LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF EDUCATION

NATIONAL SENIOR CERTIFICATE

GRADE 12

PHYSICAL SCIENCES

FINAL AMMENDED MARKING GUIDELINES

PREPARATORY 2025

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MARKS: 150

TIME: 3 Hours

This Marking Guidelines consist of 10 pages including the cover page

QUESTION 1

1.1 C✓✓ (2)

1.2 A✓✓ (2)

1.3 B✓✓ (2)

1.4 A✓✓ (2)

1.5 B✓✓ (2)

1.6 A✓✓ (2)

1.7 A✓✓ remove for Afrikaans due to translation error. (2)

1.8 B✓✓ (2)

1.9 B✓✓ (2)

1.10 D✓✓ (2)

[20]

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QUESTION 2

2.1 Chain isomers are compounds with the same molecular formula but different types of chains. ✓✓ (2)

2.2.1 C✓ (1)

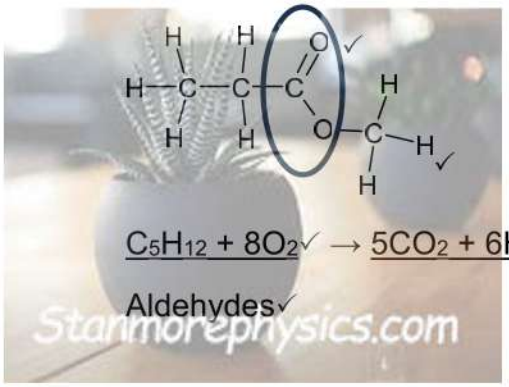
2.2.2 4 – bromo – 2,2 – dimethylpentane✓✓✓ (3)

Notes:
1. Bromo, dimethyl identified✓
2. Pentane✓
3. Whole structure correct✓

2.2.3 Pent – 1 – ene✓✓ (2)

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

2.2.4 C_nH_{2n}✓ (1)

2.3  (2)

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

2.4 $\underline{C_5H_{12}} + 8\underline{O_2}$✓ → $\underline{5CO_2} + \underline{6H_2O}$✓ (✓balance) (3)

2.5 Aldehydes✓ (1)

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2.6 $20\%\ C - atoms\ in\ comp.\ C = \frac{20}{100} \times 5$✓

$= 1$✓

Compound E has 6 C – atoms

∴ x = 6✓ and y = 14✓ **OR** (x = 6✓✓ and y = 14✓✓) (4)

[19]

QUESTION 3

3.1 Melting point is the temperature at which the solid and the liquid phases of a substance are at equilibrium. ✓✓ (2)

3.2 As the chain length/molar mass/number of carbon atoms increases, the boiling/melting point increases. ✓✓ (2)

3.3 Stronger than. ✓ (1)

3.4 Fair. ✓The compounds belong to the same homologous/intermolecular force/functional group/there is only one independent variable.✓ (2)

3.5 Gas. ✓ (1)

3.6

- Propane has a longer chain length/larger/ surface area/ bigger molecular size/more carbon atoms than ethane.✓
- Both have London forces/dispersion/dipole-dipole which are <u>stronger between propane molecules than in ethane</u>.✓/the intermolecular forces of propane are stronger
- More energy is needed to overcome the intermolecular force in propane than in ethane.✓

OR

- Ethane has shorter chain length/smaller surface area/smaller molecular size/less carbon atoms than propane.✓
- Both have London forces/dispersion/dipole-dipole which are <u>weaker between ethane molecules than in propane</u>.✓
- Less energy in needed to overcome the intermolecular forces in ethane than in propane.✓ (3)

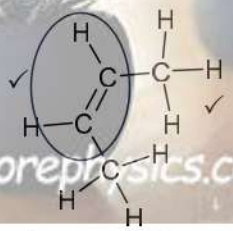
[11]

QUESTION 4

4.1.1 Substitution/hydrolysis✓ (1)

4.1.2 Butan – 2 – ol✓✓ Accept 2-butanol (1 mark for butanol, 1 mark for position) (2)

4.2.1



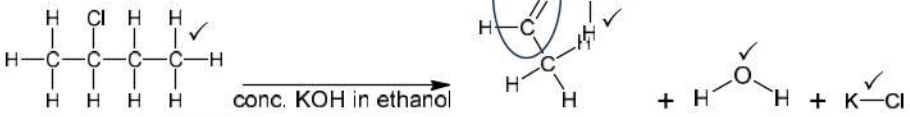
Notes:

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

(2)

4.2.2 (Strong) Heat✓ (1)

4.3.1



(5)

4.3.2 **Positive marking form 4.3.1**
But-2-ene.✓✓ /Accept 2-Butene (1 mark for butene, 1 mark for position) (2)

4.4.1 Addition/hydrogenation.✓ (1)

4.4.2 Ni/Pt/Pd/Nickel/Platinum/Palladium.✓ (1)

4.5.1 Cracking is the chemical process in which longer chain hydrocarbon molecules are broken down to shorter more useful molecules.✓✓ (2)

4.5.2 Catalyst (Pt, Pd and Ni).✓ (1)

[18]

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QUESTION 5

5.1 Rate of reaction is the change in concentration of reactants or products per unit time.✓✓ (2)

5.2 Neutralisation reaction.✓/Acid-base reaction (1)

5.3 State of division/surface area.✓ (1)

5.4 Rate of reaction.✓ (1)

5.5

$$n(CO_2) = \frac{V}{V_m}\checkmark$$
$$= \frac{53}{22\,400}\checkmark$$
$$= 0{,}002366 \text{ mol}$$

$$n(HCl) = \frac{2(0{,}002366)}{22\,400}\checkmark$$
$$= 0{,}004732\ mol$$

$$Rate = \frac{\Delta n}{\Delta t}\checkmark$$
$$= \frac{0{,}004732}{60}\checkmark$$
$$= 0{,}0000789\ mol.s^{-1}/(7{,}89 \times 10^{-5} mol.s^{-1})\checkmark$$

(5)

[10]

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QUESTION 6

6.1.1 Chemical equilibrium is a dynamic equilibrium when the rate of the forward reaction equals to the rate of the reverse reaction.✓✓ (2)

6.1.2

	SO_2	O_2	SO_3	
Ratio	2	1	2	
Initial amount(mol)	x	0,5	0	
Change	-0,75	-0,375✓	0,75	✓Ratio
Equilibrium	$x - 0,75$	0,125✓	0,75	
Concentration	$\frac{x - 0,75}{2}$	0,0625	0,375	✓ ÷ 2

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

$$10\checkmark = \frac{(0,375)^2}{\left(\frac{x-0,75}{2}\right)^2(0,0625)}\checkmark$$

$$x = 1,70 \text{ mol}\checkmark$$

(8)

6.1.3 **Positive marking from 6.1.2**

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

$$1,70 = \frac{m}{64}\checkmark$$

$$\therefore\ m = 108,8\text{g}\checkmark$$

(3)

6.2.1 Decreases.✓ (1)

6.2.2 Stays the same.✓ (1)

6.2.3 Decreases.✓ A decrease in pressure favours the reaction that produces more moles of gas/more volume.✓The reverse reaction is favoured.✓ (3)

[18]

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QUESTION 7

7.1 A weak base is a base that ionises/dissociates incompletely in water to form a low concentration of hydroxide ions.✓✓ (2)

7.2 **Option 1:**

$[H_3O^+] = 2 \times 0,02$✓ $= 0,04$ $mol.dm^{-3}$

$K_w = [H_3O^+][OH^-]$✓

$1 \times 10^{-14} = 0,04\ [OH^-]$✓ $[OH^-] = 2,5 \times 10^{-13}$ $mol.dm^{-3}$✓

Option 2:

$pH = -\log[H_3O^+]$✓

$= -\log(0,04)$ ✓

$= 1,398$

$pH + pOH = 14$

$1,398 + pOH = 14$✓

$pOH = 12,602$

$pOH = -\log[OH^-]$

$12,602 = -\log[OH^-]$

$[OH^-] = 2,50 \times 10^{-13} mol.dm^{-3}$✓

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(4)

7.3.1 $n(H_2SO_4) = cv$✓

$= (0{,}02)(0{,}025)$✓

$= 0{,}0005\ mol$

$n(NH_3) = 2(0{,}0005)$✓

$= 0{,}001\ mol$

$[NH_3]\ in\ diluted\ solution = \frac{c}{V}$

$= \frac{0{,}001}{0{,}0312}$✓

$= m0{,}032051\ mol$

n(NH_3) in 250 $cm^3 = cv$

$= 0{,}032051\ x\ 0{,}25$✓

$= 0{,}0080128\ mol$

n(NH_3) in 250 $cm^3 = n(NH3)\ in\ 20\ cm3\ of\ undiluted\ solution$

$[NH_3] = \frac{n}{V}$

$= \frac{0{,}080128}{0{,}02}$✓

$= 0{,}4\ mol.dm^{-3}$✓

(7)

7.3.2 Below 7✓

$NH_4^+ + H_2O$✓ ⟶ $NH_3 + H_3O^+$✓✓ (4)

7.4.1 An Ampholyte is a substance that can act as either an acid or a base✓✓ (2)

7.4.2 $HC_2O_4^-$✓ (1)

7.4.3 $H_2C_2O_4$✓ and H_3O^+✓ (2)

[22]

QUESTION 8

8.1 A galvanic cell is a cell in which chemical energy is converted to electrical energy.✓✓ (2)

8.2 Concentration of 1mol.dm^{-3}✓

Temperature of 25^{0}C/298K✓ (2)

8.3.1 Pt✓ (1)

8.3.2 Cr✓ (1)

8.4 2 mol.dm^{-3}✓ (2)

8.5 $3Sn^{4+} + 2Cr$✓ $\longrightarrow$ $3Sn^{2+} + 2Cr^{3+}$✓ (✓balancing) (3)

8.6 $E^{\theta}_{cell} = E^{\theta}_{cathode} - E^{\theta}_{anode}$✓

$= +0,15$✓$- (-0,74)$✓

$= +0,89V$✓ (4)

8.7 Decreases.✓ (1)

[16]



QUESTION 9

9.1 Electrolysis is the chemical process in which electrical energy is converted to chemical energy.✓✓ (2)

9.2 $Cu \longrightarrow Cu^{2+} + 2e^-$ ✓✓

Notes/*Notas*:
Ignore phases/*ignoreer fases*

$Cu^{2+} + 2e^- \leftarrow Cu$ (2/2) $Cu^{2+} + 2e^- \leftrightarrow Cu$ (0/2)

$Cu \leftrightarrow Cu^{2+} + 2e^-$ (1/2) $Cu^{2+} + 2e^- \rightarrow Cu$ (0/2)

(2)

9.3 Impure copper.✓ (1)

9.4.1 Zinc/Nickel/Zn/Ni.✓ (1)

9.4.2 Zinc/Nickel is a stronger reducing agent✓ than copper.✓ (2)

9.4.3 They will fall to the bottom.✓ (1)

9.5 $\boldsymbol{mass\ of\ copper + impurutues = 600 - 390}$✓

$\boldsymbol{= 210g}$

$\boldsymbol{mass\ of\ pure\ copper = 320 - 150}$✓

$\boldsymbol{= 170g}$

$\boldsymbol{\%\ purity = \frac{170}{210} \times 100}$✓

$\boldsymbol{= 80,95\%}$✓ (4)

9.6 It remains constant.✓The rate of oxidation of copper is equal to the rate of reduction of copper ions.✓✓ (3)

[16]

TOTAL: 150

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