education

MPUMALANGA PROVINCE

REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

PHYSICAL SCIENCES (P1 & P2)

CONTROL TEST

MARCH 2026

MARKS: 100

TIME: 2 hours

This question paper consists of 14 pages including data sheets

INSTRUCTIONS AND INFORMATION

1. Write your name in the appropriate space on the FOLIO PAPER.
2. This question paper consists of EIGHT questions. Answer ALL the questions in the FOLIO PAPER.
3. Start EACH question on a NEW page in the FOLIO PAPER.
4. Number the answers correctly according to the numbering system used in this question paper.
5. Leave ONE line between two sub questions, for example between QUESTION 2.1 and QUESTION 2.2.
6. You may use a non-programmable calculator.
7. You may use appropriate mathematical instruments.
8. You are advised to use the attached DATA SHEETS.
9. Show ALL formulae and substitutions in ALL calculations.
10. Round off your final numerical answers to a MINIMUM of TWO decimal places.
11. Give brief motivations, discussions, et cetera where required.

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QUESTION 1 : MULTIPLE-CHOICE QUESTIONS

Four options are provided as possible answers to the following questions. Each question has only ONE correct answer. Choose the answer and write only the letter (A – D) next to the question number (1.1 – 1.5) in the ANSWER BOOK, for example, 1.6 E.

1.1 Which ONE of the following is NOT TRUE about the frictional force?

A Is proportional to the applied force.

B Is proportional to the normal force.

C Is independent of the area of contact.

D Is independent of the velocity of motion. (2)

1.2 A ball is thrown vertically upwards. Which ONE of the following combination of physical quantities of the ball have NON-ZERO values at its highest point? Ignore the effects of air friction.

A Kinetic energy and time

B Acceleration and weight

C Displacement and momentum

D Potential energy and velocity (2)

1.3 Which ONE of the following is equal to the rate of change of momentum?

A $F_{net} \cdot \Delta t$

B Δp

C $m \cdot a$

D p (2)

1.4 Which ONE of the following organic compounds will RAPIDLY decolourise bromine water?

A CH_2CH_2

B CH_3CH_3

C CH_3CHO

D CH_3COOH (2)

1.5 Which ONE of the following organic compounds has STRUCTURAL ISOMERS?

A Ethanal

B 1,1-dibromoethane

C Propane

D Methanoic acid. (2)

[10]

QUESTION 2 (Start on a new page.)

A satellite of mass 2 x10^4 kg orbits around the surface of planet **X** at a distance of 4 000 km. Planet **X** has a mass FOUR TIMES the mass of planet EARTH and a radius which is a THIRD ($\frac{1}{3}$) of the radius of the EARTH.

2.1 State Newton's law of Universal gravitation in words. (2)

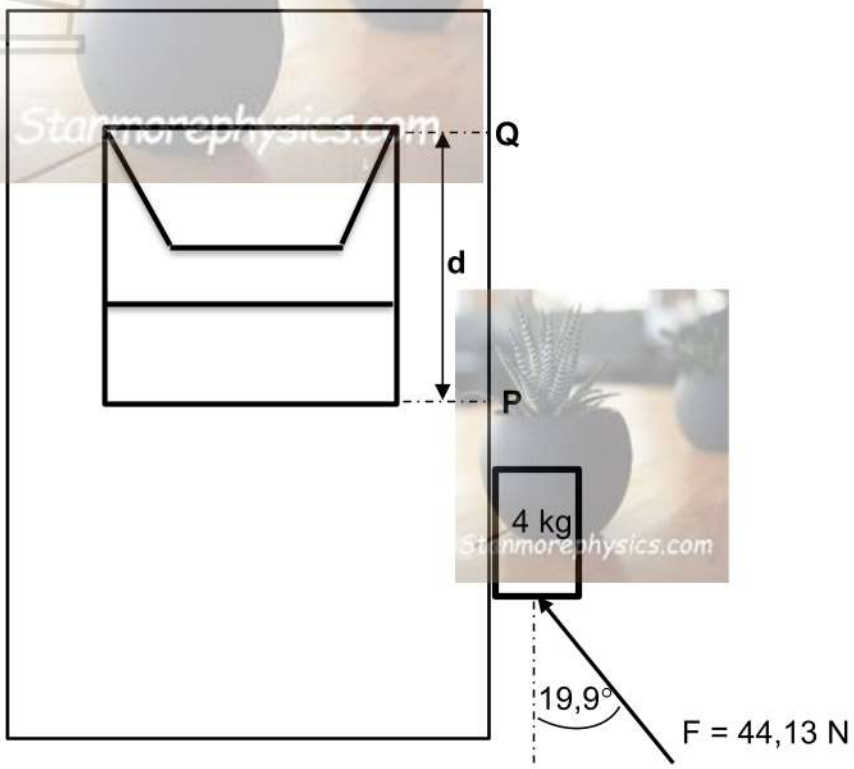
2.2 Calculate the Gravitational force that planet **X** exerts on the satellite when the satellite is at a distance of 4 000 km from the surface of the planet. (4)

2.3 How does the mass of the satellite on the surface of planet **X** compares to the mass of the satellite on the surface of planet EARTH? Write down GREATER THAN, LESS THAN OR EQUAL TO. (1)

[07]

QUESTION 3 (Start on a new page.)

In an experiment to determine the length of a window, a learner pushes a 4 kg block against the wall with a force of 44,13 N at an angle of 19,9° as shown in the diagram below. The block reaches point **P** at a speed of 1,45 $m \cdot s^{-1}$ and travels the distance, **d**, in 0,5 s.



The coefficient of kinetic friction between the wall and the block is 0,1. Ignore the effects of air friction.

3.1 Define kinetic frictional force. (2)

3.2 Draw a labelled free-body diagram indicating all the forces acting on the block whilst moving between point **P** and **Q**. (4)

3.3 Calculate the:

3.3.1 Magnitude of kinetic frictional force acting on the block. (3)

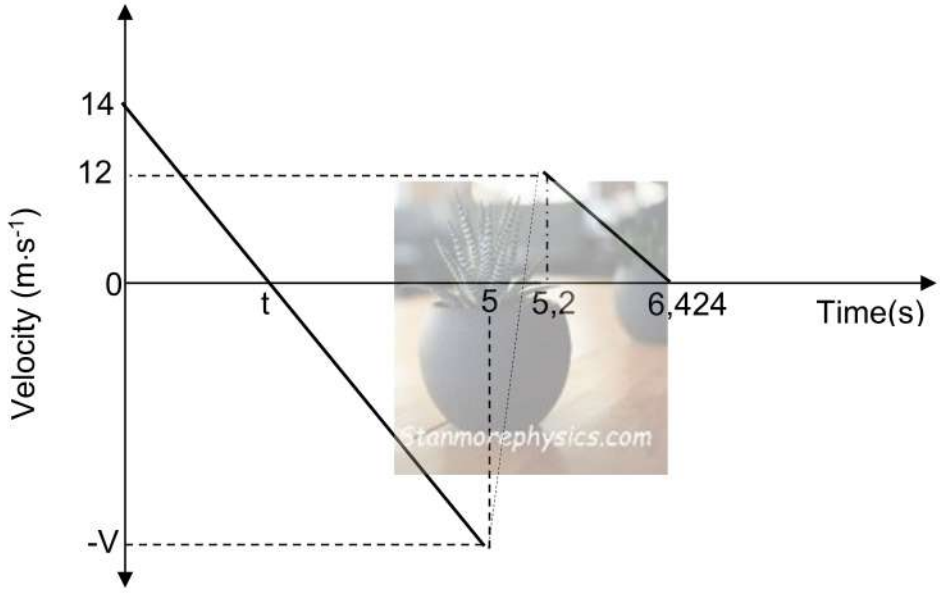
3.3.2 Length of the window (distance, **d**). (5)

3.4 The same magnitude of the force is now applied at a smaller angle. What effect will this change have on the value calculated in QUESTION 3.3.1? Write down INCREASES, DECREASES or REMAINS THE SAME. Give a reason for the answer. (2)

[16]

QUESTION 4 (Start on a new page.)

The velocity-time graph below represents the entire motion of a ball of mass 250 g is thrown vertically upwards from a height of 52,5 m above the ground. The ball rises to a maximum height of 10 m above the point of launch, falls to the ground and bounces to an unknown maximum height. Ignore the effects of air friction.



4.1 Define *free fall.* (2)

4.2 Calculate the:

4.2.1 Numerical value of, **t**, on the graph WITHOUT USING THE EQUATIONS OF MOTION. (2)

4.2.2 Velocity at which the ball reaches the ground. (3)

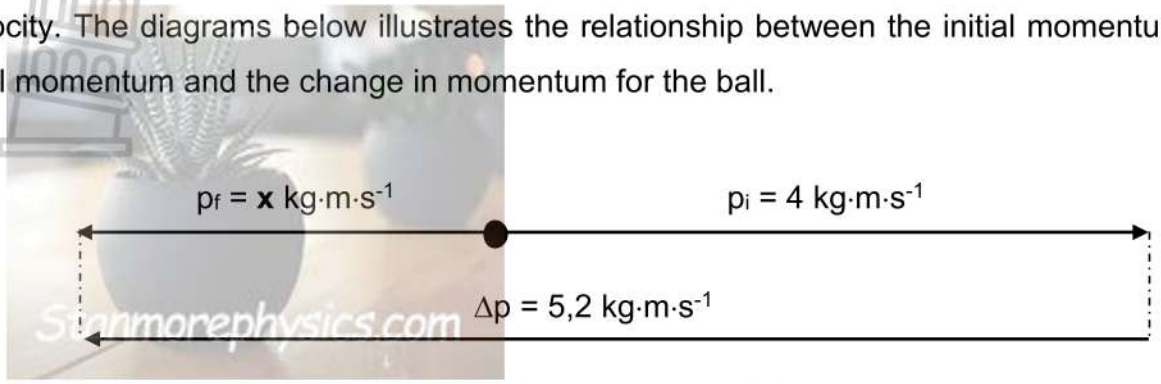
4.3 State *Newton's second law in terms of momentum*. (2)

4.4 Calculate the magnitude of the force exerted by the surface on the ball during contact. (4)

4.5 Draw the acceleration time-graph for the entire motion of the ball. (2)
[15]

QUESTION 5 (Start on a new page.)

A ball with an unknown mass, m, is thrown horizontally due EAST towards a wall, and it strikes the wall at a velocity of 36 $km \cdot h^{-1}$ and rebounce back off from the wall at an unknown velocity. The diagrams below illustrates the relationship between the initial momentum, the final momentum and the change in momentum for the ball.



5.1 Describe *linear momentum.* (2)

5.2 Calculate the:

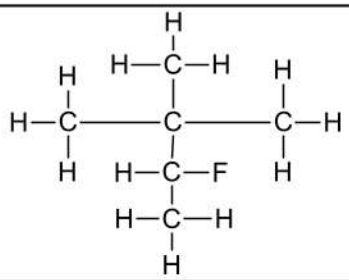
5.2.1 Mass of the ball. (3)

5.2.2 Velocity at which the ball leaves the wall after contact. (3)

[08]

QUESTION 6 (Start on a new page.)

The letters **A** to **D** in the table below represent four organic compounds from different homologous series. Use the table to answer the questions that follow.

A		**B**	Methyl ethanoate
C	Propane	**D**	CH_3COCH_3

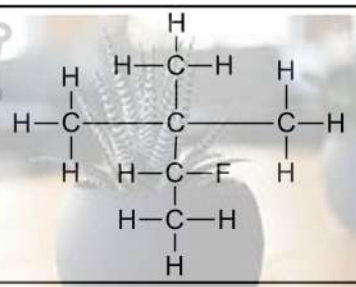
6.1 Define *homologous series*. (2)

6.2 Write down the letter(s) that represent(s) each of the following:

6.2.1 Compound produced during CONDENSATION reaction. (1)

6.2.2 FUNCTIONAL ISOMER of Propanal. (1)

The table on page 7 is redrawn below for easy reference.

A		**B**	Methyl ethanoate
C	Propane	**D**	CH_3COCH_3

6.3 For organic compound, **A**, write down the:

6.3.1 IUPAC NAME (3)

6.3.2 Type of Halo-alkane (PRIMARY, SECONDARY or TERTIARY). Give a reason for the answer. (2)

6.4 Draw the STRUCTURAL FORMULA of the ORGANIC ACID used to form compound, **B**. (2)

6.5 Write down a balanced chemical equation USING MOLECULAR FORMULA for the complete combustion of compound, **C**. (3)

6.6 Consider the organic compound, **D**, to answer the questions below.

6.6.1 Write down the name given to its functional group. (1)

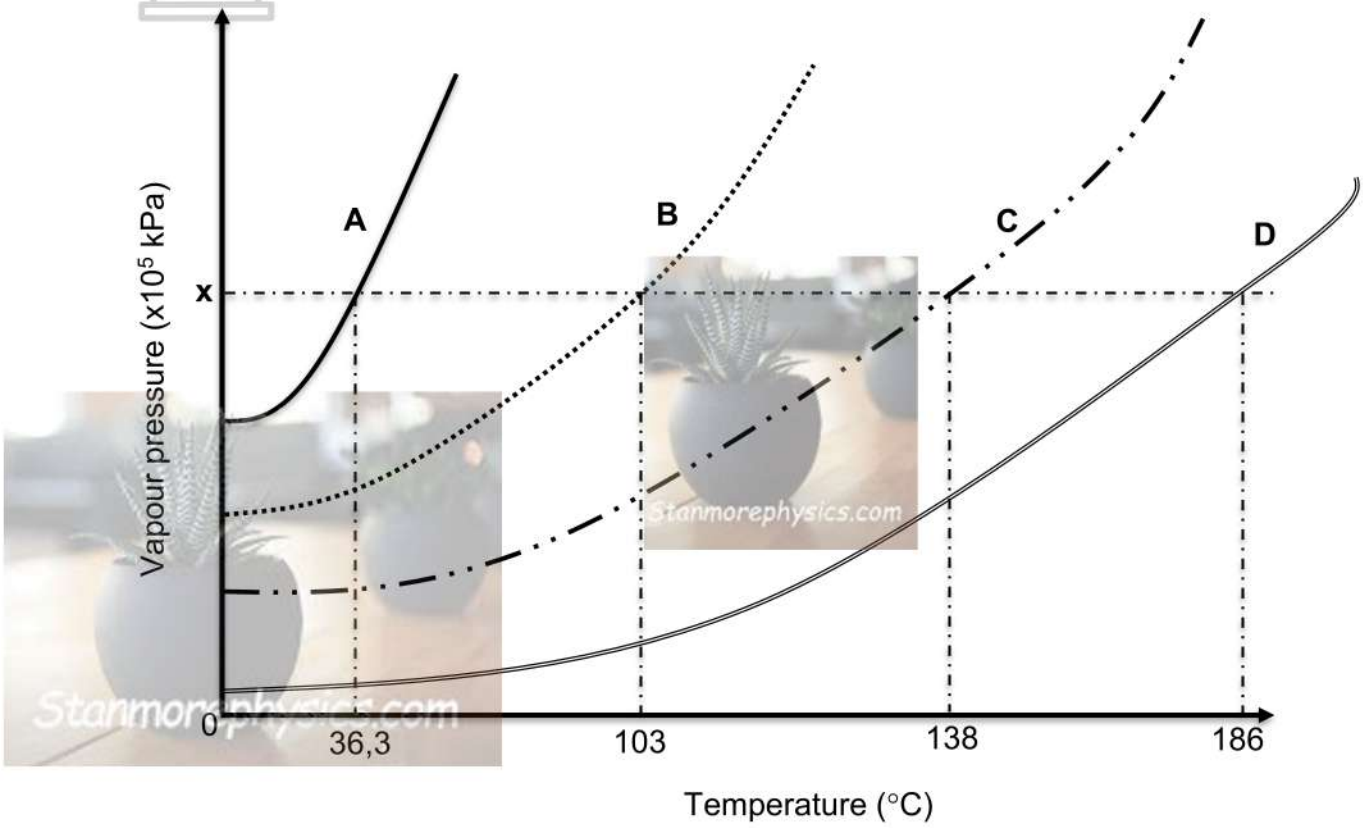
6.6.2 Draw the structural formula of the FUNCTIONAL ISOMER of compound **D**. (2)

6.6.3 Calculate the percentage composition of OXYGEN atoms in the compound. (2)

[19]

QUESTION 7 (Start on a new page.)

The vapour pressure versus temperature graph below was obtained for FOUR straight chain (unbranched) compounds with FIVE carbon atoms in their structures, **A**, **B**, **C** and **D**, which belong to different homologous series. The homologous series are randomly identified as Carboxylic acids, aldehydes, alkanes and alcohols. The boiling point of the saturated hydrocarbon is 36,3 °C



7.1 Define the term *vapour pressure*. (2)

7.2 Write down the:

7.2.1 Value represented by **x** on the graph. (1)

7.2.2 CONDENSED STRUCTURAL FORMULA of the SATURATED HYDROCARBON. (2)

7.2.3 NAME of the FUNCTIONAL GROUP of compound **B**. (2)

7.3 Which compound (**A** or **B**) has STRONGER INTERMOLECULAR FORCES? Give a reason for the answer. (2)

7.4 Explain the difference in boiling points of compound **C** and **D**. (4)

[13]

QUESTION 8 (Start on a new page.)

Consider the INCOMPLETE equations for reactions I to III below. **P**, **R** and **S** are organic compounds. Study the equations and answer the questions that follow.

I	2-bromopropane + NaOH → **P** + **Q** + H_2O
II	**P** + H_2O → **R** (minor product)
III	**R** + **S** → Propyl propanoate + **T**

8.1 Write down the:

8.1.1 NAME of the ELIMINATION reaction represented by reaction I. (1)

8.1.2 ONE reaction conditions for reaction I. (1)

8.1.3 MOLECULAR FORMULA of compound **P**. (1)

8.1.4 CHEMICAL FORMULA or CHEMICAL NAME of compound **Q**. (1)

8.2 For reaction II, write down the:

8.2.1 Type of reaction. (1)

8.2.2 Chemical formula of the INORGANIC ACID required during this reaction. (1)

8.2.3 Balanced chemical equation using STRUCTURAL FORMULAE. (3)

8.3 For reaction III, write down the:

8.3.1 Type of reaction. (1)

8.3.2 IUPAC NAME of compound **S**. (1)

8.3.3 CHEMICAL FORMULA or CHEMICAL NAME of compound **T**. (1)
[12]

GRAND TOTAL: 100

DATA FOR PHYSICAL SCIENCES GRADE 12
PAPER 1 (PHYSICS)

GEGEWENS VIR FISIESE WETENSKAPPE GRAAD 12
VRAESTEL 1 (FISIKA)

TABLE 1: PHYSICAL CONSTANTS/*TABEL 1: FISIESE KONSTANTES*

NAME/*NAAM*	SYMBOL/*SIMBOOL*	VALUE/*WAARDE*
Acceleration due to gravity *Swaartekragversnelling*	g	$9{,}8\ m{\cdot}s^{-2}$
Universal gravitational constant *Universele gravitasiekonstant*	G	$6{,}67 \times 10^{-11}\ N{\cdot}m^2{\cdot}kg^{-2}$
Radius of the Earth *Radius van die Aarde*	R_E	$6{,}38 \times 10^{6}\ m$
Mass of the Earth *Massa van die Aarde*	M_E	$5{,}98 \times 10^{24}\ kg$
Speed of light in a vacuum *Spoed van lig in 'n vakuum*	c	$3{,}0 \times 10^{8}\ m{\cdot}s^{-1}$
Planck's constant *Planck se konstante*	h	$6{,}63 \times 10^{-34}\ J{\cdot}s$
Coulomb's constant *Coulomb se konstante*	k	$9{,}0 \times 10^{9}\ N{\cdot}m^2{\cdot}C^{-2}$
Charge on electron *Lading op elektron*	e	$-1{,}6 \times 10^{-19}\ C$
Electron mass *Elektronmassa*	m_e	$9{,}11 \times 10^{-31}\ kg$

TABLE 2: FORMULAE/*TABEL 2: FORMULES*

MOTION/*BEWEGING*

$v_f = v_i + a\Delta t$	$\Delta x = v_i\Delta t + \frac{1}{2}a\Delta t^2$ or/*of* $\Delta y = v_i\Delta t + \frac{1}{2}a\Delta t^2$
$v_f^2 = v_i^2 + 2a\Delta x$ or/*of* $v_f^2 = v_i^2 + 2a\Delta y$	$\Delta x = \left(\frac{v_i + v_f}{2}\right)\Delta t$ or/*of* $\Delta y = \left(\frac{v_i + v_f}{2}\right)\Delta t$

FORCE/*KRAG*

$F_{net} = ma$	$p = mv$
$f_s^{max} = \mu_s N$	$f_k = \mu_k N$
$F_{net}\Delta t = \Delta p$ $\Delta p = mv_f - mv_i$	$w = mg$
$F = G\frac{m_1 m_2}{d^2}$ or/*of* $F = G\frac{m_1 m_2}{r^2}$	$g = G\frac{M}{d^2}$ or/*of* $g = G\frac{M}{r^2}$

DATA FOR PHYSICAL SCIENCES GRADE 12
PAPER 2 (CHEMISTRY)

GEGEWENS VIR FISIESE WETENSKAPPE GRAAD 12
VRAESTEL 2 (CHEMIE)

TABLE 1: PHYSICAL CONSTANTS/*TABEL 1: FISIESE KONSTANTES*

NAME/*NAAM*	**SYMBOL/*SIMBOOL***	**VALUE/*WAARDE***
Standard pressure *Standaarddruk*	p^{θ}	$1{,}013 \times 10^{5}$ Pa
Molar gas volume at STP *Molêre gasvolume by STD*	V_m	$22{,}4\ dm^{3}\cdot mol^{-1}$
Standard temperature *Standaardtemperatuur*	T^{θ}	273 K
Charge on electron *Lading op elektron*	e	$-1{,}6 \times 10^{-19}$ C
Avogadro's constant *Avogadro-konstante*	N_A	$6{,}02 \times 10^{23}\ mol^{-1}$

TABLE 2: FORMULAE/*TABEL 2: FORMULES*

$n=\frac{m}{M}$	$n=\frac{N}{N_A}$
$c=\frac{n}{V}$ or/*of* $c=\frac{m}{MV}$	$n=\frac{V}{V_m}$
$\frac{c_aV_a}{c_bV_b}=\frac{n_a}{n_b}$	$pH = -\log[H_3O^+]$
$K_w = [H_3O^+][OH^-] = 1 \times 10^{-14}$ at/*by* 298 K	
$E^{\theta}_{cell} = E^{\theta}_{cathode} - E^{\theta}_{anode} / E^{\theta}_{sel} = E^{\theta}_{katode} - E^{\theta}_{anode}$ or/*of* $E^{\theta}_{cell} = E^{\theta}_{reduction} - E^{\theta}_{oxidation} / E^{\theta}_{sel} = E^{\theta}_{reduksie} - E^{\theta}_{oksidasie}$ or/*of* $E^{\theta}_{cell} = E^{\theta}_{oxidisingagent} - E^{\theta}_{reducingagent} / E^{\theta}_{sel} = E^{\theta}_{oksideermiddel} - E^{\theta}_{reduseermiddel}$	
$q = I\Delta t$ $n = \frac{Q}{e}$ or/*of* $n = \frac{Q}{q_e}$	

TABLE 3: THE PERIODIC TABLE OF ELEMENTS

TABLE 3: THE PERIODIC TABLE OF ELEMENTS

1 (I)	2 (II)	3	4	5	6	7	8	9	10	11	12	13 (III)	14 (IV)	15 (V)	16 (VI)	17 (VII)	18 (VIII)
																	2 He 4
2,1 H 1																	
3 1,0 Li 7	4 1,5 Be 9											5 2,0 B 11	6 2,5 C 12	7 3,0 N 14	8 3,5 O 16	9 4,0 F 19	10 Ne 20
11 0,9 Na 23	12 1,2 Mg 24											13 1,5 Al 27	14 1,8 Si 28	15 2,1 P 31	16 2,5 S 32	17 3,0 Cl 35,5	18 Ar 40
19 0,8 K 39	20 1,0 Ca 40	21 1,3 Sc 45	22 1,5 Ti 48	23 1,6 V 51	24 1,6 Cr 52	25 1,5 Mn 55	26 1,8 Fe 56	27 1,8 Co 59	28 1,8 Ni 59	29 1,9 Cu 63,5	30 1,6 Zn 65	31 1,6 Ga 70	32 1,8 Ge 73	33 2,0 As 75	34 2,4 Se 79	35 2,8 Br 80	36 Kr 84
37 0,8 Rb 86	38 1,0 Sr 88	39 1,2 Y 89	40 1,4 Zr 91	41 Nb 92	42 1,8 Mo 96	43 1,9 Tc	44 2,2 Ru 101	45 2,2 Rh 103	46 2,2 Pd 106	47 1,9 Ag 108	48 1,7 Cd 112	49 1,7 In 115	50 1,8 Sn 119	51 1,9 Sb 122	52 2,1 Te 128	53 2,5 I 127	54 Xe 131
55 0,7 Cs 133	56 0,9 Ba 137	57 La 139	72 1,6 Hf 179	73 Ta 181	74 W 184	75 Re 186	76 Os 190	77 Ir 192	78 Pt 195	79 Au 197	80 Hg 201	81 1,8 Tl 204	82 1,8 Pb 207	83 1,9 Bi 209	84 2,0 Po	85 2,5 At	86 Rn
87 0,7 Fr	88 0,9 Ra 226	89 Ac															

58	59	60	61	62	63	64	65	66	67	68	69	70	71
Ce 140	Pr 141	Nd 144	Pm	Sm 150	Eu 152	Gd 157	Tb 159	Dy 163	Ho 165	Er 167	Tm 169	Yb 173	Lu 175
90	91	92	93	94	95	96	97	98	99	100	101	102	103
Th 232	Pa	U 238	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr

KEY/*SLEUTEL*

Atomic number
Atoomgetal

29
Cu
63,5

Electronegativity
Elektronegatiwiteit: 1,9

Symbol
Simbool

Approximate relative atomic mass
Benaderde relatiewe atoommassa

education
MPUMALANGA PROVINCE
REPUBLIC OF SOUTH AFRICA

NATIONAL

SENIOR CERTIFICATE

PHYSICAL SCIENCES
FISIESE WETENSKAPPE
GRADE 12/*GRAAD 12*

PHYSICS & CHEMISTRY (P1 & P2)

FISIKA & CHEMIE (V1 & V2)

MARCH CONTROL TEST (MARKING GUIDELINES)

MAARTKONTROLETOETS (NASIENRIGLYNE)

2026

MARKS: 100

This marking guidelines consists of 14 pages

QUESTION 1/ VRAAG 1

1.1 A ✓✓ (2)

1.2 B ✓✓ (2)

1.3 C ✓✓ (2)

1.4 A ✓✓ (2)

1.5 B ✓✓ (2)

[10]

QUESTION 2/ VRAAG 2

2.1

Marking criteria/Nasienkriteria

If any one of the underlined key phrases in the correct context is omitted, deduct 1 *mark/Indien enige van die onderstreepte frases in die korrekte konteks uitgelaat is, trek 1 punt af.*

Each body in the universe attracts every other body with a force that is directly proportional to the product of their masses and inversely proportional to the square of the distance between their centres ✓✓

Elke liggaam in die heelal trek elke ander liggaam aan met 'n krag direk eweredig aan die produk van hul massas en omgekeerd eweredig aan die kwadraat van die afstand tussen hul middelpunte. (2)

2.2

$$F = G\frac{m_1 m_2}{r^2} \checkmark$$

$$F = (6{,}67\times10^{-11})\frac{(2\times10^{4})(4\times5{,}98\times10^{24})\checkmark}{((\frac{1}{3}\times6{,}38\times10^{6}+4\ 000\times10^{3}))\checkmark^{2}}$$

$$F = 850\ 097{,}0327\ \text{N} \checkmark$$

(4)

2.3 EQUAL TO ✓

GELYK AAN

(1)

[07]

QUESTION 3 / VRAAG 3

3.1

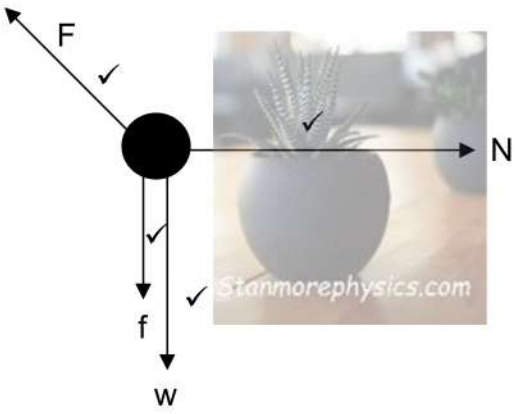
Marking criteria/Nasienkriteria
If any one of the underlined key phrases in the correct context is omitted, deduct 1 *mark/Indien enige van die onderstreepte frases in die korrekte konteks uitgelaat is, trek 1 punt af.*

Force that opposes the motion of a moving object relative to a surface ✓✓

Die krag wat die beweging van 'n bewegende voorwerp relatief tot 'n oppervlak teenwerk.

(2)

3.2



Accepted labels/*Aanvaarde benoemings*	
w	F_w / F_g / mg /39,2 N / gravitational force / gravitasiekrag / weight / gewig
f	F_f / f_k / (kinetic) Friction / (kinetiese) wrywing
N	F_N / Normal force / Normaalkrag
F	F_A / Applied force /Toegepaste krag / F_{toe} (Afrikaans)

Notes/*Aantekeninge*:

- Mark awarded for label and arrow./*Punt toegeken vir benoeming en pyltjie*.
- Do not penalize for length of arrows since drawing is not to scale./*Moenie vir die lengte van die pyltjies penaliseer nie aangesien die tekening nie volgens skaal is nie.*
- Any other additional force(s)/*Enige ander addisionele krag(te):* Max/*Maks* ¾
- If everything is correct, but no arrows/*Indien alles korrek is, maar geen pyltjies:* Max/*Maks* ¾
- If force(s) do not make contact with the dot /*Indien krag(te) nie met die kolletjie kontak maak nie*: Max/*Maks* ¾
- If components drawn for F/*Indien komponente van F geteken*: Max/*maks* ¾

(4)

3.3.1 $f_k = \mu_k N$ ✓

$f_k = (0,1)(44,13\sin 19,9°)$✓

$f_k = 1,5021$ N ✓

(3)

3.3.2

Upwards as positive **Opwaarts as positief**	**Upwards as negative** **Opwaarts as negatief**
$F_{net} = ma$ ✓	$F_{net} = ma$ ✓
$\underline{44,13\cos 19,9° - 1,5021 - 39,2}$ ✓$= 4\ a$✓	$\underline{-44,13\cos 19,9° + 1,5021 + 39,2}$ ✓$= 4\ a$✓
$a = 0,1982\ m{\cdot}s^{-2}$	$a = -0,1982\ m{\cdot}s^{-2}$
$\Delta y = V_i\Delta t + \frac{1}{2}a\Delta t^2$	$\Delta y = V_i\Delta t + \frac{1}{2}a\Delta t^2$
$\Delta y = (1,45)(0,5) + \frac{1}{2}(0,1982)(0,5)^2$ ✓	$\Delta y = (-1,45)(0,5) + \frac{1}{2}(-0,1982)(0,5)^2$ ✓
$\Delta y = 0,7498$ m ✓	$\Delta y = -0,7498$ m $\therefore \Delta y = 0,7498$ m ✓

(5)

3.4 DECREASES✓

The magnitude of the <u>normal force decreases</u> ✓

NEEM AF

Die grootte van die <u>normaalkrag neem af</u>.

(2)
[16]

QUESTION 4 / VRAAG 4

4.1

Marking criteria/Nasienkriteria
If any one of the underlined key phrases in the correct context is omitted, deduct 1 *mark/Indien enige van die onderstreepte frases in die korrekte konteks uitgelaat is, trek 1 punt af.*

Motion during which the only force acting on an object is the gravitational force ✓✓

Beweging waartydens die enigste krag wat op 'n voorwerp inwerk, die gravitasiekrag is.

(2)

4.2.1

OPTION 1/ OPSIE 1	
Upward as positive Opwaarts is positief	**Upward as negative Opwaarts is negatief**
$10 = \frac{1}{2}(t)(14)$ ✓ t = 1,4286 s✓	$-10 = \frac{1}{2}(t)(-14)$ ✓ t = 1,4286 s✓
OPTION 2/ OPSIE 2	
$-9,8 = \frac{0-14}{t-0}$ ✓ t = 1,4286 s✓	$9,8 = \frac{0-(-14)}{t-0}$ ✓ t = 1,4286 s✓

(2)

4.2.2

OPTION 1/ OPSIE 1	
Upward as positive Opwaarts is positief	**Upward as negative Opwaarts is negatief**
$v_f = v_i + a\Delta t$ ✓ $v_f = 14 + (-9,8)(5)$✓ $v_f = -35$ m·s^{-1} $\therefore v_f = 35$ m·s^{-1} downwards ✓	$v_f = v_i + a\Delta t$ ✓ $v_f = -14 + (9,8)(5)$✓ $v_f = 35$ m·s^{-1} downwards / afwaarts✓
OPTION 2/ OPSIE 2	
$v_f = v_i + a\Delta t$ ✓ $v_f = 0 + (-9,8)(3,5714)$✓ $v_f = -35$ m·s^{-1} $\therefore v_f = 35$ m·s^{-1} downwards/ afwaarts ✓	$v_f = v_i + a\Delta t$ ✓ $v_f = 0 + (9,8)(3,5714)$✓ $v_f = 35$ m·s^{-1} downwards/ afwaarts ✓

(3)

OPTION 3/ OPSIE 3	
$v_f = v_i + a\Delta t$ ✓ $v_f = -14 + (-9,8)(2,1428)$✓ $v_f = -34,999\ m\cdot s^{-1}$ $\therefore v_f = \underline{34,999\ m\cdot s^{-1}\ downwards/\ afwaarts}$ ✓	$v_f = v_i + a\Delta t$ ✓ $v_f = 14 + (9,8)(2,1428)$✓ $v_f = \underline{34,999\ m\cdot s^{-1}\ downwards/\ afwaarts}$ ✓

OPTION 4/ OPSIE 4	
$v_f^2 = v_i^2 + 2a\Delta y$✓ $v_f^2 = (0)^2 + 2(-9,8)(-62,5)$✓ $v_f = \underline{35\ m\cdot s^{-1}\ downwards/\ afwaarts}$ ✓	$v_f^2 = v_i^2 + 2a\Delta y$✓ $v_f^2 = (0)^2 + 2(9,8)(62,5)$✓ $v_f = \underline{35\ m\cdot s^{-1}\ downwards/\ afwaarts}$ ✓
OPTION 5/ OPSIE 5	
$v_f^2 = v_i^2 + 2a\Delta y$✓ $v_f^2 = (14)^2 + 2(-9,8)(-52,5)$✓ $v_f = \underline{35\ m\cdot s^{-1}\ downwards/afwaarts}$ ✓	$v_f^2 = v_i^2 + 2a\Delta y$✓ $v_f^2 = (-14)^2 + 2(9,8)(52,5)$✓ $v_f = \underline{35\ m\cdot s^{-1}\ downwards/afwaarts}$ ✓
OPTION 6/ OPSIE 6	
$F_{net}\cdot\Delta t = \Delta p$ ✓ $(-9,8)(5) = v_f - 14$ ✓ $v_f = \underline{35\ m\cdot s^{-1}\ downwards/afwaarts}$ ✓	$F_{net}\cdot\Delta t = \Delta p$ ✓ $(-9,8)(5) = v_f - (-14)$ ✓ $v_f = \underline{35\ m\cdot s^{-1}\ downwards/afwaarts}$ ✓
OPTION 7/ OPSIE 7	
$-62,5$ ✓$= \frac{1}{2}(3,5714)(v)$ ✓ $v_f = -35\ m\cdot s^{-1}$ $v_f = \underline{35\ m\cdot s^{-1}\ downwards/\ afwaarts}$ ✓	$62,5$ ✓$= \frac{1}{2}(3,5714)(-v)$ ✓ $v_f = \underline{35\ m\cdot s^{-1}\ downwards/\ afwaarts}$ ✓
OPTION 8/ OPSIE 8	
$-9,8$ ✓$= \frac{-v-14}{5-0}$ ✓ $v_f = -35\ m\cdot s^{-1}$ $v_f = \underline{35\ m\cdot s^{-1}\ downwards/\ afwaarts}$ ✓	$9,8$ ✓$= \frac{v-(-14)}{5-0}$ ✓ $v_f = \underline{35\ m\cdot s^{-1}\ downwards/\ afwaarts}$ ✓

4.3

Marking criteria/Nasienkriteria

If any one of the underlined key phrases in the correct context is omitted, deduct 1 *mark/Indien enige van die onderstreepte frases in die korrekte konteks uitgelaat is, trek 1 punt af.*

The net (or resultant) force acting on an object is equal to the rate of change of momentum of the object in the direction of the net force.✓✓

Die netto krag wat op 'n voorwerp inwerk, is gelyk aan die tempo van verandering van momentum van die voorwerp in die rigting van die netto krag.

(2)

4.4

Upward as positive Opwaarts is positief	Upward as negative Opwaarts is negatief
$F_{net} \cdot \Delta t = \Delta p$ ✓	$F_{net} \cdot \Delta t = \Delta p$ ✓
$F_{net}(0,2) = 0,25\ (12 - (-35))$ ✓	$F_{net}(0,2) = 0,25\ (-12 - 35)$ ✓
$F_{net} = 58,75$ N	$F_{net} = -58,75$ N
$F_s - (0,25)(9,8) = 58,75$ ✓	$F_s + (0,25)(9,8) = -58,75$ ✓
$F_s = 61,2$ N ✓	$F_s = -61,2$ N
	$\therefore F_s = 61,2$ N ✓

(4)

4.5

Marking criteria:

- Correct shape of the graph ✓
- Correct value of acceleration (9,8) and graph correctly labelled ✓

Note:

Graph not labelled: max. ½

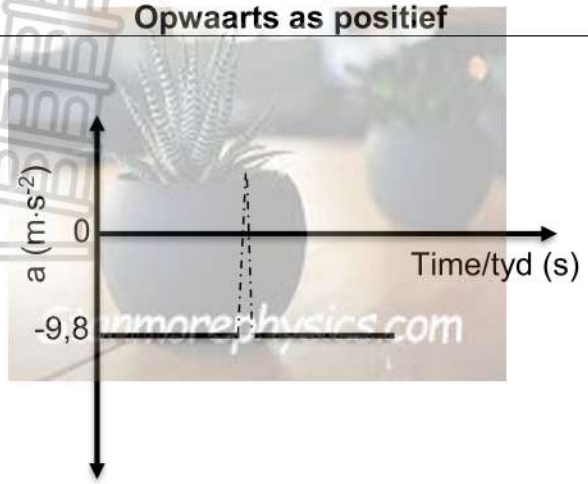
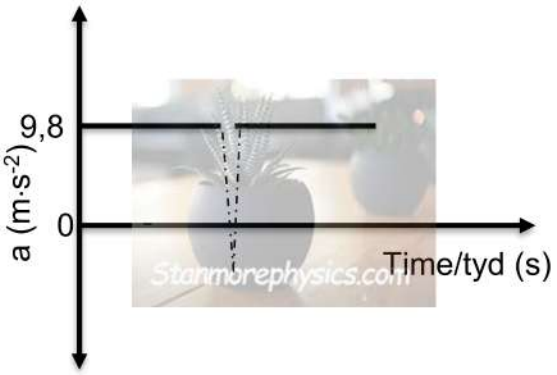
Nasienkriteria:

- *Korrekte vorm* ✓
- *Korrekte waarde vir versnelling (9,8) en grafiek is reg benoem* ✓

Nota:

Grafiek nie benoem: maks. ½

(2)

Upwards as positive Opwaarts as positief	Upwards as negative Opwaarts as negatief
	

[15]

QUESTION 5 / VRAAG 5

5.1 Vector quantity with the same direction as the velocity of the object ✓✓

'n Vektorgrootheid met dieselfde rigting as die snelheid van die voorwerp.

(2)

5.2.1 $p = mv$ ✓

$4 = m(10)$ ✓

$m = 0,4$ kg ✓

(3)

5.2.2

OPTION 1/ OPSIE 1	
East as positive **Oos as positief**	**East as negative** **Oos as negatief**
$\Delta p = p_f - p_i$ ✓ $-5,2 = 0,4v_f - 4$ ✓ $V_f = -3$ m·s^{-1} $\therefore V_f = 3$ m·s^{-1} WEST/ *WES* ✓	$\Delta p = p_f - p_i$ ✓ $5,2 = 0,4v_f - (-4)$ ✓ $\therefore V_f = 3$ m·s^{-1} WEST/ *WES* ✓
OPTION 2/ OPSIE 2	
$\Delta p = m(v_f - v_i)$ ✓ $-5,2 = 0,4(v_f - 10)$ ✓ $v_f = -3$ m·s^{-1} $\therefore v_f = 3$ m·s^{-1} WEST ✓	$\Delta p = m(v_f - v_i)$ ✓ $5,2 = 0,4(v_f - (-10))$ ✓ $v_f = 3$ m·s^{-1} $\therefore v_f = 3$ m·s^{-1} WEST ✓

(3)

[08]

QUESTION 6 / VRAAG 6

6.1

Marking criteria/Nasienkriteria

If any one of the underlined key phrases in the correct context is omitted, deduct 1 mark/*Indien enige van die onderstreepte frases in die korrekte konteks uitgelaat is, trek 1 punt af.*

A series of organic compounds that can be described by the same general formula ✓✓

OR

Series of organic compounds in which one member differs from the next with a CH_2 group

'n Reeks organiese verbindings wat deur dieselfde algemene formule beskryf kan word.

OF

'n Reeks organiese verbindings waarin een lid van die volgende verskil met 'n CH_2-groep.

(2)

6.2.1 B ✓ (1)

6.2.2 D ✓ (1)

6.3.1

Marking criteria:

- Correct stem, i.e. butane. ✓
- Correct substituents (fluoro and dimethyl) identified. ✓
- IUPAC name completely correct including numbering, sequence, hyphens and commas. ✓

Nasienkriteria:

- *Korrekte stam, d.i. butaan.* ✓
- *Korrkete substituente fluoro and dimethyl) geïdentifiseer.* ✓
- *IUPAC naam heeltemal korrek, wat nommering, volgorde, koppeltekens en kommas bevat* ✓

3–fluoro–2,2–dimethylbutane ✓✓✓

3–fluoro–2,2–dimethylbutaan ✓✓✓

(3)

6.3.2 SECONDARY ✓

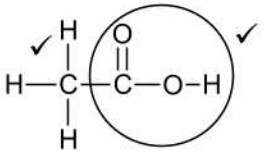
The halogen/fluorine/functional group (-X) is bonded to a C atom that is bonded to two other C atoms ✓

SEKONDÊR

Die halogeen/ fluoor/ funskionele groep (-X) is aan 'n C gebind wat aan twee ander C gebind is.

(2)

6.4



Marking criteria:

- Functional group correct. ✓
- Whole structural formula correct. ✓

Nasienkriteria:

- *Funksionele groep korrek.* ✓
- *Hele struktuurformule korrek.* ✓

(2)

6.5 $C_3H_8 + 5O_2$ ✓$\rightarrow 3CO_2 + 4H_2O$ ✓ Bal. ✓

Ignore phases/*Ignoreer fases*

Marking criteria:

- Correct chemical formulae of reactants ($C_3H_8 + O_2$) ✓
- Correct chemical formulae of products ($CO_2 + H_2O$) ✓
- Correct balancing. ✓
- Marking rule 6.3.10

Nasienkriteria:

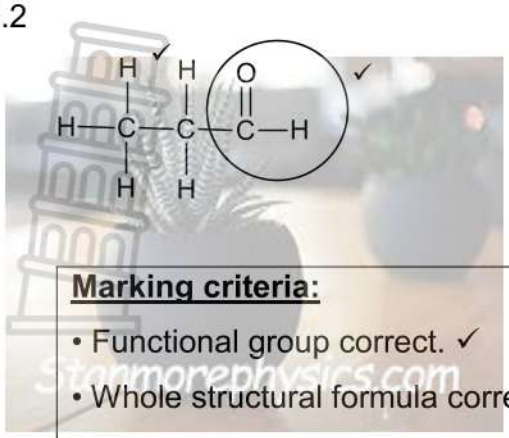
- *Korrekte chemiese formule van reaktante* ($C_3H_8 + O_2$) ✓
- *Korrekte chemiese formule van produkte* ($CO_2 + H_2O$) ✓
- *Korrekte balansering.* ✓
- Nasienreël 6.3.10

(3)

6.6.1 Carbonyl (group) ✓ (1)

Karboniel(groep)

6.6.2



Marking criteria:

- Functional group correct. ✓
- Whole structural formula correct. ✓

Nasienkriteria:

- *Funksionele groep korrek.* ✓
- *Hele struktuurformule korrek.* ✓

(2)

6.6.3

$$\%O = \frac{16}{58} \times 100 \checkmark$$

$$\%O = 27{,}586\ \% \checkmark$$

(2)
[19]

QUESTION 7 / VRAAG 7

7.1

Marking criteria/Nasienkriteria

If any one of the underlined key phrases in the correct context is omitted, deduct 1 *mark/Indien enige van die onderstreepte frases in die korrekte konteks uitgelaat is, trek 1 punt af.*

The pressure exerted by a vapour at equilibrium with its liquid in a closed system.✓✓
Die druk uitgeoefen deur 'n damp in ewewig met sy vloeistof in 'n geslote sisteem ✓✓

(2)

7.2.1 1,013 ✓(x10^5 Pa)

Accept/ Aanvaar: 101,3 kPa or 760 mmHg

(1)

7.2.2 $CH_2CH_2CH_2CH_2CH_3$ ✓✓

Or/ OF

$CH_3(CH_2)_3CH_3$ ✓✓

(2)

7.2.3 Formyl (group) ✓✓
Formiel(groep) ✓✓

(2)

7.3 **B** ✓

Higher boiling point/lower vapour pressure ✓

B

Hoër kookpunt/ laer dampdruk

(2)

7.4

Marking criteria:

- Compare structures. ✓✓
- Compare the strength of intermolecular forces. ✓
- Compare the energy required to overcome intermolecular forces. ✓

Nasienkriteria:

- *Vergelyk strukture.* ✓✓
- *Vergelyk die sterkte van intermolekulêre kragte.* ✓
- *Vergelyk die energie benodig om intermolekulêre kragte te oorkom.* ✓

OPTION 1

- **Structure:**
  Compound **C** has one site for hydrogen bonding✓, whilst compound **D** has two sites for hydrogen bonding ✓
- **Intermolecular forces:**
  Compound **D** has stronger intermolecular forces ✓ (than compound **C**)
- **Energy:**
  More energy needed to overcome intermolecular forces in compound **D** ✓(than in compound **C**)

OPSIE 1

- **Struktuur:**
  Verbinding **C** het een plek vir 'n waterstofbinding ✓, waar Verbinding D twee plekke het vir waterstofbings. ✓
- **Intermolekulêre kragte**
  Verbinding **D** het sterker intermolekulêre kragte ✓ (as verbinding **C**).
- **Energie:**
  Meer energie word benodig om die intermolekulêre kragte van verbinding **D** te oorkom ✓ (as verbinding **C**).

(4)

OPTION 2

- **Structure:**
  Compound **C** has one site for hydrogen bonding✓, whilst compound **D** has two sites for hydrogen bonding ✓
- **Intermolecular forces:**
  Compound **C** has weaker intermolecular forces ✓ (than compound **D**)
- **Energy:**
  Lesser energy needed to overcome intermolecular forces in compound **C** ✓(than in compound **D**)

OPSIE 2

- **Struktuur:**
  Verbinding **C** het een plek vir 'n waterstofbinding ✓, waar Verbinding D twee plekke het vir waterstofbings. ✓
- **Intermolekulêre kragte**
  Verbinding **C** het swakker intermolekulêre kragte ✓ (as verbinding **D**).
- **Energie:**
  Minder energie word benodig om die intermolekulêre kragte van verbinding **C** te oorkom ✓ (as verbinding **D**).

[13]

QUESTION 8 / VRAAG 8

8.1.1 Dehydrohalogenation ✓
Dehidrohalogenering ✓ (1)

8.1.2 **ANY ONE:**

- Concentrated strong base (NaOH/KOH/LiOH) ✓
- Strong heat ✓

ENIGE EEN

- *Gekonsentreerde sterk basis (NaOH/KOH/LiOH)* ✓
- *Sterk verhitting* ✓ (1)

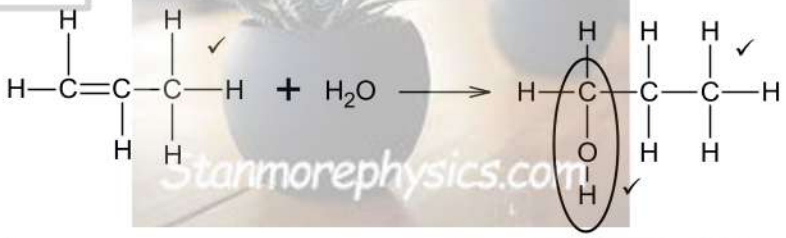
8.1.3 C_3H_6 ✓ (1)

8.1.4 NaBr/Sodium bromide/ *Natriumbromied* ✓ (1)

8.2.1 Addition✓ (Accept: Hydration)
Addisie (Aanvaar: Hidrasie) (1)

8.2.2 H_2SO_4/H_3PO_4 ✓ (1)

8.2.3



Marking criteria:
- Correct structural formula of propene ✓
- Correct functional group of propan-1-ol on the first C-atom ✓
- Whole structural formula of propan-1-ol correct ✓

Note:
If H_2O is omitted/for extra product or reactant, deduct 1 mark

Nasienkriteria
- *Korrkete struktuurformule van propeen* ✓
- *Korrekte funksionele groep van propan-1-ol op die eerste C-atoom.* ✓
- *Hele struktuurformule van propan-1-ol is korrek.* ✓

Nota:
Indien H_2O uitgelaat is/ daar is 'n ekstra reactant of produk, trek 1 punt af (3)

8.3.1 Condensation ✓
Kondensasie
Accept: Esterification
Aanvaar: *Esterifikasie* (1)

8.3.2 Propanoic acid ✓
Propanoësuur (1)

8.3.3 H_2O/Water ✓ (1)
[12]

GRAND TOTAL: 100