



**GAUTENG DEPARTMENT OF EDUCATION /
GAUTENGSE DEPARTEMENT VAN ONDERWYS
PROVINCIAL EXAMINATION / PROVINSIALE EKSAMEN**

2019

GRADE / GRAAD 11

**PHYSICAL SCIENCES
FISIESE WETENSKAPPE**

PAPER 2 / VRAESTEL 2

**MARKING GUIDELINES /
NASIENRIGLYNE**

14 pages / bladsye

**GAUTENG DEPARTMENT OF EDUCATION /
GAUTENGSE DEPARTEMENT VAN ONDERWYS
PROVINCIAL EXAMINATION / PROVINSIALE EKSAMEN**

**PHYSICAL SCIENCES (PAPER 2) /
FISIESE WETENSKAPPE (VRAESTEL 2)**

MARKING GUIDELINES / NASIENRIGLYNE

QUESTION 1: MULTIPLE-CHOICE QUESTIONS

VRAAG 1: MEERVOUDIGEKEUSE-VRAE

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

[20]

QUESTION 2 / VRAAG 2:

2.1 The bond energy of a compound is the energy needed to break one mole of its molecules into separate atoms. ✓✓

OR

The energy needed to break the bonds in a molecule. ✓✓ (2)

Die energie benodig om een mol van 'n substans op te breek in atome. ✓✓

OF

Die energie benodig om 'n binding te breek. ✓✓

2.2 $-426 \text{ kJ}\cdot\text{mol}^{-1}$ ✓ (1)

2.3 Bond length is the average distance between the nuclei of two bonded atoms.

Bindingslengte is die afstand tussen die kerne van die twee atome wat gebind is. ✓✓

(2)

2.4 $74 \times 10^{-12} \text{ m}$ ✓ (1)

2.5 At point 3 the force of attraction between the nucleus of the one atom and the electrons of the other atom balances out with the force of repulsion between the two nuclei, ✓ therefore making it more stable ✓ (Potential energy is at the lowest). At point 4 the repulsion force between the nuclei is much stronger ✓ than the attraction force between the nucleus of the one atom and the electrons of the other atom. ✓ (Increased potential energy). (4)

By punt 3 is die aantrekkingskrag tussen die kern van die een atoom en die elektrone van die ander atoom in balans met die afstotingskragte tussen die twee kerne. ✓ Dus is die binding meer stabiel. ✓ (Potensiële energie is op sy laagste). By punt 4 is die afstotingskragte tussen die twee kerne van die twee atome baie groter ✓ as die aantrekkingskragte tussen die kern van die een atoom en die elektrone van die ander atoom. ✓ (Potensiële energie is verhoog).

[10]

QUESTION 3 / VRAAG 3:

3.1 Electronegativity is a measure of the tendency of an atom in a molecule to attract bonding electrons. ✓✓

OR

A measure of an atom's attractive force on bonding electrons to form a molecule. ✓✓

(2)

Elektronegatiwiteit is 'n aanduiding van die geneigdheid van 'n atoom om die bindingselektrone van 'n molekule aan te trek. ✓✓

OF

'n Aanduiding van die atoom se aantrekkingskrag op die verbindingselektrone van 'n molekule. ✓✓

3.2 Al EN = 1,5 }
S EN = 2,5 } ✓

∴ S has a higher EN and will thus form the negative ion ✓

∴ S het die hoogste EN en sal dus die negatiewe ioon vorm.

(2)

3.3.1 O EN = 3,5 }
Mg EN = 1,2 } ✓

Δ EN = 2,3 ∴ ionic bond ✓

∴ ioonbinding

(2)

3.3.2 Cl EN = 3,0 }
H EN = 2,1 } ✓

Δ EN = 0,9 ∴ polar covalent ✓

∴ polêr kovalent

(2)

3.3.3 P EN = 2,1 }
H EN = 2,1 } ✓

Δ EN = 0 ∴ non-polar covalent / pure covalent ✓

∴ nie-polêr kovalent / suiwer kovalent

(2)

3.4 Valence electrons are the electrons in the highest energy level of an atom. ✓✓


OR

The electrons in the outer most orbital of the atom. ✓✓ (2)

Valenselektrone is die elektrone wat in die hoogste energievlak van die atoom voorkom. ✓✓

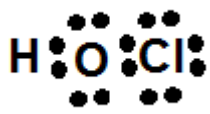
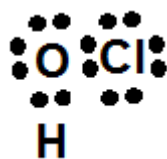
OF

Die elektrone in die buitenste orbitaal van die atoom. ✓✓

3.5.1  ✓✓ (2)

3.5.2  ✓✓ (2)

3.5.3  ✓✓ (2)

3.5.4  ✓✓ **OR / OF**  ✓✓ (2)

3.6 THREE / 3 ✓✓ (2)
DRIE

3.7.1 Tetrahedral ✓✓ (2)
Tetraëdries

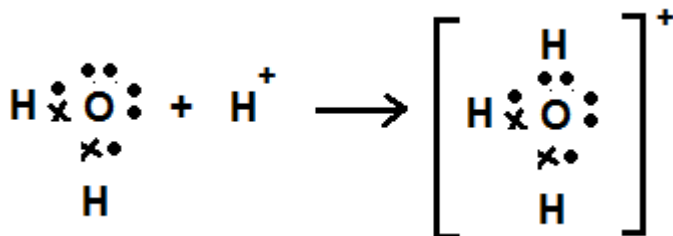
3.7.2 Trigonal planar ✓✓ (2)
Trigonaal planêr

3.7.3 Bent / Angular ✓✓ (2)
Hoekig / gebuig

3.8.1 Dative covalent bond / Coordinate bond ✓✓ (2)

Datief kovalente binding / koördinatiewe binding

3.8.2 ✓ ✓ ✓ (3)



[33]

QUESTION 4 / VRAAG 4:

4.1.1 The temperature at which the vapour pressure of a substance equals atmospheric pressure. ✓✓ (2)

Kookpunt is die temperatuur waneer die dampdruk van 'n vloeistof gelyk is aan die atmosferiese druk. ✓✓

4.1.2 There are strong hydrogen bonds between the water molecules. ✓
There are weaker dipole – dipole forces between CH₃Cl molecules. ✓
Hydrogen bonds are stronger than dipole – dipole forces
Therefore more energy is needed to overcome these forces and the boiling point is higher. ✓ (3)

Daar is sterk waterstofbindings tussen die molekules van die water ✓ en swak dipool-dipool kragte tussen die CH₃Cl molekules. ✓

Dus is meer energie nodig om die waterstofbindings tussen die watermolekules te breek. ✓

- 4.1.3 Benzene and chloroform have weak London forces between their molecules. ✓
Benzene has a larger surface area therefore stronger intermolecular forces and thus a higher boiling point. ✓

OR

Chloroform has a smaller surface area therefore weaker London forces and a lower boiling point. (2)

Daar is swak Londonkragte (geïnduseerde dipoolkragte) tussen die molekules van die chloroform en die bensien ✓ maar die molekulêre massa van die bensien is baie hoër as die van die chloroform, dus is bensien se kookpunt hoër. ✓

OF

Chloroform het 'n kleiner oppervlakarea en dus het dit swakker Londonkragte en 'n laer kookpunt.

- 4.2.1 $MgCl_2$ ✓✓ (1)
- 4.2.2 Cl_2 ✓ and / en CO_2 ✓ (2)
- 4.2.3 H_2O ✓ and / en HF ✓ (2)
- 4.2.4 HCl ✓✓ (1)
- 4.2.5 $MgCl_2$ ✓✓ (1)
- 4.3.1 Non-polar ✓✓ (2)
Nie-polêr
- 4.3.2 Polar ✓✓ (2)
Polêr
- 4.3.3 Non-polar ✓✓ (2)
Nie-polêr

- 4.4.1 Vapour pressure is the pressure exerted by a vapour at equilibrium with its liquid (2)
in a closed system. ✓✓

Dampdruk is die druk van gasmolekules van 'n stof wat in kontak is met sy vloeistof, in ewewig, in 'n geslote sisteem. ✓✓

- 4.4.2 PH_3 has a higher vapour pressure. ✓

PH_3 has London forces between its molecules. ✓

NH_3 has hydrogen bonds between its molecules. ✓

Hydrogen bonds are stronger than London forces, thus less energy is required to weaken the London forces in PH_3 ✓ (4)

PH_3 het 'n hoër dampdruk. ✓

PH_3 het Londonkragte tussen die molekules. ✓

NH_3 het waterstofbindings tussen die molekules. ✓

Waterstofbindings is sterker as Londonkragte, dus word minder energie benodig om die swak Londonkragte in PH_3 te breek. ✓

[26]

QUESTION 5 / VRAAG 5:

- 5.1 Oil is a non-polar molecule and water is a polar molecule. ✓
Oil is less dense than water. ✓ (2)
Olie is 'n nie-polêre molekule waar water polêr is. ✓
Olie is minder dig as water. ✓
- 5.2 Density is the number of molecules per unit volume. ✓✓ (2)
Digtheid: die aantal molekules per volume eenheid. ✓✓
- 5.3.1 London forces / dispersion forces. ✓✓ (2)
Londonkragte / dispersiekragte ✓✓
- 5.3.2 Electrostatic (Ionic bond) ✓✓ (2)
loonbindings (Elektrostatiese aantrekkingskragte)
- 5.3.3 Water ✓✓ (2)
- 5.3.4 Water is polar and has hydrogen bonds (dipole – dipole forces) between molecules. ✓
 KMnO_2 is an ionic solid. ✓
Water and KMnO_4 therefore have intermolecular forces of similar strength ✓, so KMnO_4 can dissociate in the water, turning it purple. ✓ (4)

Water is polêr en het waterstofbindings (sterk dipool-dipoolkragte) tussen die molekules. ✓
 KMnO_2 is 'n ioniese vastestof. ✓
Water en KMnO_4 het dus dieselfde sterkte intermolekulêre kragte ✓, dus kan KMnO_4 in water dissosieer om dit pers te kleur. ✓

[14]

QUESTION 6 / VRAAG 6:**6.1.1 ANY THREE (3) OF THE FOLLOWING: ✓✓✓**

- Particles are all identical.
- Particles are in continual motion in all directions.
- Particles do not contribute to the volume of the gas.
- There are no forces between the particles, or the particles and the wall of the container, except during collisions.
- Collision is perfectly elastic, with no loss of total energy of the molecules.
- Obey gas laws in all temperatures and pressures.

(3)

ENIGE DRIE (3) VAN DIE VOLGENDE: ✓✓✓

- *Alle molekules / deeltjies is identies.*
- *Deeltjies is konstant in beweging in alle rigtings.*
- *Deeltjies dra nie by tot die volume van die gas nie.*
- *Daar bestaan geen kragte tussen die deeltjies onderling, of tussen die deeltjies en die wande van die houer nie behalwe gedurende botsings.*
- *Botsings tussen deeltjies is volkome elasties met geen verlies aan die totale energie van die molekules nie.*
- *Gehoorzaam gaswette in alle temperature en druk.*

6.1.2 High Temperatures ✓

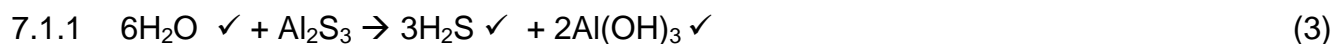
Low pressures ✓

*Hoë Temperature**Lae druk*

(2)

- 6.2.1 Boyle's Law apparatus ✓ (1)
Apparaat vir Boyle se Wet
- 6.2.2 The pressure of certain mass of an enclosed gas is inversely proportional to the volume it occupies at a constant temperature. ✓✓ (2)
Die druk van 'n sekere massa van 'n ingeslote gas is omgekeerd eweredig aan die volume, by 'n konstante temperatuur.
- 6.2.3.1 Pressure ✓ (1)
Druk
- 6.2.3.2 Volume ✓ (1)
Volume
- 6.2.3.3 Mass ✓
Temperature ✓ (2)
Massa
Temperatuur
- 6.2.4 120 kPa ✓✓ (2)
- 6.2.5 The shape would be the same ✓ but it would be higher up ✓ on the graph (Higher volume at higher pressure). (2)
Die vorm van die grafiek sal dieselfde bly, maar dit sal hoër op beweeg / hoër op die grafiek lê (Hoër volume teen 'n hoër druk). ✓✓
- 6.3.1 $\frac{p_1 V_1}{T_1} = \frac{p_2 V_2}{T_2}$ ✓
 $\frac{(101,3)(6)}{295} \checkmark = \frac{(120)V_2}{282} \checkmark$
 $V_2 = 4,84 \text{ dm}^3 / \ell \checkmark$ (5)
- 6.3.2 $t = T - 273$
 $= 282 - 273 \checkmark$
 $= 9^\circ \text{ C} \checkmark$ (2)
- 6.3.3 His lungs will expand / might burst. ✓
As the pressure decreases and the temperature increases ✓ the volume will increase, as $V \propto 1/P$ and $V \propto T$. ✓ (3)
Sy longe sal uitsit en mag dalk selfs bars ✓ aangesien die volume van 'n ingeslote gas verhoog soos die druk verminder. Die volume sal dus drasties toeneem aangesien $V \propto 1/P$ en $V \propto T$. ✓

[26]

QUESTION 7 / VRAAG 7:

$$7.1.2 \quad M(\text{Al}(\text{OH})_3) = 27 + 3(16 + 1) \\ = 78 \text{ g}\cdot\text{mol}^{-1}$$

$$n(\text{Al}(\text{OH})_3) = \frac{m}{M}$$

$$= \frac{10}{78} \checkmark$$

$$= 0,1282 \dots \text{ mol}$$

$$\therefore n(\text{Al}_2\text{S}_3) = 0,1282 \dots \times \frac{1}{2} \checkmark$$

$$= 0,0641 \dots \text{ mol}$$

$$m = nM$$

$$= (0,0641 \dots)[1(27)+3(32)] \checkmark$$

$$= 7,88 \text{ g} \checkmark$$

(4)

$$7.1.3 \quad \%O = \frac{3(16)\checkmark}{78\checkmark} \times 100 = 61,54\% \checkmark$$

(3)

$$7.2.1 \quad n(\text{HCl}) = cV \checkmark$$

$$= (0,4)(0,2) \checkmark$$

$$= 0,08 \text{ mol}$$

$$n(\text{CaCO}_3) = \frac{m}{M} \checkmark$$

$$= \frac{20}{100} \checkmark$$

$$= 0,2 \text{ mol}$$



$$2 : 1$$

$$0,08 : 0,04$$

OR / OF

$$0,4 : 0,2 \checkmark$$

Therefore CaCO_3 is in excess $\checkmark \therefore \text{CaCO}_3$ is in oormaat

(6)

$$7.2.2 \quad n(\text{CaCl}_2) = 0,08 \times \frac{1}{2} \quad \checkmark$$

$$= 0,04 \text{ mol}$$

$$m = nM$$

$$= (0,04)(40 + 2(35,5))$$

$$= 4,44 \text{ g} \quad \checkmark$$

(3)

$$7.2.3 \quad \% \text{ yield} = \frac{\text{actual}}{\text{theoretical}} \times 100 \quad / \quad \% \text{ opbrengs} = \frac{\text{reël}}{\text{teoreties}} \times 100 \quad (2)$$

$$= \frac{4}{4,44} \times 100 \quad \checkmark$$

$$= 90,09\% \quad \checkmark$$

[21]

Taxonomy Grid

Recall		Comprehension		Analysis		Evaluation	
Q no:	Mark	Q no:	Mark	Q no:	Mark	Q no:	Mark
1.1.	2	1.2. & 1.3.	4	1.4.	2		
		1.5. – 1.7	6	1.8	2		
		1.9 & 1.10	4				
2.1.	2	2.2.	1	2.5.	4		
2.3.	2	2.4.	1				
3.1.	2	3.3.	6	3.2.	2		
3.4.	2	3.5.	8	3.6.	2		
3.8.1.	2	3.7.	6				
		3.8.2.	3				
4.1.1.	2			4.1.2.	3	4.1.3.	2
4.4.1.	2	4.3.	6	4.2.	7		
				4.4.2	4		
5.2.	2	5.1.	2	5.3.4.	4		
		5.3.	6				
6.1.1.	3	6.1.2.	2	6.2.4.	2	6.3.3.	3
6.2.1.	1	6.2.3.	4	6.2.5.	2		
6.2.2.	2	6.3.2.	2	6.3.1	5		
		7.1.	2	7.2.	5	7.3.	3
				7.4.2.	3	7.4.1.	6
						7.4.3.	2
Total mark	24		63		47		16
Total %/100%	P1&2: 15%	P1:35%/P2:40%		P1:40%/P2:35%		P1&2: 10%	

Correct application of Bloom's / Barrett's Taxonomy:

Level 1: Recall of information (what? which? when? list ; label; name; define; give; describe)

Level 2: Understanding and using information (summarize; classify ; apply rules; discuss)
Applying information (distinguish; specify; compare; design ;explain; investigate ;interpret; calculate; give your input)

Level 3: Analysis of information (classify; explain; identify; interpret; compare; give reasons; prove; give causes and effects)

Level 4: Synthesize information (summarize; construct; argue; create; relate; design; formulate)
Evaluate information (judge; assess; evaluate; choose; support; compare; estimate)