## B.Sc. DEGREE (C.B.C.S.S.) EXAMINATION, MARCH 2016

### Sixth Semester

#### Core Course—NUCLEAR AND PARTICLE PHYSICS

(Common for Model I B.Sc. Physics, Model II B.Sc. Physics, B.Sc. Physics EEM and Physics – Instrumentation)

[2013 Admissions]

Time : Three Hours                                                                 Maximum : 60 Marks

### Part A (Objective Type)

*Answer all questions.*
*Each question carries 1 mark.*

1.  A nuclide is distinguished from other nuclides by the number ———— and neutrons it contains.

2.  The number of ———— in one kilo-mole of carbon is $6.02 \times 10^{26}$.

3.  The binding energy per ———— is found to be about 8 MeV.

4.  The ———— radioactivity is the radioactivity found in nature.

5.  A half life is the ———— after which one half of the original number of nuclei remains untransformed.

6.  The ———— necessary to cause fission is about 6 MeV.

7.  Materials consisting of atoms of ———— atomic mass are used as moderators.

8.  The particles heavier than ———— are known as hyperons.

                                                                                              $(8 \times 1 = 8)$

### Part B (Short Answer Questions)

*Answer any six questions.*
*Each question carries 2 marks.*

9.  What is the significance of binding energy ?

10. Distinguish between isotopes and isomers.

11. State and explain proton-electron hypothesis.

12. Differentiate between half life and mean life.

13. State Geiger-Nuttal law.

14. Explain electron-positron pair production.

15. How energy is produced in stars ?

16. What is meant by radiation hazards ?

**Turn over**

17. What are resonance particles ?

18. Differentiate between Primary and Secondary cosmic rays.

$(6 \times 2 = 12)$

### Part C (Short Essay/Problems)

*Answer any **four** questions.*
*Each question carries 4 marks.*

19. Bring out the general properties of nucleus.

20. The binding energy of $^{24}Mg_{12}$ is 198.25 MeV. Calculate its atomic mass.

21. Discuss the determination of nuclear mass by Bain bridge mass spectrograph.

22. Briefly explain theory of alpha decay.

23. Give an account on peaceful utilization of fusion power.

24. Bring out the fundamental interactions in nature.

$(4 \times 4 = 16)$

### Part D (Essays)

*Answer any **two** questions.*
*Each question carries 12 marks.*

25. Describe the shell model of the nucleus and how it accounts for magic numbers and magnetic moment of the nucleus.

26. Discuss the nuclear structure and general properties of nucleus.

27. Derive the exponential law of radioactive disintegration. Hence deduce the expression for half life and mean life.

28. Give a detailed account on origin of cosmic rays.

$(2 \times 12 = 24)$