K17U 1710

Reg. No. : ....

Name : ....

V Semester B.Sc. Degree (CBCSS – Reg./Sup./Imp.) Examination, November 2017
(2014 Admn. Onwards)
CORE COURSE IN PHYSICS
5B10PHY : Atomic, Nuclear and Particle Physics

Time : 3 Hours

Max. Marks : 40

SECTION – A

Answer **all** – very short answer type, each question carries **1** mark.

1. The magnitude S of the angular monetum due to electron spin in terms of the spin quantum number s is _____

2. The binding energy of the nucleus is equivalent to _____

3. The main source of solar energy is _____

4. Particles exchanged in gravitational interactions are _____

(4×1=4)

SECTION – B

Answer **any seven** – short answer type. **Each** question carries **two** marks.

5. What is the shortest wavelength present in the paschen series of the spectral lines ?

6. What is population inversion and optical pumping ?

7. Why does the spin of an electron play an important role in the structure of energy levels of a many electron atom but not in hydrogen atom ?

8. Explain the subshell capacities.

9. Define isotopes with example.

P.T.O.

10. What are the basic notions of tunnel theory of alpha decay ?

11. Compare the properties of radioactive rays.

12. Differentiate neutrinos and antineutrinos.

13. Why must the quarks in a hadron have different colors ?

14. What is larmor frequency ? Give an expression for it. (7×2=14)

SECTION – C

Answer **any four** – short essay/problem. **Each** question carries **three** marks.

15. Explain Franck-Hertz experiment.

16. Find the activity of 1 mg of radon whose atomic mass is 222u. $T_{1/2}$ = 3.8 days.

17. The boron isotope B^{10} captures neutrons in an (n, α) reaction whose cross section for thermal neutrons is 4×10³b. The density of B^{10} is 2.2 ×10³ kg/m³. What thickness of B^{10} is needed to absorb 99% of an incident beam of thermal neutrons ?

18. Write a short note on eight fold way model.

19. Which element has a K_α x-ray line whose wavelength is 0.180 nm ?

20. Briefly explain the Stern -Gerlach experiment. (4×3=12)

SECTION – D

Answer **any two** – long essay type. **Each** question carries **five** marks.

21. Explain the postulates of a liquid drop model. Derive Weizacker semiempirical mass formula.

22. Discuss X ray spectra in detail.

23. Explain the ultimate constituents of hadrons.

24. Give the Bohr theory of hydrogen atom leading to its energy levels and spectra. (2×5=10)