higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

PHYSICAL SCIENCE
(Second Paper)
NQF LEVEL 2

(10021002)

16 March 2020 (Y-Paper)
13:00–16:00

A nonprogrammable calculator may be used.

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

583Q2S2016

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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.

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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 They describe the behaviour of an electron in an atom or where an electron is likely to be found

1.2 Name of group of elements that are found in group VII of the periodic table

1.3 The process where water changes into its three different phases in nature

1.4 A mixture of gas, solid or liquid that has the same proportions of its components throughout any given sample

1.5 The measure of the average kinetic energy of particles of a substance

(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 element found in period 2 of the periodic table	A	transpiration
2.2	An example of a weak acid	B	intermolecular forces
2.3	Type of mixture formed by oil and water	C	nitrogen
2.4	Process during which plants produce water vapour	D	sulphur
2.5	The forces which are broken during a physical change	E	homogeneous mixture
		F	intramolecular forces
		G	heterogeneous mixture
		H	vinegar

(5 × 2) **[10]**

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QUESTION 3

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

3.1 Viscosity refers to the measure of the resistance of a fluid to flow.

3.2 Core electrons are electrons in the outermost shell of an atom.

3.3 Specific heat capacity is the amount of heat required to raise the temperature of 1 kg of a substance by 1 $^{\circ}$C.

3.4 Heat is a form of energy and is measured in joules.

3.5 Nitrogen is a good example of a divalent element.

(5 × 1) **[5]**

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 The horizontal column of elements in the periodic table is known as …

A a period.
B a group.
C noble gasses.
D halogens.

4.2 A covalent bond always forms between a ...

A metal and a nonmetal.
B metal and metalloid.
C metal and a metal.
D nonmetal and a nonmetal.

4.3 The phase change that is opposite to evaporation is called …

A condensation.
B sublimation.
C precipitation.
D boiling.

4.4 The correct chemical formulae for ammonium sulphate and aluminium oxide are respectively …

A $(NH_4)_2SO_4$ and AlO.
B $(NH_4)_2SO_4$ and AlO_2.
C $NH_4\,SO_4$ and Al_2O_3.
D $(NH_4)_2SO_4$ and Al_2O_3.

4.5 The three phases of matter are …

A ice, liquid and water vapour.
B boiling point, freezing point and melting point.
C solid, liquid and gas.
D sublimation, condensation and evaporation.

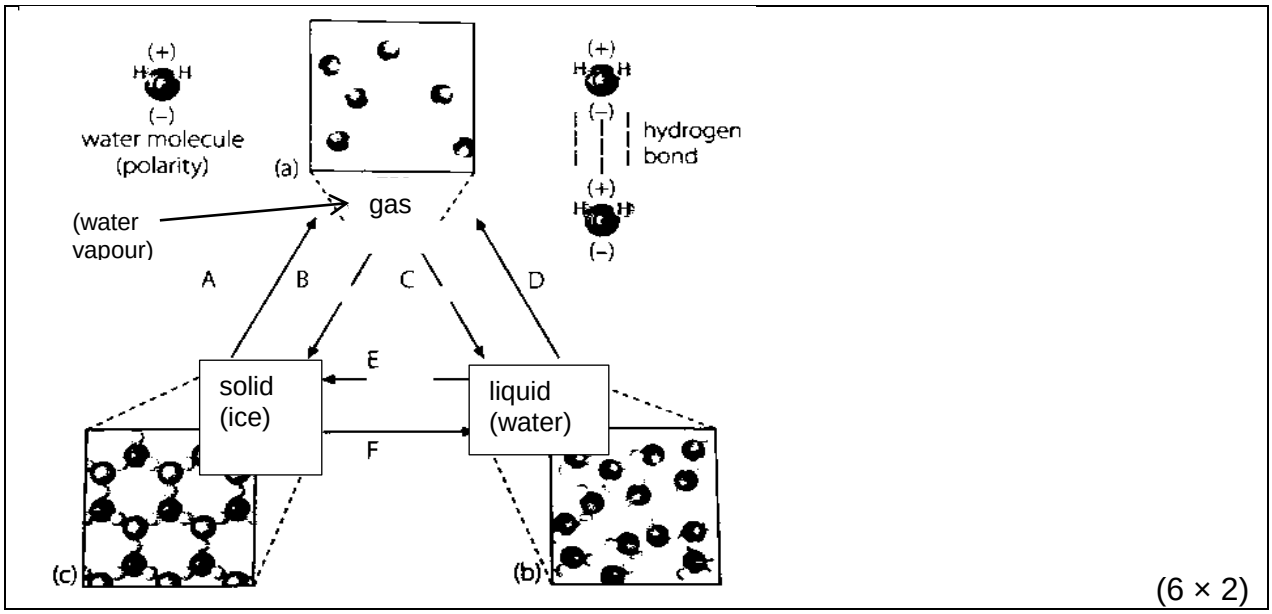
(5 × 3) **[15]**

TOTAL SECTION A: 35

SECTION B

QUESTION 5: MATTER AND MATERIALS

5.1 Name the processes indicated on the diagram by writing the answer next to the letter (A–F) in the ANSWER BOOK. For each answer write down if energy is absorbed or given off.



(6 × 2) (12)

5.2 Explain what happens if the processes named in QUESTION 5.1 changes with regards to the:

5.2.1 Original mass of the water

5.2.2 Shape of the original volume (2 × 1) (2)

5.3 Name the natural process in which water is purified. (1)

5.4 Explain the term the *relative density* of a substance. (2)

5.5 Calculate the density and relative density of a substance that has a mass of 4 200 kg and a volume of 5,2 m^3. (4)

[21]

QUESTION 6

6.1 Consider the following element with the following valence electrons:

A: $2s^2\ 2p^3$ B: $2s^1$ C: $2s^2\ 2p^5$ D: $2s^2\ 2p^2$ E: $2s^2\ 2p^6$

6.1.1 Name elements A and B. (2)

6.1.2 Write the letter (A–E) of the element that is a halogen. (1)

6.1.3 How many nucleons does element E have if its mass number is 20? (1)

6.1.4 What is the atomic number of element D? (1)

6.1.5 Write the letter of the element that is a noble gas. Explain why noble gases are inert or inactive. (3)

6.2 6.2.1 Which of the following is an isotope of $^{36}_{17}Cl$?

$^{35}_{17}Cl$, $^{37}_{16}Cl$,$^{38}_{16}Cl$, $^{16}_{37}Cl$ (1)

6.2.2 Give a reason for the answer to QUESTION 6.2.1. (3)

6.3 Define a *metallic bond.* (3)

6.4 State whether the bonds in each of the following substances are ionic, covalent or metallic:

6.4.1 Oxygen gas

6.4.2 Magnesium oxide

6.4.3 Iron

6.4.4 Ammonia

(4 × 1) (4)

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

6.5.1 Zinc(II) oxide

6.5.2 Potassium chloride

6.5.3 Water

6.5.4 Hydrogen peroxide

(4 × 1) (4)

[23]

QUESTION 7

7.1 State the *first law of thermodynamics*. (3)

7.2 Write brief explanatory notes on the following types of heat transfer:

7.2.1 Conduction

7.2.2 Radiation

7.2.3 Convection

(3 × 2) (6)

7.3 Temperature is a measure of how hot or cold a place or an object is.

7.3.1 Name the instrument used to measure temperature. (1)

7.3.2 Name THREE of these instruments mentioned in QUESTION 7.3.1. (3)

7.4 18 000 J are required to raise the temperature of 3 kg of a substance by 60 ^{o}C.

Calculate the specific heat capacity of the substance. (4)

7.5 A scented candle is lit. The wax on the inside around the wick melts. At the same time, the scent of potpourri vapours from aromatic crystals in the candle fills the air. Wax such as candle wax consists of quite large molecules in which C-atoms and H-atoms are covalently bonded.

7.5.1 Describe in terms of the kinetic molecular theory, the change which the molecules undergo when the candle wax is melting. (4)

7.5.2 Which energy change did the molecules undergo? (3)

[24]

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QUESTION 8

8.1 The mole is the basic unit used to indicate the amount of a substance.

Define the *mole* of a substance. (4)

8.2 Calculate the formula mass of the following:

8.2.1 Sodium sulphate

8.2.2 Potassium chloride

(2 × 3) (6)

8.3 Calculate the mass of 0,5 moles of $CaSO_4$. (3)

8.4 Calculate the concentration of the following:

8.4.1 30 g of magnesium chloride ($MgCl_2$) in 100 mℓ of solution

8.4.2 25 g of acetic acid (CH_3COOH) in 25 dm^3 of solution

(2 × 4) (8)

8.5 Write down chemical equations to show how the following acids ionise in water:

8.5.1 Sulphuric acid

8.5.2 Nitric acid

8.5.3 Hydrochloric acid

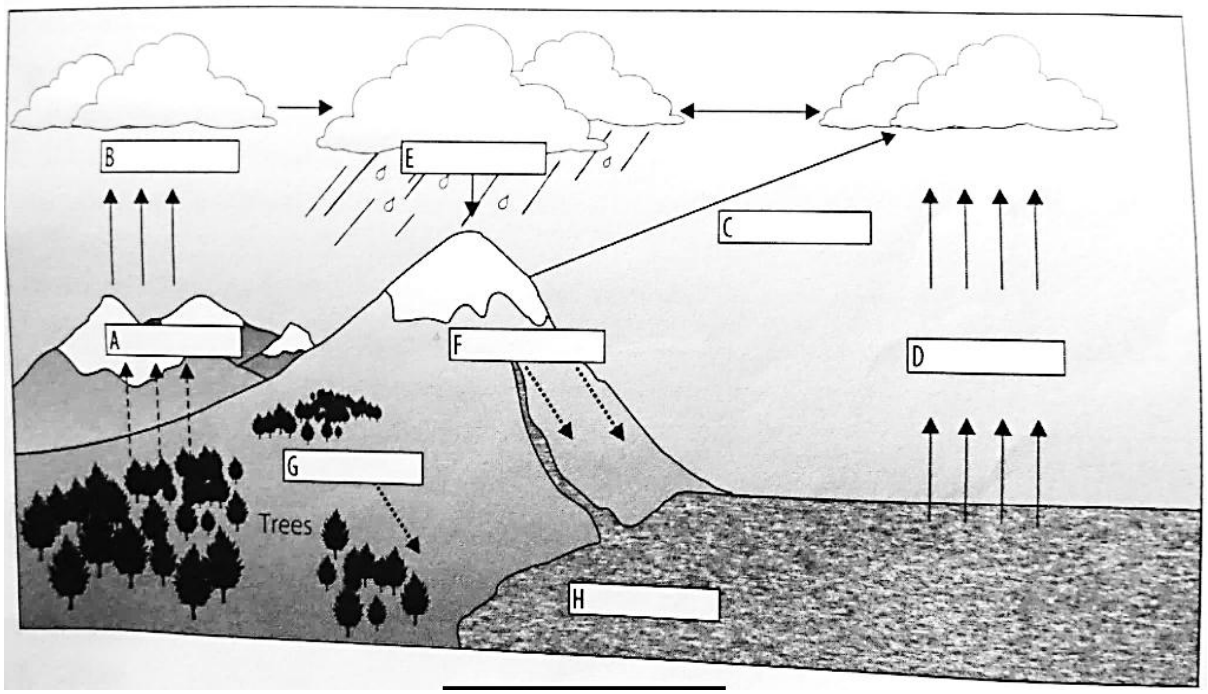
(3 × 2) (6)

[27]

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QUESTION 9

9.1 Name the water cycle as indicated in the diagram by writting the answer next to the letter (A–H) in the ANSWER BOOK.



(8)

9.2 Name TWO factors that will increase the rate of evaporation. (2)

9.3 State FOUR microscopic properties of water. (4)

9.4 Water bodies, such as lakes, dams, rivers, oceans and ground water, are contaminated due to the discharge of pollutants in the water bodies without any treatment to remove harmful compounds. Water pollution adversely affects not only aquatic plants and animals, but it also affects human beings and ecosystems.

9.4.1 Name FOUR major causes of water pollution. (4)

9.4.2 Give TWO chemical methods that can be used to purify polluted water bodies. (2)

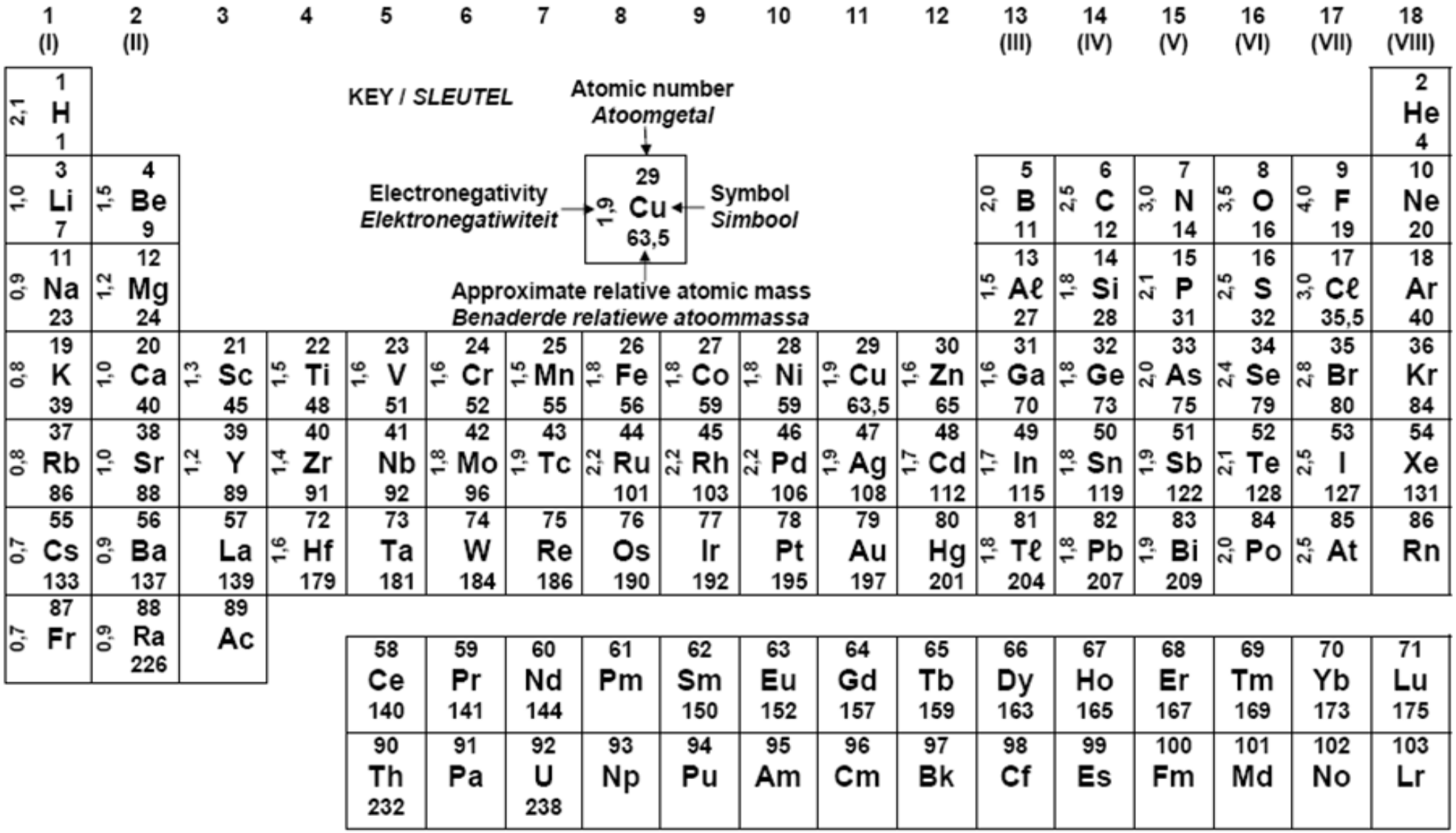
[20]

TOTAL SECTION B: 115
GRAND TOTAL: 150

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(10021002)

THE PERIODIC TABLE OF ELEMENTS
DIE PERIODIEKE TABEL VAN ELEMENTE



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