basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 10

PHYSICAL SCIENCES: CHEMISTRY (P2)

NOVEMBER 2017

MARKS: 150

TIME: 2 hours

This question paper consists of 13 pages and 2 data sheets.

INSTRUCTIONS AND INFORMATION

1. Write your name and class (for example 10A) in the appropriate spaces on the ANSWER BOOK.

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

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

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

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

6. You may use a non-programmable calculator.

7. You may use appropriate mathematical instruments.

8. You are advised to use the attached DATA SHEETS.

9. Show ALL formulae and substitutions in ALL calculations.

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

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

12. Write neatly and legibly.

QUESTION 1: MULTIPLE-CHOICE QUESTIONS

Various 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 Air can be classified as a/an …

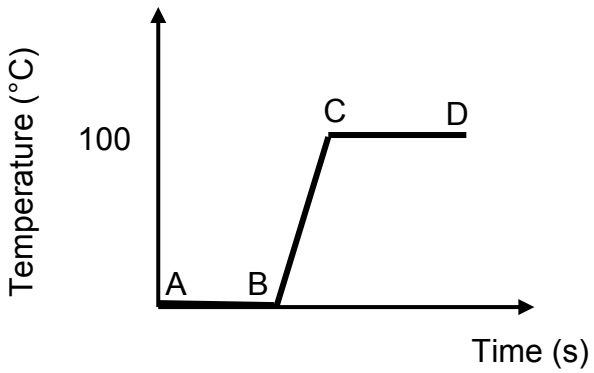
A element.

B compound.

C homogenous mixture.

D heterogeneous mixture. (2)

1.2 The graph below shows the heating curve of a substance.



In which part(s) of the graph does the substance gain kinetic energy?

A BC only

B CD only

C AB and CD

D AB, BC and CD (2)

1.3 In which ratio will group (I) elements react with group (VI) elements?

A 2 : 1

B 1 : 6

C 6 : 1

D 1 : 3 (2)

1.4 What is the total number of *nucleons* in the ion of calcium when calcium loses two electrons to form Ca^{2+}?

A 40

B 18

C 22

D 20 (2)

1.5 Which ONE of the following groups of elements shows the CORRECT trend of the density of metals?

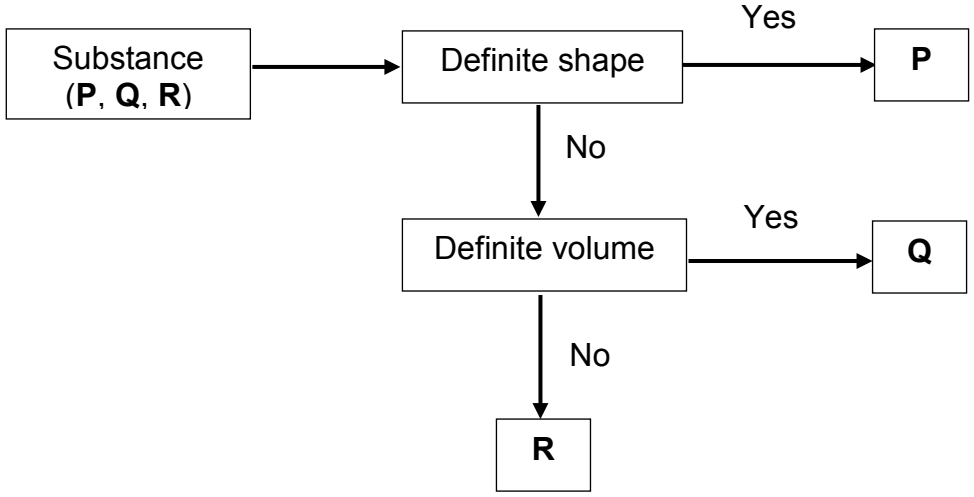
A Rb < K < Na < Li

B K < Na < Li < Rb

C Li < Na < K < Rb

D Na < Li <Rb < K (2)

1.6 A learner used the flow chart below to classify some examples of substances **P**, **Q** and **R**.



What could substances **P**, **Q** and **R** possibly be?

	P	Q	R
A	Marble	Oil	Oxygen
B	Oil	Marble	Oxygen
C	Oxygen	Oil	Marble
D	Oxygen	Marble	Oil

(2)

1.7 In a 20 g sample of molecules, which sample below has the greatest number of moles?

A NH_3

B N_2

C CO_2

D H_2 (2)

1.8 Carbon dioxide can change directly from the solid phase to the gas phase. This process is known as …

A sublimation.

B evaporation.

C decomposition.

D melting. (2)

1.9 The chemical name for $Fe_2(SO_4)_3$ is …

A iron sulphite.

B iron(III) sulphate.

C iron(II) sulphate.

D iron sulphide. (2)

1.10 All the soil on Earth is known as the …

A atmosphere.

B biosphere.

C lithosphere.

D hydrosphere. (2)
[20]

QUESTION 2 (Start on a new page.)

Consider the following substances:

C_{90}; NaCℓ; CO_2; Fe; H_2O

2.1 Write down a substance from the list above that is the following:

2.1.1 A molecular structure (1)

2.1.2 A metallic structure (1)

2.1.3 A covalent network structure (1)

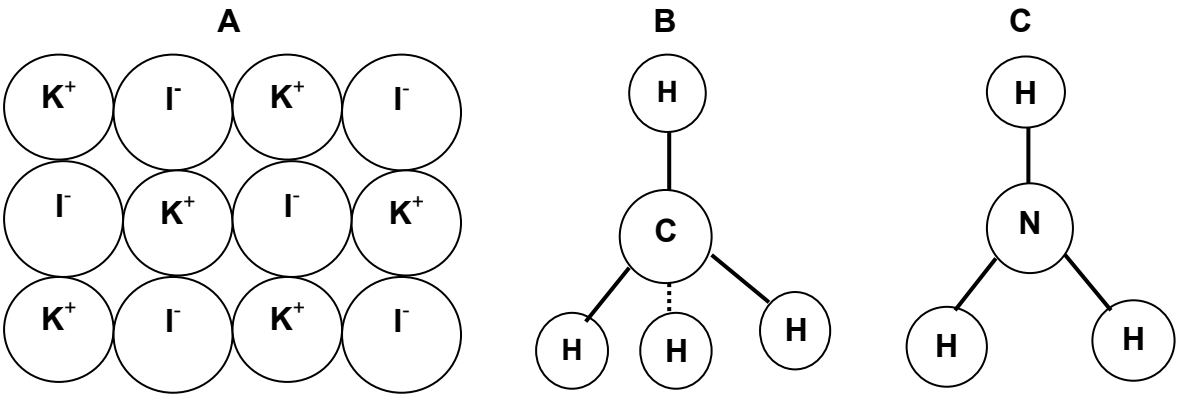
2.1.4 An ionic network structure (1)

2.2 Draw the Lewis dot diagram for the CO_2 molecule. (2)

2.3 Identify the type of chemical bond in H_2O. (1)

2.4 Draw the Lewis dot diagrams to show the formation of NaCℓ. (3)

2.5 Study the models of compounds **A**, **B** and **C** below and answer the questions that follow.



Write down the:

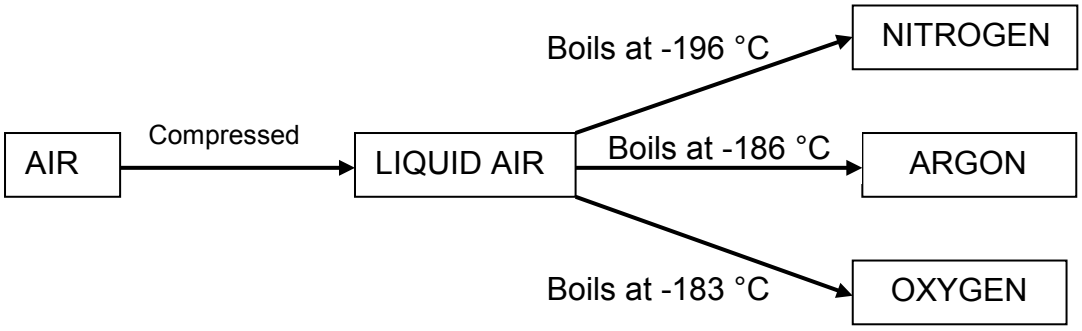
2.5.1 Chemical name of compound **A** (1)

2.5.2 Chemical formula of compound **B** (1)

2.5.3 Common name of compound **C** (1)

2.6 Many of the gases in air are very useful. An important industrial process, fractional distillation of liquid air, separates these gases from one another.

Consider the diagram below and answer the questions that follow.



2.6.1 Is this separation process *physical* or *chemical*? (1)

2.6.2 Which physical property is used to separate the gases after they have been liquefied? (1)

2.6.3 Which gas has the weakest intermolecular forces? Explain the answer. (2)

2.7 State how EACH of the following changes when *liquid nitrogen* changes into *gaseous nitrogen*. Write down only INCREASE, DECREASE or REMAIN THE SAME.

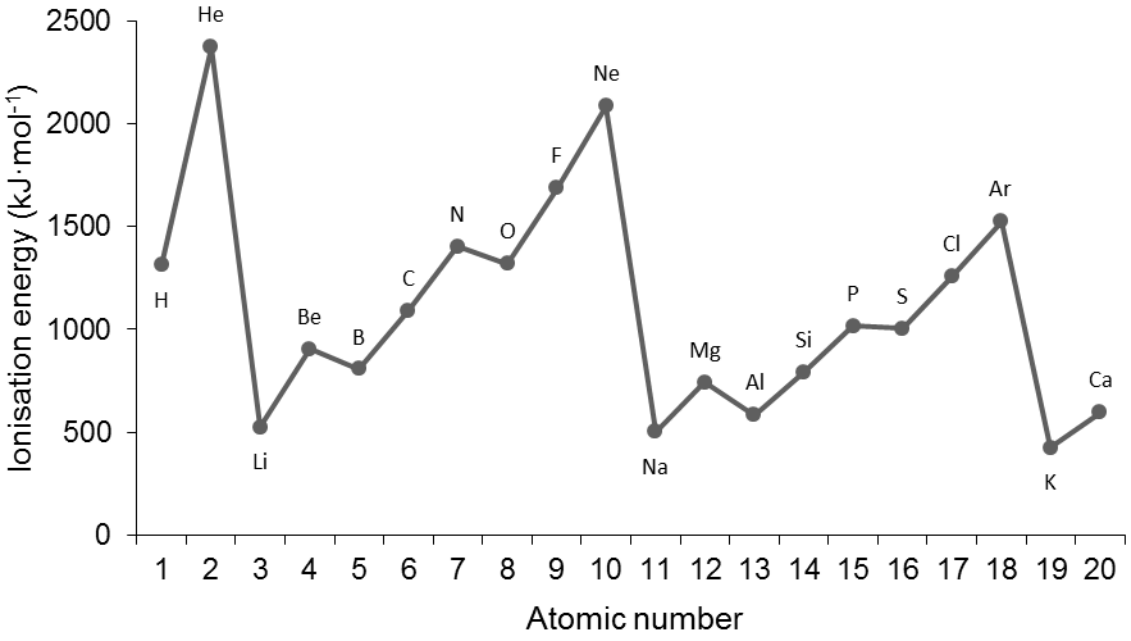
2.7.1 Spaces between the particles (1)

2.7.2 Strength of the forces between the particles (1)

2.7.3 Energy of the particles (1)
[20]

QUESTION 3 (Start on a new page.)

Consider the graph of the first ionisation energy and answer the questions that follow.



3.1 Define the term *ionisation energy*. (2)

3.2 State the general trend in ionisation energy from left to right across a period on the periodic table. (2)

3.3 There is a drop in ionisation energy from beryllium to boron.

3.3.1 Write down the sp-notation for beryllium AND boron. (4)

3.3.2 Explain this drop in ionisation energy. (3)

3.4 Is the following statement TRUE or FALSE? If false, rewrite the statement correctly.

The ionisation energy of noble gases is high because of the half-filled s- and p-orbitals. (2)

3.5 Study the ionisation energy of the group (I) elements in the graph above and answer the questions that follow.

3.5.1 Give the general name of the group (I) elements. (1)

3.5.2 State the trend in the reactivity of elements in group (I). (2)

3.5.3 Explain the reason for the trend in QUESTION 3.5.2 by using the graph of ionisation energy. (2)

[18]

QUESTION 4 (Start on a new page.)

4.1 A certain element, X, has two isotopes in nature. One isotope has an atomic mass of 106,9 amu. The percentage appearance of this isotope is 50%. The atomic mass of the other isotope is 109,1.

4.1.1 Define the term *isotope.* (2)

4.1.2 Calculate the relative atomic mass of element X. (5)

4.1.3 Identify element X in QUESTION 4.1.2. (2)

4.2 Complete the table below. Write only the answer next to the question number (4.2.1–4.2.7).

ELEMENT	ATOMIC NUMBER	MASS NUMBER	NUMBER OF PROTONS	NUMBER OF NEUTRONS	NUMBER OF ELECTRONS
Al	**13**	**27**	4.2.1	4.2.2	4.2.3
K^+	**19**	4.2.4	4.2.5	4.2.6	4.2.7

(7)
[16]

QUESTION 5 (Start on a new page.)

Hydrogen peroxide decomposes at room temperature according to the following balanced chemical equation:

$$2H_2O_2(aq) \rightarrow O_2(g) + 2H_2O(\ell)$$

5.1 What does the (aq) represent in the equation above? (1)

5.2 Identify the type of reaction above. Choose between PRECIPITATION and REDOX. Give a reason for the answer. (2)

5.3 Is the reaction an example of a *physical* or a *chemical* change? (1)

5.4 Define the term *one mole* of a substance. (2)

5.5 If 4 moles of hydrogen peroxide decomposes, calculate the volume of gas formed at STP. (4)

5.6 Calculate the number of oxygen atoms in H_2O_2 if 17 g of H_2O_2 decomposes. (4)
[14]

QUESTION 6 (Start on a new page.)

6.1 Study the balanced chemical equation of the reaction between sodium carbonate (Na_2CO_3) and hydrochloric acid ($HC\ell$) and answer the questions that follow.

$$Na_2CO_3 + 2HC\ell \rightarrow 2NaC\ell + CO_2 + H_2O$$

Identify the type of reaction above. Choose between REDOX and GAS FORMING. (1)

6.2 In a reaction, 10,6 g of sodium carbonate reacts completely with excess hydrochloric acid.

6.2.1 Calculate the molar mass of sodium carbonate. (2)

6.2.2 Calculate the initial number of moles of sodium carbonate. (2)

6.2.3 Calculate the mass of CO_2 produced during this reaction. (4)

6.2.4 Calculate the mass of sodium chloride produced if 4,87 dm^3 of carbon dioxide was produced at STP. (6)

6.3 14,2 g of a sample of hydrated sodium carbonate, $Na_2CO_3 \bullet xH_2O$, was strongly heated until no further change in mass was recorded. On heating, all the water of crystallisation evaporated as follows:

$$Na_2CO_3 \bullet xH_2O \rightarrow Na_2CO_3 + xH_2O$$

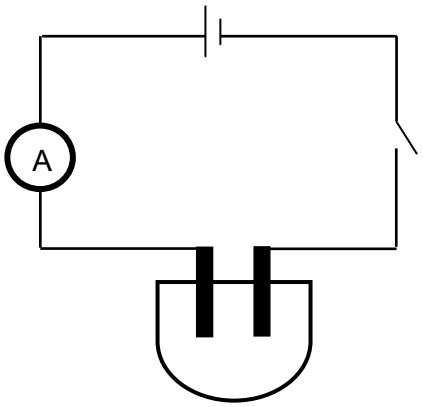
Calculate the number of moles of water of crystallisation in the sodium carbonate sample, if 5,3 g of solid remained after strong heating. (5)

[20]

QUESTION 7 (Start on a new page.)

Learners investigated the relationship between the concentration of a silver nitrate ($AgNO_3$) solution and its conductivity at a constant temperature.

They set up the apparatus, as shown below, and recorded the current. The initial reading of the ammeter was taken before anhydrous $AgNO_3$ was added to distilled water.



The anhydrous $AgNO_3$ was added to 200 cm^3 distilled water spoon by spoon. The ammeter reading was recorded after each spoon was added. The results are shown in the table below.

SPOONS OF $AgNO_3$ IN DISTILLED WATER	AMMETER READING (mA)
0	0
1	0,18
2	0,92
3	1,47
4	1,84

7.1 Give a reason why the ammeter reading was initially zero. (1)

7.2 Give ONE word/term for a solution that conducts electricity. (2)

7.3 Write down a balanced chemical equation to show how $AgNO_3$ dissociates in water. (2)

7.4 Write down the following for the investigation above:

7.4.1 A hypothesis (2)

7.4.2 Dependent variable (1)

7.4.3 Independent variable (1)

7.4.4 Controlled variable (1)

7.5 Define the term *anhydrous*. (1)

7.6 If the mass of $AgNO_3$ is 5,3 g per spoon, calculate the concentration of the solution after TWO spoons have been added. (4)

7.7 Can tap water be used for this experiment? Give a reason for the answer. (2)

7.8 From the results, deduce the relationship between the ion concentration in the solution and its conductivity. (2)

7.9 A learner accidentally dropped hydrochloric acid into the solution.

7.9.1 How will this affect the ammeter reading? Write down only INCREASE, DECREASE or REMAIN THE SAME. (1)

7.9.2 Explain the answer to QUESTION 7.9.1. (2)
[22]

QUESTION 8 (Start on a new page.)

Your teacher asked you to use your knowledge of precipitation reactions to test the quality of water in the local river.

You are provided with the following chemicals:

$AgNO_3$, $BaCl_2$, dilute HNO_3

8.1 Which chemical would you choose to test for the presence of carbonates (CO_3^{-2})? (1)

8.2 Use a balanced chemical equation to show the test for carbonates in QUESTION 8.1. (4)

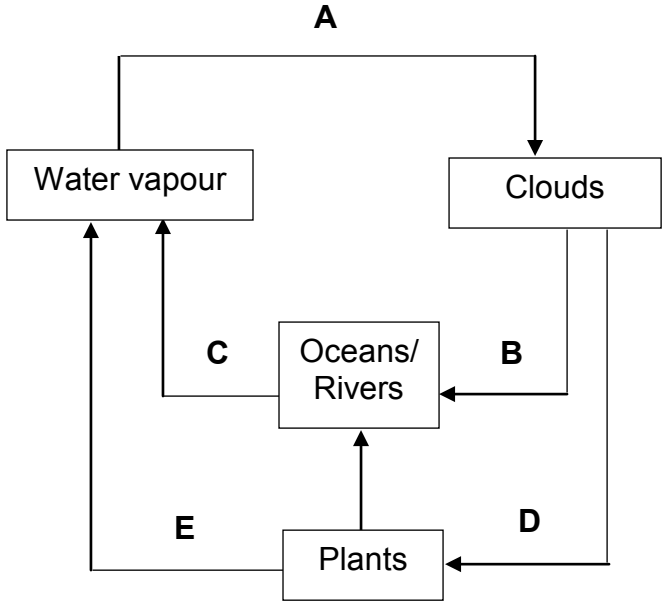
8.3 Both carbonates and sulphates form a white precipitate with the chemical in QUESTION 8.1.

Use a balanced chemical equation to explain how you would confirm that the precipitate is a carbonate. (4)

8.4 Give the chemical name of the precipitate formed when the carbonate and the chemical in QUESTION 8.1 reacts. (2)
[11]

QUESTION 9 (Start on a new page.)

Study the water cycle below and answer the questions that follow.



9.1 The water cycle consists of many processes.

Identify the following processes:

9.1.1 **A** (1)

9.1.2 **B** (1)

9.1.3 **E** (1)

9.2 Is energy ABSORBED or RELEASED during condensation? Give a reason for the answer. (2)

9.3 Give ONE reason why water vapour is referred to as an important greenhouse gas. (2)

9.4 The amount of rainfall in large parts of South Africa has decreased considerably recently. Various reasons have been given to explain the drought.

State ONE possible strategy that a community can adopt to ensure that they have a regular supply of water. (2)
[9]

TOTAL: 150

DATA FOR PHYSICAL SCIENCES GRADE 10
PAPER 2 (CHEMISTRY)

GEGEWENS VIR FISIESE WETENSKAPPE GRAAD 10
VRAESTEL 2 (CHEMIE)

TABLE 1: PHYSICAL CONSTANTS/*TABEL 1: FISIESE KONSTANTES*

NAME/*NAAM*	SYMBOL/*SIMBOOL*	VALUE/*WAARDE*
Standard pressure *Standaarddruk*	p^{θ}	1,013 x 10^5 Pa
Molar gas volume at STP *Molêre gasvolume by STD*	V_m	22,4 $dm^3 \cdot mol^{-1}$
Standard temperature *Standaardtemperatuur*	T^{θ}	273 K
Charge on electron *Lading op elektron*	e	1,6 x 10^{-19} C
Avogadro's constant *Avogadro-konstante*	N_A	6,02 x 10^{23} mol^{-1}

TABLE 2: FORMULAE/*TABEL 2: FORMULES*

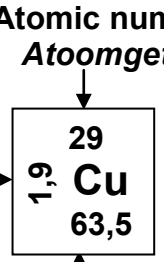
$n = \frac{m}{M}$	$n = \frac{N}{N_A}$
$c = \frac{n}{V}$ or/*of* $c = \frac{m}{MV}$	$n = \frac{V}{V_m}$

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	41 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	57 La 139	1,6 Hf 179	73 Ta 181	74 W 184	75 Re 186	76 Os 190	77 Ir 192	78 Pt 195	79 Au 197	80 Hg 201	1.8 Tℓ 204	1.8 Pb 207	1.9 Bi 209	2.0 Po	2.5 At	86 Rn
0,7 Fr 87	0,9 Ra 226	89 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

KEY/*SLEUTEL*



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE/ *NASIONALE SENIOR SERTIFIKAAT*

GRADE/*GRAAD* 10

PHYSICAL SCIENCES: CHEMISTRY (P2)
FISIESE WETENSKAPPE: CHEMIE (V2)

NOVEMBER 2017

MARKING GUIDELINES/*NASIENRIGLYNE*

MARKS/*PUNTE*: 150

These marking guidelines consist of 10 pages.
Hierdie nasienriglyne bestaan uit 10 bladsye.

approved
Dayrangi
Int-Mod - DBE
2017:11:14

Chief examiner
14/11/2017.

QUESTION 1/*VRAAG 1*

1.1	C ✓✓	(2)
1.2	A ✓✓	(2)
1.3	A ✓✓	(2)
1.4	A ✓✓	(2)
1.5	C ✓✓	(2)
1.6	A ✓✓	(2)
1.7	D ✓✓	(2)
1.8	A ✓✓	(2)
1.9	B ✓✓	(2)
1.10	C ✓✓	(2)
		[20]

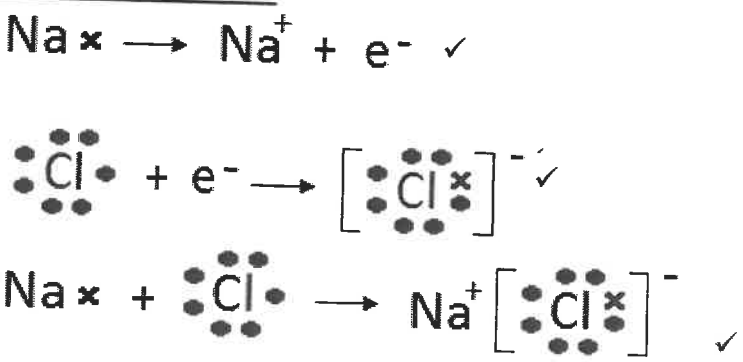
QUESTION 2/*VRAAG 2*

2.1.1 CO_2✓ **OR/*OF*** H_2O✓ (1)
2.1.2 Fe ✓ (1)
2.1.3 C_{90} ✓ (1)
2.1.4 NaCl✓ (1)

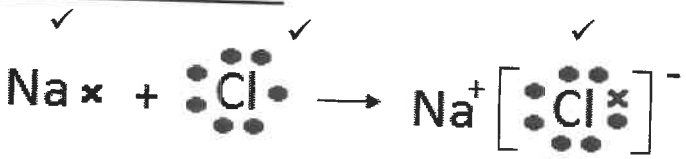
2.2  ✓ ✓ (2)

2.3 Covalent bond✓/*Kovalente binding*✓ (1)

2.4 **OPTION 1/*OPSIE 1*:**



OPTION 2/*OPSIE 2*:



(3)

2.5.1 Potassium iodide ✓/*Kaliumjodied*✓ (1)

2.5.2 CH_4 ✓ (1)

2.5.3 Ammonia ✓/*Ammoniak* ✓ (1)

2.6.1 Physical ✓/*Fisies* ✓ (1)

2.6.2 Boiling point ✓/*Kookpunt* ✓ (1)

2.6.3 Nitrogen✓; it has the lowest boiling point. ✓/*Stikstof* ✓.*Laagste kookpunt* ✓ (2)

2.7.1 INCREASE. ✓/*TOENEEM*✓ (1)

2.7.2 DECREASE. ✓/*AFNEEM*✓ (1)

2.7.3 INCREASE.✓/*TOENEEM*✓ (1)

[20]

QUESTION 3/*VRAAG 3*

3.1 Energy needed per mole to remove an electron from an atom in a gaseous phase. ✓✓
Energie benodig per mol om 'n elektron uit 'n atoom in die gasfase te verwyder. ✓✓
(2)

3.2 Ionisation energy increases from left to right, across a period. ✓✓
Ionisasie energie neem toe van links na regs oor 'n periode. ✓✓
(2)

3.3.1 Be:$1s^2\ 2s^2$✓✓
B:$1s^2\ 2s^2\ 2p^1$✓✓
(4)

3.3.2 B has a 2p energy level; 2p has a higher energy than 2s. ✓
Therefore less energy is needed to remove the valence electrons from B as from Be✓✓.
B het 'n 2p energievlak; 2p het meer energie as 2s ✓
Dus minder energie word benodig om 'n valenselektron van B te verwyder in vergelyking met Be. ✓✓

OR/*OF*

2s electrons are paired and 2p electron is unpaired. ✓ Therefore, less energy needed to remove 2p electron. ✓✓
Die 2s elektrone is gepaard teenoor die ongepaarde 2p elektrone. ✓ *Daarom word minder energie benodig om 'n 2p elektron te verwyder.* ✓✓

OR/OF

The 2p electron is further away from the nucleus ✓. Therefore, the electrostatic force weaker and requires less energy. ✓✓
Die 2p electron is verder van die kern✓, *dus is die elektrostatiese krag swakker en daarom word minder energie benodig om die elektron te verwyder.* ✓✓
(3)

3.4 False✓ The energy is high because of filled s and p-orbitals. ✓/
Vals✓ *Die energie is hoog agv die gevulde s- en p-orbitale.*✓
(2)

3.5.1 Alkali-metals✓
Alkali-metale✓
(1)

3.5.2 Reactivity increases from top to bottom✓✓
Reaktiwiteit verhoog van bo na onder in die groep.✓✓
(2)

3.5.3 Ionisation energy decreases, ✓ thus less energy to remove an electron. Therefore, reactivity increases. ✓
Ionisasie-energie neem af✓, *daarom word minder energie benodig om 'n elektron te verwyder. Reaktiwiteit neem dus toe.* ✓
(2)
[18]

QUESTION 4/*VRAAG 4*

4.1.1 Isotope: atoms of the same element having the same number of protons, but different number of neutrons. **OR** Same atomic number, but different mass numbers.✓✓
Isotoop: Atome van dieselfde element wat dieselfde getal protone het, maar verskillende getalle neutrone. ✓✓ ***OF*** *Dieselfde atoomgetalle, maar verskillende massagetalle.*
(2)

4.1.2 $50\% = 106{,}9\ \text{amu}$
$50\% = 109{,}1\ \text{amu}$ ✓

$$A_r = \frac{(50 \times 106{,}9) + (50 \times 109{,}1)}{100} \quad \text{(✓ ✓ ✓)}$$
$$= 108 \ ✓$$
(5)

4.1.3 Ag/Silver ✓✓
Ag/Silwer ✓✓
(2)

4.2.1 13 ✓
4.2.2 14 ✓
4.2.3 13 ✓
4.2.4 39 ✓
4.2.5 19 ✓
4.2.6 20 ✓
4.2.7 18 ✓
(7)
[16]

QUESTION 5/*VRAAG 5*

5.1 An aqueous solution. ✓/A solution in water ✓/*'n Waterige oplossing.*✓ (1)

5.2 Redox. ✓ Electron transfer took place. ✓/
Redoks. ✓ *Elektron oordrag het plaasgevind.* ✓

Accept/*Aanvaar*: Change in oxidation number/ *Verandering in oksidasiegetal.*
(2)

5.3 Chemical change. ✓/*Chemiese verandering.* ✓ (1)

5.4 The amount of substance having the same number of particles as there are atoms in 12g C-12.✓✓
Die stofhoeveelheid wat dieselfde getal deeltjies het as wat daar atome in 12g koolstof-12 is. ✓✓
(2)

5.5 $H_2O_2 : O_2$

$2 : 1$

$\therefore n(O_2) = 2 \text{ mol}$ ✓

$n = \frac{V}{V_m}$ ✓

$2 = \frac{V}{22,4}$ ✓

$V = 44,8 dm^3$ ✓

(4)

5.6 $n(H_2O_2) = \frac{m}{M}$

$= \frac{17}{34}$ ✓

$= 0,5 \text{ mol}$

$n = \frac{N}{N_A}$ ✓

✓

$(0,5)(2) = \frac{N}{6,02 \times 10^{23}}$

$N = 6,02 \times 10^{23}$ atoms/atome ✓

NOTE/*NOTA*:
If molar mass of H_2O_2 is incorrect, mark positively. Max 2/4
Positiewe nasien indien molêre massa van H_2O_2 verkeerd is. Maksimum punte 2/4

(4)
[14]

QUESTION 6/*VRAAG 6*

6.1.1 Gas forming ✓/*Gasvormende reaksie* ✓ (1)

6.2.1 $M(Na_2CO_3) = 2(23) + 12 + 3(16)$

$= 106$ ✓ $g \cdot mol^{-1}$ ✓ (2)

6.2.2 **POSITIVE MARKING FROM QUESTION 6.2.1**
POSITIEWE NASIEN VANAF VRAAG 6.2.1

$n(Na_2CO_3) = \frac{m}{M}$

$= \frac{10,6}{106}$ ✓

$= 0,1 \text{ mol}$ ✓

(2)

6.2.3 **POSITIVE MARKING FROM QUESTION 6.2.2**
POSITIEWE NASIEN VANAF VRAAG 6.2.2

OPTION 1/*OPSIE 1*:

$n(Na_2CO_3) : n(CO_2)$
1 : 1 ✓
Thus: $n(CO_2)=0,1$ mol

$n(CO_2) = \frac{m}{M}$ ✓

$0,1 = \frac{m}{44}$ ✓

$m = 4,4\ g$ ✓

OPTION 2/ OPSIE 2:

106 g of Na_2CO_3 : 44 g of CO_2 ✓✓

10,6 g : 4,4 g CO_2 ✓✓

(4)

6.2.4

$n(CO_2) = \frac{V_{CO_2}}{V_m}$

$= \frac{4,87}{22,4}$ ✓

$= 0,217$ mol

NOTE/ *NOTA*:
One mark for any one formula
Een punt vir enige een formule

$n(CO_2) : n(NaCl)$
1 : 2 ✓
$n(NaCl) = 0,434$ mol

$n(NaCl) = \frac{m}{M}$ ✓

✓ $0,434 = \frac{m}{58,5}$ ✓

$m = 25,16\ g$ ✓

NOTE/ *NOTA*:
If ratio 1:2 is not given, allocate two marks for 0,434 in the substitution.
Indien verhouding 1:2 nie gewys word nie, gee twee punte vir 0,434 vir die invervanging.

(6)

6.3

OPTION1/*OPSIE 1*:

Mass of H_2O = 14.2 – 5,3
= 8,9 g ✓

$n(Na_2CO_3) = \frac{m}{M}$ $n(H_2O) = \frac{m}{M}$

$= \frac{5,3}{106}$ ✓ $= \frac{8,9}{18}$ ✓

= 0,05 mol = 0,5 mol

$Na_2CO_3 : H_2O$

$\frac{0,05}{0,05} : \frac{0,5}{0,05}$ ✓ Divide by smallest number

1 : 10

Thus x = 10 ✓

OPTION 2/*OPSIE 2*:

Mass of H_2O = 14,2 – 5,3

= 8,9g ✓

$M(Na_2CO_3)$ = 160 g·mol^{-1} $M(H_2O)$ = 18 g·mol^{-1}

$n(Na_2CO_3) : n(H_2O)$

$\frac{m(Na_2CO_3)}{M(Na_2CO_3)} : \frac{m(H_2O)}{M(H_2O)}$ ✓

$\frac{5,3}{160} : \frac{8,9}{18}$ ✓

$0,05 : 0,5$

$\frac{0,05}{0,05} : \frac{0,5}{0,05}$ ✓ Divide by smallest number

1 : 10

Thus x =10 ✓

(5)
[20]

QUESTION 7/*VRAAG 7*

7.1 Distilled water does not contain free ions. ✓
Gedistilleerde water bevat geen vrye ione nie. ✓ (1)

7.2 Electrolyte ✓✓/*Elektroliet* ✓✓ (2)

7.3 $AgNO_3(s) \rightarrow Ag^+(aq)$ ✓ + $NO_3^-(aq)$ ✓
NOTE/*NOTA*: Phases need not be shown/ *Fases kan uitgelaat word.* (2)

7.4.1 The conductivity of $AgNO_3$ solution will increase with an increase in the concentration of the $AgNO_3$ solution at a constant temperature. ✓✓
Die geleidingsvermoë van die $AgNO_3$ oplossing sal toeneem met 'n toename in die konsentrasie van die oplossing, mits die temperatuur konstant bly.✓✓ (2)

7.4.2 Conductivity ✓/*Geleidingsvermoë* ✓
Accept/*Aanvaar*: Ammeter reading/ *Ammeter lesing* (1)

7.4.3 Concentration (of the $AgNO_3$ solution) ✓
Konsentrasie (van die $AgNO_3$ oplossing) ✓
Accept/*Aanvaar*: Spoons of $AgNO_3$ in distilled water/ *Lepels $AgNO_3$ in gedistilleerde water.* (1)

7.4.4 Temperature ✓/*Temperatuur* ✓ (1)

7.5 Without water ✓/*Sonder water/Watervry.* ✓ (1)

7.6 Mass of $AgNO_3 = (5,3)(2)$
$= 10,6$ g ✓

$$c = \frac{m}{MV} \quad ✓$$

$$= \frac{10,6}{170(0,2)} \quad ✓$$

$$= 0,31 \text{ mol} \cdot \text{dm}^{-3} \quad ✓$$

(4)

7.7 No. ✓ Tap water contains ions and it will affect the conductivity of the $AgNO_3$ solution. ✓
Nee, ✓ *Die kraanwater sal die geleidingsvermoë van die $AgNO_3$ oplossing beïnvloed.* ✓ (2)

7.8 An increase in concentration of ions in a solution increases conductivity of a solution. ✓✓
Met 'n toename in konsentrasie van ione, neem die geleidingsvermoë toe. ✓✓ (2)

7.9.1 DECREASE ✓/*AFNEEM* ✓ (1)

7.9.2 Silver chloride precipitate forms/ a reaction takes place ✓, thus decreasing the concentration of the ions in the solution.✓
Daar vorm 'n silwerchloried neerslag/'n chemiese reaksie vind plaas ✓ wat die konsentrasie van die ione in oplossing laat afneem.✓ (2)
[22]

QUESTION 8/*VRAAG 8*

8.1 $BaCl_2$✓ (1)

8.2 $CO_3^{-2}(aq) + BaCl_2(aq)$ ✓ → $BaCO_3(s)$✓ + $2Cl^-(aq)$ ✓ Bal ✓
NOTE/*NOTA*: Phases need not be shown/ *Fases kan uitgelaat word* (4)

8.3 $BaCO_3(s) + HNO_3(aq)$ ✓ → $Ba(NO_3)_2(aq) + CO_2(g)$✓ + $H_2O(l)$✓
NOTE/*NOTA*: Phases need not be shown/ *Fases kan uitgelaat word* (4)

8.4 Barium carbonate ✓✓/*Bariumkarbonaat.* ✓✓ (2)
[11]

QUESTION 9/*VRAAG 9*

9.1.1 Condensation ✓/*Kondensasie* ✓ (1)

9.1.2 Precipitation ✓/*Presipitasie* ✓ (1)

9.1.3 Transpiration ✓/*Transpirasie* ✓ (1)

9.2 Released✓, energy is released to the surrounding/cooling takes place/particles moves closer together. ✓
Vrygestel✓, *energie is vrygestel na die omgewing toe/afkoeling vind plaas/deeltjies beweeg nader aan mekaar.* ✓ (2)

9.3 Water absorbs the infrared energy from the sun and re-emits it therefore regulating the climate. ✓✓
Water absorber die infrarooi energie van die son en stel dit weer vry om klimaat te reguleer. ✓✓ (2)

9.4 Drilling of boreholes/Building of dams✓✓
Boorgate te sink/Damme te bou ✓✓
Accept/*Aanvaar*: Any applicable answer/ *Enige toepaslike antwoord word aanvaar.* (2)
[9]

TOTAL/*TOTAAL*: 150