



BBC-003-0491103

Seat No. _____

**B. Sc./M. Sc. (Applied Physics) (Sem. X) (CBCS)
Examination**

June-July - 2021

*Paper-15, Group C-3 : Swift Heavy Ions for Material
Modifications*

(New Course)

Faculty Code : 003

Subject Code : 0491103

Time : $2\frac{1}{2}$ Hours]

[Total Marks : 70

- Instructions :** (1) Attempt any FIVE questions.
(2) Numbers in the right margin indicate marks.

- 1 Write answer of following short questions (**Two** marks each) 14
- (1) Define Range distribution in solids.
 - (2) Define Screen Coulomb Potential.
 - (3) Write the full forms of SRIM and TRIM.
 - (4) Write about the important issues in nanomaterials.
 - (5) What is an ion-track?
 - (6) Give an example of lamella structure formation by SHI irradiation.
 - (7) Write applications of transparent conducting oxides.
- 2 Write answer of following short questions (**Two** marks each) 14
- (1) Calculate the atomic density of Al, where,
 $p = 2.7 \text{ gm/cm}^3$ and $A = 27$.
 - (2) Calculate the energy of an electron in MeV having mass
 $m = 9.11 \times 10^{-31} \text{ kg}$.

- (3) What do you mean by tandem accelerator?
 - (4) What do you mean by self organization?
 - (5) Give two example of SHI induced modifications in the properties of Manganite thin films.
 - (6) Which type of defects responsible for the change in T_c in superconductor?
 - (7) Write down the properties and application of zinc oxide.
- 3** Write answers of following questions. **14**
- (1) Derive an equation for maximum energy transfer T_M in Centre of Mass coordinates.
 - (2) Write a detailed note on inter atomic force in solids.
- 4** Write answers of following questions. **14**
- (1) Write a note on Scattering Cross Section.
 - (2) Discuss Screen coulomb potential in detail.
- 5** Write answers of following questions. **14**
- (1) Discuss the application of SRIM and TRIM simulation software.
 - (2) Write a note on ion implantation and their applications.
- 6** Write answers of following questions. **14**
- (1) Discuss the different beam line of 15UD Tandem accelerator at IUAC, New Delhi and write their applications.
 - (2) Draw a well labelled diagram of 15UD Tandem accelerator.
- 7** Write answers of following questions. **14**
- (1) Discuss step wise process of nanostructure formation by ion irradiation.
 - (2) Discuss effect of SHI on magnetic nanoparticles in silica.

- 8 Write answers of following questions. 14
- (1) Write a note on ion induced self - organization phenomena.
 - (2) Discuss precipitation of metal particles in oxide by ion irradiation.
- 9 Write answers of following questions. 14
- (1) Explain enhancement of critical current density in high T_c superconductor.
 - (2) Describe the effect of SHI irradiation on the transparent conducting oxide with example.
- 10 Write answers of following questions. 14
- (1) Explain modification in transport properties of manganite thin films by ion irradiation.
 - (2) Discuss the columnar tracks and flux pinning in high T_c superconductor.
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