K20U 1548

Reg. No. : .....

Name : .....

V Semester B.Sc. Degree (CBCSS – Reg./Sup./Imp.) Examination, November 2020
(2014 Admn. Onwards)
CORE COURSE IN PHYSICS
5B10 PHY : 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. Dimension of nucleus is of the order of _____
2. Name the experiment which demonstrated space quantisation firstly.
3. Particles which obey exclusion principle are called _____
4. Convert barn to SI unit.

(4×1=4)

SECTION – B

(Answer **any seven** – Short answer type – **each** question carries **2** marks.)

5. Write Rutherford scattering formula and write the meaning of terms in it.
6. What is stimulated emission ?
7. Define Pauli's exclusion principle.
8. What is L-S coupling ?
9. Explain nuclear fusion.
10. Derive an expression for density of nucleus.
11. What are the four radioactive series ? Write parent nuclei and stable end product of each series.

P.T.O.

12. What is internal conversion ? What is the difference between photoelectric effect and internal conversion ?

13. What are the quark models of proton, neutron, π and Ω ?

14. What are the four fundamental interactions in nature ? Give the name of one affected particle in each interaction. **(7×2=14)**

SECTION – C

(Answer **any four** – Short essay/problem type – **each** question carries **3** marks.)

15. Using uncertainty principle find the rough mass of meson.

16. Half life of Rn^{222} is 3.8 days. Calculate the time taken for a sample of Rn^{222} to decay 70% of its initial no. of nuclei.

17. Explain Bohr atom.

18. Find the minimum kinetic energy of Alpha particle in laboratory frame of reference to cause the reaction ^{14}N (α, p)^{17}O. The masses of ^{14}N, ^{4}He, ^{1}H and ^{17}O are respectively 14.00307u, 4.00260u, 1.00783u, 16.99913u.

19. Write down the muon and pion decay reaction. Check whether they obey the conservation laws.

20. Explain Frank-Hertz experiment. **(4×3=12)**

SECTION – D

(Answer **any two** – Essay type – **each** question carries **5** marks.)

21. Explain nuclear fission reactors.

22. Derive semi empirical mass formula.

23. Explain spectra of hydrogen atom.

24. Explain spin orbit coupling and total angular momentum. **(2×5=10)**