E 3412 (Pages : 3) Reg. No.....

Name.....

B.Sc. DEGREE (C.B.C.S.S.) EXAMINATION, MARCH/APRIL 2012

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 B.Sc. Physics-Instrumentation)

Time : Three Hours Maximum Weight : 25

Part A

Answer **all** *questions.*

Objective type questions-Weigth 1 *for each bunch.*

Bunch I

1. The size of a nucleus is of the order of
   (a) Pico (b) Micro
   (c) Nm (d) Fermi
2. The total angular momentum of the nucleus is called
   (a) Magneton (b) Dipole moment.
   (c) Spin (d) None of these
3. Which of the following decay reduces the mass number by two?
   (a) Beeta (b) Gamma.
   (c) Alpha (d) None of these
4. The permissible dose of radiation for an individual working 40 hour per week is :
   (a) 6.25mr per hour (b) 250 mr per hour.
   (c) 2.50 mr per hour (d) 6.50 mr per hour.

Bunch II

5. The ionization chamber is filled with boron trifluoride vapor for the detection of :
   (a) Neutron (b) Proton
   (c) Electron (d) None of these
6. Radioactive decay is a statistical process that obeys the laws of
   (a) Physics (b) Chance.
   (c) Decay (d) None of these

Turn over

7. Which of the following is emitted in a K- electron capture :
   (a) Neutron. b) Neutrino.
   (c) Proton. (d) None of these.
8. Classification of elementary particles are done according to their
   (a) Mass. (b) Charge.
   (c) Half life. d) None of these.

Bunch III

9. The counts observed per second is called :
   (a) Efficiency of the counter (b) Efficiency of ionization.
   (c) Efficiency (d) None of these
10. Fermi's neutrino theory is for :
   (a) Electron capture. (b) Beeta decay.
   (c) Alpha decay. d) None of these.
11. The nuclear fission can be explained on the basis of :
   (a) Liquid drop model. (b) Bohr model.
   (c) Shell model. (d) None of these.
12. Each quark has :
   (a) A negative quark. (b) A positive quark.
   (c) An antiquark. (d) A hadron.

Bunch IV

13. The term magic numbers is associated with :
   (a) Mass defect. (b) Shell model.
   (c) Binding energy (d) None of these.
14. Ordinary potassium has an activity of about one milli curie per :
   a) Gram. (b) Kilogram.
   (c) Milligram. (d) None of these.
15. The fission of one gram of ^{235}U per day evolves energy at the rate of about :
   (a) 1000MW (b) 100MW.
   (c) 10MW (d) 1 MW.
16. Cosmic rays are high energy :
   (a) Charge less particles. (b) Charged particles.
   (c) Neutral particles. (d) None of these.

$(4 \times 1 = 4)$

Part B (Short Answer questions)

Answer **five** *questions.*
Weight 1 *each.*

17. Distinguish between isobars and isomers.
18. Explain the significance of binding energy.
19. Sketch the Bainbridge's mass spectrograph.
20. What is half life ? Explain.
21. What is carbon dating ? Give two applications.
22. Explain the Q - value of a nuclear reactor
23. How do hadrons differ from leptons ? Explain
24. What is east - west effect ?

(5 × 1 = 5)

Part C (Short Essay /Problems.)

Answer **four** *questions.*
Weight 2 *each.*

25. Find the density of $^{12}C_6$ nucleus.
26. Determine the binding energy per nucleon for He_3 and He_4.
27. How long does it take for 40% of a sample of radon to decay ?
28. Calculate the amount of energy released in the fission process of 1 mg of $_{92}U^{235}$ if 200 MeV of energy is released per fission.
29. The half life of alpha emitter is ^{210}Po is 138 days. What mass of ^{210} Po is needed for 10 mCi source ?
30. Explain latitude effect of cosmic rays.

(4 × 2 = 8)

Part D (Essay)

Answer any **two** *questions.*
Weight 4 *each.*

31. Discuss the working of a GM counter.
32. Describe the theory of alpha decay.
33. Bring out the classification of elementary particles.

(2 × 4 = 8)