



# 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)**

**EXEMPLAR/MODEL 2012**

**MEMORANDUM**

**MARKS/PUNTE: 150**

**This memorandum consists of 10 pages.  
*Hierdie memorandum bestaan uit 10 bladsye.***

**QUESTION 1/VRAAG 1**

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

**QUESTION 2/VRAAG 2**

- 2.1
- 2.1.1 F ✓ (1)
- 2.1.2 G ✓ (1)
- 2.1.3 E ✓ (1)
- 2.1.4 B ✓ (1)
- 2.1.5 A ✓ (1)
- 2.1.6 C ✓ (1)
- 2.1.7 D ✓ (1)
- 2.2 Phase change (directly) ✓ from solid to gas. ✓  
*Faseverandering (direk) ✓ van vaste stof na gas. ✓* (2)

- 2.3 Due to the higher temperature outside:  
Particles have higher average kinetic energy./Particles vibrate (move) faster. ✓  
Forces of attraction (between molecules) become weaker. ✓  
Regular pattern (structure) breaks down./Phase change starts to occur. ✓

*Weens die hoër temperatuur buite:*

*Deeltjies het hoër gemiddelde kinetiese energie./Deeltjies vibreer vinniger. ✓*

*Aantrekkingskragte (tussen molekule) word swakker. ✓*

*Reëlmatige patroon (struktuur) word afgebreek. /Faseverandering begin plaasvind. ✓*

(3)  
[12]

### QUESTION 3/VRAAG 3

- 3.1
- 3.1.1 54 °C ✓ (1)
- 3.1.2 93 °C ✓ (1)
- 3.2 No ✓  
Melting point is not 0 °C./Boiling point is below 100 °C. ✓
- Nee ✓*  
*Smeltpunt is nie 0 °C nie./Kookpunt is minder as 100 °C. ✓* (2)
- 3.3
- 3.3.1 Liquid ✓ and gas ✓ (2)  
*Vloeistof ✓ en gas ✓*
- 3.3.2 Solid/Vaste stof ✓ (1)
- 3.4 Remains constant. ✓  
Energy is used to break bonds during the phase change. ✓  
No energy available to increase kinetic energy of particles. ✓
- Bly konstant ✓*  
*Energie word gebruik om bindings te breek tydens die faseverandering. ✓*  
*Geen energie is beskikbaar om die kinetiese energie van deeltjies te verhoog nie. ✓* (3)  
[10]

**QUESTION 4/VRAAG 4**

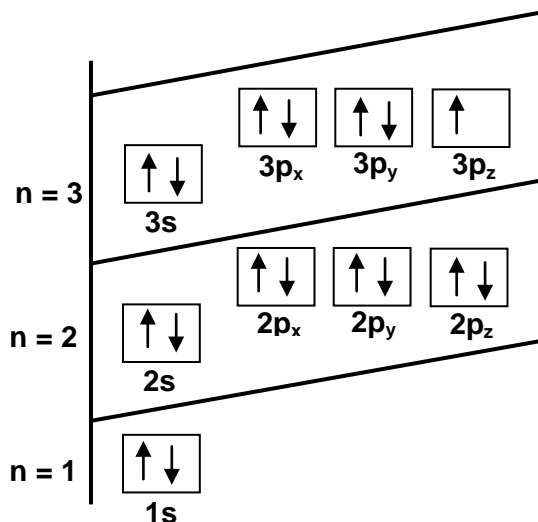
4.1

4.1.1 Table salt/Tafelsout ✓ (1)

4.1.2 NaCl ✓ (1)

4.2

4.2.1



| <b>Criteria for Aufbau diagram:/Riglyne vir Aufbau-diagram:</b>   |   |
|---|---|
| Two paired electrons shown in block/circle as opposite pointing arrows in 1 <sup>st</sup> energy level.<br><i>Twee gepaarde elektrone in blokkie/sirkel, as pyltjies wat in teenoorgestelde rigting wys, in die 1<sup>ste</sup> energievlak aangetoon.</i>  | ✓ |
| Eight paired electrons shown in 4 blocks/circles as opposite pointing arrows in 2 <sup>nd</sup> energy level.<br><i>Agt gepaarde elektrone in 4 blokkies/sirkels, as pyltjies wat in teenoorgestelde rigting wys, in die 2<sup>de</sup> energievlak aangetoon.</i>  | ✓ |
| Six paired electrons shown in 3 blocks/circles as opposite pointing arrows and one unpaired electron shown as arrow in 3 <sup>rd</sup> energy level.<br><i>Ses gepaarde elektrone in 3 blokkies/sirkels, as pyltjies wat in teenoorgestelde rigting wys, en een ongepaarde elektron in blokkie in die 3<sup>de</sup> energievlak aangetoon.</i> | ✓ |

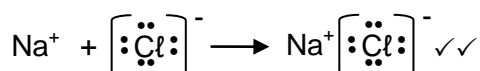
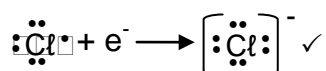
4.2.2 7 ✓ (1)

4.3

4.3.1  $1s^2 2s^2 2p^6 3s^1$  ✓ (2)

4.3.2 11 ✓ (1)

4.4  $\text{Na}\cdot \rightarrow \text{Na}^+ + \text{e}^-$  ✓



(3)

(1)

(2)

(1)

(4)

4.5 Ionic (lattice) ✓  
*Ioniese (rooster)* ✓ (1)

4.6  
4.6.1 A group of two or more atoms bonded covalently ✓  
and that behave as a unit in chemical reactions. ✓  
*'n Groep van twee of meer atome wat kovalent gebind is ✓  
en wat as 'n eenheid in chemiese reaksies optree. ✓* (2)

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

4.6.3  $:\ddot{\text{Cl}}:\ddot{\text{Cl}}:$  ✓✓

**Criteria/Riglyne:**

- Symbols of two chlorine atoms shown with two electrons shown as dots/crosses between them. ✓  
*Simbole van twee chlooratome getoon met twee elektrone aangedui as kolle/kruise tussen hulle. ✓*
- Another 6 electrons as pairs placed around each chlorine atom. ✓  
*6 ander elektrone as pare rondom elke chlooratoom geplaas. ✓*

(2)  
**[19]**

**QUESTION 5/VRAAG 5**

5.1  
5.1.1 S ✓ (1)

5.1.2 S ✓ (1)

5.1.3 Q ✓ (1)

5.2  
5.2.1 Q ✓ & Y ✓ (2)

5.2.2 (Group/*Groep*) 1 ✓ (1)

5.3  
5.3.1 R ✓ (1)

5.3.2 Brick-red/*Yellow-red* ✓  
*Baksteenrooi/Geelrooi* ✓ (1)

5.4  
5.4.1  $\text{Q}_2\text{P}$  ✓  
Accept/*Aanvaar*:  $\text{Li}_2\text{S}$  (1)

5.4.2  $\text{RT}_2$  ✓  
Accept/*Aanvaar*:  $\text{CaCl}_2$  (1)

5.5  $^{37}_{17}\text{Cl}$  ✓✓✓

**Criteria/Riglyne:**

- Correctly identified as  $\text{Cl}$  /*Korrek as Cl geïdentifiseer* ✓
- $A = 37$  ✓
- $Z = 17$  ✓

(3)

5.6

5.6.1 Atoms of the same element/Atoms with the same atomic numbers, but different mass numbers (due to difference in number of neutrons). ✓ (2)

Atome van dieselfde element/Atome met dieselfde atoomgetal, maar verskillende massagetalle (as gevolg van 'n verskil in die aantal neutrone.) ✓

5.6.2 Relative atomic mass/Relatiewe atoommassa =  $\frac{5(23) + 15(25)}{20}$   
 = 24,5 ✓ (4)  
**[19]**

**QUESTION 6/VRAAG 6**

6.1

6.1.1 (ii) ✓ (1)

6.1.2 (i) ✓ (1)

6.2 Gaseous phase/Gas ✓  
 Gasfase/Gas ✓ (1)

6.3  $\text{CaCO}_3(\text{s}) \rightarrow \text{CaO}(\text{s}) + \text{CO}_2(\text{g})$  ✓ Bal. ✓ Phases/fases ✓  

|             |            |               |          |
|-------------|------------|---------------|----------|
| Reactants ✓ | Products ✓ | Balancing ✓   | Phases ✓ |
| Reaktanse ✓ | Produkte ✓ | Balansering ✓ | Fases ✓  |

 (4)

6.4  $2\text{SO}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow \text{SO}_3(\text{g})$  ✓ (1)

6.5 Law of conservation of mass ✓  
 Wet van behoud van massa ✓ (1)

6.6 Reactants/Reaktanse:  
 $m(2\text{SO}_2) + m(\text{O}_2) = 2(32 + 32) + 32 = 128 + 32 = \underline{160 \text{ g}}$  ✓  
 Products/Produkte:  
 $m(2\text{SO}_3) = 2(32 + 48) = \underline{160 \text{ g}}$  ✓  
 Mass(reactants) = mass(products) ✓  
 Massa(reaktanse) = massa(produkte) ✓ (3)  
**[12]**

**QUESTION 7/VRAAG 7**

7.1

7.1.1 No free/mobile ions. ✓  
*Geen vrye/beweeglike ione nie.* ✓ (1)

7.1.2 Electrolyte/*Elektroliet* ✓ (1)

7.1.3  $\text{NH}_4^+$  ✓ &  $\text{NO}_3^-$  ✓ (2)

|  |   |
|--|---|
| <p><b>OPTION 1/OPSIE 1</b></p> $n(\text{NH}_4\text{NO}_3) = \frac{m}{M} \checkmark$ $= \frac{15}{80} \checkmark$ $= 0,19 \text{ mol}$ $c(\text{NH}_4\text{NO}_3) = \frac{n}{V} \checkmark$ $= \frac{0,19}{250 \times 10^{-3}} \checkmark$ $= 0,75 \text{ mol} \cdot \text{dm}^{-3} \checkmark$ | <p><b>OPTION 2/OPSIE 2</b></p> $c((\text{NH}_4\text{NO}_3) = \frac{m}{MV} \checkmark \checkmark$ $= \frac{15}{(80)(250 \times 10^{-3})} \checkmark \checkmark$ $= 0,75 \text{ mol} \cdot \text{dm}^{-3} \checkmark$ |
|--|---|

(5)

7.2

7.2.1 Barium sulphate/*Bariumsulfaat* ✓  
 $\text{BaSO}_4$  ✓ (2)

7.2.2 To ensure the precipitate is indeed a sulphate./Barium sulphate is insoluble in nitric acid. ✓  
*Om te bevestig dat die presipitaat wel 'n sulfaat is./Bariumsulfaat is onoplosbaar in salpetersuur.* ✓ (1)

7.2.3 B ✓✓ (2)

7.3

7.3.1  $\text{BaCl}_2(\text{aq}) + \text{MgSO}_4(\text{aq}) \checkmark \rightarrow \text{BaSO}_4(\text{s}) + \text{MgCl}_2(\text{aq}) \checkmark$  Bal. ✓ Phases: ✓

|                    |                   |                      |                |
|--------------------|-------------------|----------------------|----------------|
| Reactants ✓        | Products ✓        | Balancing ✓          | Phases ✓       |
| <i>Reaktanse</i> ✓ | <i>Produkte</i> ✓ | <i>Balansering</i> ✓ | <i>Fases</i> ✓ |

(4)

7.3.2 Precipitation reaction/*Presipitasie*reaksie ✓ (1)

**[19]**

**QUESTION 8/VRAAG 8**

8.1

8.1.1

$$\begin{aligned}n(\text{Mg}) &= \frac{m}{M} \\ &= \frac{1,5}{24} \checkmark \\ &= 0,0625 \text{ mol}\end{aligned}$$

$$\begin{aligned}n(\text{H}_2) &= n(\text{Mg}) = 0,0625 \text{ mol} \checkmark \\ m(\text{H}_2) &= nM \\ &= (0,0625) (2) \checkmark \\ &= 0,125 \text{ g} \checkmark\end{aligned}$$

✓ Any one/Enige een

(5)

8.1.2 **POSITIVE MARKING FROM QUESTION 8.1.1**  
**POSITIEWE NASIEN VAN VRAAG 8.1.1**

$$\begin{aligned}n(\text{H}_2) &= \frac{V}{V_m} \checkmark \\ 0,0625 &= \frac{V}{22,4} \checkmark \\ \therefore V &= 1,4 \text{ dm}^3 \checkmark\end{aligned}$$

(3)

8.1.3 **POSITIVE MARKING FROM QUESTION 8.1.1**  
**POSITIEWE NASIEN VAN VRAAG 8.1.1**

$$\begin{aligned}n(\text{MgCl}_2) &= \frac{m}{M} \checkmark \\ 0,0625 \checkmark &= \frac{m}{95} \checkmark \\ \therefore m &= 5,94 \text{ g} \checkmark\end{aligned}$$

(4)

8.1.4 **POSITIVE MARKING FROM QUESTION 8.1.1**  
**POSITIEWE NASIEN VAN VRAAG 8.1.1**

$$\begin{aligned}n(\text{Cl}) &= \frac{N}{N_A} \checkmark \\ \underline{2(0,0625)} \checkmark &= \frac{N}{6,02 \times 10^{23}} \checkmark \\ \therefore N(\text{Cl atoms/atome}) &= 7,53 \times 10^{22} \checkmark\end{aligned}$$

(3)

$$\begin{aligned}8.2 \quad M(\text{Na}_2\text{CO}_3) &= 106 \text{ g}\cdot\text{mol}^{-1} \checkmark \\ M(x\text{H}_2\text{O}) &= 268 - 106 = 162 \text{ g}\cdot\text{mol}^{-1} \checkmark \\ n(\text{H}_2\text{O}) &= \frac{162}{18} \checkmark = 9 \text{ mol} \checkmark\end{aligned}$$

(4)



8.3

8.3.1 The formula which gives the simplest whole-number ratio of atoms in the compound. ✓✓

*Die formule wat die eenvoudigste heelgetalverhouding van atome in die verbinding voorstel. ✓✓*

(2)

8.3.2 In 100 g of compound/*In 100 g van die verbinding:*  
 71,65g Cl; 24,27 g C and 4,07 g H

$$n(\text{Cl}) = \frac{71,65}{35,5} = 2,02 \text{ mol } \checkmark$$

$$n(\text{C}) = \frac{24,27}{12} = 2,02 \text{ mol } \checkmark$$

$$n(\text{H}) = \frac{4,07}{1} = 4,07 \text{ mol } \checkmark$$

Whole number ratio/*Heelgetalverhouding:*

$$\frac{2,02}{2,02} : \frac{2,02}{2,02} : \frac{4,07}{2,02} \checkmark$$

$$\text{C} : \text{H} : \text{Cl} = 1 : 2 : 1$$

Empirical formula/*Empiriese formule* = CH<sub>2</sub>Cl ✓

(5)

[26]

### QUESTION 9/VRAAG 9

9.1

9.1.1 Evaporation/*Verdamping* ✓

(1)

9.1.2 Condensation/*Kondensasie* ✓

(1)

9.1.3 Transpiration/*Transpirasie* ✓

(1)

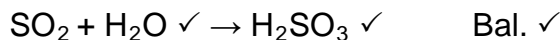
9.2

9.2.1 (Sample/*Monster*) 1 ✓

Too acidic/*Té suur* ✓

(2)

9.2.2



|                    |                   |                      |
|--------------------|-------------------|----------------------|
| Reactants ✓        | Products ✓        | Balancing ✓          |
| <i>Reaktanse</i> ✓ | <i>Produkke</i> ✓ | <i>Balansering</i> ✓ |

(3)

9.2.3 **ANY ONE/ENIGE EEN:**

- Destroy/Damage/Harm plants. ✓

*Vernietig/Beskadig plante. ✓*

- Less food for animals due to damage to plants/crops.

*Minder voedsel vir diere as gevolg van skade aan plante/gewasse.*

(1)

9.3

9.3.1 **ANY ONE/ENIGE EEN:**

- Disinfectant/*Ontsmettingsmiddel* ✓✓
- Destroy harmful bacteria/organisms  
*Vernietig skadelike bakterieë/organismes*

(2)

9.3.2  $\text{AgNO}_3$  /Silver nitrate/*Silwernittraat* ✓✓

(2)

**[13]**

**TOTAL/TOTAAL: 150**