

ACIDS AND BASES GRADE 11 MEMO

2014 Free State Preliminary Paper 2 Q 7.1.2 and 7.1.3

7.1.2 HSO_4^- ✓ (1)

7.1.3 Sulphate ion / *Sulfaatioon* ✓ (1)

2024 Eastern Cape November Paper 2 Q 7.1.2 and 7.1.3

7.1.2 H_2O ✓ and/ *en* HCO_3^- ✓ (2)

7.1.3 H_2CO_3 ✓ and/ *en* H_3O^+ ✓ (2)

2023 Gauteng November Paper 2 Q 7.2

7.2 7.2.1 A solution of precisely known concentration. ✓✓
'n Oplossing waarvan die konsentreise presies bekend is. ✓✓ (2)

7.2.2 $\text{H}_2\text{SO}_4(\ell) + 2\text{H}_2\text{O}(\ell) \rightarrow 2\text{H}_3\text{O}^+(\text{aq}) + \text{SO}_4^{2-}(\text{aq})$ ✓✓
(balancing/*balansering*) (3)

7.3 7.3.1 $\frac{n_a}{n_b} = \frac{c_a V_a}{c_b V_b}$ ✓
 $\frac{1}{2} \checkmark = \frac{c_a (0,012) \checkmark}{0,2 (0,02) \checkmark}$
 $c_a = 0,17 \text{ mol.dm}^{-3}$ ✓ (5)

7.3.2 Methyl orange ✓, reaction of strong acid ✓ and strong base ✓.
Metieloranje ✓, reaksie van 'n sterk suur ✓ en 'n sterk basis. ✓ (3)

2020 Eastern Cape November Paper 2 Q 8.1-8.2 and 8.3.2

QUESTION 8/VRAAG 8

8.1 8.1.1 A base is a proton/ H^+ ion acceptor. ✓✓ /
'n Basis is 'n protoon/ H^+ ioon-aanvaarder (2)

8.1.2 HPO_4^{2-} and/en PO_4^{3-} ✓ **OR/OF** H_3O^+ and/en H_2O (1)

8.1.3 ACIDIC / SUUR. ✓
(Excess)/ (Oormaat) H_3O^+ ✓ are produced / word geproduseer. (2)

8.1.4 HPO_4^{2-} ✓✓ (2)

8.2 $CuO + 2HNO_3 \longrightarrow Cu(NO_3)_2 + H_2O$ ✓ ✓Balancing / Balansering

Marking guide/ Nasienriglyn

- Reactants / Reaktante
- Products / Produkte
- Balancing / Balansering

(3)

8.3.2 $c_1V_1 = c_2V_2$
 $9 \times 10 \checkmark = 1,5 \checkmark V$
 $60 \text{ cm}^3 = V_{\text{solution / oplossing}}$
 $V_{\text{water}} = 60 - 10 \checkmark$
 $= 50 \text{ cm}^3 \checkmark$ (4)

2014 Limpopo Preliminary Paper 2 Q 7.1-7.2.1 and 7.3-7.4

7.1 A solution that contains a low (number of mole) amount of acid in proportion to the volume of water. ✓ ✓ // 'n oplossing wat min (aantal mol) suur in verhouding tot die volume water bevat (2)

7.2

7.2.1 $M(\text{KOH}) = 39 + 16 + 1 = 56 \text{ g} \cdot \text{mol}^{-1}$

$m(\text{KOH}) = cMV = (0,2)(56)(0,3) = 3,36 \text{ g}$ ✓

OR/ OF

$n = c \cdot V = (0,2)(0,3) = 0,06 \text{ mol}$

$m = nM = (0,06)(56) = 3,36 \text{ g}$ (4)

7.3. Bromothymol blue ✓ / broomtimolblou

H_2SO_4 is a strong acid and KOH is a strong base ✓. Therefore the equivalent point will be at approximately $\text{pH} = 7$ ✓ // H_2SO_4 is 'n sterk suur en KOH is 'n sterk basis ✓. Daarom is die ekwivalentpunt omtrent by $\text{pH} = 7$ (3)

7.4. $\frac{C_a V_a}{C_b V_b} = \frac{n_a}{n_b}$ ✓

$\therefore \frac{C_a (20,0)}{(0,2)(15,0)} = \frac{1}{2}$ ✓ (ratio)

$\therefore C_a = \frac{(0,2)(15,0)}{(2)(20,0)} = 0,075 \text{ mol} \cdot \text{dm}^{-3}$ ✓ (5)

2022 Gauteng November Paper 2 Q 7

7.1 7.1.1 It is a proton (H^+ ion) donor. ✓✓
Dit is 'n proton (H^+ - ioon) skenker. ✓✓ (2)

7.1.2 Conjugate acid/*Gekonjugeerde suur*: $H_2SO_4(aq)$ ✓

Conjugate base/*Gekonjugeerde basis*: $SO_4^{2-}(aq)$ ✓ (2)

7.1.3 HSO_4^{-1} ✓✓

OR/OF

H_2O (2)

7.2 7.2.1 An acid that ionises completely in water ✓ to form a high concentration of H_3O^+ ions. ✓
'n Suur wat volledig in water ioniseer ✓ om 'n hoë konsentrasie H_3O^+ ione te vorm. ✓ (2)

7.2.2 $n_b = c_b V_b$ ✓
 $= (0,2)(20 \times 10^{-3})$ ✓
 $= 4 \times 10^{-3} \text{ mol}$ ✓ (3)

7.2.3 $n_a = \frac{1}{2} n_b$
 $n_a = \frac{1}{2} (4 \times 10^{-3})$ ✓
 $= 2 \times 10^{-3} \text{ mol}$ ✓ (2)

7.2.4 $c_a = \frac{n}{V}$ ✓
 $= \frac{2 \times 10^{-3}}{12 \times 10^{-3}}$ ✓
 $= 0,17 \text{ mol. dm}^{-3}$ ✓ (3)

[16]

2015 Mpumalanga Preliminary Paper 2 Q 7.1.4-7.1.5

7.1.4 Bromothymol blue; ✓ H_2SO_4 is a strong acid and KOH is a strong base ✓. The equivalence point will be at approximately $\text{pH} = 7$ which is the endpoint of bromothymol blue.

7.1.5 OPTION 1 / OPSIE 1

$$\left(\frac{n_a}{n_b}\right) = \left(\frac{C_a V_a}{C_b V_b} \checkmark\right)$$
$$\left(\frac{1}{2}\right) \checkmark = \frac{C_a \times 20}{0,2 \times 15} \checkmark$$
$$C_a = 0,075 \text{ mol} \cdot \text{dm}^{-3} \checkmark$$

OPTION 2 / OPSIE 2

$$\begin{aligned} n(\text{NaOH}) &= cV \checkmark \\ &= 0,2 \times 0,015 \\ &= 0,003 \text{ mol} \\ \frac{n(\text{H}_2\text{SO}_4)}{n(\text{NaOH})} &= \frac{1}{2} \\ n(\text{H}_2\text{SO}_4) &= \frac{1}{2} (0,003) \checkmark \\ &= 0,0015 \text{ mol} \\ c &= \frac{n}{V} \\ &= \frac{0,0015}{0,020} \checkmark \\ &= 0,075 \text{ mol} \cdot \text{dm}^{-3} \checkmark \end{aligned} \quad (4)$$

2019 November Paper 2 Q 8

8.1

8.1.1 An acid is a proton donor. ✓✓
'n Suur is 'n protonskenker. (2)

8.1.2 HNO_3 and/en NO_3^- ✓✓

OR/OF

H_2O and/en H_3O^+ (2)

8.1.3 Acidic/Suur ✓

Hydronium ions/ H_3O^+ formed in water. ✓
Hidroniumione/ H_3O^+ vorm in water. (2)

8.1.4 **Marking guidelines/Nasienriglyne**

If any of the underlined key words/phrases are omitted: minus 1 mark
Indien enige van die onderstreepte sleutelwoorde/frases uitgelaat is:
minus 1 punt

An ampholyte is a substance that can act as either acid or base. ✓✓
'n Amfoliet is 'n stof wat as suur of basis kan optree. (2)

8.1.5 H_2O ✓

8.1.6 Reaction 1: It/ H_2O reacts as base/accepts a proton or H^+ . ✓
Reaction 2: It/ H_2O reacts as acid/donates a proton or H^+ . ✓ (2)

8.1.7

Marking guidelines/Nasienriglyne

- Substitute $0,1 \text{ dm}^3$ & $0,2 \text{ mol} \cdot \text{dm}^{-3}$ in formula/ratio. ✓
Vervang $0,1 \text{ dm}^3$ & $0,2 \text{ mol} \cdot \text{dm}^{-3}$ in formule/verhouding.
- Use ratio/Gebruik verhouding:
 $n(\text{dilute/verdu}) = n(\text{concentrated/gekonsentreerd})$ ✓
- Substitute $0,02 \text{ mol}$ & $0,16 \text{ mol} \cdot \text{dm}^{-3}$ in formula/ratio.
Vervang $0,02 \text{ mol}$ & $0,16 \text{ mol} \cdot \text{dm}^{-3}$ in formule/verhouding.
- Final answer/Finale antwoord: $0,025 \text{ dm}^3 / 25 \text{ cm}^3$ ✓

OPTION 1/OPSIE 1

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

$$0,2 = \frac{n}{0,1} \checkmark$$

$$\therefore n(\text{conc/gekons}) = 0,02 \text{ mol} = n(\text{dilute/verdu}) \checkmark$$

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

$$0,16 = \frac{0,02}{V} \checkmark$$

$$V = 0,125 \text{ dm}^3$$

$$\text{Amount added/Hoeveelheid bygevoeg: } 0,125 - 0,1 = 0,025 \text{ dm}^3 \checkmark$$

OPTION 2/OPSIE 2

$$c_1V_1 = c_2V_2$$

$$(0,2)(100) \checkmark = (0,16)V_2 \checkmark \checkmark$$

$$V_2 = 125 \text{ cm}^3$$

Amount added/Hoeveelheid bygevoeg:

$$125 - 100 = 25 \text{ cm}^3 \checkmark$$

(4)

8.2

8.2.1

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

$$0,16 = \frac{n}{0,08} \checkmark$$

$$n = 0,0128 \text{ mol}$$

$$\begin{aligned} n(\text{ZnO}) &= \frac{1}{2}n(\text{HNO}_3) \\ &= \frac{1}{2}(0,0128) \checkmark \\ &= 0,0064 \end{aligned}$$

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

$$0,0064 = \frac{m}{81} \checkmark$$

$$m = 0,52 \text{ g} \checkmark$$

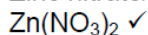
Marking guidelines/Nasienriglyne

- Formula/Formule: $n = \frac{m}{M} / c = \frac{n}{V}$ ✓
- Substitute/Vervang $0,16 \text{ dm}^3 \cdot \text{mol}^{-1}$ & $0,08 \text{ dm}^3$ in $c = \frac{n}{V}$ /ratio/verhouding ✓
- Use ratio/Gebruik verhouding:
 $n(\text{ZnO}) = \frac{1}{2}n(\text{HNO}_3)$ ✓
- Substitute/Vervang $81 \text{ g} \cdot \text{mol}^{-1}$ in $n = \frac{m}{M}$ /ratio/verhouding. ✓
- Final answer/Finale antwoord: $0,52 \text{ g}$ ✓

(5)

8.2.2

Zinc nitrate/Sinknitraat ✓



(2)

[21]

2015 Gauteng Preliminary Paper 2 Q 7.5

7.5.1 Option 1:

$$\begin{aligned}
 n &= \frac{m}{M} \\
 &= \frac{8,0}{56} \checkmark \\
 &= 0,14 \text{ mol} \\
 c &= \frac{n}{V} \\
 &= \frac{0,14}{0,25} \checkmark \\
 &= 0,57 \text{ mol} \cdot \text{dm}^{-3} \checkmark
 \end{aligned}$$

Option 2:

$$\begin{aligned}
 c &= \frac{m}{MV} \\
 &= \frac{8,0}{56 \times 0,25} \checkmark \checkmark \\
 &= 0,57 \text{ mol} \cdot \text{dm}^{-3} \checkmark
 \end{aligned}$$

(3)

7.5.2 $\frac{c_a V_a}{c_b V_b} = \frac{n_a}{n_b}$ (dilute acid) $\checkmark$

$$\frac{c_a(40)}{(0,57)(25)} \checkmark = \frac{1}{2} \checkmark$$

OR

$$c_a = \frac{1 \times 0,57 \times 25}{2 \times 40} \checkmark$$

$$= 0,178 \text{ mol} \cdot \text{dm}^{-3} \checkmark$$

OR $c_a = \frac{1 \times 0,57 \times 0,025}{2 \times 0,04} \checkmark$

$$= 0,178 \text{ mol} \cdot \text{dm}^{-3}$$

(4)

7.5.3 **Concentrated acid**

n_1 (moles concentrated) = n_2 (moles dilute) $\checkmark$

$$c_1 \times V_1 = c_2 \times V_2$$

$$\begin{aligned}
 c_1 &= \frac{0,178 \times (490 + 10)}{10} \checkmark \\
 &= 8,9 \text{ mol} \cdot \text{dm}^{-3} \checkmark
 \end{aligned}$$

OR

$$\begin{aligned}
 c_1 &= \frac{0,178 \times 0,5}{0,01} \checkmark \\
 &= 8,9 \text{ mol} \cdot \text{dm}^{-3} \checkmark
 \end{aligned}$$

(4)

[22]

2018 November Paper 2 Q 8

QUESTION 8/VRAAG 8

8.1 A hydroxide ion can act as proton acceptor. ✓✓
 'n Hidroksiedioon kan optree as protonontvanger. (2)

8.2 Dative covalent bond ✓
 Datiefkovaalente binding (1)

8.3 $\text{HCl}(\text{aq}) + \text{H}_2\text{O}(\text{l}) \checkmark \rightarrow \text{H}_3\text{O}^+(\text{aq}) + \text{Cl}^-(\text{aq}) \checkmark$
OR/OF
 $\text{HCl}(\text{aq}) + \text{NH}_3(\text{g}) \checkmark \rightarrow \text{NH}_4^+(\text{aq}) + \text{Cl}^-(\text{aq}) \checkmark$ (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 dm^3 of solution.
 Konsentrasie is die aantal mol van 'n stof per dm^3 -oplossing. (2)

8.5

OPTION 1/OPSIE 1 $c = \frac{n}{V} \checkmark$ $0,75 = \frac{n}{5} \checkmark$ $n = 3,75 \text{ mol}$ $c = \frac{n}{V}$ $= \frac{3,75}{1000} \checkmark$ $= 3,75 \times 10^{-3} \text{ mol} \cdot \text{dm}^{-3} \checkmark$	OPTION 2/OPSIE 2 $c_1 V_1 = c_2 V_2 \checkmark$ $(0,75)(5) \checkmark = c_2(1000) \checkmark$ $c_2 = 3,75 \times 10^{-3} \text{ mol} \cdot \text{dm}^{-3} \checkmark$ OPTION 3/OPSIE 3 $\frac{\checkmark 5}{1000 \checkmark} = \frac{c}{0,75} \checkmark$ $c = 3,75 \times 10^{-3} \text{ mol} \cdot \text{dm}^{-3} \checkmark$
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(4)

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 HNO_3
- Ratio/*Verhouding* 2:1
- Usage of 74 g.mol^{-1} in formula $n = m/M$
- Answer/*Antwoord*
- Correct conclusion/*Korrekte gevolgtrekking*

OPTION 1/OPSIE 1

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

$$0,75 = \frac{n}{5}$$

$$n = 3,75 \text{ mol} \quad \checkmark$$

$$\text{Ratio } \text{HNO}_3 : \text{Ca(OH)}_2$$

$$2 : 1 \quad \checkmark$$

$$n(\text{Ca(OH)}_2) = 1,875 \text{ mol}$$

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

$$1,875 = \frac{m}{74} \quad \checkmark$$

$$m = 138,75 \text{ g} \quad \checkmark$$

No, it is insufficient. $\checkmark$

Nee, dit is nie genoeg nie

POSITIVE MARKING FROM 8.5**POSITIEWE NASIEN VANAF 8.5****OPTION 3/OPSIE 3**

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

$$n = \frac{120}{74} \quad \checkmark$$

$$n = 1,62 \text{ mol}$$

$$n = cV$$

$$= 3,75 \times 10^{-3} (1000)$$

$$= 3,75 \text{ mol} \quad \checkmark$$

$$\text{HNO}_3 : \text{Ca(OH)}_2$$

$$2 : 1 \quad \checkmark$$

$$n(\text{Ca(OH)}_2) = \frac{1}{2}(3,75)$$

$$= 1,875 \text{ mol} \quad \checkmark$$

$$1,875 > 1,62 \text{ mol}$$

No it is insufficient $\checkmark$

Nee dis nie genoeg nie

POSITIVE MARKING FROM 8.5**POSITIEWE NASIEN VANAF 8.5****OPTION 2/OPSIE 2**

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

$$3,75 \times 10^{-3} = \frac{n}{1000}$$

$$n = 3,75 \text{ mol} \quad \checkmark$$

$$\text{Ratio } \text{HNO}_3 : \text{Ca(OH)}_2$$

$$2 : 1 \quad \checkmark$$

$$n(\text{Ca(OH)}_2) = 1,875 \text{ mol}$$

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

$$1,875 = \frac{m}{74} \quad \checkmark$$

$$m = 138,75 \text{ g} \quad \checkmark$$

No, it is insufficient. $\checkmark$

Nee, dit is nie genoeg nie

2019 Eastern Cape Exemplar Paper 2 Q 8

QUESTION 8/VRAAG 8		
8.1.1	Acid is a substance that donates protons (H^+) 'n Suur is 'n stof wat protone (H^+) skenk	(2)
8.1.2	Base. ✓ It <u>accepts protons</u> (H^+) in both reactions ✓ Basis. Dit <u>aanvaar protone</u> (H^+) in albei reaksies	(2)
8.1.3	HSO_4^- ✓✓	(2)
8.1.4	$H_2SO_4 + 2 NaHCO_3 \rightarrow Na_2SO_4 + 2 H_2O + 2 CO_2$ ✓ (✓ Balanced/ Gebalanseerd) Accept/Aanvaar $H_2SO_4 + NaHCO_3 \rightarrow NaHSO_4 + H_2O + CO_2$	(3)
8.2.1	A standard solution is a solution of which the <u>concentration is</u> exactly known. ✓✓ 'n Standaardoplossing is 'n oplossing waarvan die <u>konsentrasie</u> presies bekend is.	(2)
8.2.2	Reaction 2/ Reaksie 2 $n(NaOH) = cv$ ✓ $n(NaOH) = (0,968)(0,025)$ ✓ $n(NaOH) = 0,0242 \text{ mol}$ Mole Ratio/Verhouding $CH_3COOH : NaOH$ 1 : 1 $n(CH_3COOH) = 0,0242 \text{ mol}$ ✓ Original/Oorspronlik (CH_3COOH) $n(CH_3COOH) = cv$ $n(CH_3COOH) = (0,5)(0,25)$ ✓ $n(CH_3COOH) = 0,125 \text{ mol}$ $n(\text{reacted}) = 0,125 - 0,0242$ ✓ $n(\text{reacted}) = 0,1008 \text{ mol}$ Reaction 1/Reaksie Mole Ratio $CH_3COOH : CaCO_3$ 2 : 1 ✓ $n(CaCO_3) = 0,1008/2$ ✓ $n(CaCO_3) = 0,0504 \text{ mol}$ $m(CaCO_3) = nM$ $m(CaCO_3) = (0,0504)(100)$ ✓ $m(CaCO_3) = 5,04 \text{ g}$ $\% \text{ purity / suiwerhede} = \frac{5,04}{56} \times 100\%$ ✓ $\% \text{ purity / suiwerhede} = 9\%$ ✓	(10)
		[21]

2024 North West Preliminary Paper 2 Q 7.1.1;7.1.3 and 7.2

7.1.1 An acid ionises incompletely in water ✓ to form a low concentration of H_3O^+ . ✓
'n Suur ioniseer onvolledig in water om 'n lae konsentrasie H_3O^+ te vorm. (2)

7.1.3 Greater than 7 ✓
A strong base (NaOH) reacts with a weak acid (HF) ✓ / 'n Sterk basis (NaOH)
reageer met 'n swak suur (HF) (2)

$$\begin{aligned} 7.2.1 \quad n(MgCO_3) &= \frac{m}{M} \\ &= \frac{3,5}{84} \quad \checkmark \\ &= 0,042 \text{ mol} \end{aligned}$$

$$\begin{aligned} n(HCl) &= 2n(MgCO_3) = (2)(0,042) \quad \checkmark \\ &= 0,084 \text{ mol} \quad \checkmark \end{aligned} \quad (3)$$

7.2.2 POSITIVE MARKING FROM QUESTION 7.2.1

$$\begin{aligned} n(NaOH) &= cV \quad \checkmark \\ &= \frac{(1,2)(0,02)}{1} \quad \checkmark \\ &= 0,024 \text{ mol} \end{aligned}$$

$$n(HCl)_{\text{excess}} = n(NaOH) = 0,024 \text{ mol} \quad \checkmark$$

$$\begin{aligned} n(HCl)_{\text{initial}} &= n_{\text{(reacted)}} + n_{\text{(excess)}} \\ &= 0,084 + 0,024 \quad \checkmark \\ &= 0,108 \text{ mol} \end{aligned}$$

$$\begin{aligned} c(HCl) &= \frac{n}{V} \\ &= \frac{0,108}{0,05} \quad \checkmark \\ &= 2,16 \text{ mol} \cdot \text{dm}^{-3} \quad \checkmark \end{aligned}$$

Range (2,08 – 2,16)

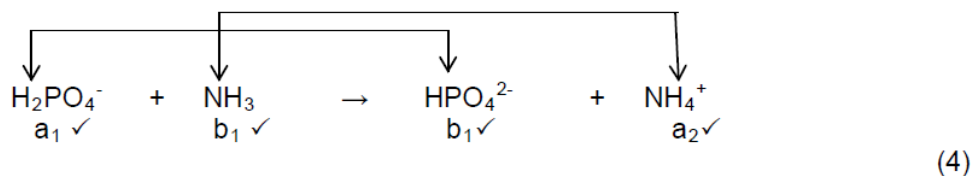
(6)
[16]

2016 November Paper 2 Q 8

QUESTION 8/VRAAG 8

- 8.1 Acid is a proton donor ✓✓
Suur is 'n protonskenker (2)

- ### 8.2.1 conjugate pairs/gekonjugeerde pare



- 8.2.2 A substance which can act as an acid or a base. ✓
'n Stof wat as 'n suur of 'n basis kan optree (1)

- 8.2.3 $\text{H}_2\text{PO}_4^-/\text{HPO}_4^{2-}$ ✓✓ (2)

- 8.3.1 $\text{Na}_2\text{CO}_3 + 2\text{HCl} \rightarrow \text{NaCl} + \text{H}_2\text{O} + \text{CO}_2$ balancing/*balansering* ✓ (1)

- $$\begin{aligned} 8.3.2 \quad n &= cV \checkmark \\ &= (0,2)(0,1) \checkmark \\ &= 0,02 \text{ mol } \checkmark \end{aligned} \quad (3)$$

- $$8.3.3 \quad n_{\text{Mg(OH)}_2} = (0,02)(0,1) \checkmark$$
- $$= 0,002 \text{ mol}$$

$$n_{\text{HCl(excess)}} = 2(0,002) = 0,004 \text{ mol} \checkmark$$

$$n_{\text{HCl react with Na}_2\text{CO}_3} = 0,02 - 0,004 \checkmark = 0,016 \text{ mol}$$

$$n_{\text{Na}_2\text{CO}_3} = 0,008 \text{ mol} \checkmark$$

$$m_{\text{Na}_2\text{CO}_3} = nM = (0,008)(106) \checkmark$$
$$= 0,848 \text{ g} \checkmark$$

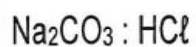
$$\% \text{purity} = \frac{0,848}{10} \times 100 \checkmark = 8,48\% \checkmark$$

(8)
[21]

2019 Limpopo Preliminary Paper 2 Q 7.2

7.2

$$n = \frac{m}{M} = \frac{0,32}{106} = 0,003 \text{ mol} \checkmark$$



$$0,003 : 0,006 \checkmark$$

$$c_{\text{HCl}} = \frac{n}{V} = \frac{0,006}{0,1} = 0,06 \text{ mol} \cdot \text{dm}^{-3} \checkmark$$

$$c_1 V_1 = c_2 V_2$$

$$c_1 \times 10 \checkmark = 0,06 \times 500 \checkmark$$

$$c_1 = 3 \text{ mol} \cdot \text{dm}^{-3} \checkmark$$

Marking Criteria/Nasiennriglyne

- Substitution/Vervang $M=106 \checkmark$
- Calculate/Bereken $n(\text{Na}_2\text{CO}_3) = 0,003 \text{ mol} \checkmark$
- Use ratios/Gebruik molverhouding:
 $n(\text{HCl}) = n(\text{Na}_2\text{CO}_3) \checkmark$
- Calculate/Bereken $c_{\text{HCl}} \checkmark$
- Substitute/Vervang $c_1 \times 10 \checkmark$
- Substitution/Vervang $0,06 \times 500 \checkmark$
- Final answer: $3 \text{ mol} \cdot \text{dm}^{-3} \checkmark$

(7)

2014 Eastern Cape Preliminary Paper 2 Q 7.4

7.4 Consider reaction 2/Beskou reaksie 2

$$\begin{aligned} \frac{n_a}{n_b} &= \frac{c_a \cdot V_a}{c_b \cdot V_b} \checkmark \\ \therefore \frac{1}{2} \checkmark &= \frac{(1) \cdot V_a}{(0,5) \cdot 28} \checkmark \\ V_a &= 7 \text{ cm}^3 \checkmark \end{aligned}$$

$$\begin{aligned} V_a &= 7 \text{ cm}^3 \text{ used in reaction 2} \\ \therefore V_a &= (50-7) = 43 \text{ cm}^3 \text{ used in reaction 1} \checkmark \end{aligned}$$

Consider reaction 1/Beskou reaksie 1

$$\begin{aligned} n_a &= C_a V_a = (1)(0,043) = 0,043 \checkmark \text{ mol H}_2\text{SO}_4 \\ n_{\text{H}_2\text{SO}_4} &= n_{\text{CaCO}_3} = 0,043 \text{ mol} \checkmark \quad (\text{ratio 1:1}) \\ \therefore m_{\text{CaCO}_3} &= nM \checkmark \\ &= (0,043)(40 + 12 + 3(16)) \checkmark \\ &= \underline{4,3\text{g}} \checkmark \end{aligned}$$

OR/OF

Consider reaction 2/Beskou reaksie 2

$$\begin{aligned} n_{\text{NaOH}} &= cV \checkmark \\ (0,5)(0,028) &= 0,014 \text{ mol NaOH} \checkmark \\ 2n_{\text{H}_2\text{SO}_4} : n_{\text{NaOH}} \checkmark &=> 0,007 \text{ mol H}_2\text{SO}_4 \checkmark \quad (\text{ratio 2:1}) \\ V_{\text{H}_2\text{SO}_4} &= \frac{n}{c} = \frac{0,007}{1} = 0,007 \text{ dm}^3 \checkmark \end{aligned}$$

Consider reaction 1/Beskou reaksie 1

$$\begin{aligned} V_{\text{H}_2\text{SO}_4} \text{ reacting with CaCO}_3 &= 0,05 - 0,007 \text{ dm}^3 = 0,043 \text{ dm}^3 \checkmark \\ n_{\text{H}_2\text{SO}_4} \text{ reacting with CaCO}_3 &= cV \\ &= (1)(0,043) \\ &= 0,043 \text{ mol} \checkmark \\ n_{\text{H}_2\text{SO}_4} &= n_{\text{CaCO}_3} = 0,043 \text{ mol} \checkmark \quad (\text{ratio 1:1}) \\ m_{\text{CaCO}_3} &= nM \checkmark = (0,043)(100) \checkmark = \underline{4,3 \text{ g}} \end{aligned}$$

OR/OF

Consider reaction 2/Beskou reaksie 2

$$\begin{aligned} n_{\text{NaOH}} &= cV \checkmark \\ (0,5)(0,028) &= 0,014 \text{ mol} \checkmark \text{ NaOH} \\ 2n_{\text{H}_2\text{SO}_4} \text{ excess} &= n_{\text{NaOH}} \checkmark = 0,007 \text{ mol} \checkmark \quad (\text{ratio 2:1}) \end{aligned}$$

Consider reaction 1/ Beskou reaksie 1

$$\begin{aligned} n_{\text{H}_2\text{SO}_4} \text{ total} &= cV = 1(0,05) = 0,05 \text{ mol} \checkmark \\ n_{\text{H}_2\text{SO}_4} \text{ reacting with CaCO}_3 &= 0,05 - 0,007 \\ &= 0,043 \text{ mol} \checkmark \\ n_{\text{H}_2\text{SO}_4} &= n_{\text{CaCO}_3} = 0,043 \text{ mol} \checkmark \quad (\text{ratio 1:1}) \\ m_{\text{CaCO}_3} &= nM \checkmark = (0,043)(100) \checkmark = \underline{4,3 \text{ g}} \checkmark \end{aligned}$$

(10)