M 7337

Reg. No. : .....

Name : .....

V Semester B.Sc. Degree (CCSS – Reg./Supple./Imp.) Examination, November 2014

(2012 Admission)

CORE COURSE IN PHYSICS

5B10 PHY : Atomic, Nuclear and Particle Physics

Time : 3 Hours

Max. Weightage : 30

SECTION – A

Answer **all** questions. **Each** bunch carries **1** W.

1. The minimum energy required to ionize hydrogen atom from its ground state is above
   a) 13.6 eV b) 1.36 eV c) 136 eV d) 3.4 eV
2. The kinetic energy of an electron in atom is
   a) equal to the PE b) Half of PE c) Twice its PE d) Thrice its PE
3. The non conservation of orbital angular momentum of the electron in an atom is due to
   a) Spin orbit interaction
   b) Spin-Spin interaction
   c) Electrostatic interaction between electrons
   d) Electrostatic interaction between electrons and nucleus
4. The multiplicity of the state $2D_{3/2}$ is given by
   a) 1 b) 2 c) 3 d) 4
5. The volume of a nucleus in an atom is proportional to
   a) mass number b) proton number
   c) neutron number d) electron number

P.T.O.

6. Nuclear forces are
   a) Short range attractive
   b) Short range repulsive forces
   c) Long range attractive forces
   d) Long range repulsive forces

7. Photoelectric absorption takes place when a sufficiently energetic photon interacts with
   a) Free electron
   b) Electron of outermost shell
   c) Nucleus
   d) K shell electron

8. When an electron and positron annihilate
   a) Nothing is created
   b) One photon is created
   c) Two photons are created
   d) Two neutrons are created **(2×1=2 W)**

SECTION – B

Answer **any six**. **Each** question carries **1** weightage :

9. Explain the salient features of Rutherford scattering.

10. What is meant by stimulated emission process ?

11. What is a wave function ? Is it a physical reality ?

12. Briefly mention the nuclear properties.

13. What is radioactive equilibrium ?

14. What are baryons ? Give its property.

15. Distinguish between Fermions and Bosons.

16. What is black body radiation ? Give an example of a black body. **(6×1=6 W)**

SECTION – C

Answer **any nine**. **Each** question carries **2** weightage.

17. Explain the statement of Bohrs Correspondence principle. Give its significance and give an example of this principle.

18. What is Rydberg constant ? Calculate the wavelength of $H\alpha$ and $H\beta$ lines of the hydrogen spectrum in the visible region.

19. Explain the idea of electron spin. Find the equatorial velocity of an electron assuming that it is a uniform sphere of radius 5×10^{-7}m. Mass of electron = 9.1×10^{-31} kg .

20. Explain atomic shells and sub shells of electrons.

21. What is Binding energy ? Find the energy release if two , $_1H^2$ nuclei fuse together to form $_2He^4$ nucleus. The BE per nucleon of $_1H^2$ is 1.1MeV and of $_2He^4$ is 7.0MeV.

22. How does the liquid drop model explain the binding curve ?

23. What is radioactive decay ? What are the features of radioactivity that are different from classical physics ?

24. Define half life of a radioactive element. The half life of radon is 3.82 days. How long does it take for 60% of a sample of radon to decay ?

25. Explain compound nucleus reactions.

26. What are Leptons ? Explain the decay schemes of a pion and a muon.

27. What is equipartition of energy ? Find the rms speed of oxygen molecular mass of oxygen = 5.31×10^{-26} kg.

28. Explain the Planck radiation law. Give its significance. **(9×2=18 W)**

SECTION – D

Answer **any one** question (Weightage **4**) :

29. What are the assumptions of the nuclear shell mode ? How is the magicity of magic numbers accounted using the shell model ?

30. What are the postulates of the Bohr atom model ? Derive an expression for the energy of the hydrogen atom in the n^{th} orbit. What is the significance of the negative sign in the energy term ? **(1×4=4 W)**
