Sixth Semester B.Sc., Degree Examinations

May / June 2026

(Semester Scheme NEP 2021 onwards)

PHYSICS

Paper : VII : NSF0510 : Elements of Condensed Matter And Nuclear Physics

Time: 2 hrs.] [Max.Marks:60

Instructions to Students :

1. *The Students should legibly write Section number along with question numbers within the margin ONLY.*
2. *The answer without Section number and question numbers will not be valued.*
3. *Draw neat and labelled diagram wherever necessary.*
4. *Section I multiple Choice Questions should be answered in the first page of main answer book and same questions shall not be answered repeatedly.*
5. *Any identifications like marking, ticking, dots etc., in the options of MCQ on the question paper is strictly prohibited. Do not write anything (except register number) on the question paper*
6. *This question paper consists of four Sections.*
7. *Take necessary data from tables.*
8. *Symbols have their usual meaning.*
9. *Usage of scientific calculator is allowed.*

SECTION- I

I. *Select the most appropriate answer from options provided :* *10X 1= 10 Marks*

I-1) Co-ordination number of simple cubic crystal is

A) 6 B) 12

C) 8 D) 16

I-2) The K_α line is seen in which of the following ?

A) Continuous X – ray spectrum

B) Characteristic X – ray spectrum

C) Compton effect

D) Photo – electric effect

I-3) Which one of the following is Curie's law for paramagnetism ?

A) $X \alpha \frac{1}{T}$ B) $X \alpha T$

C) $X \alpha \frac{1}{T^2}$ D) $X \alpha T^3$

Contd…2

I-4) A super conducting material placed in a magnetic field will

A) Attract the magnetic field towards its centre

B) Repel all the magnetic lines of forces.

C) Attract the magnetic field but transfer it into concentrated zone

D) Not influence the magnetic field.

I-5) The combination $a \neq b \neq c$; $\alpha \neq \beta \neq \gamma \neq 90^0$ describes a crystal structure of type.

A) Tetragonal B) Monoclinic

C) Triclinic D) Hexagonal

I-6) In a radio active compound with nuclei 'No' & decay constant 'λ', the total number of nuclei after time t is

A) No $e^{\lambda t}$ B) No $e^{-\lambda t}$

C) No $e^{-\lambda t}$ D) No $e^{\lambda t}$

I-7) Cyclotron is used for accelerating

A) Electron B) Protons

C) Photons D) Gravitons

I-8) The nucleus of the atom is positive

A) due to the presence of electrons around it

B) due to the presence of neutrons

C) due to the presence of protons

D) None of the above

I-9) Atoms having same atomic number but different mass number are called

A) Isotones B) Isotherms

C) Isotopes D) Isobars

I-10) Which of the following material is used in scintillation detector ?

A) Sodium chloride B) Sodium iodide

C) Sodium sulphate D) Sodium carbonate

Contd...3

SECTION- II

II. ***Answer any FIVE of the following questions.*** ***5X 3= 15 Marks***

II-1) State and explain Weidmann – Franz law.

II-2) A plane cuts the crystallographic axes at 3a, 2b & 6C in a crystal. Determine the Miller Indices of the plane.

II-3) Write a note on Domain theory of Ferromagnetism.

II-4) Give the cause, examples and applications of piezo – electric effect.

II-5) State and explain Gieger – Nuttal law.

II-6) Define photoelectric effect, Compton scattering and pair production.

II-7) Mention the properties of Nuclei.

II-8) Explain the basic working principle of semiconductor detector.

SECTION- III

III. ***Answer any THREE of the following questions.*** ***3X 5= 15 Marks***

III-1) Derive an expression for average energy of free electron gas at absolute zero temperature.

III-2) Distinguish between Type – I and Type – II superconductor.

III-3) Explain the main features of binding energy curve.

III-4) Write the construction and working of photomultiplier tube.

III-5) Obtain approximately the ratio of the nuclear radii of the gold isotope $^{197}_{79}Au$ and the silver isotope $^{107}_{47}Ag$

SECTION- IV

IV. ***Answer the following:*** ***2X 10= 20 Marks***

IV-1) a) Write Debye's theory of specific heat in detail.

OR

b) Give Langevin's classical theory of diamagnetism.

IV-2) a) Explain the processes involved in β - decay.

OR

b) Explain the construction and working of GM – counter.

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