K25U 0172

Reg. No. : .....

Name : .....

Sixth Semester B.Sc. Degree (C.B.C.S.S.-OBE – Regular/Supplementary/ Improvement) Examination, April 2025
(2019 to 2022 Admissions)
CORE COURSE IN PHYSICS
6B12PHY : Nuclear, Particle and Astrophysics

Time : 3 Hours Max. Marks : 40

SECTION – A

Answer **all** questions. **Each** carries **1** mark.

1. The binding energy per nucleon is maximum for _____ nucleus.
2. 1 Curie = _____ decays/second.
3. Write down the relation between apparent magnitude and absolute magnitude.
4. A method to determine the distance to a star is _____
5. Escape velocity of a black hole is _____
6. Pressure in a white dwarf star is due to_____ **(6×1=6)**

SECTION – B

Answer **any six**. **Each** carries **2** marks.

7. What is a neutrino ?
8. What is meant by proton separation energy ?
9. What is Lawson's criteria ?
10. What are strange particles ? Give an example.

P.T.O.

11. What are Higgs bosons ?

12. Name three units used for measuring astronomical distances.

13. Distinguish between giant and supergiant stars.

14. Write a note on "White dwarfs". **(6×2=12)**

SECTION – C

Answer **any four**. **Each** carries **3** marks.

15. Compute the density of a typical nucleus.

16. Find the energy released in the fission of 1kg of Uranium that has been enriched to 3% in the radioisotope of U^{235}. Each fission releases about 200MeV.

17. In p-p collision, a lambda hyperon, a proton, a positively charged pion and a new particle are formed. Find the new particle using conservation principles.

18. In 1956, an experiment was performed at Berkeley to search for the antiproton, which could be produced in the reaction $p + p \rightarrow p + p + p + \bar{p}$. What is the threshold energy for this reaction ? The rest energy of the proton is 938MeV.

19. The Luminosity of Sun is 3.9×10^{26} W and the value of solar constant on the surface of the earth is 1388 W/m^2. Calculate the distance of earth from the Sun.

20. Briefly explain the death of a star. **(4×3=12)**

SECTION – D

Answer **any two**. **Each** carries **5** marks.

21. Explain the conservation laws in radioactive decay.

22. Derive an expression for threshold kinetic energy of nuclear reaction.

23. What is H-R diagram ? How the star's properties such as luminosity and mass are explained based on it ?

24. Explain the end result of high mass star's evolution (Discuss pulsars, Neutron stars and Black holes). **(2×5=10)**

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