B.Sc. 4th Semester (Honours) Examination 2021-22

PHYSICS

Course ID: 42415 **Course Code: SH/PHS/405/SEC-2**

Course Title: Radiation Safety (SEC T3)

Time: 2 Hours **Full Marks: 40**

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable

SECTION-I

1. Answer any ***five*** questions: 2 x 5=10

(a) What is Bethe Bloch formula?

(b) What is known as Compton wavelength?

(c) What is the main function of International Commission on Radiological Protection (ICRP)?

(d) What do you mean by Derived Air Concentration (DAC)?

(e) Why the X-rays are more penetrative than visible light?

(f) What is the Q value of a nuclear reaction?

(g) What are the basic differences between Gas detectors and Scintillation detectors?

(h) Name four applications of nuclear techniques for the betterment of society?

SECTION-II

2. Answer any ***four*** questions: 4 x 5=20

(a) Differentiate between absorbed dose and equivalent dose. What do you mean by effective dose, collective equivalent dose? 3+2

(b) Define sterilization. Explain the use of nuclear techniques for crime detection. 1+4

(c) What do you mean by the cross section of a nuclear reaction? Mention three different types of nuclear reactions with proper examples. 2+3

(d) What are the continuous and characteristic X-ray spectra? Discuss the origin of characteristic X-rays with proper diagram. 2+3

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(e) What is Accelerator Driven Sub-critical System (ADS)? What is its role in nuclear waste disposal management? 3+2

(f) What do you meant by the terms (i) mass stopping power, (ii) range and (iii) straggling related to the α particle radiation. 2+1+2

SECTION-III

3. Answer any ***one*** question: 10 x 1=10

(a) Discuss the working principle of a GM counter with proper diagram. Compare a proportional counter with a GM counter. What is a PET scan used for? 5+3+2

(b) What is nuclear binding energy? How does the average nuclear binding energy depend on nuclear mass number? How the stability of atomic nucleus can be demonstrated on the basis of N-Z curve? Which isotope is more stable $^{6}Li_{3}$ or $^{8}Li_{3}$? 2+3+3+2