higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

T310**(E)**(A9)T

NATIONAL CERTIFICATE

CHEMICAL PLANT OPERATION N4

(8050004)

9 April 2019 (X-Paper)
09:00–12:00

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DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE
CHEMICAL PLANT OPERATION N4
TIME: 3 HOURS
MARKS: 100

INSTRUCTIONS AND INFORMATION

1. Answer ALL the questions.
2. Read ALL the questions carefully.
3. Number the answers according to the numbering system used in this question paper.
4. Sketches must be large, neat and fully labelled.
5. Write neatly and legibly.

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QUESTION 1

Indicate whether the following statements are TRUE or FALSE. Choose the answer and write only 'True' or 'False' next to the question number (1.1–1.5) in the ANSWER BOOK.

1.1 Kinematic viscosity is defined as the absolute viscosity of a fluid divided by its density.

1.2 In a conical ball mill, feed enters from left through 30° and product leaves through the 60° cone to the right.

1.3 Air from the atmosphere is the main raw material used to produce oxygen and methane.

1.4 Zirconium is a metallic element used as a construction material for atomic reactors.

1.5 Hard water makes it difficult for soap to have an effect.

(5 × 1) **[5]**

QUESTION 2

2.1 Define each of the following:

2.1.1 Turbulent flow

2.1.2 Relative roughness

2.1.3 Impact pressure

(3 × 2) (6)

2.2 An open vertical tube attached to a water mains shows water in the tube to a height of 3,5 m.

Calculate the total pressure of the water in the mains in kilopascals. Assume the density of water is 999 kg/m^3 and the atmospheric pressure is 101,3 kPa. (7)

2.3 Write brief, clarifying notes on fluid head. (7)

[20]

QUESTION 3

3.1 Name FOUR types of size reduction equipment. (4)

3.2 Define *angle of nip*. (2)

3.3 Draw a labelled diagram of a conical ball mill. (8)

3.4 Describe the operation of a jaw crusher. (6)

[20]

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QUESTION 4

4.1 Draw a labelled flow diagram for the manufacture of hydrogen through steam propane. (10)

4.2 Carbon dioxide (CO_2) is available in gaseous form, liquid form and solid form.

4.2.1 State FIVE advantageous properties of carbon dioxide. (5)

4.2.2 Give THREE uses of liquid carbon dioxide. (3)

4.3 Complete and balance the following reaction equation:

$Na_2CO_3 + CO_2 + H_2O \rightleftharpoons$ (2)

[20]

QUESTION 5

5.1 The hydrogen cation exchange process is one of the methods used to soften water.

Describe this process with the aid of relevant reaction equations. (16)

5.2 Define *hardness of water*. (2)

5.3 Name TWO types of lime soda processes. (2)

[20]

QUESTION 6

6.1 What will the effect of sea water be on each of the following materials?

6.1.1 Steel

6.1.2 Titanium

6.1.3 Wood

6.1.4 Aluminium

(4 × 1) (4)

6.2 State TWO properties of cast iron. (2)

6.3 State THREE methods used for chlorination of hydrocarbons using hydrochloric (HCl) acid. (3)

6.4 Give FOUR disadvantages of titanium. (4)

6.5 Define *nitration*. (2)

[15]

TOTAL: 100

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