UNIVERSITY OF JOHannesburg

DEPARTMENT OF CHEMICAL ENGINEERING TECHNOLOGY

PROGRAM : NATIONAL DIPLOMA
SUBJECT : CHEMICAL PROCESS INDUSTRIES
CODE : WPD2111
DATE : JULY SUPPLEMENTARY EXAMINATION
DURATION : 3HRS 00MIN
TOTAL MARKS : 170
FULL MARKS : 160

EXAMINER : MR. M BELAID & DR. T SEODIGENG
MODERATOR : MR. M. MOLLAGEE
NUMBER OF QUESTIONS : 7
NUMBER OF PAGES : 3 (INCLUDING THIS COVER PAGE)

INSTRUCTIONS : - EXAMINATION RULES FOR THE UNIVERSITY OF JOHANNESBURG APPLY
                - ANSWER ALL QUESTION
                - CALCULATORS ARE ALLOWED
QUESTION 1: PETROLEUM REFINING

1.1 Identify the operation given in the figure below and state what it is used for in petroleum refining.

1.2 Supply the missing information as indicated by (a) – (g) in the figure above.

1.3 Describe each of the following operations in petroleum refining.
   a) Reforming
   b) Alkylation
   c) Isomerisation

1.4 List six uses of petroleum refining products.

QUESTION 2: COAL

2.1. Discuss the five (5) different analysis performed on coal explaining briefly each component?

2.2. Discuss each of the two (2) methods of converting coal to liquid.

QUESTION 3: IRON AND STEEL

3.1. Discuss water pollution in iron and steel production.

3.2. With the use of a diagram, describe the cast iron making process

3.3. Discuss the characteristics and uses of non-ferous alloys such as
   a) Copper
   b) Nickel
   c) Titanium
QUESTION 4: FUEL CELLS

4.1. List four (4) advantages of fuel cells vs. that of internal combustion engine. [8]
4.2. Discuss three (3) major design challenges of fuel cells. [6]
4.3. Discuss the three (3) thermal processes for hydrogen production and give balanced chemical reactions for each. [6]

QUESTION 5:

Discuss the following:

5.1 Discuss the steps of the Ancillary process and give all the chemical reactions (10)
5.2 Discuss the role of the laboratory in soap and detergent production processes and give examples of typical tests that take place. (15)

QUESTION 6:

6.1. Discuss nitrogen based fertilisers and give a detailed block diagram of the production of ammonia. (15)
6.2. Draw block diagram of Portland cement production (15)

QUESTION 7:

7.1 List the major steps in the implementation of cleaner production. (15)
7.2 Discuss major factors which are the origin of waste and emission. (10)