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

Course: Radiation Safety   Semester   :IV
Program: B. Sc. (Hons) Physics   Time   : 03 hrs.
Course Code: PHY2019   Max. Marks: 100

Instructions: Your answer should be concise and to the point.

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	Calculate the population ratio of two states in a gaseous laser that produces light of wavelength $6000 A^0$ at 300 K.	4	CO1
Q 2	Explain Compton Scattering. Can it be observed with visible light?	4	CO1
Q 3	What is nuclear waste disposal? Why its proper disposal is crucial for survival?	4	CO3
Q 4	Describe step index multimode fiber and graded index fiber with schematic diagrams.	4	CO3
Q 5	Explain mass attenuation coefficient for the interaction of electromagnetic radiation with matter.	4	CO2

SECTION B
(4Qx10M= 40 Marks)

Q 6	Obtain a relation between transition probabilities for spontaneous and stimulated emission of radiation.	10	CO1
Q 7	(a) Explain the term radiation dosimetry and various units used in radiation exposure.	5	CO3
	(b) Describe thermoluminescence and highlight the difference between thermoluminescence and photoluminescence?	5	CO3
Q 8	(a) State and explain laws of photoelectric effect.	5	CO1
	(b) The photoelectric work function of Potassium is 2.0 eV. If light having a wavelength 3600 A^0 fall on Potassium, find (i) the kinetic energy in eV of the most energetic electrons ejected (ii) the stopping potential (iii) the velocity of these electrons.	5	CO3

Q 9	Describe the principle, construction and working of a scintillation radiation counter. Briefly give a few desirable properties of a good scintillation counter.		CO2
	Or	10	
	Explain Range & Range Straggling when a charged particle interacts with matter along-with their mathematical formulation		CO2

SECTION-C
(2Qx20M=40 Marks)

Q 10	(a) Explain the construction & working of Ruby laser with suitable energy level diagram.	10	CO1
	(b) How does light propagate in optical fibres? What are various kinds of losses that an optical signal suffer while propagating through fiber.	10	CO2
Q 11	(a) Describe the concept and working principal of gas detector with suitable diagrams. Explain GM counter in detail	10	CO2
	(b) Derive Bethe- Bloch formula for the energy loss of a heavy charged particle moving through matter.	10	CO3
	OR		
	(a) Explain alpha, beta and gamma radiations and their sources.	10	CO2
	(b) Can pair production happen in empty space? Justify your answer with the mechanism of pair production	10	CO3