



**higher education
& training**

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE

WATER TREATMENT PRACTICE N3

(8120033)

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

Nonprogrammable calculators may be used.

This question paper consists of 4 pages and 1 periodic table.

118Q1E2327

DEPARTMENT OF HIGHER EDUCATION AND TRAINING
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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. Use only a black or blue pen.
 5. Sketches should be clear, neat and labelled. A pencil may be used.
 6. Write neatly and legibly.
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QUESTION 1

Define the following terms:

- 1.1 Flocculation
- 1.2 Turbidity
- 1.3 Protozoa
- 1.4 Disinfection
- 1.5 Sedimentation



(5 × 2) **[10]**

QUESTION 2

- 2.1 Name three main properties of water with respect to hydraulics. (3)
- 2.2 Pumps are machines that allow transport and movement of fluid.
 - 2.2.1 State FOUR ways in which pumps cause the transport and movement of fluid. (4)
 - 2.2.2 Name SIX types of pump. (6)
- 2.3 Draw a neat, labelled sketch to illustrate a pressure relief valve in the open position. (5)
- 2.4 Describe the purpose and functioning of a globe valve. (2)



[20]

QUESTION 3

- 3.1 Complete and balance the following chemical reactions:



- 3.1.1 $\text{Al}_2(\text{SO}_4)_3 + \text{Ca}(\text{HCO}_3)_2 \longrightarrow$ (4)
- 3.1.2 $\text{MgCO}_3 + \text{Ca}(\text{OH})_2 \longrightarrow$ (2)
- 3.1.3 $\text{CaSO}_4 + \text{Na}_2\text{CO}_3 \longrightarrow$ (2)
- 3.1.4 $\text{NH}_3 + \text{HOCL} \longrightarrow$ (2)
- 3.1.5 $\text{Ca}(\text{HCO}_3)_2 \xrightarrow{\text{boil}}$ (3)

- 3.2 A reservoir has a diameter of 60 metres and a height of 14 metres.

Determine the capacity of the reservoir in litres. (4)

- 3.3 A stone weighing 500 g is placed in a 1 000 ml measuring cylinder containing 320 ml of water. The water level now rises to 600 ml.



Determine the relative density of the stone.

(3)
[20]

QUESTION 4

- 4.1 State THREE sources of surface runoff. (3)
- 4.2 Name FOUR gases and state the reaction of each to the impurities found in water. (4 × 2) (8)
- 4.3 Name THREE layers formed in water during summer conditions. (3)
- 4.4 Briefly describe the common sequence of the process followed when removing iron and manganese during the oxidation of potassium permanganate. (3)
- 4.5 Name FOUR types of sedimentation tanks. (4)
- 4.6 Name FOUR processes which occur within filter media during filtration. (4)

[25]



QUESTION 5

- 5.1 There are various methods of corrosion control applied in water purification as part of the purification process.
Name three methods to remove substances causing corrosion and briefly explain how each is applied in corrosion control. (3 × 2) (6)
- 5.2 Draw a neat, labelled sketch to illustrate the break-point chlorination curve. (10)
- 5.3 Name TWO methods of applying cathodic protection to metal when it comes into contact with soil or water. (2)
- 5.4 Write down the formula to calculate stability (Ryznar index). (2)
- 5.5 Name FOUR colours found in colour coding for rapid identification of different machinery and machine parts. (4)
- 5.6 Name ONE type of protective clothing used by workers in a workshop or plant. (1)



(1)
[25]

TOTAL: 100

TABLE 3: THE PERIODIC TABLE OF ELEMENTS
TABEL 3: DIE PERIODIEKE TABEL VAN ELEMENTE

1 (I)	2 (II)	3	4	5	6	7	8	9	10	11	12	13 (III)	14 (IV)	15 (V)	16 (VI)	17 (VII)	18 (VIII)
1 H 1 2,1																	2 He 4
3 Li 7 1,0	4 Be 9 1,5											5 B 11 2,0	6 C 12 2,5	7 N 14 3,0	8 O 16 3,5	9 F 19 4,0	10 Ne 20
11 Na 23 0,9	12 Mg 24 1,2											13 Al 27 1,5	14 Si 28 1,8	15 P 31 2,1	16 S 32 2,5	17 Cl 35,5 3,0	18 Ar 40
19 K 39 0,8	20 Ca 40 1,0	21 Sc 45 1,3	22 Ti 48 1,5	23 V 51 1,6	24 Cr 52 1,6	25 Mn 55 1,5	26 Fe 56 1,8	27 Co 59 1,8	28 Ni 59 1,8	29 Cu 63,5 1,9	30 Zn 65 1,6	31 Ga 70 1,6	32 Ge 73 1,8	33 As 75 2,0	34 Se 79 2,4	35 Br 80 2,8	36 Kr 84
37 Rb 86 0,8	38 Sr 88 1,0	39 Y 89 1,2	40 Zr 91 1,4	41 Nb 92 1,6	42 Mo 96 1,8	43 Tc 96 1,9	44 Ru 101 2,2	45 Rh 103 2,2	46 Pd 106 2,2	47 Ag 108 1,9	48 Cd 112 1,7	49 In 115 1,7	50 Sn 119 1,8	51 Sb 122 1,9	52 Te 128 2,1	53 I 127 2,5	54 Xe 131
55 Cs 133 0,7	56 Ba 137 0,9	57 La 139	72 Hf 179 1,6	73 Ta 181	74 W 184	75 Re 186	76 Os 190	77 Ir 192	78 Pt 195	79 Au 197	80 Hg 201	81 Tl 204 1,8	82 Pb 207 1,8	83 Bi 209 1,9	84 Po 209	85 At 210	86 Rn 222
87 Fr 223 0,7	88 Ra 226 0,9	89 Ac															
58 Ce 140	59 Pr 141	60 Nd 144	61 Pm	62 Sm 150	63 Eu 152	64 Gd 157	65 Tb 159	66 Dy 163	67 Ho 165	68 Er 167	69 Tm 169	70 Yb 173	71 Lu 175				
90 Th 232	91 Pa	92 U 238	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr				

KEY/SLEUTEL

Atomic number
AtoomgetalElectronegativity
ElektronegatiwiteitSymbol
SimboolApproximate relative atomic mass
Benaderde relatiewe atoommassa