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G. VENKATASWAMY NAIDU COLLEGE (AUTONOMOUS), KOVILPATTI – 628 502.



UG DEGREE END SEMESTER EXAMINATIONS - NOVEMBER 2024.

(For those admitted in June 2021 and later)

PROGRAMME AND BRANCH: B.Sc., PHYSICS

SEM	CATEGORY	COMPONENT	COURSE CODE	COURSE TITLE
V	PART - III	CORE	U21PH510	ATOMIC PHYSICS

Date & Session: 11.11.2024/FN

Time : 3 hours

Maximum: 75 Marks

Course Outcome	Bloom's K-level	Q. No.	SECTION - A (10 X 1 = 10 Marks) Answer <u>ALL</u> Questions.
CO1	K1	1.	In Bainbridge mass spectrograph, the sensitivity depends on the strength of the deflecting _____ and the field of the area of the chamber D. a) Magnetic Field b) Current c) Electric field d) None of these
CO1	K2	2.	Which property of cathode rays led to the discovery of the electron? a) Charge b) Mass c) Speed d) Magnetic field
CO2	K1	3.	What technique did Lenard use to determine the e/m ratio for photoelectrons? a) Electronic deflection b) Magnetic deflection c) Photoelectric Effect d) X-ray diffraction
CO2	K2	4.	At threshold frequency, the K.E. of emitted photoelectrons is. a) infinity b) negative c) just zero d) none of these
CO3	K1	5.	Every electron has a spin quantum number of unique value _____. a) 5/2 b) 3/2 c) 1/2 d) 0
CO3	K2	6.	What does Pauli's exclusion principle specifically apply to? a) orbitals b) quantum numbers c) energy levels d) electron spin
CO4	K1	7.	In j-j coupling, what is the primary interaction between? a) spin and spin b) orbital and orbital c) spin and orbital d) electron and nucleus
CO4	K2	8.	Larmor's theorem describes the precession of which of the following? a) electrons b) protons c) magnetic moment d) electric field
CO5	K1	9.	The Laue method involves diffraction through which type of materials? a) liquids b) crystals c) gases d) metals
CO5	K2	10.	In Moseley's law, the term Z represents _____ of an element. a) atomic mass b) atomic number c) neutron number d) electron affinity
Course Outcome	Bloom's K-level	Q. No.	SECTION - B (5 X 5 = 25 Marks) Answer <u>ALL</u> Questions choosing either (a) or (b)
CO1	K3	11a.	Describe Bainbridge's mass spectrograph and explain how atomic masses are determined with it. (OR)
CO1	K3	11b.	The distance between traces corresponding to masses 12 and 16 in an Aston's mass spectrograph is 4.8 cm. Calculate the mass of the particle whose trace is at a distance of 8.4 cm from the trace of mass 16.

CO2	K3	12a.	Derive Einstein's photoelectric equation. (OR)
CO2	K3	12b.	Calculate the work function of sodium, in electron-volts, given that the threshold wavelength is 6800 Å and $h = 6.625 \times 10^{-34}$ Js.
CO3	K4	13a.	Describe Rutherford's model of atom and the evidence that led to it. What are its drawback? (OR)
CO3	K4	13b.	State and explain Pauli's exclusion principle as applied to electrons in atoms.
CO4	K4	14a.	Explain the doublet Fine structure of Sodium D line. (OR)
CO4	K4	14b.	State and explain Larmor's theorem. Deduce the change in K.E. due to Larmor precession.
CO5	K5	15a.	Describe Moseley's work on X-rays. What is Moseley's law? What is its importance? (OR)
CO5	K5	15b.	Describe Laue's experiment and point out its significance.

Course Outcome	Bloom's K-level	Q. No.	SECTION - C (5 X 8 = 40 Marks) Answer ALL Questions choosing either (a) or (b)
CO1	K3	16a.	Describe the construction of Aston's mass spectrograph with necessary theory and show how it can be used in the detection of isotope. (OR)
CO1	K3	16b.	Describe in detail about the Millikan's oil drop method for the determination of electronic charge.
CO2	K4	17a.	Give an account on Millikan's experimental verification of Einstein's photoelectric equation. Explain how Millikan calculated the value of the Planck's constant and work function of the material. (OR)
CO2	K4	17b.	Illustrate the Lennard's method to determine e/m for photoelectrons.
CO3	K4	18a.	State the postulates of Bohr regarding the atom model. Obtain expressions for the radius and electron - energy of the n^{th} orbit. Explain how Bohr's atom model successfully accounts for the hydrogen spectrum. (OR)
CO3	K4	18b.	Discuss in detail about the Quantum numbers associated with the Vector atom model.
CO4	K5	19a.	Discuss the Stern and Gerlach experiment and indicate the importance of the results obtained. (OR)
CO4	K5	19b.	What is Zeeman effect? Describe the experimental arrangement for studying the Zeeman effect. Show that the Zeeman shift $d\lambda = \pm \frac{Be\lambda^2}{4\pi mc}$.
CO5	K5	20a.	Describe and explain the Bragg X-ray spectrometer method of determining the wavelength of X-rays. (OR)
CO5	K5	20b.	Explain in detail about the main features of continuous X-ray spectrum.