22PHU622N

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION MAY 2026
(Sixth Semester)

Branch – **PHYSICS**

NUCLEAR PHYSICS

Time: Three Hours Maximum: 75 Marks

SECTION-A (10 Marks)
Answer **ALL** questions
ALL questions carry **EQUAL** marks (10 × 1 = 10)

Module No.	Question No.	Question	K Level	CO
1	1	The packing fraction is related to (i) Nuclear spin (ii) Mass defect (iii) Charge (iv) Radius	K1	CO1
	2	The most stable nuclei have mass number around (i) 20 (ii) 56 (iii) 120 (iv) 238	K2	CO1
2	3	Alpha particles are (i) Electrons (ii) Helium nuclei (iii) Protons (iv) Neutrons	K1	CO2
	4	The Geiger–Nuttall law relates (i) Energy & range (ii) Half-life & decay constant (iii) Decay constant & alpha energy (iv) Mass & charge	K2	CO2
3	5	GM counter works on (i) Ionization (ii) Scintillation (iii) Pair production (iv) Fluorescence	K1	CO3
	6	Cyclotron frequency depends on (i) Velocity (ii) Magnetic field (iii) Radius (iv) Energy	K2	CO3
4	7	Q-value of reaction represents (i) Charge (ii) Energy released (iii) Spin (iv) Radius	K1	CO4
	8	Fusion occurs at (i) Low temperature (ii) High temperature (iii) Room temperature (iv) Zero K	K2	CO4
5	9	Mesons are (i) Leptons (ii) Hadrons (iii) Bosons only (iv) Photons	K1	CO5
	10	Primary cosmic rays consist mainly of (i) Electrons (ii) Protons (iii) Mesons (iv) Neutrons	K2	CO5

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SECTION - B (35 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** Marks (5 × 7 = 35)

Module No.	Question No.	Question	K Level	CO
1	11.a.	Explain mass defect, binding energy and packing fraction.	K2	CO1
		(OR)		
	11.b.	Describe the properties of nuclear forces.		
2	12.a.	Explain properties of alpha particles and Geiger–Nuttall law.	K2	CO2
		(OR)		
	12.b.	Explain law of radioactive disintegration and half-life.		
3	13.a.	Use the scintillation counter technique to analyze radiation detection in a particle accelerator experiment.	K3	CO3
		(OR)		
	13.b.	Apply the concept of linear resonance accelerator to calculate the energy gained by a particle in a given setup.		
4	14.a.	Calculate the Q-value for a given nuclear fission reaction and apply it to determine energy release.	K3	CO4
		(OR)		
	14.b.	Apply the theory of nuclear fusion to explain the working principle of a hydrogen bomb and distinguish it from nuclear fission.		
5	15.a.	Analyze latitude and east–west asymmetry effects of cosmic rays.	K4	CO5
		(OR)		
	15.b.	Analyze the origin of secondary cosmic rays and the role of Van Allen belts.		

SECTION -C (30 Marks)

Answer **ANY THREE** questions

ALL questions carry **EQUAL** Marks (3 × 10 = 30)

Module No.	Question No.	Question	K Level	CO
1	16	Explain Liquid Drop Model and describe Weizsacker's semi-empirical mass formula and discuss nuclear stability.	K3	CO1
2	17	Explain Gamow's theory of alpha decay.	K2	CO2
3	18	Explain construction and working of betatron.	K2	CO3
4	19	Apply the principles of controlled chain reaction to explain the principle, construction, and uses of a nuclear reactor.	K3	CO4
5	20	Analyze the classification of elementary particles into leptons, mesons, hyperons, and quarks, and examine how the fundamental interactions govern their behavior.	K4	CO5

Z-Z-Z END