



GAUTENG DEPARTMENT OF EDUCATION
GAUTENGSE DEPARTEMENT VAN ONDERWYS
PROVINCIAL EXAMINATION
PROVINSIALE EKSAMEN
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GRADE / GRAAD 11

PHYSICAL SCIENCES
FISIESE WETENSKAPPE

PAPER / VRAESTEL 2

MEMORANDUM

14 pages / bladsye

**GAUTENG DEPARTMENT OF EDUCATION
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**PHYSICAL SCIENCES / FISIESTE WETENSKAPPE
(Paper / Vraestel 2)**

**QUESTION 1: MULTIPLE-CHOICE QUESTIONS
VRAAG 1: MEERVOUDIGEKEUSE-VRAE**

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

QUESTION 2 / VRAAG 2:

- 2.1 Intermolecular forces are the attraction forces between molecules. ✓✓
Intermolekulêre kragte is die aantrekkingskrag tussen molekules. ✓✓ (2)
- 2.2.1 Hydrogen bonds ✓
Waterstofbindings ✓ (1)
- 2.2.2 Dipole-dipole forces ✓
Dipool-dipool kragte ✓ (1)
- 2.2.3 The strength of the intermolecular forces increases as the molecular size increases. ✓✓ HI has a bigger molecular mass than HCl thus HI has a higher melting point. ✓✓ More energy is needed to break the stronger dipole-dipole forces in HI. ✓✓
Die krag van die intermolekulêre kragte verhoog soos die molekulêre grootte verhoog. ✓✓ HI het 'n groter molekulêre massa as die HCl dus het HI 'n hoër kookpunt. ✓✓ Meer energie is nodig om die sterker dipool – dipoolkragte in HI te breek. ✓✓ (6)
- 2.2.4 Hydrogen iodide. ✓✓
Waterstofjodied. ✓✓ (2)
- 2.3.1 Boiling point is the temperature at which a liquid's vapor pressure is equal to its atmospheric pressure. ✓✓
Kookpunt is die temperatuur waarteen die dampdruk van 'n vloeistof gelyk is aan die atmosferiese druk. ✓✓ (2)
- 2.3.2 There are strong Hydrogen bonds between the molecules of the methanol ✓ and weak London forces (induced dipole forces) between the molecules of the methane. ✓ Thus more energy is needed to break the hydrogen bonds between the molecules of the methanol. ✓
Daar is sterk waterstofbindings tussen die molekules van die metanol ✓ en swak London kragte (geïnduseerde dipool kragte) tussen die molekules van die metaan. ✓ Dus word meer energie benodig om die waterstofbindings tussen die metanol molekules te breek. ✓ (3)

[17]

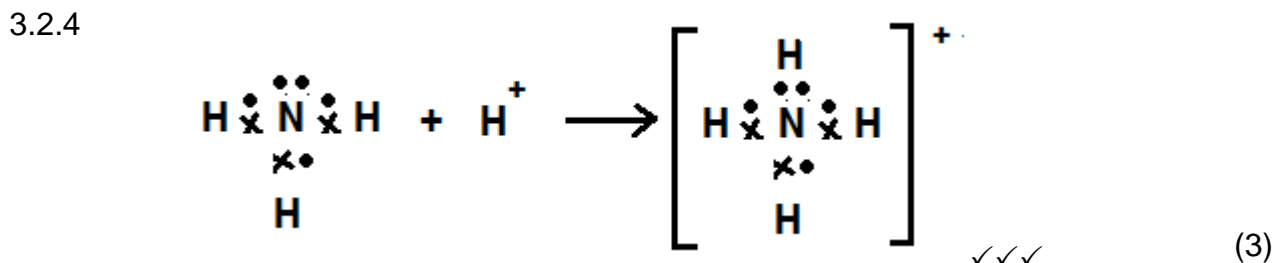
QUESTION 3 / VRAAG 3:

3.1 A way of representing atoms or molecules by showing valence electrons as **dots / crosses** surrounding the element symbol. ✓✓
*’n Manier om atome of molekules voor te stel deur die valensie-elektrone as **kolletjies / kruisies** om die simbool van die element te toon.* ✓✓ (2)

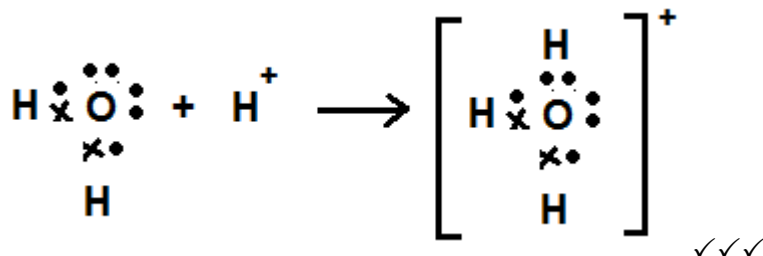
3.2.1 **NaCl** – Ionic bond ✓ / *Ioniese binding*
H₂O & NH₃ – polar covalent bond ✓ / *polêre kovalente binding*
H₂ – non-polar covalent bond ✓ / *nie-polêre kovalente binding* (3)

3.2.2 **NaCl** – ionic / not a molecule / *ionies / nie ’n molekule*
H₂O – Angular / bent / *hoekig / gebuig* ✓
NH₃ – Pyramidal / *piramidaal* ✓
H₂ – linear / *linieêr* ✓ (3)

3.2.3 H₂O / water to form H₃O⁺ / *water om H₃O⁺ te vorm* ✓
 and / en
 NH₃ / ammonium / amoniak to form NH₄⁺ / *NH₃ / ammonium / amoniak om NH₄⁺ te vorm* ✓ (2)



OR / OF



[13]

QUESTION 4 / VRAAG 4:

- 4.1 Strong Hydrogen bonds ✓✓ / Sterk waterstofbindings (2)
- 4.2 Heat of vaporisation is the amount of heat required to make water evaporate. ✓✓
Verdampingshitte is die hoeveelheid hitte benodig om water te laat verdamp. ✓✓ (2)
- 4.3 **POLAR** ✓ Because of
 1. The EN difference, H_2O $\Delta EN = 3,5 - 2,1 = 1,4$ ∴ polar covalent ✓
 ∴ O attract shared electron pair more than H ✓
 2. Because of the non-symmetrical shape and two lone pairs on the oxygen. ✓ (4)
- POLÊR** ✓ omdat
 1. H_2O $\Delta EN = 3,5 - 2,1 = 1,4$ ∴ polêr kovalent ✓ ∴ O trek die gedeelde elektronpaar meer as die waterstof. ✓
 2. As gevolg van die nie-simmetriese vorm en die twee paar ongepaarde elektrone op die suurstof. ✓
- 4.4 Molecular dipoles occur due to the unequal sharing of electrons ✓ between atoms in a molecule. Those atoms that are more electronegative pull the bonded electrons closer to themselves creating a positive and a negative side to the opposite sides of the molecule. ✓ (2)
’n Molekulêre dipool ontstaan wanneer daar ’n oneweredige verdeling van elektrone tussen die atome ✓ in die molekule ontstaan a.g.v. ’n groot verskil in elektronegatiwiteit. Dit gee dan aanleiding tot die vorming van ’n positiewe en negatiewe lading aan die teenoorgestelde kante van die molekule. ✓
- 4.5 KCl ✓ (1)
- 4.6 KCl – forms an ionic bond and will be able to dissociate in water to form K^+ and Cl^- ions, ✓ where I_2 forms a non-polar bond and will not mix with the polar water molecules. ✓ (2)
 KCl – vorm ’n ioniese binding wat in staat is om te dissosieer in water om K^+ en Cl^- ione te vorm, ✓ terwyl I_2 ’n nie-polêre molekule is en dus nie met die polêre watermolekules sal meng nie. ✓
- 4.7 Capillary action ✓✓ – the adhesion forces between the molecules of different origin e.g. water and glass are bigger than the cohesion forces of the water molecules. ✓ (3)
Kapillêre werking ✓✓ – die adhesiekragte tussen die molekules van verskillende stowwe is groter as die adhesiekragte tussen die watermolekules. ✓✓

[16]

QUESTION 5 / VRAAG 5:

- 5.1 **Ideal gas:** It is a hypothetical gas that will obey all the gas laws under all conditions of pressure and temperature. ✓✓ (two marks or none) (2)
Ideale gas: 'n Hipotetiese gas wat al die gaswette nakom onder alle omstandighede van temperatuur en druk. ✓✓ (twee of geen punte)
- 5.2 Hydrogen gas (H₂) ✓✓ OR Helium Gas (He) (2)
 Waterstofgas (H₂) ✓✓ OF Heliumgas (He)
- 5.3 Temperature ✓✓ (2)
 Temperatuur ✓✓
- 5.4.1 **Dependent variable:** Volume of the gas ✓
Independent variable: Different temperatures of the water bath. ✓ (2)
Afhanklike veranderlike: Volume van die gas ✓
Onafhanklike veranderlike: Verskillende temperature van die waterbaddens. ✓
- 5.4.2 Charles's law ✓✓ (2)
 Charles se wet ✓✓
- 5.4.3 Type of gas
 Mass of gas
 Pressure of the gas (any two) ✓✓ (2)
 Tipe gas
 Massa van die gas
 Druk van die gas (enige twee) ✓✓
- 5.4.4 58 – 60 cm³ ✓✓ (2)
- 5.4.5 $pV = nRT$ ✓
 $p \times 7,5 \times 10^{-4} \checkmark = 12 \times 8,31 \times 298 \checkmark$

$$p = \frac{12 \times 8,31 \times 298}{7,5 \times 10^{-4}}$$

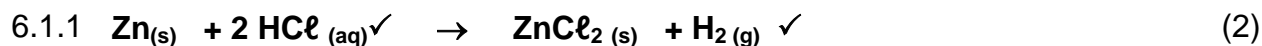
$$p = 39622080 \text{ Pa} / 3,96 \times 10^7 \text{ Pa} \checkmark$$
 (4)
- | |
|--|
| $p = ?$
$V = 750 \div (100)^3$
$= 7,5 \times 10^{-4} \text{ m}^3$
$T = 298 \text{ K}$
$R = 8,31$
$n = 12 \text{ mol}$ |
|--|

5.5.1 LOWER THAN ✓
MINDER AS ✓ (1)

5.5.2 1 mole of gas at the same temperature and pressure has the same volume
($pV = nRT$ ∴ $p \propto n$) ✓ ∴ if the pressure is $\frac{1}{2}$ then the molar mass is less ✓ (2)
1 mol van enige gas teen dieselfde temperatuur en druk het dieselfde volume ($pV = nRT$ ∴ $p \propto n$) ✓ ∴ dus as die druk $\frac{1}{2}$ is, is die molêre massa minder ✓

[21]

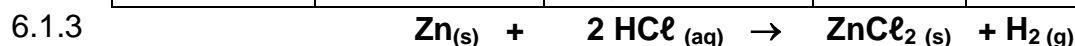
QUESTION 6 / VRAAG 6:



6.1.2

	$\text{Zn}_{(s)}$ +	$2 \text{HCl}_{(aq)}$ →	$\text{ZnCl}_{2(s)}$	+ $\text{H}_{2(g)}$
Mole ratio: <i>Mol verhouding:</i>	1	2	1	1
Initial mole <i>Aanvangs mol</i>	$n = m / M$ $= 45,5\text{g} / 65$ $= 0,7 \text{ mol } \checkmark$	$= 50 / 36,5$ $= 1,37 \text{ mol } \checkmark$		
Change in mol <i>Verandering in mol</i>	Have enough. <i>Het genoeg Zn</i>	Mol ratio / <i>verhouding:</i> $1,37 \div 2 = 0,685$ $\text{mol } \checkmark$ \therefore limiting reactant \checkmark <i>Beperkende reagens</i>		

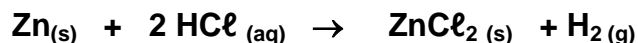
(4)



Change in mol <i>Verandering in mol</i>	Used 0,685 mol (mole ratio used / <i>mol verhouding gebruik</i>) \checkmark	If 1,37 mol used <i>gebruik</i>		
Mol left or formed at end <i>Mol oorgelaat of aan die einde gevorm</i>	$0,7 - 0,685$ $= 0,015 \text{ mol } \checkmark$ $m = n \times M$ $= 0,015 \times 65$ $= 0,975 \text{ g } \checkmark$ Zn left / <i>Zn oor</i>			

(3)

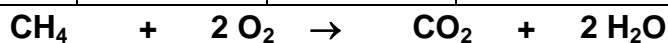
6.1.4



Change in mol <i>Verandering in mol</i>		0,137		0,685 mol (mole ratio used / gebruik) ✓
Mol left or formed at end <i>Mol oor / gevorm aan die einde</i>				$n = V/V_m$ ✓ $= 0,685 \div 22,4$ $= 15,34 \text{ dm}^3$ ✓

(3)

6.2.1



Mole ratio: <i>Mol verhouding:</i>	1	2	1	2
Initial mole <i>Aanvangs mol</i>	3	excess / oortollig	0	0
Change in mol <i>Verandering in mol</i>	If all used / <i>Indien alles gebruik</i> 3		Ratio 1:1 ✓ / <i>verhouding 1:1</i> ∴ 3 mole	
Mol left or formed at end <i>Mol oor / gevorm aan die einde</i>			$m = n \times M$ ✓ $= 3 \times (44)$ ✓ $= 132\text{g}$ ✓ CO ₂ that can be produced <i>CO₂ wat geproduseer kan word</i>	

(4)

$$6.2.2 \quad \% \text{ Yield / opbrengs} = \frac{\text{actual yield / ware opbrengs}}{\text{Max possible yield / maks moontlike opbrengs}} \quad \checkmark$$

$$= \frac{87}{132} \times 100 \quad \checkmark$$

$$= 65,91\% \quad \checkmark \quad (3)$$

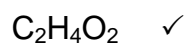
6.3

	C	H	O	
	39,9 g	6,7 g	53,4 g	= 100g
$\frac{m}{M}$ =	$\frac{39,9}{12}$	$\frac{6,7}{1}$	$\frac{53,4}{16}$	\checkmark row / ry
\div smallest <i>kleinste</i>	$\frac{3,3}{3,3}$	$\frac{6,7}{3,3}$	$\frac{3,3}{3,3}$	\checkmark row / ry
Mol ratio:	1	:	2	:
			1	\checkmark row / ry

$$\text{IPF} = \text{CH}_2\text{O} = M = 12 + 2 + 16$$

$$= 30 \text{ g}\cdot\text{mol}^{-1} \quad \checkmark$$

$$\text{Molecular Formula / Molekulêre formule} = 60 \div 30 = 2 \times \text{CH}_2\text{O}$$



(6)
[25]

QUESTION 7 / VRAAG 7:

$$7.1 \quad n = m/M$$

$$= \frac{12}{65}$$

$$= 0,1846 \text{ mol } \checkmark$$

But in each mole of **NaN₃** there are 3 moles of N

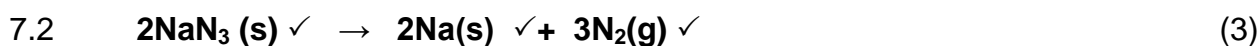
Maar in elke mol NaN₃ is daar 3 mol N

$$n_N = 0,1846 \times 3 = 0,554 \text{ mol } \checkmark$$

$$n = \frac{N_0}{N_A} \checkmark$$

$$0,554 = N_0 \div 6,02 \times 10^{23} \checkmark$$

$$\therefore N_0 \text{ N atoms / atome} = 3,45 \times 10^{23} \text{ atoms / atome } \checkmark \quad (5)$$



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

$$= \frac{85}{22,4}$$

$$= 3,795 \text{ mol } \checkmark$$

Use mole ratio
Gebruik mol verhouding
2,53 mol \checkmark



\therefore Mass **NaN₃** needed to fill bag:

\therefore *Massa NaN₃ benodig om sak te vul:*

$$m = n \times M$$

$$= 2,53 \times 65 \checkmark$$

$$= 164,45 \text{ g } \checkmark \quad (5)$$

7.4 The chemical formula that shows the simplest ratio between the atoms of a compound. $\checkmark\checkmark$ (2)

Die chemiese formule wat die eenvoudigste verhouding tussen die atome in 'n verbinding aantoon.

7.5 % **Na** 35,39 **N** 64,61 ✓ = 100

$\frac{m}{M} =$ $\frac{35,39}{23}$ $\frac{64,61}{14}$

1,549 4,615

÷ smallest $\frac{1,549}{1,549}$ $\frac{4,615}{1,549}$
kleinste

Mol ratio: 1 : 3 ✓ row / ry

∴ IPF = **NaN₃** ✓
Empiriese formule = **NaN₃**

(3)

7.6.1 DECREASE ✓✓
VERMINDER

(2)

7.6.2 $p \propto T$ Pressure of a gas is directly proportional to temperature /
Druk van 'n gas is direk verwant aan die temperatuur daarvan
If the temperature decreases, the average kinetic energy of the gas
molecules decreases ✓ and the pressure decreases. ✓
As die temperatuur van die gas afneem sal die gemiddelde kinetiese
energie van al die deeltjies ook afneem en dus sal die druk verlaag.

(3)

[23]

QUESTION 8 / VRAAG 8:

8.1. Oxygen ✓✓ (2)
Suurstof

8.2 $2\text{KClO}_3 \checkmark \rightarrow 2\text{KCl} \checkmark + 3\text{O}_2 \checkmark$ ✓balancing / balansering (4)
One for each correct formula / Een punt vir elke korrekte formule.

8.3 $n = m/M$
 $= \frac{16,2}{122,5}$
 $= 0,1322 \text{ mol} \checkmark$
In each mole of KClO_3 there is 1 mol of K ✓
In elke mol KClO_3 is daar 1 mol K
 $n = \frac{N_o}{N_A}$
 $0,1322 = N_o \div 6,02 \times 10^{23} \checkmark$
 $\therefore N_o \text{ K ions/ ione} = 7,97 \times 10^{22} \text{ ions/ ione} \checkmark$ (4)

8.4 $2\text{KClO}_3 \rightarrow 2\text{KCl} + 3\text{O}_2$

If all off 16,2 g KClO_3 decomposed
As 16,2 g KClO_3 alles ontbind

$n = m/M$
 $= \frac{16,2}{122,5}$
 $= 0,132 \text{ mol } \text{KClO}_3$ use ratio ✓
gebruiksverhouding
 $0,132 \text{ KCl}$
 $m = n \times M$
 $= 0,132 \times 74,5$
 $= 9,83\text{g} \checkmark$

% Purity = $\frac{\text{Actual yield}}{\text{Max yield}} \times 100 \checkmark$ %Suiwerheid = $\frac{\text{ware opbrengs}}{\text{maks moontlike opbrengs}} \times 100$

$$= \frac{7,2}{9,83} \times 100 \checkmark$$

$$= 73,25 \% \checkmark$$

(5)
[15]

Taxonomy Grid / Taksonomietabel

Recall / Onthou		Comprehension / Verstaan		Analysis / Analiseer		Evaluation / Evalueer	
Q no: / Vr nr:	Mark / Punt	Q no: / Vr nr:	Mark / Punt	Q no: / Vr nr:	Mark / Punt	Q no: / Vr nr:	Mark / Punt
1.1	2	1.3	2	1.7	2	8.1	4
1.2	2	1.4	2	1.10	2	9.2	7
2.1	2	1.5	2	3.3	4	9.3	3
3.1	4	1.6	2	3.5	2		
4.1	1	1.8	2	4.4	2		
5.3.1	2	1.9	2	4.5	2		
5.3.2	2	2.2	4	5.1	5		
5.3.3	2	2.3	6	5.2	2		
5.4	2	3.2	2	6.4	2		
6.1	3	3.4	4	6.5	2		
7.4.2	2	4.2	2	6.7	5		
		4.3	2	7.2	3		
		6.2	6	7.4.3	6		
		6.3	2	8.3	3		
		6.6	2	8.4	4		
		7.1	2	9.1	6		
		7.3	6				
		7.4.1	2				
		7.4.4	4				
		8.2	3				
Total mark / Totale punte	16% 24	39,33% 59		34,67% 52		9,3 % 14	
Total / Totaal % / 100%	P1&2: 15%	P1:35%/P2:40%		P1:40%/P2:35%		P1&2: 10%	

**Correct application of Bloom's / Barrett's Taxonomy: /
Korrekte toepassing van Bloom / Barrett se taksonomie:**

Level 1: Vlak 1:	Recall of information (what? which? when? list; label; name; define; give; describe) <i>Oproep van inligting (wat? watter? wanneer? lys; benoem; definieer; voorsien; beskryf)</i>
Level 2: Vlak 2:	Understanding and using information (summarise; classify; apply rules; discuss) Applying information (distinguish; specify; compare; design; explain; investigate; interpret; calculate; give your input) <i>Verstaan en gebruik inligting (som op klassifiseer); pas reëls toe; bespreek)</i>
Level 3: Vlak 3:	Analysis of information (classify; explain; identify; interpret; compare; give reasons; prove; give causes and effects) <i>Toepassing van inligting (onderskei; spesifiseer; vergelyk; ontwerp; verduidelik; ondersoek; interreter; bereken; gee jou opinie)</i>
Level 4: Vlak 4:	Synthesize information (summarize; construct; argue; create; relate; design; formulate) Evaluate information (judge; assess; evaluate; choose; support; compare; estimate) <i>Sintetiseer inligting (som op; konstrueer; argumenteer; skep; formuleer)</i> <i>Evalueer inligting (beoordeel; assessseer; evalueer; kies; ondersteun; vergelyk; skat)</i>