Name:

Enrolment No:

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, May 2023

Course: Radiation Safety **Semester : IV**
Program: BSc (Hons) Physics **Time : 03 hrs.**
Course Code: PHYS 2019 **Max. Marks: 100**

SECTION A
(5Qx4M=20Marks)
Attempt All Questions. Each Question will carry 4 Marks

S. No.		Marks	CO
Q1	Classify different Laser Sources based on active medium with examples.	**4**	**CO1**
Q2	The activity of a 2 milligram sample of ^{144}Ce is found to be 37 k Bq. Determine its specific activity in Ci/gm.	**4**	**CO1**
Q3	Describe the basic principle of ALARA	**4**	**CO2**
Q4	Explain the origin of Cerenkov radiations.	**4**	**CO2**
Q5	In an ancient burial cave, A team of archaeologists discovers ancient wood furniture. Only 80% of the original 14C remains in the wood. How old is the furniture? Half life of C-14 is 5700 yrs	**4**	**CO3**

SECTION B
(4Qx10M= 40 Marks)
Each question will carry 10 marks (10×4 = 40 Marks)
There is an internal choice for Q9.

Q6	Describe the principle and functioning of a thermo luminescent detector (TLD)	**10**	**CO2**
Q7	Briefly describe the different mechanism to obtain population inversion in laser systems.	**10**	**CO1**
Q8	Write short notes on a) Dose b) Exposure Obtain and expression between Dose rate and Exposure rate	**10**	**CO3**
Q9	Define stopping power and obtain classical expression for stopping power of charge particles in matter. OR	**10** **10**	**CO2**

	Describe LD 50/60, doubling dose and radiation toxicity with respect to radiation protection principles.		
	SECTION-C **(2Qx20M=40 Marks)** **1. Each Question carries 20 Marks.** **2. Attempt two questions. There is an internal choice for Q11.**		
Q10	a) Explain the principle, construction and working of a Gas filed detector. b) Compute the thickness of Al and Pb to transmit 10% of a narrow beam of 0.1-MeV gamma radiation. Given: attenuation coefficient at this energy for Al is $\mu = 0.435\ cm^{-1}$ and for Pb it is $\mu = 59.7\ cm^{-1}$	**10** **10**	**CO3**
Q11	a) Explain the phenomena of Compton scattering and hence obtain expression for fraction of energy lost by the photon in this scattering. b) Monochromatic 0.1-MeV gamma rays are scattered through an angle of 120° by a carbon block. Evaluate the kinetic energy of the Compton electron. OR a) Explain the different categories based on energy and the interaction mechanism of neutrons with matter. b) Show that the maximum energy a neutron of mass M and energy E_n can transfer in a single head on elastic collision to a nuclei of mass m is $Q = \frac{4mME_n}{(m+M)^2}$	**15** **05** **10** **10**	**CO3**