higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE

PLANT OPERATION THEORY N1

(11040001)

29 November 2023 (X-paper)
09:00–12:00

Drawing instruments and nonprogrammable calculators may be used.

This question paper consists of 6 pages.

152Q1E2329

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DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE
PLANT OPERATION THEORY N1
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 black or a blue pen.
5. Write neatly and legibly.

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QUESTION 1

Various options are given as possible answers to the following questions. Choose the answer and write only the letter (A–D) next to the question number (1.1–1.5) in the ANSWER BOOK.

1.1 Atoms form bonds when valence electrons interact when electrons are transferred from one atom to another.

A Ionic
B Covalent
C Metallic
D Non-metallic

1.2 Carbon dioxide reacts with water and forms … .

A Carbon
B Carbonic acid
C Carbon monoxide
D Carbon dioxide

1.3 Which ONE of the following is a pure substance?

A Air
B Sugar solution
C Stainless steel
D Water

1.4 The valency of sulphur in the form element is … .

A 2
B 3
C 6
D 16

1.5 The relative formula mass of aluminium hydroxide is … .

A 99
B 61
C 27
D 78

(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 (6.1–6.5) in the ANSWER BOOK.

2.1 Softening refers to the removal of organic matter and micro-organisms from water.

2.2 Sludge is a soft thick mud, especially at the bottom of a liquid.

2.3 Oil is an example of a combustible material.

2.4 Anaerobic organisms need oxygen in order to live.

2.5 Chlorine in water is used to kill pathogenic micro-organisms and bacteria.

(5 × 1) **[5]**

QUESTION 3

3.1 Define the term, *pure substance*. (2)

3.2 Complete the table below by writing only the answer next to the question number (3.1.1–3.1.5) in the ANSWER BOOK.

Element	Mass number	Atomic number	Number of protons	Number of neutrons	Number of electrons
Magnesium ion	**3.2.1**	12	12	**3.2.2**	12
3.2.3	23	**3.2.4**	11	**3.2.5**	11

(5 × 1) (5)

3.3 Write down the chemical formula of the following compounds:

3.3.1 Table salts

3.3.2 Water

(2 × 1) (2)

3.4 Write a balanced equation for the following chemical reaction:

$NaOH + HC\ell \longrightarrow +$ (2)

3.5 List FIVE properties of acids. (5)

3.6 Classify each of the following as either a physical change or a chemical change:

3.6.1 Table salts dissolve in water

3.6.2 Cooking oats in water

(2 × 1) (2)
[18]

QUESTION 4

4.1 Name FIVE types of valves used to operate fluids. (5)

4.2 Briefly discuss the advantages and disadvantages of lead pipes. Also explain hoe lead pipes are formed. (4)

4.3 Explain how the density of a liquid may cause a loss of pressure in a pipe. (3)

4.4 Sketch a needle valve and label each part clearly. (7)
[19]

QUESTION 5

5.1 Give the FIVE factors to be taken into consideration when supplying power to a pump. (5)

5.2 List the advantages of *centrifugal pumps* compared to *reciprocating (positive displacement) pumps.* (8)

5.3 A pump with 75% efficiency runs for a period of 18 hours to do 16 GJ of work.

Given: Work (F) = P × h

P = F ÷ t
h = Output ÷ Input × 100%

Calculate:

5.3.1 The power of the pump in kW

5.3.2 The power of the source in kW

(2 × 3) (6)
[19]

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QUESTION 6

6.1 Explain the following terms:

6.1.1 Distillation

6.1.2 Condensation (6)

6.2 Define the term, *pollution.* (2)

6.3 Not all water is good enough to drink.

What are the main sources of water pollution in water systems? (5)

6.4 Water can be permanently hard.

6.4.1 Name TWO substance that can make water permanently hard. (2)

6.4.2 How can permanent hardness be removed? (1)

6.5 Differentiate between *distilled water* and *soft water.* (4)
[20]

QUESTION 7

7.1 State THREE firefighting methods that may be used to extinguish a fire and explain the working principle of each method. (3 × 2) (6)

7.2 Name advantages and disadvantages of pressure control. (5)

7.3 Calculate the volume of a gas that can be stored in a sphere with an inner diameter of 4,4 m. (3)
[14]

TOTAL: 100

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