education

Department of Education
FREE STATE PROVINCE

CONTROL TEST/*KONTROLE TOETS*

GRADE/*GRAAD* 12

PHYSICAL SCIENCES
FISIESE WETENSKAPPE

MARCH/*MAART* 2024

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MARKS/*PUNTE*: 100

MARKING GUIDELINE
NASIENRIGLYN

This marking guideline consists of 10 pages.
Die nasienriglyn beslaan 10 bladsye

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QUESTION 1: MULTIPLE-CHOICE QUESTIONS
VRAAG 1: VEELVULDIGE ANTWOORDVRAE

1.1 B ✓✓ (2)

1.2 A ✓✓ (2)

1.3 B ✓✓ (2)

1.4 D ✓✓ (2)

1.5 A ✓✓ (2)

1.6 C ✓✓ (2)

1.7 C ✓✓ (2)

1.8 B ✓✓ (2)

1.9 A ✓✓ (2)

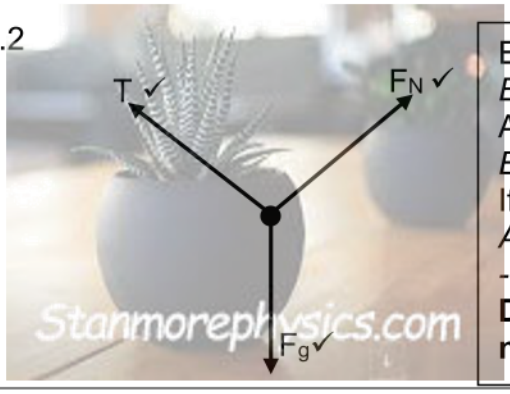
1.10 D ✓✓ (2)

[20]

QUESTION 2/*VRAAG 2*

2.1 A body will remain in its state of rest or motion at constant velocity unless a non-zero resultant/net force acts on it.✓✓/ *'n Liggaam sal in sy toestand van rus of beweging teen konstante snelheid bly, tensy 'n nie-nul resulterende/netto krag daarop inwerk* (2)

2.2



Each arrow plus label: One mark /
Elke pyl plus byskrif: Een punt
Any other additional force(s): -1 /
Enige ander addisionele krag(te): -1
If force(s) do not make contact with body: -1 /
As krag(te) nie kontak met liggaam maak nie: -1
Do Not accept components for Fg/ Anvaar nie omponente nie vir F_g

ACCEPTED LABELS/*AANVAARBARE BYSKRIFTE*	
T	F_T, Tension/*Spanning*
F_N	N, Normal force, Normal/*Normaalkrag, Normaal*
F_g	w, 147 N

NB: Accept a Force diagram. / *Aanvaar 'n kragtediagram.*

(3)

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2.3

OPTION 1:/*OPSIE 1*

For 10 kg: Up +ve/*Vir 10 kg: Op +*

$F_{net}=ma$✓

$T + F_g=ma$

$T - 10\times9,8$✓$=0$

$T=98$ N

For 15 kg: Down the incline +ve

Vir 15 kg: Af langs die helling +

$F_{net}=ma$

$- T+mg\sin\theta =ma$

$- 98+15\times9,8\sin\theta$✓$=0$

$\theta=41,81°$✓

✓ On either one/*Enige een*

OPTION 2:/*OPSIE 2*

For 10 kg: Up -ve/ *Vir 10 kg: Op -*

$F_{net}=ma$✓

$T + F_g=ma$

$-T + 10\times9,8$✓$=0$

$T=98$ N

For 15 kg: Down the incline -ve

Vir 15 kg: Af langs die helling -

$F_{net}=ma$

$T-mg\sin\theta =ma$

$98-15\times9,8\sin\theta$✓ $=0$

$\theta=41,81°$✓

✓ On either one/ *Enige een*

(5)

[10]

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QUESTION 3/*VRAAG 3*

3.1 The product of the resultant/net force acting on an object ✓and the time the net force acts on the object.✓ / *Die produk van die resulterende/netto krag wat op 'n voorwerp inwerk✓en die tyd wat die netto krag op die voorwerp inwerk.* (2)

3.2 6 kg·m·s^{-1}✓ to the right/*na regs*✓ (2)

3.3 **POSITIVE MARKING FROM QUESTION 3.2:/ *POSITIEF NASIEN VANAF VRAAG 3.2***

OPTION/*OPSIE* 1:Right +ve/*Regs+*	**OPTION 2/*OPSIE 2*: Left +ve/*Links+***
$\Delta p = m(v_f - v_i)$✓ 6✓$= 0,5(v_f - 0)$✓ $v_f = 12$ m·s^{-1} to the right✓	$\Delta p = m(v_f - v_i)$✓ $-6 = 0,5(v_f - 0)$✓ $v_f = -12$ m·s^{-1} $v_f = 12$ m·s^{-1} to the right/*na links*✓ (4)

3.4 A system on which the net external force is zero.✓✓/*'n Sisteem waar die netto eksterne krag nul is* (2)

3.5 **POSITIVE MARKING FROM QUESTION 3.3:/ *POSITIEWE NASIEN UIT VRAAG 3.3*:**

OPTION 1/*OPSIE 1*: **Right +ve/*Regs+***	**OPTION 2/*OPSIE 2*:** **Left +ve/*Links+***
$\Sigma p_i = \Sigma p_f$✓ $m_b v_{ib} + m_c v_{ic} = m_b v_{fb} + m_c v_{fc}$ $0,5\times12 + 0,9\times-10$ ✓$= 0,5\times-2 + 0,9v_{fc}$✓ $v_{fc} = -2,22$ m·s^{-1} ∴speed/spoed = 2,22 m·s^{-1}✓	$\Sigma p_i = \Sigma p_f$✓ $m_b v_{ib} + m_c v_{ic} = m_b v_{fb} + m_c v_{fc}$ $0,5\times-12 + 0,9\times10$ ✓$= 0,5\times2 + 0,9v_{fc}$✓ $v_{fc} = 2,22$ m·s^{-1} ∴speed/spoed =2,22 m·s^{-1}✓

(4)

3.6 **POSITIVE MARKING FROM QUESTIONS 3.3 & 3.5:**
NB: If a learner starts with $\Sigma K_i = \Sigma K_f$, give a maximum of 3/5.
POSITIEWE NASIEN VANUIT VRAE 3.3 & 3.5:
NB: As 'n leerder met $\Sigma K_i = \Sigma K_f$ begin, gee 'n maksimum van 3/5.

$\Sigma K_f = \frac{1}{2}m_b v_{ib}^2 + \frac{1}{2}m_c v_{ic}^2$ ✓
$= \frac{1}{2}\times0,5\times12^2 + \frac{1}{2}\times0,9\times10^2$✓
$= 81$ J

$\Sigma K_f = \frac{1}{2}m_b v_{fb}^2 + \frac{1}{2}m_c v_{fc}^2$
$= \frac{1}{2}\times0,5\times2^2 + \frac{1}{2}\times0,9\times2,22^2$✓
$= 3,22$ J

$\Sigma K_i \neq \Sigma K_f$ ✓
∴The collision is inelastic✓ / *Die botsing is nie-elasties* (5)
[19]

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QUESTION 4/*VRAAG 4*

4.1 NO / *NEE* ✓ (1)

4.2 Gravitational force is NOT the only force acting on the package.✓/ *Gravitasiekrag is NIE die enigste krag wat op die pakkie inwerk nie*. (1)

4.3 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)

4.4.1 10 $m \cdot s^{-1}$✓ (1)

4.4.2 9,8 $m \cdot s^{-2}$✓downwards✓/*afwaarts* (2)

4.5.1 **POSITIVE MARKING FROM QUESTION 4.4.1/ *POSITIEWE NASIEN VANUIT VRAAG 4.4.1***

OPTION 1/*OPSIE 1*:	**OPTION 2/*OPSIE 2*:**
Up +ve/*Op +*	**Up -ve/*Op -***
$v_f = v_i + a\Delta t$✓	$v_f = v_i + a\Delta t$✓
$0 = 10 + (-9,8)\Delta t$✓	$0 = -10 + 9,8\Delta t$✓
$t = 1,02$ s✓	$t = 1,02$ s✓

(3)

4.5.2 **POSITIVE MARKING FROM QUESTION 4.4.1: / *POSITIEWE NASIEN VANUIT VRAAG 4.4.1***

OPTION 1/*OPSIE 1*:	**OPTION 2/*OPSIE 2*:**
Up +ve/*Op +*	**Up -ve/*Op -***
$v_f = v_i + a\Delta t$✓	$v_f = v_i + a\Delta t$✓
$= 10 + (-9,8) \times 8$✓	$= -10 + 9,8 \times 8$✓
$= -68,4\ m \cdot s^{-1}$	$= 68,4\ m \cdot s^{-1}$
speed/spoed$= 68,4\ m \cdot s^{-1}$✓	speed/spoed$= 68,4\ m \cdot s^{-1}$✓
OPTION 3/*OPSIE 3*:	**OPTION 4/*OPSIE 4*:**
Up +ve/*Op +*	**Up -ve/*Op -***
$v_f = v_i + a\Delta t$✓	$v_f = v_i + a\Delta t$✓
$= 0 + (-9,8) \times (8-1,02)$✓	$= 0 + 9,8 \times (8-1,02)$✓
$= -68,4\ m \cdot s^{-1}$	$= 68,4\ m \cdot s^{-1}$
speed/spoed$= 68,4\ m \cdot s^{-1}$✓	speed/spoed$= 68,4\ m \cdot s^{-1}$✓
OPTION 5/*OPSIE 5*:	**OPTION 6/*OPSIE 6*:**
Up +ve/*Op +*	**Up -ve/*Op -***
$v_f = v_i + a\Delta t$✓	$v_f = v_i + a\Delta t$✓
$= -10 + (-9,8) \times (8-2,04)$✓	$= 10 + (9,8) \times (8-2,04)$✓
$= -68,408\ m \cdot s^{-1}$	$= 68,408\ m \cdot s^{-1}$
speed/spoed$= 68,408\ m \cdot s^{-1}$✓	speed/spoed$= 68,408\ m \cdot s^{-1}$✓

(3)

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4.5.3 **POSITIVE MARKING FROM QUESTION 4.4.1 & 4.5.2:/ *POSITIEWE NASIEN VANUIT VRAAG 4.4.1 & 4.5.2:***

OPTION 1: Up +ve/ *OPSIE 1: OP +*

$v_f = v_i + a\Delta t$
$= 10 - 9{,}8 \times (8 - 2)$✓
$= -48{,}8\ m \cdot s^{-1}$

$v_f^2 = v_i^2 + 2a\Delta y$✓
$-68{,}4^2$ ✓$= -48{,}8^2 + 2(-9{,}8)\Delta y$✓
$\Delta y = -117{,}2$ m
∴displacement = 117,2 m✓ down✓
∴*verplasing* = 117,2 m✓ af✓

$\Delta y = v_i\Delta t + \frac{1}{2}a\Delta t^2$✓
$= -48{,}8 \times 2$ ✓ $+ \frac{1}{2} \times (-9{,}8)(2^2)$✓
$= -117{,}2$ m
∴displacement (Δy) = 117,2 m✓ down✓
∴*verplasing* = 117,2 m✓ af✓

$\Delta y = \left(\frac{v_f + v_i}{2}\right)\Delta t$✓
$= \left(\frac{-68{,}4 - 48{,}8}{2}\right)$ ✓✓×2✓
$= -117{,}2$ m
∴displacement = 117,2 m✓ down✓
∴*verplasing* = 117,2 m✓ af✓

Area (Trapezium)$= \frac{1}{2}(a + b)h$✓
$= \frac{1}{2}(-68{,}4 - 48{,}8)$✓✓×2✓
$= -117{,}2$ m
∴displacement = 117,2 m✓ down✓
∴*verplasing* = 117,2 m✓ af✓

OPTION 2: Up -ve / *OPSIE 2: Op -*

$v_f = v_i + a\Delta t$
$= -10 + 9{,}8 \times (8 - 2)$✓
$= 48{,}8\ m \cdot s^{-1}$

$v_f^2 = v_i^2 + 2a\Delta y$✓
$68{,}4^2$ ✓$= 48{,}8^2 + 2(9{,}8)\Delta y$✓
$\Delta y = 117{,}2$ m
∴displacement = 117,2 m✓ down✓
∴*verplasing* = 117,2 m✓ af✓

$\Delta y = v_i\Delta t + \frac{1}{2}a\Delta t^2$ ✓
$= 48{,}8 \times 2$ ✓ $+ \frac{1}{2} \times (9{,}8)(2^2)$ ✓
$= 117{,}2$ m
∴displacement (Δy) = 117,2 m✓ down✓
∴*verplasing* = 117,2 m✓ af✓

$\Delta y = \left(\frac{v_f + v_i}{2}\right)\Delta t$✓
$= \left(\frac{68{,}4 + 48{,}8}{2}\right)$ ✓✓×2✓
$= 117{,}2$ m
∴displacement = 117,2 m✓ down✓
∴*verplasing* = 117,2 m✓ af✓

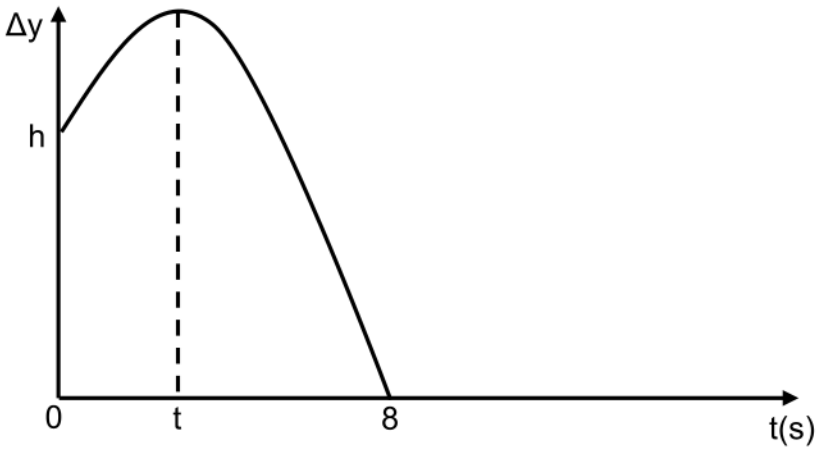
Area (Trapezium)$= \frac{1}{2}(a + b)h$✓
$= \frac{1}{2}(68{,}4 + 48{,}8)$✓✓×2✓
$= 117{,}2$ m
∴displacement = 117,2 m✓ down✓
∴*verplasing* = 117,2 m✓ af✓

(6)

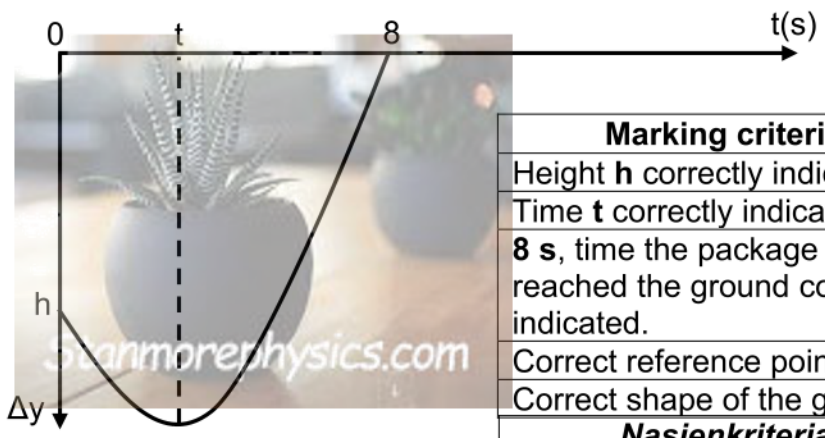
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4.6

Up: + ve/ *Op +*



Up: - ve / *Op -*



Marking criteria	Mark
Height **h** correctly indicated.	✓
Time **t** correctly indicated.	✓
8 s, time the package reached the ground correctly indicated.	✓
Correct reference point used.	✓
Correct shape of the graph.	✓

Nasienkriteria	***Punt***
Hoogte h korrek aangedui.	✓
Tyd t korrek aangedui.	✓
***8 s**, wanneer die pakkie die grond bereik korrek aangedui.*	✓
Korrekte verwysingspunt gebruik.	✓
Korrekte vorm van die grafiek.	✓

NB: If ground is not used as the reference point, max 4/5 can be awarded./ *Indien die grond nie as verwysingspunt gebruik word nie, kan maksimum 4/5 toegeken word.*

(5)
[24]

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QUESTION 5/*VRAAG 5*

5.1 A series of organic compounds that can be described by the same general formula✓✓ OR 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 waarin een lid van die volgende verskil met 'n CH_2-groep.* (2)

5.2.1 Aldehydes.✓ / *Aldehiede* (1)

5.2.2 (carbon-carbon) triple bond✓/ *(koolstof-koolstof) trippel binding* (1)

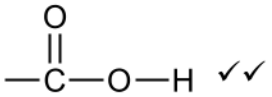
5.2.3 A OR/*OF* C ✓ (1)

5.3.1 5,6-dimethylhept-2-yne OR 5,6-dimethyl-2-heptyne / *5,6-dimetielhept-2-yn OF 5,6-dimetiel-2-heptyn*

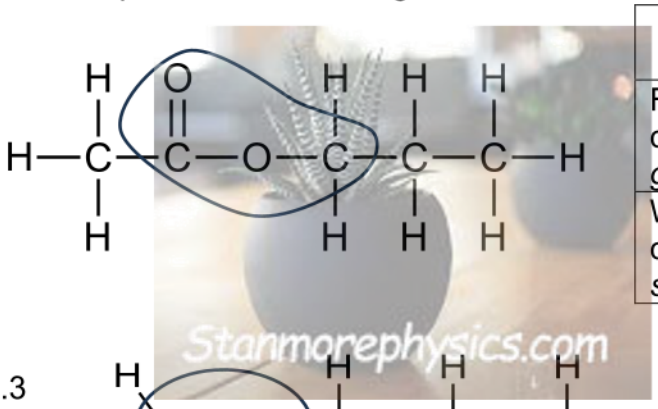
CRITERIA/KRITERIA	
Hept-2-yne/2-heptyne/ *Hept-2-yn/2-heptyn*	✓
Dimethyl/*Dimetiel*	✓
Whole name correct/ *Hele naam korrek*	✓

(3)

5.3.2 Butanone ✓✓ OR 2-butanone OR butan-2-one / *Butanoon OF 2-butanoon OF butan-2-oon* (2)

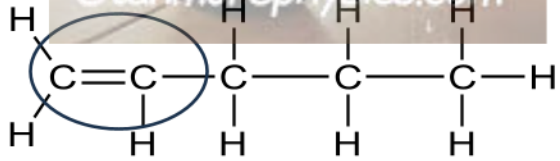
5.4.1  ✓✓ (2)

5.4.2 Compound D./*Verbinding D*

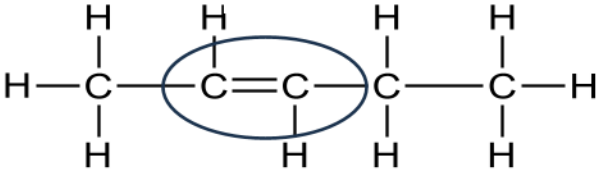


MARKING CRITERIA *NASIENKRITERIA*	
Functional group correct./ *Funksionele groep korrek*	✓
Whole structure correct./*Hele struktuur korrek*	✓

(2)

5.4.3 

OR/*OF*



MARKING CRITERIA *NASIENKRITERIA*	
Functional group correct./ *Funksionele groep korrek*	✓
Whole structure correct./*Hele struktuur korrek*	✓

(2)
[16]

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QUESTION 6/*VRAAG 6*

6.1 The temperature at which the solid and liquid phases of a substance are at equilibrium.✓✓/ Die temperatuur waarteen die *vaste en vloeibare fases van 'n stof in ewewig is*. (2)

6.2
- Butane has less branches/larger surface area than methylpropane ✓
- Butane consists of stronger intermolecular forces than methylpropane.✓
- More energy is needed to overcome the strength of intermolecular forces in butane than in methylpropane.✓

OR

- Methylpropane has more branches/ smaller surface than butane.
- Methylpropane consists of weaker intermolecular forces than butane.
- Less energy is needed to overcome the strength of intermolecular forces in methylpropane than in butane.

- *Butaan het minder takke/groter oppervlakte as metielpropaan*
- *Butaan het sterker intermolekulêre kragte as metielpropaan.*
- *Meer energie is nodig om die intermolekulêre kragte te oorkom in butaan as in metielpropaan.*

OF

- *Metielpropaan het meer takke/ kleiner oppervlak as butaan.*
- *Metielpropaan het swakker intermolekulêre kragte as butaan.*
- *Minder energie is nodig om die intermolekulêre kragte te oorkom in metielpropaan as in butaan.* (3)

6.3 Liquid✓/*Vloeistof* (1)

6.4 Higher than./*Hoër as*✓ (1)

6.5
- In addition to London forces and dipole-dipole forces, propan-1-ol consist of one site of hydrogen bonding✓ and ethanoic acid consist of two sites of hydrogen bonding.✓
- Ethanoic acid consist of stronger intermolecular forces than propan-1-ol.✓
- More energy is needed to overcome the strength of intermolecular forces in ethanoic acid than in propan-1-ol/boiling point of ethanoic acid is greater than that of propan-1-ol.✓

OR

- In addition to London forces and dipole-dipole forces, propan-1-ol consist of one site of hydrogen bonding and ethanoic acid consist of two sites of hydrogen bonding.
- Propan-1-ol consist of weaker intermolecular forces than ethanoic acid.
- Less energy is needed to overcome the strength of intermolecular forces in propan-1-ol than in ethanoic acid/ boiling point of propan-1-ol is smaller than that of ethanoic acid.

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- *Benewens Londen-kragte en dipool-dipoolkragte het propan-1-ol een plek van vir 'n waterstofbinding* ✓ *en etanoësuur twee plekke vir 'n waterstofbinding.* ✓
- *Etanoësuur besit sterker intermolekulêre kragte as propan-1-ol.*
- *Meer energie is nodig om die intermolekulêre kragte in etanoësuur te oorkom as in propan-1-ol/kookpunt van etanoësuur is groter as dié van propaan-1-ol.*

OF

- *Benewens Londen-kragte en dipool-dipoolkragte, het propan-1-ol een plek vir 'n waterstofbinding en etanoësuur besit twee plekke vir 'n waterstofbinding.*
- *Propaan-1-ol besit swakker intermolekulêre kragte as etanoësuur.*
- *Minder energie is nodig om die intermolekulêre kragte in propan-1-ol te oorkom as in etanoësuur/kookpunt van propan-1-ol is kleiner as dié van etanoësuur.*

(4)
[11]
GRAND TOTAL: 100

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