SUBJECT CODE : PH/MC/NP64

B.Sc. DEGREE EXAMINATION APRIL 2012
BRANCH III - PHYSICS
SIXTH SEMESTER

REG. No._____

COURSE   :   MAJOR – CORE
PAPER   :   NUCLEAR PHYSICS
TIME   :   30 MINS.   MAX. MARKS : 30
SECTION – A

TO BE ANSWERED IN THE QUESTION PAPER ITSELF:

ANSWER ALL QUESTIONS:

I. CHOOSE THE CORRECT ANSWER:

1.   One Atomic Mass unit is equal to
      a) 931 Mev   b) 936 Mev   c) 900 Mev

2.   In β decay the particle emitted with β particle is
      a) Proton   b) Electron   c) Neutrino

3.   The atomic radius or range of nuclear force is
      a) 10^{-14}m   b) 10^{-15}m   c) 10^{-16}m

4.   Number of attractive forces in the nucleus is
      a) 1   b)2   c)3

5.   Geiger-Nuttal law is
      a) log λ = A+B log R   b) log R = A+B log λ   c) log A = B+ λ log R

6.   Nuclear charge is
      a) z^2e b). ze^2 c) ze

7.   In a linear accelerator the length of cylinders are in the ratio
      a) 1:2:3   b) 1: √2: √3   c) 1:3:3

8.   According to liquid drop mode all nuclei will have
      a) Elliptical shape   b) Spherical shape   c) Square shape

9.   α Spectrum provides a conclusive evidence of the existence of
      a) Discrete energy levels   b) Continuous energy levels
      c) Combined energy levels

10. Tunnel effect is
    a) Leaking of α particles through the barrier
    b) Jumping of α particle over the barrier
    c) Existence of α particle inside the nucleus

11. Half life period of a radio active substance is
    a) $0.6931/\lambda$ b) $\lambda/0.6931$ c) $1/\lambda$

12. Threshold energy for a nuclear reaction is the energy of the projectile which is
    a) 0   b) Minimum   c) Maximum

13. In Archaeological dating, the carbon isotope used is
    a) $_6c^{13}$ b) $_6c^{12}$ c) $_6c^{14}$

14. Plasma is the state of
    a) Low ionization   b) High ionization   c) Zero ionization

15. Each Baryon is given a Baryon number
    a) 1   b) -1   c) 0

II. FILL IN THE BLANKS:

16. The disintegration constant λ is _____.

17. The empirical formula for the nuclear radius is _____.

18. The heat and light from the sun is due to _____ reaction.

19. $_4Be^9 +$ _____ $-> {}_6C^{12} + {}_0n^1$.

20. Fermions are _____ spin particles.

III. STATE TRUE OR FALSE:

21. The ionization produced by $'\gamma'$ rays is higher than that of α rays.

22. In fusion reaction neutrons are multiplied in an arithmetical progression.

23. Ionization chamber is much less sensitive to β particle.

24. Breeder reactor converts non fissionable material into fissionable material.

25. A meson is made up of 3 quarks.

IV.   ANSWER BRIEFLY:

26. What are doubly magic nuclei?

27. Define Mass defect.

28. Mention 3 methods of acceleration of a charged particle.

29. What are Baryons?

30. What is NQR. Mention one application of NQR.

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STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI – 600 086.
(For candidates admitted during the academic year 2008-09 & thereafter)

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TIME   :   2 ½ HOURS   MAX. MARKS : 70

SECTION – B

ANSWER ANY FIVE QUESTIONS: (5X 5 = 25)

1. The half life of radon is 3.8 days. After how many days will one twentieth of a sample be left-over?

2. Calculate the binding energy of α particle and express the result in Mev and Joule.
    Mass of proton = 1.007276 amu, Mass of Neutron = 1.008665 amu, Mass of Helium = 4.001506 amu.

3. Cyclotron in which the flux density is 2.8 w/m^2 is employed to accelerate Deuteron. How rapidly should the electric field between the dees be reversed?
    Mass of Deuterium = 3.32×10^{-27} Kg and charge = 1.6×10^{-19} J

4. Explain the liquid drop model of the nucleus.

5. Give the neutrino theory of β decay.

6. Explain the source of stellar energy.

7. Describe the working of the scintillation counter.

SECTION C

ANSWER ANY THREE QUESTIONS: (3X15= 45)

8. Write a note on the following
    a. Theory of α decay
    b. Range of α particles
    c. Interaction of gamma ray with matter

9. a.   Explain the shell model of the nucleus
    b.   Obtain semi empirical mass formula for B.E using liquid drop model.

10. Discuss the theory, construction and working of a cyclotron

11. a. What are the conservation laws regarding elementary particles and how are they classified.
    b. Discuss - Particles and Anti particles.

12. Describe the construction and working of a nuclear reactor. What are its uses?

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