



LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF EDUCATION

**NATIONAL
SENIOR CERTIFICATE**

GRADE 12

**PHYSICAL SCIENCES (PHYSICS)
PAPER 2: MAY - JUNE 2025
MEMO**

MARKS: 150

TIME: 3 Hours

This Marking Guidelines consist of 8 pages including the cover page

QUESTION 1

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

[20]**QUESTION 2**

2.1

- 2.1.1 F✓ (1)
- 2.1.2 C✓ (1)
- 2.1.3 A✓ (1)
- 2.1.4 F✓ (1)
- 2.1.5 A✓ and H✓ (2)
- 2.1.6 G✓ (1)
- 2.1.7 E✓ (1)

2.2

- 2.2.1 2-methyl✓butane✓ (2)
- 2.2.2 methyl✓propan-2-ol✓✓ (3)

Notes:

1. Methyl identified✓
2. Propanol✓
3. Whole structure correct✓

- 2.2.3 2-bromo✓butanal✓ (2)



2.2.4 3,3-dimethylpent-1-yne✓✓

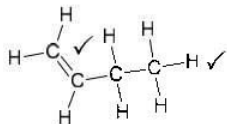
Notes:

1. dimethyl identified✓
2. Pentyne✓
3. Whole structure correct✓

(3)

2.3

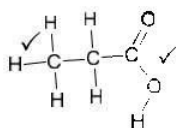
2.3.1

**Notes:**

1. Correct functional group✓
2. Whole structure correct✓

(2)

2.3.2

**Notes:**

1. Correct functional group✓
2. Whole structure correct✓

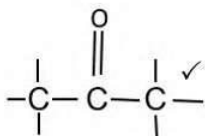
(2)

2.4

2.4.1 C₃H₆O₂✓

(1)

2.4.2



(1)

2.4.3 CH₃COOH✓✓/(Accept: CH₃ - COOH)

(2)

2.4.4 Methanol✓

(1)

2.4.5 Formyl✓ (group)/Accept: carbonyl

(1)

2.4.6 Alkyne✓

(1)

[29]**QUESTION 3**

3.1

3.1.1 The temperature at which the vapour pressure is equal to the atmospheric pressure.✓✓

(2 or 0)

(2)

3.1.2 Thermometer✓/Accept: Bunsen burner/heat source/flame

(1)

3.2

3.2.1 Molar mass✓/molecular size/chain length/number of C atoms/surface area

(1)



- 3.2.2 Boiling point✓ (1)
- 3.2.3 Relationship between dependant and independent variables:
 As molar mass/molecular size/chain length increases✓ the boiling point also increases. ✓
 OR
 As molar mass/molecular size/chain length decreases✓ the boiling point also decreases. ✓
 (DIRECTLY PROPORTIONAL NOT ACCEPTED) (2)
- 3.3 London forces✓✓ (2)
- 3.4 E✓ (1)
- 3.5 E has a smaller surface area/shorter chain length/more spherical✓ than D therefore the intermolecular forces in E are weaker✓ and need less energy to overcome than those in D. ✓ (3)
- [13]

QUESTION 4

- 4.1 Secondary.✓ The carbon atom bonded to the halogen/chlorine, is bonded to two other carbon atoms.✓✓ (3)
- 4.2 Substitution/hydrolysis ✓✓ (2)
- 4.3 $\text{CH}_3\text{CH}(\text{OH})\text{CH}_2\text{CH}_3 \rightarrow \text{CH}_3\text{CHCHCH}_3 + \text{H}_2\text{O}$ (✓ balancing) (3)
- 4.4 Dilute strong base/Dilute NaOH✓✓/Excess water/moderate heat/ethanol as solvent (2)
- 4.5 Sulphuric acid✓
 H_2SO_4 ✓ (2)
- 4.6 Hydrohalogenation/hydrochlorination✓ (1)
- [13]



QUESTION 5

5.1 Reactant that is totally consumed when a chemical reaction is completed. ✓✓ (2 or 0) (2)

5.2 CaCO_3 is the limiting reagent ✓ (1)

5.3
$$n_{(\text{CaCO}_3)} = \frac{m}{M} \checkmark$$

$$= \frac{0,4}{100} \checkmark$$

$$= 0,004 \text{ mol} \checkmark$$
 (3)

5.4 $0,004 \text{ mol} \checkmark$ (1)

5.5

$$\text{Rate} = \frac{n}{\Delta t} \checkmark$$

$$= \frac{0,004}{10} \checkmark$$

$$= 0,0004 \text{ mol/s} \checkmark$$

(3)

5.6 $n_{(\text{CO}_2)} \text{ formed} = n_{(\text{CaCO}_3)} \text{ reacted} = 0,004 \text{ mol} \checkmark$

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

$$0,004 = \frac{V}{22,4} \checkmark$$

$$V = 0,896 \text{ dm}^3 \checkmark$$

REMOVE the question
for all schools due to
late errata not received
by all in time

(0)

5.7 When concentration is increased, there are more reactant particles ✓ in the same volume, the number of effective collisions per unit time increase, ✓✓ increase in the rate of reaction. (3)

5.8 Decreases. ✓ When granules are used, the surface area decreases ✓ and therefore the number of effective collisions per unit time decreases. ✓ (3)

5.9 The reaction is complete/ CaCO_3 has been used up. ✓ (1)



5.10

5.10.1 C✓ (1)

5.10.2 D✓ (1)

5.10.3 The average kinetic energy is the same✓ as for graph A showing that the temperature is the same. The area under the graph D is double/larger✓ showing that the quantity of nitrogen gas is larger. ✓ (3)

[26]

- 4

QUESTION 6

6.1

OPTION 1	2SO ₂	O ₂	2SO ₃	
Initial amount(mol)	x	1,25✓	0	✓(ratio)
Change	1,0	0,5	1,0	
Equilibrium amount	$x - 1,0$	0,75	1,0	✓
Equilibrium conc.	$\frac{x - 1,0}{0,5}$	1,5	2	✓(÷ 0,5)

OPTION 2

	2SO ₂	O ₂	2SO ₃	
Initial amount(mol)	$\frac{x}{0,5}$	2,5✓	0	✓(÷ 0,5)
Change	-2	-1	+2	✓(ratio)
Equilibrium amount	$\frac{x}{0,5} - 2$	1,5	2	✓

$$K_c = \frac{[SO_3]^2}{[SO_2]^2[O_2]}✓$$

$$42,67✓ = \frac{(2)^2}{\left(\frac{x-1,0}{0,5}\right)^2 (1,5)}✓$$

$$x = 1,125(\text{mol})✓ \quad (8)$$

6.2

6.2.1 Concentration of O₂ increased.✓✓ (2)

6.2.2 Pressure was increased.✓✓ (2)

6.2.3 Increase in pressure favours the reaction that produces less number of moles.✓ The forward reaction was favoured.✓ As the concentrations of the reactants decrease,✓ the concentration of the products increases.✓ (4)



6.3

6.3.1 System that is isolated from its surroundings.✓✓/ A system that does not constantly interact with the environment / A system that does not exchange energy and matter with the environment (2)

6.3.2 Turns yellow.✓ (1)

6.3.3 Sodium hydroxide reacts with H^+ and reduces their concentration.✓ The forward reaction is favoured.✓ The concentration of chromate ions increases.✓/the product/ H^+ increases (3)

[22]

QUESTION 7

7.1 An acid is a proton (H^+ ion) donor.✓✓ (2)

7.2

7.2.1 HCl and Cl^- ✓
 H_3O^+ and H_2O ✓ (2)

7.2.2 Substance that can either act as acid or base.✓✓ (2)

7.2.3 H_2O ✓ (1)

7.2.4 H_3O^+ ✓ (1)

7.2.5 **OPTION 1**

$$C = \frac{m}{MV} \checkmark$$

$$= \frac{3,65}{(36,5)(0,2)} \checkmark$$

$$= 0,5 \text{ mol. dm}^{-3} \checkmark$$

OPTION 2

$$\frac{3,65}{36,5}$$

$$= 0,1 \text{ mol}$$

$$c = \frac{n}{v}$$

$$= \frac{0,1}{0,2}$$

$$= 0,5 \text{ mol. dm}^{-3}$$

(3)

$$\begin{aligned}
 7.2.6 \quad p^H &= -\log [H_3O^+] \checkmark \\
 &= -\log (0,5) \checkmark \\
 &= 0,3 \checkmark
 \end{aligned}$$

Remove Question 7.2.6 due to late errata not received in time by all schools

(0)

7.3



(3)

7.3.2 Number of moles of MgCO_3

$$\begin{aligned}
 n &= \frac{m}{M} \\
 &= \frac{1,68}{84} \checkmark
 \end{aligned}$$

$$= 0,02 \text{ mol}$$

Number of moles of HNO_3 which reacted with MgCO_3

$$n = 2(0,02) \checkmark$$

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

Let the initial concentration of the acid be x

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

$$x = \frac{n}{0,039} \checkmark$$

$$\therefore n = 0,039x$$

$$n(\text{HNO}_3) \text{ in } 12 \text{ cm}^3 = 0,012x \checkmark$$

Ratio $\text{HNO}_3:\text{NaOH} = 1:1$

$$\therefore n(\text{NaOH}) \text{ in } 15 \text{ cm}^3 = 0,012x \checkmark$$

$$[\text{NaOH}] = \frac{0,012x}{0,015} \checkmark$$

$$= 0,8x$$

$$n(\text{NaOH}) \text{ in } 25 \text{ cm}^3 = cV$$

$$= (0,8x)(0,025) \checkmark$$

$$= 0,02x$$

$$n(\text{HNO}_3) \text{ in excess} = 0,02x$$

Number of moles of HNO_3 which reacted with MgCO_3

$$n(\text{MgCO}_3) = 0,039x - 0,02x \checkmark$$

$$= 0,019x$$

$$0,019x = 0,04$$

$$x = 2,11$$

$$[\text{HNO}_3] = 2,11 \text{ mol dm}^{-3} \checkmark$$

(0)

[27]

- 13

GRAND TOTAL = [150] - [17] = [133].

REWORK THE RAW TOTAL OF 133 BACK TO 150 using the formula

$$\frac{\text{mark obtained}}{133} \times 150$$

