M 9821

Reg. No. : .....

Name : .....

V Semester B.Sc. Degree (CCSS-Reg./Supple./Imp.)
Examination, November 2015
CORE COURSE IN PHYSICS
5B10 PHY : Atomic, Nuclear and Particle Physics
(2012 Admn. Onwards)

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 average binding energy of a nucleon in a nucleus of an atom is

   a) 8 eV b) 80 eV c) 8 MeV d) 80 MeV

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. X-rays consist of

   a) negatively charged particles b) positively charged particles

   c) electromagnetic radiation d) stream of neutrons

P.T.O.

5. The volume of a nucleus in an atom is proportional to

a) mass number
b) proton number
c) neutron number
d) electron number

6. Weak nuclear forces act on

a) Hadrons
b) Leptons
c) Hadrons and Leptons
d) All charged particles

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. The quarks are supposed to exist in following number of flavours

a) Two b) Four c) Six d) Sixteen

(2×1= 2 W.)

SECTION – B

Answer **any six. Each** bunch carries **1** W.

9. Explain the salient features of Rutherford scattering.

10. What is Pauli's exclusion principle ?

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

12. Explain meson theory of nuclear forces.

13. What is radioactive equilibrium ?

14. Briefly explain quark hypothesis.

15. Distinguish between Fermions and Bosons.

16. Explain ultraviolet catastrophe.

(6×1= 6 W.)

SECTION – C

Answer **any nine**.

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

18. How do atoms absorb and emit energy ?

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 $= 9.1\times10^{-31}$ kg.

20. How does an X-Ray spectra occur ? Which element has a K_α x-ray line of wavelength 0.18 nm. Rydberg constants = 1.097×10^{7}/m.

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 1.1 MeV and of $_2He^4$ is 7.0 MeV.

22. What are stable nuclei ? What limits the size of a stable nuclei ?

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

24. What is nuclear fusion ? Explain the mechanism of energy production in the sun.

25. Explain compound nucleus reactions.

26. What are exchange particles ? Explain their role in fundamental interactions.

27. What is equipartition of energy ? Find the rms speed of oxygen molecules of mass.

28. What are Neutron stars ? Explain their features. What is a pulsar ? **(9×2=18 W.)**

SECTION – D

Answer **any one** question.

29. What are the postulates of the Bohr atom model ? Derive an expression for the energy of the hydrogen atom in the orbit. What is the significance of the negative sign in the energy term ?

30. What is chain reaction ? Describe the construction and working of a breeder reactor. **(1×4=4 W.)**
