

University of Alberta
Department of Chemical and Materials Engineering

Lecturer: Dr. Stojan Djokić

MAT E 201
Materials Science I

Assignment No.3 **(12 marks)**

January 24, 2020,

Due Date: January 31, 2020 by 3:00 pm

1. Determine the indices for the directions in the hexagonal lattice shown in Figure 1, using both the three-digit and four digit systems. **(2 mark)**
2. Determine the indices in the four-digit system for the planes shown in Figure 2. **(1 mark)**
3. A tin film has $1.8 \cdot 10^6$ interplanar spacings d_{100} . Considering that the plane (100) is parallel to the surface of the film calculate in millimetres the thickness of Sn film. Tin has FCC structure with the lattice parameter 0.64912 nm. **(2 marks)**
4. Using the ionic radii given in Appendix B, determine the coordination number expected for the following compounds: a) Fe_2O_3 , b) Cr_2O_3 , c) CaCl_2 , d) FeS , e) GeO_2 , f) PbO , g) TiO_2 , h) UO_2 **(2 marks)**
5. Would you expect UO_2 to have the sodium chloride, zinc blende or fluorite structure? Based on your answer determine: a) the lattice parameter, b) the density and c) the packing factor. **(3 marks)**
6. A diffracted x-ray beam is observed from the (311) planes of Al at 2θ angle of 78.3° when x-rays of 0.15418 nm wavelength are used. Calculate the lattice parameter of the aluminium. **(2 mark)**