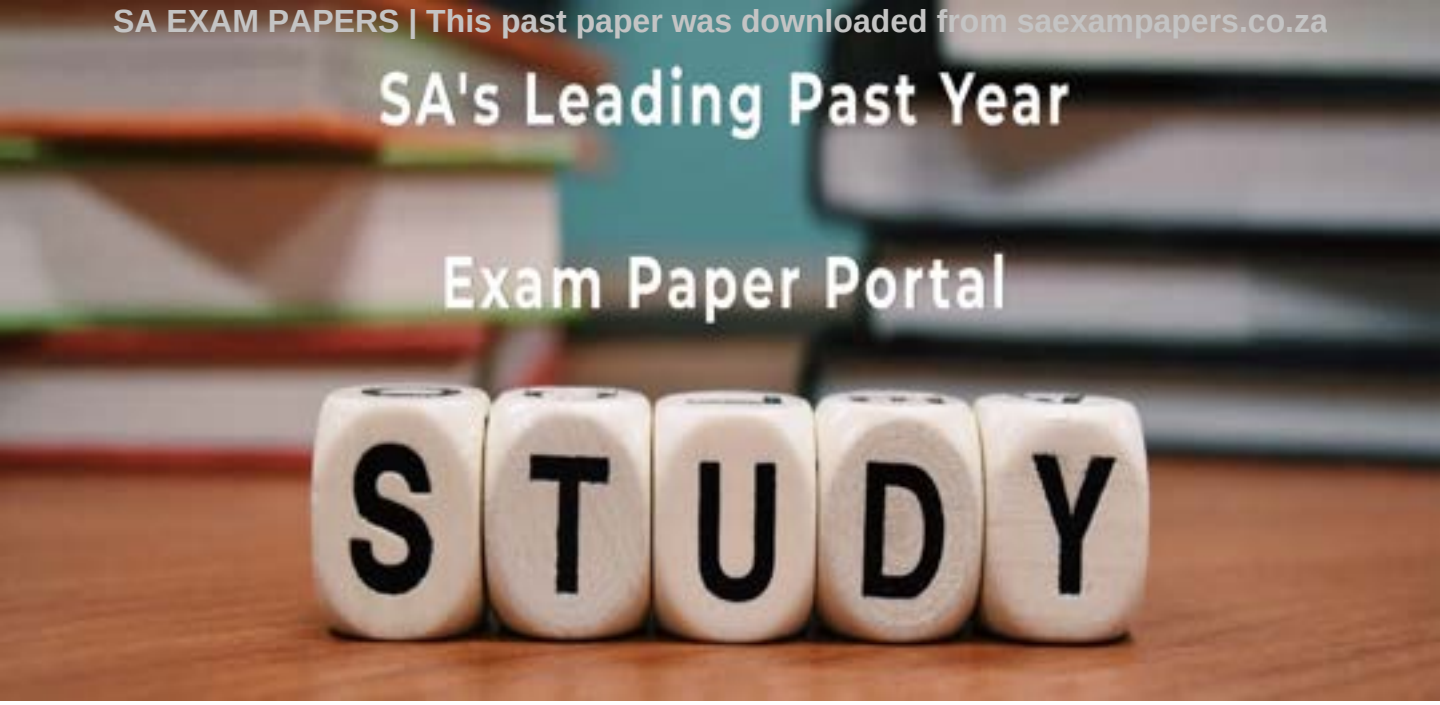


education
MPUMALANGA PROVINCE
REPUBLIC OF SOUTH AFRICA

FURTHER EDUCATION AND TRAINING

NKANGALA DISTRICT/ DISTRIK

GRADE/ GRAAD 12

PHYSICAL SCIENCES

MARCH 2025

CONTROLLED TEST

MEMO

MARKS/ PUNTE:100

TIME/ TYD :2 HOURS/ URE

This marking guideline paper consists 9 of pages
Hierdie nasienriglyn bestaan uit 9 bladsye

QUESTION/ VRAAG 1

1.1 A (2)

1.2 D✓✓ (2)

1.3 D✓✓ (2)

1.4 B✓✓ (2)

1.5 A✓✓ (2)

1.6 C✓✓ (2)

[12]

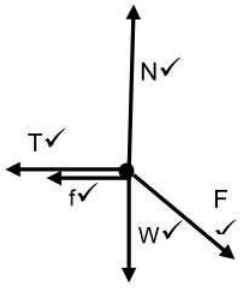
QUESTION/ VRAAG 2

2.1 When a net force acts on an object, the object will accelerate in the direction of the force and the acceleration is directly proportional to the force and inversely proportional to the mass of the object

Wanneer 'n resulterende/netto krag op 'n voorwerp inwerk, versnel die voorwerp in die rigting van die krag teen 'n versnelling direk eweredig aan die krag en omgekeerd eweredig aan die massa van die voorwerp. ✓✓

(2)

2.2



Accepted labels	
F	Fa/applied force/35N/ Toegepaste krag
N	Normal force/F_N / Normaalkrag
T	Tension / F_T / Spanning
f	Frictional force / F_f/f_k / wrywingskrag
w	Fg / Fw /force of earth on block / weight / mg / gravitational force/ gewig/ gravitasiekrag

(5)

2.3.1 $F_{net}=ma$

$F_{net}=0$

$F\cos\theta - T - f = 0$

$F\cos\theta - T - \mu_k N = 0$

$F\cos\theta - T - (\mu_k mg+35\sin 20^\circ) = 0$ Any one ✓

$35\cos 20 - T - (0.2)(6\times 9.8+35\sin 20^\circ)$✓$=0$✓

$T=18.74$ N✓

Marking criteria
Formula/ Formule✓
Substitution for friction / Vervanging van wrywing✓
Whole substitution / Hele vervanging✓
Answer with correct units / Antwoord met korrekte eenheid✓

(4)

2.3.2 **POSITIVE MARKING FROM / POSITIEWE MERK VANAF 2.3.1**

$F_{net}=ma$

$F_{net}=0$

$T-(mg\sin\theta)-(\mu_k mg\cos\theta) = 0$ Any one / Enige een✓

$18.74 - (m\times 9.8\sin 30^\circ) - (0.15)(m\times 9.8\cos 30^\circ)$✓$= 0$ ✓

$m = 3.03$ kg ✓

(4)

[15]

QUESTION/ VRAAG 3

3.1 Motion under the influence of the gravitational force/weight ONLY (2)
Vryval is die beweging waartydens die ENIGSTE krag wat op 'n voorwerp inwerk, die gravitasiekrag is.✓✓

3.2.

OPTION/ OPSIE 1	OPTION/ OPSIE 2
UPWARD AS POSITIVE/ OPWAARTS POSITIEF $v_f^2=v_i^2+2a\Delta y$ ✓ $0^2=29^2+2(-9,8)\Delta y$✓ Δy= 42,91m ✓ **DOWNWARD AS POSITIVE/ AFWAARTS AS POSITIEF** $v_f^2=v_i^2+2a\Delta y$ ✓ $0^2=(-29)^2+2(9,8)\Delta y$✓ Δy= 42,91m ✓	**DOWNWARD AS POSITIVE/ AFWAARTS AS POSITIEF** $v_f^2=v_i^2+2a\Delta y$ ✓ $29^2=0^2+2(9,8)\Delta y$✓ Δy= 42,91m ✓ **UPWARD AS POSITIVE/ OPWAARTS POSITIEF** $v_f^2=v_i^2+2a\Delta y$ ✓ $(-29)^2=0^2+2(-9,8)\Delta y$✓ Δy= 42,91m ✓

(3)

3.3

OPTION/ OPSIE 1	OPTION/ OPSIE 2
UPWARD AS POSITIVE/ OPWAARTS POSITIEF $v_f=v_i+a\Delta t$✓ -29✓ = 29 + (-9.8)Δt ✓ Δt = 5,92 s ✓ **DOWNWARD AS POSITIVE/ AFWAARTS AS POSITIEF** $v_f=v_i+a\Delta t$✓ 29 ✓= -29 + (9.8)Δt ✓ Δt = 5,92 s ✓	**UPWARD AS POSITIVE/ OPWAARTS POSITIEF** $v_f=v_i+a\Delta t$✓ 0 = 29 + (-9.8)Δt ✓ Δt = 2,96 s Δt = 2× 2,96 ✓ = 5,92 s ✓ **DOWNWARD AS POSITIVE/ AFWAARTS AS POSITIEF** $v_f=v_i+a\Delta t$✓ 29 ✓ = -29 + (-9.8)Δt ✓ Δt = 5,92 s ✓

(4)

3.4 **POSITIVE MARKING FROM/ POSITIEWE MERK VANAF 3.3**

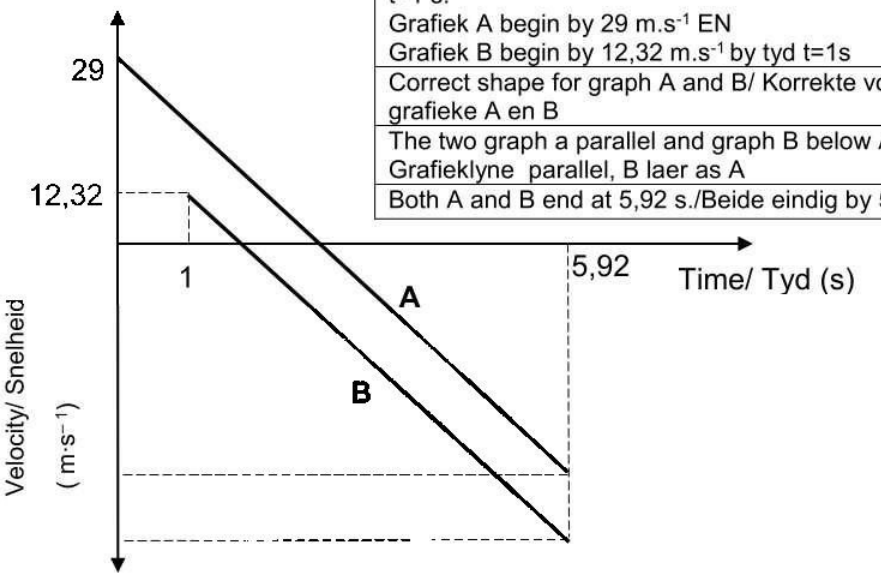
UPWARD AS POSITIVE/ OPWAARTS POSITIEF	DOWNWARD AS POSITIVE/ AFWAARTS AS POSITIEF
$\Delta y = vi\Delta t + \frac{1}{2}\ a\Delta t^2$✓ -58 ✓= $v_i(5,92-1)+\frac{1}{2}(-9,8)(5,92-1)^2$✓ v_i=12,32 $m\cdot s^{-1}$✓	$\Delta y = vi\Delta t + \frac{1}{2}\ a\Delta t^2$✓ 58✓ = $v_i(5,92-1)+\frac{1}{2}(9,8)(5,92-1)^2$✓ v_i=12,32 $m\cdot s^{-1}$✓

(4)

3.5 **POSITIVE MARKING FROM/ POSITEWE MERK VANAF 3.3 and/ en 3.4**

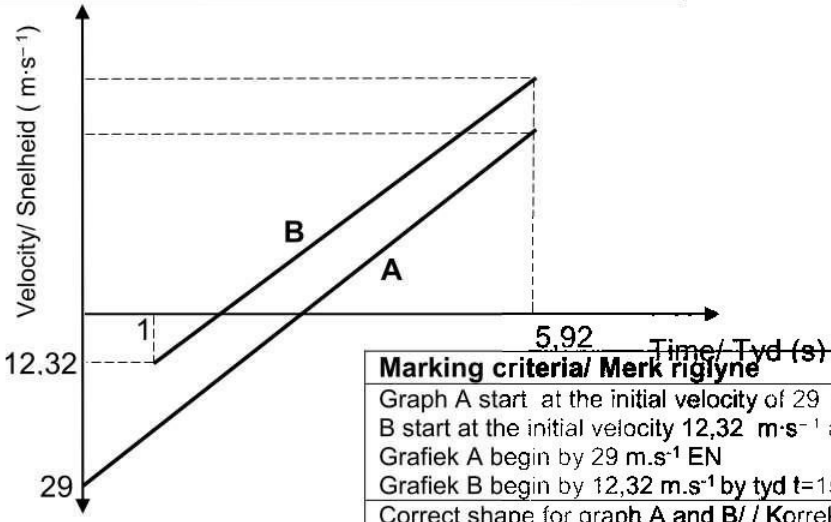
UPWARDS AS POSTIVE

OPWAARTS AS POSITIEF



Marking criteria/ Merk riglyne	
Graph A start at the initial velocity of 29 $m \cdot s^{-1}$ and Graph B start at the initial velocity 12,32 $m \cdot s^{-1}$ and at t=1 s. Grafiek A begin by 29 $m.s^{-1}$ EN Grafiek B begin by 12,32 $m.s^{-1}$ by tyd t=1s	✓
Correct shape for graph A and B/ Korrekte vorm vir grafieke A en B	✓
The two graph a parallel and graph B below A. Grafieklyne parallel, B laer as A	✓
Both A and B end at 5,92 s./Beide eindig by 5.92s	✓

DOWNWARD AS POSITIVE/ AFWAARTS AS POSITIEF



Marking criteria/ Merk riglyne	
Graph A start at the initial velocity of 29 $m \cdot s^{-1}$ and Graph B start at the initial velocity 12,32 $m \cdot s^{-1}$ and at t=1 s. Grafiek A begin by 29 $m.s^{-1}$ EN Grafiek B begin by 12,32 $m.s^{-1}$ by tyd t=1s	✓
Correct shape for graph A and B/ / Korrekte vorm vir grafieke A en B	✓
The two graph a parallel and graph B above A./ Grafieklyne parallel, B laer as A	✓
Both A and B end at 5,92 s./ Beide eindig by 5.92s	✓

(4)

QUESTION/ VRAAG 4

(2)

4.1 In an isolated system the total mechanical energy is conserved/remains constant.
Die totale meganiese energie (som van gravitasie- potensiële energie en kinetiese energie) in 'n geslote sisteem bly konstant. ✓✓

4.2 $\sum(mg + \frac{1}{2}mv^2)_i = \sum(mg + \frac{1}{2}mv^2)_f$

$0 + \frac{1}{2}\times 1,2\times v_i^2$✓ $= 1,2\times 0,65 + 0$✓

$v_i = 3,57\ m\cdot s^{-1}$✓ (4)

4.3 In an isolated system the total linear momentum is conserved/remains constant.
Die totale lineêre momentum in 'n geïsoleerde sisteem bly konstant (behoue). ✓✓ (2)

4.4 **POSITIVE MARKING FROM/ POSITIEWEE MERK VANAF 4.2**

$\sum p_i = \sum p_f$

$m_1v_{i1} + m_2v_{i2} = m_1v_{f1} + m_2v_{f2}$ } Any one/ Enige een ✓

$0,4\times v_b$✓$+0 = 0,4\times(-0,36) + 1,2\times 3,57$✓

$v_b = 10,35\ m\cdot s^{-1}$✓

(4)

[12]

QUESTION/ VRAAG 5

5.1 A bond or an atom or a group of atoms that determine(s) the (physical and chemical) properties of a group of organic compounds
Funksionele groep: 'n Binding of 'n atoom of 'n groep atome wat die fisiese en chemiese eienskappe van 'n groep organiese verbindings bepaal ✓✓

(2)

5.2.1 A✓ & C✓ (2)

5.2.2 Ketone / Ketoon✓ (1)

5.2.3 4-bromo-3,3-dimethlyhexane
4-bromo-3,3-dimetielheksaan

Marking criteria

- Correct stem i.e hexane/ Korrekte stamnaam ✓
- All substituents (bromo and dimethyl) correctly identified./ Alle substituente (bromo en dimetiel) korrek geidentifiseerd ✓
- Correct IUPAC name / Korrekte IUPAC naam. ✓

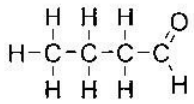
(3)

5.2.4 C_nH_{2n}✓ (1)

5.2.5 Pent-2-ene/ Pent-2-een✓✓ (2)

5.3.1 Compound with the same molecular formula but different functional groups
Organiese molekule met dieselfde molekulêre formule, maar verskillende funksionele groepe ✓✓ (2)

5.3.2 Carbonyl/ Karboniel✓ (1)

5.3.3 
✓✓
Butanal ✓

Marking criteria / Nasienriglyn
- Correct functional group/ Korrekte funksionele groep ✓
- Whole structure. Hele struktuur ✓
- Correct IUPAC name/ Korrekte IUPAC ✓

(3)

[17]

QUESTION/ VRAAG 6

6.1 Temperature at which the vapour pressure equals atmospheric pressure./✓✓
Die temperatuur waarby die dampdruk van die stof gelyk is aan atmosferiese druk. (2)

6.2 What is the relationship between chain length/ surface area/ molecular mass and boiling point of organic compound ?
Wat is die verband tussen kettinglengte/ oppervlakte/ molekulêre massa en kookpunt van organiese verbinding? ✓✓

Marking criteria/ Merk riglyne
- Must be a question/ Moet 'n vraag wees (?)
- Dependent variable / Afhanklike veranderlike
- Independent variable / Onafhanklike veranderlike

(2)

6.3
- Chain length / surface area/ molecular mass increases from A-C.
  Kettinglengte /oppervlakte/ molekulêre massa neem toe vanaf A-C ✓
- The strength of London forces/ intermolecular forces increases from A-C.
  Die sterkte van Londen-kragte/ intermolekulêre kragte neem toe vanaf A-C ✓
- More energy needed to overcome intermolecular forces.
  Meer energie word benodig om intermolekulêre kragte te oorkom ✓ (3)

6.5.2 Compound/ Verbinding C ✓ (1)

6.5.3
- Between molecules of C/ alcohol has hydrogen bonds with one site of bonding
  Tussen molekules van C/ alkohol is daar waterstofbindings met een plek van binding ✓
- Between molecules of propanoic acid/ carboxylic acids has hydrogen bonds with two sites of bonding ✓ (4)

- Intermolecular forces in propanoic acid/carboxylic acids are stronger than in compoundC /alcohol
  Die Intermolekulêre kragte in propaansuur/karboksielsure is sterker as in verbinding C/ alkohol ✓
- More energy is needed to overcome intermolecular forces in carboxylic acids/propanoic acid than alcohol/ compound C.
  Meer energie is nodig om intermolekulêre kragte in karboksielsure/ propaansuur te oorkom as alkohol/ verbinding C ✓

[12]

QUESTION/ VRAAG 7

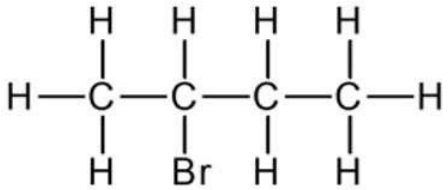
7.1.1 The chemical process/reaction in which longer chain hydrocarbon/alkane molecules are broken down to shorter (more useful) molecules.
Die chemiese proses waarin langer kettingkoolwaterstof-molekule afgebreek word in korter, meer bruikbare, molekules ✓✓ (2)

7.1.2 C_6H_{14} ✓ (1)

7.1.3 $2C_6H_{14}$ ✓+ $19O_2 \rightarrow 14H_2O + 12CO_2$ ✓ Balancing / Balansering✓ (3)

7.2.1 Addition/Addisie (Hydrohalogination/ Hidrohalogenasie)✓ (1)

7.2.2



Marking criteria/ Merk riglyne

- Correct functional group/ Korrekte funksionele groep ✓
- Whole structure./ Hele struktuur ✓

(2)

7.2.3 Substitution/ Substitusie (Hydrolysis)✓ (1)

7.2.4 HBr ✓ (1)

7.2.5 Esterification/ Esterifikasie ✓ (1)

7.2.6 Concentrated Sulphuric acid / Gekonsentreerde Swaelsuur ✓ (1)

7.2.7 Butyl ethanoate / Butieletanoaat✓✓ (2)

[15]

TOTAL/ TOTAAL: 100