22PHU622

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION MAY 2025
(Sixth Semester)

Branch – **PHYSICS**

NUCLEAR PHYSICS

Time: Three Hours | Maximum: 50 Marks

SECTION-A (5 Marks)
Answer **ALL** questions
ALL questions carry **EQUAL** marks (5 x 1 = 5)

1 Identify, the Nuclei having the same mass number but with the protons and neutron number interchanged.
(i) Isobars (ii) Isotones
(iii) Mirror nuclei (iv) Isomeric nuclei

2 Find the Geiger –Nuttal law?
(i) $\log \lambda = A - \log R$ (ii) $\log R = A + \log \lambda$
(iii) $\log R = A - \log \lambda$ (iv) $\log \lambda = A + \log R$

3 Name an accelerator, whose magnetic field is kept constant and the frequency of applied electric field is varied.
(i) Synchro -cyclotron (ii) synchrotron
(iii) Proton synchrotron (iv) linear accelerator

4 Which of the following elements is the example for transuranic elements?
(i) $_{90}Th^{232}$ (ii) $_{93}Np^{239}$
(iii) $_{91}Pa^{233}$ (iv) $_{92}U^{239}$

5 Mention the particle which are largely composed in a Primary cosmic rays.
(i) Electrons (ii) Protons
(iii) Neutrons (iv) Gamma rays

SECTION - B (15 Marks)
Answer **ALL** Questions
ALL Questions Carry **EQUAL** Marks (5 x 3 = 15)

6 a How packing fraction is related to the binding energy of a nucleus?
OR
b Describe Proton – electron hypothesis.

7 a Compare the properties of Alpha and Beta particle.
OR
b Apply the law of radioactive disintegration, to find the half-life period.

8 a Outline the characteristics of a GM counter.
OR
b Explain the working of cyclotron with neat diagram.

9 a Analyze the condition for sustained chain reaction
OR
b Differentiate the atom bomb and hydrogen bomb.

10 a Describe the cascade theory of cosmic ray showers.
OR
b Analyze any two fundamental interaction in nature.

Cont...

SECTION -C (30 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** Marks (5 x 6 = 30)

11 a Examine Weizsacker's semi empirical mass formula.

OR

b Enumerate the Yukawa's theory of nuclear forces. Point out the characteristic of nuclear forces.

12 a Discuss the Neutrino theory of Beta decay.

OR

b Give the theory of successive disintegration of radioactive substance. Explain the radioactive equilibrium.

13 a Discuss the construction and working of the Wilson Cloud chamber. Point out its advantages.

OR

b Explain the construction and working of a linear accelerator.

14 a Examine the Q- value equation for a nuclear reaction

OR

b Outline the construction and working of a nuclear reactor. Mention some of its uses.

15 a Explain the origin of cosmic rays. Discuss the interaction of cosmic rays in earth atmosphere.

OR

b Classify the elementary particles.

Z-Z-Z

END