higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE

CHEMICAL PLANT OPERATION N6

(8050026)

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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. Use only a blue or black pen.
5. Write neatly and legibly.

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QUESTION 1

Choose an item from COLUMN B that matches a description in COLUMN A. Write only the letter (A–G) next to the question number (1.1–1.5) in the ANSWER BOOK.

COLUMN A		COLUMN B	
1.1	Used to separate vapour solids	A	filtration
1.2	Removal of wax from wax distillates	B	fixed-bed adsorber
1.3	The designs have involved improvements in both the perforation design and the tray arrangements	C	waxes
		D	adsorption
1.4	One of the heavy distillates in refining operations using fractionation	E	Linde plates
		F	bubble plate
1.5	Designed for vapours at high pressure	G	Higgens contractor

(5 × 1) **[5]**

QUESTION 2

Indicate whether the following statements are TRUE or FALSE by writing only 'True' or 'False' next to the question number (2.1–2.5) in the ANSWER BOOK.

2.1 Crude oils vary in compounds with respect to the paraffin, naphthalene and aromatic groups.

2.2 Cracking is the building up of any hydrocarbon in such a way that carbon-carbon bonds break up to form new hydrocarbon products.

2.3 LPG refers to liquid processed gas.

2.4 Refrigeration is one of the methods used to dehydrate water from natural gas.

2.5 Producer gas is non-combustible.

(5 × 1) **[5]**

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QUESTION 3

Complete the following sentences by writing only the missing word or words next to the question number (3.1–3.5) in the ANSWER BOOK.

3.1 … refer to the measuring of physical quantity and can change.

3.2 … measures the heat energy of a body.

3.3 A meter that measures difference in pressure is called a … flow meter.

3.4 A filled-system thermometer is advantageous in the process industries, as its measuring system is …

3.5 The … consists of two fixed ends open for pressure application.

(5 × 1) **[5]**

QUESTION 4

4.1 Distillation is one of the methods used in the petroleum industry to separate various liquids according to their volatility.

Differentiate between *simple batch distillation* and *continuous distillation*. (4)

4.2 State FOUR factors contributing to the shape of the breakthrough curve concerning adsorption. (4)

4.3 Describe discharge gutters as a component of distillation and fractionation columns. (6)

4.4 In a Higgens contractor, the stationary upper bed of solids is contracted with liquids flowing downwards.

Make a labelled sketch of a Higgens contractor indicating the position of the piston and the valve. (6)

[20]

QUESTION 5

5.1 High temperature during the carbonisation of coal yields more gaseous products than liquid products.

5.1.1 List FOUR gaseous products from coal. (4)

5.1.2 Name TWO liquid products from coal. (2)

5.1.3 Discuss the step-by-step decomposition of coal. (6)

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5.2 Define the following terms:

5.2.1 Isomerisation (2)

5.2.2 Aromatisation (1)

5.3 Briefly explain the alkylation of hydrocarbons. (5)
[20]

QUESTION 6

6.1 Briefly explain the following terms:

6.1.1 Acids (4)

6.1.2 Bases (5)

6.2 Write brief explanatory notes on the principle and the rate of ion exchange. (10)

6.3 Write brief explanatory notes on the brine purification step in the preparation of caustic soda using a diaphragm cell. (3)

6.4 Explain what is meant by *ion exclusion*. (3)
[25]

QUESTION 7

7.1 Make a fully labelled sketch of a chain-balance plummet hydrometer. (8)

7.2 Briefly explain the hydrogen electrode. (2)

7.3 Convert 203 °F to °C.

GIVEN: °F = 1,8 °C + 32 (3)

7.4 State the advantages and disadvantages of the Venturi tube as a primary element measuring flow. (7)
[20]

TOTAL: 100

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