

# basic education

Department:  
Basic Education  
REPUBLIC OF SOUTH AFRICA

**NATIONAL  
SENIOR CERTIFICATE/  
NACIONALE  
SENIOR SERTIFIKAAT**

**GRADE/GRAAD 11**

**PHYSICAL SCIENCES: CHEMISTRY (P2)  
FISIESE WETenskAPPE: CHEMIE (V2)**

**NOVEMBER 2018**

**MARKING GUIDELINES/NASIEENRIGLYNE**

**MARKS/PUNTE: 150**

These marking guidelines consist of 16 pages.  
*Hierdie nasienriglyne bestaan uit 16 bladsye.*

## QUESTION 1/VRAAAG 1

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

**QUESTION 2/VRAG 2**

- 2.1 Chemical bond is mutual attraction between two atoms resulting from the simultaneous attraction between their nuclei and (outer) electrons. ✓✓  
*Chemiese binding is die wederzijdse aantrekking tussen twee atome as gevolg van die gelyktydige aantrekking tussen hulle kerne en (buite)-elektrone.* (2)
- 2.2.1  $\text{H} \overset{\ominus}{\underset{\ominus}{\text{O}}} \text{:N}$  ✓✓ (2)
- 2.2.2  $\begin{array}{c} \cdot\cdot \\ \cdot\cdot \\ \text{O} \\ \cdot\cdot \\ \cdot\cdot \\ \text{H} \end{array}$  ✓✓ (2)
- 2.3 Linear ✓  
*Lineêr* (1)
- 2.4  $3 - 2.5 = 0.5$  ✓ (1)
- 2.5 Polar ✓  
*Polêr* (1)
- 2.6 CN has a higher order bond/triple bond with more orbitals overlapping ✓ than CH, which is a single bond. ✓ Thus CN bond needs more energy to break.  
*CN het 'n hoër orde/drievoudige binding met meer orbitale wat oorvleuel as die CN enkel binding. Dus benodig die CN-binding meer energie om te breek.* (2)
- 2.7 CN has a longer bond length than CH ✓ because the H atom is smaller than the N atom. ✓  
*CN het 'n groter bindingslengte as CH omdat die H-atom kleiner as die N-atom is* (2)

2.8 Yes/Ja ✓ (1)

2.9



- HCN has polar molecules with dipole-dipole forces. ✓
  - H<sub>2</sub>O has polar molecules with hydrogen bonds (dipole-dipole forces). ✓
  - If the forces are of the same order/comparable the substances will dissolve. ✓
- OR
- Both molecules are polar ✓
  - HCN has dipole-dipole forces and H<sub>2</sub>O has (dipole-dipole forces) hydrogen bonds ✓
  - Like dissolve like. ✓
- OR
- HCN het polêre molekules met dipool-dipoolkragte.
  - H<sub>2</sub>O het polêre molekules met waterstofbindings.
  - Indien die intermolekulêre kragte van dieselfde orde is, sal stowwe oplos
- OR
- Beide molekules is polêr ✓
  - HCN het dipool-dipool kragte en H<sub>2</sub>O het (dipool-dipool kragte) waterstofbindings ✓
  - Soort los op in soort ✓

(3)  
 [17]

**QUESTION 3/VRAG 3**

- 3.1
- NH<sub>3</sub> has hydrogen bonds between the molecules ✓
  - N<sub>2</sub> has London forces/induced dipole forces ✓
  - NH<sub>3</sub> has stronger intermolecular forces than N<sub>2</sub> and therefore a higher boiling point than N<sub>2</sub> ✓
- OR
- N<sub>2</sub> has weaker intermolecular forces than NH<sub>3</sub> and therefore a lower boiling point than NH<sub>3</sub>
  - (Accept: less energy requires to overcome weaker forces of H<sub>2</sub>)
- OR
- NH<sub>3</sub> het waterstofbindings tussen die molekules
  - N<sub>2</sub> het Londonkragte/geïnduseerde dipoolkragte
  - NH<sub>3</sub> het sterker intermolekulêre kragte as N<sub>2</sub> en daarom 'n hoër kookpunt as N<sub>2</sub>
- OR
- N<sub>2</sub> het swakker intermolekulêre kragte as NH<sub>3</sub> en daarom 'n laer kookpunt as NH<sub>3</sub>
  - (Aanvaar: NH<sub>3</sub> vereis meer energie om sterker kragte te oorkom)
- 3.2 H<sub>2</sub> ✓ (1)

- 3.3
- H<sub>2</sub> and N<sub>2</sub> both have weak London forces/induced dipole forces ✓
  - N<sub>2</sub> is a larger molecule/has a greater molecular mass/has a larger surface area than H<sub>2</sub> ✓
  - and therefore N<sub>2</sub> has stronger intermolecular forces. ✓
- OR
- H<sub>2</sub> is a smaller molecule/has a smaller molecular mass/has a smaller surface area than N<sub>2</sub> ✓
  - and therefore H<sub>2</sub> has weaker intermolecular forces. ✓
  - H<sub>2</sub> en N<sub>2</sub> het beide swak Londonkragte/geïnduseerde dipoolkragte
  - N<sub>2</sub> is 'n groter molekule/groter molekulêre massa/groter oppervlaktearea as H<sub>2</sub>
  - en daarom het N<sub>2</sub> sterker intermolekulêre kragte.
- OF
- H<sub>2</sub> is 'n kleiner molekule/het kleiner molekulêre massa/kleiner oppervlaktearea as N<sub>2</sub>
  - en daarom swakker intermolekulêre kragte.

- 3.4
- H<sub>2</sub> ✓
- It has the weakest intermolecular forces/London forces ✓
- It has the lowest boiling point ✓
- OR
- It has the weakest intermolecular forces/London forces ✓
- Boiling point is inversely proportional to vapour pressure ✓
- Dit het die swakste intermolekulêre kragte
- Dit het die laagste kookpunt
- OF
- Dit het die swakste intermolekulêre kragte/Londonkragte
- Kookpunt is omgekeerd eweredig aan die dampdruk
- (3) [10]

QUESTION 4/VRAAG 4

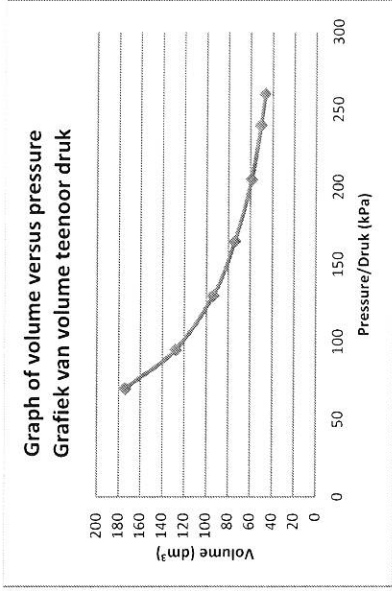
- 4.1 Boyle's law/Boyle se wet ✓ (1)

4.2

Criteria for hypothesis/Riglyne vir hipotese	
The dependent and independent variables are stated correctly. Die afhanklike en onafhanklike veranderlikes korrek genoem.	✓
State the relationship between the dependent and independent variables. Stel die verwantskap tussen die afhanklike en onafhanklike veranderlike.	✓
Dependent variable/afhanklike veranderlike: volume	
Independent variable/onafhanklike veranderlike: pressure/druk	

Example/Voorbeeld:  
If the pressure of an enclosed gas increases the volume will decrease at constant temperature.  
The pressure of an enclosed gas is inversely proportional to the volume it occupies if the temperature is kept constant.  
Die druk van 'n ingeslote gas is omgekeerd eweredig aan die volume wat dit beslaan indien die temperatuur konstant gehou word.  
Indien die druk van 'n ingeslote gas toeneem, sal die volume afneem.

- 4.3 (2)



Refer to the last page of the memo for the graph drawn to scale  
Verwys na die laaste bladsy van die memo vir die skaalgrafiek

Criteria for marking the graph/Nasienkriteria vir grafiek

Use of correct scale on both axis (If learners used table values as scale values maximum 1/3 for line drawn) Korrekte skaal op die asse (Indien leerders tabelwaardes as skaalwaardes gebruik maksimum 1/3 vir lyn getrek)	✓
At least five (5) points plotted correctly Ten minste vyf (5) punte korrek gestip	✓
Curve is drawn Kurve getrek	✓

(3)

- 4.4 Any set of values can be used from the table :

Enige stel waardes vanaf die tabel kan gebruik word:

$$p_1 V_1 = p_2 V_2 \quad \checkmark$$

$$70(174) = (300)V_2 \quad \checkmark$$

$$V_2 = 40,5 \text{ dm}^3 \quad \checkmark$$

(Accept/Aanvaar 40,32 – 40,8 dm<sup>3</sup>)

- 4.5 At high pressure a gas starts to deviate from ideal gas behaviour ✓

because the volume of the molecules of a gas and the intermolecular forces start to influence the measured value, causing it to be greater than the theoretical value calculated./Forces of repulsion between the gas particles prevents them from moving closer ✓

By hoë druk sal 'n gas begin afwyk van ideale gasgedrag want die volume van die gasdeeltjies en intermolekulêre kragte begin die waarde van die volume beïnvloed, wat veroorsaak dat die gemete waarde groter is as die berekende waarde./Afstotingskragte veroorsaak dat gasdeeltjies nie nader aan mekaar kan beweeg nie

- 4.6 Low/Laag ✓

- 4.7 Temperature is an indication of the average kinetic energy of the molecules of a gas. If the temperature of a gas decreases, the molecules move slower and closer together ✓ up to a point where the gas will start to condense ✓ and not behave like an ideal gas.

OR  
The intermolecular forces of attraction becomes significant ✓ then the gas condenses. ✓

Temperatuur is die aanduiding van die gemiddelde kinetiese energie van die molekules van 'n gas. Indien die temperatuur afneem sal die molekules stadiger en nader aan mekaar beweeg tot by die punt waar die gas sal begin kondenseer sodat dit nie meer soos 'n ideale gas optree nie.

OR  
Die intermolekulêre kragte word beduidend en dit veroorsaak dat die gas kondenseer.

- 4.8
- $pV = nRT \quad \checkmark$

$$(70\,000)(174 \times 10^{-3}) = n(8,31)(293) \quad \checkmark$$

$$n = 5 \text{ moles} \quad \checkmark$$

## QUESTION 5/VRAAG 5

- 5.1

$$n = \frac{m}{M}$$

$$n = \frac{160}{40} \quad \checkmark$$

$$n = 4 \text{ mole}$$

$$pV = nRT \quad \checkmark$$

$$(120\,000)V = (4)(8,31)(288) \quad \checkmark$$

$$V = 0,08 \text{ m}^3 \quad \checkmark$$

(4)

- 5.2 POSITIVE MARKING FROM QUESTION 5.1

POSITIEWE NASIEN VANAF VRAAG 5.1

OPTION 1/OPSIE 1

$$p_1 V_1 = p_2 V_2 \quad \checkmark$$

$$\frac{T_1}{T_2}$$

$$\frac{120(0,08)}{288} = \frac{240 V_2}{308} \quad \checkmark$$

$$V_2 = 0,043 \text{ m}^3 \quad \checkmark \quad (427,78 \text{ dm}^3)$$

OPTION 2/OPSIE 2

$$pV = nRT \quad \checkmark$$

$$(240\,000)V = (4)(8,31)(308) \quad \checkmark$$

$$V = 0,043 \text{ m}^3 \quad \checkmark \quad (426,58 \text{ dm}^3)$$

(4)  
[8]

## QUESTION 6/VRAAG 6

- 6.1.1

One mole is the amount of a substance having the same number of particles as there are atoms in 12 g carbon-12. ✓✓  
Een mol is die stofhoeveelheid wat dieselfde getal deeltjies het as wat daar atome in 12 g koolstof-12 is.  
[2 or 0]

(2)

- 6.1.2
- $\text{Na}_2\text{CO}_3 + 2\text{HCl} \rightarrow 2\text{NaCl} + \text{H}_2\text{O} + \text{CO}_2 \quad \checkmark$

(2)

- 6.1.3

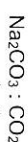
Mark allocation/Nasiennriglyne:

- Formula for/ Formule vir volume ✓
- Substitution of 0,306 and 24,45 ✓/Vervanging van 0,306 en 24,45 ✓
- Using ratio/Gebruik verhouding ✓
- Formula for/ Formule vir mass ✓
- Substitutions of moles ✓ and 106 ✓/Vervanging van mole en 106 ✓
- Answer with units/ Antwoord met eenheid ✓

$$n = \frac{V}{V_m} \quad \checkmark$$

$$n = \frac{0,306}{24,45} \quad \checkmark$$

$$n = 0,0125 \text{ mol of CO}_2$$



1 : 1 ✓ (use of the ratio/gebruik die verhouding)

$$n = 0,0125 \text{ mol of Na}_2\text{CO}_3$$

$$n = \frac{m}{M} \quad \checkmark$$

$$0,0125 = \frac{m}{106} \quad \checkmark$$

$$m = 1,33 \text{ g} \quad \checkmark \quad (1,325 - 1,33 \text{ g})$$

(7)

6.1.4 POSITIVE MARKING FROM QUESTION 6.3

POSITIEWE NASIEN VANAF VRAAG 6.3

OPTION 1/OPSIE 1

$$\% \text{CaCO}_3 \text{ unreacted} = \frac{1,5 - 1,33}{1,5} \times 100 \quad \checkmark$$

$$= 11,33\% \quad \checkmark \quad (11,33\% - 11,67\%)$$

OPTION 2/OPSIE 2

$$\% \text{CaCO}_3 \text{ reacted} = \frac{1,33}{1,5} \times 100 = 88,67\% \quad \checkmark$$

$$\% \text{ unreacted} = 100 - 88,67 = 11,33\% \quad \checkmark$$

OPTION 3/OPSIE 3

$$n = \frac{m}{M}$$

$$n = \frac{1,5}{106}$$

$$n = 0,0142 \text{ mol}$$

$$\text{initial mol} - \text{reacted mol} = 0,0142 - 0,0125 = 0,0017 \text{ mol unreacted}$$

$$\% \text{CaCO}_3 \text{ unreacted} = \frac{0,0017}{0,0142} \times 100 = 11,97\% \quad \checkmark$$

6.2.1 Sulphuric acid  $\checkmark$   
Swawe/suur

(2)

(1)

6.2.2

Mark allocation/Punte toekenning:

- Any one of the formulae/Enige een van formules  $\checkmark$
- Substitution of/Vervanging van 3 g (5 g – 2 g)  $\checkmark$
- Ratio/Verhouding 1:1  $\checkmark$
- Substitution of moles and volume in  $\text{dm}^3$  /Vervanging van mol en volume in  $\text{dm}^3$   $\checkmark$
- Answer with units/Antwoord met eenheid  $\checkmark$

OPTION 1/OPSIE 1

$$n = \frac{m}{M}$$

$$= \frac{3}{65}$$

$$= 0,0462 \text{ mol of Zn}$$

Ratio Zn :  $\text{H}_2\text{SO}_4$   
1 : 1  $\checkmark$

$$n(\text{H}_2\text{SO}_4) = 0,0462 \text{ mol}$$

$\checkmark$  any one of the two formula/Enige een van formules

$$c = \frac{n}{V}$$

$$= \frac{0,0462}{0,05}$$

$$= 0,92 \text{ mol} \cdot \text{dm}^{-3} \quad \checkmark$$

OPTION 2/OPSIE 2

$$n = \frac{m}{M}$$

$$= \frac{3}{65}$$

$$= 0,0462 \text{ mol of Zn}$$

Ratio Zn :  $\text{H}_2\text{SO}_4$   
1 : 1  $\checkmark$

$$n(\text{H}_2\text{SO}_4) = 0,0462 \text{ mol}$$

$\checkmark$  any one of the two formula/Enige een van formules

$$m = nM$$

$$= (0,0462)(98)$$

$$= 4,5276 \text{ g of H}_2\text{SO}_4$$

$$c = \frac{m}{MV}$$

$$= \frac{4,5276}{(98)(0,05)}$$

$$= 0,92 \text{ mol} \cdot \text{dm}^{-3} \quad \checkmark$$

OPTION 3/OPSIE 3

$$n = \frac{m}{M}$$

$$= \frac{5}{65}$$

$$= 0,0769 \text{ mol of Zn initial}$$

$\checkmark$  any one of the two formula/Enige een van formules

$$n = \frac{m}{M}$$

$$= \frac{2}{65}$$

$$= 0,0308 \text{ mol of Zn final}$$

$$n_{\text{used}} = 0,0769 - 0,0308 = 0,0461 \text{ mol}$$

Ratio Zn :  $\text{H}_2\text{SO}_4$   
1 : 1  $\checkmark$

$$n(\text{H}_2\text{SO}_4) = 0,0461 \text{ mol}$$

$$c = \frac{n}{V}$$

$$= \frac{0,0461}{0,05}$$

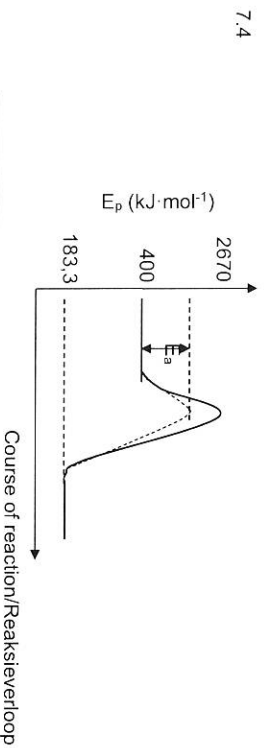
$$= 0,92 \text{ mol} \cdot \text{dm}^{-3} \quad \checkmark$$

**QUESTION 7/VRAAG 7**

7.1 The minimum energy needed for a reaction to take place. ✓✓  
Die minimum energie benodig vir die reaksie om plaas te vind.  
[2 or 0]

7.2 More energy is released than absorbed OR energy of products is less than energy of reactants OR  $\Delta H < 0$  OR  $\Delta H$  is negative ✓  
Meer energie word afggee as opgeneem OF energie van die produkte is minder as die energie van reaktante OF  $\Delta H < 0$  OF  $\Delta H$  is negatief

7.3  $\Delta H = H_{\text{products}} - H_{\text{reactants}}$   
= 183,3 ✓ - 400 ✓  
= -216,7 kJ·mol<sup>-1</sup> ✓



Criteria for marking/Nasienkriteria	
Lower curved line/Laer kurwe lyn	✓
Lower activation energy indicated	✓
Laer aktiveringsenergie aangedui	✓

7.5 One mole of any gas occupies the same volume at the same temperature and pressure. ✓✓  
Een mol van enige gas beslaan dieselfde volume by dieselfde temperatuur en druk.  
[2 or 0]

[19]

7.6

OPTION 1/OPSIE 1	4NH <sub>3</sub>	5O <sub>2</sub>	4NO	6H <sub>2</sub> O	
Initial vol	6	9	0	0	
Change in vol	6	7,5	6	9	Ratio ✓
Final vol	0	1,5	6	9	

Total volume = 1,5 + 6 + 9 = 16,5 dm<sup>3</sup> ✓

**OPTION 2/OPSIE 2**

Mol ratio 4 : 5 : 4 : 6 from balanced equation  
Mol verhouding 4 : 5 : 4 : 6 vanuit gebalanseerde vergelyking

Volume ratio reacting 6 : 7,5 : 6 : 9 ✓  
Volume verhouding wat reageer 6 : 7,5 : 6 : 9

O<sub>2</sub> in excess/in oormaat  
Only/Slegs 7,5 dm<sup>3</sup> of/van 9 dm<sup>3</sup> reacts/reageer  
9 - 7,5 = 1,5 dm<sup>3</sup> ✓

Total volume at the end of reaction = (6 + 9) + 1,5 = 16,5 dm<sup>3</sup> ✓  
Totale volume aan die einde van die reaksie = 6 + 9 + 1,5 = 16,5 dm<sup>3</sup>

7.7

$$n = \frac{m}{M}$$

$$n(\text{H}) = \frac{1,59}{1} \quad \checkmark$$

$$= 1,59 \text{ mol}$$

$$n(\text{N}) = \frac{22,2}{14} \quad \checkmark$$

$$= 1,5857 \text{ mol}$$

$$n(\text{O}) = \frac{76,2}{16} \quad \checkmark$$

$$= 4,625 \text{ mol}$$

H	:	N	:	O	
1,59	:	1,5857	:	4,625	
1,5857	:	1,5857	:	1,5857	✓ divide by smallest number/ deel deur kleinste getal
1	:	1	:	3	

Empirical formula/Empiriese formule is HNO<sub>3</sub> ✓

(5)  
[19]

**QUESTION 8/IVRAAG 8**

- 8.1 A hydroxide ion can act as proton acceptor. ✓✓  
*'n Hidroksiedioon kan optree as protonontvanger.* (2)
- 8.2 Dative covalent bond ✓  
*Datiefkovalente binding* (1)
- 8.3  $\text{HC}\ell(\text{aq}) + \text{H}_2\text{O}(\ell) \checkmark \rightarrow \text{H}_3\text{O}^+(\text{aq}) + \text{C}\ell^-(\text{aq}) \checkmark$   
**OR/OF**  
 $\text{HC}\ell(\text{aq}) + \text{NH}_3(\text{g}) \checkmark \rightarrow \text{NH}_4^+(\text{aq}) + \text{C}\ell^-(\text{aq}) \checkmark$  (2)
- 8.4 Concentration is the amount of solute per litre of solution. ✓✓  
*Konsentrasie is die hoeveelheid opgeloste stof per liter van 'n oplossing.*  
**OR/OF**  
Concentration is the number of moles of a substance per  $\text{dm}^3$  of solution.  
*Konsentrasie is die aantal mol van 'n stof per  $\text{dm}^3$  –oplossing.* (2)

8.5

<p><b>OPTION 1/OPSIE 1</b></p> $c = \frac{n}{V}$ $0,75 = \frac{n}{5} \checkmark$ $n = 3,75 \text{ mol}$ $c = \frac{n}{V}$ $= \frac{3,75}{1000} \checkmark$ $= 3,75 \times 10^{-3} \text{ mol} \cdot \text{dm}^{-3} \checkmark$	<p><b>OPTION 2/OPSIE 2</b></p> $c_1V_1 = c_2V_2 \checkmark$ $(0,75)(5) \checkmark = c_2(1000) \checkmark$ $c_2 = 3,75 \times 10^{-3} \text{ mol} \cdot \text{dm}^{-3} \checkmark$ <p><b>OPTION 3/OPSIE 3</b></p> $\frac{5}{1000} = \frac{c}{0,75} \checkmark$ $c = 3,75 \times 10^{-3} \text{ mol} \cdot \text{dm}^{-3} \checkmark$
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8.6 **Mark allocation/Punte toekenning**

- Usage of formula(e) of  $c = n/V$  and/or  $n = m/M$
- Usage or calculation of number of moles (3,75 mol) of  $\text{HNO}_3$
- Ratio/Verhouding 2:1
- Usage of  $74 \text{ g} \cdot \text{mol}^{-1}$  in formula  $n = m/M$
- Answer/Antwoord
- Correct conclusion/Korrekte gevolgtrekking

**OPTION 1/OPSIE 1**

$c = \frac{n}{V}$   
 $0,75 = \frac{n}{5}$   
 $n = 3,75 \text{ mol} \checkmark$

Ratio  $\text{HNO}_3 : \text{Ca}(\text{OH})_2$   
 $2 : 1 \checkmark$   
 $n(\text{Ca}(\text{OH})_2) = 1,875 \text{ mol}$

$n = \frac{m}{M}$   
 $1,875 = \frac{m}{74} \checkmark$   
 $m = 138,75 \text{ g} \checkmark$

✓ any one of the two formula/Enige een van formules

**POSITIVE MARKING FROM 8.5**  
**OPTION 2/OPSIE 2**

$c = \frac{n}{V}$   
 $3,75 \times 10^{-3} = \frac{n}{1000}$   
 $n = 3,75 \text{ mol} \checkmark$

Ratio  $\text{HNO}_3 : \text{Ca}(\text{OH})_2$   
 $2 : 1 \checkmark$   
 $n(\text{Ca}(\text{OH})_2) = 1,875 \text{ mol}$

$n = \frac{m}{M}$   
 $1,875 = \frac{m}{74} \checkmark$   
 $m = 138,75 \text{ g} \checkmark$

✓ any one of the two formula/Enige een van formules

**OPTION 3/OPSIE 3**

$n = cV$   
 $= 3,75 \times 10^{-3}(1000)$   
 $= 3,75 \text{ mol} \checkmark$

$\text{HNO}_3 : \text{Ca}(\text{OH})_2$   
 $2 : 1 \checkmark$   
 $n(\text{Ca}(\text{OH})_2) = \frac{1}{2}(3,75)$   
 $= 1,875 \text{ mol} \checkmark$

$n = \frac{m}{M}$   
 $n = \frac{120}{74} \checkmark$   
 $n = 1,62 \text{ mol}$

✓ any one of the two formula/Enige een van formules

No, it is insufficient. ✓  
*Nee, dit is nie genoeg nie*

No, it is insufficient. ✓  
*Nee, dit is nie genoeg nie*

No it is insufficient ✓  
*Nee dis nie genoeg nie*

**QUESTION 9/VRAAG 9**

- 9.1 Reduction is a decrease in oxidation number ✓✓  
*Reduksie is die afname in oksidasiegetalle* (2)
- 9.2 Mn is +7 / Mn<sup>7+</sup> ✓ (1)
- 9.3 H<sub>2</sub>S / S<sup>2-</sup> ✓ (1)
- 9.4 The oxidation number of S increases ✓ from -2 to 0 ✓  
*Die oksidasiegetal van S neem toe van -2 na 0* (2)
- 9.5 MnO<sub>4</sub><sup>-</sup> / Mn<sup>7+</sup> ✓ (1)
- 9.6 H<sub>2</sub>S(g) → S + 2H<sup>+</sup> + 2e<sup>-</sup> ✓✓ (2)
- 9.7 H<sub>2</sub>S → S + 2H<sup>+</sup> + 2e<sup>-</sup>  
 $\text{MnO}_4^- + 8\text{H}^+ + 5e^- \rightarrow 2\text{Mn}^{2+} + 4\text{H}_2\text{O}$  ✓  
 $2\text{MnO}_4^- + 5\text{H}_2\text{S} + 6\text{H}^+ \rightarrow 2\text{Mn}^{2+} + 5\text{S} + 8\text{H}_2\text{O}$  ✓ balancing ✓ equation (3)

**QUESTION 10/VRAAG 10**

- 10.1 • Dangerous for workers because they can be trapped underground. ✓  
 • Sinkholes ✓  
 • (Any relevant answer)  
 • *Gevaarlik vir werkers want hulle kan ondergronds vasgekeer word*  
 • Sinkgate  
 • *(Enige relevante antwoord)* (2)
- 10.2 O<sub>2</sub> ✓ (1)
- 10.3 Oxidation number of O decreases from 0 (in O<sub>2</sub>) to -2 (in NaOH) ✓  
*Die oksidasiegetal van O neem af van 0 (in O<sub>2</sub>) na -2 (in NaOH)* (1)
- 10.4 Fe<sup>3+</sup> + 3e<sup>-</sup> → Fe ✓✓ (2)
- 10.5  $\% \text{Fe} = \frac{2(56)}{160} \times 100\% \checkmark$   
 = 70 % ✓ (2)
- 10.6  $m(\text{Fe}) = (0,65)(2\,500) \checkmark$  or/of  $\frac{55}{100}(2\,500)$   
 = 1 625 kg Fe extracted/ontgin ✓ (Accept/Aanvaar 1 625 x 10<sup>6</sup> g) (2)
- TOTAL/TOTAAL: 150 [10]**

**SUBMIT THIS SHEET WITH THE ANSWER BOOK/  
 LEWER SAAM MET DIE ANTWOORDEBOEK IN**

NAME/NAAM \_\_\_\_\_ CLASS/KLAS \_\_\_\_\_  
 QUESTION/VRAAG 4.3

