

CLASS: M.Sc. PHYSICS

15A/327

St. JOSEPH'S COLLEGE (AUTONOMOUS) TIRUCHIRAPPALLI – 620 002

SEMESTER EXAMINATIONS – APRIL 2015

TIME: 3 Hrs.

MAXIMUM MARKS: 100

SEM	SET	PAPER CODE	TITLE OF THE PAPER
IV	2013	12PPH4112	NUCLEAR PARTICLE AND ASTROPHYSICS

SECTION – A

Answer all the questions:

20 x 1 = 20

Choose the correct answer:

1. A negative nuclear quadrupole moment indicate that the nucleus is
a) Prolate
b) Oblate
c) Spherical
d) Spheriodal
2. The nuclear process in which the law of conservation of parity is violated is
a) α - decay
b) β -decay
c) γ - decay
d) Fission
3. The compound nucleus theory was given by
a) Rutherford
b) Nelsson
c) Curie
d) Bohr
4. The converted quantity corresponding to the symmetry operation inversion of space is
a) Linear momentum
b) Angular momentum
c) Parity
d) Strangness
5. The amount of energy generated in the star and related as electromagnetic radiation is its
a) Intensity
b) Luminosity
c) Brightness
d) Refractive index

Fill in the blanks:

6. _____ is the only two nucleon bound system made up of a proton and a neutron.
7. The mass of the neutrino should be _____ or very nearly so.
8. _____ is the source of stellar energy.
9. The baryons possessing the rest mass greater than that of nucleons are called _____.
10. _____ are the birth places of stars.

State True or False:

11. The attractive force near the surface of the nucleus is similar to the force of surface tension on the surface of a liquid drop.
12. Nuclear isomers are long lived excited nuclear states.
13. The Q value of an exoergic reaction is negative.
14. The electromagnetic interaction among elementary particles independent of the charges on the particles.
15. At some point in the past, the entire universe would have been a single point.

Answer in one or two sentences:

16. Define binding energy of a nucleus.
17. What are Sargent diagrams?
18. What is the function of a reflector in a nuclear reactor?
19. Why is the positron called the antiparticle of the electron?
20. What is stellar evolution?

SECTION – B

Answer all the questions:

5 x 6 = 30

21. a. Discuss the evidences for the existence of the shell structure within the nucleus.

OR

- b. Briefly explain the magnetic dipole moment of nuclei.
22. a. How does the double beta decay confirm the hypothesis that the neutrino and antineutrino are different?

OR

- b. Write a note on internal conversion.
23. a. Explain the conservation laws in nuclear reactions.

OR

- b. What is a nuclear chain reaction? Obtain the four factor formula.
24. a. Explain the quantum numbers necessary to explain the behavior of elementary particle.

OR

- b. What do you mean by grand unification theory?
25. a. Give a brief description of the physical properties of stars.

OR

- b. Explain synchrotron radiation.

SECTION – C

Answer any FOUR questions:

4 x 12.5 = 50

26. Discuss in detail the resemblances between the nucleus and a liquid drop – obtain the semi empirical mass formula.

27. Obtain and explain the selection rules that govern beta decay.
28. Explain the compound nucleus theory of nuclear reactions.
29. Discuss in detail the classification of elementary particles.
30. Discuss the development of Radio astronomy in India. What is hot big bang cosmology?
