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education

Department of Education
FREE STATE PROVINCE

CONTROL TEST

GRADE 12

PHYSICAL SCIENCES

TIME: 2 HOURS

This paper consists of 12 pages and one information sheet.

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INSTRUCTIONS AND INFORMATION

1. Write your name and other information in the appropriate spaces on the ANSWER BOOK.
2. This question paper consists of 6 questions. Answer ALL questions in the ANSWER BOOK.
3. Start EACH question on a NEW page in the ANSWER BOOK.
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 pocket 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 where applicable.
11. Give brief motivations, discussions, et cetera where required.
12. Write neatly and legibly.

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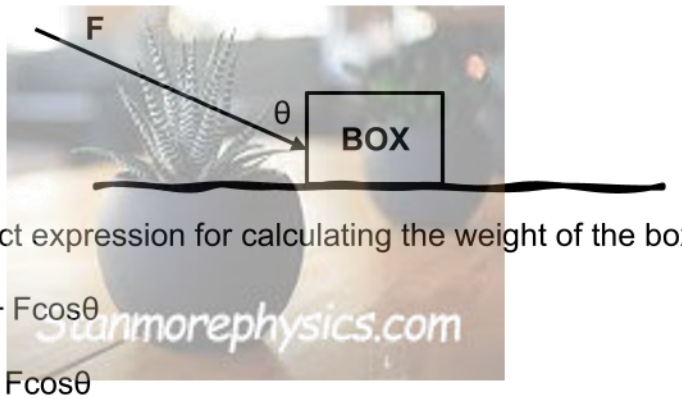
QUESTION 1: MULTIPLE-CHOICE QUESTIONS

Four options are provided as possible answers to the following questions. Each question has only ONE correct answer. Choose the answer and write down only the letter A, B, C or D next to the question number (1.1–1.10) in your ANSWER BOOK.

1.1 The diagram below shows the box being pushed along a rough horizontal surface by the force **F** which makes an angle of θ with the vertical.



The correct expression for calculating the weight of the box is:

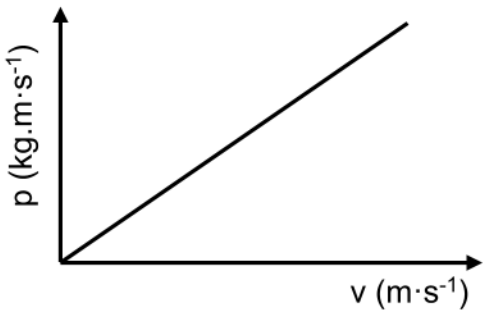
A N + Fcosθ

B N - Fcosθ

C N + Fsinθ

D N - Fsinθ (2)

1.2 The relationship between the velocity and momentum of an object is represented through the sketch graph below.



Which physical quantity is represented by the gradient of the above graph?

A Mass

B Impulse

C Acceleration

D Displacement (2)

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1.3 The rate of change in momentum is equal to …

A impulse.

B net force.

C momentum.

D change in momentum. (2)

1.4 Which one of the following combinations in the table best describes the effect of the arrestor beds on the force and the velocity of the truck during an emergency stop?

	FORCE	VELOCITY
A	Increase	Increase
B	Increase	Decrease
C	Decrease	Increase
D	Decrease	Decrease

(2)

1.5 Stone **X** is thrown vertically upwards with speed ***v*** from the top of a building. At the same time, a second stone **Y** is thrown vertically downwards with the same speed ***v*** from the top of the same building. Air resistance is negligible. Which one of the following statements is true about the speeds at which the stones hit the ground?

A The speed of stone **X** is equal to the speed of stone **Y**.

B The speed of stone **X** is greater than the speed of stone **Y**.

C The speed of stone **Y** is greater than the speed of stone **X**.

D The speed of stone **X** can only be compared to the speed of stone **Y** when the height of the building is known. (2)

1.6 When the projectile approaches its maximum height, its velocity will ...

A be zero.

B increase.

C decrease.

D remain constant. (2)

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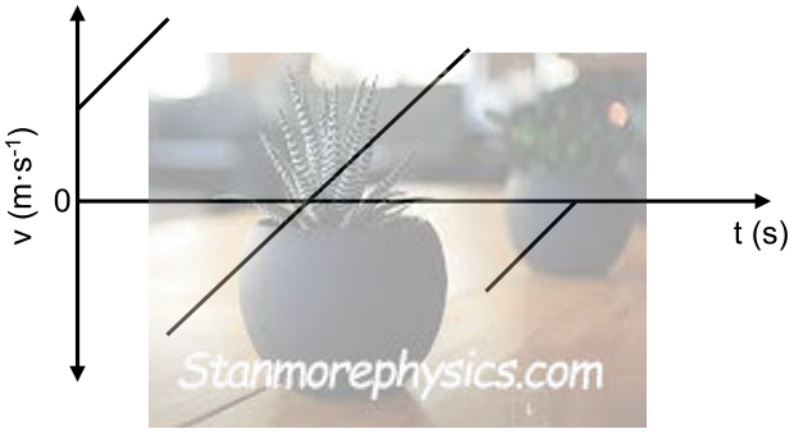
1.7 Motion of a projectile which bounces off the floor several times is represented through a velocity versus time graph below.



Which of the statements below are INCORRECT about the motion of the projectile?

(i) Initially the projectile goes upwards.

(ii) Projectile bounces twice off the floor.

(iii) Initial velocity of the projectile is zero.

(iv) Upward motion was taken as positive.

A i and ii only

B i, ii, iii and iv

C i, iii and iv only

D ii, iii and iv only (2)

1.8 Which one of the following is the correct condensed structural formula of 2,3-dichloro-2-methylpentane?

A $CH_3CH(CH_3)CC\ell_2CH_2CH_3$

B $CH_3CC\ell(CH_3)CHC\ell CH_2CH_3$

C $CH_3CC\ell_2CH(CH_3)CH_2CH_3$

D $CH_3CH_2CH_2CHC\ell CHC\ell CH_3$ (2)

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1.9 Which one of the following molecular formulae represents an alkyne?

A C_6H_{10}

B C_6H_{12}

C C_6H_{14}

D C_7H_{14} (2)

1.10 Which one of the following organic compounds has the HIGHEST boiling point?

A butane

B butanone

C butan-1-ol

D butanoic acid (2)

[20]

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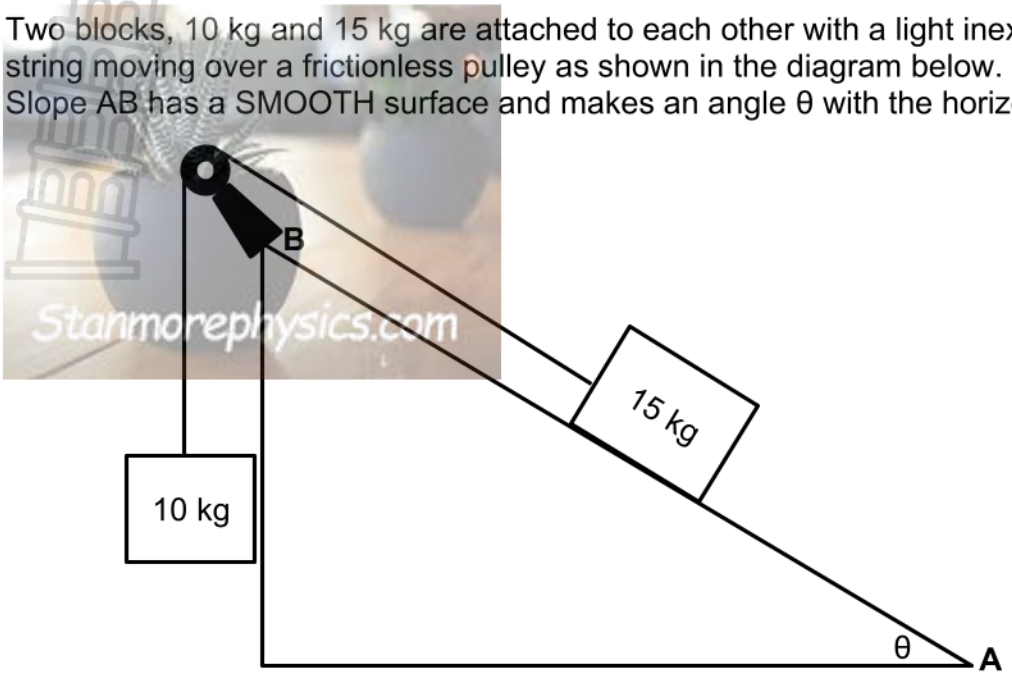
QUESTION 2

Two blocks, 10 kg and 15 kg are attached to each other with a light inextensible string moving over a frictionless pulley as shown in the diagram below.
Slope AB has a SMOOTH surface and makes an angle θ with the horizontal.



Both blocks are stationary.

2.1 State Newtons' first law of motion. (2)

2.2 Draw the free-body diagram showing ALL the forces acting on the 15 kg block. (3)

2.3 Calculate angle θ. (5)
[10]

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QUESTION 3

A metal ball **A**, with mass 750 g, rolls horizontally in a straight line towards a stationary metal ball **B**, with mass 500 g, as shown below. Metal ball **A** travels at a constant speed of 5 m·s^{-1} before colliding with metal ball **B**. Due to the collision, metal ball **A** experiences an impulse of 6 N·s to the left.
The system is *isolated*.

3.1 Define the term *impulse*. (2)

3.2 Write down the magnitude and direction of the change in momentum experienced by metal ball B due to its collision with metal ball A. (2)

3.3 Calculate the velocity of the metal ball B immediately after collision. (4)

After the collision with metal ball **A**, metal ball **B** collide with another metal ball **C**, with mass 900 g, which is travelling at 10 m·s^{-1} to the left. Metal ball **B** moves at 2 m·s^{-1} to the left after the collision.

3.4 What does it mean that the system is *isolated*? (2)

3.5 Calculate the speed of metal ball C after the collision. (4)

3.6 Use a calculation to prove whether the collision between metal ball B and metal ball C is elastic or inelastic collision. (5)
[19]

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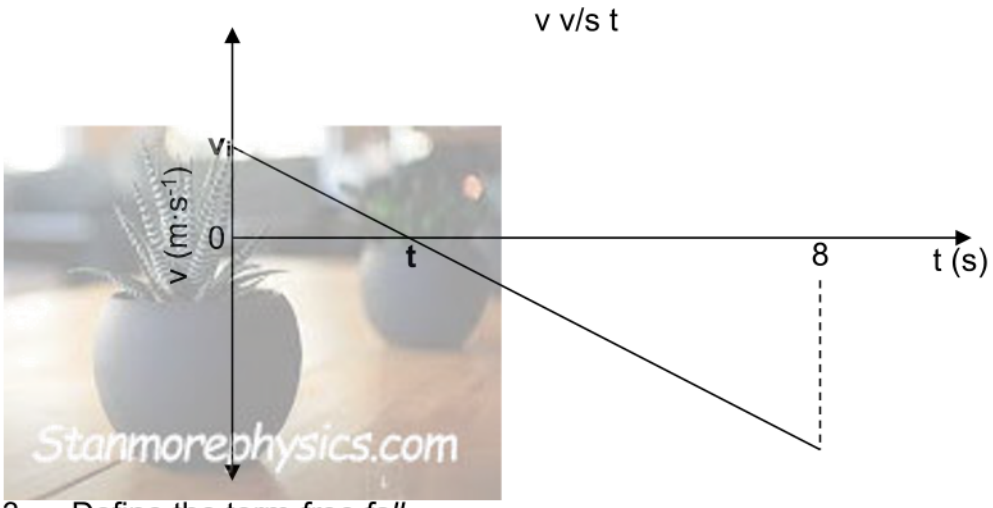
QUESTION 4

A helicopter picks up a package through a cord from the ground as shown below. The package is then pulled up at CONSTANT VELOCITY of 10 $m \cdot s^{-1}$.

4.1 Will the package be considered a projectile while being pulled up? Write down YES or NO. (1)

4.2 Give a reason for your answer to question 4.1. (1)

When the package reaches a certain height ***h***, the cord break and the package undergo *free fall*. The motion of the package after the cord breaks until it hits the ground is represented through the velocity-time graph below.



4.3 Define the term *free fall*. (2)

4.4 Write down the following:

4.4.1 value of v_i. (1)

4.4.2 magnitude and direction of the acceleration of the package at time t. (2)

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4.5 Calculate:

4.5.1 time *t*. (3)

4.5.2 the speed the package hits the ground with. (3)

4.5.3 the displacement the package covered in the last 2 s of its fall. (6)

4.6 Draw a displacement-time graph for the motion of the package from the moment the cord breaks until it reaches the ground.
TAKE THE GROUND AS THE REFERENCE POINT.

Indicate the following on your graph:

- Height ***h*** from which the cord brakes.
- Time t.
- The time the package reaches the ground. (5)

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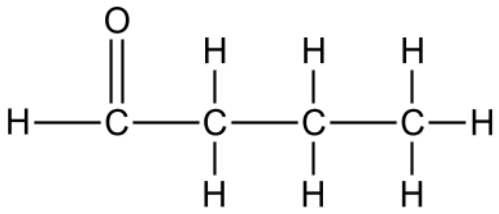
QUESTION 5

The letters A to D represent four organic compounds from DIFFERENT homologous series.

A	$CH(CH_3)_2CH(CH_3)CH_2CCCH_3$	**B**	
C	C_5H_{10}	**D**	Propyl ethanoate

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5.1 Define the term homologous series. (2)

5.2 Write down the:

5.2.1 NAME of the homologous series to which compound B belongs. (1)

5.2.2 NAME of the functional group of compound A. (1)

5.2.3 Letter representing the UNSATURATED hydrocarbon. (1)

5.3 Write down the IUPAC name of:

5.3.1 Compound A. (3)

5.3.2 FUNCTIONAL isomer of compound B. (2)

5.4 Write down the STRUCTURAL FORMULA of:

5.4.1 The FUNCTIONAL group of the functional isomer of compound D. (2)

5.4.2 Compound D. (2)

5.4.3 STRAIGHT chain isomer of compound C. (2)
[16]

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QUESTION 6

A group of learners investigate the effect of different factors on the melting points of different organic molecules of comparable molecular mass. The results from their investigation are shown in the table below.

ORGANIC MOLECULE.	MOLECULAR MASS ($g.mol^{-1}$)	MELTING POINT.
Butane	58	-138°C
Methylpropane	58	-159,6°C
Propan-1-ol	60	-126°C
Ethanoic acid	60	16°C

Use the information in the above table to answer the questions below:

6.1 Define the term *melting point*. (2)

6.2 Fully explain the difference in the melting points of butane and methylpropane. (3)

6.3 Is ethanoic acid a SOLID or LIQUID at room temperature? (1)

6.4 How does the vapour pressure of propan-1-ol compare to that of ethanoic acid?
Write down LOWER THAN, HIGHER THAN or EQUAL TO. (1)

6.5 Fully explain the answer to question 6.4. (4)

[11]

GRAND TOTAL: 100

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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 gravitasiekonstante*	G	6,67 x 10^{-11} $N{\cdot}m^2{\cdot}kg^2$
Radius of the earth *Radius van die aarde*	R_E	6,38 x 10^6 m
Mass of the earth *Massa van die aarde*	M_E	5,98 x 10^{24} kg
Speed of light in a vacuum *Spoed van lig in 'n vakuum*	c	3,0 x 10^8 $m{\cdot}s^{-1}$
Planck's constant *Planck se konstante*	h	6,63 x 10^{-34} J·s
Coulomb's constant *Coulomb se konstante*	k	9,0 x 10^{-9} $N{\cdot}m^2{\cdot}C^{-2}$
Charge of electron *Lading op elektron*	e	-1,6 x10^{-19} C
Electron mass *Elektronmassa*	m_e	9,11 x 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* $g = G\frac{M}{r^2}$

WORK, ENERGY AND POWER/*ARBEID, ENERGIE EN DRYWING*

$W = F\Delta x\cos\theta$	$U = mgh$ or/*of* $E_p = mgh$
$K = \frac{1}{2}mv^2$ or/*of* $E_k = \frac{1}{2}mv^2$	$W_{net} = \Delta K$ or/*of* $W_{net} = \Delta E_k$ $\Delta K = K_f - K_i$ or/*of* $\Delta E_k = E_{kf} - E_{ki}$
$W_{nc} = \Delta K + \Delta U$ or/*of* $W_{nc} = \Delta E_k + \Delta E_p$	$P = \frac{W}{\Delta t}$
$P_{ave} = Fv_{ave}$ / $P_{gemid} = Fv_{gemid}$	

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Department of Education
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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)

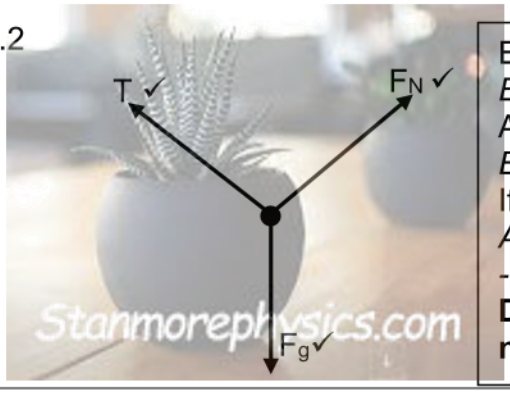
1.10 D ✓✓ (2)

[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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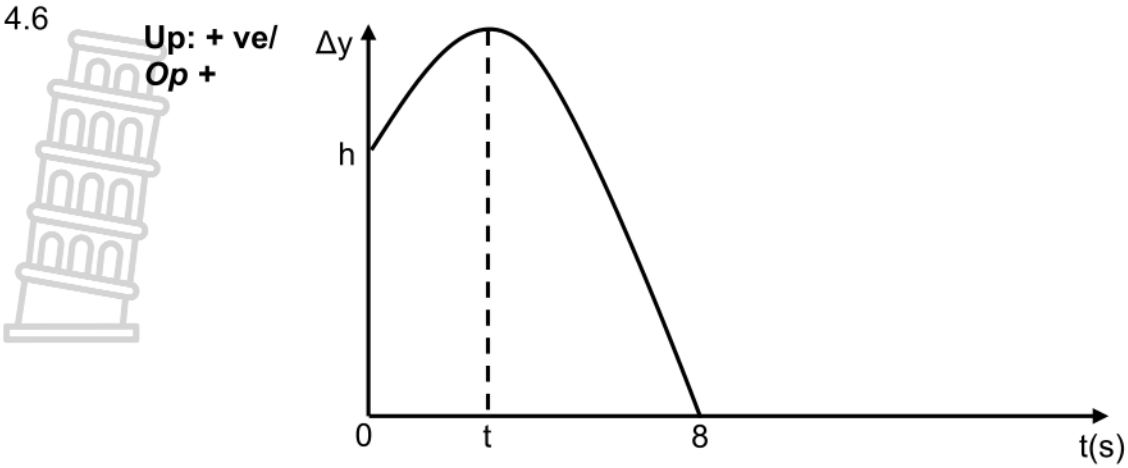
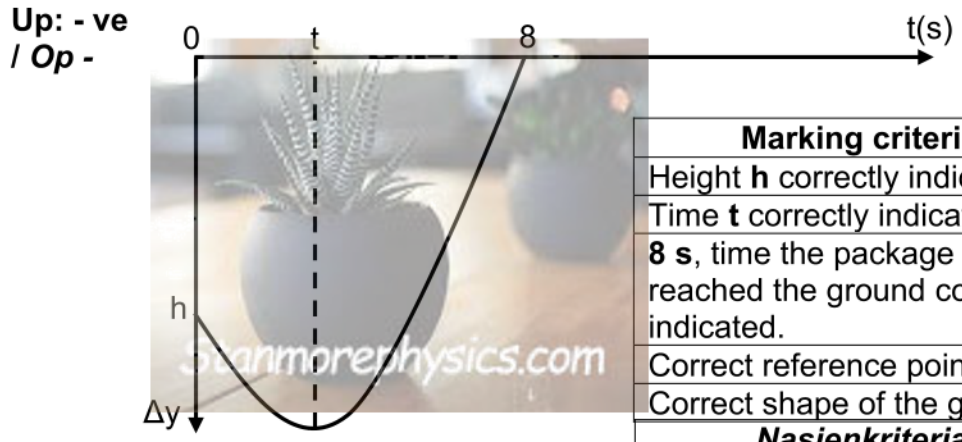
4.6





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)

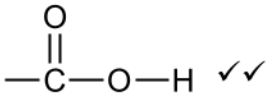
5.2.3 A OR/*OF* C ✓ (1)

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*

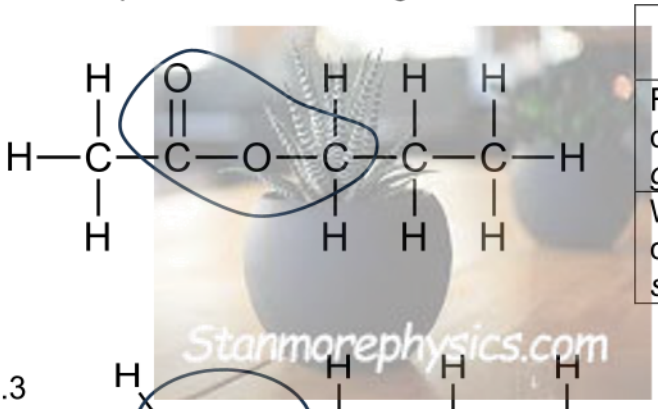
CRITERIA/KRITERIA	
Hept-2-yne/2-heptyne/ *Hept-2-yn/2-heptyn*	✓
Dimethyl/*Dimetiel*	✓
Whole name correct/ *Hele naam korrek*	✓

(3)

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

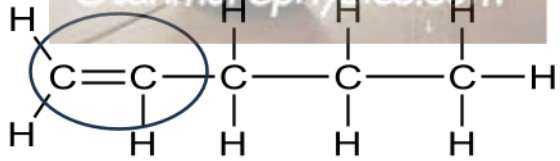
5.4.1  ✓✓ (2)

5.4.2 Compound D./*Verbinding D*

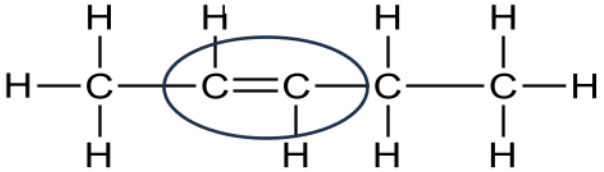


MARKING CRITERIA *NASIENKRITERIA*	
Functional group correct./ *Funksionele groep korrek*	✓
Whole structure correct./*Hele struktuur korrek*	✓

(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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