Reg. No. : Name:..... K19U 2270

V Semester B.Sc. Degree (CBCSS- Reg./Sup./Imp.) Examination, November-2019

(2014 Admn. Onwards)

Core Course in Physics

5B 10 PHY: ATOMIC, NUCLEAR & PARTICLE PHYSICS

Time: 3 Hours

Max. Marks: 40

Write answers in English only.

SECTION-A

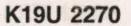
Answer All - Very short answer type - each question carries 1 mark. $(4 \times 1 = 4)$

- 1. What is the SI unit of radioactivity?
- Which element is used to date the objects of biological origin?
- ----- is the antiparticle of the electron.
- When the spin of an element is ½ then we obtain ----- state.

SECTION-B

Answer any SEVEN - short answer type - Each question carries TWO $(7 \times 2 = 14)$ marks.

- 5. Write a note on spin-orbit coupling.
- Write a note on atomic structures.
- Explain the eightfold way of classification of hadrons.
- What is Franck-Hertz experiment?
- How emission and absorption spectral lines originate.





- 10. Obtain the relationship between the cross section and beam intensity? Also find the relation between the surviving particles and slab thickness.
- 11. Give brief account of half-life of the radioactive element.
- 12. What are stable nuclei?
- 13. Explain the correction in the binding energy formula obtained using liquid drop model.
- 14. Brief account of Lasers.

SECTION - C

Answer any FOUR - short essay/problem - Each question carries THREE marks. (4×3=12)

- 15. Find the possible values of the total angular momentum quantum number J under LS coupling of two atomic electrons whose orbital quantum numbers are $t_1 = 1$ and $t_2 = 2$.
- 16. Show that the following decays conserves the lepton numbers L_{ϵ} and L_{μ}
 - a) $\Pi^- \rightarrow \mu^- + \overline{\nu}_{\mu}$
 - b) $\mu^- \rightarrow e^- + \nu_+ + \bar{\nu}_e$
 - c) ye + e+
- 17. Experiments indicate that 13.6 eV is required to separate a hydrogen atom into a proton and an electron. i.e. its total energy is E = 13.6 eV. Find the orbital radius and velocity of the electron in a hydrogen atom.
- 18. The atomic ratio between the uranium isotopes ^{238}U and ^{234}U in a mineral sample is found to be $^{1.8\times10^4}$. The half life of ^{234}U is $T_{1/2}(234) = 2.5\times10^5 y$. Find the half-life of ^{238}U .
- 19. The binding energy of the neon isotope $^{20}Ne_{10}$ is 160.647 MeV. Find its atomic mass $\left(m\binom{1}{1}H\right)=1.007825u, m(n)=1.008665\right)$.



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20. Find the longest wavelength present in the Balmer series of hydrogen corresponding to the H_{α} line.

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SECTION - D

Answer any TWO - Long essay type - Each question carries FIVE marks. (2x5=10)

- 21. Write a note on electron spin.
- 22. What is shell model?
- 23. Write a note on Quarks.
- 24. Explain nuclear fusion in stars.