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SIXTH SEMESTER U.G. DEGREE EXAMINATION, MARCH 2023

(CBCSS-UG)

Physics/Applied Physics

PHY 6B 12/APH 6B 12—NUCLEAR PHYSICS AND PARTICLE PHYSICS

(2019 Admissions onwards)

Time: Two Hours

Maximum: 60 Marks

The symbols used in question paper have their usual meanings.

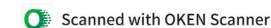
Section A (Short Answer Type)

Answer all questions in two or three sentences. Each correct answer carries a maximum of 2 marks.

- 1. What are Isotopes? Give an example.
- 2. Explain the electron capture process.
- 3. What do you mean by radiocarbon dating?
- 4. Explain Lawson's criterion for fusion reactors.
- 5. Draw the schematic of a pressurized water nuclear reactor.
- 6. Draw the count rate versus applied voltage of a GM tube and indicate the different regions.
- 7. What are the basic requirements of a neutron counting system?
- 8. Explain the working principle of an intersecting beam accelerator.
- 9. Compare the basic properties of particles and antiparticles. Give an example.
- 10. What is the strange behavior of kaons and hyperons?
- List the different quarks and their charges.
- 12. Give the essence of electroweak theory.

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Turn over



Section B (Paragraph/Problem Type)

(Answer all questions in a paragraph of about half a page to one page, Each correct answer carries a maximum of 5 marks.

- 13. The half-life of radon is 3.8 days. After how many days will only one twentieth of a radon san be left over?
- 14. Draw the schematic of an ionization chamber and indicate the parts involved.
- 15. Using a suitable figure, explain the working principle of a linear accelerator.
- 16. Explain the advantage of a synchrocyclotron over a cyclotron.
- 17. Calculate the threshold kinetic energy for the reaction $p + {}_{1}^{3}H_{2} \rightarrow {}_{1}^{2}H_{1} + {}_{1}^{2}H_{1}$, if the proton incident on ${}_{1}^{3}H$ at rest.
- 18. Find the Q value of the following decay $K^0 \to \pi^0 + \pi^-$
- 19. Name the conservation law that would be violated in the following decay $p + p \rightarrow p + n + K$

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Section C (Essay Type)

Answer in about two pages, any one question.

Answer carries 10 marks.

- 20. Discuss the essential properties of an atomic nucleus; constituents, size, shape, mass and bin energy.
- 21. Explain the proton-proton and carbon cycles of nuclear fusion.

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