SAMPLE PAPER-03

PHYSICS (Theory)

Class – XII

Time allowed: 3 hours | Maximum Marks: 70

General Instructions:

a) All questions are compulsory.
b) Questions 1 to 5 are one mark questions.
c) Questions 6 to 10 are two marks questions.
d) Questions 11 to 22 are three marks questions.
e) Question 23 is four marks question.
f) Question 24 to 26 are five marks questions.
g) There is no overall choice in the question paper, but internal choice is there.
h) Use of calculator is not permitted.

1. Why it is not possible to charge just one end of metal rod?

2. Two wires of equal crossectional area, one of iron and the other of manganin, have the same resistance. Which one will be longer?

3. What is the SI unit of magnetic flux?

4. Name the series of hydrogen spectrum which has least wavelength.

5. Why a transistor cannot be used as a rectifier?

6. Give two properties of electric field lines. Sketch them for an isolated positive point charge.

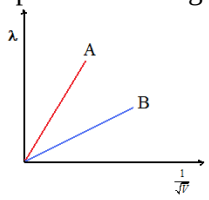
7. A conducting loop is held stationary normal to the field between the poles of a fixed permanent magnet. By choosing the magnet sufficiently strong, is it possible to generate the electric current in the loop. Give reason also.

8. What do you mean by critical angle? Give one practical application of total internal reflection.

OR

Write down the three differences between inference and diffraction.

9. The two lines A and B shown are the graphs of the de Broglie wavelength λ as a function of $\frac{1}{\sqrt{V}}$ (V is the accelerating potential) for two particles having the same charge.



Which of the two represents the particle of heavier mass?

10. Write down the function of (i) transducer and (ii) antenna?

11. State Coulomb's law in electrostatics. The electrostatic force between two charges of 200 μC and 500 μC placed in free space is 5 gf. Find the distance between the two charges. ($g = 10\ m/s^2$)

12. Derive an expression for the electric current in terms of drift velocity. How the drift velocity of the electron depends on the temperature of the conductor?

13. Two wires A and B have the same length equal to 44 cm and carry a current of 10 A each. Wire A is bent into a circle and wire B is bent into a square.

14. Define the coefficient of self induction. A coil has an inductance of 0.03H. Calculate the emf induced when current in the coil changes at a rate of 200 A/s.

OR

Find the frequency of LCR series resonant circuit. Define Q factor and show that $Q = \frac{1}{R}\sqrt{\frac{L}{C}}$.

15. Identify the part of the electromagnetic spectrum which is : (i) suitable for radar systems used in aircraft navigation, (ii) produced in nuclear reactions, (iii) produced by bombarding a metal target target by high speed electrons.

16. Discuss refraction through a glass slab. Show that the emergent ray is parallel to the incident ray but displaced.

17. What are de Broglie waves? What is the de Broglie wavelength associated with an electron accelerated through a potential difference of 100 V?

18. Obtain the expression for the energy of orbital electrons in hydrogen atom using Bohr's postulates. The energy of the hydrogen atom in its ground state is – 13.6eV. Determine the energy of the energy level whose quantum number is 3.

19. Discuss the working of transistor as a switch.

20. Distinguish between space wave and sky wave propagation. With the help of suitable diagram, explain these waves are propagated.

21. Calculate the energy released in joule in the process of fission by 1 mg of $_{92}U^{235}$, assuming that 200 MeV of energy is released per fission. (Avagadro's Number = 6.023×10^{23})

22. (a) What do you mean by power of a lens? Give its unit also.

(b) A converging lens has a focal length of 20 cm when immersed in water. What is its nature and power? (absolute refractive index of glass = 1.5 and absolute refractive index of water = 1.33)

23. Sunita was a childless widow. She ran her life only by the pension for the senior citizen from Government. When she switches of one bulb in her house all the other appliances get switched off. She could not even spend for an electrician.

Sapna living nearby decided to do something about this. She referred to physics books and learnt that the series combination for the household connection should be the reason. She called an electrician and had the circuit changed to parallel combination. The problem was solved and Sunita was happy. She thanked Sapna for her help to solve the problem.

(i) What are the values possessed by Sapna?

(ii) Why for household a parallel combination used? Give two advantages.

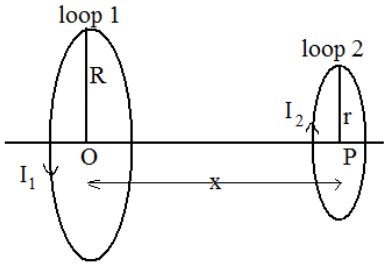
24. (a) State Biot Savart's law and find the expression for the magnetic field at a point due to a straight current carrying conductor.

(b) How many turns should be in a closely wound circular coil of radius 0.4 m in order for a current of 3.2 A to produce a magnetic field of 1.61×10^{-4} T at its centre?

OR

(a) Explain the phenomenon of mutual induction.

(b) A circular loop of radius 0.3 cm lies parallel to a much bigger circular loop of radius 20 cm. The centre of the small loop is on the axis of the bigger loop. The distance between their centres is 15 cm. Find the mutual inductance of the two loops.



25. Describe Davisson-Germer experiment to establish the wave nature of electrons. Draw a labeled diagram of the apparatus used and show the necessary calculations.

OR

(a) Establish photoelectric equation and use this to explain the laws of photoelectric effect.

(b) What is the lowest frequency of light that will cause the emission of photoelectrons from a surface whose nature is such that 1.65eV is required to eject an electron?

26. (a) Show mathematically that the electric field intensity due to a short dipole at a distance d along its axis is twice the intensity at the same distance along the equatorial axis.

(b) Two charges of + 0.2 μμC and – 0.2 μμC are 10^{-6} cm apart. Calculate the electric field at an axial point at a distance of 10 cm from their mid point.

OR

(a) Deduce an expression for the capacitance of a parallel plate capacitor when a conducting slab is inserted between the plates. Assume that the slab thickness to be less than the plate separation.

(b) A capacitor of 20 μF and charged to 500 V is connected in parallel to another capacitor of 10 μF charged to 200 V. Find the common potential.