

UNIVERSITY OF PRETORIA

GLY 251 - CRYSTAL CHEMISTRY AND OPTICS

1. Semester test

Answer all the questions and use sketches where applicable.

Theory questions

- 1 Discuss the definition of a mineral and what unique aspects are important. [10]
- 2 Explain the difference between the generation of continuous X-rays and of characteristic X-rays, and why the latter occur only at specific wavelengths. [10]
- 3 What controls solid solution? [10] *Gr 83*
- 4 Define the following terms: Ionic radius, isostructuralism, polymorphism, polytypism, substitutional solid solution. [10] *134 141*
- 5 What is Bragg's equation, what are its components, and what can it be used for (give an example using the equation)[10], *$\lambda = 2d \sin \theta$*
- 6 Write down the general formulae (i.e., taking all possible substitutions into account) of the minerals diopside, orthopyroxene, and plagioclase. [10]
 CaMgSiO_4 (Fe,Mg)SiO₃ (Ca,Na)AlSi₃O₈
- 7 Construct a question about the crystallographic structure of a mineral and its role for variation in mineral composition - and answer it. [10]

Practical questions

Atomic Weights	
Si	28.0855
Al	26.98154
O	15.9994
K	39.0983
Cu	63.546
Fe	55.847
Ti	47.88
Cr	51.996
Mn	54.9380
V	50.9415
S	32.066

Mm KAlSi₂O₆ = 218.247
Mm KAlSi₃O₈ = 278.33

*$\frac{(SiO_2) \times 2}{Mm} = \frac{120.147}{218.247} \times 100\%$
 $= 55.05\%$*

*$Mm(SiO_2) \times 3 = 180.25$
 $\frac{180.25}{278.33} \times 100\% = 64.76\%$*

If leucite is KAlSi₂O₆, how much more SiO₂ does K-feldspar contain? [25]

