TB206545W **Reg. No :.....**

Name :.....

B. Sc. DEGREE (C.B.C.S.) EXAMINATION, MARCH 2023

(2020 Admission Regular, 2019, 2018 Admissions Supplementary)

SEMESTER VI - CORE COURSE (PHYSICS)

PH6B11B18 - NUCLEAR, PARTICLE AND ASTROPHYSICS

Time : 3 Hours **Maximum Marks : 60**

Part A

I. Answer any Ten questions. Each question carries 1 mark **(10x1=10)**

1. Explain nuclear magneton.
2. List any two detectors of nuclear radiations.
3. Graphically illustrate the binding energy per nucleon versus the mass number curve.
4. Define the mean life of a radioactive sample.
5. Define the activity of a radioactive sample.
6. Write a short note on main sequence of star.
7. Explain the Harvard classification system of stars.
8. Give the nuclear reaction occuring in a hydrogen bomb.
9. Taking nuclear fission into consideration , explain the terms critical mass and critical size.
10. Identify the main component of cosmic rays.
11. Explain hypercharge.
12. Explain the strange behaviour of K mesons and hyperons.

Part B

II. Answer any Six questions. Each question carries 5 marks **(6x5=30)**

13. Compute the mass number of a nucleus whose radius R is 3.46 fm.
14. Discuss the evidence for the shell structure of the nuclei.
15. Determine the mass-energy equivalence of a proton at rest in units of electron volts.
16. Write a note on (i) nuclear isomerism and (ii) internal conversion.
17. The total luminosity of the sun is $3.9X10^{26}$ watts, and its radius is $6.96X10^{8}m.$ Assuming that the sun radiates like a black body,calculate its surface temperature.
18. Describe chain reaction. Distinguish between controlled and uncontrolled chain reactions.
19. Differentiate between nuclear fission and nuclear fusion.
20. Give short notes on particles and their antiparticles.
21. Explain the east- west effect of cosmic rays.

Part C

III. Answer any Two questions. Each question carries 10 marks **(2x10=20)**

22. Describe the construction and working of an ionization chamber.
23. Describe the law of successive disintegration. Explain the radioactive dating and determination of age of the earth.
24. Describe the origin of the ray line and continuous spectrum. Discuss the neutrino hypothesis.
25. Discuss the symmetry principles and the conservation laws that are applicable to elementary particles.