

B. Sc. DEGREE END SEMESTER EXAMINATION - MARCH 2024**SEMESTER 6 - PHYSICS****COURSE : 19U6CRPHY11 - NUCLEAR, PARTICLE PHYSICS AND ASTROPHYSICS***(For Regular 2021 Admission and Supplementary 2020/2019 Admissions)*

Time : Three Hours

Max. Marks: 60

PART A**Answer any 8 (2 marks each)**

1. What resists the gravitational collapse of a white dwarf and the main sequence stars?
2. Write any two assumptions of the liquid drop model of the nucleus.
3. Write the symmetry associated with the conservation of electric charge.
4. Are there reactors which can run with fast neutrons?
5. Name the two massive quark flavors.
6. Draw the nuclear stability curve.
7. What are magic numbers?
8. Write the order of magnitude of nuclear radius. What is its unit?
9. Describe the inner zone of Van - Allen Belt?
10. Explain the concept of half life in Radioactive decay.

(2 x 8 = 16)**PART B****Answer any 6 (4 marks each)**

11. In the following process show the conservation of quantum numbers
 $n \longrightarrow p + e^{-} + \bar{\nu}_e$
12. Polonium emits alpha particles with a KE of 10.54 MeV. Find its alpha particle disintegration energy.
13. What are leptons? write a note on the interactions that effect the leptons and give three examples.
14. What are resonance elementary particles?
15. In a distant galaxy two stars were identified with one star having 1.5 times the temperature of the second star. Find the ratio of their radii.
16. A nucleus with A=235 splits into two nuclei whose mass numbers are in the ratio 2:1. Find the radii of the new nuclei.
17. The half life of radium is 1590 years. In how many years will 2g of pure element (a) lose one centigram and (b) be reduced to one centigram.
18. Prove theoretically that an electron cannot exist inside the nucleus.

(4 x 6 = 24)**PART C****Answer any 2 (10 marks each)**

19. Explain the following particle detectors, (a) Wilson cloud chamber (b) Bubble chamber (c) Scintillation counter.
20. Discuss (i) the properties of alpha and beta particles and (ii) alpha and beta energy spectra.
21. Explain the evolution of stars. Find the final stage volume of a star more massive than the sun.
22. Explain the following (1) Photon diffusion time (2) white dwarf and black dwarf (3) Chandrasekhar limit (4) Black holes.

(10 x 2 = 20)