basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 10

TECHNICAL SCIENCES: CHEMISTRY (P2)

EXEMPLAR 2016

MARKS: 150

TIME: 3 hours

This question paper consists of 10 pages and 1 data sheet.

INSTRUCTIONS AND INFORMATION

1. This question paper consists of NINE questions. Answer ALL the questions in the ANSWER BOOK.

2. Start EACH question on a NEW page in the ANSWER BOOK.

3. Number the answers correctly according to the numbering system used in this question paper.

4. Leave ONE line between two subquestions, for example between QUESTION 2.1 and QUESTION 2.2.

5. You may use a non-programmable calculator.

6. You are advised to use the attached DATA SHEET.

7. Round off your final numerical answers to a minimum of TWO decimal places.

8. Give brief motivations, discussions, et cetera where required.

9. Write neatly and legibly.

QUESTION 1: MULTIPLE-CHOICE QUESTIONS

Four options are provided as possible answers to the following questions. Each question has only ONE correct answer. Choose the answer and write only the letter (A–D) next to the question number (1.1–1.10) in the ANSWER BOOK, for example 1.11 E.

1.1 Which ONE of the following elements is a good electrical conductor at room temperature?

A Copper

B Wood

C Silicon

D Plastic (2)

1.2 A light metal that is easy to machine with:

A Chromium

B Vanadium

C Platinum

D Aluminium (2)

1.3 The SI unit for temperature is …

A degrees Celsius.

B kelvin.

C joule.

D watt. (2)

1.4 The formula for a nitrite ion:

A NO_3^-

B NO_2^-

C N_3^-

D N_2^+ (2)

1.5 The NAME of a compound represented by the chemical formula CuO:

A Copper oxygen

B Copper(I) oxide

C Copper(II) oxide

D Copper peroxide (2)

1.6 The sp notation for magnesium:

A $1s^2\ 2s^2\ 2p^6\ 3s^1$

B $1s^2\ 2s^2\ 2p^6$

C $1s^2\ 2s^2\ 2p^6\ 3s^2$

D $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^2$ (2)

1.7 Which ONE of the following compounds is a pure substance?

A Table salt

B Muddy water

C Diamond

D Pencil (2)

1.8 Which combination of elements has the same number of valence electrons?

A Sulphur, fluorine and helium

B Oxygen, sulphur and selenium

C Sulphur, chlorine and argon

D Nitrogen, sulphur and bromine (2)

1.9 Two isotopes of chlorine, Cℓ-37 and Cℓ-35, are given. Which ONE of the following pairs represents the number of neutrons in the two isotopes respectively?

A 20 and 18

B 18 and 20

C 37 and 17

D 35 and 17 (2)

1.10 Substances of which the conductivity increases with an increase in temperature are …

A non-metals.

B metalloids.

C metals.

D alkali metals. (2)
[20]

QUESTION 2 (Start on a new page.)

2.1 Define a *pure substance*. (2)

2.2 Consider the substances listed below.

sulphur; chlorine; lead; gold; lead sulphide; copper; sodium; mercury sulphide; magnesium; oxygen; mercury; fluorine

From the list above, write down the:

2.2.1 Metals (5)

2.2.2 Non-metals (4)

2.2.3 Compounds (2)

Write down the NAMES of compounds formed from the combination of elements given below.

2.2.4 Sodium and chlorine (2)

2.2.5 Magnesium and oxygen (2)

2.2.6 Copper and chlorine (2)

2.3 What is the NAME given to elements that belong to the same group as chlorine? (2)

[21]

QUESTION 3 (Start on a new page.)

3.1 Differentiate between a *cation* and an *anion*. (4)

3.2 Write down the NAME and the CHARGE of EACH of the underlined ions:

3.2.1 $\underline{Mg}(OH)_2$ (2)

3.2.2 $Ca\underline{SO_4}$ (2)

3.2.3 $K\underline{NO_3}$ (2)

3.3 Write down the CHEMICAL FORMULAE of the binary compounds:

3.3.1 Sodium bromide (2)

3.3.2 Magnesium oxide (2)

3.3.3 Hydrogen chloride (2)

3.4 In Stock notation the number of charges on the metal ion in a compound is indicated with Roman numerals whenever the metal exhibits multiple valences.

Use Stock notation to write the chemical formulae of the compounds:

3.4.1 FeI_3 (2)

3.4.2 HgO (2)
[20]

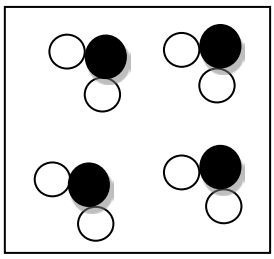
QUESTION 4 (Start on a new page.)

Consider the table of elements below.

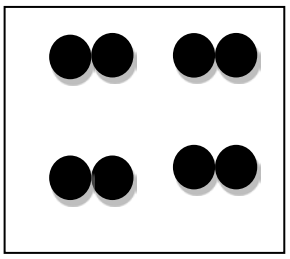
ELEMENTS	SYMBOLS
Oxygen	●
Hydrogen	○
Carbon	◯

Refer to the table of elements above and diagrams A, B and C below to answer the questions that follow.

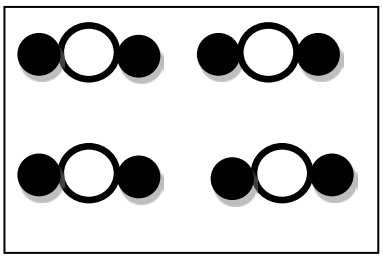
A



B



C



4.1 Write down chemical formulae for EACH compound represented by **A**, **B** and **C**. (6)

4.2 What is the ratio in which atoms are combined to form compound **A**? (2)

4.3 How many atoms make up compound **A**? (1)

4.4 Write down the NAME of compound **C**. (2)
[11]

QUESTION 5 (Start on a new page.)

5.1 Redraw the table below in the ANSWER BOOK and complete it.

NAMES OF IONS	CHEMICAL FORMULA
Sulphate	5.1.1
5.1.2	SO_3^{2-}
Carbonate	5.1.3
5.1.4	OH^-

(4)

5.2 Complete and balance the following equations:

5.2.1 $Zn + HC\ell \rightarrow$_____ $+ H_2$ (2)

5.2.2 $N_2 +$ _____ $\rightarrow NH_3$ (2)

5.2.3 $Na_2CO_3 + HC\ell \rightarrow NaC\ell +$ _____ + _____ (3)

5.3 Write down a balanced equation for EACH of the reactions below.

5.3.1 Sulphur dioxide + Oxygen → Sulphur trioxide (3)

5.3.2 Hydrogen sulphide + Oxygen → Water + Sulphur dioxide (3)

[17]

QUESTION 6 (Start on a new page.)

Grade 10 Technical Sciences learners set up an experiment to test the electrical conductivity of certain materials. They are provided with the following apparatus: a copper rod, plastic ruler, three cells, connecting wires, a light bulb and a switch.

6.1 For this experiment identify the:

6.1.1 Independent variable (1)

6.1.2 Dependent variable (1)

6.1.3 Control variable (1)

6.2 Draw a labelled circuit diagram to show how the apparatus will be assembled to conduct the experiment. (5)

6.3 How will the learners establish if the material provided will conduct electricity? (2)

6.4 The light bulb fuses (burns out) during the experiment. Which instrument can the learners use to determine if there will be current flow in the circuit? (1)

[11]

QUESTION 7 (Start on a new page.)

7.1 Many people live in shacks made of corrugated iron sheets, which are very hot in summer and very cold in winter. The use of expanded polystyrene as a construction material in the building technology can be the solution for these people. The material can be used to line the inside of shacks because it is a thermal insulator.

7.1.1 Define a *thermal insulator*. (2)

7.1.2 Give TWO examples of OTHER material that can be used as a thermal insulator. (2)

7.2 Classify the following materials as magnetic or non-magnetic:

7.2.1 Iron (1)

7.2.2 Plastic ruler (1)

7.2.3 Aluminium (1)

7.3 State any THREE practical applications of magnets in everyday life. (3)
[10]

QUESTION 8 (Start on a new page.)

8.1 Two isotopes of element X are given below.

$$^{14}_{6}X \qquad ^{12}_{6}X$$

8.1.1 Define the term *isotope.* (2)

8.1.2 In which group and period is element X? (2)

8.1.3 What is the name and symbol of element X? (2)

8.1.4 Determine the number of neutrons of elements X-14 and X-12. (4)

8.2 How many protons does EACH of the following elements have?

8.2.1 Silicon (1)

8.2.2 Nitrogen (1)

8.2.3 Aluminium (1)

8.3 Differentiate between *core electrons* and *valence electrons*. (4)
[17]

QUESTION 9 (Start on a new page.)

9.1 Differentiate between *heat* and *temperature*. (4)

9.2 Convert the following values:

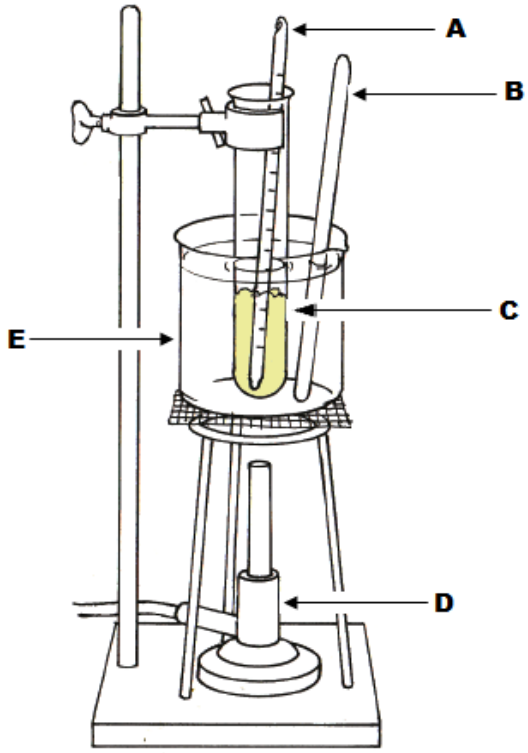
9.2.1 126 °C to kelvin (2)

9.2.2 173 K to °C (2)

9.3 Name THREE types of thermometers. (3)

9.4 State any THREE uses of thermometers in everyday life. (3)

9.5 The experimental below was used to determine the melting point of paraffin wax.



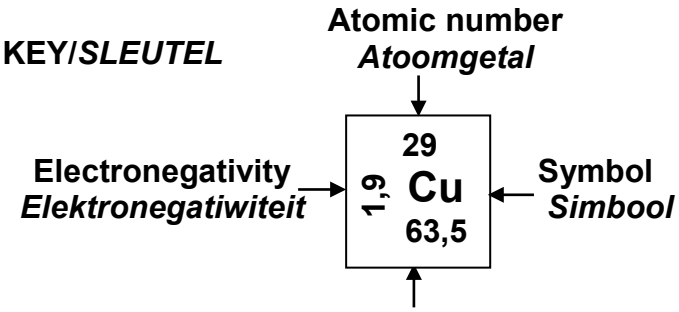
9.5.1 Name apparatus **A** to **E**. (5)

9.5.2 What is the function of apparatus **B**? (2)

9.5.3 Why is the paraffin wax not heated directly on an open flame? (2)
[23]

TOTAL: 150

TABLE 3: THE PERIODIC TABLE OF ELEMENTS/*TABEL 3: DIE PERIODIEKE TABEL VAN ELEMENTE*



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

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