higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

PHYSICAL SCIENCE
(Second Paper)
NQF LEVEL 2

(10021002)

28 November 2018 (X-Paper)
09:00–12:00

A nonprogrammable calculator and drawing instruments may be used.

This question paper consists of 9 pages and 1 periodic table.

NCV

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TIME: 3 HOURS
MARKS: 150

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. Round off ALL answers to TWO decimals.
5. Show formulae and substitutions in ALL calculations.
6. Write neatly and legibly.

NCV

SECTION A

QUESTION 1

Give ONE term for each of the following descriptions. Write only the term next to the question number (1.1–1.5) in the ANSWER BOOK.

1.1 A substance containing one kind of atom

1.2 Instrument used to measure temperature

1.3 Pollutant gas which causes water to become acidic

1.4 Property of material that allows electricity to pass through

1.5 Chemical compound used to remove permanent hardness in water

(5 × 1) **[5]**

QUESTION 2

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

COLUMN A		COLUMN B	
2.1	Eutrophication	A	anaerobic microorganism
2.2	Noble gas	B	when a body of water becomes enriched with minerals and nutrients that induce excessive growth of plants and algae
2.3	Radiation		
2.4	Vinegar	C	heat moving in a different direction
2.5	Algae	D	can be used in a kettle to remove mineral deposits from the element
		E	argon
		F	heat energy given off in waves by a substance
		G	aerobic microorganism
		H	hydrogen

(5 × 1) **[5]**

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QUESTION 3

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

3.1 The atomic mass of sodium is 23 amu.

3.2 An electrolyte is a solution that allows electricity to pass through it.

3.3 Water does not dissolve in many solutes.

3.4 Sulphur dioxide is an example of an element.

3.5 Aerosol is a chemical substance that is poured onto soil to help make plants grow.

(5 × 2) **[10]**

QUESTION 4

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 (4.1–4.5) in the ANSWER BOOK.

4.1 Sodium, potassium and lithium are known as …

A alkali metals.
B indicators.
C acids.
D alkali earth metals.

4.2 Carbon dioxide reacts with water to form …

A carbon.
B carbonic acid.
C carbon monoxide.
D carbon dioxide.

4.3 The combined mass of water found on, under, and above the earth surface:

A Lithosphere
B Atmosphere
C Hydrosphere
D Biosphere

4.4 While ice is melting…

A its temperature drops
B its temperature increases
C its temperature remains unchanged
D it gives off heat

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4.5 A method of separating mixtures of different liquids based on their boiling points:

A Fractional distillation
B Chromatography
C Precipitation
D Filtration

(5 × 3) **[15]**

TOTAL SECTION A: 35

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SECTION B

QUESTION 5: MATTER AND MATERIALS

5.1 Matter can be regarded as anything that occupies space and possesses mass. Scientists discovered matter, how it is made up of particles and how the behaviour of these particles affects the phases of matter.

Using the idea of the behaviour of particles in different phases of matter, explain why:

5.1.1 A liquid can be poured while a solid cannot be poured

5.1.2 A gas will completely fill any container

5.1.3 A solid expands when it is heated

(3 × 3) (9)

5.2 Name TWO macroscopic properties used to classify materials. (2)

5.3 The table below shows the densities of some common materials.

MATERIAL	DENSITY (g/cm^3)
Wood	0,7
Water	1,0
Sugar	1,6
Gold	19,3
Styrofoam	0,1

5.3.1 Which of the materials listed in the table will float in water? (2)

5.3.2 Which of the materials listed in the table will drop in water? (2)

5.4 The density of water is 1 000 kg/m^3.

Calculate the mass of water with a volume of 12 m^3. (4)

[19]

QUESTION 6: MATTER AND MATERIALS

6.1 Define each of the following terms:

6.1.1 Atomic mass

6.1.2 Compound

(2 × 2) (4)

6.2 Radio-isotopes have important applications in chemistry.

6.2.1 Define the term *isotopes* and give an example. (4)

6.2.2 Give THREE uses of radio-isotopes. (3)

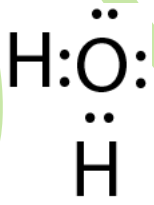
6.3 All atoms in the table below are neutral.

Complete the table by writing only the answer next to the question number (6.3.1– 6.3.5) in the ANSWER BOOK.

ATOM (ELEMENT)	SYMBOL	NUMBER OF NEUTRONS	NUMBER OF PROTONS	NUMBER OF VALENCE ELECTRONS
6.3.1	$^{19}_{9}F$	6.3.2	9	6.3.3
Nitrogen	6.3.4	14	6.3.5	6.3.6

(6 × 1) (6)

6.4 The Lewis structure of a water molecule can be represented as follows:



6.4.1 Give the valence number of hydrogen. (1)

6.4.2 Give the electron configuration of an oxygen atom in s-p notation. (2)

6.4.3 Draw the Bohr (energy-level) diagram of oxygen. (4)

6.4.4 Is water ionic or covalent? (1)

6.4.5 Describe the bonds formed between oxygen and hydrogen in the water molecule. (3)

[28]

QUESTION 7: CHEMICAL CHANGE

7.1 Oxygen boils at -183 °C.

What is this temperature o the kelvin scale? (2)

7.2 Define *specific heat capacity*. (2)

7.3 The temperature of 6 kg water was raised by 50 °C .

Calculate the amount of heat required to raise this temperature if its specific heat capacity is 4 187 J/kg°C. (4)

7.4 Differentiate between *physical change* and *chemical change* and give ONE example of each.

(2 × 3) (6)

[14]

QUESTION 8: CHEMICAL CHANGE

8.1 Define the term *ion*. (2)

8.2 Write down the chemical formula of each of the following:

8.2.1 Calcium hydroxide

8.2.2 Sodium carbonate

(2 × 2) (4)

8.3 Write down the names of each of the following compounds:

8.3.1 HNO_3

8.3.2 $Ca(OH)_2$

(2 × 2) (4)

8.4 Write a balanced chemical equation for each of the following chemical reactions:

8.4.1 $SO_2 + O_2 \longrightarrow SO_3$ (3)

8.4.2 $Zn + HC\ell \longrightarrow \ldots + \ldots$ (5)

8.5 Define a *displacement reaction*. (2)

8.6 Calculate the formula mass of each of the following:

8.6.1 CH_3COOH

8.6.2 $Mg(NO_3)_2$

(2 × 4) (8)

8.7 Calculate the mass of each of the following in grams:

8.7.1 1,5 moles of $CuSO_4$

8.7.2 0,5 moles of $MgCO_3$

(2 × 3) (6)
[34]

QUESTION 9: CHEMICAL SYSTEMS AND INDUSTRY

9.1 Every municipality builds dams to store water and water treatment plants to produce drinkable water for the community.

9.1.1 Name TWO impurities that may be in the water from the dam. (2)

9.1.2 How do municipalities ensure that there are no harmful bacteria in the water which may cause diseases? (2)

9.1.3 Name TWO diseases that may be found in water. (2)

9.2 List the FOUR steps in a municipality tap-water treatment process.

(4 × 2) (8)

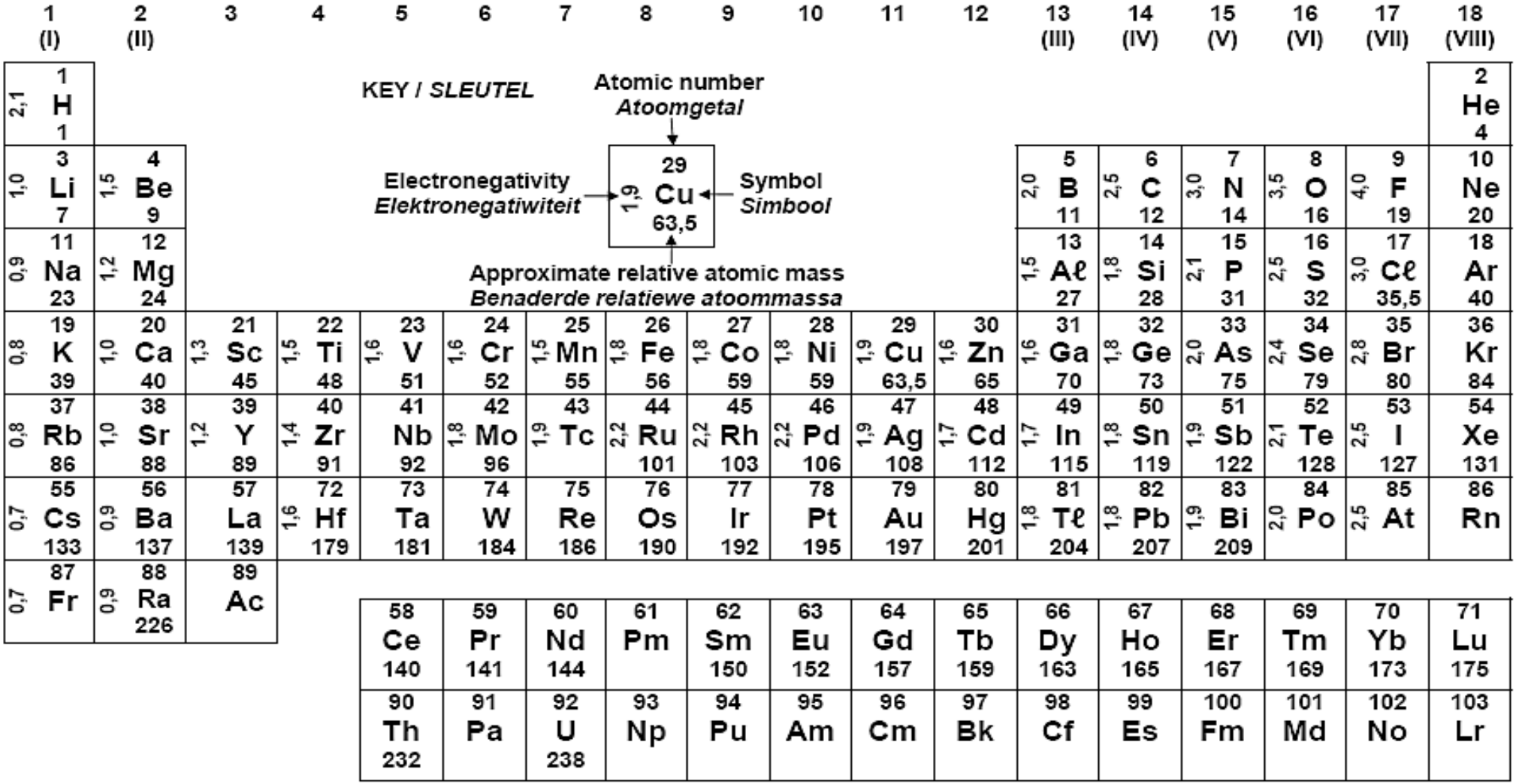
9.3 Give THREE advantages of hard water. (6)
[20]

TOTAL SECTION B: 115
GRAND TOTAL: 150

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PERIODIC TABLE

THE PERIODIC TABLE OF ELEMENTS
DIE PERIODIEKE TABEL VAN ELEMENTE



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