



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,  $\pi$  and  $\Omega$  ?
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  $\text{Rn}^{222}$  is 3.8 days. Calculate the time taken for a sample of  $\text{Rn}^{222}$  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  $^{14}\text{N}(\alpha, p)^{17}\text{O}$ . The masses of  $^{14}\text{N}$ ,  $^4\text{He}$ ,  $^1\text{H}$  and  $^{17}\text{O}$  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)
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