

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*
- 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], *$n\lambda = 2d\sin\theta$*
- 6 Write down the general formulae (i.e., taking all possible substitutions into account) of the minerals diopside, orthopyroxene, and plagioclase. [10] *$CaMgSiO_4$ $(Fe, Mg)SiO_3$ $(Ca, Na)AlSi_3O_8$*
- Construct a question about the crystallographic structure of a mineral and its role for variation in mineral composition - and answer it. [10]

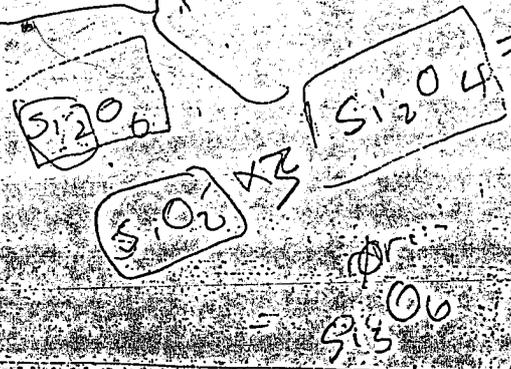
Practical questions

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

$Mm \text{ KAlSi}_2\text{O}_6 = 218.247$
 $Mm \text{ KAlSi}_3\text{O}_8 = 278.33$

$\frac{Mm(SiO_2) \times 2}{Mm(KAlSi_3O_8)}$
 $= \frac{120.147}{278.33} \times 100\%$
 $= 43.17\%$

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



If leucite is $KAlSi_2O_6$, how much more SiO_2 does K-feldspar contain? [25]

Handwritten calculations and diagrams for the practical question:

$KAlSi_3O_8$
 278.33
 SiO_2
 180.25
 $\frac{180.25}{278.33} \times 100\%$
 $= 64.76\%$