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Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

T320**(E)**(A6)T

# NATIONAL CERTIFICATE

# CHEMICAL PLANT OPERATION N5

(8050015)

**6 August 2019 (X-Paper)**
**09:00–12:00**

**This question paper consists of 4 pages.**

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# DEPARTMENT OF HIGHER EDUCATION AND TRAINING
# REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE
CHEMICAL PLANT OPERATION N5
TIME: 3 HOURS
MARKS: 100

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**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 your ANSWER BOOK.

1.1 Heat of reaction refers to the difference in energy between the products of the reaction and the reactants.

1.2 Tumbling mixers resemble ball mills without the balls.

1.3 The double-naben or fishtail blade is particularly effective with heavy plastic materials.

1.4 When heat is supplied and causes an immediate rise in temperature, then this heat is known as latent heat.

1.5 When heat is supplied and causes a change in state without a change in temperature, then this heat is known as sensible heat.

(5 × 1) **[5]**

## QUESTION 2

2.1 Tabulate the difference between an *axial-flow turbine* and a *radial-flow turbine*. (8)

2.2 Draw a fully labelled diagram of a premix (gas) burner. (12)

**[20]**

## QUESTION 3

3.1 Explain the working principles of the following burners:

3.1.1 Atomising oil burner

3.1.2 Open-circuit gas turbine

(2 × 5) (10)

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3.2 Heavy naphtha A from the crude fractionators is combined with heavy naphtha B. After mixing the combined feed enters the catalytic reformer.

Assume:

- A contains 65$C_6$ hydrocarbons and 35% $C_8$ hydrocarbons
- B contains 55% $C_6$ hydrocarbons and 45% $C_8$ hydrocarbons

If 280 kg of A and 120 kg of B are mixed per minute, calculate the following:

3.2.1 The kilograms of mixture produced per minute (4)

3.2.2 The composition of the mixture (11)
**[25]**

## QUESTION 4

4.1 Sketch and describe the operation of a tubular centrifuge. (10)

4.2 Discuss the operation of a Muller mixer. (7)

4.3 Define the *standard heat of formation.* (3)

4.4 Discuss the operation of centrifugal decanters. (5)
**[25]**

## QUESTION 5

5.1 Write THREE balanced reactions which take place in the production of sulphuric acid. (3 × 2) (6)

5.2 Draw a neat, labelled diagram of the contact process for the preparation of sulphuric acid by burning sulphur. (12)

5.3 Name FOUR raw materials used in the production of nitric acid. (4)

5.4 State THREE methods used in the preparation of nitric acid. (3)
**[25]**

**TOTAL: 100**

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