two properties of equipotential surface.
7. What are polar and non-polar molecules? Give one example for each.
8. Give two differences between polar and non-polar molecules.
9. Name the three factors on which capacitance of a parallel plate capacitor depends.
10. Name the factors on which energy stored in a capacitor depends.
11. Obtain the expression for the potential energy of two point charges in the absence of electric field.
12. Give three important results of electrostatics of conductors.
13. Mention the expression for (i) the capacitance of a capacitor with a dielectric medium between plates
    (ii) the energy stored in a capacitor and explain the terms.

5 MARKS QUESTIONS:

1. Define electrostatic potential. Derive the expression for potential due to an isolated point charge.
2. Obtain the expression for the potential energy of three point charges in the absence of electric field.
3. Define capacitance. Deduce the expression for the capacitance of a parallel plate capacitor. What happens to its capacitance when air is replaced by a medium of dielectric constant 'K' between the plates?
4. What is equivalent capacitance? Obtain the expression for equivalent capacitance when three capacitors are connected in (i) series (ii) parallel.

CHAPTER – 3: CURRENT ELECTRICITY

2 OR 3 MARKS QUESTIONS

1. (i) State and explain Ohm's law (ii) Write three limitations of Ohm's law.
2. Derive the relation between current density, conductivity and electric field OR Derive $\vec{j} = \sigma\vec{E}$
3. Derive the expression for drift velocity in terms of electric field and relaxation time.
4. Derive the relation between electric current and drift velocity (Derive $I = neAv_d$).
5. Show the variation of resistivity of the following with absolute temperature graphically.
   (i) conductors (Copper) (ii) semiconductors (Silicon or Germanium) (iii) nichrome (Alloy).
6. State and explain Kirchhoff's rules and mention their significance.

5 MARKS QUESTIONS:

1. Derive an expression for equivalent internal resistance and equivalent emf of two cells joined in series.
2. Derive an expression for equivalent internal resistance and equivalent emf of two cells connected in parallel.
3. Derive the expression for conductivity: $\sigma = \frac{ne^2\tau}{m}$; where the symbols have their usual meaning.
4. Derive an expression for the balancing condition of Whetstone's bridge.

CHAPTER – 4 : MOVING CHARGES AND MAGNETISM

2 and 3 MARKS QUESTIONS:

1. Derive the expression for magnetic force on a current carrying conductor. OR Derive: $\vec{F} = I(\vec{l} \times \vec{B})$
2. Derive the expressions for radius and time period of revolution of charged particle moving perpendicular to uniform magnetic field.
3. State and explain Biot-Savart's law with the help of a diagram.
4. State Ampere's circuital law. Using Ampere's circuital law, derive the expression for magnetic field at a point due to a long straight wire carrying current.
5. What is a solenoid? Derive the expression for magnetic field at a point inside the solenoid.
6. How can a moving coil galvanometer be converted into voltmeter? Explain with a diagram and expression.
7. How can a moving coil galvanometer be converted into ammeter? Explain with a diagram and expression.

5 MARKS QUESTIONS:

1. Derive an expression for the magnetic field at any point on the axis of a circular current loop/coil.
2. Obtain an expression for the force between two infinitely long straight parallel conductors carrying current. Hence define "ampere".
3. Deduce the expression for the torque experienced by current loop placed in uniform magnetic field.

CHAPTER – 5 : MAGNETISM AND MATTER

2 and 3 MARKS QUESTIONS:

1. Give the three properties of magnetic field lines.
2. Define (i) Magnetisation (ii) Magnetic susceptibility (iii) Magnetic intensity.
3. State and explain Gauss's law in magnetism.
4. Give three properties of diamagnetic materials. Give an example for diamagnetic material.
5. Give three properties of paramagnetic materials. Give an example for paramagnetic material.
6. Give three properties of ferromagnetic materials. Give an example for ferromagnetic material.
7. Write three differences between diamagnetic materials and paramagnetic materials.
8. Give three differences between diamagnetic materials and ferromagnetic materials.
9. Write the expression for magnetic potential energy of a magnetic dipole (needle) kept in a uniform magnetic field and explain the terms. When will magnetic potential energy of a needle be (i) maximum (ii) minimum?

CHAPTER – 6: ELECTROMAGNETIC INDUCTION

2 OR 3 MARKS QUESTIONS:

1. Briefly explain Henry and Faraday's coil-magnet experiment on electromagnetic induction.
2. State and explain Faraday's law of electromagnetic induction.
3. State and explain Lenz's law in electromagnetic induction. What is the significance of Lenz's law?
4. Mention three factors on which self-inductance of a solenoid depends.
   [Ans: Number of turns in the solenoid, area of cross section and length of solenoid]
5. Mention three factors on which mutual inductance of a pair of coaxial solenoids depend.
6. What is AC generator? State the principle of AC Generator.
7. Obtain an expression for motional emf induced in a conductor moving perpendicular to the uniform magnetic field. (Derive $\varepsilon = Blv$).
8. Obtain an expression for energy stored in an inductor ($U_B = \frac{1}{2} LI^2$).

CHAPTER – 7: ALTERNATING CURRENT

2 OR 3 MARKS QUESTIONS:

1. Write the relation connecting rms value(V) & peak value(v_m) of alternating current. [Ans: $V=\frac{v_m}{\sqrt{2}}$ or $v_m = \sqrt{2}\, V$]
2. Show that current and voltage are inphase in pure resistive AC circuit.
3. Mention the expression for the resonant frequency in series LCR circuit and explain the terms.
4. Obtain the expression for the resonant frequency in series LCR circuit.
5. What is a transformer? State the principle of transformer.
6. Mention three sources of power loss in a transformer.

CHAPTER – 8: ELECTROMAGNETIC WAVES

2 MARKS QUESTIONS:

1. (a) What is displacement current? Give the expression for it. (b) Why does displacement current needed?
2. (a) What is the source of electromagnetic waves? (b) What is the nature of electromagnetic waves?
3. Mention any two properties/characteristics of electromagnetic waves.
4. Give any two uses of (a) Microwaves (b) Infra-red waves (c) Ultraviolet rays (d) X-rays (e) gamma rays.
5. Give the wavelength range of (a) Microwaves (b) Infra-red waves (c) Ultraviolet rays (d) X-rays (e) gamma rays.

CHAPTER – 9 : RAY OPTICS AND OPTICAL INSTRUMENTS

3 MARKS QUESTIONS:

1. Obtain the relation between focal length and radius of curvature for a concave mirror [Derive f = R/2].
2. (i) State laws of reflection. (ii) State laws of refraction.
3. State and explain Snell's law of refraction. Mention its limitation. [It is not applicable for normal incidence, i=0].
4. What is total internal reflection? Give two conditions for total internal reflection.
5. Mention three applications/uses of total internal reflection.
6. Write the principle and two uses of optical fibers.
7. Draw a neat-labelled ray diagram (with arrow marks) of a simple microscope for the image formation at near point. Write the expression for magnification.
8. Draw a neat-labelled ray diagram (with arrow marks) of a compound microscope for the image formation at near point. Write the expression for magnification.
9. Draw a neat-labelled ray diagram of (i) refracting telescope (ii) reflecting telescope (cassegrain).

5 MARKS QUESTIONS:

1. Obtain mirror equation: $1/f = 1/u + 1/v$
2. Obtain the relation between u, v, R and n for a spherical refracting surface.
3. Derive Lens-maker's formula.
4. Derive the expression for effective focal length of two thin lenses kept in contact.
5. Obtain an expression for the refractive index of the material of the prism in terms of the angle of the prism and angle of minimum deviation.

CHAPTER – 10: WAVE OPTICS

2 or 3 or 5 MARKS QUESTIONS:

1. Define wavefront. What type of wavefront obtained from (i) a point source (ii) a line source (iii) a star?
2. Give three differences between interference and diffraction.
3. State Huygens principle. Using Huygens principle arrive at Snell's law of refraction for a plane wave.
4. Using Huygens principle, show that the angle of reflection is equal to angle of incidence when a plane wave reflected by a plane surface.
5. Give the theory of interference. Write the conditions for constructive interference and destructive interference in terms of path difference and phase difference.
6. Define diffraction and polarisation. Which phenomenon shows/prove wave nature of light? [Polarisation]
7. What are Polaroids? Mention two uses of polaroids.
8. Give mathematical formula for Malus Law and explain the terms.

CHAPTER – 11 : DUAL NATURE OF RADIATION AND MATTER

2 OR 3 OR 5 MARKS QUESTIONS:

1. Define (i) Work function of a metal (ii) Threshold frequency (iii) Stopping potential
2. Mention three types of electron emission.
3. Write four experimental observations of photoelectric effect.
4. Write Einstein's photoelectric equation and explain the terms.
5. Write Einstein's explanation of experimental observations of photoelectric effect.
6. Mention three characteristic properties of photon/particle nature of light.
7. What are matter waves? Write the de-Broglie relation for de-Broglie wavelength of matter waves.

CHAPTER – 12 : ATOMS

2 OR 3 MARKS QUESTIONS:

1. Draw a neat labelled of diagram of Geiger-Marsden alpha (α) –particle scattering experiment. Write an observation.
2. Write the three postulates of Bohr's atom model.
3. Mention two limitations of Bohr atom model.
4. Derive the expression for total energy of electron orbiting in hydrogen atom in terms of radius.
5. Draw the energy level diagram of hydrogen atom.
6. Define the terms: Ionization energy and excitation energy.
7. Using Bohr's postulates, derive the expression for total energy of electron in n^{th} orbit of hydrogen atom.
8. Give de Broglie explanation/proof of Bohr's postulate of quantization (with derivation).

CHAPTER – 13 : NUCLEI

2 OR 3 MARKS QUESTIONS

1. Define isotope/isobar/isotone. Give examples to each.
2. Mention two characteristics/properties of nucleus.
3. Define mass defect and binding energy of a nucleus. Write the relation between them.
4. What is nuclear force? Mention three characteristics/properties/features of nuclear force.
5. Give two differences between nuclear fission and nuclear fusion.

CHAPTER – 14 : SEMICONDUCTOR ELECTRONICS

2 and 3 MARKS QUESTIONS:

1. Classify the conductors, semiconductors and insulators on the basis of energy bands (band theory of solids).
2. Define: (i) valence band (ii) conduction band (iii) energy gap/band gap.
3. Give three differences between intrinsic and extrinsic semiconductors.
4. Give three differences between n-type and p-type semiconductors.

5 MARKS QUESTIONS:

1. What is a rectifier? Describe the working of a p-n junction diode as a half wave rectifier with the help of a circuit diagram. Draw input and output waveforms.
2. What is rectification? Describe the working of a p-n junction diode as a full wave rectifier with the help of a circuit diagram. Draw input and output waveforms.