



MAASAI MARA UNIVERSITY

**REGULAR UNIVERSITY EXAMINATIONS
2018/2019 ACADEMIC YEAR**

FOURTH YEAR SECOND SEMESTER

**SCHOOL OF SCIENCE AND INFORMATION SCIENCES
BACHELOR OF SCIENCE IN CHEMISTRY**

COURSE CODE: CHE 418

COURSE TITLE: INDUSTRIAL CHEMISTRY II

DATE: 24TH APRIL, 2019

TIME: 1100 - 1300HRS

INSTRUCTIONS TO CANDIDATES

1. Answer Question **ONE** and any other **TWO** questions.
2. All Examination Rules Apply.

SECTION A

Question One (30mks)

- a) Define the following terms;
- (i) A reactor (1 mk)
 - (ii) Endothermic reaction (1 mk)
 - (iii) Exothermic reaction (1 mk)
- b) State three factors to consider when designing a chemical reactor (3 mks)
- c) Chemical reactors are classified based on four factors. State the factors (4 mks)
- d) Briefly describe the working of the following reactors;
- (i) Batch reactor (2 mks)
 - (ii) Two-phase reactor (2 mks)
 - (iii) CSTR (2 mks)
- e) (i) State the two most common forms of petroleum (2 mks)
- (ii) State any three uses of petroleum (3 mks)
- f) (i) Explain desalting and dehydration method of petroleum refining (2 mks)
- (ii) State the three methods used in the desalting and dehydration process (3 mks)
- g) State the functions of the following components of a petroleum refining column.
- (i) The vertical shell (1 mk)
 - (ii) Column internals (1 mk)

SECTION B

Answer any TWO questions from this section, each question carries 20 marks

Question Two (20mks)

- a) Define blending as used in petroleum refining. (1 mk)
- b) State and briefly explain the two thermal processes carried out in petroleum refining (4 mks)
- c) (i) Distinguish between catalytic cracking and hydrocracking (1 mk)
- (ii) Briefly describe catalytic reforming as applied in petroleum processing (2 mks)
- d) With an example define a petrochemical (2 mks)
- e) State any two non-hydrocarbon substances obtained from petroleum (2 mks)

- f) Explain why research and development of new catalysts is important to manufacturers of polymers (2 mks)
- g) Describe the plug flow reactor and state any two areas where it's commonly applied (3 mks)
- h) (i) State the composition of natural gas (2 mks)
(ii) Distinguish between associated and non-associated natural gas (1 mk)

Question Three (20mks)

- a) (i) Why is it necessary to remove moisture from natural gas (2 mks)
(ii) Ethylene glycol, diethylene glycol, and triethylene glycol are typical solvents used to remove water from natural gas. Why is triethylene glycol preferred (2 mks)
(iii) Other than using solvents to remove moisture from natural gas, describe two other methods used to remove water from natural gas (4 mks)
- b) (i) Distinguish between natural rubber and synthetic rubber (1 mk)
(ii) State the four main steps involved in production of natural rubber before industrial processing (4 mks)
(iii) State one product that dominates the rubber industry (1mk)
- c) State and describe the three grades of natural rubber recovered before industrial processing (6 mks)

Question Four (20mks)

- a) (i) State the two functions of carbon black in rubber (2 mks)
(ii) Describe calendaring used in rubber processing (2 mks)
- b) Explain vulcanization of rubber (2 mks)
- c) (i) Define a fertilizer (1 mk)
(ii) State the main function of fertilizers (1 mks)
(iii) State the main roles of nitrogen as an ingredient in fertilizer (2 mks)
(iv) Apart from nitrogen, state the other primary components of fertilizers (2 mks)
(v) State the raw materials for the respective macronutrients (3 mks)
(vi) A fertilizer is labeled 5-10-2, explain (2 mks)
- e) State the raw materials for the formation of ammonium nitrate (2 mks)
- f) Describe the granulation process in fertilizer processing (3 mks)

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