

National Exams May 2017

04-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 an 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 8 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) Olivine, amphiboles and pyroxenes are three silicate mineral groups. Giving a mineral example of each, please explain how these mineral groups are different.

2) Mg, Fe, Ca, Na, K and Al are common in silicate minerals. List one mineral name and chemical formula for examples of minerals containing these elements.

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) magma mixing, (c) crustal assimilation.

4) What are the four basic agents of metamorphism? Give a geological example for each.

5) What is regional metamorphism? What key mineral and textural features would you anticipate to see 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? How do they form?
Draw and label a cross section of an ignimbrite showing the internal stratigraphy?
- 2) What are komatiites and how are they formed? Why are modern analogues to komatiites no longer found?
- 3) What is the difference between metamorphism and metasomatism? Exoskarn, Endoskarn and hornfels form during these processes, please explain what they are and how they relate.
- 4) What could cause melting to occur in each of the following tectonic settings (for each setting give all possible mechanisms? (a) divergent plate boundary, (b) island arc or continental margin arc, (c) continental rift valley, (d) intraplate oceanic island.
- 5) Effusive vs Explosive eruptions. Give an example of each and contrast the products? Name a place on Earth where you might find each of these products.
- 6) What is the difference between the calc-alkaline rocks and the tholeiitic and alkaline rocks? Please draw an AFM diagram showing the differences.
- 7) List 3 controlling factors on magma viscosity, give a geological example of each, and briefly describe these effects.
- 8) List the three types of igneous layering. Describe how each of these types of layering are created and provide an example of each type.