Name: **Enrolment No:**	

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, May 2022

Course: Nuclear and Particle Physics **Semester: IV**
Program: BSc (H) Chemistry, Math, Geology **Time: 03 hrs.**
Course Code: PHYS2012 **Max. Marks: 100**

Instructions:

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	Enlist four different methods to determine the nuclear radius.	**4**	**CO1**
Q 2	Calculate the electric field at the surface of the wire of a proportional counter with a wire radius 0.1 mm and a cylinder radius 1 cm, for a 1500 volt applied between the two.	**4**	**CO3**
Q. 3.	Determine the possible gamma ray multipole transitions for $\frac{11}{2}^{-} \rightarrow \frac{5}{2}^{-}$	**4**	**CO3**
Q.4.	Enlist four properties of nuclear forces.	**4**	**CO1**
Q.5.	Radius of Silver nucleus (Z = 47) is 7 x 10^{-15} m. Determine the minimum kinetic energy a particle should have to just reach it.	**4**	**CO2**
	SECTION B **(4Qx10M= 40 Marks)**		
Q 6	Describe briefly the principle, construction and working of Geiger Muller Counter.	**10**	**CO4**
Q.7	Determine the kinetic energy of alpha particles produced when 238U decays to 234Th, the Q value of the reaction being 4.270 MeV. Also determine the kinetic energy of the recoiling nucleus.	**10**	**CO3**
Q.8	Describe in brief the different p-p chains in stellar nucleosynthesis	**10**	**CO4**
Q.9	Classify the different known elementary particles based on their spin. OR Determine the strangeness S and the hypercharge Y of a neutral elementary particle whose isotopic spin projection is +1/2 and baryon charge is +1. Predict the particle also	**10**	**CO5**
	SECTION-C **(2Qx20M=40 Marks)**		
Q 10	a) Explain the principle, construction and functioning of LINAC. b) Protons of 2 MeV energy enter a linear accelerator that has 97	**15**	**CO5**

	drift tubes connected alternately to a 200 MHz oscillator. The final energy of the protons is 50 MeV. What are the lengths of the second and the last drift tubes.	**05**	
Q. 11	a) Define impact parameter and obtain an expression for it in terms of scattering angle and the kinetic energy of the incident particle. b) A 6 MeV alpha particle is scattered by the nucleus of a mercury atom (Z = 80) at 120^0. Determine the minimum distance to which the alpha particle approaches the nucleus. OR a) Isobars are the nuclides that have same mass number A. Derive a formula for the atomic number of the most stable isobar of a given A and use it to find the most stable isobars of A = 25. b) Describe the concept of mass parabola, Obtain expression for atomic number of most stable nuclei among a given set of isobars.	**15** **05** **10** **10**	**CO1**