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Reg. No. : .....

Name : .....

Sixth Semester B.Sc. Degree Examination, April 2023

First Degree Programme Under CBCSS

Physics

Core Course X

PY 1642 : NUCLEAR AND PARTICLE PHYSICS

(2013 – 2017 Admission)

Time : 3 Hours Max. Marks : 80

SECTION – A

Answer **all** questions. **Each** question carries 1 mark.

1. Define nuclear magnetron.
2. Distinguish between isotopes and isotones.
3. Define half-life of a radioactive nucleus.
4. Write the equation for the law of radioactive decay.
5. Give an example of a two-nucleon system.
6. What are the uses of a GM Counter?
7. How to know that a nuclear reaction is exoergic or endoergic from its Q-value?
8. What is a hydrogen bomb?

P.T.O.

9. How cosmic rays are originated?

10. What are cosmic rays?

(10 × 1 = 10 Marks)

SECTION – B

Short answer type questions: Answer **any eight** questions. **Each** question carries **2** marks.

11. Explain the significance of angular momentum of an atomic nucleus.

12. Write a note on nuclear quadrupole effect.

13. How neutrinos become significant in beta-decay from a nucleus?

14. Explain Geiger-Nuttal law.

15. Explain the process of pair production.

16. What do you understand by scintillation? What is its use in nuclear detectors?

17. What is an endoergic nuclear reaction?

18. What do you mean by the critical size of an atom bomb?

19. How enormous amount of energy is radiating from sun?

20. Write a short account of nuclear power generation in India.

21. Explain Cerenkov radiation?

22. Briefly explain primary and secondary cosmic rays.

(8 × 2 = 16 Marks)

SECTION – C

Answer **any six** questions. **Each** question carries **4** marks.

23. Calculate the binding Energy of a neutron in a ${}_3Li^7$ nucleus. Express the result in *u*, MeV andJoules. Given that, mass of ${}_3Li^7$=7.016004u, Mass of ${}_3Li^6$=6.015125u and ${}_0n^1$=1.008665*u*

24. Explain the collective model of nucleus.

25. Explain the meson theory of nuclear forces.

26. The half-life period of Radium is 1590 years. In how many years 1 gram of radium will be disintegrated to 1/16th of its initial value. Calculate its radioactive disintegration constant.

27. Derive the law of successive disintegration.

28. What is magnetic spectrograph? What is its use?

29. Derive the equation connecting radioactive scattering cross section and number of nucleons in a nuclear reaction.

30. Derive the expression for mean life of a radioactive nucleus.

31. Explain energy balance in nuclear reactions and Q-value.

(6 × 4 = 24 Marks)

SECTION – D

Answer **any two** questions. **Each** question carries **15** marks.

32. Explain the different factors affecting the liquid drop model of a nucleus and derive the semi empirical mass formula. Explain the merits and demerits of this model.

33. Explain the principle and working of a cyclotron. How the defects of a cyclotron resolved by a synchro-cyclotron?

34. What do you understand by nuclear fission? Explain the energy released during fission. How a chain reaction can be used to produce energy using a nuclear reactor?

35. Write detailed notes on. (a) The elementary particle quantum numbers. and (b) Conservation laws and symmetry of elementary particles.

(2 × 15 = 30 Marks)