

POSSIBLE ANSWERS FOR / MOONTLIKE ANTWOORDE VIR :

PHYSICAL SCIENCE PAPER 2 (CHEMISTRY) STANDARD GRADE
QUESTION 1 / VRAAG 1

NOVEMBER 2003

1.1	D	1.2	C	1.3	B
1.4	C	1.5	A	1.6	D
1.7	A	1.8	C	1.9	D
1.10	C	1.11	B	1.12	A
1.13	B	1.14	D	1.15	B

[15x3=45]

QUESTION 2 / VRAAG 2

2.1.1 Cu ✓✓

2.1.2 NH₃ ✓✓

2.1.3 NaBr ✓✓

2.1.4 Ar ✓✓

(8)

2.2 Increase in temp. increases the kinetic energy (increases speed of the molecules) ✓ ($E_k \propto T$) (E_k is directly proportional to T). The force of the collisions (or number) increases ✓ (at constant volume) leading to an increase in pressure ✓ /
Toename in temperatuur verhoog die kinetiese energie (verhoog die spoed van die molekule), ($E_k \propto T$) (E_k is direk eweredig aan T). Die krag van die botsings (of aantal botsings) neem toe (by konstante volume) en lei tot 'n verhoging in druk

IF/AS: $T \propto p$ (when temperature increases, pressure increases) (1/3)
 $T \propto p$ (wanneer temperatuur toeneem, neem druk ook toe)

(3)

2.3
$$\frac{p_1 V_1}{T_1} = \frac{p_2 V_2}{T_2} \checkmark$$

$$\frac{100 \times 3,2}{30+273} = \frac{70 \times 3,3}{T_2} \checkmark$$

$$T_2 = \frac{70 \times 3,3 \times 303}{100 \times 3,2}$$

$$= 218,7 \text{ K } \checkmark \text{ or/of } 219 \text{ K or/of } (-54,3^\circ\text{C})$$

(5)

2.4 $n\{\text{Cu}(\text{NO}_3)_2\} = cV \checkmark = 0,25 \times 0,2 = 0,05 \text{ mol}$

$$n(\text{NO}_3^-) = 2 \times 0,05$$

$$= 0,1 \text{ mol } \checkmark$$

No multiplication by 2: max: 2/4
Geen vermenigvuldiging met 2:
max: 2/4

OR/OF $n\{\text{Cu}(\text{NO}_3)_2\} = cV \checkmark$
 $= 0,25 \times 200 \times 10^{-3}$

$$n(\text{NO}_3^-) = 2 \checkmark \times 0,25 \times 200 \times 10^{-3} \checkmark$$

$$= 0,1 \text{ mol } \checkmark$$

OR/OF $c = \frac{m}{MV} \checkmark$

$$0,25 = \frac{m}{124 \times 0,2} \checkmark \text{ Substitution } \checkmark$$

$$= 6,2 \text{ g } \checkmark$$

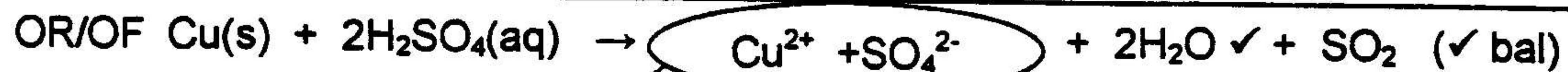
$$n = \frac{m}{M} = \frac{6,2}{62} = 0,1 \text{ mol } \checkmark$$

(4)
[20]

One mark awarded to any formula/
Een punt vir enige formule toegeken.

QUESTION 3 / VRAAG 3

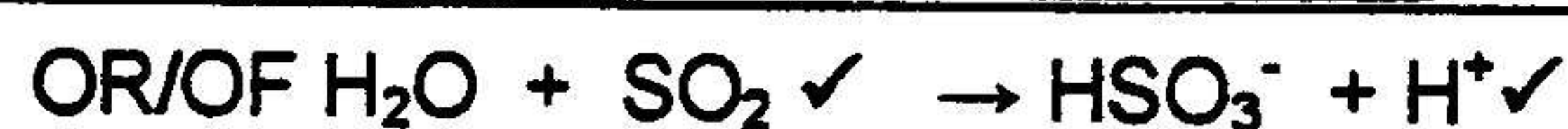
3.1



(3)

3.1.2 (High) solubility $\checkmark\checkmark$ Hoë oplosbaarheidOR/OF Acidic property (proton donor) $\checkmark\checkmark$ / Suureienskap (protonskenker)OR/OF Acidic oxide/Suuroksied $\checkmark\checkmark$ Strong acid/Sterk suur (1/2)

(2)

 \Rightarrow Accepted / aanvaar

3.2

3.2.1 A: NO $\checkmark\checkmark$ nitrogen oxide/ nitric oxide / nitrogen(II) oxide (1/2)
stikstofoksied / stikstof(II)oksiedB: NO₂ $\checkmark\checkmark$ nitrogen dioxide/ nitrogen(IV) oxide (1/2)
stikstofdoksied / stikstof(IV)oksied

(2)

C: HNO₃ $\checkmark\checkmark$ (nitric acid / salpetersuur 1/2)

(6)

3.2.2 Platinum-rhodium or/of Platinum or/of rhodium $\checkmark\checkmark$
(Pt or/of Rh 1/2)

(2)

3.3

3.3.1 Chloride ion /Chloriedioon $\checkmark\checkmark$ OR/OF Name of any soluble chloride/
Naam van enige oplosbare chloried (2)Cl⁻ OR/OF Formula of soluble
chloride/formule vir oplosbare
chloried (1/2)Chlorine/chloor / Cl/Cl₂ /
Chlorine ion / chloorioon
(0/2)3.3.2 Test tube / Proefbuis A: Br⁻ (Bromide/Bromied) $\checkmark\checkmark$
(Bromine / broom / Br 1/2)

(2)

3.3.3 Test tube / Proefbuis C: I⁻ (Iodide/Jodied) $\checkmark\checkmark$
(Iodine / Jodium / I 1/2)

(2)

[21]

QUESTION 4 / VRAAG 4

4.1

4.1.1 Exothermic ✓ / Eksotermies (1)

4.1.2 $\Delta H = 150 \text{ kJ.mol}^{-1}$ ✓ ✓
If unit is omitted or wrong/
Geen of verkeerde eenheid (1/2) -150 kJ.mol⁻¹ (0/2) (2)4.1.3 Activation energy / Aktiveringsenergie = 360 (kJ.mol⁻¹) ✓✓ (2)

4.1.4 Decreases ✓✓ / Afneem (2)

4.1.5 Stays the same ✓✓ / Bly dieselfde (2)

4.1.6 Stays the same ✓✓ / Bly dieselfde (2)

4.1.7 Increases ✓✓ / Verhoog (toeneem) (2)

4.2

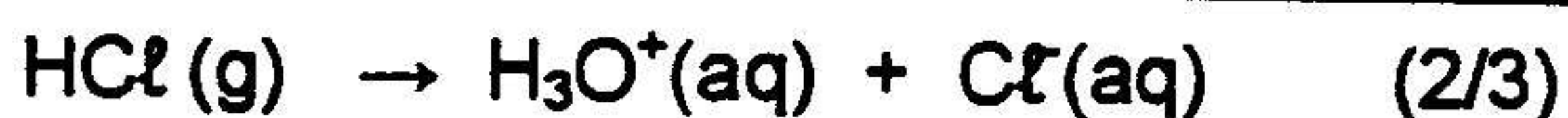
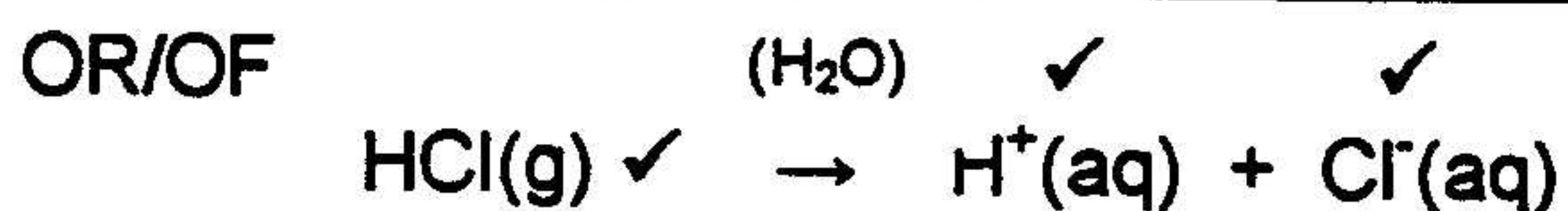
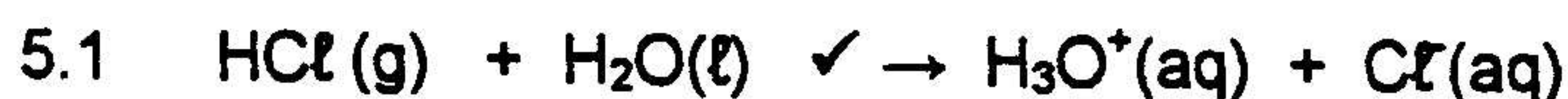
4.2.1 Increases ✓✓ / Verhoog (toeneem) (2)

4.2.2 Stays the same ✓✓ / Bly dieselfde (2)

4.2.3 Increases ✓✓ / Verhoog (toeneem) (2)

[19]

QUESTION 5 / VRAAG 5



Ignore phases/
Ignoreer fases

Accept / aanvaar ⇒

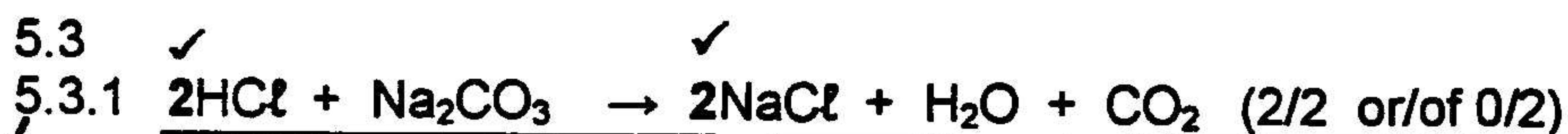
(3)

5.2 Ionises (dissociates) (almost) completely / Ioniseer (dissosieer) (feitlik)
volledig ✓✓

OR/OF: High K_a value / Hoë K_a -waarde ✓✓

Donates H^+ easily / Skenk H^+ maklik ✓✓

(2)



OR/OF multiples of 2 across the entire equation acceptable /
veelvoude van 2 oor die hele vergelyking aanvaarbaar) 2/2

(2)

5.3.2 $\frac{c_a V_a}{c_b V_b} = \frac{n_a}{n_b}$ ✓

$\frac{0,2 \times 20}{0,1 \times V_b} = \frac{2}{1}$ ✓

$V_b = \frac{0,2 \times 20 \times 1}{0,1 \times 2}$

$= 20 \text{ cm}^3$ ✓

OR/OF Moles of acid / Mol suur.

$n_a = c_a V_a$ ✓

$n_a = 0,2 \times 0,02 = 0,004 \text{ mol}$ ✓

2 mol acid reacts with 1 mol base/
2 mol suur reageer met 1 mol basis

$n_b = 0,004 / 2 = 0,002 \text{ mol}$ ✓

Concentration of base / Konsentrasie van basis:

$V_b = \frac{n}{c} = \frac{0,002}{0,1} = 0,02 \text{ dm}^3 = 20 \text{ cm}^3$ ✓

(5)

$n_a V_a c_a = n_b V_b c_b$ ✓

$1 \times 20 \times 0,2 = 2 \times V_b \times 0,1$ ✓

$V_b = \frac{0,2 \times 20 \times 1}{0,1 \times 2}$

$= 20 \text{ cm}^3$ ✓

Penalise once for mol omitted or incorrect unit/
Penaliseer een keer vir mol weggelaat of
verkeerde eenheid

When the equation $c_a V_a = c_b V_b$ is used, a
maximum of 4/5 marks is awarded, only if $n_a:n_b$ in
5.3.1 is 1:1.

Wanneer die vergelyking $c_a V_a = c_b V_b$ gebruik
word, word 'n maksimum van 4/5 toegeken, slegs
as $n_a:n_b$ in 5.3.1 1:1 is.

5.3.3 Methyl orange ✓✓ / Metieloranje

(5)

(2)

[14]

6.1.1 + 6.1.2
Consider any two of the observations alongside for questions 6.1.1 + 6.1.2 together for max. 4 marks/
Aanvaar enige twee van die waarnemings hiernaas vir vrae 6.1.2 + 6.1.2 tesame vir maks. 4 punte

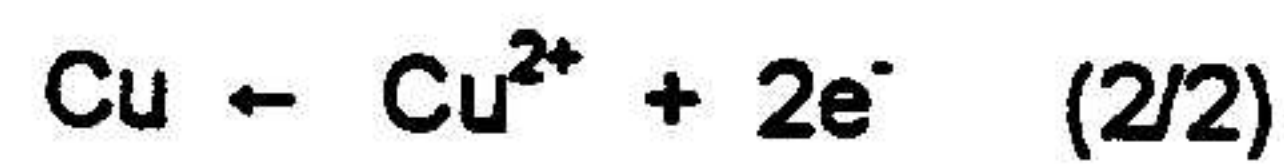
Blue changes to light blue/colourless/fades(not white) ✓✓/
Blou raak ligblou/ligter/keurloos OR/OF
Copper forms/*Koper vorm* ✓✓ OR/OF
Black/brown/shades of brown precipitate/solid forms ✓✓/
Swart/bruin/skakerings van bruin/vaste stof vorm/ OR/OF
Mg becomes pitted/corroded/*Mg raak uitgevreet/verweer* ✓✓

Bubbles formed/*Borrels gevorm* (1/2)

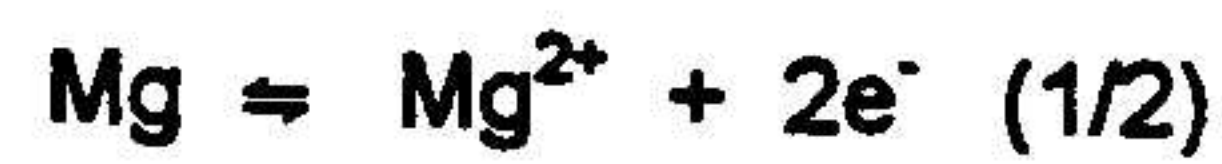
(2)



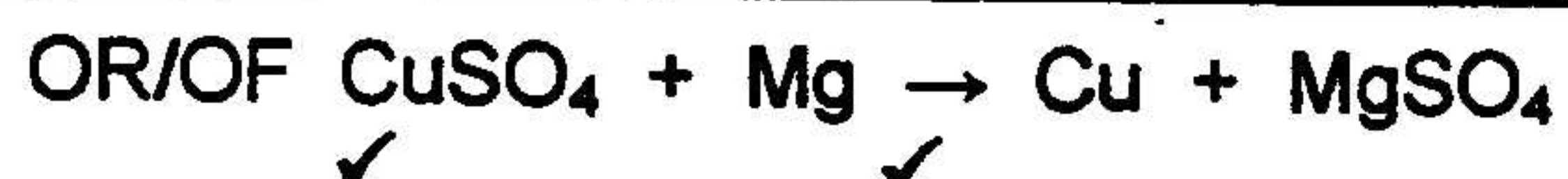
If the correct answer to 6.2.1 was given in 6.2.2, and the correct answer to 6.2.2 was given at 6.2.1, two marks are awarded for 6.2.1 + 6.2.2/
As die regte antwoord op 6.2.1 by 6.2.2 gegee is, en die regte antwoord op 6.2.2 by 6.2.1 gegee is, word twee punte vir 6.2.1 en 6.2.2 toegeken



(2)



(2)



IF ionic charges are omitted, 1 mark is forfeited per equation. (not applicable to electrons)/
INDIEN ioonlading weggelaat is, word 1 punt per vergelyking verbeur. (n.v.t. op elektrone)

IF equation is incomplete/INDIEN vergelyking onvolledig is (0/2)

No positive marking from 6.2.1 through 6.2.2 up to 6.2.3 but if 6.2.1 and 6.2.2 were swapped around then positive marking at 6.2.3/
Geen pos. nasien van 6.2.1 deur 6.2.2 tot by 6.2.3 maar as 6.2.1 en 6.2.2 omgeruil word, dan positiewe nasien by 6.2.3. Max. 4/6

(2)

IF equation is unbalanced, 1 mark is forfeited per equation./
INDIEN vergelyking ongebalanseerd is, word 1 punt per vergelyking verbeur.

6.3 No/Nee ✓

(1)

6.4 Ag is not a strong enough reducing agent ✓✓ to reduce Cu^{2+} to Cu ✓
Ag is nie 'n sterk genoeg reduseermiddel om Cu^{2+} na Cu te reduseer nie

Ag is a weaker reducing agent than Cu ✓✓ and can therefore not reduce Cu^{2+} to Cu ✓ / Ag is 'n swakker reduseermiddel as Cu en kan daarom nie Cu^{2+} na Cu reduseer nie

Cu is a stronger reducing agent than Ag ✓✓ and can therefore not oxidise Ag to Ag^+ ✓ / Cu is 'n sterker reduseermiddel as Ag en kan daarom nie Ag na Ag^+ oksideer nie

$$\begin{aligned} E_{\text{cell/set}} &= E_{\text{cathode/katode}} - E_{\text{anode}} \\ &= 0,34 - 0,8 \\ &= -0,46 \text{ V (negative/negatief) } \checkmark\checkmark\checkmark \end{aligned}$$

(3)
[14]

QUESTION 7 / VRAAG 7

7.1 Alkenes ✓✓ / Alkene OR/OF C_nH_{2n} ✓ (2)

7.2 E (C_4H_{10}) ✓✓ OR/OF any other alkane/enige ander alkaan ✓✓ (2)

Correct names also correct/Korrekte name ook reg

7.3
$$\begin{array}{c}
 \text{H} \quad \text{H} \\
 | \quad | \\
 \text{H} - \text{C} = \text{C} - \text{H} \\
 \checkmark
 \end{array}
 + \text{Br}_2 \rightarrow
 \begin{array}{c}
 \text{Br} \quad \text{H} \\
 | \quad | \\
 \text{H} - \text{C} - \text{C} - \text{H} \\
 | \quad | \\
 \text{H} \quad \text{Br}
 \end{array}
 \checkmark \checkmark$$
If Br atoms are on the same carbon atom, then 0/2. As Br-atom op dieselfde koolstofatoom is, 0/2. (3)

H_2BrCCH_2Br 1/2

Hydrogen atoms omitted – Deduct one mark/Waterstof-atome weggelaat – Trek een punt af
No marks for incorrect formulae (e.g. 1 extra H)/Geen punte vir verkeerde formule (bv. 1 ekstra H)

No marks for name given/Geen punte vir die naam nie

7.4 Compound B has single C-C bonds ✓ (OR it is saturated) (OR it is an alkane) and therefore more energy is required to break the bonds. ✓ /
Verbinding B het enkel C-C bindings (OF dit is versadig) (OF dit is 'n alkaan) en daarom word meer energie benodig om die bindings te breek

OR/OF Compound B has sigma bondings and A has sigma and pi-bondings ✓
and pi-bonds are weaker than sigma-bonds ✓ /
Verbinding B het sigma-bindings en A het sigma en pi-bindings en die pi-bindings is swakker as die sigma-bindings

OR/OF Because of the double bonding ✓ in compound A a pair of electrons is available for bonding ✓
A.g.v. die dubbelbinding in verbinding A is 'n elektronpaar beskikbaar vir binding

(2)

7.5 Trichloromethane ✓✓ / Trichloormetaan Chloroform 0/2 (2)

7.6 D (C_2H_2) ✓✓ OR/OF ethyne/acetylene/etyn/asetileen ✓✓ (2)

7.7 Carbon dioxide/Koolstofdioksied (koolsuurgas) ✓✓ and/en water/steam/stoom ✓✓ (4)

CO_2 (1/2) and/en H_2O (1/2)

[17]

TOTAL/TOTAAL : 150