QP CODE: 25020395

25020395

Reg No : .....

Name : .....

B.Sc DEGREE (CBCS) REGULAR / REAPPEARANCE / MERCY CHANCE EXAMINATIONS, FEBRUARY 2025

Sixth Semester

CORE COURSE - PH6CRT11 - NUCLEAR, PARTICLE AND ASTROPHYSICS

Common for B.Sc Physics Model I, B.Sc Physics Model II Applied Electronics, B.Sc Physics Model II Computer Applications & B.Sc Physics Model III Electronic Equipment Maintenance

2017 Admission Onwards

339813CB

Time: 3 Hours Max. Marks : 60

Part A

*Answer any **ten** questions.*

*Each question carries **1** mark.*

1. What is nuclear force? Write any of its three properties.
2. What are the disadvantages of cloud chamber?
3. What are the general utilizations of a Van de Graff generator?
4. What is the principle of betatron?
5. Compare the velocities of α-particle, β-particle and γ- rays.
6. What is meant by inverse β -decay?
7. Distinguish between exothermic and endothermic reactions.
8. Explain how the intensity of cosmic ray varies from sea level to higher altitude.
9. What are secondary cosmic rays?
10. Name the first lepton discovered and by whom?
11. What is the structure of a quark?
12. What is a red giant?

(10×1=10)

Part B

*Answer any **six** questions.*

*Each question carries **5** marks.*

13. If an electron exists in the nucleus, what would be its kinetic energy?

14. What are the different properties of an atomic nucleus ?

15. Calculate the binding energy of a neutron in the $_3Li^7$ nucleus. Express the results in u, MeV and joules.

16. Explain liquid drop model of Nuclear structure.

17. In an archaeological expedition, charcoal from an ancient fire pit was excavated. The sample showed a $_6C^{14}$ activity of 11.3 counts per gram per minute. The absolute activity of $_6C^{14}$ is constant for all wood samples and is equal to 15.3 counts per gram per minute. Estimate the age of charcoal sample. Half life of $_6C^{14}$ = 5568 years.

18. Explain internal conversion and internal pair production.

19. Explain proton – proton cycle.

20. Check whether the following reactions are allowed or not. Explain the reason (a) $\pi^+ + n \rightarrow K^0 + K^+$ (b) $\pi^- + p \rightarrow K^0 + \Lambda^0$

21. Write a note on supernova explosion.

(6×5=30)

Part C

*Answer any **two** questions.*

*Each question carries **10** marks.*

22. How does nuclear shell model explain the nuclear magic numbers?

23. Explain the difference between ionization chamber, proportional counter and GM counter.

24. What are the four radioactive series? Name the parent isotope and the stable end product of all these radioactive series. Write down the Actinium series from the parent isotope to the end product showing the α and β emissions.

25. Explain the symmetry and conservation laws in particle physics.

(2×10=20)