QP CODE: 24000637

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Reg No : .....

Name : .....

B.Sc DEGREE (CBCS) REGULAR / REAPPEARANCE EXAMINATIONS, MARCH 2024

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

0B28CE7C

Time: 3 Hours Max. Marks : 60

Part A

*Answer any **ten** questions.*

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

1. What are mirror nuclei? Give examples
2. What is coulomb energy of a nucleus?
3. What is the cause of magic numbers?
4. What is the working principle of Bubble chamber ?
5. Which isotope is the end product of Uranium series?
6. Give one example of each electron emission and positron emission.
7. Define Q value of a reaction.
8. What is azimuth effect of cosmic rays?
9. What is isocosm?
10. Name the four basic interactions.
11. What is absolute magnitude of a star?
12. What is a neutron star?

(10×1=10)

Part B

*Answer any **six** questions.*

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

13. Assuming that the nucleus is spherical in shape, arrive at an expression for nuclear density.

14. The binding energy of the neon isotope $_{10}Ne^{20}$ is 160.647 MeV. Find its atomic mass. Mass of hydrogen atom is 1.007825 u.

15. An ionization chamber exposed to a beam of α particles registers a current of 3.5×10^{-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.

16. What are the advantages of Linear accelerator over Van de Graaff generator ?

17. How much time will it take for an 8mCi source to reduce to 1mCi source? Given half life period is 10 years.

18. The atomic ratio between the uranium isotopes U^{238} and U^{234} in a mineral sample is found to be 1.8×10^4. The half life of U^{234} is 2.5×10^5 years. Find the half life of U^{238}.

19. Assuming that the energy released by the fission of a single Uranium atom is 202 MeV, calculate the number of fissions per second required to produce 1 Watt of power.

20. Which of the following reactions are forbidden? Explain the reason. (a) $\pi^+ + n \rightarrow \pi^- + p$ (b) $\pi^+ + n \rightarrow \Lambda^0 + K^+$

21. Describe the various symmetry operations in particle physics.

(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 construction and working of cyclotron.

24. Explain in detail the three types of Gamma decay processes. Draw and explain the K- and L- conversion lines obtained along with the continuous β – emission spectrum.

25. Describe the elementary particles.

(2×10=20)