

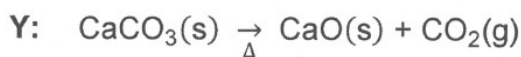
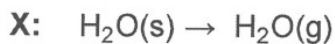
Chemiese en Fisiese Veranderings

November 2018

- 1.6 Watter EEN van die volgende stellings is VERKEERD oor die eienskappe van 'n fisiese verandering?
- A Wanneer 'n fisiese verandering plaasvind, kan die verbindings hulself herrangskik, maar die bindings tussen die atome sal nie breek nie.
 - B Fisiese verandering in materie is omkeerbaar.
 - C Energie word geabsorbeer wanneer materie van 'n vaste stof na 'n vloeistof verander.
 - D Molekule bly nie gedurende 'n fisiese verandering behoue nie. (2)

VRAAG 5 (Begin op 'n nuwe bladsy.)

Bestudeer die fisiese en chemiese prosesse hieronder en beantwoord die vrae wat volg.

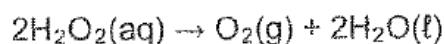


- 5.1 Definieer die term *fisiese verandering*. (2)
- 5.2 Skryf die LETTER neer van die proses wat die volgende verteenwoordig:
- 5.2.1 Fisiese verandering (1)
 - 5.2.2 Ontbindingsreaksie (1)
- 5.3 Gee die naam van die fisiese verandering wat in VRAAG 5.2.1 genoem is. (1)
- 5.4 Noem TWEE eienskappe van 'n reaksie wat aandui dat 'n chemiese verandering plaasgevind het. (2)
- 5.5 Vir proses Z, skryf neer:
- 5.5.1 Wat die simbool Δ verteenwoordig (1)
 - 5.5.2 'n GEBALANSEERDE CHEMIESE REAKSIE (Toon die fases van AL die reaktante en produkte.) (4)
- 5.6 'n 20 g-monster $\text{CaCO}_3(\text{s})$ in proses Y ontbind om 11,2 g CaO te vorm. In 'n tweede monster ontbind 30 g om x g CO_2 te vorm.
- 5.6.1 Noem die *wet van konstante samestelling*. (2)
 - 5.6.2 Gebruik die wet in VRAAG 5.6.1 om massa x van die CO_2 wat gevorm het, te bereken. (4)

[18]

VRAAG 5 (Begin op 'n nuwe bladsy.)

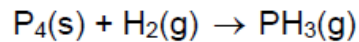
Waterstofperoksied ontbind by kamertemperatuur volgens die volgende gebalanseerde chemiese vergelyking:



- 5.1 Wat stel die (aq) in die vergelyking hierbo voor? (1)
- 5.2 Identifiseer die soort reaksie hierbo. Kies tussen NEERSLAG en REDOKS. Gee 'n rede vir die antwoord. (2)
- 5.3 Is die reaksie 'n voorbeeld van 'n *fisiese* of 'n *chemiese* verandering? (1)
- 5.4 Definieer die term *een mol* van 'n stof. (2)
- 5.5 Indien 4 mol waterstofperoksied ontbind, bereken die volume gas wat by STD gevorm word. (4)
- 5.6 Bereken die getal suurstofatome in H_2O_2 indien 17 g H_2O_2 ontbind. (4)

[14]

- 1.8 Bestudeer die ongebalanseerde chemiese vergelyking hieronder.



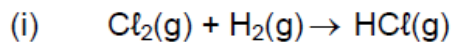
Watter EEN van die stelle koëffisiënte sal die chemiese reaksie balanseer?

- A 4, 2, 3
- B 1, 6, 4
- C 1, 4, 4
- D 2, 10, 8

(2)

VRAAG 6 (Begin op 'n nuwe bladsy.)

Die ongebalanseerde chemiese vergelyking (i) en die woordvergelyking (ii) vir twee chemiese reaksies word hieronder getoon.



(ii) aluminiumkarbonaat $\rightarrow$ aluminiumoksied + koolstofdioksied

- 6.1 Watter EEN van die reaksies, (i) of (ii), is:

6.1.1 'n Ontbindingsreaksie (1)

6.1.2 'n Sintesereaksie (1)

- 6.2 Wat verteenwoordig die (g) in reaksie (i)? (1)

- 6.3 Skryf die chemiese formule vir die volgende neer:

6.3.1 Aluminiumkarbonaat (2)

6.3.2 Aluminiumoksied (2)

- 6.4 Skryf 'n gebalanseerde chemiese reaksie vir reaksie (i) neer. (2)

- 6.5 Gebruik die gebalanseerde reaksie in VRAAG 6.4 om te toon dat massa tydens 'n chemiese reaksie behoue bly. (3)

- 6.6 Bereken die persentasie samestelling van waterstofchloried. (3)

[15]

VRAAG 6 (Begin op 'n nuwe bladsy.)

Magnesiumlint brand in suurstof met 'n helder, wit vlam om 'n wit vaste stof, magnesiumoksied, te vorm.

- 6.1 Noem die tipe chemiese binding in:
- 6.1.1 Magnesiumlint (1)
 - 6.1.2 Magnesiumoksied (1)
- 6.2 Is die reaksie tussen magnesiumlint en suurstof 'n FISIESE of CHEMIESE verandering? Gee 'n rede vir die antwoord. (2)
- 6.3 Skryf 'n gebalanseerde vergelyking vir die reaksie tussen magnesium en suurstof neer. (3)
- 6.4 Gebruik die wet van massabehoud om aan te toon dat massa gedurende die reaksie in VRAAG 6.3 behoue bly. (4)
- [11]

Science Clinic 1

7.1 Complete the table below:

	Volume	Shape	Spaces between particles	Forces between particles	Arrangement of particles	Movement of particles
Gas	Depends on container		Far apart			
Liquid		Depends on container				Slide past each other switching places.
Solid	Fixed				Close together. Fixed positions in a set pattern.	

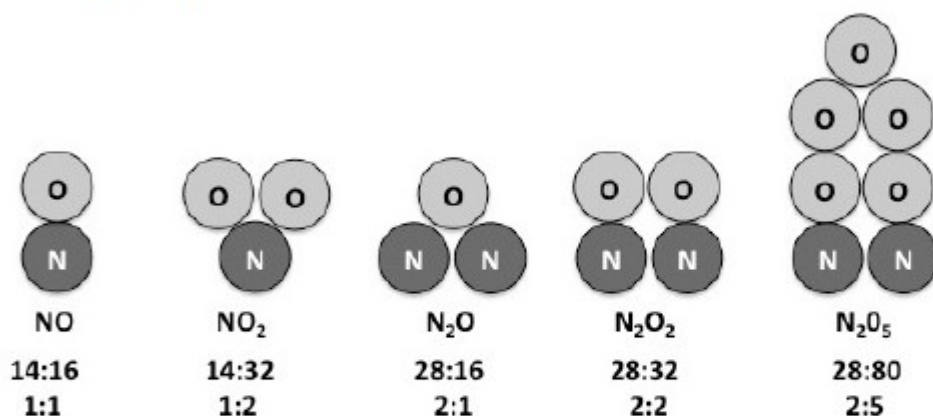
7.2 Sodium and chlorine are very dangerous elements in their pure form. Table salt contains these two elements but is safe to eat. Explain.

7.3 Thabo burns a piece of magnesium which has a mass of 1 gram. He weighs what is left and found the mass was 1,8 grams.

2.3.1 What type of chemical reaction has occurred?

2.3.2 How could you explain this?

7.4 When lightning strikes, a huge amount of energy is transmitted through the air. Nitrogen molecules reacts with oxygen molecules to form the different nitrous oxides (NO_x) shown.



7.4.1. Draw Lewis diagrams for oxygen and nitrogen.

7.4.2. What does the first ratio below the molecule show?

7.4.3. What does the second ratio below the molecule show?

7.4.4. Write balanced chemical reactions to show how NO and N₂O₅ are formed.

7.4.5. Which NO_x has the most energy stored in its bonds? Explain.

Science Clinic 2

7.5 When methane (CH_4) reacts with oxygen, water and carbon dioxide are formed.

7.5.1. Write a balanced equation for the reaction.

7.5.2. The change is _____.

7.5.3. Represent the reaction by drawing pictures of the molecules involved.

7.5.4. How many oxygen atoms are there in one oxygen molecule?

7.5.5. Complete the following table:

	Reactants before	→	Products after
Word equation			
Chemical equation			
Atoms	C: H: O:		C: H: O:
Mass of all atoms			

7.6.

7.6.1. Define the term *exothermic*.

7.6.2. Use the tables of bond energies below to determine whether the reactions that follow are endothermic or exothermic reactions.

Bond	C-H	O-H	C-C	C-O	H-H
Energy ($\text{kJ} \cdot \text{mol}^{-1}$)	410	460	348	358	431

Bond	O=O	N-H	$\text{N} \equiv \text{N}$	C=O	O-O
Energy ($\text{kJ} \cdot \text{mol}^{-1}$)	495	391	945	745	

7.6.2.1. decomposition of hydrogen peroxide to form water and oxygen

7.6.2.2. combustion of methane to form H_2O and CO_2

7.6.2.3. decomposition of ammonia to form H_2 and N_2

7.7. Write out the chemical equations for each of the following reactions and then balance the equations.

7.7.1. sodium + oxygen → sodium oxide (A)

7.7.2. sodium nitrate → sodium nitrite + oxygen (B)

7.7.3. hydrogen iodide → hydrogen + iodide (C)

7.7.4. carbon + oxygen → carbon dioxide (D)

7.7.5. copper + sulfuric acid → copper sulphate + sulphur dioxide + water (E)

Science Clinic 3

7.8. Write only A, B, C, D or E. Which reactions in question 4.7 would you classify as:

7.8.1. Synthesis

7.8.2. Decomposition reactions.

7.9. Lithium burns in oxygen with a bright red flame to produce a white solid, lithium oxide.

7.9.1. Name the type of chemical bonding in:

7.9.1.1. Lithium

7.9.1.2. magnesium oxide

7.9.2. Is the reaction between lithium and oxygen a PHYSICAL or CHEMICAL change?
Give a reason for the answer.

7.9.3. Write down a balanced equation for the reaction between lithium and oxygen.

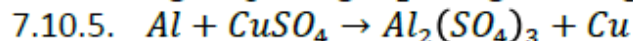
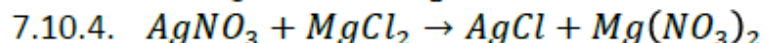
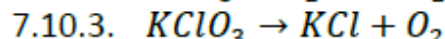
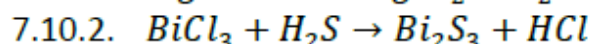
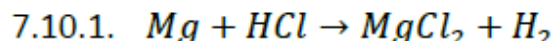
7.9.4. Use the law of conservation of mass to show that mass is conserved during the reaction.

Lithium is also very reactive in water, forming lithium hydroxide and hydrogen gas.

7.9.5. Name the type of chemical bonding in hydrogen gas.

7.9.6. Write down a balanced equation for the reaction between lithium and water.

7.10. Rewrite and balance the following chemical equations.



QUESTION 5/VRAAG 5

- 5.1 A change in which no new substances are formed. ✓✓/In Verandering waarin geen nuwe stowwe gevorm word nie.

OR/OF

A change in which energy changes are small in relation to chemical changes. ✓✓/In Verandering waarin energieveranderinge klein is in vergelyking met chemiese veranderinge.

OR/OF

A change in which mass, number of atoms and molecules are being conserved. ✓✓/In Verandering waarin massa, getal atome en molekule behoue bly.

(2)

- 5.2.1 X ✓

(1)

- 5.2.2 Y ✓

(1)

- 5.3 Sublimation. ✓/Sublimasie

(1)

- 5.4 Colour change. ✓/Kleurverandering

Formation of gas ✓/Vorming van gas

Formation of a precipitate ✓/Vorming van 'n neerslag

Change in temperature ✓/Verandering in temperatuur (Any two/Enige twee)

(2)

- 5.5.1 Heat. ✓/Hitte

(1)

- 5.5.2 $4\text{Fe(s)} + 3\text{O}_2\text{(g)} \rightarrow 2\text{Fe}_2\text{O}_3\text{(s)}$

(4)

Notes/Aantekeninge

- Reactants✓; products✓; phases✓; balancing✓
Reaktanse/produkte/fases/balanseering

Marking rule 6.3.10./Nasienreël 6.3.10.

- 5.6.1 States that, no matter how a chemical compound is prepared, it always contains the same elements in the same proportion by mass. ✓✓/Stel dit dat dit nie saak maak hoe 'n chemiese binding berei word nie; dit bevat altyd dieselfde elemente in dieselfde verhouding by massa.

(2)

5.6.2 **OPTION 1/ OPSIE 1:**

Mass of CO₂ in the 1st sample/*Massa van CO₂ in die 1^{ste} monster*
 = 20 – 11,2 ✓
 = 8,8 g

Proportion of CO₂ in the 1st sample/*Verhouding van CO₂ in die 1^{ste} monster*
 = $\frac{8,8}{20}$ ✓

∴ Mass of CO₂ in the 2nd sample/*Massa van CO₂ in die 2^{de} monster*
 = $\frac{8,8}{20} \times 30$ ✓
 = 13,2 g ✓

(4)

OPTION 2/ OPSIE 2:	OPTION 3/ OPSIE 3:
100 g CaCO ₃ → 44 g CO ₂ ✓ 30 g CaCO ₃ → x g CO ₂ ✓ $x = \frac{30 \times 44}{100}$ ✓ x = 13,2 g ✓	20 g CaCO ₃ → 11,2 g CaO ✓ 30 g CaCO ₃ → x g CaO ✓ x = 16,83 g CaO ∴ Mass of CO ₂ in the 2 nd sample/ <i>Massa van CO₂ in die 2^{de} monster</i> = 30 – 16,83 = 13,2 g ✓

[18]

QUESTION 5/VRAAG 5

5.1 An aqueous solution. ✓/A solution in water ✓/In Waterige oplossing. ✓ (1)

5.2 Redox. ✓ Electron transfer took place. ✓/
Redoks. ✓ Elektron oordrag het plaasgevind. ✓

Accept/Aanvaar: Change in oxidation number/ Verandering in oksidasiegetal. (2)

5.3 Chemical change. ✓/Chemiese verandering. ✓ (1)

5.4 The amount of substance having the same number of particles as there are atoms in 12g C-12. ✓✓
Die stofhoeveelheid wat dieselfde getal deeltjies het as wat daar atome in 12g koolstof-12 is. ✓✓ (2)

5.5 $H_2O_2 : O_2$
2 : 1
 $\therefore n(O_2) = 2 \text{ mol}$ ✓
 $n = \frac{V}{V_m}$ ✓
 $2 = \frac{V}{22,4}$ ✓
 $V = 44,8 \text{ dm}^3$ ✓ (4)

5.6 $n(H_2O_2) = \frac{m}{M}$
 $= \frac{17}{34}$ ✓
 $= 0,5 \text{ mol}$
 $n = \frac{N}{N_A}$ ✓
 $(0,5)(2) = \frac{N}{6,02 \times 10^{23}}$
 $N = 6,02 \times 10^{23} \text{ atoms/atome}$ ✓

NOTE/NOTA:

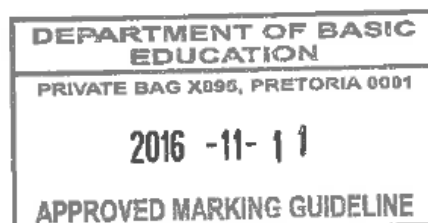
If molar mass of H_2O_2 is incorrect, mark positively. Max 2/4

Positiewe nasien indien molêre massa van H_2O_2 verkeerd is. Maksimum punte 2/4

(4)
[14]

QUESTION 6/VRAAG 6

- 6.1 6.1.1 Reaction (ii) ✓ / *Reaksie (ii)* (1)
 6.1.2 Reaction (i) ✓ / *Reaksie (i)* (1)
- 6.2 Gas phase ✓
 Gasfase (1)
- 6.3 6.3.1 aluminium carbonate: $Al_2(CO_3)_3$ ✓✓
 aluminiumkarbonaat: $Al_2(CO_3)_3$ (2)
- 6.3.2 aluminium oxide: Al_2O_3 ✓✓
 aluminiumoksied: Al_2O_3 (2)
- 6.4 $Cl_2 (g) + H_2 (g) \rightarrow 2HCl_{(g)}$ ✓ Reactants/ Reagense ✓ Products/ Produkte (2)
- 6.5 Reactants/*Reaktante*: $M (Cl_2) + M (H_2)$
 $= (2)(35,5) + (2)(1)$
 $= \underline{73 \text{ g.mol}^{-1}}$ ✓
- Products/*Produkte*: $M (2 HCl)$
 $= (2)(1 + 35,5)$
 $= \underline{73 \text{ g.mol}^{-1}}$ ✓
- Thus the mass of the reactants = mass of the products ✓
 Dus die massa van die reaktante = massa van die produkte. (3)
- 6.6 $M(HCl) = 1 + 35,5$
 $= 36,5 \text{ (g.mol}^{-1})$ ✓
- $\%H = \frac{1}{36,5} \times 100$
 $= 2,74\%$ ✓
- $\%Cl = \frac{35,5}{36,5} \times 100$
 $= 97,26\%$ ✓



QUESTION 6/VRAAG 6

6.1
6.1.1 Metallic (bond)/Metaal (binding) ✓ (1)

6.1.2 Ionic (bond)/Ioniese (binding) ✓ (1)

6.2 Chemical change/Chemiese verandering ✓
A new substance is produced. ✓
'n Nuwe stof word gevorm. (2)

6.3 $2\text{Mg} + \text{O}_2 \rightarrow 2\text{MgO}$ ✓ Bal. ✓ (3)

<u>Notes/Aantekeninge</u>		
• Reactants ✓ Reaktanse ✓	Products ✓ Produkte ✓	Balancing ✓ Balansering ✓
• Ignore/Ignoreer ⇌		
• Marking rule 3.10/Nasienreël 3.10		

6.4 $2\text{Mg} + \text{O}_2 \rightarrow 2\text{MgO}$
 $2(24) \checkmark + 2(16) \checkmark = 2(16 + 24) \checkmark$
 $80 = 80 \checkmark$ (4)

<u>Marking criteria/Nasienriglyne:</u>
• M(reactant 1) correctly calculated. ✓ M(reaktans 1) korrek bereken.
• M(reactant 2) correctly calculated. ✓ M(reaktans 2) korrek bereken.
• M(product) correctly calculated. ✓ M(produk) korrek bereken.
• M(reactants) = M(product) ✓ M(reaktanse) = M(produkte)

Science Clinic Memo 1

7.1.

	Volume	Shape	Spaces between particles	Forces between particles	Arrangement of particles	Movement of particles
Gas	Depends on container	Depends on container	Far apart	SMALL	FAR APART	VERY FAST
Liquid	FIXED	Depends on container	TOUCHING	MEDIUM	Touching each other but not in fixed positions	Slide past each other switching places.
Solid	Fixed	FIXED	TOUCHING	LARGE	Close together. Fixed positions in a set pattern.	Vibrate in fixed position

7.2. A chemical reaction takes place. Sodium and chlorine react to form a new substance Table salt which has different properties.

7.3.

7.3.1. Chemical

7.3.2. The 1,0g magnesium reacted with 0,8g oxygen in the air to form 1,8g MgO.

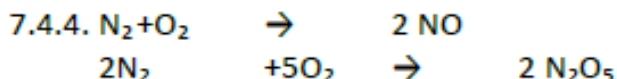
7.4.

7.4.1.



7.4.2. Molar mass ratio.

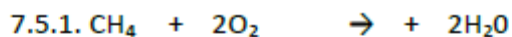
7.4.3. The ratio between the numbers of O and N atoms in the molecule.



Science Clinic Memo 2

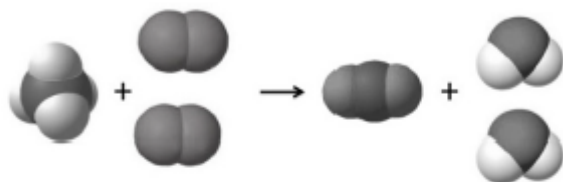
7.4.5. N_2O_5 has more energy stored because more bonds were formed when the reaction took place.

7.5.



7.5.2. Chemical

7.5.3.



7.5.4. 2

7.5.5.

	Reactants before	→	Products after
Word equation	Methane (CH_4) reacts with oxygen		Water and carbon dioxide
Chemical equation	$\text{CH}_4 + 2\text{O}_2$		$\text{CO}_2 + 2\text{H}_2\text{O}$
Atoms	C = 1 H = 4 O = 4		C = 1 H = 4 O = 4
Mass of all atoms	$(1 \times 12) + (4 \times 1) + (4 \times 16) = 80$		$(1 \times 12) + (4 \times 1) + (4 \times 16) = 80$

7.6.

7.6.1. A reaction that releases heat into the environment.

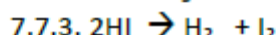
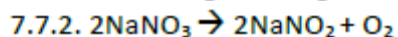
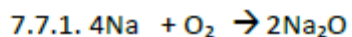
7.6.2.

7.6.2.1. Exothermic

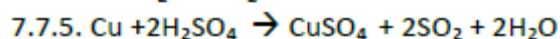
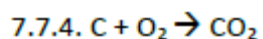
7.6.2.2. Exothermic

7.6.2.3. Endothermic

7.7.



Science Clinic Memo 3



7.8.

7.8.1. A and D

7.8.2. B and C

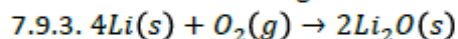
7.9.

7.9.1.

7.9.1.1. Metallic bonding

7.9.1.2. Ionic bonding

7.9.2. A chemical change. There are new bonds formed between lithium and oxygen.



7.9.4. Reactants: Products:

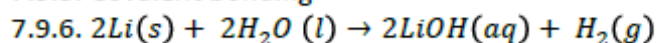
$$4(7) + (32) \qquad 2(30)$$

$$=60 \qquad =60$$

Mass of reactants= mass of products

Therefore mass is conserved

7.9.5. Covalent bonding



7.10.

