



RAN-1149

B.Sc. (Sem. VI) Examination

March / April - 2019

Physics Paper VIII

(Atomic and nuclear physics)

Time: 2 Hours]

[Total Marks: 50

સૂચના : / Instructions

(1)

નીચે દર્શાવેલ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fill up strictly the details of signs on your answer book

Name of the Examination:

B.Sc. (Sem. VI)

Name of the Subject :

Physics Paper VIII

Subject Code No.: **1 1 4 9**

Seat No.:

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Student's Signature

- (2) Figures to the right indicate total marks carried by the question.
- (3) All symbols used have their usual meaning.
- (4) Students are allowed to use a non-programmable scientific calculator.

Q1 Answer in brief:

[8]

- (1) The range of strong interactions is about _____ m
- (2) What is a Lorentz unit?
- (3) Total number of electrons required to complete the M-shell is _____
- (4) What is the vector atom model?
- (5) What are alpha particles?
- (6) Define disintegration energy of alpha particle.
- (7) Write Geiger's law in the form of range and energy of alpha particle.
- (8) Name the quarks that combine to form a neutron.

Q2 (A) Answer anyone in detail: [10]

- (1) Explain experimental arrangement for the normal Zeeman effect.
Using classical theory of normal Zeeman effect show

$$\text{that the Zeeman shift is } \pm \frac{Be\lambda^2}{4\pi mc}$$

- (2) Explain in detail about the quantum numbers associated with vector atom model.

(B) Answer anyone : [4]

- (1) An electron beam enters a uniform magnetic field of flux density 1.2 Wb/m^2 . Find the energy difference between electrons having spins parallel and anti-parallel to the field. Planck's constant $h = 6.62 \times 10^{-34} \text{ J-S}$,

$$\text{Mass of electron } m = 9.1 \times 10^{-31} \text{ kg},$$

$$\text{Charge of electron } e = 1.6 \times 10^{-19} \text{ C and } c = 3 \times 10^8 \text{ m/S.}$$

- (2) The experimental values of e/m of electron and the Bohr magneton are $1.76 \times 10^{11} \text{ C/kg}$ and $9.21 \times 10^{-24} \text{ J/T}$ respectively. Calculate the value of Planck's constant.

Q3 (A) Answer any one in detail: [10]

- (1) Explain in detail about the Neutrino theory of β decay.
(2) Explain Geiger-Nuttall experiment to measure the range of the α particle. Discuss Geiger-Nuttall law.

(B) Answer any one : [4]

- (1) α -particles from Polonium travel along a semicircle of radius 20 cm in magnetic field of intensity 1.763 Wb/m^2 . Find the energy of α -particles?

$$E/M \text{ of } \alpha\text{-particle is } 4.824 \times 10^7 \text{ C/kg. Mass of } \alpha\text{-particle is } 6.643 \times 10^{-27} \text{ kg}$$

- (2) How charge of the α particle can be determined?

Q4 Answer any two [14]

- (1) Write short note on range and velocity of α particle
(2) Bucherer's experiment
(3) Explain Pauli exclusion principle
(4) Explain Paschen-Back effect