higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

PHYSICAL SCIENCE
(Second Paper)
NQF LEVEL 2

(10021002)

15 March 2018 (X-Paper)
09:00–12:00

Nonprogrammable calculators and drawing instruments may be used.

This question paper consists of 8 pages and 1 periodic table.

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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. Sketches must be large, neat and fully labelled.
5. Show formulae and substitutions in ALL calculations.
6. Round off ALL answers to TWO decimals.
7. Write neatly and legibly.

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SECTION A

QUESTION 1

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

1.1 A property of a material that allows electricity to pass through

1.2 The reaction between an alkali and an acid

1.3 A solution that can conduct electricity

1.4 The process by which something is destroyed progressively through chemical reaction

1.5 Smallest particle of elements that can participate in any chemical reaction

(5 × 1) **[5]**

QUESTION 2

Choose a term from COLUMN B that matches a description 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	An example of a heterogeneous mixture	A	hydrogen gas
2.2	A chemical found in hard water	B	helium
2.3	A diatomic molecule	C	base
2.4	Material that dissolves in water to give a pH < 7	D	carbon dioxide
2.5	An element which is a noble gas	E	glucose
		F	calcium ion
		G	sand
		H	acid

(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 A mixture of sand and salt can be separated by adding the sand and salt to water, followed by filtration and evaporation.

3.2 Transpiration is the process of losing water through tiny pores in the leaves of plants.

3.3 Core electrons are found in the last occupied energy level.

3.4 A mole is the amount of a particular substance that contains the same number of atoms in 12 g of carbon-12.

3.5 Chromatography is a method of separating small quantities of substances that are in mixture form.

(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 Elements in the same group have the same number of …

A electrons.
B protons.
C neutrons.
D valence electrons.

4.2 Filtration techniques are used to separate a/an …

A heterogeneous mixture.
B immiscible liquid.
C salt solution.
D solvent.

4.3 The common name of NaCl:

A Caustic Soda
B Baking soda
C Table Salt
D Washing soda

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4.4 Which ONE of the following elements is a non-metals?

A Calcium
B Chlorine
C Magnesium
D Sodium

4.5 A soft thick mud, especially at the bottom of a liquid:

A Sterilise
B Screen
C Sand filters
D Sludge

(5 × 3) **[15]**

TOTAL SECTION A: 35

SECTION B

QUESTION 5: MATTER AND MATERIALS

5.1 Define the following terms:

5.1.1 Matter

5.1.2 Element

(2 × 2) (4)

5.2 Describe the properties of each phase of matter and give ONE example of each. (3 x 3) (9)

5.3 Complete the following sentences by using the words in the list below. Write only the missing word or words next to the question number (5.3.1–5.3.3) in the ANSWER BOOK.

solid; liquid; gas

5.3.1 A … takes on the shape of the container and has its own volume.

5.3.2 A … has its own shape and volume.

5.3.3 A … takes on the shape and volume of the container.

(3 × 1) (3)

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5.4. Complete the following displacement reactions in words:

5.4.1 Sodium + water → (3)

5.4.2 Magnesium + oxygen → (2)

[21]

QUESTION 6: MATTER AND MATERIALS

6.1 Name the THREE parts an atom consists of and indicate their charges. (3 × 2) (6)

6.2 An atom of an element has the electron configuration $1s^2s^2\ 2p^6\ 3s^2$.

6.2.1 Identify the element. (1)

6.2.2 Does the atom gain or lose the electron to form an ion? (1)

6.2.3 How many valence electrons can be found in a neutral atom of this element? (1)

6.2.4 What is the atomic number of this element? (1)

6.2.5 What is the mass number of this element? (1)

6.3 Radioactive isotopes are very useful in medicine for the treatment of cancer.

6.3.1 Define the term *isotopes.* (2)

6.3.2 Explain the differences between the following hydrogen isotopes:

$^1H_1$, $^2H_1$, $^3H_1$ (3)

6.4 Explain the difference between *ionic* and *covalent* bonding. (2 x 2) (4)

6.5 $Ca(OH)_{2(aq)} + CO_{2(aq)} \rightarrow CaCO_{3(s)} + H_2O_{(l)}$

6.5.1 Give the correct chemical name for each substance in the above reaction. (4)

6.5.2 Give the common name for $Ca(OH)_{2(aq)}$ and $CaCO_3$ respectively. (2)

6.5.3 Is the $CaCO_3$ and H_2O mixture that is formed homogeneous or heterogeneous? (1)

[27]

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QUESTION 7: CHEMICAL CHANGE

7.1 State THREE ways in which heat is transferred through objects. (3)

7.2 Name THREE effects of heat on a substance. (3)

7.3 Read the table of the specific heat capacities of some common substances given below.

Substance	Specific heat capacity (kJ/kg °C)
Water	4,187
Alcohol	2,93
Mercury	140
Silver	240
Aluminium	908

400 g of hot alcohol at a temperature of 40 °C is added to another volume of alcohol at a temperature of 5 °C. The final temperature of the mixture is 12,5 °C.

Calculate the mass of the cold alcohol. (6)

7.4 Convert the following:

7.4.1 229 K to °C

7.4.2 -10 °C to K

(2 × 2) (4)

7.5 Differentiate between *heat* and *temperature* and state the units of each.

(2 × 2) (4)

[20]

QUESTION 8: CHEMICAL CHANGE

8.1 Define the following terms:

8.1.1 Neutralisation

8.1.2 pH-scale

(2 × 2) (4)

8.2 In a fire extinguisher a plunger, when struck, breaks a glass vial that contains H_2SO_4. The acid comes into contact with Na_2CO_3.

8.2.1 Write a balanced equation for the reaction which takes place between the acid and the carbonate after the plunger has been struck. (5)

8.2.2 Explain why the above reaction is able to extinguish a fire. (2)

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8.3 Calculate the formula mass of the following compounds:

8.3.1 $(NH_4)_2SO_4$ (3)

8.3.2 KCℓ (2)

8.4 Name THREE physical properties of a base. (3)

8.5 Calculate the concentration of NaOH in 250 cm^3 solution. (5)
[24]

QUESTION 9: CHEMICAL SYSTEM AND INDUSTRY

9.1 Explain the water cycle. (6)

9.2 Define the term *pollution.* (3)

9.3 Water can be made permanently hard.

9.3.1 Give TWO substances that can make water permanently hard. (2)

9.3.2 Explain how permanent hardness can be removed. (2)

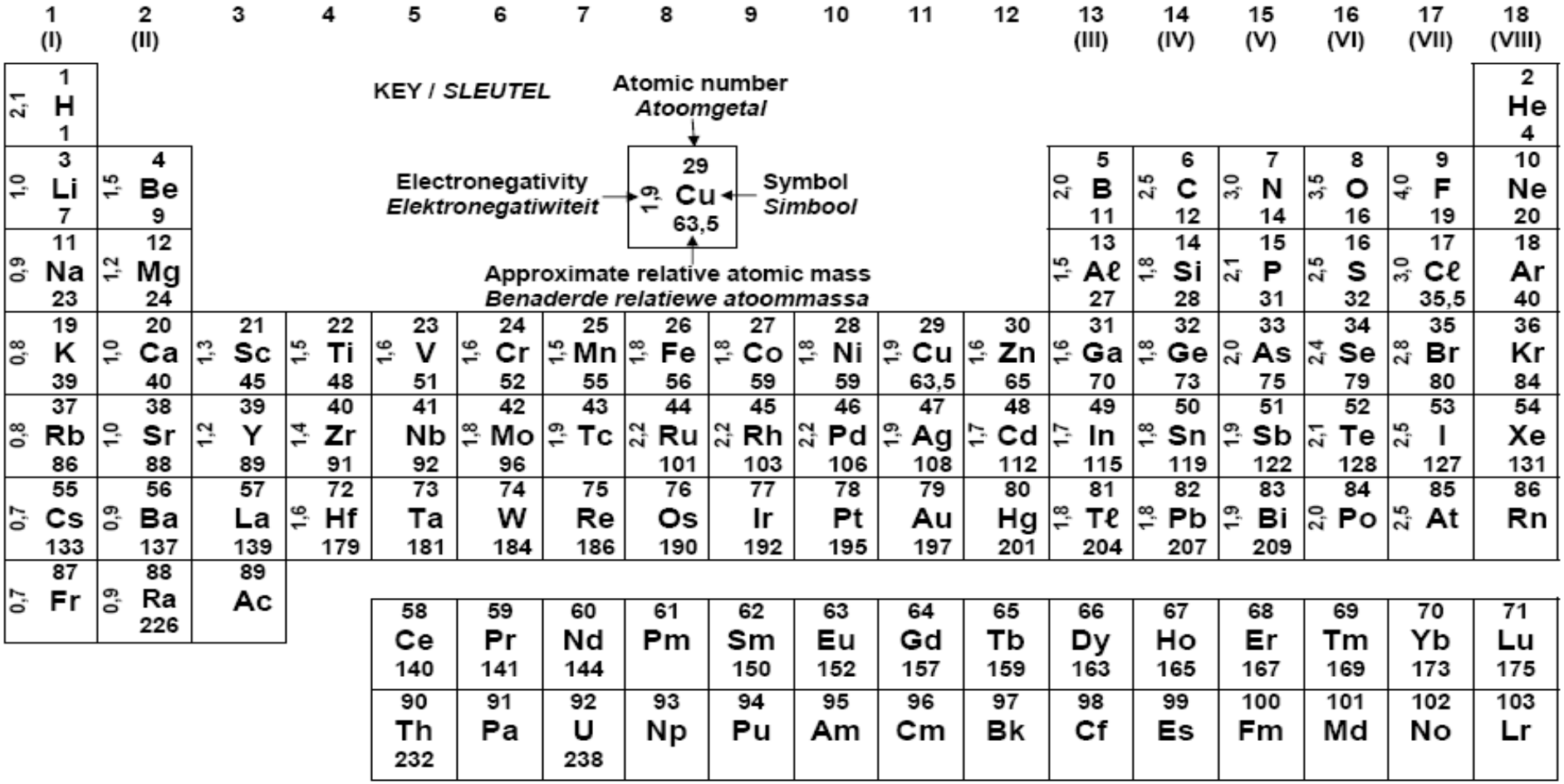
9.4 Name THREE effects of hard water. (3 × 2) (6)

9.5 Differentiate between *purification* and *softening* of water. (2 × 2) (4)
[23]

TOTAL SECTION B: 115
GRAND TOTAL: 150

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THE PERIODIC TABLE OF ELEMENTS
DIE PERIODIEKE TABEL VAN ELEMENTE



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