higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

T1770**(E)**(J30)T

NATIONAL CERTIFICATE

WATER TREATMENT PRACTICE N3

(8120033)

30 July 2018 (X-Paper)
09:00–12:00

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.
5. **Calculators may be used.**

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QUESTION 1

1.1 Indicate whether the following statements are TRUE or FALSE. Choose the answer and write only 'True' or 'False' next to the question number (1.1.1–1.1.10) in the ANSWER BOOK.

1.1.1 Breakpoint is the point at which a chlorine dosage has satisfied the chlorine demand.

1.1.2 Disinfection is the water treatment process that kills disease-causing organisms in water, usually by adding chlorine.

1.1.3 Jar tests are laboratory procedures used to evaluate coagulation, flocculation and sedimentation processes and to estimate a proper coagulant dose.

1.1.4 Apparent colour is measured in the presence of turbidity in water.

1.1.5 The chemical formula of lime is Na_3CO_3.

1.1.6 Sterilisation is the destruction of only harmful microorganisms.

1.1.7 Hypochlorous acid is a strong acid.

1.1.8 Prechlorination is used to control algal growth and slime organisms in a plant.

1.1.9 If the Langelier index is positive, the water has scale-forming properties.

1.1.10 Flow measurement calculates detention times.

(10 × 1) (10)

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1.2 Choose a term from COLUMN B that matches a term in COLUMN A. Write only the letter (A–J) next to the question number (1.2.1–1.2.10) in the ANSWER BOOK.

COLUMN A		COLUMN B	
1.2.1	Algae	A	NaOH
1.2.2	Turbidity	B	protozoa
1.2.3	Slaked lime	C	disinfection
1.2.4	Caustic soda	D	suspended matter
1.2.5	Microorganisms	E	sulphuric acid
1.2.6	Ammonia	F	ferric oxide
1.2.7	Acid	G	calcium hydroxide
1.2.8	Dechlorination	H	sand traps
1.2.9	Rust	I	ammonium
1.2.10	Presedimentation	J	measured in NTU

(10 × 1) (10)
[20]

QUESTION 2

2.1 Calculate the molecular mass of each of the following compounds:

2.1.1 Sodium sulphate

2.1.2 Calcium chloride

2.1.3 Hypochlorous acid

2.1.4 Copper sulphate

(4 × 3) (12)

2.2 Write and balance the chemical reactions of each of the following:

2.2.1 Iron is oxidised to form rust. (4)

2.2.2 Magnesium bicarbonate reacts with lime. (5)

2.3 Determine the capacity of a reservoir with a diameter of 30 metres and a height of 9 metres. (4)
[25]

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QUESTION 3

3.1 Describe the different types of salt found in these types of water:

3.1.1 Soft water (2)

3.1.2 Brackish water (3)

3.1.3 Buffer capacity (4)

3.2 Differentiate between the presence of magnesium sulphate and sodium chloride in drinking water with the emphasis on the medical consequences if these compounds exist in high concentrations. (8)

3.3 Industries use different colours for safety identification.

Give the meaning of each of the following colours:

3.3.1 Red

3.3.2 Yellow

3.3.3 Green

3.3.4 Light orange

(4 × 1) (4)

3.4 List SIX toxic substances found in polluted/contaminated water. (6)

3.5 What is the purpose of sedimentation? (3)

[30]

QUESTION 4

4.1 Explain the most apparent disadvantages of pressure filters when compared to rapid-gravity filters. (6)

4.2 Differentiate between *DPD* and *orthotolidine* methods. (4)

4.3 Explain, by using reactions, the difference between *free residual chlorine* and *chlorine gas.* (8)

4.4 Explain how chlorine gas leakages are detected. (4)

4.5 List THREE records to keep during chlorination or disinfection. (3)

[25]

TOTAL: 100

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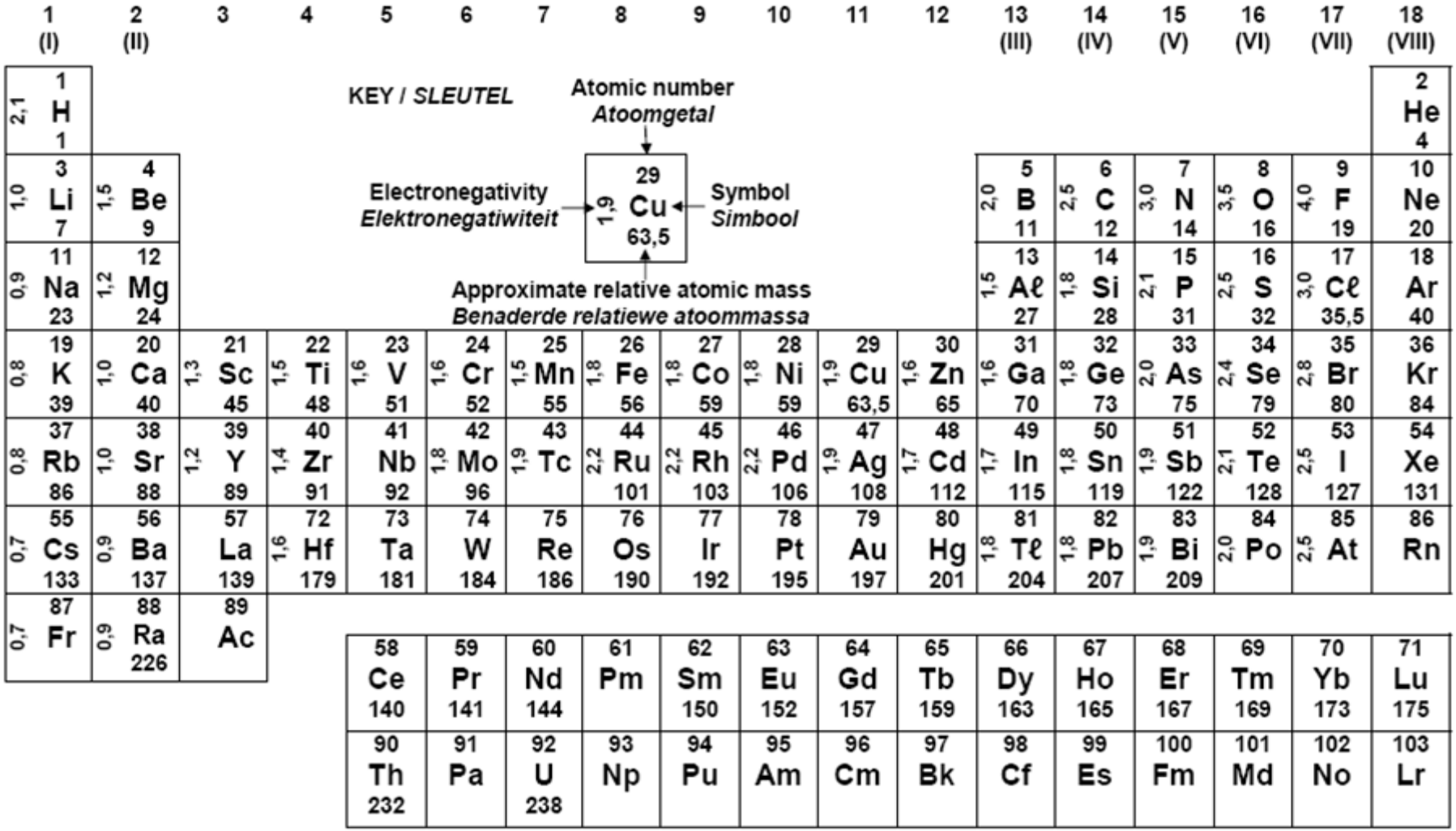
WATER TREATMENT PRACTICE N3

PERIODIC TABLE OF ELEMENTS



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)
2,1 H 1																	2 He 4
1,0 Li 3 7	1,5 Be 4 9											2,0 B 5 11	2,5 C 6 12	3,0 N 7 14	3,5 O 8 16	4,0 F 9 19	Ne 10 20
0,9 Na 11 23	1,2 Mg 12 24											1,5 Aℓ 13 27	1,8 Si 14 28	2,1 P 15 31	2,5 S 16 32	3,0 Cℓ 17 35,5	Ar 18 40
0,8 K 19 39	1,0 Ca 20 40	1,3 Sc 21 45	1,5 Ti 22 48	1,6 V 23 51	1,6 Cr 24 52	1,5 Mn 25 55	1,8 Fe 26 56	1,8 Co 27 59	1,8 Ni 28 59	1,9 Cu 29 63,5	1,6 Zn 30 65	1,6 Ga 31 70	1,8 Ge 32 73	2,0 As 33 75	2,4 Se 34 79	2,8 Br 35 80	Kr 36 84
0,8 Rb 37 86	1,0 Sr 38 88	1,2 Y 39 89	1,4 Zr 40 91	Nb 41 92	1,8 Mo 42 96	1,9 Tc 43	2,2 Ru 44 101	2,2 Rh 45 103	2,2 Pd 46 106	1,9 Ag 47 108	1,7 Cd 48 112	1,7 In 49 115	1,8 Sn 50 119	1,9 Sb 51 122	2,1 Te 52 128	2,5 I 53 127	Xe 54 131
0,7 Cs 55 133	0,9 Ba 56 137	La 57 139	1,6 Hf 72 179	Ta 73 181	W 74 184	Re 75 186	Os 76 190	Ir 77 192	Pt 78 195	Au 79 197	Hg 80 201	1,8 Tℓ 81 204	1,8 Pb 82 207	1,9 Bi 83 209	2,0 Po 84	2,5 At 85	Rn 86
0,7 Fr 87	0,9 Ra 88 226	Ac 89															

Ce 58 140	Pr 59 141	Nd 60 144	Pm 61	Sm 62 150	Eu 63 152	Gd 64 157	Tb 65 159	Dy 66 163	Ho 67 165	Er 68 167	Tm 69 169	Yb 70 173	Lu 71 175
Th 90 232	Pa 91	U 92 238	Np 93	Pu 94	Am 95	Cm 96	Bk 97	Cf 98	Es 99	Fm 100	Md 101	No 102	Lr 103

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