QP CODE: 22100927

22100927

Reg No : .....

Name : .....

B.Sc DEGREE (CBCS) REGULAR / REAPPEARANCE EXAMINATIONS, APRIL 2022

Sixth Semester

CORE - 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

2AB8B4AB

Time: 3 Hours

Max. Marks : 60

Part A

*Answer any **ten** questions.*

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

1. Distinguish between isobars and isotones.
2. What limits the size of a stable nucleus?
3. Why nuclear shell model referred to as independent model ?
4. What is the role of magnetic field in a cyclotron?
5. Which isotope is the end product of Neptunium series?
6. Explain how alpha particles of energy less than 26MeV can escape from a nucleus?
7. What is meant by orbital electron capture?
8. What is the unit of reaction cross section?
9. From which isotope the fissionable Plutonium is produced in breeder reactor?
10. Distinguish between baryons and hadrons.
11. What is meant by hyperons?
12. Define Chandrasekhar limit.

(10×1=10)

Part B

*Answer any **six** questions.*

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

13. Calculate the nuclear density of the carbon nucleus.

14. Explain liquid drop model of Nuclear structure.

15. Explain nuclear spin and magnetic moment.

16. The linear attenuation coefficient for 3 MeV gamma rays in water is about $5m^{-1}$. Find the relative intensity of the beam after it has passed through 0.15 m of water.

17. Find the activity of 1mg of Radon whose atomic mass is 222U and half life period is 3.8days.

18. Determine the amount of energy released in the so-called D – T fusion reaction

    ${}_1H^2 + {}_1H^3 = {}_2He^4 + n$

    Given m $({}_1H^2)$ = 2.014102u, m $({}_1H^3)$ = 3.016049u, m $({}_2He^4)$ = 4.002603u, m_n = 1.008665u.

19. Explain latitude and altitude effect on cosmic rays and the reason behind it.

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. Briefly explain various conservation laws in particle physics.

(6×5=30)

Part C

*Answer any **two** questions.*

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

22. Explain the principle, construction and working of Wilson cloud chamber.

23. Explain the working of Linear accelerator. What are the advantages of Linear accelerator. What are the advantages of Linear Accelerator over Van de Graaff generator ?

24. Write a short on (a) Primary and secondary cosmic rays (b) Cosmic ray shower (c) Van Allen belt.

25. Define HR diagram. What are the uses? Sketch and explain HR diagram

(2×10=20)