

National Exams December 2019

**18-Geol-A1, Mineralogy and Petrology**

3 hours duration

**NOTES:**

1. If doubt exists as to the interpretation of any question, the candidate is urged to submit with the answer paper, a clear statement of any assumptions made.
2. This is a CLOSED BOOK EXAM. No calculator is permitted.
3. There are **two parts** to this exam: **PART 1:** Short Answer (~ 1/2 page, each question). Answer all 5 ten-mark questions (50 marks). **PART 2:** Short Answer (~ 1 page, each question): Answer 5 of the 7 ten-mark questions (50 marks). The first ten questions as they appear in the answer book will be marked.

**PART 1: Short Answer (~ 1/2 page, each):**  
Answer all 5 ten-mark questions (50 marks).

- 1) Feldspar and Olivine are two silicate mineral groups. Giving a mineral example (i.e., name) of each, please explain how these mineral groups are different. Name one rock where both of these minerals can be found.
  
- 2) What are the two most important factors that control whether an element will substitute for another element in a mineral structure and why are they important?
  
- 3) What kind of evidence would determine if any of the following processes have changed the composition of magmas and resulting igneous rocks (a) crystal fractionation, (b) immiscibility, (c) crustal assimilation.
  
- 4) There are 7 crystal systems in mineral crystallography. Name and describe 2 of these crystal systems. Give a mineral example of each.
  
- 5) What is dynamic metamorphism? What key mineral and textural features would you anticipate seeing in this type of metamorphism?

**PART 2: Short Answer (~ 1 page, each):**  
Answer 5 of the 7 ten-mark questions (50 marks):

- 1) What is an ignimbrite and how do they form? Draw a labeled diagram of an ignimbrite.
- 2) What are MORB and how are they formed?
- 3) What is the Wilson Cycle? From start to end draw a series of labelled diagrams that demonstrate this complete cycle.
- 4) What's the difference between metamorphism and metasomatism?
- 5) Pick 4 common igneous minerals that you would find in a felsic rock and list some distinguishing features for recognizing using a hand lens or microscope.
- 6) What is Bowen's Reaction series? Please explain how different igneous rocks are created using Bowen's Reaction series.
- 7) Sulfide minerals are common in the Earth. List three minerals (i.e., names) in this group. Give the mineral formula for each and a diagnostic property for the identification of each (i.e., how can you tell them apart?).