

B.Sc. Semester-IV Examination, 2022-23**PHYSICS [Honours]**

Course ID : 42415 Course Code : SH/PHS/405/SEC-2(T3)

Course Title : Radiation Safety

Time : 2 Hours

Full Marks : 40

*The figures in the right-hand margin indicate marks.**Candidates are required to give their answers in their own words as far as practicable.***SECTION-I**

1. Answer any **five** questions: 2×5=10
- How are Auger electrons generated?
 - Mention different modes of β -decay with suitable equations.
 - Why is the radioactive decay called statistical process?
 - Can a GM tube be used to detect γ -rays?
 - How the range of α -particle depends on decay constant of the radioactive substance?
 - What is radiation sickness?
 - What is nuclear waste?
 - What do you mean by pair production?

[Turn Over]

2. Answer any **four** questions: 5×4=20
- Discuss the mechanisms through which γ -ray photons interact with matters. Why is α -decay not possible classically? 3+2
 - Discuss the mechanisms of radiation damage of living cells. Mention the determinants of biological effects caused due to exposure of ionizing radiations. 3+2
 - What is an MRI scan? Is there any side effect from any MRI scan? Explain. How does an MRI machine work? 1+1+3
 - Draw and explain the variation of binding energy per nucleon with mass number. Hence discuss from the curve:
 - The saturation property of nuclear force.
 - The nuclear fission and fusion can produce enormous amount of energy. 1+1+3
 - What is radiation dosimetry? Describe in very short how thermo-luminescent dosimetry works. 2+3
 - Differentiate between absorbed dose and equivalent dose. What do you mean by effective dose and collective equivalent dose? 3+2

SECTION-III

3. Answer any **one** question: $10 \times 1 = 10$
- a) i) For which kind of nuclei (light, medium or heavy) the fusion reaction is exoergic. Justify your answer.
- ii) Given the atomic mass of ${}^2_1\text{H}$ to be 2.014102u, calculate the maximum wavelength of a photon which can split a deuteron.
- iii) How do the continuous and characteristic X-ray spectra originate?
- iv) The maximum KE of photoelectron is 1.3 eV when ultraviolet light of wavelength 350 nm is directed at a potassium surface. Find the work function of potassium. $2+3+3+2$
- b) Write short notes on the use of nuclear techniques on (i) Sterilization and (ii) Food preservation. What is the differences between γ -rays and x-rays? What is the main fuel of Nuclear Fusion reaction? $(3+3)+3+1$

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PHYSICS [Honours]

Course ID : 42415 Course Code : SH/PHS/405/SEC-2(T4)

Course Title : Weather Forecasting

Time : 2 Hours

Full Marks : 40

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

SECTION-I

1. Answer any **five** of the following questions: $2 \times 5 = 10$
- a) Why temperature decreases with altitude in the troposphere?
- b) What is the difference between weather and climate?
- c) What is lapse rate?
- d) Differentiate between PM 2.5 and PM 10 that cause air pollution. What should be their range for a good air quality?
- e) What is aerosol?
- f) Explain the term "meteorological parameters".
- g) How does the humidity affect the temperature?
- h) What is probability forecast?

SECTION-II

2. Answer any **four** of the following questions:

$$5 \times 4 = 20$$

- a) What is ozone layer depletion? What is the problem of ozone layer depletion? $2+3$
- b) How is the climate changes over a period of time in a particular region?
- c) Explain the uses of satellites for weather forecasting.
- d) Explain the composition and structure of the earth's atmosphere.
- e) Briefly write about cyclone and anticyclone, and their characteristics.
- f) Write short notes on: $2\frac{1}{2} + 2\frac{1}{2}$
 - i) Tornadoes
 - ii) Hurricanes

SECTION-III

3. Answer any **one** of the following questions:

$$10 \times 1 = 10$$

- a) Explain the term 'global warming'. Write down its causes and its impact on society. $2+(4+4)$
- b) How do you measure wind speed and direction? Discuss the forces governing the wind production. $4+6$