higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

T1770**(E)**(A3)T

NATIONAL CERTIFICATE

WATER TREATMENT PRACTICE N3

(8120033)

3 April 2019 (X-Paper)
09:00–12:00

Nonprogrammable calculators may be used.

This question paper consists of 5 pages and 1 periodic table.

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DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE
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. 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 (1.1–1.10) in the ANSWER BOOK.

1.1 Chlorination is any device that is used to add chlorine to water.

1.2 The purpose of softening water is to convert non-settleable particles into settleable particles.

1.3 Corrosion is electro-chemical in nature.

1.4 Post-chlorination involves the chlorination of the final purified water.

1.5 The chemical formula of carbon monoxide is CO.

1.6 Sterilisation is the destruction of only harmful micro-organisms.

1.7 Magnesium sulphate is a temporary hardness present in water.

1.8 Apparent colour is measured once the turbidity has been removed from water.

1.9 Protozoa are much larger than bacteria and their identification is usually microscopic.

1.10 Floccotan is a brown organic liquid made from wattle bark extract.

(10 × 1) **[10]**

QUESTION 2

2.1 Write down the chemical formula for each of the following compounds:

2.1.1 Slaked lime

2.1.2 Soda ash

2.1.3 Calcium carbonate

2.1.4 Magnesium bicarbonate

2.1.5 Magnesium hydroxide

2.1.6 Sulphurous acid

2.1.7 Ferric chloride

2.1.8 Hypochlorous acid

2.1.9 Chlorine gas

2.1.10 Rust (ferric oxide)

(10 × 1) (10)

2.2 Name TEN uses of water as stipulated in the National Water Act (No. 36 of 1998). (10)
[20]

QUESTION 3

3.1 Specify if the problem associated with each of the following substances in drinking water is PHYSICAL, CHEMICAL or TOXIC. Choose the answer and write only 'Physical' or 'Chemical' or 'Toxic' next to the question number (3.1.1–3.1.5) in the ANSWER BOOK.

3.1.1 Iron

3.1.2 Turbidity

3.1.3 pH

3.1.4 Electrical conductivity

3.1.5 Fluoride

(5 × 1) (5)

3.2 Name TWO methods used to eliminate or remove algae from water. (2)

3.3 List THREE general types of coagulant aids. (3)

3.4 What observations could lead to the identification of pollution in surface water? (5)

3.5 Give the atomic number of the following elements:

3.5.1 Magnesium

3.5.2 Phosphorus

3.5.3 Beryllium

3.5.4 Argon

3.5.5 Neon

(5 × 1) (5)
[20]

QUESTION 4

4.1 The excess lime process is when slaked lime is produced on-site by burning limestone in kilns.

Give the reaction for this process. (3)

4.2 List SIX factors that may jeopardize the sedimentation process. (6)

4.3 Sedimentation is one of the most important processes in the treatment of water, as it decreases loading on filtration and other treatment processes.

4.3.1 What is sedimentation?

4.3.2 Name TWO types of sedimentation tanks based on the methods of operation.

(2 × 2) (4)

4.4 Explain FIVE advantages of a slow sand filter. (5)

4.5 State THREE important reasons for removing turbidity. (3)

4.6 In what THREE major stage of the filtration process most operating problems appear? (3)

[24]

QUESTION 5

5.1 What is the difference between *disinfection* and *sterilisation*? (2)

5.2 Use a sketch to describe the breakpoint chlorination curve. (10)

5.3 Name THREE methods of chlorination. (3)

[15]

QUESTION 6

6.1 The total daily inflow to a water purification plant is 14 000 m^3. The suspended solid concentration after adding chemicals is 60 mg/l and the suspended solid concentration of the settled sludge is 450 mg/l.

Determine the expected volume in cm^3 of the sludge extracted daily. (5)

6.2 Give the formula to calculate the PHs (stability of water). (2)

6.3 Give a balanced chemical reaction for magnesium carbonate and calcium hydroxide. (4)

[11]

TOTAL: 100

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PERIODIC TABLE

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

KEY/*SLEUTEL*

Atomic number / *Atoomgetal*

Symbol / *Simbool*

29 Cu 63,5

Electronegativity / *Elektronegatiwiteit* 1,9

Approximate relative atomic mass / *Benaderde relatiewe atoommassa*

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 (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 (2,0)	85 At (2,5)	86 Rn
87 Fr (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

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