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Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

T330(E)(J31)T

NATIONAL CERTIFICATE

CHEMICAL PLANT OPERATION N6

(8050026)

31 July 2019 (X-Paper)

09:00–12:00

This question paper consists of 4 pages.



DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA
NATIONAL CERTIFICATE
CHEMICAL PLANT OPERATION N6
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 Tar products are by-products from the coke production process.
- 1.2 A pH value of 7 refers to a strong alkali.
- 1.3 The McLeod gauge is used to measure the pressure of mercury as low as $2,5 \times 10^{-4}$ mm. 
- 1.4 A pitot static tube  can be used to find the distribution of velocities in a main.
- 1.5 Raoult's law states that a gas with a low pressure is expressed as equilibrium vapour pressure of the component which is proportional to the mole fraction of the same component.

(5 × 1) **[5]**

QUESTION 2

- 2.1 Adsorbent is a separation in which certain components are transferred to the surface of a solid adsorbent.
- 2.1.1  What are the THREE types of adsorbers used in the industry? (3)
- 2.1.2 Differentiate between *adsorbent* and *adsorbate*. (2)
- 2.2 Briefly explain the following:
- 2.2.1 Raoult's law (3)
- 2.2.2 Continuous distillation (6)
- 2.2.3 Murphree plate efficiency  (6)
- [20]**

QUESTION 3

- 3.1 Discuss the following plates found in a distillation and fractionation column:
- 3.1.1 Counterflow plates (4)
- 3.1.2 Bubble-cap plates  (6)

- 3.2 Define the following terms:
- 3.2.1 Cracking or pyrolysis (3)
- 3.2.2 Reforming or aromatisation (2)
- 3.3 Undesirable water and hydrogen sulphide must be removed from natural gas.
- 3.3.1 Give THREE reasons why water is removed from natural gas. (3)
- 3.3.2 Name FOUR methods used to remove water from natural gas. (4)
- 3.4 Explain each of the following petroleum crudes:
- 3.4.1 Paraffin-base crudes (3)
- 3.4.2 Intermediate-base crudes (5)
- [30]**

QUESTION 4

- 4.1 Give THREE examples of the gaseous products that are also produced during carbonation of coal under high temperatures. (3)
- 4.2 Write the chronological steps of the coke-oven procedure. (11)
- 4.3 Draw a flow diagram of the manufacturing of aluminium sulphate by means of the Dorr procedure. (6)
- [20]**

QUESTION 5

- 5.1 Discuss the following steps that are used in the preparation of caustic soda with the use of a diaphragm cell:
- 5.1.1 Special purification of caustic soda (3)
- 5.1.2 Final evaporation (2)
- 5.2 Name FOUR types of temperature scales. (4)
- 5.3 Draw a diagram of a simple potentiometer and describe its operation. (7)
- 5.4 A thermometer is an instrument that is widely used in the industry to measure the temperature of materials.
- State FIVE disadvantages of using a filled system thermometer. (5)
- 5.5 Differentiate between strong and weak acids. (4)
- [25]**

TOTAL: 100