

Or

- (b) Discuss Bohr-Wheeler theory of nuclear fission and derive stability limit against spontaneous fission.
6. (a) Explain single particle model of the nucleus and discuss the role of spin-orbit coupling in this model.

Or

- (b) Discuss in detail the collective model of Bohr and Mottelson.
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2017

Time : 3 hours

Full Marks : 80

Answer from **both** the Sections as per directed

The figures in the right-hand margin indicate marks

Candidates are required to answer in their own words as far as practicable

(BASIC NUCLEAR PHYSICS)

SECTION – A

1. Answer any *four* questions : 4 × 4
- (a) Explain nuclear mass and binding energy of the nucleus.
- (b) Explain briefly the theory of Deuteron.
- (c) Briefly explain effective range theory.
- (d) Write a note on compound reactions.

(e) What are magic numbers? Explain its existence.

(f) What are schmidt lines? Explain.

Or

2. Answer all questions : 2 × 8

(a) Define nuclear radius.

(b) What is central force?

(c) What is scattering length?

(d) What are resonance reactions?

(e) Define quadrupole moment of nucleus.

(f) Explain briefly the significance of magic number.

(g) Explain fusion reaction.

(h) Give the salient features of liquid drop model.

SECTION – B

Answer all questions : 16 × 4

3. (a) Explain the angular momentum of the nucleus and describe the method to determine the magnetic dipole moment and quadrupole moment.

Or

(b) Describe the theory of tensor forces and explain the significance of magnetic moment and quadrupole moment of deuteron.

4. (a) Explain how neutron-proton scattering differs from proton-proton scattering and discuss scattering cross-section.

Or

(b) Explain the Meson theory of nuclear forces and discuss the Yukawa interaction.

5. (a) Discuss different types of nuclear reactions and obtain Breit-Wigner formula for S-waves.