



DG-3118
Third Year B. Sc. (Sem. V) Examination
March/April – 2016
Atomic & Nuclear Physics : Paper - VIII

Time : 2 Hours]

[Total Marks : 50

Instructions :

(1)

<p>નીચે દર્શાવેલ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી. Fillup strictly the details of signs on your answer book.</p> <p>Name of the Examination :</p> <p>Third Year B. Sc. (Sem. V)</p> <p>Name of the Subject :</p> <p>Atomic & Nuclear Physics : Paper - VIII</p> <p>Subject Code No. : 3 1 1 8 Section No. (1, 2,.....) : Nil</p>	<p>Seat No. :</p> <table border="1" style="width: 100%; height: 20px;"><tr><td style="width: 15%;"></td><td style="width: 15%;"></td><td style="width: 15%;"></td><td style="width: 15%;"></td><td style="width: 15%;"></td><td style="width: 15%;"></td></tr></table> <div style="border: 1px solid black; border-radius: 15px; height: 60px; display: flex; align-items: center; justify-content: center; margin-top: 10px;">Student's Signature</div>						

- (2) All symbols have their usual meanings.
- (3) Draw a neat diagram wherever necessary.
- (4) Figures to the right indicate full marks.
- (5) Use of scientific calculator is allowed.

1 Answer the following in brief. [08]

- (1) What is the difference between absorption spectra and line spectra.
- (2) Define the term "ionization energy".
- (3) Give the condition for forbidden transition.
- (4) What are the possible values of L_z for $\ell = 1$.
- (5) State postulates of Bohr's atomic model
- (6) What do you mean by Bremsstrahlung?
- (7) What is the principle of ionization chamber?
- (8) What do you mean by Cherenkov radiation ?

2 (a) Describe Rutherford's model of the atom and the evidence that led to it. [10]
What are its drawbacks?

OR

2 (a) By considering the radial part of Schrodinger's equation obtain the formula for [10]
electron angular momentum for a hydrogen atom. Also explain the
conservation and quantization of angular momentum.

- 2 (b) Find different wavelengths that would appear in the spectrum of hydrogen atom for transition from $n=5$ to $n=1$ state ? Rydberg's constant $R=1.097 \times 10^7 \text{m}^{-1}$. [04]
OR
- 2 (b) Find the longest wavelength present in the Balmer series of hydrogen corresponding to the H_α line . Rydberg's constant $R=1.097 \times 10^7 \text{m}^{-1}$. [04]
- 3 (a) Explain fully the Wilson cloud chamber. How is it used to determine the energy of a particle passing through it? [10]
- OR
- 3 (a) Describe with the diagram the construction and action of Van de Graff generator. Mention it uses. [10]
- 3 (b) α -particles of energy 5 MeV pass through an ionization chamber at the rate of 10 per second. Assuming all the energy is used in producing ions pairs. Calculate the current produced. (35 eV is required for producing an ion pair and $e=1.6 \times 10^{-19} \text{C}$) [04]
- OR
- 3 (b) A cyclotron in which the flux density is 1.4 weber/m^2 is employed to accelerate proton. How rapidly should the electric field between the dees be reversed? [04]
Mass of the proton = $1.67 \times 10^{-27} \text{kg}$ and charge = $1.6 \times 10^{-19} \text{C}$.
- 4 Attempt **any two**: [14]
- (1) Write a short note on selection rules for the different types of transitions of electron in different energy levels for a hydrogen atom.
- (2) Explain space quantization using the uncertainty principle.
- (3) Write a short note on Van Allen Belts.
- (4) Write a short note on gamma rays absorption.
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