

## **NATIONAL EXAMINATIONS – May 2012**

### **09-Mmp-A1 General Geology and Exploration**

3 hours duration

#### **NOTES:**

- A. 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.
- B. This is a CLOSED BOOK EXAM. Candidates may use one of two calculators, the Casio or Sharp approved models.
- C. FIVE (5) questions constitute a complete exam paper. YOU MUST ANSWER QUESTIONS 1 TO 4. Candidates must choose one more question from any of the remaining questions. Where stated in the examination, please hand in any additional pages with your exam booklet.
- D. The first of any of Questions 5 to 7 as it appears in the answer book will be marked, unless the candidate clearly indicates that another question should be substituted for a specified question that was answered previously.
- E. Each question is of equal value. The marks assigned to the subdivisions of each question are shown for information. The total marks for the exam is 100.

**\*\*\* IMPORTANT: YOU MUST ANSWER QUESTIONS 1, 2, 3, and 4 \*\*\***

1. Consider the following 5 ore minerals:

- |                   |                |                 |
|-------------------|----------------|-----------------|
| (i) stibnite      | (iii) chromite | (v) pentlandite |
| (ii) chalcopyrite | (iv) hematite  |                 |

- a) For each ore mineral listed above, state its most common crystal form, as would be seen in a hand specimen. {5 marks}
- b) For each ore mineral listed above, state the element of the Periodic Table for which it is a major ore mineral. {5 marks}
- c) For each ore mineral listed above, state one diagnostic physical property which may be unambiguously used to identify the mineral in a hand specimen. {5 marks}
- d) Excluding any of the ore minerals listed above, state an ore mineral for each of the following elements: {5 marks}

- |                  |                    |                    |
|------------------|--------------------|--------------------|
| (i) thorium (Th) | (iii) sodium (Na)  | (v) magnesium (Mg) |
| (ii) tin (Sn)    | (iv) potassium (K) |                    |

2. Ores can be classified into a variety of deposit types on the basis of ore genesis. For each genetic category below, list a deposit type that is characteristic of that category and the type of ore that would typically be mined from it. {20 marks}
- (i) sedimentary deposits
  - (ii) sedimentary hydrothermal deposits
  - (iii) volcanic-related deposits
  - (iv) metamorphically reworked deposits
  - (v) igneous carbonatite-alkaline-related deposits
  - (vi) ultramafic igneous deposits
  - (vii) granite-related hydrothermal deposits
  - (viii) hydrothermal epigenetic deposits
  - (ix) weathering-related deposits
3. The morphology and timing of ore bodies are often important in understanding the genesis and formation of important mineral deposits.
- a) Briefly define the following terms. {8 marks}
- (i) syngenetic ore deposit
  - (ii) epigenetic ore deposit
  - (iii) concordant ore deposit
  - (iv) discordant ore deposit
- b) Discordant ore bodies can generally be categorized as: (1) regularly shaped or (2) irregularly shaped. For each category, briefly describe the general nature of two kinds of deposits and give an example of each. {12 marks}
4. Ores can form in a variety of geological environments resulting from a variety of processes. List and define two internal geologic processes and three external geologic processes which are thought to be responsible for ore genesis, and state the most likely kind of genetic ore deposit to be formed. {20 marks}

**\*\*\* IMPORTANT: COMPLETE ONLY ONE MORE QUESTION \*\*\*  
FROM QUESTIONS 5, 6, OR 7**

5. Many different geophysical surveying techniques can be used to find and delineate ore bodies.
- a) Explain the fundamental physical principles by which gravity methods are designed to operate. *{4 marks}*
  - b) Explain how gravity methods could be useful in mineral exploration and hydrocarbon exploration. *{6 marks}*
  - c) Gravity data must undergo a series of corrections before it can be used. Explain the purpose of this and briefly describe four required corrections. *{10 marks}*
6. Geochemical surveys in the surficial environment depend on sampling appropriate materials. Describe five different materials that can be sampled and state how this material may be useful in a geochemical survey. *{20 marks}*
7. Diamond-core drilling is a commonly used sampling method.
- a) Briefly describe the method, the conditions under which it is most effectively used, as well as its advantages and disadvantages. *{8 marks}*
  - b) Briefly outline the various drilling parameters which must be taken into account when designing a drilling program and explain how each may affect the overall project. *{12 marks}*