Model Question Paper

Atomic physics - Part IV

12th Standard

Physics

Reg.No. : | | | | | | |

I.Answer all the questions.

II.Use blue pen only.

Time : 01:00:00 Hrs

Total Marks : 80

Part-A

5 x 1 = 5

1) The e/m value of an electron measured by J.J Thomoson IS

(a) $9.11 \times 10^{11} \quad C/kg$ (b) $1.7592 \times 10^{11} \quad C/kg$ (c) $1.7952 \times 10^{31} \quad C/kg$ (d) $1.602 \times 10^{-19} \quad C/kg$

2) According to Thomson atom model the wavelength of spectral line emitted Hydrogen is

(a) 4801 $\mathring{A}$ (b) 6563 $\mathring{A}$ (c) 4861 $\mathring{A}$ (d) 1300 $\mathring{A}$

3) When an α-particle directed towards the centre of the nucles the distance of closest approach by it the nucleus is given by

(a) $r_o = \frac{1}{4\pi\varepsilon_o}\frac{4Ze^2}{mv^2}$ (b) $r_o = \frac{1}{4\pi\varepsilon_o}\frac{Ze^2}{4mv^2}$ (c) $r_o = \frac{Ze^2}{8\pi\varepsilon_o mv^2}$ (d) $r_o = \frac{1}{4\pi\varepsilon_o}\frac{4mv^2}{Ze^2}$

4) According to Rutherford's atom model, ato, may be regarded as a sphere of.....

(a) diameter $10^{-14}m$ (b) radius $10^{-14}m$ (c) diameter $10^{-10}m$ (d) radius $10^{-10}m$

5) The relationship showing the total energy of an eletron in n^{th} orbit is

(a) $E_n = \frac{-Ze^2}{8\pi\varepsilon_o r_n}$ (b) $E_n = \frac{-mZe^2e^4}{8\varepsilon_o n^2h^2}$ (c) $E_n = \frac{mZ^2e^4}{8\pi\varepsilon_o r_n}$ (d) $E_n = \frac{mZ^2e^4}{8\pi\varepsilon_o r_n}$

Part-B

6 x 5 = 30

6) In Bragg's spectrometer, the angle for first order spectrum was observed to be 8°. Calculate the crystal lattice spacing if the wavelength of the X-rays is 0.7849 $\mathring{A}$.

7) Find the minimum wavelength of X-rays produced by an X-rays tube at 1000 kV.

8) Calculate the mass of an electron from the known values of specific charge and charge of electron.

9) Wavelength of Balmer second line is 4861 $\mathring{A}$. Calculate the wavelength of the first line.

10) Monochromatic x-ray of wavelength 1 $\mathring{A}$, when falls of a crystal, successive reflections take place at angle 30° and 45° respectively. Find the lattice constant of the crystal.

11) The energy of an excited hydrogen atom is -3.4 eV. Calculate the angular momentum of the electron according to Bohr theory.

1 x 5 = 5

12) Derive an expression for the frequency of spectral line and also for Rydberg's constant.

Part-C

5 x 10 = 50

13) Explain with principle, Millikan's oil drop method in determining the charge of an electron.

14) Derive an expression for the radius of the nth orbit. Hence prove that the energy of an electron in that orbit is $E_n = \frac{-me^4}{8E_o^2n^2h^2}$

15) With the help of energy level diagram explain the working of He-Ne laser.

16) a) Explain the working of Ruby Laser with a neat sketch.

(OR)

b) Describe with principle and construction, the method of determining e/m of electron by JJ Thomson method.

****