

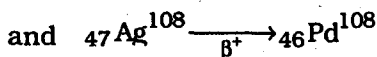
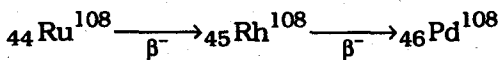
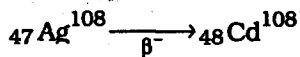
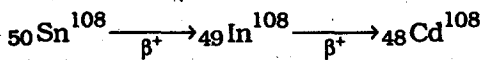
2009**M.Sc.****3rd SEMESTER EXAMINATION****PHYSICS****PAPER—PH-2103***Full Marks : 40**Time : 2 Hours**The figures in the margin indicate full marks.**Candidates are required to give their answers in their own words as far as practicable.**Illustrate the answers wherever necessary.***Module—PH-2103A****(Marks : 20)***Answer Q. No. 1 and any one from the rest.*

1. Answer any five bits : 2×5
- (a) State the applications of double focusing mass spectrometer in modern physics.
- (b) Write down the Weizsacker's semi-empirical mass formula for ${}_Z X_N^A$ and mention the B.E. correction terms.

(Turn Over)

- (c) How can you conclude that α -decay is possible only when $A \geq 150$ of radioactive nuclei.
- (d) Diagrammatically present charge-current distribution configuration of the nuclei ${}_Z Y_N^A$.
- (e) What is Kuric plot ?
- (f) Discuss the Selection rules in multiple γ transition based on the conservation of angular momentum.
- (g) Draw a Schematic experimental set up for detection of neutrino.
- (h) Show the isomeric-transition of ${}_{35}\text{Br}^{80}$ (isomeric nuclei) with energy level diagram for emission of γ , β^+ and β^- radiation.
2. What are mass parabola ? Express the parabolic mass relationship. Graphically show the transitions of the following even $A=108$ isobaric nuclei with parabolic presentation :

2+2+3+3



3. Graphically discuss nuclear resonance absorption and fluorescence. What is recoilfree gamma ray Spectroscopy? State the important uses of Moßbauer effect. 6+2+2

Module-PH-2103B

(Particle Physics)

(Marks : 20)

Answer Q. No. 1 and any one from the rest.

1. Answer any five bits : 2×5
- (a) Calculate the coupling constant for Gravitational interaction in natural unit.
- (b) $\pi^0 \longrightarrow \gamma + \gamma$
- $K^0 \longrightarrow \pi^0 + \pi^0$
- In the above reactions predict the conservation of Isospin (I) and third component of Isospin (I_3).
- (c) Write down GNN formula for quarks. Calculate the charges for S and d quarks by this formula.
- (d) Define structure constant in Lie group. Write down the generators in SU(2) group.
- (e) Prove that time reversal operator is anti-unitary.
- (f) Show that in SU(2)
- $2 \otimes 2 = 3 \oplus 1$.
- (g) Define G-parity. Where it is conserved?
- (h) What are proper and improper symmetries?

2. (a) For Baryons prove that
 $3 \otimes 3 \otimes 3 = 10 \oplus 8 \oplus 8 \oplus 1$. 5
- (b) Isospin symmetry predicts that $m_p = m_n$. Prove it. 3
- (c) Explain spontaneous symmetry breaking in particle physics. 2
3. (a) Prove that

$$S + t + u = \sum_i m_i^2$$

where s, t, u are mandels'tam variables. 5

- (b) Calculate the threshold K.E. of the proton in the lab. frame to create an anti-proton in a proton-proton collision. 5
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