



KENYATTA UNIVERSITY

UNIVERSITY EXAMINATIONS 2011/2012

SECOND SEMESTER EXAMINATION FOR THE DEGREE OF MASTER OF SCIENCE

SCH 514: MINERAL PROCESSING AND RECYCLING

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DATE: MONDAY 2ND APRIL 2012

TIME: 9.00 A.M. – 12.00 P.M.

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INSTRUCTIONS

The Question being answered must be indicated on every new page

1.
 - a) Differentiate between a mineral and other material substances (6 marks)
 - b) All the minerals known thus far can be classified in one of the seven crystal systems.
 - i) List any four of these crystal systems and, in each of them, give the cell constants. (4 marks)
 - c) Besides a knowledge of the chemical composition of a given rock sample, a knowledge of the mineral(s) present is essential. Give the reason(s) for this supporting your answer with specific examples (10 marks)

(Total for Q. 1 20 marks)

2. Outline briefly the principles of :-
 - i) Froth flotation (12 marks)
 - ii) Gravity concentration (8 marks)giving, in each case, an example of a mineral concentrated using the technique you have described.

(Total for Q.2...20 marks)

3. You are supplied with samples of the minerals:-

- i) Spodumene,
- ii) Ilmenite, TiFeO_3 , and,
- iii) Gold-containing rocks and any chemical one may require.

Outline very briefly how one may prepare samples of the following:-

- a) A sample of Lithium carbonate, Li_2CO_3 (5 marks)
- b) A sample of pure titanium metal (5 marks)
- c) Pigment grade rutile, TiO_2 (5 marks)
- d) A sample of silver metal (5 marks)

(Total for Q.2 - 20 marks)

4. a) Name four major compounds found in Portland Cement clinker and outline very briefly how a sample of Portland Cement may be prepared. (8 marks)
- b) Portland Cement could be an extremely simple substance to Manufacture if it were not for the very high temperature needed to form the products. Explain (2 marks)
- c) Both iron oxide (Fe_2O_3 or Fe_3O_4) and Gypsum, $\text{CaSO}_4 \cdot 2.5 \text{H}_2\text{O}$. Are additives added during the manufacture of Portland cement. Give the state at which each of these is added, its value (if any) and maximum allowed level (6 marks)
- d) Magnesium oxide is an undesirable component of clinker. Give the reasons for this explaining clearly the maximum level allowed in the final product.

(5 marks - Total for Q.4 20 marks)

5. a) The Phrase Municipal Solid Waste is rather inappropriate. Outline very briefly the reasons for this supporting your Answers with specific examples. (8 marks)
- b) Give four methods used for recovering aluminum from Clay. (12 marks)

(Total for Question 5 - 20 marks)