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# 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**

**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. ✓✓/’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)

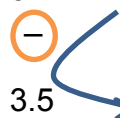
3.2.1 80 °C ✓ (1)

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  $^{30}_{14}\text{Si}$  ✓✓  $^{28}_{14}\text{Si}$  ✓ (2)

- 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 swapping of A and Z/*Geen punt indien A en Z omgeruil word*

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

4.2.3  $\text{S}^{2-}$  ✓✓ (2)

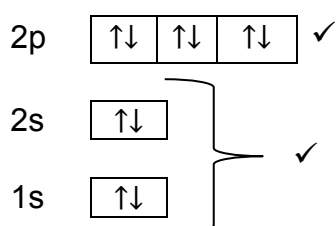
- Identification of correct element (S)/*Identifiseer korrekte element (S)* ✓
- Correct charge (2-)/*Korrekte lading (2-)* ✓
- Incorrect identification of element/*Verkeerde element (0/2)*

4.3.1  $\text{Rb}_2\text{O}$  ✓✓ (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*  
 $\therefore$  has the same valency as P/ Na. ✓/  $\therefore$  *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 ✓  $\therefore$  more energy is needed to remove the electrons. ✓/ *Die aantrekkingskrag tussen die kern en die buite-elektrone raak sterker  $\therefore$  meer energie is nodig om die elektrone te verwyder.* (4)

4.5 10 (electrons) ✓



4.6 Hund's rule ✓/ *Hund se reël* (1)

4.7 Relative atomic mass/*Relatiewe atoommassa*:

$$A_r = \frac{(28 \times 92,23 + 29 \times 4,68 + 30 \times 3,09)}{100} \checkmark$$

$$= 28,11 \text{ (u)} \checkmark$$

(3)  
[22]

### QUESTION 5/VRAAG 5

5.1 A change in which no new substances are formed.  $\checkmark\checkmark$ /In Verandering waarin geen nuwe stowwe gevorm word nie.

**OR/OF**

A change in which energy changes are small in relation to chemical changes.  $\checkmark\checkmark$ /In 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.  $\checkmark\checkmark$ /In Verandering waarin massa, getal atome en molekule behoue bly.

(2)

5.2.1 X  $\checkmark$

(1)

5.2.2 Y  $\checkmark$

(1)

5.3 Sublimation.  $\checkmark$ /Sublimasie

(1)

5.4 Colour change.  $\checkmark$ /Kleurverandering

Formation of gas  $\checkmark$ /Vorming van gas

Formation of a precipitate  $\checkmark$ /Vorming van 'n neerslag

Change in temperature  $\checkmark$ /Verandering in temperatuur (Any two/Enige twee)

(2)

5.5.1 Heat.  $\checkmark$ /Hitte

(1)

5.5.2  $4\text{Fe(s)} + 3\text{O}_2\text{(g)} \rightarrow 2\text{Fe}_2\text{O}_3\text{(s)}$

(4)

#### Notes/Aantekeninge

- Reactants $\checkmark$ ; products $\checkmark$ ; phases $\checkmark$ ; balancing $\checkmark$

*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.  $\checkmark\checkmark$ /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<sub>2</sub> in the 1<sup>st</sup> sample/Massa van CO<sub>2</sub> in die 1<sup>ste</sup> monster  
 = 20 – 11,2 ✓  
 = 8,8 g

Proportion of CO<sub>2</sub> in the 1<sup>st</sup> sample/Verhouding van CO<sub>2</sub> in die 1<sup>ste</sup> monster  
 =  $\frac{8,8}{20}$  ✓

∴ Mass of CO<sub>2</sub> in the 2<sup>nd</sup> sample/Massa van CO<sub>2</sub> in die 2<sup>de</sup> monster  
 =  $\frac{8,8}{20} \times 30$  ✓  
 = 13,2 g ✓

(4)

<b>OPTION 2/ OPSIE 2:</b>	<b>OPTION 3/ OPSIE 3:</b>
100 g CaCO <sub>3</sub> → 44 g CO <sub>2</sub> ✓ 30 g CaCO <sub>3</sub> → x g CO <sub>2</sub> ✓  $x = \frac{30 \times 44}{100}$ ✓  x = 13,2 g ✓	20 g CaCO <sub>3</sub> → 11,2 g CaO ✓ 30 g CaCO <sub>3</sub> → x g CaO ✓  x = 16,83 g CaO  ∴ Mass of CO <sub>2</sub> in the 2 <sup>nd</sup> sample/ Massa van CO <sub>2</sub> in die 2 <sup>de</sup> 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  $\text{Mg} \bullet \bullet + 2 \begin{bmatrix} \times \times \\ \times \text{Cl} \times \\ \times \times \end{bmatrix} \longrightarrow \text{Mg}^{2+} + 2 \begin{bmatrix} \times \times \times \\ \bullet \text{Cl} \times \\ \times \times \end{bmatrix}^{-} \longrightarrow \text{MgCl}_2$  (3)

[12]



## QUESTION 7/VRAAG 7

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

7.2  $\text{Na}_2\text{CO}_3(\text{s}) \rightarrow 2\text{Na}^+(\text{aq}) + \text{CO}_3^{2-}(\text{aq})$   
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  $c(\text{HCl}) = \frac{n(\text{HCl})}{V(\text{HCl})}$  ✓  
 $1 = \frac{n(\text{HCl})}{0,005}$  ✓  
 $n = 0,005 \text{ mol}$  ✓ (3)

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

$$n(\text{NaCl}) : n(\text{HCl}) = 1 : 1$$

$$n(\text{NaCl}) = \frac{1}{1} \times 0,005 \checkmark$$

$$n(\text{NaCl}) = 0,005 \text{ mol}$$

$$n(\text{NaCl}) = \frac{m}{M} \checkmark$$

$$0,005 \checkmark = \frac{m}{58,5 \checkmark} \checkmark$$

$$m = 0,29 \text{ g} \checkmark$$

Marking criteria/Nasienriglyne:

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

(5)  
[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. <i>Afhanklike en onafhanklike veranderlikes korrek genoem.</i>	✓
Ask a question about the relationship between the independent and dependent variables. <i>Vra 'n vraag oor die verwantskap tussen die onafhanklike en afhanklike veranderlikes.</i>	✓

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  $\text{CaCl}_2$  ✓/’n Oplossing  $\text{CaCl}_2$   
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  $n(\text{C}) : \text{C}(\text{H}) : n(\text{O})$  [ ignore this question]

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

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

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

$$3,33 : 6,67 : 3,33$$

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

$$1 : 2 : 1 \checkmark$$

Empirical formula/Empiriese formule:  $\text{CH}_2\text{O}$

$$M(\text{CH}_2\text{O}) = 12 + 2 + 16 = 30 \text{ g} \cdot \text{mol}^{-1} \checkmark$$

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

∴ Molecular formula/Molekulêre formule is:  $\text{C}_6\text{H}_{12}\text{O}_6 \checkmark$

(7)  
[11]

**QUESTION 9/VRAAG 9**

9.1 Precipitation reaction ✓/Presipitasieëreksie (1)

9.2.1 Sulphate ✓/Sulfaat (1)

9.2.2  $\text{BaCO}_3 + 2\text{HNO}_3 \checkmark \rightarrow \text{Ba}(\text{NO}_3)_2 + \text{CO}_2 + \text{H}_2\text{O} \checkmark$

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

$$\begin{aligned} 9.3.1 \quad n(\text{Na}_2\text{CO}_3) &= \frac{m}{M} \checkmark \\ &= \frac{5}{106} \checkmark \\ &= 0,047 \text{ mol} \end{aligned}$$

$$n(\text{BaCO}_3) : n(\text{Na}_2\text{CO}_3)$$

$$1 : 1 \checkmark$$

$$m(\text{BaCO}_3) = n \times M$$

$$= 0,047 \times 197 \checkmark$$

$$= 9,26 \text{ g} \checkmark \quad (\text{Range/Gebied: } 9,25 - 9,87) \quad (5)$$

Marking criteria/Nasienriglyne:

- Formula/Formule  $n = \frac{m}{M} \checkmark$
- Substitution/Inervanging ✓
- Using ratio/Gebruik verhouding ✓
- Multiply by/Vermenigvuldiging met  $197 \text{ g} \cdot \text{mol}^{-1} \checkmark$  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**

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

$$= \frac{8,3}{9,26} \times 100 \checkmark$$

$$= 89,63\% \checkmark \quad (\text{Range/Gebied: } 84,26 - 89,64) \quad (2)$$

**[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/**  
**FINAL TOTAL: 141**