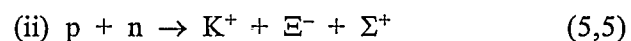
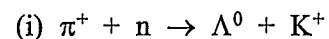


6. (a) Write the differences between baryons and mesons. (5)

(b) Draw the meson octet and specify the mesons at the vertices and at the Centre. (3)

(c) Explain which of the following reactions are allowed or forbidden under the conservation of charge, baryon number, strangeness, isospin, z component of isospin, Also state the kind of interaction followed.



[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 4824

J

Unique Paper Code : 2224002010

Name of the Paper : Nuclear and Particle Physics

Name of the Course : **B.Sc. Hons. - (Physics)_NEP:
UGCF-2022**

Semester : IV / VI (GE Paper)

Duration : 3 Hours

Maximum Marks : 90

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt any **FIVE** questions in all.
3. Question No. 1 is compulsory.
4. **All** questions carry equal marks.
5. Use of non – programmable scientific calculator is allowed.

1. Attempt any six questions : (6×3=18)
 - (a) Show that the nuclear density is the same for all the nuclei.
 - (b) Give three salient features of the Shell model.
 - (c) Write the differences between the spectra observed in Alpha and Beta Decay?
 - (d) Define the terms (i) isobar (ii) isotone (iii) isotope
 - (e) Compute the value of Nuclear magneton.
 - (f) What is Internal Conversion process?
 - (g) What are Leptons? Give two examples of Leptons.
2. (a) Derive and compute the magnetic moment of a proton. (6)
- (b) Calculate and compare the binding energies per nucleon for $^{20}_{10}\text{Ne}$ and in $^{238}_{92}\text{U}$ in MeV/c^2 . The atomic mass of $^{20}_{10}\text{Ne}$ is 19.992440 u and $^{238}_{92}\text{U}$ is 238.050783 u (where $u = 931.5 \text{ MeV}/c^2$). (6)
- (c) Draw N-Z graph. Explain why stable nuclei have a greater number of neutrons than protons? What are magic nuclei? (2,2,2)

3. (a) Discuss Gamow's theory of α -decay and hence deduce the expression for the Gamow factor. (9)
- (b) Illustrate the variation of the binding energy per nucleon with the atomic mass number. Explain the shape on the basis of the liquid drop model. (2,7)
4. (a) What is meant by a nuclear reaction? Give two examples. (4)
- (b) Write three main differences between Direct and Compound nucleus reactions. (6)
- (c) Define the Q-value for a nuclear reaction. Explain its significance. Neutrons from $^7\text{Li} (p,n)^7\text{Be}$ reaction are observed at laboratory angle of 30° , where masses are $m(^7\text{Li}) = 7.016004u$, $m(p) = 1.007825u$, $m(^7\text{Be}) = 7.016929u$, $m(n) = 1.008665u$. At what bombarding energy are neutrons of zero energy obtained? (2,2,4)
5. (a) What are Cerenkov radiations? Explain the various ways of interactions of Gamma ray with matter. (2,6)
- (b) Explain the principle, construction and working of Scintillation detector. (10)