FINAL

KWAZULU-NATAL PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

PROVINCIAL STANDARDISED ASSESSMENT

GRADE 12

PHYSICAL SCIENCES P2 (CHEMISTRY)

MARKING GUIDELINES

JUNE 2026

Stanmorephysics.com

MARKS: 150

These marking guidelines consist of 10 pages.

QUESTION 1

1.1 C ✓✓ (2)

1.2 A ✓✓ (2)

1.3 D ✓✓ (2)

1.4 C ✓✓ (2)

1.5 C ✓✓ (2)

1.6 B ✓✓ (2)

1.7 C ✓✓ (2)

1.8 A ✓✓ (2)

1.9 A ✓✓ (2)

1.10 B ✓✓ (2)

[20]

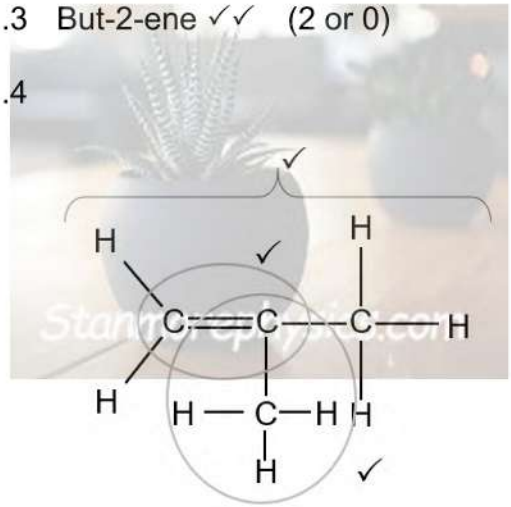
QUESTION 2

2.1.1 Compounds with the same molecular formula, but different structural formula. ✓✓ (2/0) (2)

2.1.2 Unsaturated. ✓
It has a <u>double bond between carbon</u> ✓ atoms.
(Accept: It has a general formula C_nH_{2n}) (2)

2.1.3 But-2-ene ✓✓ (2 or 0) (2)

2.1.4



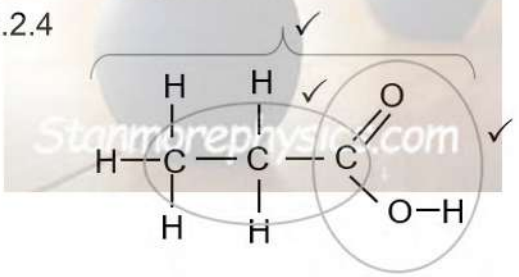
Marking criteria
- Functional group (double bond): ✓
- Side chain (methyl) on carbon 2: ✓
- Whole structure correct: ✓

(3)

2.2.1 Haloalkanes ✓ (1)

2.2.2 3-ethyl-4-fluorohexane ✓✓✓
Note:
If: 4-fluoro-3-ethylhexane: 2/3 (3)

2.2.3 General formula for carboxylic acid: $C_nH_{2n}O_2$.
(12 x n) + (1 x 2n) + (16 x 2) ✓= 74 ✓
n = 3
∴ X = 3 ✓
Y = 6 ✓
Z = 2 ✓ (5)

2.2.4 

✓ ✓ ✓

Positive marking from 2.2.3
Marking criteria
- Functional group: ✓
- Chain of 3 carbon atoms: ✓
- Whole structure correct: ✓

(3)
[21]

QUESTION 3

3.1 The greater the molecular mass/chain length the higher the boiling point. ✓✓(2/0)
(Boiling point increases with an increase in molecular mass) (2)

3.2.1 An organic compound made of Carbon and Hydrogen atoms only. ✓✓(2/0) (2)

3.2.2 C_5H_{12} ✓ (Accept: Pentane)
Its boiling point is higher than the room temperature. ✓ (2)

3.2.3 $\underline{C_3H_8 + 5O_2}$ ✓→ $\underline{3CO_2 + 4H_2O}$ ✓ Bal. ✓ (3)

3.3.1 An alcohol in which the carbon bonded to OH is directly bonded to one carbon ✓✓(2/0) (2)

3.3.2
- Alcohols have <u>Hydrogen bonds, dipole-dipole and London forces</u> ✓ between their molecules.
- <u>London forces in $C_4H_{10}O$ are the strongest</u> ✓ compared to the other compounds.
- <u>More energy is required to overcome the intermolecular forces in $C_4H_{10}O$</u> ✓ than the other alcohols. (3)

3.4
- C_5H_{12} (Alkanes) have London forces ✓ between their molecules.
- $C_4H_{10}O$ (Alcohols) have Hydrogen bonds, ✓ dipole-dipole, and London forces between their molecules.
- Intermolecular forces of $C_4H_{10}O$ are stronger than that of C_5H_{12}. ✓
- More energy is required to overcome Intermolecular forces of $C_4H_{10}O$ ✓

(4)

[18]

Stanmorephysics.com

QUESTION 4

4.1.1 A concentrated base contains a large amount of base in proportion to the volume of water. ✓
A dilute base contains a small amount of base in proportion to the volume of water. ✓ (2)



4.1.2 Substitution ✓ (Hydrolysis). (1)

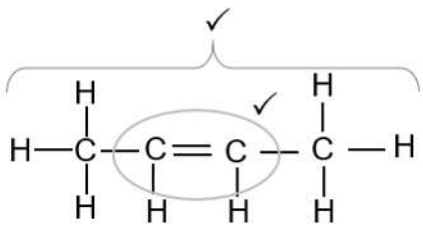
4.1.3 Alcohols. ✓ (1)

4.1.4 Butan-2-ol ✓✓
Note
(If: Butanol / Butan-1-ol: 1/2) (2)

4.1.5 Elimination✓ (Dehydrohalogenation) (1)

4.1.6 Dissolve 2-Bromobutane in Ethanol.(alcohol) ✓ (1)

4.1.7



Marking criteria
- Functional group (double bond): ✓
- Whole structure correct: ✓

(2)

4.1.8 Sodium bromide/NaBr. ✓ (1)

4.2.1 Platinum/Pt ✓ (Palladium/Pd/Nickel/Ni) (3)

4.2.2 Q ✓ and R ✓ (2)

4.2.3 Propan-1-ol/1 - propanol. ✓✓ (2 or 0) (2)

4.2.4 - Heat ✓
- Concentrated H_2SO_4 ✓ (2)

4.2.5 Ester ✓ (group) (1)

4.2.6 $\underline{C_3H_8O + C_2H_4O_2}$ ✓→ $\underline{C_5H_{10}O_2 + H_2O}$ ✓ Bal. ✓ (3)
NB: If they use correct structural formulae 2/3

[22]

Stanmorephysics.com

QUESTION 5

5.1.1 The minimum energy required for a reaction to take place. ✓✓ (2)

5.1.2 1340 ($kJ.mol^{-1}$). ✓ (1)

Stanmorephysics.com

5.1.3 According to the balanced equation, 197 kJ is released for 2 mol SO_3.
Energy released for 1 mol of SO_3:
$\frac{197}{2}$ ✓= 98, 5 kJ per mol
Energy released to make 24 g of SO_3:
$n = \frac{m}{M} = \frac{24}{80}$ ✓= 0, 3 mol
Energy = 0, 3 x 98, 5 ✓= 29, 55 kJ. ✓ (4)

5.2.1 What is the relationship between surface area and reaction rate? ✓✓
(How does the surface area affect the reaction rate?) (2)

5.2.2 Experiment 2. ✓
Aluminium has a greater surface area. ✓ (2)

5.2.3 Temperature ✓ (1)

5.2.4
- Increase in temperature increases the average kinetic energy of particles. ✓
- More particles collide with sufficient kinetic energy. ✓
- More effective collisions per unit time/ Higher frequency of effective collisions. . ✓ (3)

5.3 **Volume of CO_2 formed:**

Reaction rate = $\frac{\Delta Volume}{\Delta time}$: 0, 05 ✓ = $\frac{V - 0}{180 - 0}$ ✓

V = 0, 9 dm^3

Number of moles of CO_2 formed:

n = $\frac{V}{Vm} = \frac{0,9}{24}$ ✓ = 0, 0375 mol

Number of moles of Na_2CO_3 used (Ratio CO_2: Na_2CO_3):

$n_{(Na2CO3)} = n_{(CO2)}$ = 0, 0375 mol. ✓

Mass of Na_2CO_3 used:

m = n x M = 0, 0375 x 106 ✓ = 3, 975 g

Percentage purity of Na_2CO_3:

% purity = $\frac{3,975}{5}$ x 100 ✓

= 79, 5 % ✓ (7)

[22]

Stanmorephysics.com

QUESTION 6

6.1 Chemical equilibrium. ✓ (1)

6.2 When the equilibrium in a closed system is disturbed, the system will re-instate a new equilibrium by favouring the reaction that will oppose the disturbance. ✓✓ (2)

Marking criteria

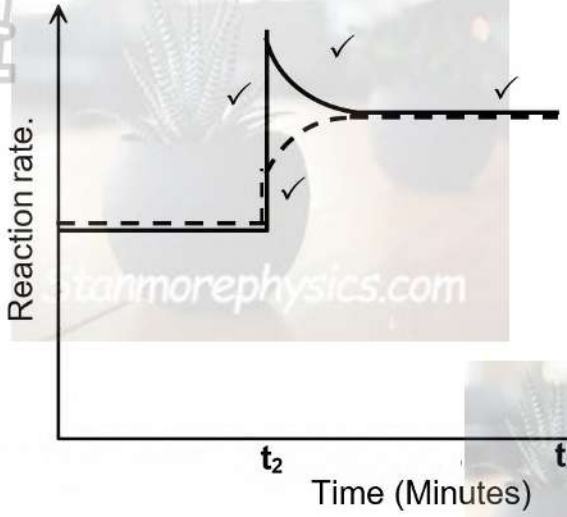
If any one of the underlined key phrases in the **correct context** is omitted, deduct 1 mark. Stanmorephysics.com

6.3
- Temperature was increased. ✓
- Concentrations of N_2 and H_2 increase while concentration of NH_3 decreases. ✓
- Reverse reaction is favoured. ✓
- Endothermic reaction is favoured. ✓ (4)

6.4.1
- Forward reaction. ✓
- An increase in pressure favours the reaction that proceeds towards the fewer number of moles. ✓

(2)

6.4.2



Marking criteria
- Both rates increase at t_2: ✓
- Rate of forward increases more than rate of reverse at t_2: ✓
- After t_2, Rate of forward decreases while rate of reverse increases: ✓
- Both rates become equal and remain constant (horizontal) before t_3: ✓

(4)

Stanmorephysics.com

6.5 **Marking criteria**

- Percentage O_2: 0, 65 x 8 = 5, 2 mol ✓
- Number of moles of O_2 used: 8 – ✓5, 2 = 2, 8 mol
- Ratio n(NO):n(O_2):n(NO_2) = 2:1:2 ✓
- Number of moles at equilibrium:
  $n_{initial}$-n_{used} for NO and O_2 and $n_{initial}$+n_{formed} for NO_2:
  2, 4 (NO): 5, 2 (O_2): 5, 6 (NO_2) ✓
- Concentration at equilibrium: Dividing all number of moles by unknown volume. ✓
- Correct Kc expression. ✓
- Substitution of Kc value. ✓
- Substitution of concentration values in terms of unknown volume. ✓
- Correct volume: 3, 01 dm^3. ✓

	NO (g)	**O_2 (g)**	**NO_2 (g)**
Ratio	2	1	2
Initial n (mol)	8	8	-
Change (mol)	-5, 6	-2, 8✓	+5, 6 ✓
Equilibrium (mol)	2, 4	5, 2✓	5, 6 ✓
$c = \frac{n}{V}$ (mol.dm^{-1})	$\frac{2,4}{x}$	$\frac{5,2}{x}$	$\frac{5,6}{x}$ ✓

$K_c = \frac{[NO_2]^2}{[NO]^2.[O_2]}$ ✓

3, 15✓ = $\frac{(\frac{5,6}{x})^2}{(\frac{2,4}{x})^2.(\frac{5,2}{x})}$ ✓

x = 3, 01

V= 3, 01 dm^3 ✓

(9)

[22]

QUESTION 7

7.1.1 Diprotic✓
The acid can donate two hydrogen ions. ✓ (2)

7.1.2 HSO_4^-✓ (1)

7.1.3 Sulphate ion. ✓ (1)

7.2.1 Reaction between salt and water. ✓ ✓ (2)

7.2.2 $HCO_3^- + H_2O$ ✓→ $H_2CO_3 + OH^-$ ✓Balancing✓

Marking criteria
- Left side correct: $HCO_3^- + H_2O$ ✓
- Right side correct: $H_2CO_3 + OH^-$✓
- Balancing: ✓

(3)

7.3.1 $[H_3O^+] = 2 \times [H_2SO_4] = 2 \times 0,12$ ✓$= 0,24$ mol.dm^{-3}.
pH = - log $[H_3O^+]$ ✓
= - log (0, 24) ✓
= 0, 62 ✓ (4)

7.3.2 - Bromothymol blue ✓
- Reaction between a strong base and strong acid✓ (2)

Stanmorephysics.com

7.3.3 **Marking criteria**

- Number of moles of NaOH in 16 ml. ✓
- Number of moles of H^+ in 20 ml. ✓
- n of H^+ in 500 ml: 0, 00488 x 25 ✓
- Number of moles of H_2SO_4: 0, 12 x 0, 3 ✓= 0, 036 mol.
- Number of moles of H^+ in 0, 036 mol of H_2SO_4:
  Ratio: $n(H^+) = 2 \times n(H_2SO_4)$ = 2 x 0, 036 ✓= 0, 072 mol.
- Number of moles of H^+ from HCl:
  Total $n_{(\text{entire solution})} - n_{(H2SO4)}$ = 0, 122 – 0, 072 ✓= 0, 05 mol.
- Number of moles of HCl:
  Ratio $HCl:H^+$ = 1:1, $n_{(HCl)}$ = 0, 05 mol. ✓
- Formula for concentration: c=n/v ✓
- Substitution into formula c = n/v = 0,05/0,2. ✓
- Concentration of HCl: 0, 25 $mol.dm^{-3}$.✓

Number of moles of NaOH in 16 ml.

n = c.v = 0, 305 x 0, 016 ✓= 0, 00488 mol.

Number of moles of H^+ in 20 ml of acidic solution.

Ratio $OH^-:H^+$ = 1:1

$n_{(H+)} = n_{(OH-)}$ = 0, 00488 mol. ✓

Number of moles of H^+ in 500 ml

$n(H^+)$ = 0, 00488 x 25 ✓= 0, 122 mol.

Number of moles of H_2SO_4 in 500 ml.

n = c.v = 0, 12 x 0, 3 ✓= 0, 036 mol.

Number of moles of H^+ in 0, 036 mol of H_2SO_4 present in 500 ml.

Ratio $H^+:H_2SO_4$ = 2:1

$n(H^+) = 2 \times n(H_2SO_4)$ = 2 x 0, 036 ✓ = 0, 072 mol.

Number of moles of H^+ of HCl in 500 ml.

$n_{(H+)} = n_{(\text{total H+})} - n_{(\text{H+ of H2SO4})}$ = 0, 122 – 0, 072 ✓= 0, 05 mol.

Number of moles of HCl in 500 ml.

Ratio $HCl:H^+$ = 1:1

$n(HCl) = n(H^+)$ = 0, 05 mol. ✓

Concentration of HCl in 200 ml.

$c = \frac{n}{V}$ ✓ $= \frac{0,05}{0,2}$ ✓

c = 0, 25 $mol.dm^{-3}$. ✓ (10)

[25]

TOTAL 150

Copyright Reserved