GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

PROVINCIAL EXAMINATION/ *PROVINSIALE EKSAMEN*

NOVEMBER 2023

GRADE/*GRAAD* 11

MARKING GUIDELINES/*NASIENRIGLYNE*

PHYSICAL SCIENCES: CHEMISTRY/
FISIESE WETENSKAPPE: CHEMIE

PAPER/*VRAESTEL* 2

EXEMPLAR

9 pages/*bladsye*

QUESTION/*VRAAG1*

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

[20]

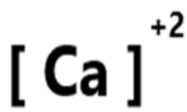
QUESTION/*VRAAG 2*

2.1 2.1.1.



✓✓ (2)

2.1.2.



✓✓ Without brackets only 1 mark/
✓✓ *Sonder hakies slegs 1 punt* (2)

2.2. A covalent bond is a bond in which electron pairs are shared between the two atoms to form a molecule. ✓✓
'n Kovalente binding is 'n binding waar elektronpare gedeel word tussen twee atome om 'n molekule te vorm. ✓✓ (2)

2.3 Calcium/Ca ✓
Kalsium/Ca ✓ (1)

2.4 The bond between positive ions and delocalised valence electrons in a metal. ✓✓
'n Binding tussen positiewe ione en gedelokaliseerde elektrone in 'n metaal. ✓✓ (2)

EXEMPLAR

2.5 2.5.1 CO_2/carbon dioxide ✓
CO_2/koolstofdioksied ✓ (1)

2.5.2 CaO ✓ (1)

2.6 Electronegativity is a measure of the tendency of an atom in a molecule to attract bonding electrons. ✓✓
Elektronegatiwiteit is die maatstaf van die neiging van 'n atoom in 'n molekuul om bindingselektrone aan te trek. ✓✓ (2)

2.7 ΔEN = 3,5 – 1 = 2,5 ✓
∴ Ionic bond ✓/*Ioniese binding* ✓ (2)

2.8 Non-polar molecule ✓/*Nie-polêre molekule* ✓ (1)

2.9 ΔEN = 3.5 – 2,5 = 1,0
∴ polar bond ✓/
∴ polêre binding ✓
But shape is symmetrical thus the molecule is polar ✓/*Maar die vorm is simmetries en dus is die molekule polêr.* ✓ (2)
[18]

QUESTION/*VRAAG 3*

3.1 The temperature at which the vapour pressure of a substance equals atmospheric pressure. ✓✓
Die temperatuur waarby die dampdruk van 'n stof gelyk is aan die atmosferiese druk. ✓✓ (2)

3.2 3.2.1 London/dispersion forces ✓
London/dispersiekragte ✓ (1)

3.2.2 I_2 ✓ (1)

3.2.3 As the molecular mass increases, ✓
the strength of the intermolecular forces increases ✓
Therefore more energy is needed to overcome/weaken the intermolecular forces. ✓ (no mark if BROKEN is used instead of overcome or weaken)
Thus the boiling boiling point increases. ✓✓
Indien die molekulêre massa toeneem, ✓
word die sterkte van die intermolekulêre kragte groter. ✓✓
Meer energie word benodig om die intermolekulêre kragte te oorkom/te verswak. ✓*(geen punte indien GEBREEK in plaas van oorkom gebruik word nie.)* (3)

EXEMPLAR

3.3 3.3.1 NH_3/ammonium ✓
NH_3/ammoniak ✓ (1)

3.3.2 HCℓ/hydrogen chloride ✓
HCℓ/*waterstofchloried* ✓ (1)
[9]

QUESTION/*VRAAG* 4

4.1 What is the relationship between the pressure and volume of an enclosed mass of gas, when the temperature is kept constant? ✓✓
Wat is die verband tussen die druk en volume van 'n ingeslote massa gas, indien die temperatuur konstant gehou word. ✓✓ (2)

4.2.1 Pressure ✓
Druk ✓ (1)

4.2.2 Temperature/mass of gas ✓
Temperatuur/massa van gas ✓ (1)

4.3 Boyle's Law.✓ The pressure of an enclosed gas is inversely proportional to the volume it occupies at a constant temperature ✓✓
Boyle se wet. ✓*Die druk van 'n ingeslote gas is omgekeerd eweredig aan die volume van die gas by 'n konstante temperatuur.* ✓✓ (3)

4.4

OPTION/*OPSIE 1*	**OPTION/*OPSIE 2***
$p_1V_1 = p_2V_2$ ✓	$p_1V_1 = p_2V_2$ ✓
(200)(16,5) = (110)X ✓	(150)(1,65x 10^{-2}) = (110)X ✓
X = 30 cm^3 ✓	X = 3 x 10^{-2} dm^3 ✓

(3)

4.5 At low temperatures, a real gas's particles will occupy space and have volume. ✓✓
By lae temperature sal 'n werklike gas se deeltjies spasie inneem en volume besit. ✓✓
OR/*OF*
The attraction and repulsive forces between the particles become significant. ✓✓ Thus, a real gas will liquify at low temperatures.
Die aantrekkings- en afstotingskragte tussen deeltjies raak noemenswaardig. ✓✓*Dus sal 'n werklike gas vervloei by lae temperature*. (2)

4.6 pV = nRT ✓
200 x 10^3 (50 x 10^{-6}) ✓= n 8,31 (298) ✓
n = 0,00403 mol/4,30 x 10^{-3} mol ✓ (4)

4.7 The average kinetic energy of the molecules of the gas. ✓✓
Die gemiddelde kinetiese energie van die molekules van die gas. ✓✓ (2)

EXEMPLAR

4.8 The volume of the container is constant thus: ✓
As the kinetic energy of the molecules of the gas increases, the number of collisions on the sides of the container increases. ✓
Pressure will increase. ✓
Die volume van die houer is konstant dus: ✓
Soos wat die kinetiese energie van die molekules van die gas toeneem, sal die aantal botsings teen die kante van die houer toeneem. ✓
Die druk sal toeneem. ✓ (3)
[21]

QUESTION/*VRAAG* 5

5.1 5.1.1 The simplest ratio in which the elements of the compound are bonded to each other.✓✓
Die eenvoudigste verhouding waarin die elemente van 'n verbinding aanmekaar gebind is. ✓✓ (2)

5.1.2 O% = 100 – (60,0+ 4,44) ✓
= 35,56%

C: n= $\frac{m}{M}$ = $\frac{60,0}{12}$ ✓= 5 mol

H: n= $\frac{m}{M}$ = $\frac{4,44}{1}$ ✓= 4,44 mol
O: n= $\frac{m}{M}$ = $\frac{35,56}{16}$ ✓= 2,22 mol

C	:	H	:	O
$\frac{5}{2,22}$	:	$\frac{4,44}{2,22}$	:	$\frac{2,22}{2,22}$ ✓

2,25 : 2 : 1
9 : 8 : 4
Empirical formula/*Empiriese formule*: $C_9H_8O_4$✓ (6)

5.1.3 M($C_9H_8O_4$) = 9(12) + 8(1) + 4(16)
= 180 g.mol^{-1}

$$\frac{\text{molar mass/}molêre\ \ mass}{\text{emprical mass/}empiriese\ \ massa} = \frac{180}{180} = 1\ \checkmark$$

molecular formula/*molekulêre formule*: $C_9H_8O_4$✓ (2)

5.2 M (Na_2CO_3) = 106g·mol^{-1}
M (x H_2O) = 268 – 106 ✓✓ = 162g·mol^{-1}
n(H_2O) =m/M =162/18 ✓
n(H_2O) = 9 mol✓ (4)
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EXEMPLAR

QUESTION/*VRAAG* 6

6.1 6.1.1 The limiting reagent is the reactant that is used up first. ✓✓
Die beperkende reagens is die een wat eerste opgebruik word. ✓✓ (2)

6.1.2 $n(KCl) = cV$ ✓
$= 0,25\ (0,055)$ ✓
$= 0,0138$
$n(AgNO_3) = cV$
$= 0,15(0,07)$ ✓
$= 0,0105$
$KC\ell : AgNO_3$
1 : 1 ✓
0,0105 : 0,0105
$AgNO_3$ is the limiting reagent/*die beperkende reagens* ✓ (5)

6.1.3 $n(AgCl) = n(AgNO_3) = 0,0105$ mol ✓
$m = nM$ ✓
$= 0,0105(143,5)$ ✓
$= 1,51$ g ✓ (4)

6.2 6.2.1 $n(CaCO_3) = \frac{m}{M}$ ✓
$= \frac{50}{100}$ ✓
$= 0,5$ mol ✓ (3)

6.2.2 $n(CO_2) = \frac{m}{M} = \frac{18,2}{44}$ ✓
$= 0,414$ mol
$n(CaCO_3) = n(CO_2) = 0,414$ mol ✓

$m(CaCO_3) = nM$
$= 0,414(100)$ ✓
$= 41,4$ g
% purity/*suiwerheid* = $\frac{41,4}{50}$ x 100 ✓
$= 82,8\%$ ✓ (5)

6.2.3 % purity/*suiwerheid* = 70% = $\frac{m}{50}$ ✓
$m = 35$ g $CaCO_3$
$n(CaCO_3) = \frac{m}{M} = \frac{35}{100}$ ✓
$= 0,35$ mol
$n(CO_2) = n(CaCO_3)$
$= 0,35$ mol ✓
$m(CO_2) = nM$
$= 0,35(44)$ ✓
$= 15,4$ g ✓ (5)
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EXEMPLAR

QUESTION/*VRAAG* 7

7.1 7.1.1 An acid is a proton (H^+ ion) donor. ✓✓
'n Suur is 'n proton (H^+- ioon) skenker. ✓✓ (2)

7.1.2 It ionises to form 2 protons/2 moles of H^+ ions. ✓✓/
Dit ioniseer om 2 protone/2 mol H^+ ione te vorm. ✓✓
OR/*OF*
It donates 2 H^+ ions per H_2SO_4 molecule. ✓✓
Dit skenk 2 H^+ ione per H_2SO_4 molekule. ✓✓ (2)

7.1.3 Ampholyte ✓
Amfoliet ✓ (1)

7.2 7.2.1 A solution of precisely known concentration. ✓✓
'n Oplossing waarvan die konsentraise presies bekend is. ✓✓ (2)

7.2.2 $H_2SO_4(\ell) + 2H_2O(\ell)$ ✓→ $2H_3O^+(aq) + SO_2^{-4}$ (aq) ✓ ✓
(balancing/*balansering*) (3)

7.3 7.3.1 $\frac{n_a}{n_b} = \frac{c_a V_a}{c_b V_b}$✓

$\frac{1}{2}$ ✓= $\frac{c_a\ (0{,}012)✓}{0{,}2\ (0{,}02)✓}$

c_a = 0,17 mol.dm^{-3}✓ (5)

7.3.2 Methyl orange ✓, reaction of strong acid ✓ and strong base ✓.
Metieloranje ✓, reaksie van 'n sterk suur ✓ en 'n sterk basis. ✓ (3)
[18]

QUESTION/*VRAAG 8*

8.1 Endothermic✓
Endotermies ✓ (1)

8.2 The Products have more Potential energy than the reactants. ✓✓
Die produk het meer Potensiële energie as die reaktante. ✓✓
OR/*OF*
More energy is absorbed than released ✓✓
Meer energie word geabsorbeer as vrygestel. ✓✓ (2)

8.3 + 14,8 kJ.mol^{-1}✓✓ without a + sign only 1 mark/*sonder 'n + teken slegs een punt* (2)

8.4 4 + 6 ✓ (1)

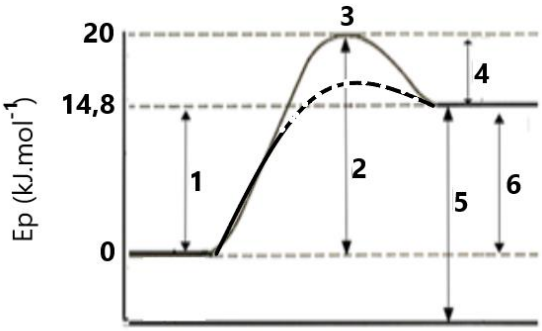
8.5 the minimum energy needed for a reaction to take place. ✓✓
die minimum energie benodig vir 'n reaksie om plaas te vind, ✓✓ (2)

EXEMPLAR

8.6 3 ✓ (1)

8.7 It decreases the activation energy, ✓
by providing an alternative pathway for the reaction. ✓
Dit verminder die aktiveringsenergie, ✓
deur 'n alternatiewe roete vir die reaksie te skep. ✓ (2)

8.8



Course of the reaction/*verloop van die reaksie*

NOTE/*LET WEL*:
- ✓ Dotted line from reactants to products
- ✓ *Stippellyn van reaktante na produkte*
- ✓ Lower that 3 and higher than 4
- ✓ *Laer as 3 en hoër as 4*

(2)
[13]

QUESTION/*VRAAG* 9

9.1 9.1.1 An increase in the oxidation number. ✓✓
'n Toename in die oksidasiegetal. ✓✓ (2)

9.1.2 +6 ✓✓ (2)

9.2 9.2.1 Electrons are transferred. ✓/
Elektrone word oorgedra. ✓
OR/*OF*
The oxidation number of Fe^{2+}/$C\ell_2$ changes. ✓
Die oksidasiegetal van Fe^{2+}/$C\ell_2$ verander. ✓
OR/*OF*
Fe^{2+} is oxidised/$C\ell_2$ is reduced. ✓
Fe^{2+} is geoksideer/$C\ell_2$ is gereduseer. ✓ (1)

9.2.2 Fe^{2+}✓ The oxidation number increases from +2 to +3. ✓
Fe^{2+}✓ *Die oksidasiegetal neem toe van +2 na +3.* ✓
(2)

9.2.3 $C\ell_2 + 2e^- \rightarrow 2C\ell^-$✓✓ (2)

9.2.4 $C\ell_2 + 2e^- \rightarrow 2C\ell^-$ ✓
$Fe^{2+} \rightarrow Fe^{3+} + e^-$ ✓
$2Fe^{2+} + C\ell_2 \rightarrow 2Fe^{3+} + 2C\ell^-$✓ ✓(balancing/*balansering*) (4)
[13]

TOTAL/*TOTAAL:* 150

EXEMPLAR

TAXONOMY GRID

	Recall		Comprehension		Analysis		Evaluation	
	Q no:	Mark	Q no:	Mark	Q no:	Mark	Q no:	Mark
	1.1	2	1.3	2	1.2	2		
	1.7	2	1.4	2	1.5	2		
			1.6	2	1.10	2		
			1.8	2				
			1.9	2				
	2.2	2	2.1.1	2	2.7	2		
			2.1.2	2	2.9	2		
	2.3	1	2.4	2				
	2.6	2	2.5	2				
			2.8	1				
	3.1	2	3.2.1	1				
			3.2.2	1				
			3.2.3	3				
			3.3.1	2				
	4.7	2	4.1	2	4.4	3	4.8	3
			4.2	2	4.6	4		
			4.3	3				
			4.5	2				
	5.1.1	2			5.1.2	6	5.2	4
					5.1.3	2		
			6.1.1	2	6.1.2	5		
					6.1.3	4		
					6.2.1	3		
					6.2.2	5		
					6.2.3	5		
	7.1.1	2	7.1.2	2	7.3.1	5		
	7.1.3	1	7.2.1	3	7.2.2	2		
			7.3.2	3				
	8.1	1	8.2	2	8.8	2		
	8.5	2	8.3	2				
			8.4	1				
			8.6	1				
			8.7	2				
	9.1.1	2	9.1.2	2				
			9.2.1	1				
			9.2.2	2				
			9.2.3	2				
			9.2.4	4				
Actual Total	15%	23	43%	64	37%	56	5%	7
Target Total	15%	15	40%	40	35%	35	10%	10

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