National Exams December 2016

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 ***6*** ten-mark questions (60 marks). **PART 2:** Short Answer (~ 1 page, each question): Answer ***4*** **of the 7** ten-mark questions (40 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 ***6*** ten-mark questions (60 marks).

1) Silicate tetrahedron are the basic building blocks of silicate minerals. Mica, amphiboles and pyroxenes are three silicate mineral groups. Giving a mineral example of each, please explain how these mineral groups are different.

2) Oxide minerals are common minerals. List the name and chemical formula for tin, iron, aluminum, titanium and uranium bearing oxide minerals.

3) Explain the differences and similarities between sanidine, microcline and orthoclase.

4) 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.

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

6) What is contact 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 ***4*** **of the 7** ten-mark questions (40 marks):

1) What is an ophiolite? How do they form?
Draw and label a cross section of a ophiolite showing the internal stratigraphy?

2) What mineralogical differences would distinguish between Barrovian and Buchan Facies Series metamorphism of pelitic rocks?

3) What are paired metamorphic belts and why are they important?
Give two examples of paired metamorphic belts.

4) 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.

5) 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.

6) There is a variety of volcanic eruption types. List them. Describe the process(es) that make these types different. What rock type might you expect for each of these? What tectonic locations would you expect to see each of these?

7) What is the difference between the calc-alkaline rocks and the tholeitic and alkaline rocks? Please draw an AFM diagram showing the differences.