GAUTENG DEPARTMENT OF EDUCATION

PROVINCIAL EXAMINATION

JUNE 2017

GRADE 10

PHYSICAL SCIENCES
PAPER 2

CHEMISTRY

TIME: 90 minutes

MARKS: 100

9 pages + 1 data sheet

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INSTRUCTIONS

1. Answer ALL the questions in the ANSWER BOOK.

2. This question paper consists of TWO sections

   SECTION A: 20 marks
   SECTION B: 80 marks

3. You may use a non-programmable calculator.

4. You may use appropriate mathematical instruments.

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

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

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

SECTION A

QUESTION 1: MULTIPLE-CHOICE QUESTION

Four options are provided as possible answers to the following questions. Each question has only ONE correct answer. Write only the letter (A – D) next to the question number (1.1 – 1.10) in the ANSWER BOOK.

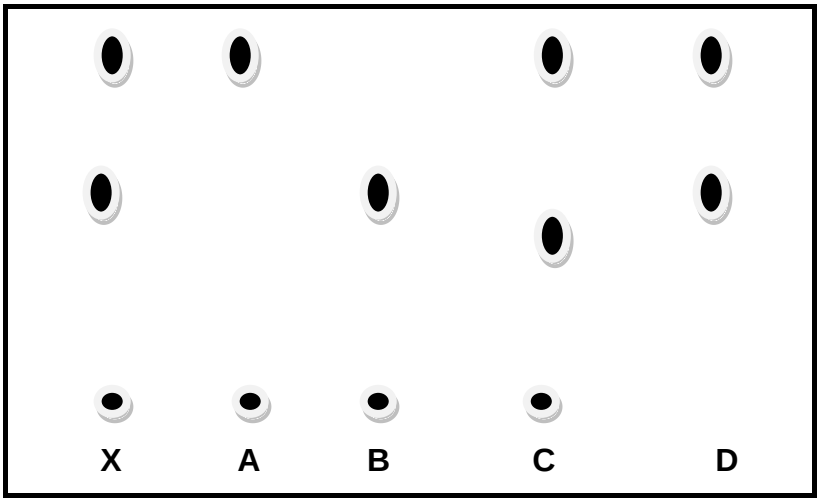
1.1 The three subatomic particles of an atom are ...

A neutrons, ions, protons.
B electrons, neutrons, cations.
C electrons, protons, neutrons.
D protons, electrons, neutral. (2)

1.2 Elements are arranged in the periodic table according to their ...

A relative atomic mass.
B mass number.
C atomic number.
D atomic mass. (2)

1.3 The diagram below shows a chromatogram of an ink X used in a fraud case and four inks A, B, C and D from four suspects.



Which ink, from **A** to **D**, is most likely to have been use in the fraud case? (2)

1.4 Which of the following is a homogenous mixture?

A Oil and water
B Ethanol
C Air
D Sand and water (2)

1.5 The change in phase from a gas to liquid is called ...

A melting.
B condensation.
C freezing.
D boiling. (2)

1.6 An example of a diatomic molecule is ... .

A Cl_2
B H_2O
C CO_2
D H_2O_2 (2)

1.7 The following electron configuration $1s^2\ 2s^2\ 2p^6\ 3s^2$, represent ... .

A Na
B Mg^{2+}
C F^+
D Mg (2)

1.8 The correct formula for aluminium oxide is ... .

A Al_2O_3
B Al_3O_2
C AlO_3
D AlO (2)

1.9 Which of the following is a physical reaction?

A Sugar caramelises
B Iron and sulphur are melted together
C Gold melts.
D A piece of magnesium burns in air. (2)

1.10 Which of the following equations shows the balanced chemical equation between aluminium and chlorine?

A $A\ell + C\ell \rightarrow A\ell C\ell$
B $A\ell + C\ell_2 \rightarrow A\ell C\ell_2$
C $2A\ell + 3C\ell_2 \rightarrow 2A\ell C\ell_3$
D $4A\ell + 3C\ell_2 \rightarrow 2A\ell_2 C\ell_3$ (2)

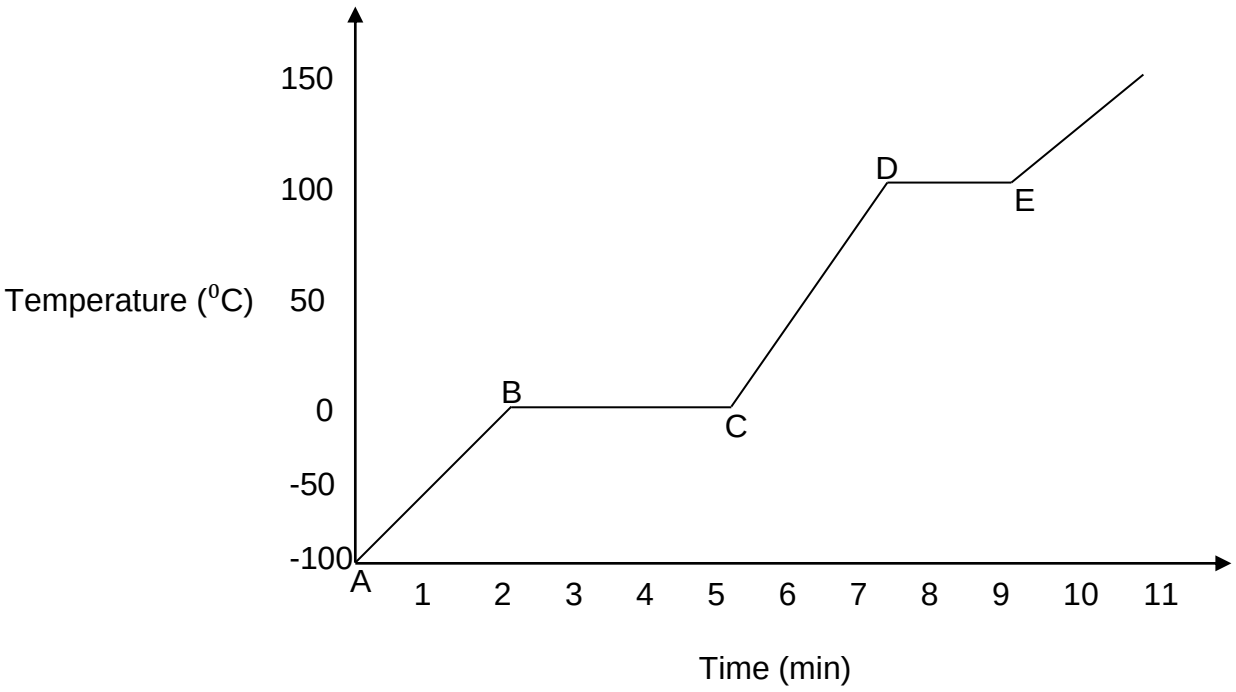
[20]

TOTAL SECTION A: 20

SECTION B

QUESTION 2

Learners conducted an experiment to determine the heating curve of water. They heated ice in a beaker and recorded the temperature of the water over a period of time. The results for the experiment are shown in the graph below.



2.1 Write down a suitable aim for the experiment. (2)

2.2 Write down the ...

2.2.1 dependent variable. (1)

2.2.2 independent variable. (1)

2.3 The following apparatus and chemicals were used during the experiment: A bunsen burner, a trip stand and gauze, a beaker, ice, a thermometer and a stop watch.

Write down, in point form, the method used to conduct the experiment. (4)

2.4 Making reference to intermolecular forces and average kinetic energy between molecules, explain what is happening ...

2.4.1 between points D and E. (3)

2.4.2 at point A. (3)

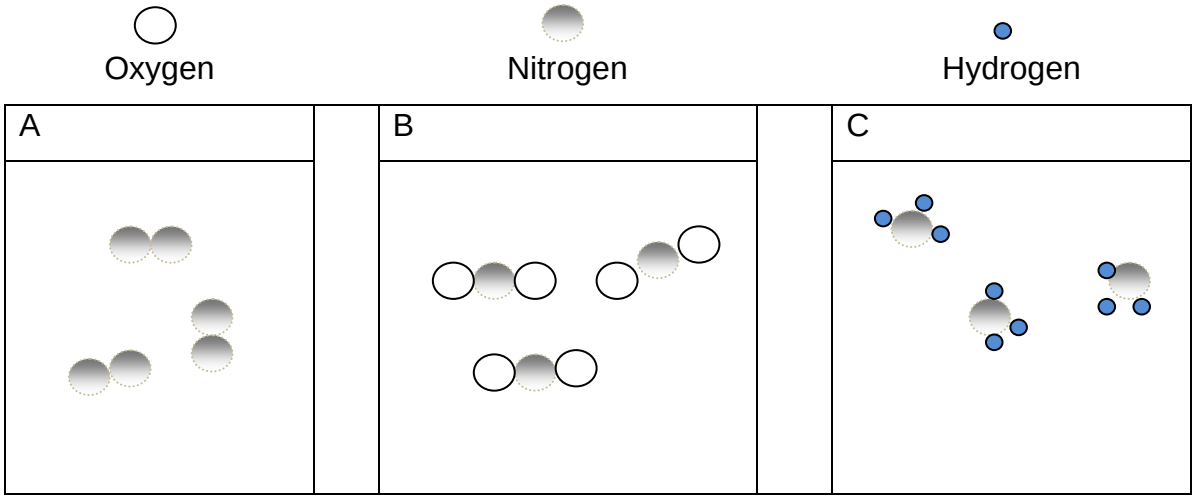
2.5 Are the changes shown by the results in the graph above, physical or chemical? Explain your answer. (3)

2.6 If the heating continues beyond point E, will the water be changed into oxygen and hydrogen. Explain you answer. (3)
[20]

QUESTION 3

3.1 Differentiate between *an element* and *a compound*. (4)

3.2 The table below is a key of elements.



Use the key and the diagrams A, B and C above to answer the questions that follow.

3.2.1 Which compound (A, B or C) is considered to be an element? (1)

3.2.2 What type of bond exists between atoms in compound B? (1)

3.2.3 Write down the chemical formulae for each of the compounds represented by A, B and C. (3)

3.2.4 Draw Lewis diagrams for compounds A and C. (4)

3.2.5 Write down the CHEMICAL NAME for compounds A, B and C. (3)

3.2.6 Use the above key and a diagram to represent the balanced chemical equation below:

$$N_2\ (g) \quad + \quad O_2\ (g) \quad \rightarrow \quad NO_2\ (g)$$ (4)
[20]

QUESTION 4

Study the table below and answer the questions follow.

Atom	Electron configuration
A	$1s^2\ 2s^2\ 2p^1$
B	$1s^2\ 2s^2\ 2p^2$
C	$1s^2\ 2s^2\ 2p^3$
D	$1s^2\ 2s^2\ 2p^4$
E	$1s^2\ 2s^2\ 2p^5$
F	$1s^2\ 2s^2\ 2p^6$

4.1 Which atom represented above is a noble gas? (1)

4.2 Explain what is meant by *first ionisation energy*. (2)

4.3 Identify which atom in the table above has the greatest first ionisation energy. (1)

4.4 How many valence electrons does atom E have? (1)

4.5 If the elements represented above are for elements in the second period of the periodic table, which atom is represented by C? (1)

4.6 Which element has the same number of valence electrons as Sulphur? (1)

4.7 Which atom will form an ion with a charge of 3+ and what is the real name of this atom? (2)

[9]

QUESTION 5

Three isotopes of magnesium exists in nature. The magnesium isotopes Mg-25 and Mg-26 are used during absorption, circulation and metabolism in animals and humans. The relative abundance and masses of the isotopes of magnesium are shown in the table below. Study the table and answer the questions follow.

	Percentage abundance	Relative Isotope Mass
^{24}Mg	78,99	23,985
^{25}Mg	10,00	24,986
^{26}Mg	11,01	25,985

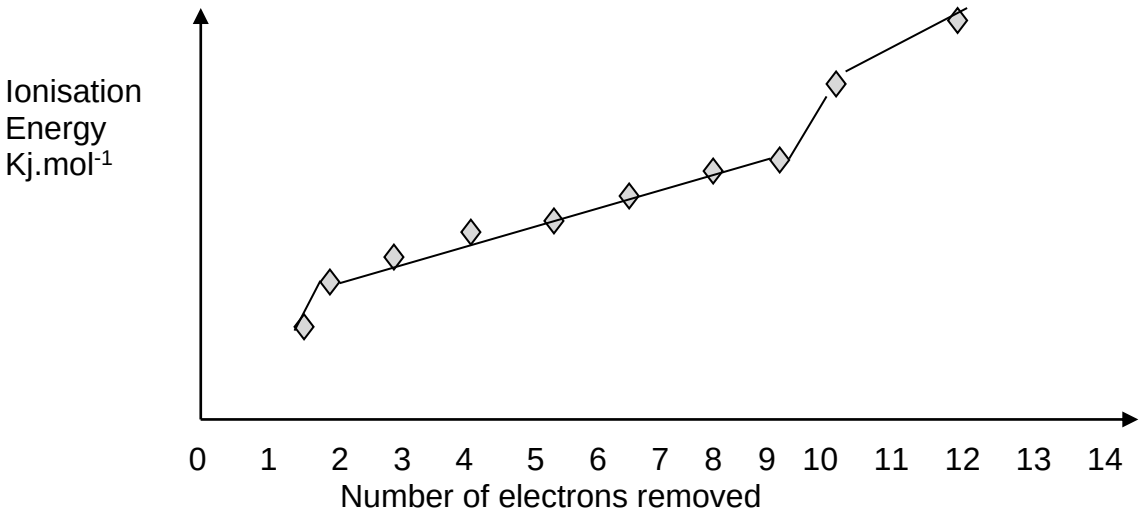
5.1 Define the term *isotope*. (2)

5.2 Draw the aufbau diagram for the magnesium ion formed. (3)

5.3 Explain what is meant by *relative atomic mass*. (2)

5.4 Determine the relative atomic mass for the element magnesium. (4)

5.5 The following graph shows the consecutive ionisation energies for the element magnesium.



5.5.1 Write down the electron configuration of the magnesium. (2)

5.5.2 What conclusion can be drawn from the graph of ionisation energy against the number of electrons removed? (2)

5.5.3 Explain your answer to Question 5.5.2 in terms of core electrons and valance electrons (4)

[19]

QUESTION 6

6.1 Give the Law of Conservation of Mass. (2)

6.2 The Haber Process is a reaction used in the production of fertilizer. The chemical equation for the reaction is shown below:

$$N_2(g) + H_2(g) \rightarrow NH_3(g)$$

6.2.1 Is the reaction a synthesis or decomposition reaction? (1)

6.2.2 Give a reason for your answer to Question 6.2.1. (2)

6.3 Use the Law of Constant Composition to determine whether mass is conserved during the reaction above. (5)

6.4 Write down a balanced equation to demonstrate that mass is conserved for the Haber process. (2)

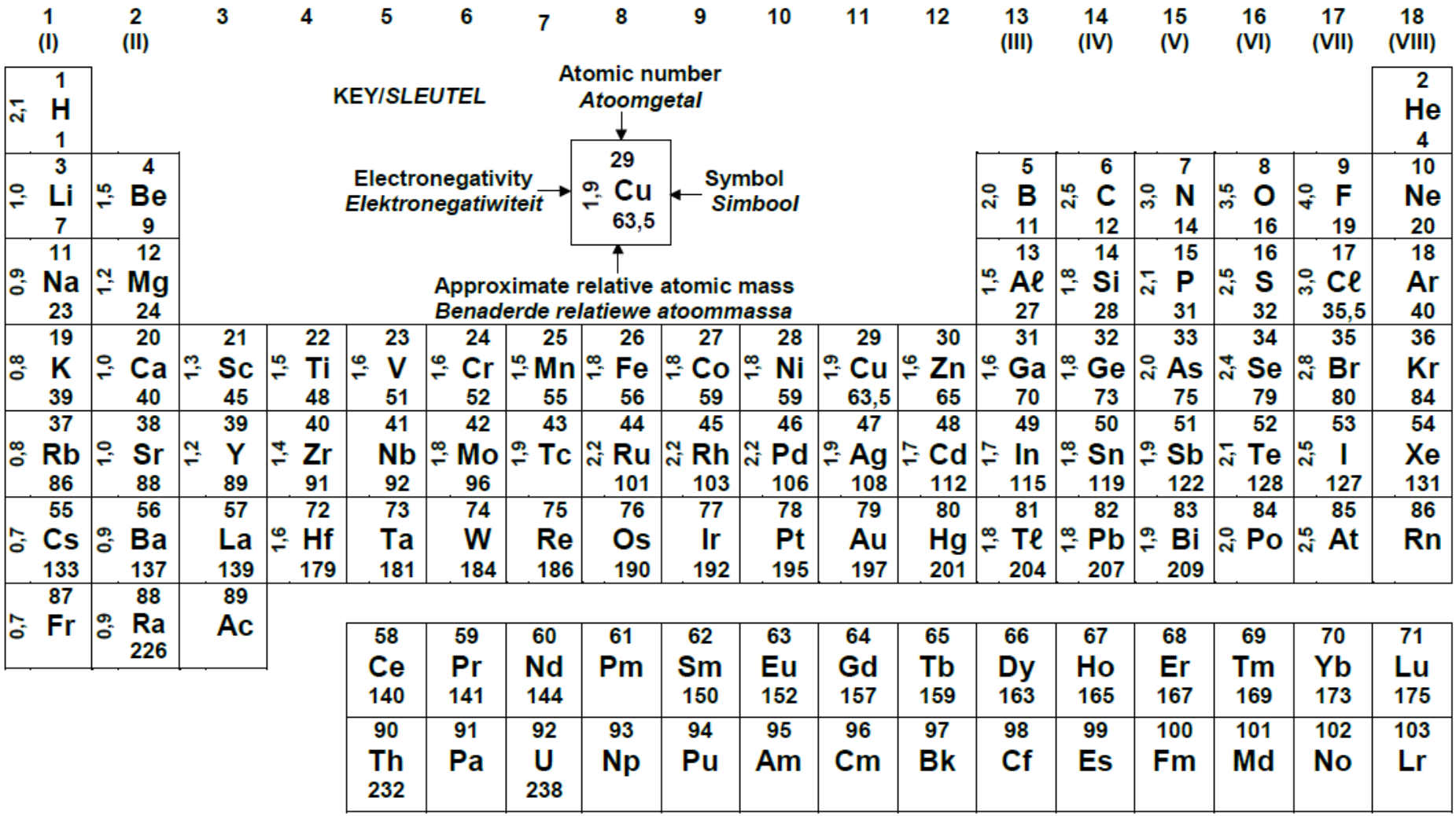
[12]

TOTAL SECTION B: 80

TOTAL: 100

END

THE PERIODIC TABLE OF ELEMENTS / *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	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	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	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	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