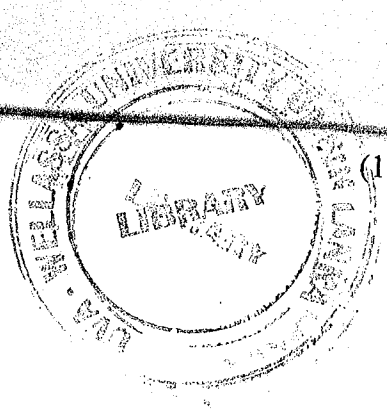
Physics and Chemistry of Minerals
3rd Year 2nd Semester - 2015

2015



(10 mark)

Part B

7.

a. Briefly describe any three analytical techniques used in mineral science. (20 mark)

b. Derive the Bragg's law for X-ray diffraction (XRD). Discuss how it enables determination of d-spacing within mineral structures. (10 mark)

c. X-rays with wavelength 1.54 Å are "reflected" from the (110) planes of a cubic crystal with unit cell **a** = 6 Å. Calculate the Bragg angle, θ for all orders of reflection, n. (20 mark)

d. An element crystallizes into a structure which may be described by a cubic type of unit cell having one atom in each corner of the cube and two atoms on one of its face diagonals. If the volume of this unit cell is $24 \times 10^{-24} cm^3$ and density of the element is $7.20 g/cm^3$, calculate the number of atoms present in 200g of the element. (10 mark)

(Total 60 mark)

41

8.

a. When can we use colour as an identifying tool for minerals? (10 mark)

b. Given an absorption spectrum, how can we determine the colour a mineral would possess? (10 mark)

c. What are the four primary mechanisms that cause colour in minerals? Describe them. (20 mark)

d. Briefly describe the types of defects in minerals. (20 mark)

(Total 60 mark)

41