DCPH601

Reg. No. | | | | | | | | |

VI Semester B.Sc. Degree Examination, July/August-2024

PHYSICS

Elements of Condensed Matter and Nuclear Physics

(NEP Scheme Freshers 2021-22 onwards)

Paper : PHY.DSCT7

Time : 2½ Hours **Maximum Marks : 60**

Instructions to Candidates : **1. Answer the number of questions as cited in each part.**

2. Use of non-programmable scientific calculator is allowed.

PART - A

Answer any Four of the following. Each question carries 2 marks. **(4×2=8)**

1. State and explain Wiedemann Franz law.
2. What is hysteresis? Draw the hysteresis curve.
3. Mention any two properties of superconductors.
4. What is meant by range of α - particle?
5. What is Cerenkov radiation?
6. What is pair production? Give an example.

PART - B

Answer any Four of the following. Each question carries 5 marks. **(4×5=20)**

7. Calculate the lattice spacing in a cubic lattice of side 2.5 A° for (111) planes.
8. A magnetic field of 1800 Am^{-1} produces a magnetic flux of 3×10^{-5} Wb in an iron bar of cross-sectional area 0.2cm^2. Calculate its absolute permeability.
9. A solid dielectric material has polarizability of 7×10^{-40} Fm^2. Assuming the internal field to be Lorentz field, calculate the dielectric constant of the material if it has 3×10^{28} atoms m^{-3}.

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10. Neptunium $\left({}_{93}Np^{237}\right)$ emits α-particles of energy 4.19 MeV. Calculate α-disintegration energy.

11. Calculate Compton shift, if the x-rays of wavelength 1A° are scattered from a carbon block and viewed at 90° to the incident beam.

Given : $h = 6.626102 \times 10^{-34}\ Js$, $c = 3 \times 10^{8}\ ms^{-1}$, $m_o = 9.1 \times 10^{-31} kg$.

12. A magnetic filed of 4T is employed in a cyclotron to accelerate protons, Find the frequency of the electric field applied between the dees, Given mass of proton $= 1.67 \times 10^{-27} kg$.

PART - C

Answer any Four of the following. Each question carries 8 marks. **(4×8=32)**

13. a) Distinguish between continuous and characteristic x-ray spectra.

b) Derive Bragg's law of x-ray diffraction. **(4+4)**

14. Define Hall effect. Derive an expression for Hall voltage and Hall field in the case of metals and hence derive an expression for Hall Co-efficient. **(8)**

15. a) What is Lorentz field?

b) Derive the expression for Lorentz field of a dielectric. **(1+7)**

16. Describe the main features of the specific binding energy versus mass number curve. **(8)**

17. a) What is β-decay? Mention the types of beta emission.

b) State and explain Geiger-Nuttal Law. **(4+4)**

18. Describe the construction and working of a Geiger-Muller counter and explain the features of its characteristic curve. **(8)**