

[83/A-18]

SEAT No. _____

No. of pages: 2

SARDAR PATEL UNIVERSITY

B. Sc, 6th Semester

Friday, 29th March 2019

Session: Morning, Time: 10:00 to 01:00 PM

Subject Code: (PHYSICS) US06CPHY03

Subject Title: Nuclear Physics

Max Marks: 70

Que: 1

Write correct answer for each of the following MCQs.

[10]

- 1 Nuclear particles which have total nuclear angular momentum equal to odd half integral of $h/2\pi$ follow _____ statistics.
 - a) Fermi-Dirac
 - b) Maxwell-Boltzman
 - c) Boltzman-Maxwell
 - d) Bose-Einstein
- 2 For a spherically symmetric nucleus, the value of its electric quadrupole moment is _____.
 - a) High
 - b) Low
 - c) Zero
 - d) Negative
- 3 The net magnetic moment of a nucleus is given by $\vec{\mu} = \gamma \vec{I}$, where γ is _____.
 - a) Gyromagnetic ratio
 - b) Electromagnetic ratio
 - c) Gamma rays
 - d) Gamma magnetic ratio
- 4 The typical life span of a compound nucleus is _____ sec.
 - a) 10^{-26}
 - b) 10^{-6}
 - c) 10^{-36}
 - d) 10^{-16}
- 5 $x + X \rightarrow Y + y$ for this nuclear process, X is _____.
 - a) Bombarding particle
 - b) Target nucleus
 - c) Product particle
 - d) Product nucleus
- 6 The size of assembly for _____ is referred as the critical size.
 - a) $k = 0$
 - b) $k < 1$
 - c) $k = 1$
 - d) $k > 1$
- 7 The value of G-factor for proton is _____.
 - a) 5.56
 - b) 5.65
 - c) 5.68
 - d) 5.86
- 8 In time of flight tube method the fissionable material is put on a _____ foil.
 - a) Aluminium
 - b) Cadmium
 - c) Copper
 - d) Nickel
- 9 If a magnetic field is placed around a bubble chamber, we can measure _____ and momentum of the particle.
 - a) Charge
 - b) Mass
 - c) Volume
 - d) Density
- 10 The time interval in which G-M counter cannot record two incident particles is known as its _____.
 - a) Dead time
 - b) Recovery time
 - c) Resolving time
 - d) Recombination time

(1)

(P.T.O)

- Que 2** Write answers of any ten questions in brief. [20]
- 1 With the argument of beta decay process, explain non-existence of electrons in nucleus.
 - 2 Define: Isobars and Isotones.
 - 3 Draw a labeled diagram of Aston's mass spectrograph.
 - 4 With example explain stripping nuclear reaction process.
 - 5 For the nuclear reaction ${}_{30}\text{Zn}^{63} \rightarrow {}_{29}\text{Cu}^{63} + {}_{-1}\text{e}^0 + {}_0\nu^0$, obtain its Q-value.
 - 6 For nuclear reaction process, define elastic and inelastic scattering.
 - 7 What is fission chain reaction?
 - 8 Write the reaction process when Cu^{63} is bombarded by high energy protons from a cyclotron.
 - 9 Write chain reaction process for ${}_{56}\text{Ba}^{143}$ to be stable by β decay process.
 - 10 Define: 1. Recovery time 2. Dead time of GM counter.
 - 11 What is the working principle of cyclotron?
 - 12 What are the advantages and disadvantages of spark chamber?
- Que 3** [A] Explain principle, construction and working of Dempster mass spectrometer. [06]
 [B] For a nucleus discuss its wave mechanical property 'PARITY'. [04]
- OR**
- Que 3** [A] Explain the methods of [06]
 1. Mirror nuclei and 2. Electron scattering to estimate the radius of nucleus.
 [B] Write a short note on nuclear angular momentum. [04]
- Que 4** Derive Q-value equation for two body in laboratory co-ordinate system and solve it for threshold energy of projectile. [10]
- OR**
- Que 4** Explain each term of Weizsacher's semi-empirical mass formula. [10]
- Que 5** [A] Derive four factor formula for neutron cycle in thermal nuclear reactor. [06]
 [B] Explain the method of enrichment of uranium. [04]
- OR**
- Que 5** [A] Define the term NMR and explain experimental set up for it. [06]
 [B] Write a note on Homogeneous and Heterogeneous nuclear reactors. [04]
- Que 6** [A] Explain principle, construction and working of Cockcroft Walton generator. [06]
 [B] Write a note on: Photomultiplier tube. [04]
- OR**
- Que 6** [A] Explain principle construction and working of Van-de-graff accelerator. [06]
 [B] Explain in brief about any two basic components of accelerators. [04]

