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LB—81—2023

FACULTY OF SCIENCE AND TECHNOLOGY

M.Sc. (Third Semester) EXAMINATION

APRIL/MAY, 2023

[CBCS New]

PHYSICS

PH-16

(Nuclear and Particle Physics)

(Saturday, 6-05-2022) **Time : 2.00 p.m. to 5.00 p.m.**

Time— Three Hours *Maximum Marks*—75

N.B. :— (*i*) *All* questions are compulsory and carry equal marks.

(*ii*) Figures to the right indicate full marks.

1. What do you mean by electric quandrupole ? Discuss elecric quadrupole moment of a nucleus. 15

Or

(*a*) Explain the concept of nuclear dipole moment in detail. 8

(*b*) Write a note on the nuclear quantum numbers. 7

2. Derive the expression for stopping power of heavy charged particles. 15

Or

(*a*) Write a short note on the charge conjugation and time reversal. 8

(*b*) Explain construction and working of a scintillation detector. 7

3. Discuss the nuclear liquid drop model in detail with its assumptions, evidences and limitations. 15

Or

(*a*) Explain the characteristics of Nuclear Forces. 8

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(*b*) State the shell model configuration and assign the spin and particles to the ground state of the nucleus of $_{31}Sc^{41}$. 7

4. Explain the R-S disintegration law along with the decay constant and the half life period. 15

Or

(*a*) Explain the concept of non-conservation of parity in beta decay processes. 8

(*b*) With suitable examples, explain the selection rules for classification of beta transitions. 7

5. Attempt any *three* : 15

(*i*) Find the binding energy per nucleon for an alpha particle. Given, m_p = 1.007825 amu, m_n = 1.008665 amu, m_α = 4.002603 amu and 1 amu = 931.5 MeV.

(*ii*) Write a note on straggling and range for alpha particles.

(*iii*) Explain charge independence property of nucleons.

(*iv*) Explain the term mean life for radioactive subetanees.