



**Progressive Education Society's**  
**Modern College of Arts, Science & Commerce Ganeshkhind, Pune – 16**  
**(Autonomous)**  
**End Semester Examination: MAR / APR 2025**  
**Faculty: Science and Technology**

**Program: B.Sc. (Gen 03)**  
**Program (Specific): General B.Sc.**  
**Class: T.Y.B.Sc**  
**Name of the Course: Nuclear Physics**  
**Course Code: 24-PHY-364**  
**Paper: IV**

**Semester: VI**

**SET: A**  
**Course Type: DSC**  
**Max. Marks: 35**

**Time: 2Hr**

**Instructions to the candidate:**

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw a well labelled diagram wherever necessary.*

**Q1) Define or state the following** **5**

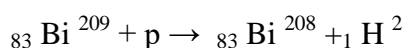
- a) What is compound Nucleus ?
- b) Define radioactivity.
- c) Define packing fraction.
- d) What is a quark?
- e) Define binding energy.

**Q2) Answer the following. (Attempt any 4)** **4**

- a) What is recovery time in G.M counter?
- b) If we have function  $f(x)$  for which  $f(x) = -f(x)$ , what is its parity?
- c) Which force holds the nucleon together in a nucleus?
- d) What is an exoergic and endoergic reaction?
- e) What is the roll of effective multiplication factor ( $k$ ) in chain reaction?
- f) What do you mean by critical size of the reactor?

**Q3) Answer the following. (Attempt any 4/6)** **8**

- a) Write a short note on electrical quadrupole moment.
- b) State any three conservation laws in nuclear reaction.
- c) Explain lepton in short.
- d) Describe ideal equilibrium.
- e) Write a short note on carbon dating.
- f) Obtain the threshold energy for the following reaction

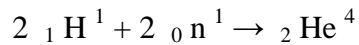


Where mass of  ${}_{83}\text{Bi}^{209} = 208.980394 \text{ a.m.u}$   
 Mass of proton =  $1.007825 \text{ a.m.u}$   
 Mass of  ${}_{83}\text{Bi}^{208} = 207.979731 \text{ a.m.u}$

**Q4) Short answer questions (Attempt any 2/4)**

**8**

- Explain the construction and working of cyclotron .
- Explain with a neat labelled diagram working of scintillation counter.
- Calculate the energy released during the following fusion reaction



Where mass of  ${}_1\text{H}^1 = 1.007825 \text{ a.m.u}$

mass of  ${}_0\text{n}^1 = 1.008665 \text{ a.m.u}$

mass of  ${}_2\text{He}^4 = 4.003424 \text{ a.m.u}$

- Derive the equation  $N = N_0 e^{-\sigma n x}$  for nuclear cross-section.

**Q5) Attempt any two of the following (2/4)**

**10**

- Draw a diagram of swimming pool reactor and explain it.
- Derive an equation for the specific activity.
- Describe proton – proton cycle.
- Explain binding energy curve.

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