

3/21

0302E1359

Candidate's Seat No : _____

MSc Sem.-1 Examination**402****Medical Physics****February-2025****Time : 2-30 Hours]****[Max. Marks : 70**

Q.1	Name the types of Exchange forces and discuss them in detail.	[14]
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OR

Q.1	Discuss: Effective range theory.	[14]
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Q.2	<p>A. Draw the mass parabola for the family of isobars with $A = 91$ and estimate (i) nuclear charge of the most stable isobar, (ii) the energy release Q_{β^-} and Q_{β^+}, for transitions leading to Z_0.</p> <p>B. Explain: Segre chart of stable nuclides and stability curve.</p>	[14]
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OR

Q.2	<p>A. Determine the spin and parity of nuclear ground states of following nuclei from the shell model i. ${}_{27}^{56}\text{Co}$ ii. ${}_{15}^{30}\text{P}$</p> <p>B. According to the shell model find out the spins and parities of following nuclei in (a) ground state and (b) the first excited state i. ${}_{9}^{17}\text{F}$ ii. ${}_{49}^{115}\text{In}$</p>	[14]
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Q.3	<p>A. Define 'Activity'. Calculate the activity of 2gm of ${}_{88}^{226}\text{Ra}$, whose half-life is 1622 years.</p> <p>B. Assume that a particular type of nucleus with decay constant λ is produced at a steady rate P nuclei per second. Find the number of nuclei $N(t)$ present t seconds after the production starts.</p> <p>C. Explain why the percentage of radium contained in uranium is always experimentally found to be the same. Which type of equilibrium exist between them? Explain.</p>	[14]
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OR

Q.3	A. Explain Nuclear Isomerism. B. Explain decay of Co-60 and Cs-137. Why and where are they used?	[14]
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Q.4	A. Discuss fundamental interactions. B. Discuss CP and CPT invariance.	[14]
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OR

Q.4	Give the possible combination of three Quarks, and with proper graphical presentation, discuss the relationship between charge and strangeness for the spin-3/2 baryons, then compare it with spin-3/2 three-quark combinations.	[14]
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Q.5	Attempt any seven out of twelve. Short questions (One- or Two-line answers) / Fill in the blanks (Each question is of two mark).	[14]
(i)	What do you understand by elastic scattering?	
(ii)	Calculate the binding energy of α -particle. (Given: mass of ${}^1_1\text{H}$ atom = 1.007825u, mass of neutron = 1.008665u, mass of ${}^4_2\text{He}$ atom = 4.00260u)	
(iii)	Give the stability limit against spontaneous fission, estimated by Bohr and Wheeler.	
(iv)	What do you understand by doubly magic nucleus. Give an example of such nucleus.	
(v)	Give the statement of Fermi Gas Model.	
(vi)	Give the asymmetry energy term B_a .	
(vii)	Give an example of Secular Equilibrium.	
(viii)	What is the normal range of α -particles in air? Give its corresponding K.E. and velocities values also.	
(ix)	Primary cosmic rays have a range of _____ energy. How many percentages of proton is there in primary cosmic rays?	
(x)	What do you understand by conservation of parity?	
(xi)	Mesons have _____ parity, Fermions and their antiparticles have _____ parity.	
(xii)	Give the processes, which are forbidden according to lepton conservation law.	

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