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 2016

MEMORANDUM

MARKS/*PUNTE*: 147

This memorandum consists of 12 pages.
Hierdie memorandum bestaan uit 12 bladsye.

15/11/2016

QUESTION 1/*VRAAG 1*

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

QUESTION 2/*VRAAG 2*

2.1 A pure substance is a substance that cannot be separated into simpler components by physical methods. ✓
OR
A pure substance is made up of one (same) type of element or molecule. ✓
'n Suiwer stof is 'n stof wat nie deur fisiese metodes in eenvoudiger komponente opgebreek kan word nie.
OF
'n Suiwer stof bestaan slegs uit een (dieselfde) tipe element of molekule. (1)

2.2
2.2.1 Element ✓ (1)
2.2.2 Consist of only one type of atom.✓
Bestaan uit net een tipe atoom (1)
2.2.3 Mixtures ✓/*Mengsel* (1)
2.2.4 It is a combination of many gases. ✓
Dit is 'n kombinasie van baie gasse (1)

2.3 Pots and pans are made of metal, because metal is a <u>good conductor</u> ✓that allows heat to be transferred so that the food can cook. The handles are <u>insulators (poor conductor of heat)</u> ✓ so that you do not burn your hands when you pick up a hot pot.
Potte en panne word van metaal gemaak, omdat metaal 'n <u>goeie geleier</u> van hitte is wat toelaat dat hitte oorgedra word, sodat die kos kan gaar word. Die handvatsels is <u>isolators (swak geleiers van hitte)</u> sodat jou hande nie brand as jy 'n warm pot optel nie. (2)

2.4
2.4.1 $NaC\ell$ ✓✓ (2)
2.4.2 $Ca(OH)_2$ ✓✓ (2)
[11]

QUESTION 3/*VRAAG 3*

3.1 3.1.1 Temperature ✓/*Temperatuur* (1)

3.1.2 Time ✓ Also accept phase change
Tyd. Aanvaar ook faseverandering (1)

3.2 What is the relationship between an increase in temperature over a period of time and/or phase change? ✓✓
Wat is die verwantskap tussen 'n toename in temperatuur vir 'n tydperk en/of faseverandering?
NOTE: ✓The dependent and independent variable must be mentioned.
✓The relationship between the variables must be identified.
The question should not be answered with a YES or NO.
LET WEL: Die onafhanklike en afhanklike veranderlike moet genoem word.
Die verwantskap tussen die veranderlikes moet ook genoem word.
Die vraag moet nie kan beantwoord word deur 'n JA of NEE antwoord nie. (2)

3.3 Solid ✓/*Vaste stof* (1)

3.4 -24 °C ✓ (1)

3.5 Boiling point is the temperature of a liquid at which its vapour pressure is equal to the external (atmospheric) pressure. ✓✓
Kookpunt is die temperatuur van 'n vloeistof waar sy dampdruk gelyk is aan die eksterne (atmosferiese) druk. (2)

3.6 Liquid changes to gas. ✓/*Vloeistof na gas* (1)

3.7 The kinetic energy of the particles remains the same✓, the energy is used to overcome/break/weaken the intermolecular forces (forces of attraction) between the particles✓, particles move further away from each other (increase in potential energy)✓ resulting in a phase change✓.
Die kinetiese energie bly dieselfde✓, die energie word gebruik om die intermolekulêre kragte (aantrekkingskragte) tussen die deeltjies te oorkom /breek/verswak ✓,die deeltjies beweeg verder uit mekaar uit, dus neem die potensiële energie toe.✓ en sodoende vind 'n faseverandering plaas.✓ (4)

3.8 Substance 2.✓
Substance 2 has a lower melting and/or boiling point than substance 1. ✓
Stof 2.
Stof 2 het 'n laer smelt- en/of kookpunt as stof. (2)

3.9 Thermometer ✓/*Termometer* (1)

3.10 EQUAL TO.✓
Substance 1 and 2 are at the same temperature. Therefore they will have the same average kinetic energy.✓
GELYK AAN.
Stof 1 en 2 is by dieselfde temperatuur. Dus sal hulle oor dieselfde gemiddelde kinetiese energie beskik. (2)
[18]

QUESTION 4/*VRAAG 4*

4.1 Ionisation energy is the energy needed to remove an electron from (one mole) of an atom✓✓ in a gaseous phase.
Ionisasie-energie is die energie benodig om 'n elektron uit (een mol) van 'n atoom in 'n gasfase te verwyder. (2)

4.2 4.2.1 Metals have lower first ionisation energy than non-metals✓✓, therefore metals would rather lose electrons to form a positive ion (cation).
Metale het laer eerste ionisasie-energie as nie-metale, daarom sal metale eerder elektrone verloor om 'n positiewe ioon (katioon) te vorm. (2)

4.2.2 Non-metals have higher first ionisation energy than metals✓✓, therefore non-metals would rather gain electrons to form the negative ions (anions).
Nie-metale het hoër eerste ionisasie-energie as metale, daarom sal nie-metale eerder elektrone opneem om die negatiewe ione (anione) te vorm. (2)

4.3 The second electron is removed from the energy level very close to the nucleus (atomic radius decreases), therefore the force of attraction between the electron and the nucleus is stronger✓ hence more energy is needed to remove the second electron✓.
OR
When lithium loses its first electron, it attains a stable electron configuration✓, hence more energy is needed to remove the second electron✓.

Die tweede elektron word verwyder van die energievlak wat naby aan die kern is (atoomradius verminder), dus is die aantrekkingskrag tussen die elektron en die kern sterker. Daarom word meer energie benodig om die tweede elektron te verwyder.
OF
Wanneer litium die eerste elektron verloor, verkry dit 'n meer stabiele elektronkonfigurasie. Daarom word meer energie benodig om die tweede elektron te verwyder. (2)
[8]

QUESTION 5/*VRAAG 5*

5.1 Isotopes are atoms of the same element having the same number of protons but different numbers of neutrons. ✓✓
OR
Isotopes are atoms of the same element having the same atomic number but different atomic mass (mass number). ✓✓
Isotope is atome van dieselfde element wat dieselfde getal protone het, maar verskillende getalle neutrone.
OF
Isotope is atome van dieselfde element wat dieselfde atoomgetal het, maar verskillende atoommassas (massagetal) het. (2)

5.2 5.2.1 $^{19}_{9}X$ and/*en* $^{20}_{9}X$ ✓
OR/*OF*
A and/en C✓ (1)

5.2.2 Fluorine✓/*Fluoor* (1)

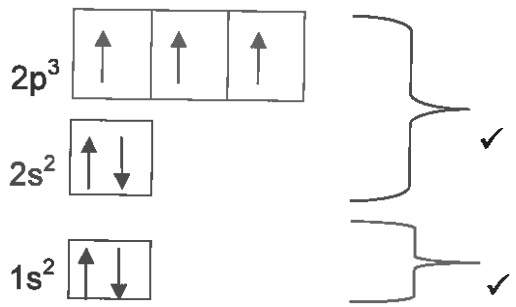
5.3 $$Ar(Cu) = \left(\frac{69}{100} \times 63\right)^{\checkmark} + \left(\frac{31}{100} \times 65\right)^{\checkmark}$$
$$= 63.62 \checkmark\checkmark$$ (4)

5.4 5.4.1 19 ✓
5.4.2 10 ✓
5.4.3 Mg (isotope) **OR** magnesium (isotope)✓
Mg (isotoop) **OF** magnesium (isotoop)✓
5.4.4 12 ✓
5.4.5 13 ✓ (5)

5.5 $(NH_4)_2SO_4$ ✓ (1)

5.6 Covalent bond✓.
Electrons are shared✓ between the atoms of hydrogen and nitrogen.
Kovalente binding.
Elektrone word gedeel tussen die atome van waterstof en stikstof. (2)

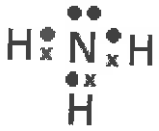
5.7



✓
✓ (2)

5.8 5 ✓ (1)

5.9



✓✓ (2)
[21]

QUESTION 6/*VRAAG 6*

6.1 6.1.1 Reaction (ii) ✓/*Reaksie (ii)* (1)
6.1.2 Reaction (i) ✓/*Reaksie (i)* (1)

6.2 Gas phase ✓
Gasfase (1)

6.3 6.3.1 aluminium carbonate: $Al_2(CO_3)_3$ ✓✓
aluminiumkarbonaat: $Al_2(CO_3)_3$ (2)

6.3.2 aluminium oxide: Al_2O_3 ✓✓
aluminiumoksied: Al_2O_3 (2)

6.4 $Cl_{2\,(g)} + H_{2\,(g)} \rightarrow 2HCl_{(g)}$ ✓Reactants/ Reagense ✓ Products/ Produkte (2)

6.5 Reactants/*Reaktante*: M (Cl_2) + M (H_2)
= (2)(35,5) + (2)(1)
= 73 g.mol^{-1} ✓

Products/Produkte: M (2 HCl)
= (2)(1 + 35,5)
= 73 g.mol^{-1} ✓

Thus the mass of the reactants = mass of the products ✓
Dus die massa van die reaktante = massa van die produkte. (3)

6.6 M(HCl) = 1 + 35,5
= 36,5 (g.mol^{-1}) ✓

$$\%H = \frac{1}{36.5} \times 100$$
$$= 2,74\% \checkmark$$

$$\%Cl = \frac{35,5}{36,5} \times 100$$
$$= 97,26\% \checkmark$$

(3)
[15]

QUESTION 7/*VRAAG 7*

7.1 An electrolyte is a solution that conducts electricity ✓✓through the movement of ions.
'n Elektroliet is 'n oplossing wat elektrisiteit gelei deur die beweging van ione. (2)

7.2 $KC\ell$ ✓ $\rightarrow K^+$ ✓ + $C\ell^-$ ✓ (3)

7.3 $KC\ell : K^+$
1 : 1
Thus 2 mol of $KC\ell$ dissolves.✓✓
Dus 2 mol $KC\ell$ los op. (2)

7.4 $\%K = \frac{39}{74,5} \times 100$ ✓
$= 52,35\%$ ✓ (2)

7.5 Increase ✓/*Toeneem* (1)

7.6 ⊖ **NEGATIVE MARKING FROM QUESTION 7.5.**
NEGATIEWE NASIEN VAN VRAAG 7.5.
With an increase in concentration of the metal salt, potassium chloride, more ions are released ✓ into the solution. Thus, more free ions are available to conduct electricity. ✓
Met 'n toename in die konsentrasie van die metaalsout, kaliumchloried, word meer ione in die oplossing vrygelaat. Dus is meer ione beskikbaar om elektrisiteit te gelei. (2)
[12]

QUESTION 8/*VRAAG 8*

8.1 8.1.1 The empirical formula is the simplest whole number ratio of atoms in a compound. ✓✓
Die empiriese formule is die eenvoudigste heelgetalverhouding van atome in 'n verbinding. (2)

8.1.2 If 100 g of the compound is available then:
Indien 100 g van die verbinding beskikbaar is, dan is daar:

53,3 g O	40 g C	6,6 g H
M(O) = 16 g·mol^{-1}	M(C) = 12 g·mol^{-1}	M(H) = 1 g·mol^{-1}
n = m/M	n = m/M	n = m/M
n = 53,3/16	n = 40/12	n = 6,6/1
n = 3,33125 mol ✓	n = 3,3 mol ✓	n = 6,6 mol ✓

Thus/*Dus*:

O	:	C	:	H
3,33125 / 3,3	:	3,3 / 3,3	:	6,6 / 3,3 ✓
1	:	1	:	2

Emiprical formula/*Empiriese formule* = C H_2 O✓
ACCEPT TABLE METHOD
AANVAAR TABEL METODE (5)

8.1.3 M(CH_2O)
= 12 + 2(1) + 16
= 30 g·mol^{-1} ✓

$$\frac{\text{Formule mass/}\textit{Formulemassa}}{\text{Empirical mass/}\textit{Empiriese massa}} = \frac{60}{30} = 2 \checkmark$$

Thus the *molecular formula*
Dus is die molekulêre formule = (CH_2O) x 2
= $C_2H_4O_2$ ✓ (3)

8.2 M (Na_2CO_3) = 106 g·mol^{-1} ✓

M (x H_2O) = 268 – 106
= 162 g·mol^{-1} ✓

$$n(H_2O) = \frac{162}{18} \checkmark$$
$$= 9 \text{ mol} \checkmark$$

(4)
[14]

QUESTION 9/*VRAAG 9*

9.1 Temperature/*Temperatuur*: 273 K or/*of* 0 °C ✓
Pressure/*Druk*: 1,013 x 10^5 Pa (101,3 kPa) or/*of* 1 atm ✓ (2)

9.2 9.2.1

MARK OPTION 1 AND 2 IF 10g Na IS USED. ***MERK OPSIE 1 EN 2 INDIEN 10g Na GEBRUIK IS.***	**MARK OPTION 3 IF 2dm^3 WATER IS USED** ***MERK OPSIE 3 INDIEN 2dm^3 WATER GEBRUIK IS.***
OPTION 1/*OPSIE 1*: $n(Na) = \frac{m}{M}$ ✓ $= \frac{10}{23}$ ✓ = 0,43 mol Na Na : H_2 2 : 1 ✓ Thus 0,22 mol H_2 produced ✓ *Dus 0,22 mol H_2 word geproduseer.* $n(H_2) = \frac{m}{M}$ $0,22 = \frac{m}{2}$ m = 0,43 g ✓ H_2 produced/*gevorm* **OPTION 2/*OPSIE 2*:** 2 mol Na produces 1 mol H_2 ✓ (2)(23g) ✓ produces (1)(2g) ✓ 10g produces *x*✓ *x* = 0,43g✓	**OPTION 3/*OPSIE 3*:** 2 mol H_2O : 1 mol H_2 ✓ (2)(18) ✓ : 2 ✓ 2000 g : *x*✓ *x* = 111,11g ✓

(5)

9.2.2

POSITIVE MARKING FROM 9.2.1
POSITIEWE NASIEN VAN 9.2.1

MARK OPTION 1 AND 2 IF 10 g Na IS USED.
MERK OPSIE 1 EN 2 INDIEN 10g Na GEBRUIK IS.

OPTION 1/*OPSIE1*:

$n(H_2) = \frac{V}{V_m}$ ✓

$0,22 = \frac{V}{22,4}$ ✓

$V = 4,93\ dm^3$ ✓

Accept $4,82\ dm^3$

OPTION 2/*OPSIE 2*:

1 mol : $22,4\ dm^3$ ✓
2g : $22,4\ dm^3$✓
0,43g : x
$x = 4,82\ dm^3$✓

MARK OPTION 3 IF $2dm^3$ WATER IS USED
MERK OPSIE 3 INDIEN $2dm^3$ WATER GEBRUIK IS.

OPTION 3/*OPSIE 3*:

1 mol : $22,4\ dm^3$ ✓
2g : $22,4\ dm^3$✓
111,11g : x
$x = 1244,43\ dm^3$

(3)

9.2.3

POSITIVE MARKING FROM 9.2.1
POSITIEWE NASIEN VAN 9.2.1

MARK OPTION 1 AND 2 IF 10 g Na IS USED.
MERK OPSIE 1 EN 2 INDIEN 10g Na GEBRUIK IS.

OPTION 1/*OPSIE 1*:

n(Na) : n(NaOH)
2 : 2 ✓
Thus mol NaOH = 0,43 mol
Dus mol NaOH = 0,43 mol

$n(NaOH) = \frac{m}{M}$ ✓

$0,43 = \frac{m}{(23+16+1)}$ ✓

m = 17,2 g ✓ of NaOH produced/*gevorm*

OPTION 2/*OPSIE 2*:

1 mol Na produces/*produseer* 1 mol NaOH ✓
23g produces/*produseer* 40g ✓
10g produces/*produseer* *x*✓
x = 17,39g✓

MARK OPTION 3 IF 2dm^3 WATER IS USED
MERK OPSIE 3 INDIEN 2dm^3 WATER GEBRUIK IS.

OPTION 3/*OPSIE 3*:

1 mol H_2O : 1 mol NaOH ✓
18g : 40g ✓
2000g : *x*✓
x = 4444,44g✓

(4)

9.2.4

POSITIVE MARKING FROM 9.2.3
POSITIEWE NASIEN VAN 9.2.3

$c = \frac{n}{V}$ ✓

$c = \frac{0,43}{2}$ ✓

c = 0,22 mol.dm^{-3} ✓

(3)
[14]

QUESTION 10/*VRAAG 10*

10.1 Precipitate ✓/*Presipitaat/Neerslag* (1)

10.2 10.2.1 Step I: $BaCl_2$ ✓
Step II: no reaction ✓

Stap I: $BaCl_2$
Stap II: geen reaksie ✓ (2)

10.2.2 Step I: $AgNO_3$ ✓
Step II: HNO_3 ✓

Stap I: $AgNO_3$
Stap II: HNO_3 (2)

10.2.3 White ✓/*Wit* (1)

10.3 10.3.1 C ✓ (1)
10.3.2 D ✓ (1)
10.3.3 A ✓ (1)

10.4 Precipitation ✓/*Presipitasie (neerslag)*
Evaporation ✓/*Verdamping*
Condensation ✓/*Kondensasie* (3)

10.5 Building dams that store drinking water and water for household needs or agriculture.
Boreholes are used to tap ground water for use.
Any applicable answer. ✓✓

Bou damme vir drinkwater en huishoudelike gebruik of landbou.
Boorgate word gebruik om grondwater te gebruik.
Enige aanvaarbare antwoord. ✓✓ (2)
[14]

TOTAL/*TOTAAL*: 147

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TO: HEADS OF EXAMINATION SECTIONS
HEADS OF CURRICULUM SECTIONS

EXAMINATION INSTRUCTION NO 35 OF 2016

AMENDMENTS TO THE MARKING GUIDELINE OF THE 2016 COMMON EXAMINATION FOR GRADE 10: PHYSICAL SCIENCES P2

Error on both English and Afrikaans versions: Question 9.

1. An error was identified in sub question 9.2.4. Information required to calculate the concentration of NaOH was omitted.
2. This sub question which carried 3 marks must not be marked, and, these 3 marks must be excluded.
3. Consequently the total marks for the question paper must be reduced to 147 marks, then scaled up to 150 marks.
4. Refer to **Annexure A** that provides the conversion table that must be used to calculate the learner's total marks.
5. For further information please contact the Director: Examinations and Assessment, Ms P Ogunbanjo at 012 357 3909 or email: Ogunbanjo.p@dbe.gov.za

DR RR POLIAH
CHIEF DIRECTOR: NATIONAL ASSESSMENT AND PUBLIC EXAMINATIOS
DATE: 15-11-16.

DEPARTMENT OF BASIC EDUCATION
PRIVATE BAG X895, PRETORIA 0001
2016 -11- 11
APPROVED MARKING GUIDELINE
PUBLIC EXAMINATION

Annexure A: GRADE 10 PHYSICAL SCIENCES P2: ENGLISH AND AFRIKAANS VERSIONS- MARKS CONVERTED FROM 147 TO 150

Mark out of 147	Converted to 150
1	1
2	2
3	3
4	4
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10	10
11	11
12	12
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Mark out of 147	Converted to 150
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Mark out of 147	Converted to 150
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Mark out of 147	Converted to 150
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