higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE

WASTE-WATER TREATMENT PRACTICE N3

(8120003)

28 November 2022 (X-paper)
09:00–12:00

This question paper consists of 6 pages.

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DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE
WASTE-WATER TREATMENT PRACTICE N3
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. Start each section on a new page.
5. Use only a black or blue pen.
6. Write neatly and legibly.

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SECTION A

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 The best way to measure flow in a pipe is …

A with a venture flume.
B to measure how long it will take to fill a fixed volume.
C by using a rectangular weir.
D by using a manometer.

1.2 Cast iron can handle liquids with temperatures of up to …

A 450 °C.
B 550 °C.
C 1 100 °C.
D 2 400 °C.

1.3 Stress corrosion can be explained as …

A localised corrosion at sharp corners and edges.
B selective attack along the grain boundaries of the metal.
C high mechanical stresses combined with corrosive media.
D None of the above

1.4 The chemical symbol for cobalt is …

A Clo
B Cb
C Co
D Cot

1.5 At which pH range does optimum removal of phosphates take place with the addition of alum?

A 4,0 to 5,0
B 5,5 to 6,5
C 8,0 to 8,5
D 11,0 to 12,1

(5 × 1) **[5]**

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QUESTION 2

Choose a term from COLUMN B that matches a description in COLUMN A. Write only the letter (A–J) next to the question number (2.1–2.5) in the ANSWER BOOK.

COLUMN A		COLUMN B	
2.1	Method of measuring flow suitably	A	brackish water
2.2	Contains 1 500 to 6 000 ppm total dissolved solids	B	pitting corrosion
2.3	Corrosion where a protective film or corrosion layers break down	C	V-notch weir
2.4	Colour measured in the absence of turbidity	D	apparent colour
2.5	Loss of electrons	E	magnetic flowmeter
		F	actual colour
		G	oxidation
		H	friction head
		I	reduction
		J	crevice corrosion
		K	Hazen colour
		L	Stress corrosion

(5 × 1) **[5]**

QUESTION 3

Indicate whether the following statements are TRUE or FALSE by writing only 'True' or 'False' next to the question number (3.1–3.5) in the ANSWER BOOK.

3.1 The SI system stands for System Integrated units.

3.2 The density of a liquid is indirectly proportional to its mass per volume.

3.3 Absolute pressure includes atmospheric pressure.

3.4 Cavitation is the formation of bubbles in a liquid by the movement of a propeller through it.

3.5 Soft water contains a lot of calcium and magnesium (100 mg/L $CACO_3$)

(5 × 2) **[10]**

TOTAL SECTION A: 20

SECTION B

QUESTION 4

4.1 Write the formula for hydraulic gradient. (2)

4.2 Name FOUR groups of pumps. (4)

4.3 List THREE main types of valves classified according to its closing mechanism. (3)

4.4 Give THREE advantages of underground water. (3)

4.5 Explain each of the following:

4.5.1 Photosynthetic autotrophic bacteria

4.5.2 Cryophilic bacteria

(2 × 2) (4)

4.6 List FOUR types of nonwaterborne systems. (4)
[20]

QUESTION 5

5.1 Write the term used for a condition where sludge does not settle even at low concentration (2)

5.2 Name FIVE causes of bulking. (5)

5.3 List SEVEN types of aeration methods. (7)

5.4 Explain the anoxic zone as found in the activated sludge process. (2)

5.5 List FOUR types of sand filters. (4)
[20]

QUESTION 6

6.1 Draw a process flow diagram of a biological-filtration sewage-treatment plant. (15)

6.2 State FIVE precautions to take when storing chlorine gas. (5)
[20]

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QUESTION 7

7.1	Name TWO functions of a maturation pond in a sewage-treatment process.		(2)
7.2	Give FOUR advantages of stabilisation ponds.		(4)
7.3	What is meant by the *valency* of an element?		(2)
7.4	What is the biggest cause of algae in an oxidation pond?		(2)
7.5	List FOUR types of zones in the self-purification of streams.	(4 × 2)	(8)
7.6	Name TWO properties of a well-digested sludge?		(2)
			[20]

TOTAL SECTION B: 80
GRAND TOTAL 100

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