

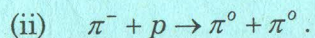
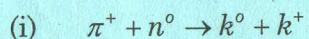
9. (a) Explain with the help of Gamow's theory, how α - particles with energies less than the height of the potential barrier are emitted from a radio active nucleus.

Or

- (b) Discuss Fermi theory of beta decay.
10. (a) Derive the Gell-Mann-Okubo mass formula and show how one can deduce the mass of Ω .

Or

- (b) Which of the following reactions are allowed and forbidden under the conservation of charge, strangeness and baryon number.



S.No. 187

12PPH09

(For the candidates admitted from 2012 – 2013 onwards)

M.Sc. DEGREE EXAMINATION, NOVEMBER 2017.

Third Semester

Physics

NUCLEAR AND PARTICLE PHYSICS

Time : Three hours

Maximum : 75 marks

PART A — (5 × 5 = 25 marks)

Answer ALL the questions.

1. (a) Discuss angular momentum and magnetic moment of the nucleus.

Or

- (b) The mass of the hydrogen atom and of neutron are 1.008142 and 1.008982 amu respectively. Calculate the packing fraction and binding energy per nucleon of ^{16}O nucleus. Atomic mass of ^{16}O nucleus is 15.994915 units.

2. (a) What is Yukawa potential? Explain how does it vary with distance?

Or

- (b) Write about the properties of ground state of deuteron.

3. (a) State and explain Reciprocity theorem.

Or

- (b) Calculate the Q-value of the reaction ${}^2_1\text{H}(d, n){}^3_2\text{He}$. Given mass of ${}^2_1\text{H} = 2.0141$, ${}^3_2\text{He} = 3.01603$ and ${}^1_0n = 1.008665$ units.

4. (a) Explain 'Internal conversion'. Why are we term it as Gamma transition? In internal conversion what are the properties of the nucleus conserved?

Or

- (b) Discuss parity violation in β - decay.

5. (a) Explain in detail the different types of particle interactions among elementary particles.

Or

- (b) Explain $SU(2)$ and $SU(3)$ symmetry theory in elementary particles.

PART B — (5 × 10 = 50 marks)

Answer ALL questions.

6. (a) Obtain an expression for the binding energy and mass of a nucleus in the ground state on the basis of semi-empirical mass formula of Weizsacker.

Or

- (b) State the main assumptions of the nuclear shell model. What are the experimental evidence that suggests the model?

7. (a) Give a brief account of the meson theory of nuclear forces.

Or

- (b) Describe the low energy n-p scattering and arrive the expression for phase shift S_0 .

8. (a) What is meant by nuclear resonance? Derive Breit-Wigner formula for nuclear reactions.

Or

- (b) Give the theory of stripping reactions with particular reference to semi classical description and wave mechanical description.