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Total No. of Questions : 11

M.Sc (Physics) (Campus) (2016 Onwards) (Sem.-4)

EXPERIMENTAL TECHNIQUES IN NUCLEAR PHYSICS AND PARTICLE PHYSICS

Subject Code : PHS-541

M.Code : 51232

Time : 3 Hrs. Max. Marks : 70

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains SEVEN questions carrying FIVE marks each and students have to attempt any SIX questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION-A

1. Write briefly :

a) What is the importance of Fano factor in determining the energy resolution of a detector?

b) What is minimum energy of gamma ray photon after Compton scattering, if original incident photon energy is 0.611 MeV?

c) Why does pair production cannot occur in vacuum?

d) Determine the cyclotron frequency of proton (mass of proton = 1.67×10^{-27} kg) in a magnetic field of 3.1 Tesla.

e) Why Sodium Iodide (NaI) detector is activated with Thallium (Tl)?

f) Why are hydrogenic materials used as moderators in nuclear reactors to slow down the neutrons?

g) What is the main source of natural background radiation?

h) What are applications of electron spectrometer?

i) What is Plasma Effect?

j) What are advantages of centre of mass frame?

SECTION-B

2. What is the photoelectric effect? How is it different from Compton scattering? Why photoelectric effect cannot take place with free electron?

3. Distinguish between extendable and non-extendable dead time of a detector.

4. Explain the difference between inorganic scintillator and organic scintillator.

5. Explain the working principle of gas filled detector.

6. Write a short note on slow and fast neutron detection system.

7. What are the various sources of background radiations? Discuss the purpose of Compact Muon Solenoid in LHC experiment in detail.

8. Write a short note on recoil distance Doppler shifted attenuation method (RDM) for nuclear life time measurements.

SECTION-C

9. Explain principle, construction, working and limitations of Proportional Counter. Discuss the pulse formation and its shape of a proportional counter.

10. Derive the expression of depletion depth for semiconductor detectors.

11. What is radioactive ion beam? Discuss various methods of production of radioactive ion beam. Highlights the importance of ion beam.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.