Reg. No. : ....

Name : ....

V Semester B.Sc. Degree (CBCSS – 2014 Admn. – Regular)
Examination, November 2016
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. What is the condition for orbital stability ?

2. The fine structure doubling of spectral lines arises from a magnetic interaction between the spin and orbital angular momenta of an atomic electron called _____ ?

3. Which nuclear theory says particle exchange can produce either attraction or repulsion ?

4. Hadrons are composed of _____   (4×1=4)

SECTION – B

Answer **any seven**. Short answer type. **Each** question carries **two** marks :

5. Write a short note on spectral lines.

6. How emission and absorption spectral lines originate ?

7. State pauli exclusion principle.

8. How does binding energy value affect the stability of the nucleus ?

9. Write a short note on different kinds of radioactive decay.

10. Write a note on nuclear fission according to the liquid drop model.

11. Discuss the four fundamental interactions.

12. What are quarks ?

13. What are magic numbers ?

14. In what way does the electron structure of an alkali metal atom differ from :

   A) That of a halogen atom

   B) That of an inert gas atom.   (7×2=14)

SECTION – C

Answer **any four**. Short essay/problem. **Each** question carries **three** marks :

15. A hydrogen atom initially in the ground level absorbs a photon, which excites it to the n = 4 level. Determine the wavelength and frequency of photon.

16. Find the density of $_6C^{12}$ nucleus.

17. The capture cross section of Co^{59} for thermal neutrons is 37 b :

   A) What percentage of a beam of thermal neutrons will penetrate a 1 mm sheet of Co^{59}. The density of Co^{59} is 8.9×10^3 kg/m³.

   B) What is the mean free path of the thermal neutrons in Co^{59}.

18. The half of the alpha emitter Po^{210} is 138 days. What mass of polonium (210) is needed for a 10 m Ci source.

19. Briefly explain the meson theory of Yukawa.

20. Estimate the magnetic energy U_m for an electron in the 2p state of a hydrogen atom using the Bohr model whose n = 2 state corresponds to the 2p state. **(4×3=12)**

SECTION – D

Answer **any two.** Long essay type. **Each** question carries **five** marks :

21. Describe the principle features of the nuclear model of the atom with the help of Rutherford scattering experiment.

22. Classify the elementary particle in detail.

23. Discuss on Bohr's correspondence principle.

24. Explain energy production in stars.   **(2×5=10)**

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