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 2018

MARKING GUIDELINES/*NASIENRIGLYNE*

MARKS/*PUNTE*: 150

Approved
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DEPARTMENT OF BASIC EDUCATION
PRIVATE BAG X895, PRETORIA 0001
Chief Examiner 2018 -11- 21 DBE
APPROVED MARKING GUIDELINE
PUBLIC EXAMINATION

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

NOTE/NOTA: **Ignore 1.4/ *Ignoreer 1.4 and***
Question 8.4 molecular formula not in CAPS *Vraag 8.4 molekulere formule nie in KABV*
MARKS/*PUNTE*: 141

QUESTION 1/*VRAAG 1*

1.1 C ✓✓ (2)

1.2 C ✓✓ (2)

1.3 B ✓✓ (2)

1.4 (Ignore this question/*Ignoreer hierdie vraag)*

1.5 A ✓✓ (2)

1.6 D ✓✓ (2)

1.7 C ✓✓ (2)

1.8 C ✓✓ (2)

1.9 D ✓✓ (2)

1.10 C ✓✓ (2)
[18]

QUESTION 2/*VRAAG 2*

2.1 A pure substance consisting of one type of atom. ✓✓*I'n Suiwer stof wat uit een tipe atoom bestaan.* (2)

2.2.1 P ✓ (1)

2.2.2 Q ✓ (1)

2.2.3 R ✓ (1)

2.3 Element ✓ (1)

2.4 Evaporation ✓/*Verdamping* (1)

2.5.1 Q: Boiling point ✓/*Kookpunt* (1)

2.5.2 R: Magnetism ✓/*Magnetisme* (1)
[9]

QUESTION 3/*VRAAG 3*

3.1 The temperature of the liquid at which the vapour pressure equals the external (atmospheric) pressure. ✓✓/*Die temperatuur van die vloeistof waarteen die dampdruk aan die eksterne (atmosferiese) druk gelyk is.* (2)

3.2.1 80 °C ✓ (1)

3.2.2 D ✓ (1)

3.2.3 C ✓ (1)

3.3 Liquid changes to gas ✓/*Vloeistof verander na gas* (1)

3.4 Remains the same. ✓/*Bly dieselfde* (1)

3.5 Energy is used to overcome the intermolecular forces. ✓/*Energie word gebruik om die intermolekulêre kragte te oorkom.*
No energy available to increase the kinetic energy of the particles. ✓/*Geen energie beskikbaar om die kinetiese energie van die partikels te verhoog nie.* (2)

3.6 A ✓
Lowest boiling point. ✓✓/*Laagste kookpunt*

OR/*OF*

Highest vapour pressure at a specific temperature./*Hoogste dampdruk by 'n spesifieke temperatuur* (3)

3.7 Vapour pressure increases with an increase in temperature. ✓✓/*Dampdruk verhoog wanneer temperatuur verhoog.*

OR/*OF*

Vapour pressure is proportional to temperature. ✓✓/*Dampdruk is direk eweredig aan temperatuur.* (2)
[14]

QUESTION 4/*VRAAG 4*

4.1 The number of protons in an atom of an element ✓✓/*Die aantal protone in 'n atoom van 'n element* (2)

4.2.1 $^{30}_{14}Si$ ✓✓ $^{28}_{14}Si$✓

- Identification of element (Si)/ *Identifiseer element (Si)*✓
- Correct mass number and atomic number (A and Z)/*Korrekte massagetal en atoomgetal (A en Z)*✓
- No mark for swopping of A and Z/*Geen punt indien A en Z omgeruil word*

(2)

4.2.2 P ✓ / Sodium / Na/ *Natrium* (1)

4.2.3 S^{2-} ✓✓

- Identification of correct element (S)/*Identifiseer korrekte element (S)*✓
- Correct charge (2-)/*Korrekte lading (2-)*✓
- Incorrect identification of element/*Verkeerde element* (0/2)

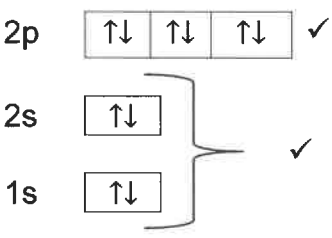
(2)

4.3.1 Rb_2O ✓✓ (2)

4.3.2 Rb is in the same group as P / Na✓ /*Rb is in dieselfde groep as P/ Na*
OR/OF Rb is in group 1/*Rb is in groep 1*
∴ has the same valency as P/ Na. ✓/ ∴ *het dieselfde valensie as P/ Na.* (2)

4.4 Increases. ✓/*Neem toe*
From P to R, the atomic radius gets smaller. ✓ **OR/OF** The outer electrons get closer to the nucleus.
Van P na R raak die atomiese radius kleiner./Die buite-elektrone kom nader aan die kern.
The attraction between the nucleus and the outer electron gets stronger ✓ ∴ more energy is needed to remove the electrons. ✓/*Die aantrekkingskrag tussen die kern en die buite-elektrone raak sterker* ∴ *meer energie is nodig om die elektrone te verwyder.* (4)

4.5 10 (electrons) ✓



✓ ✓

(3)

4.6 Hund's rule ✓/*Hund se reël* (1)

4.7 Relative atomic mass/*Relatiewe atoommassa*:

$$A_r = \frac{(28\times92,23 + 29\times4,68 + 30\times3,09)\checkmark}{100\ \checkmark}$$

$$= 28,11\ (u)\ \checkmark$$ (3)

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QUESTION 5/*VRAAG 5*

5.1 A change in which no new substances are formed. ✓✓*I'n Verandering waarin geen nuwe stowwe gevorm word nie.*

OR/*OF*

A change in which energy changes are small in relation to chemical changes. ✓✓*I'n Verandering waarin energieveranderinge klein is in vergelyking met chemiese veranderinge.*

OR/*OF*

A change in which mass, number of atoms and molecules are being conserved. ✓✓*I'n Verandering waarin massa, getal atome en molekule behoue bly.* (2)

5.2.1 X ✓ (1)

5.2.2 Y ✓ (1)

5.3 Sublimation. ✓/*Sublimasie* (1)

5.4 Colour change. ✓/*Kleurverandering*

Formation of gas ✓/*Vorming van gas*

Formation of a precipitate ✓/*Vorming van 'n neerslag*

Change in temperature ✓/*Verandering in temperatuur* (Any two/*Enige twee*) (2)

5.5.1 Heat. ✓/*Hitte* (1)

5.5.2 $4Fe(s) + 3O_2(g) \rightarrow 2Fe_2O_3(s)$ (4)

Notes/Aantekeninge
- Reactants✓; products✓; phases✓; balancing✓
  Reaktanse/produkte/fases/balansering

Marking rule 6.3.10./*Nasienreël 6.3.10.*

5.6.1 States that, no matter how a chemical compound is prepared, it always contains the same elements in the same proportion by mass. ✓✓/*Stel dit dat dit nie saak maak hoe 'n chemiese binding berei word nie; dit bevat altyd dieselfde elemente in dieselfde verhouding by massa.* (2)

5.6.2 ***OPTION 1/ OPSIE 1:***

Mass of CO_2 in the 1st sample/*Massa van CO_2 in die 1ste monster*
= 20 – 11,2✓
= 8,8 g

Proportion of CO_2 in the 1st sample/*Verhouding van CO_2 in die 1ste monster*
= $\frac{8,8}{20}$ ✓

∴ Mass of CO_2 in the 2nd sample/*Massa van CO_2 in die 2de monster*
= $\frac{8,8}{20}$ x 30 ✓

= 13,2 g✓

(4)

OPTION 2/ OPSIE 2:	***OPTION 3/ OPSIE 3:***
100 g $CaCO_3$ → 44 g CO_2 ✓ 30 g $CaCO_3$ → x g CO_2 ✓ $x = \frac{30 \times 44}{100}$ ✓ x = 13,2 g✓	20 g $CaCO_3$ → 11,2 g CaO ✓ 30 g $CaCO_3$ → x g CaO ✓ x = 16, 83 g CaO ∴ Mass of CO_2 in the 2nd sample/ *Massa van CO_2 in die 2de monster* = 30 – 16, 83✓ = 13,2 g✓

[18]

QUESTION 6/*VRAAG 6*

6.1.1 A ✓ (1)

6.1.2 B ✓ (1)

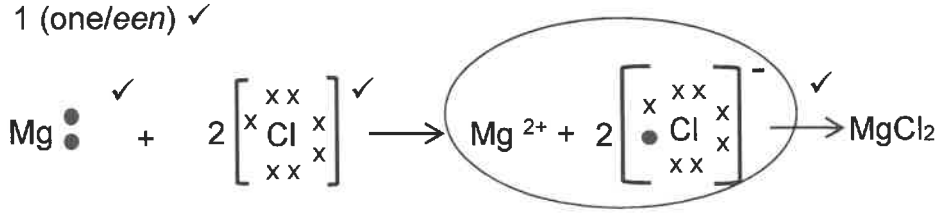
6.2 It is formed when a pool of delocalised electrons✓ surround the positive metal ion core.✓/*Rooster metaal ione met wolk/poel gedelokaliseerde elektrone wat positiewe ioonkerne omring* (2)

6.3 Ionic (bond) ✓/*Ioniese (binding)* (1)

6.4.1 A pure substance consisting of two or more different elements. ✓✓/*'n Suiwer stof wat uit twee of meer verskillende elemente bestaan.* (2)

6.4.2 Alkali earth ✓ (metals)/*Aardalkali (metale)* (1)

6.4.3 1 (one/*een*) ✓ (1)

6.4.4 

(3)

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QUESTION 7/*VRAAG 7*

7.1 Hydrated: surrounded by water molecules✓/*Gehidrateer: omring deur water molekules* (1)

7.2 $Na_2CO_3(s) \rightarrow 2Na^+(aq) + CO_3^{2-}(aq)$
Products: ✓ Balancing: ✓/*Produkte:/Balansering:* (2)

7.3.1 The amount of a substance having the same number of particles as there are atoms in 12 g carbon-12. ✓✓/*Die hoeveelheid van 'n stof met dieselfde getal partikels as wat daar atome in 12 g koolstof-12 is.* (2)

7.3.2 Acid-base ✓/gas forming (reaction)/*Suur-basis/gasvormend (reaksie)* (1)

7.3.3 $c(HCl) = \frac{n(HCl)}{V(HCl)}$✓

$1 = \frac{n(HCl)}{0,005}$✓

$n = 0,005$ mol ✓ (3)

7.4 **POSITIVE MARKING FROM 7.3.3/ *POSITIEWE NASIEN VANAF 7.3.3***

$n(NaCl) : n(HCl) = 1 : 1$

$n(NaCl) = \frac{1}{1} \times 0,005$✓

$n(NaCl) = 0,005$ mol

$n(NaCl) = \frac{m}{M}$✓

$0,005$✓ $= \frac{m}{58,5}$✓

$m = 0,29$ g ✓ (5)

Marking criteria/Nasienriglyne:
- **Using** ratio/***Gebruik*** *verhouding*✓
- Formula/*Formule* $n = \frac{m}{M}$✓
- Substituting of/ *Invervanging van* 0,005 mol✓ & 58,5 g·mol^{-1} ✓in $n = \frac{m}{M}$
- Final answer/*Finale antwoord*: 0,29 g ✓

[14]

QUESTION 8/*VRAAG 8*

8.1 A solution that conducts electricity✓✓ (through the movement of ions). / *'n Oplossing wat elektrisiteit deur die beweging van ione gelei.*
NOTE/*LET WEL*: If learners refer to movement of electrons, a mark is forfeited/*Indien leerder verwys na beweging van elektrone, penaliseer met 1 punt.* (2)

8.2.1 What is the relationship between a type of substance and its (electrical) conductivity? ✓✓/*Wat is die verwantskap tussen 'n tipe stof en sy (elektriese) geleidingsvermoë?*

OR/*OF*

How does a type of substance affect the (electrical) conductivity of a substance? ✓✓/*Hoe beïnvloed 'n tipe stof die (elektriese) geleidingsvermoë van 'n stof?* (2)

Marking Criteria/Nasienriglyne:	
Dependent and independent variable correctly stated. *Afhanklike en onaafhanklike veranderlikes korrek genoem.*	✓
Ask a question about the relationship between the independent and dependent variables. *Vra 'n vraag oor die verwantskap tussen die onafhanklike en afhanklike veranderlikes.*	✓

8.2.2 Conductivity ✓/*Geleidingsvermoë* (1)

8.2.3 Type of a substance ✓/*Tipe stof* (1)

8.2.4 Mass OR Temperature ✓/*Massa OF Temperatuur* (1)

8.3.1 A solution of $CaCl_2$ ✓/*'n Oplossing* $CaCl_2$
It is the strongest electrolyte ✓/*Dit is die sterkste elektroliet.*

OR/*OF*

It has the highest concentration of (chloride) ions ✓/*Dit het die grootste getal (chloried) ione.* (2)

8.3.2 A solution of sugar ✓/*'n Oplossing van suiker*
It contains no free ions. ✓/*Dit bevat geen vrye ione nie.* (2)

8.4 n(C):C(H):n(O)

$$\frac{m(C)}{M[C]} : \frac{m(H)}{M[H]} : \frac{m(O)}{M[O]}$$

Assume mass of 100 g of a sample/*Aanvaar massa van 100 g van 'n monster*

$$\frac{40}{12}\checkmark : \frac{6,67}{1}\checkmark : \frac{53,33}{16}\checkmark$$

3,33 : 6,67 : 3,33

$$\frac{3,33}{3,33} : \frac{6,67}{3,33} : \frac{3,33}{3,33}$$

1 : 2 : 1✓

Empirical formula/*Empiriese formule*: CH_2O

$M(CH_2O) = 12 + 2 + 16 = 30\ g{\cdot}mol^{-1}$✓

$$\text{Factor/}Faktor = \frac{180}{30} = 6\checkmark$$

∴ Molecular formula/*Molekulêre formule* is: $C_6H_{12}O_6$ ✓ (7)
[11]

QUESTION 9/*VRAAG 9*

9.1 Precipitation reaction ✓/*Presipitasiereaksie* (1)

9.2.1 Sulphate ✓/*Sulfaat* (1)

9.2.2 $BaCO_3 + 2HNO_3$ ✓ $\rightarrow Ba(NO_3)_2 + CO_2 + H_2O$✓

Reactants✓; products✓; balancing✓
Reaktanse/produkte/ balansering (3)

9.3.1 $n(Na_2CO_3) = \frac{m}{M}$✓

$= \frac{5}{106}$✓

$= 0,047$ mol

$n(BaCO_3) : n(Na_2CO_3)$

$1 : 1$✓

$m(BaCO_3) = n \times M$

$= 0,047 \times 197$✓

$= 9,26$ g ✓ (Range/*Gebied*: 9,25 – 9,87) (5)

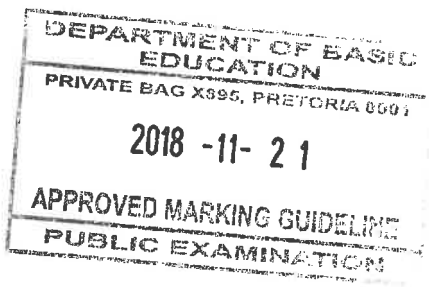
Marking criteria/Nasienriglyne:
- Formula/*Formule* $n = \frac{m}{M}$✓
- Substitution/Inver*vanging* ✓
- Using ratio/*Gebruik verhouding* ✓
- Multipy by/*Vermenigvulding met* 197 g·mol^{-1} ✓in $n = \frac{m}{M}$
- Final answer/*Finale antwoord*: 9,26 g ✓

9.3.2 **POSITIVE MARKING FROM 9.3.1/ *POSITIEWE NASIEN VANAF 9.3.1***

$$\%\ \text{yield/}opbrengs = \frac{\text{actual yield/}werklike\ opbrengs}{\text{theoretical yield/}teoretiese\ opbrengs} \times 100$$

$= \frac{8,3}{9,26} \times 100$ ✓

$= 89,63\%$✓ (Range/*Gebied*: 84,26 – 89,64) (2)
[12]



QUESTION 10/*VRAAG 10*

10.1 Hydrosphere: includes all water of the earth found as liquid water ✓ *Hidrosfeer: sluit alle water van die aarde in wat as vloeibare water gevind word*
Biosphere: includes all the living organisms. ✓/*Biosfeer: sluit alle lewende organismes in* (2)

10.2.1 (A) Transpiration ✓/*Transpirasie*

10.2.2 (B) Condensation ✓/*Kondensasie*

10.2.3 (C) Precipitation ✓/*Presipitasie* (3)

10.3 (A) Energy gained ✓/*Energie gewen*

(B) Energy lost. ✓/*Energie verloor* (2)

10.4 Roots of plants absorb water from the ground. ✓/*Plantwortels absorbeer water uit die grond.*
Plants release the water to the atmosphere by transpiration. ✓/*Plante stel water deur transpirasie aan die atmosfeer vry.*
The water condenses to form clouds. ✓/*Die water kondenseer om wolke te vorm.*
Then water falls back to the ground by precipitation. ✓/*Water val dan terug grond toe deur presipitasie.* (4)
[11]

TOTAL/*TOTAAL*: 150
141