

National Exams May 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.

This is a Closed Book Exam. No calculator permitted.

2. Part 1 all six questions must be answered totally 60 marks.

3. Part 2 four of the seven questions must be answered totally 40 marks.

4. Clarity and organization of the answer are important.

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A) **PART 1:** Short Answer (~ 1/2 page, each):  
Answer all 6 ten-mark questions (60 marks):

1. Mica, amphiboles and pyroxenes are mineralogically different. Giving a mineral example of each, please explain how these mineral groups are different (hint: crystallographic).

2. Sulphide minerals are common 'ore' minerals. List the name and chemical formula for tin, zinc, nickel, lead and copper bearing sulphide minerals.



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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?

B) **PART 2:** Short Answer (~ 1 page, each):

Answer **4 of the 7** ten-mark questions (40 marks):

1. What is an ignimbrite? How do they form?  
Draw and label a cross section of a ignimbrite showing the internal stratigraphy?
2. Pick four of the following metamorphic reactions and explain their mechanism of operation, using examples:
  - a. Univariant reaction
  - b. Divariant Reactions
  - c. Solid—Solid reactions
  - d. Dehydration reactions
  - e. Decarbonation reaction
  - f. Redox Reaction
  - g. Cation exchange reaction.
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. Draw a well-labelled cross section of oceanic crust. Older oceanic crust differs from younger oceanic crust, how and why? Does it subduct the same?
5. What is:
  - a. metamorphic index mineral?
  - b. metamorphic facies?
  - c. metamorphic facies series?How do these relate to each other using a geological example(s).
6. Using AFM diagrams, please illustrate and explain the index mineral progression in a Barrovian facies series.
7. 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?