

## Paper VII — ATOMIC AND NUCLEAR PHYSICS

(For those who joined in July 2003 and after)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

(5 × 20 = 100)

- Explain the electronic structure of atoms with suitable energy level diagram. Briefly discuss the spectra of alkaline earths.
  - Describe the rotating crystal method for determining crystal structure. Explain the electronic configuration of diatomic molecules with examples.
- Explain the properties of nuclei. Obtain the empirical formula for nuclear radius. Explain its importance.

Or

Or

- Explain neutron-proton scattering at low energies.

- Discuss in detail the Gamow's theory of alpha decay.

Or

(b) Discuss in detail the multipole radiation. Explain the angular correlation in Gamma emission.

- What is meant by Q value of a nuclear reaction? Obtain an expression for it. Write the laws of nuclear reactions.
  - Explain the various methods of detecting neutrons. Discuss the phenomenon plasma confinement.
- Explain the various conservation laws associated with fundamental particles. Discuss the four types of interactions.
  - What is isospin? Find the isospin for a nucleon and pions. Obtain Gell-Mann-Okubo mass relation.

Or

Or