

**QUESTION 1 / VRAAG 1**

- |        |        |        |        |        |
|--------|--------|--------|--------|--------|
| 1.1 C  | 1.2 B  | 1.3 C  | 1.4 A  | 1.5 D  |
| 1.6 B  | 1.7 D  | 1.8 D  | 1.9 A  | 1.10 B |
| 1.11 C | 1.12 A | 1.13 B | 1.14 A | 1.15 D |
- 3 x 15 = [45]**

**QUESTION 2 / VRAAG 2**

2.1.1 Boyle's Law / Boyle se wet (2)

2.1.2 The pressure of a given mass of an enclosed gas is inversely proportional to the volume of the gas provided the temperature remains constant. (3)

*Die druk van 'n gegewe massa ingeslote gas is omgekeerd eweredig aan die volume van die gas mits die temperatuur konstant bly.*

- Fixed quantity of gas
  - p inversely proportional to V (relationship)
  - T constant
- 
- Vaste massa gas
  - p omgekeerd eweredig aan V (verwantskap)
  - T konstant

If relationship was not given or incorrect - NO MARKS  
 As verwantskap nie gegee word nie of verkeerd - GEEN PUNTE

Accept indirectly proportional  
 Aanvaar indirek eweredig

2.1.3

$$p_1 V_1 = p_2 V_2$$

$$(105 \times 50) = 450 V_2$$

$$\therefore V_2 = 11,67 \text{ dm}^3$$

OR/OF

$$V_2 = \frac{p_1 V_1}{p_2} = \frac{105 \times 50}{450} = 11,67 \text{ dm}^3$$

(4)

2.1.4 No/ Nee (1)

2.1.5 At high pressures the volume of the gas molecules becomes significant and contributes to the gas volume. (2)  
*By hoë druk kan die volume van die gasmolekule nie geïgnoreer word nie en dra by tot totale gas volume.*

2.1.6 Hydrogen bonds./ Waterstofbinding. (2)

2.2

$$c[\text{Ca}(\text{NO}_3)_2] = \frac{m}{MV}$$

$$= \frac{10}{164 \times 0,5}$$

$$= 0,12 \text{ mol.dm}^{-3}$$

$$\therefore c[\text{NO}_3^-] = 2 \times 0,12$$

$$= 0,24 \text{ mol.dm}^{-3} \checkmark$$

OR  
OF

$$M_r(\text{Ca}(\text{NO}_3)_2) = 164 \text{ g.mol}^{-1}$$

$$n = \frac{m}{M_r} = \frac{10}{164} = 0,06 \text{ mol}$$

$$\therefore n(\text{NO}_3^-) = 2 \times n(\text{Ca}(\text{NO}_3)_2) = 0,12 \text{ mol}$$

$$\therefore [\text{NO}_3^-] = \frac{n}{V} = \frac{0,12}{0,5} = 0,24 \text{ mol.dm}^{-3}$$

1 mark for both 10 g and 0,5 dm<sup>3</sup>  
1 punt vir beide 10 g en 0,5 dm<sup>3</sup>

OR/ OF

$$m(\text{NO}_3^-) = \frac{2 \times 62}{164} \times 10 = \frac{124}{164} = 7,56 \text{ g}$$

$$c[\text{NO}_3^-] = \frac{m}{MV} = \frac{7,56}{62 \times 0,5}$$

$$= 0,24 \text{ mol.dm}^{-3} \checkmark$$

$$m(\text{NO}_3^-) = \frac{2 \times 62}{164} \times 10 = \frac{124}{164} = 7,56 \text{ g}$$

$$n = \frac{m}{M_r} = \frac{7,56}{62} = 0,12 \text{ mol}$$

$$c[\text{NO}_3^-] = \frac{n}{V} = \frac{0,12}{0,5} = 0,24 \text{ mol.dm}^{-3}$$

1 mark for both 7,56 g and 0,5 dm<sup>3</sup>  
1 punt vir beide 7,56 g en 0,5 dm<sup>3</sup>

OR/ OF

$$c[\text{NO}_3^-] = 2 \times c[\text{Ca}(\text{NO}_3)_2]$$

$$= 2 \times \frac{m}{MV} = 2 \times \frac{10}{164 \times 0,5}$$

$$= 0,24 \text{ mol.dm}^{-3}$$

(4)  
[18]

QUESTION 3/ VRAAG 3

3.1

3.1.1 Sulphur dioxide/ Swaweldioksied (SO<sub>2</sub>) (2)  
Sulphur (IV) oxide/ Swawel(IV)oksied

3.1.2 sulphurous acid/swawelligsuur (H<sub>2</sub>SO<sub>3</sub>) (2)  
OR/OF hydrogen sulphite / waterstofsulfiet

3.1.3 2SO<sub>2</sub> + O<sub>2</sub> → 2SO<sub>3</sub> (✓bal) (Accept/Aanvaar ⇒) (3)

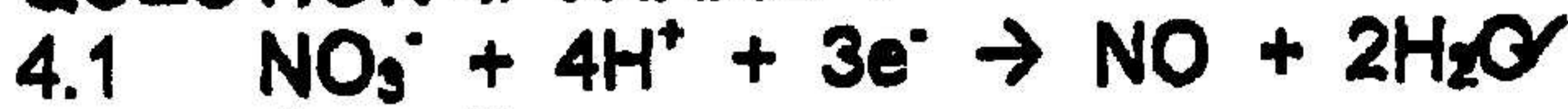
3.1.4 H<sub>2</sub>SO<sub>4</sub> (Sulphuric acid/ swawelsuur) (2)

Accept equation for the formation of H<sub>2</sub>SO<sub>4</sub>  
Aanvaar vergelyking vir die vorming van H<sub>2</sub>SO<sub>4</sub>

3.2 2H<sub>2</sub>S + SO<sub>2</sub> → 3S + 2H<sub>2</sub>O (✓bal) ⇒ -1 (3)

2CaS + SO<sub>2</sub> → 3S + 2CaO or other sulphide/of ander sulfied [12]

**QUESTION 4/ VRAAG 4**



(2)

OR/OF



$\text{NO}_3^- + 4\text{H}^+ + 3\text{e}^- \rightleftharpoons \text{NO} + 2\text{H}_2\text{O}$ (1/2)	$\text{NO}_3^- + 2\text{H}^+ + \text{e}^- \rightleftharpoons \text{NO}_2 + \text{H}_2\text{O}$ (1/2)
$\text{NO}_3^- + 4\text{H}^+ + 3\text{e}^- \leftarrow \text{NO} + 2\text{H}_2\text{O}$ (0/2)	$\text{NO}_3^- + 2\text{H}^+ + \text{e}^- \leftarrow \text{NO}_2 + \text{H}_2\text{O}$ (0/2)
$\text{NO} + 2\text{H}_2\text{O} \leftarrow \text{NO}_3^- + 4\text{H}^+ + 3\text{e}^-$ (3/2)	$\text{NO}_2 + \text{H}_2\text{O} \leftarrow \text{NO}_3^- + 2\text{H}^+ + \text{e}^-$ (3/2)
$\text{NO} + 2\text{H}_2\text{O} \rightleftharpoons \text{NO}_3^- + 4\text{H}^+ + 3\text{e}^-$ (0/2)	$\text{NO}_2 + \text{H}_2\text{O} \rightleftharpoons \text{NO}_3^- + 2\text{H}^+ + \text{e}^-$ (0/2)

4.2 Award 2 marks irrespective of any attempt of answering the question  
*Gee 2 punte ongeag van poging om vraag te beantwoord*

4.3 Award 3 marks irrespective of any attempt of answering the question  
*Gee 3 punte ongeag van poging om vraag te beantwoord*

4.2 Nitrogen oxide / nitrogen monoxide Stikstofoksied / stikstofmonoksied
4.3 $2\text{NO}(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2\text{NO}_2(\text{g})$

4.4  $\text{Cu}^{2+}$  ion (copper ion 0/2)  
 $\text{Cu}^{2+}$  ioon (koper ioon 0/2)

(2)

[9]

**QUESTION 5/ VRAAG 5**

- 5.1.1 Temperature/ *Temperatuur* ✓✓ (2)
- 5.1.2 Slower (Rate decreases)/ *Stadiger (Tempo neem af)* ✓✓ (2)
- 5.1.3 Faster (Rate increases)/ *Vinniger (Tempo neem toe)* ✓✓ (2)
- 5.1.4 Surface area / *Reaksie oppervlakte* ✓✓ (2)
- |   |
|---|
| State of division/ <i>Toestand van verdeeldheid</i><br>Powdered Zinc/ <i>Sinkpoeier</i> |
|---|
- 5.2.1 Endothermic/ *Endotermies* ✓ (1)
- 5.2.2 Yellow/ *Geel* ✓✓ (2)
- 5.2.3 DECREASES/ *AFNEEM* ✓✓ (2)
- 5.2.4 STAYS THE SAME/ *BLY DIESELFDE*  
 (NO EFFECT/ *GEEN INVLOED*) ✓✓ (2)
- 5.2.5 INCREASES / *INEEM TOE* ✓✓ (2)
- 5.2.6 STAYS THE SAME/ *BLY DIESELFDE*  
 (NO EFFECT/ *GEEN INVLOED*) ✓✓ (2)

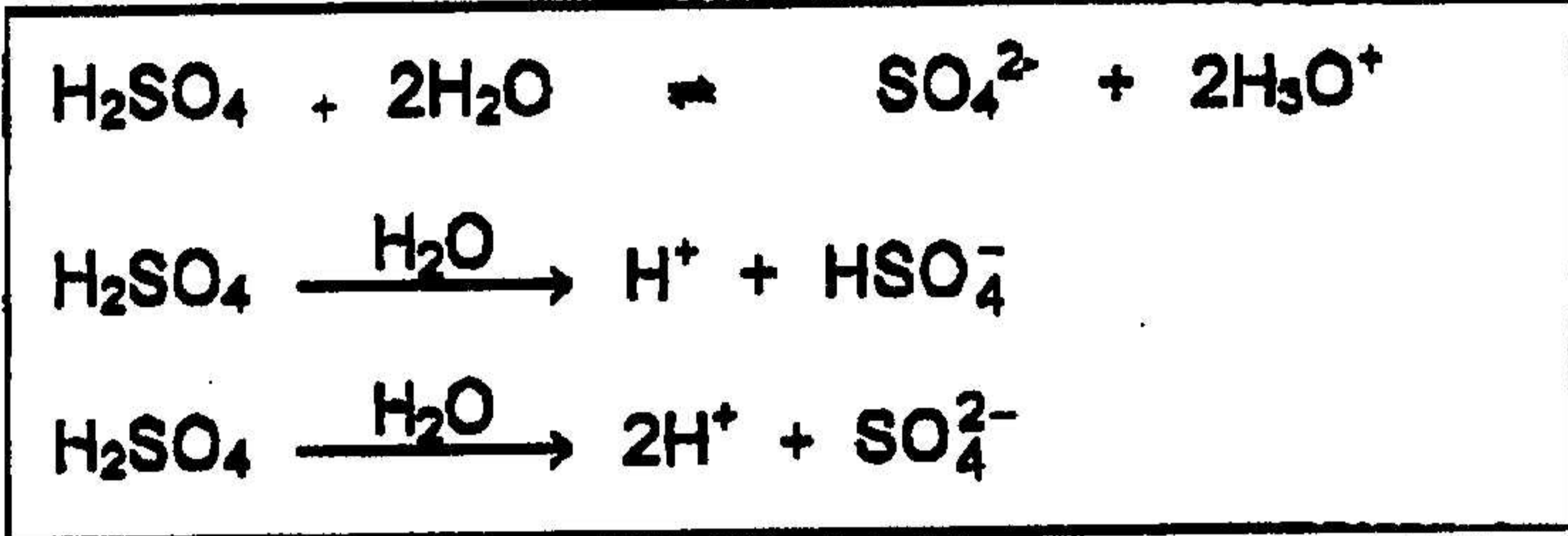
[19]

QUESTION 6/ VRAAG 6

6.1 A solution of known concentration. ✓✓ (2)  
 'n Oplossing waarvan die konsentrasie bekend is

6.2 Ionises (Dissociates) (almost) completely in solution. ✓✓ Large  $K_a$  value (2)  
Ioniseer (Dissosieer) (bykans) volledig in oplossing /Lae  $K_a$  waarde

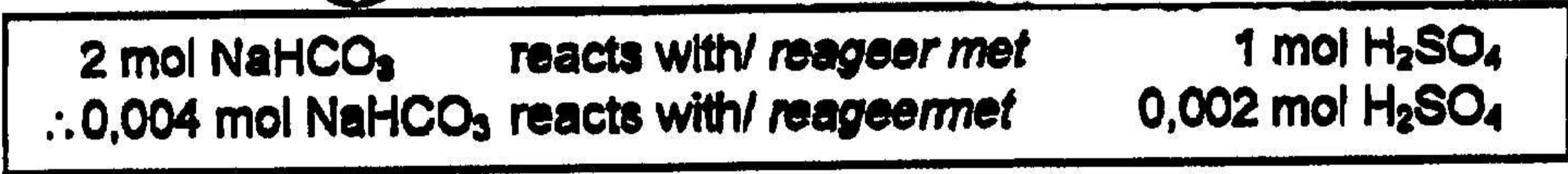
6.3  $H_2SO_4 + H_2O \rightleftharpoons HSO_4^- + H_3O^+$  (✓ bal) . (3)



Single arrow accepted  
 Enkel pyl word aanvaar

6.4  $n = c \times V = 0,20 \times 0,02 = 0,004 \text{ mol}$  ✓ (3)  
 $m = cMV = 0,2 \times 84 \times 0,02 = 0,336 \text{ g}$   
 $n = \frac{m}{M} = \frac{0,336}{84} = 0,004 \text{ mol}$

6.5  $n(H_2SO_4) = \frac{1}{2} n(NaHCO_3) = \frac{1}{2} \times 0,004 = 0,002 \text{ mol}$  (2)



6.6  $c = \frac{n}{V} = \frac{0,002}{0,012} = 0,167 \text{ mol.dm}^{-3}$  ✓ (2)  
 $\frac{c_a V_a}{c_b V_b} = \frac{n_a}{n_b} \therefore c_a = 0,167 \text{ mol.dm}^{-3}$

Accept correct rounding  
 Aanvaar korrekte afronding

6.7 Methyl orange/ Metieloranje ✓✓ (2)  
**[16]**

**QUESTION 7 / VRAAG 7**

7.1.1 Chemical energy to electrical energy ✓✓ (2 or/of 0) (2)  
*Chemiese energie na elektriese energie*

7.1.2  $Cu^{2+} + 2e^{-} \rightarrow Cu$  ✓✓ (2)

$Cu^{2+} + 2e^{-} \rightleftharpoons Cu$	(1/2)
$Cu^{2+} + 2e^{-} \leftarrow Cu$	(0/2)
$Cu \leftarrow Cu^{2+} + 2e^{-}$	(2/2)
$Cu \rightleftharpoons Cu^{2+} + 2e^{-}$	(0/2)

7.1.3  $Cu^{2+}$  ✓✓ (copper ions / koper ione) (2)

$CuSO_4$ or any other soluble $Cu^{2+}$ -salt <i><math>CuSO_4</math> of enige ander oplosbare <math>Cu^{2+}</math>-sout</i>
--

7.1.4 Maintain electrical neutrality / complete the circuit/ allow free movement of ions between the solutions ✓✓ (2)

Any one <i>Enige een</i>
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*Hou elektriese neutraliteit in stand / voltooi die stroombaan/ laat toe dat ione vrylik tussen die onderskeie oplossings beweeg*

7.1.5  $Zn|Zn^{2+} || Cu^{2+}|Cu$  (2)

$Zn Zn^{2+}   Cu^{2+} Cu$	1/2
$Zn^{2+} Zn    Cu^{2+} Cu$	1/2
$Zn Zn^{2+}    Cu Cu^{2+}$	1/2
NO OTHER ALTERNATIVES/ GEEN ANDER ALTERNATIEWE	

7.2.1 Cu is not a strong enough reducing agent to reduce  $H_2SO_4$  ✓✓ (2)  
*Cu is nie 'n sterk genoeg reduseermiddel om  $H_2SO_4$  te reduseer nie.*

OR / OF  $H_2SO_4$  is not a strong enough oxidising agent to oxidise Cu ✓✓  
 *$H_2SO_4$  is nie 'n sterk genoeg oksideermiddel om Cu te oksideer nie.*

OR/OF Emf of - 0,17 V calculated/ *Emk van - 0,17 V bereken* ✓✓

7.2.2 Use concentrated sulphuric acid/ *Gebruik gekonsentreerde swawelsuur.* ✓✓ (4)  
 Heat the test tube/ *Verhit die proefbuis* ✓✓

7.3 Reducing agent / Reduseermiddel ✓✓ (2)  
 [18]

QUESTION 8/ VRAAG 8

8.1.1 -OH ✓✓

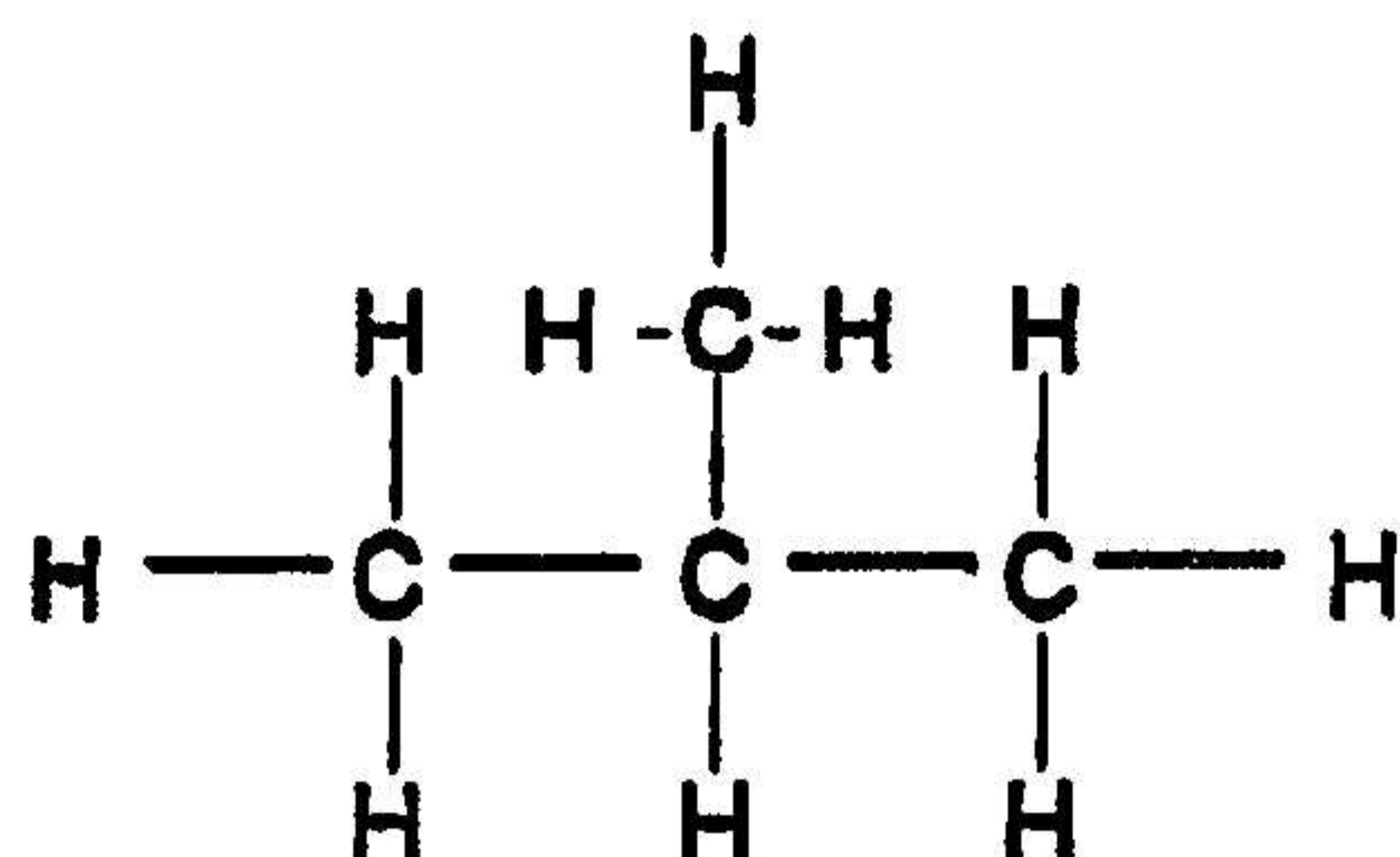
No other possibilities  
Geen ander moontlikhede

(2)

8.1.2 Alkyne/Alkyn ✓✓

(2)

8.2



Hydrogens omitted -1  
Waterstowwe uitgelaat -1

✓✓✓

(3)

$  \begin{array}{c}  \text{CH}_3 \\    \\  \text{CH}_3 - \text{CH} - \text{CH}_3  \end{array}  $	or any expanded version of enige uitgebreide struktuur	$\frac{2}{3}$
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8.3.1 E ✓✓

8.3.2 A ✓✓

8.3.3 B ✓✓

For 8.3.1 to 8.3.3 - Accept structural formula  
Vir 8.3.1 tot 8.3.3 - Aanvaar struktuur formule

(2)

(2)

(2)

[13]

TOTAL: 150