QP CODE: 26017186

26017186

Reg No : .....

Name : .....

**B.Sc DEGREE (CBCS) REGULAR / REAPPEARANCE / MERCY CHANCE EXAMINATIONS, MARCH 2026**

**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

212D9DD8

Time: 3 Hours

Max. Marks : 60

**Part A**

*Answer any **ten** questions.*

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

1. How can be calculated nuclear mass ?
2. Write down the semi empirical mass formula and explain the symbols.
3. What is meant by i) supercooling ii) superheating ?
4. Give any two uses of betatron.
5. Compare the charges of α- and β- particles.
6. Explain how alpha particles of energy less than 26MeV can escape from a nucleus?
7. What is internal pair production?
8. What do you mean by nuclear fusion?
9. Explain how the intensity of cosmic ray varies from sea level to higher altitude?
10. What are the possible colors of quarks?
11. What do you mean by Hertzsprung-Russel diagram?
12. What is a neutron star?

(10×1=10)

**Part B**

*Answer any **six** questions.*

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

13. Explain how beta emission is explained on the basis of proton- neuton hypothesis of the nucleus.

14. What is the density of the nucleus to that of water?

15. Explain the evidences for nuclear shell model.

16. An ionization chamber exposed to a beam of α particles registers a current of $3.5 \times 10^{-13}$ A. On the average 25 alpha particles enter the chamber per second. Assuming that the production of an ion pair in the chamber involves the expenditure of 35 MeV of energy, calculate the energy of the alpha particles.

17. Draw the β – spectrum of any β – emitting isotope. Explain why the β – spectrum is continuous?

18. Distinguish between laboratory frame of reference and center of mass frame of reference.

19. Calculate the energy released by fission of 1g of $U^{235}$ in KWh. Energy per fission is 200MeV.

20. Explain the muon decay.

21. Write a note on the elementary particle quantum numbers?

(6×5=30)

**Part C**

*Answer any **two** questions.*

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

22. Explain nuclear shell model on the basis of nucleon spin orbit interaction.

23. Explain the working of Vande Graaff generators ? What are the limitations.

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)