

(DPHY 22)

M.Sc. (Final) DEGREE EXAMINATION, JUNE 2010.

Second Year

Physics

Paper VI — NUCLEAR PHYSICS, MOLECULAR AND
RESONANCE SPECTROSCOPY

Time : Three hours

Maximum : 100 marks

Answer any FIVE questions.

All questions carry equal marks.

1. (a) Describe a method to determine the magnetic dipole moment.
(b) Explain the binding energy of a nucleus and dependence on mass number with suitable example.
2. (a) What are the characteristics of nuclear forces?
(b) Discuss Yukawa's theory of meson exchange.
3. (a) Explain threshold energy and cross section for nuclear reactions.
(b) Discuss Fermi's theory of β -decay.

4. (a) Write a note on nuclear isomerism.
(b) Discuss in detail the interaction between the elementary particles.
5. (a) Describe the experimental set-up for NMR to note resonance absorption of proton.
(b) Mention the different relaxation mechanisms observed in NMR.
6. (a) What are Bloch equations? Find the solutions of Bloch equations.
(b) Describe the construction and working of ESR spectrometer.
7. (a) Write a note on spherical top molecules.
(b) Describe the construction and working of IR spectrometer.
8. (a) Distinguish between rotational, vibrational and electronic spectra of diatomic molecules.
(b) Describe the theory of diatomic molecule as a non rigid rotator.

9. Write notes on any TWO of the following :

- (a) Semi empirical mass formula.
- (b) Nuclear reactors.
- (c) NQR spectrometer.
- (d) Diatomic linear symmetric top.
