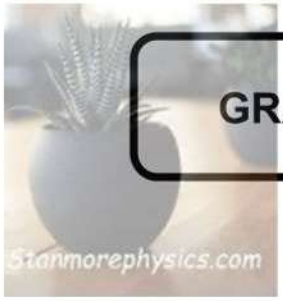
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PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF
EDUCATION

SEKHUKHUNE SOUTH DISTRICT

NATIONAL
SENIOR CERTIFICATE



GRADE 11

PHYSICAL SCIENCES
CONTROLLED TEST 2 ERRATA
13 SEPTEMBER 2024



MARKS : 90

	QUESTION 1	
1.2	REMOVED, beyond scope	(-2)
	QUESTION 2	
2.32	Accept $\Delta H > 0$	
2.3.2	REPLACED Y WITH R Option 2 $E_A(catalysed) = E_{AC} - E_R$ $490 = R - 450$ ✓ $R = 940\ kJ$ ✓	(2)
2.3.3	Option 2 $\Delta H = Energy\ absorbed - Energy\ released$ $\Delta H = 800 - 520$ ✓ $280kJ$ ✓	(2)
	QUESTION 3	
3.2.2	Volume ✓ (Do not accept $\frac{1}{V}$)	(1)
3.2.3	**ACCEPT:** Numbers of moles of gas ✓OR number of gas molecules✓ in place of the mass	(1)
3.3	**REMOVE:** The gradient of the graph is PV, for each of the graphs PV is constant and is not the same. Coordinates of the graph M cannot be used to obtain answers on graph P	(-4)
3.4	**ACCEPT:** P✓ • If the temperature is low; the average kinetic energy will be low.✓ • The particles will move closer to each other and the intermolecular forces between the particles increase.✓ • When the energy of particles decrease significantly and the gas liquefies.✓	(4)
	QUESTION 4	
4.1.2	REMOVED, beyond scope	(-2)

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4.2.1	**Marking criteria** • Formula ✓ • Subtitute P_1as 500 ✓ • Substitute P_2 **as** 40 ✓ • $\underline{V_1}$ + ✓25 ✓ • Final answer ✓	(6)
	QUESTION 5	
5.4	So, in $Al_2(SO_4)_3$: n = cV = (0,2)(0,1) √ =0.02×2 = 0.04mol In $AlCl_3$: n = cV = (0,1)(0,1) √ = 0,01 mol So, the total number of moles of Al^{3+} ions in the mixture : n_{total} = 0, 04 + 0, 01 √ = 0, 05 mol $C = \frac{n}{V}$ ✓ $= \frac{0.05}{0.2}$ ✓ = 0.25mol.dm^{-3}✓	
	QUESTION 6	
6.3	Removed	(-2)
6.5	Mass % H = $\frac{0.0002822222}{2\times10^{-3}}$ x 100 √ , = 14.11% √	(3)

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GRADE 11

PHYSICAL SCIENCES: CONTROL TEST 2
13 SEPTEMBER 2024
MARKING GUIDELINE

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TOTAL: 100 MARKS

This marking guideline consists of 8 pages

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QUESTION 1

1.1 B √√

1.2 D √√

1.3 C √√

1.4 C √√

1.5 B √√

1.6 D √√

1.7 A √√ **[14]**

QUESTION 2

2.1 The minimum energy needed for a reaction to take place. √√ (2)

2.2 Endothermic √
Energy of products is higher than that of the reactants or
Energy of the reactants is lower than that of the products √ (2)

2.3.1 1250 – P = 800 √
P = 450 (kJ) √ (2)

2.3.2 800 – 490 = 310 √
∴ Y = 1250 – 310
∴ Y = 940(kJ) √ (2)

2.3.3 Q = 1250 – 520
= 730 √

$\Delta H = \Delta H_p - \Delta H_R$
= 730 – 450
= 280 kJ √ (2)

2.4.1 Stays constant √ (1)

2.4.2 Decreases √ (1)

2.4.3 Decreases √ (1)

[13]

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QUESTION 3

3.1 The pressure of an enclosed (mass of) gas is inversely proportional to the volume it occupies at constant temperature. √√ (2)

3.2.1 Pressure √ (1)

3.2.2 Volume √ (1)

3.2.3 Temperature √
(Enclosed) mass of gas √ (2)

3.3 $\frac{1}{V}$ = 5,0

V = 0,2 dm^3



$P_1V_1 = P_2V_2$ √

(100)(0,2) √ = (150) V_2 √

∴ V_2 = 0,13333 dm^3

∴ **x** = $\frac{1}{V}$

= $\frac{1}{0,13333}$

= 750 dm^3 √ (4)

3.4 **P** √

- Temperature is a measure of the average kinetic energy √
- pV is a measure of the energy contained and the gradient = pV √
- The gradient for graph P is smaller, which indicates that the temperature is lower. √ (4)

[14]

QUESTION 4

4.1.1 The average kinetic energy of the molecules of the gas √√ (2)

4.1.2 a) (20 + 273) K = 293 K √ (1)

b) (55 + 273) K = 328 K √ (1)

4.2.1 $P_1V_1 = P_2V_2$ ✓

500 (V_1) ✓ = 40 (V_1 + 25) ✓

$500V_1 = 40V_1 + 1\,000$ ✓

$460V_1$ ✓ = 1 000

$V_1 = 2{,}17\ cm^3$ ✓ (6)

[10]

QUESTION 5

5.1 The amount of solute per litre of solution √√

5.2

OPTION 1

$C = \frac{m}{MV}$ √

$= \frac{6{,}84\ √}{(342)(0{,}2)\ √}$

$= 0{,}10\ mol.dm^{-3}$√

OPTION 2

$n = \frac{m}{M}$

$= \frac{6{,}84}{342}$ √

= 0,02 mol

$c = \frac{n}{V}$ √

$= \frac{0{,}02}{0{,}2}$ √

$= 0{,}10\ mol.dm^{-3}$√ (4)

5.3 $Al_2(SO_4)_3(s) \rightarrow 2\ Al^{3+}(aq) + 3\ SO_4^{2-}(aq)$

C (SO_4^{2-}) = 3 x c ($Al_2(SO_4)_3$)

= 3 (0, 10) √

$= 0{,}30\ mol.dm^{-3}$ √ (2)

5.4 In order to calculate the concentration of the final mixture we need to know the total number of moles of Al^{3+} ions present in the mixture.

So, in $Al_2(SO_4)_3$: n = cV

= (0,2)(0,1) √

= 0,02 mol

In $AlCl_3$: n = cV

= (0,1)(0,1) √

= 0,01 mol

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So, the total number of moles of Al^{3+} ions in the mixture :

n_{total} = 0, 02 + 0, 01 √

= 0, 03 mol

$C = \frac{n}{V}$ √

$= \frac{0,03}{0,2}$ √

= 0, 15 $mol.dm^{-3}$ √ (6)

[14]

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QUESTION 6

6.1 $n(CO_2) = \frac{m}{M}$

$= \frac{6{,}21\ x\ 10^{-3}}{44}$ √

= 0, 00014113636 mol

n(C) = n (CO_2) √

= 0, 00014113636 mol √ (3)

6.2 m(C) = nM √

= (0, 00014113636)(12) √

= 0.00169363636 g √ (3)

6.3 Mass % C = $\frac{0.00169363636}{4{,}24\ x\ 10^{-3}}$ x 100 √

= 39,94 % √ (2)

6.4 $n(H_2O) = \frac{m}{M}$

$= \frac{2{,}54\ x\ 10^{-3}}{18}$ √

= 0,000141111 mol

n(H) = 2 n(H_2O) √

= 2 (0,000141111)

= 0,0002822222 mol √

m(H) = nM √

= (0,0002822222)(1) √

= 0,0002822222 g √ (6)

6.5 Mass % H = $\frac{0{,}0002822222}{4{,}24\ x\ 10^{-3}}$ x 100 √

= 6,66% √ (2)

6.6 Mass % O = 100 – 39,94 – 6,66 √

= 53,40 % √ (2)

6.7 Mole ratio = n(C) : n(H) : n (O)

$= \frac{39,94}{12} : \frac{6,66}{1} : \frac{53,4}{16}$ √

= 3,328333 : 6,66 : 3,3375 √

= 1 :2:1 √

Empirical formula is CH_2O √ (4)

6.8 Molecular formula = $\frac{molar\ mass\ (\ compound)}{molar\ mass\ (empirical\ formula)}$ (empirical formula)

$= \frac{60}{30}$ √√ (CH_2O)

= 2 (CH_2O)

= $C_2H_4O_2$ √ (3)

[25]

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QUESTION 7

7.1 Oxygen √

n (NH_3) = $\frac{m}{M}$ n (O_2) = $\frac{m}{M}$

= $\frac{500}{17}$ √ = $\frac{500}{32}$ √

= 29,4118 mol = 15,625 mol

Suppose all n(NH_3) is used up :

n (O_2) : n (NH_3) = 5 : 4

n (O_2) = $\frac{5}{4}$ n (NH_3)

= $\frac{5}{4}$ (29,4118) √

= 36, 76475 mol √

36, 76475 mol > 15,625 mol available √

Oxygen is the limiting reagent

OR

Suppose all n (O_2) is used up :

n (NH_3) : n (O_2) = 4 :5

n (NH_3) = $\frac{4}{5}$ n (O_2)

= $\frac{4}{5}$ (15,625)

= 12,5 mol

12,5 mol < 29,4118 mol available

Ammonia is in excess

Hence Oxygen is the limiting reagent

7.2 12,50 mol NH_3 will produce 12,50 mol NO √

m (NO) = nM

= (12,50)(30) √

= 375 g

% yield = $\frac{210}{375}$ x 100 √

= 56% √ **(4)**

TOTAL: 100

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