

GLY 251 - CRYSTAL OPTICS AND CHEMISTRY

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Answer all questions. Write legibly. No creative spelling permitted. Use sketches where applicable. Points for each question are given in brackets.  
Total possible points = 100.

- 1 Quartz and tridymite: what are they, what are their compositions, how are they related, how are they different, how come they are important? **[10]**
- 2 Discuss whether olivine and enstatite have the same relationship as cyanite and andalusite. **[10]**
- 3 Can garnets have any combination of elements and element ratios, or are there rules that have to be obeyed by minerals in general and garnets in particular? **[10]**
- 4 How do you identify a mineral under the microscope? Give all required steps from grain selection to identification of the optical character. **[10]**
- 5 What equation is fundamental for X-ray diffraction (please provide this equation) and what information can you obtain from this technique? **[10]**
- 6 An analysis gives (in weight %):  $\text{SiO}_2$  55.05;  $\text{Al}_2\text{O}_3$  23.35;  $\text{K}_2\text{O}$  21.59. Discuss whether this mineral analysis represents a feldspar. **[10]**
- 7 A cubic mineral gives an analysis of  $\text{SiO}_2$  36.41;  $\text{Al}_2\text{O}_3$  20.6;  $\text{MnO}$  43.00 (in weight %). Discuss whether this is johannsenite (the manganese equivalent of diopside). **[10]**  
Calculate a proper mineral formula. **[10]**
- 8 The following analysis (in weight %) is of a spinel.  $\text{TiO}_2$  0.7;  $\text{Al}_2\text{O}_3$  7.5;  $\text{FeO}$  54.8;  $\text{MgO}$  3.3;  $\text{ZnO}$  28.35. Do whatever is required. Discuss whether this analysis is of acceptable quality. **[10]**  
Calculate a proper mineral formula. **[10]**