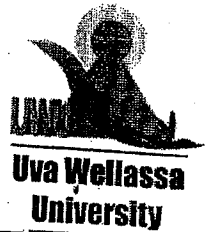




Uva Wellassa University of Sri Lanka
Faculty of Science and Technology
Mineral Resources and Technology Degree Programme
3rd Year 2nd Semester Examination – August/September 2014



MRT 311-2 - Physics and Chemistry of Minerals

Part B

7.

- a. Briefly describe any three analytical techniques used in mineral science. (20 marks)
- b. Derive the Bragg's law for X-ray diffraction (XRD). Discuss how it enables determination of d-spacing within mineral structures. (10 marks)
- c. X-rays with wavelength 1.54 \AA are "reflected" from the (1 1 0) planes of a cubic crystal with unit cell $a = 6 \text{ \AA}$. Calculate the Bragg angle, θ for all orders of reflection, n . (20 marks)
- 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 $24 \times 10^{-24} \text{ cm}^3$ and density of the element is 7.20 g/cm^3 , calculate the number of atoms present in 200g of the element. (10 marks)

8.

- a. Briefly describe the types of defects in minerals. (20 marks)
- b. Write an account on mineral deformation. (20 marks)
- c. Describe the types of strengthening mechanisms of minerals. (20 marks)

9.

- a. What is a solid solution? Discuss the three main types of solid solutions and provide mineral examples for each. (20 marks)
- b. How do pressure (P) and temperature (T) affect solid solution formation? (15 marks)
- c. Write a brief account on garnet solid solutions. (10 marks)
- d. Calculate the oxide percentages in coupled substitute 30% jadite and 70% diopside mixture. (15 marks)