higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

PHYSICAL SCIENCE
(Second paper)
NQF LEVEL 2

(10021002)

9 December 2020 (X-paper)
09:00–12:00

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

467Q2N2009

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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. Show formulae and substitutions in all calculations.
5. Round off all final answers to TWO decimal places.
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 Material that dissolves in water to give a pH greater than 7

1.2 Non-metal that exists in nature in the form of a liquid at room temperature and pressure

1.3 Class of elements found on the right side of the periodic table

1.4 Phase of matter in which particles have the lowest density

1.5 Sphere responsible for earthquakes

(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	Separating funnel	A	changes energy from one form to another
2.2	Heat	B	substance that does not allow electrons to flow easily from one atom to another
2.3	Electrical insulator	C	transfer of heat through electromagnetic waves
2.4	Solute	D	element with properties between those of metals and solid nonmetals
2.5	Metalloid	E	equipment used to separate two immiscible liquids
		F	amount of substance dissolved in a liquid
		G	material that allows heat to pass through
		H	stable nonreactive gases

(5 × 1) **[5]**

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 Protons are negatively charged particles.

3.2 Chlorine destroys pathogenic micro-organisms.

3.3 Metal is a good conductor of heat and electricity.

3.4 Acids are insoluble in water.

3.5 The cooling of a gas until it changes into liquid is known as sublimation.

(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 An example of a thermal conductor:

A Plastic
B Nitrogen
C Iodine
D Mercury

4.2 Elements on the periodic table are arranged in order of …

A decreasing mass numbers.
B increasing atomic numbers.
C increasing atomic volumes.
D the ability to conduct electricity.

4.3 Which statement describes the liquid phase?

A It retains volume and conforms to the shape of a container.
B It does not retain volume but conforms to the shape of a container.
C It retains volume but does not conform to the shape of a container.
D It neither retains volume nor conforms to the shape of a container.

4.4 Which is NOT a way to test water quality?

A humidity
B dissolved oxygen
C pH
D salinity

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4.5 Which sphere near the surface of the earth contains water?

A Atmosphere
B Biosphere
C Geosphere
D Hydrosphere

(5 × 3) **[15]**

TOTAL SECTION A: 35

SECTION B

QUESTION 5

5.1 Look at the pictures below and answer the questions:



SUBSTANCE A



SUBSTANCE B

5.1.1 Explain the term *matter*. (2)

5.1.2 What will cause substance B to undergo a phase change? (2)

5.1.3 Name the natural process with which substance A is purified. (2)

5.1.4 Name the types of particles at A and B respectively and explain how they differ. (3 + 3) (6)

5.2 Use the table below to determine the unknown sample.

MATERIALS	DENSITY (in g/ cm^3)
Water	1,0
Aluminium	2,7
Iron	7,9
Silver	10,5
Gold	19,3

5.2.1 An unknown sample has a volume of 2 cm^3 and a mass of 38,6 g.

What is the density of the sample? (3)

5.2.2 Name the sample mentioned in QUESTION 5.2.1. (1)

5.2.3 Name TWO physical properties that could be used to identify this sample. (2)

5.2.4 Which property of this sample makes it to undergo a chemical change. (1)

[19]

QUESTION 6

6.1 The following questions pertain to the water molecule (H_2O).

6.1.1 In which group on the periodic table is hydrogen? (1)

6.1.2 Is hydrogen a metal or a nonmetal? Give a reason for the answer. (3)

6.1.3 How many valence electrons are in a neutral oxygen atom? (1)

6.1.4 In which period on the periodic table is oxygen? (1)

6.1.5 Explain which type of bond is likely to exist between an oxygen atom and a hydrogen atom. (3)

6.1.6 Give the sp-notation of oxygen ion. (3)

6.2 Write down the chemical formula of each of the following compounds:

6.2.1 Calcium carbonate

6.2.2 Magnesium hydroxide

(2 × 2) (4)

[16]

QUESTION 7

7.1 Name FOUR important sources of heat. (4)

7.2 Define each of the following terms:

7.2.1 Specific heat capacity

7.2.2 Heat capacity

(2 × 2) (4)

7.3 A piece of copper of mass of 2,3 kg must be heated from 15 °C to 52 °C. The specific heat capacity of copper is 390 J/kg·°C.

7.3.1 How much heat is needed to raise the temperature of this piece of copper from 15 °C to 52 °C?

7.3.2 What is the *heat capacity* of this piece of copper?

(2 × 4) (8)

7.4 Name and explain TWO thermometric properties of a substance. (2 × 2) (4)

7.5 Neon boils at -246 °C.

What is the temperature on the kelvin scale? (2)

[22]

QUESTION 8

8.1 Give TWO differences between *physical* and *chemical* changes. (2 × 2) (4)

8.2 Calcium can be decomposed through electrolysis by passing electric current through an aqueous solution of calcium chloride wherein calcium and gaseous chloride are formed.

8.2.1 Explain the term *aqueous solution*. (2)

8.2.2 Write down the formula of the ions present in this solution. (2 × 2) (4)

8.2.3 Could a current pass through a sample of solid $CaC\ell_2$? Explain the answer. (3)

8.2.4 Write down an equation for the decomposition of $CaC\ell_2$. (3)

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8.3 Calculate the formula mass of each of the following:

8.3.1 PbO_2

8.3.2 $KC\ell O_3$

(2 × 2) (4)

8.4 10,6 g of anhydrous sodium carbonate (Na_2CO_3) was dissolved in water and the volume made up to 500 cm^3.

8.4.1 Write down the balanced chemical equation for the reaction of sodium carbonate and hydrochloric acid. (4)

8.4.2 Name the type of gas released. (1)

8.4.3 Determine the concentration of sodium carbonate (Na_2CO_3) in mol/dm^3. (5)

[30]

QUESTION 9

9.1 Acid rain contains harmful acid that can damage the environment.

9.1.1 Write down the balanced chemical equation that represents the formation of acid rain. (4)

9.1.2 Give THREE ways in which acid rain can be harmful. (3)

9.2 Name THREE essential requirements for safe municipal water supply. (3)

9.3 Name the TWO groups into which water hardness can be divided. (2)

9.4 Name FIVE methods to remove hardness from water. (5)

9.5 What is the difference between *aerobic* and *anaerobic* wastewater processes? (2 × 2) (4)

[21]

QUESTION 10

10.1 Define the term *pollution*. (2)

10.2 Name FIVE major causes of pollution. (5)

[7]

TOTAL SECTION B: 115
GRAND TOTAL: 150

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THE PERIODIC TABLE OF ELEMENTS
DIE PERIODIEKE TABEL VAN ELEMENTE

