

National University of Ireland, Galway
OLLSCOIL NA hÉIREANN, GAILLIMH

SUMMER EXAMINATIONS 2000

**3rd SCIENCE
GEOLOGY [GE 322]**

PAPER TWO

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Ms. S. Baxter

Time allowed: Three hours

Answer four questions:

One from Section A, **one** from Section B, **one** from Section C and **one other** from any section.

Please use separate Answer Books for each Section.

Illustrate your answers with neat sketches and diagrams where appropriate.

SECTION A

1. Describe how the Quartz Wedge, Sensitive Tint and Quarter-Wave Plate are used in determinative optical mineralogy.
2. Show how the interference colour chart serves to illustrate the relationship
 $R = (N_{\max} - N_{\min}) D$.
(R =Retardation; N_{\max} and N_{\min} = Maximum and Minimum Refractive Indices respectively ; D =Thickness of thin section)
3. Outline the optical and microscopic features that would allow you to recognise each of the minerals in the following groupings :
 - a) Chiastolite, Fibrolite and Kyanite.
 - b) Cordierite and Andalusite.
 - c) Hypersthene and Augite.
 - d) Hornblende and Diopside.

SECTION B

4. Using examples and diagrams to illustrate your answer, compare and contrast the forms mafic and felsic intrusions may take.
5. **Figure 1** illustrates the Pressure-Temperature dependence of the silica polymorphs (quartz, tridymite and cristobalite).
Using Gibb's Phase Rule, calculate the degrees of freedom (F) at points A, B and C. What does the value of F signify? (10)

(b) **Figure 2** illustrates the leucite-silica system at $P = 1$ bar. What is special about the points R and E? Describe what happens as a melt of composition M is cooled from 1600°C to 900°C . How would you determine the approximate degree of crystallinity (i.e. the % of crystals in the system) at R? (12).

(c) What evidence may be seen in thin section which might suggest that this cooling and crystallisation did not take place in equilibrium conditions (3).
6. How many magmas of different compositions evolve from a common parent magma?

SECTION C

7. Write short notes on the following:
 - a) Burial metamorphism
 - b) Ocean-ridge metamorphism
 - c) Orogenic metamorphism.
 - d) High strain metamorphism
8. Write an illustrated essay on Skarns.
9. Discuss the use of composition-assemblage triangular diagrams in metamorphic petrology.

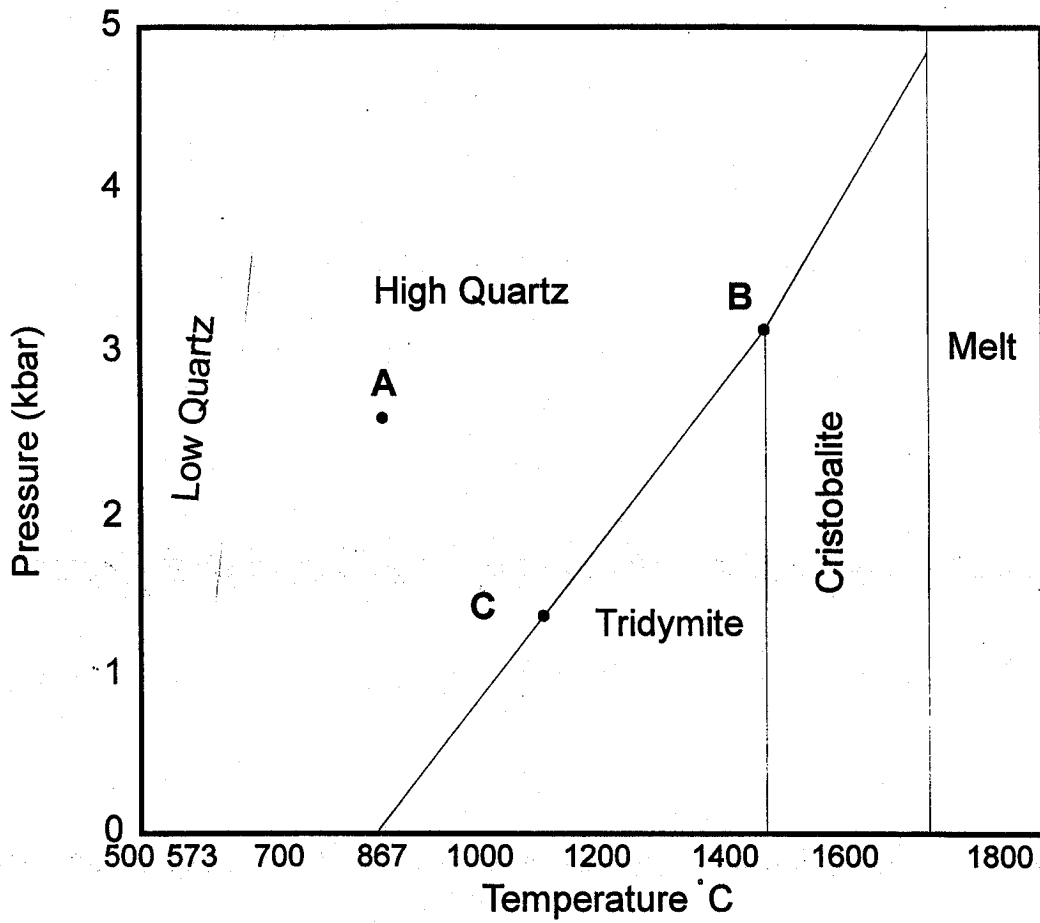


Figure 1

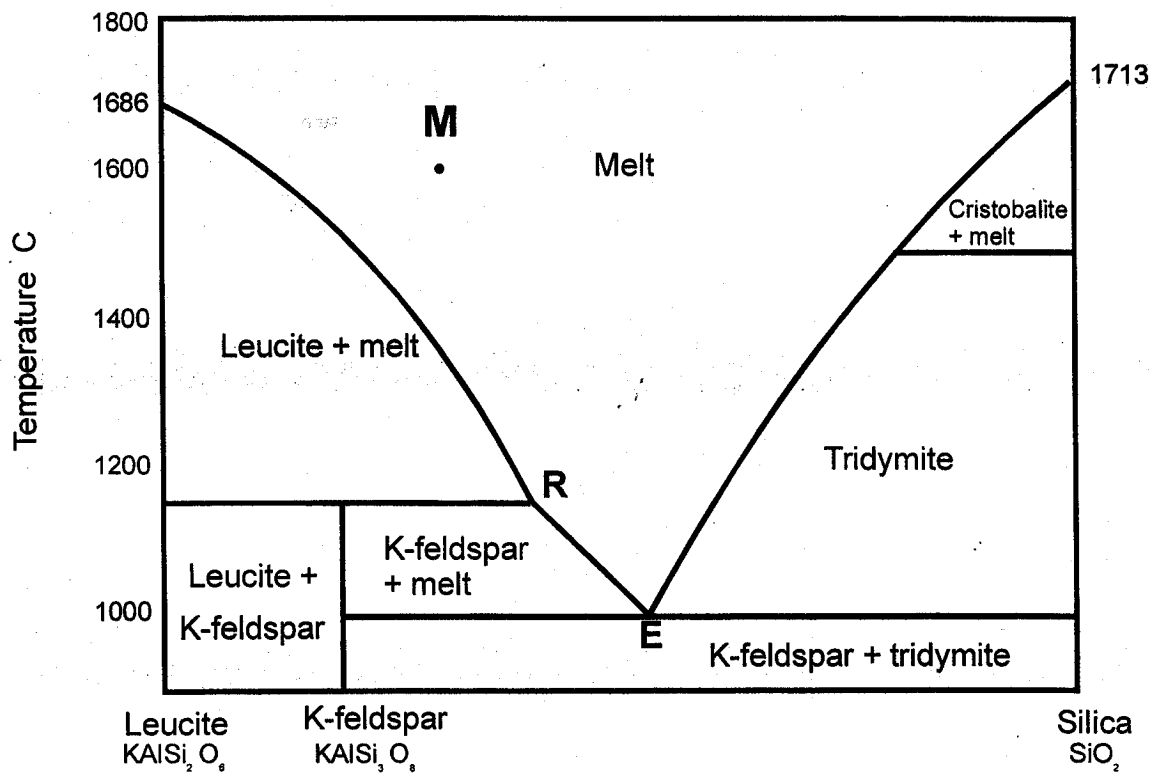


Figure 2