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**GRADE 12 / GRAAD 12**

**PHYSICAL SCIENCES  
FISIESE WETENSKAPPE**

**MEMORUNDUM**

**MARCH 2023 / MAART 2023**

**MARKS: 100 / PUNTE: 100**

**TIME: 2 HOURS / TYD: 2 UUR**

**This memorandum consists of 9 pages.  
Hierdie memorandum bestaan uit 9 bladsye.**

**QUESTION 1/VRAAG 1**

- 1.1 D✓✓ 1.2 C✓✓ 1.3 A✓✓ 1.4 C✓✓ 1.5 C✓✓  
1.6 D✓✓ 1.7 D✓✓ 1.8 C✓✓ 1.9 B✓✓ 1.10 A✓✓

[20]

**QUESTION 2/VRAAG 2**

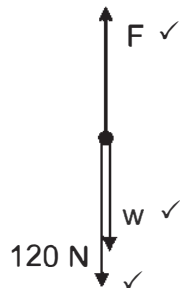
2.1 **Marking criteria/Nasienkriteria**

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

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

Wanneer 'n netto krag op 'n voorwerp inwerk, sal die voorwerp in die rigting van die krag versnel. Die versnelling is direk eweredig aan die krag en omgekeerd eweredig aan die massa van die voorwerp. ✓✓ (2)

2.2



(3)

**Accepted labels/Aanvaarde benoemings**

w	$F_g/F_w$ /weight/mg/gravitational force/ $F_{\text{earth on 4kg block}}$ $F_g/F_w$ /gewig/mg/gravitasie krag/ $F_{\text{aarde op 4kg blok}}$
---	--

T	FT/Ft/spanning/ $F_s$ FT/Ft/spanning/ $F_s$
---	--

F	$F_{\text{Applied}}$ / $F_{\text{toegepas}}$
---	--

**Notes/Aantekeninge**

- Mark awarded for label and arrow./Punt toegeken vir benoeming en pyltjie.
- Do not penalise 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  $2/3$
- If everything correct, but no arrows/Indien alles korrek, maar geen pyltjies: Max/Maks  $2/3$
- If force(s) do not make contact with the dot/Indien krag(te) nie met die kolletjie kontak maak nie: Max/Maks  $2/3$

2.3 UPWARDS AS POSITIVE/OPWAARTS AS POSITIEF

<p><b>For the 8 kg block/Vir die 8 kg blok</b></p> $F_{\text{net}} = ma \checkmark$ $T - w = ma$ $120 - (8 \times 9,8) = 8a \checkmark$ $a = 5,2 \text{ m} \cdot \text{s}^{-2} \quad \xrightarrow{+}$	<p><b>For the 4 kg block/Vir die 4 kg blok</b></p> $F_{\text{net}} = ma$ $F - T - w = ma$ $F - 120 - (4 \times 9,8) \checkmark = 4(5,2) \checkmark$ $F = 180 \text{ N} \checkmark$
---	--

DOWNWARDS AS POSITIVE/AFWAARTS AS POSITIEF

<p><b>For the 8 kg block/Vir die 8 kg blok</b></p> $F_{\text{net}} = ma \checkmark$ $-T + w = ma$ $-120 + (8 \times 9,8) = 8a \checkmark$ $a = -5,2 \text{ m} \cdot \text{s}^{-2} \quad \xrightarrow{+}$	<p><b>For the 4 kg block/Vir die 4 kg blok</b></p> $F_{\text{net}} = ma$ $-F + T + w = ma$ $-F + 120 + (4 \times 9,8) \checkmark = 4(-5,2) \checkmark$ $F = 180 \text{ N} \checkmark$
--	---

(5)  
[10]

QUESTION 3/VRAAG 3

3.1 Right as positive/Reg as positief

$$\Delta p_A = m(v_f - v_i) \checkmark$$

$$= 0,75(-2,5 - 4) \checkmark$$

$$= -4,875 \text{ kgm} \cdot \text{s}^{-1}$$

$\therefore \Delta p = 4,875 \text{ kgm} \cdot \text{s}^{-1} \checkmark$  left/ in opposite direction.  $\checkmark$   
links/ in teenoorgestelde rigting.

Left as positive/Links as positief

$$\Delta p_A = m(v_f - v_i) \checkmark$$

$$= 0,75[2,5 - (-4)] \checkmark$$

$$= 4,875 \text{ kgm} \cdot \text{s}^{-1}$$

$\therefore \Delta p = 4,875 \text{ kgm} \cdot \text{s}^{-1} \checkmark$  left/ in opposite direction.  $\checkmark$   
links/in teenoorgestelde rigting.

(4)

3.2

$\Delta p_B = -\Delta p_A \checkmark$ $\Delta p_B = -(-4,875)$ $= 4,875 \text{ kgm} \cdot \text{s}^{-1}$	
$\Delta p_B = m(v_f - v_i) \checkmark$ $4,875 = 1,25(v_f - (-3)) \checkmark$ $v_f = 0,9 \text{ m} \cdot \text{s}^{-1} \text{ Right/ in opposite direction} \checkmark$ <p style="text-align: right;"><i>/Regs/ in teenoorgestelde rigting</i></p>	$\Delta p_B = m(v_f - v_i) \checkmark$ $-4,875 = 1,25(v_f - 3) \checkmark$ $v_f = -0,9 \text{ m} \cdot \text{s}^{-1}$ $v_f = 0,9 \text{ m} \cdot \text{s}^{-1} \text{ Right/ in opposite direction} \checkmark$ <p style="text-align: right;"><i>/Regs/ in teenoorgestelde rigting</i></p>

(4)

3.3 0 (zero/Nul)  $\checkmark$

(1)

3.4 **POSITIVE MARKING FROM 3.1 AND 3.2/  
POSITIEWE NASIEN VAN 3.1 EN 3.2**

**Object A/Voorwerp A**

OR/OF

**Object A/Voorwerp A**

$$F_{net}\Delta t = \Delta p \checkmark$$

$$F_{net}(0,2) = -4,875 \checkmark$$

$$F_{net} = -24,375 \text{ N}$$

$$\text{Magnitude/Grootte} = 24,375 \text{ N} \checkmark$$

$$F_{net}\Delta t = \Delta p \checkmark$$

$$F_{net}\Delta t = m_A(v_{Af} - v_{Ai})$$

$$F_{net}(0,2) = 0,75(-2,5 - 4) \checkmark$$

$$F_{net} = -24,375 \text{ N}$$

$$\text{Magnitude/Grootte} = 24,375 \text{ N} \checkmark$$

**Object B/Voorwerp B**

OR/OF

**Object B/Voorwerp B**

$$F_{net}\Delta t = \Delta p \checkmark$$

$$F_{net}(0,2) = 4,875 \checkmark$$

$$F_{net} = 24,375 \text{ N}$$

$$\text{Magnitude/Grootte} = 24,375 \text{ N} \checkmark$$

$$F_{net}\Delta t = \Delta p \checkmark$$

$$F_{net}\Delta t = m_B(v_{Bf} - v_{Bi})$$

$$F_{net}(0,2) = 1,25[0,9 - (-3)] \checkmark$$

$$F_{net} = 24,375 \text{ N}$$

$$\text{Magnitude/Grootte} = 24,375 \text{ N} \checkmark$$

(3)

3.5 **POSITIVE MARKING FROM 3.1 AND 3.2/  
POSITIEWE NASIEN VAN 3.1 EN 3.2**

$$\Sigma K_i = \frac{1}{2}m_A v_A^2 + \frac{1}{2}m_B v_B^2 \quad \checkmark$$

$$= \frac{1}{2}(0,75)(4)^2 + \frac{1}{2}(1,25)(3)^2 \checkmark$$

$$= 11,625 \text{ J}$$

$$\Sigma K_f = \frac{1}{2}m_A v_A^2 + \frac{1}{2}m_B v_B^2$$

$$= \frac{1}{2}(0,75)(2,5)^2 + \frac{1}{2}(1,25)(0,9)^2 \checkmark$$

$$= 4,369 \text{ J}$$

Inelastic / Onelasties  $\checkmark \Sigma K_i \neq \Sigma K_f$  **or/of**  $\Sigma K_f \leq \Sigma K_i \checkmark$

(5)

[17]

**QUESTION 4/VRAAG 4**

4.1.1 An object which has been given an initial velocity and then it moves under the influence of the gravitational force only.

*'n Voorwerp wat 'n aanvanklike snelheid gekry het en daarna beweeg dit slegs onder die invloed van gravitasiekrag.*

(2)

4.1.2 It is moving with constant acceleration.  $\checkmark \checkmark$

*Dit beweeg met konstante versnelling.*

(2)

Fisiese Wetenskappe Kontrole toets 1 Gradel/Graad 12 Memo

4.1.3 (i) Upwards/opwaarts ✓ (1)

(ii) Once/ one/1 ✓ / Een keer/ een/1 (1)

(iii) 1.2 (s) ✓ (1)

4.1.4 Energy is lost ✓ in deforming the ball ✓ during the bounce.  
Energie gaan verlore ✓ met die vervorming van die bal ✓ tydens die botsing. (2)

4.2.1 Motion under the influence of gravity/weight/gravitational force only. ✓ ✓  
Beweging slegs onder die invloed van gravitasie/gewig/swaartekrag. (2 or/of 0).

**OR/OF**

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

Beweging waar die enigste krag wat op die liggaam inwerk, gravitasie/gewig/swaartekrag is. (2 or/of 0).

4.2.2 (i) (3)

$$\begin{aligned} v_f &= v_i + a\Delta t \checkmark \\ 0 &= 12 + (-9,8)\Delta t \checkmark \\ \Delta t &= 1,22 \text{ s} \checkmark \end{aligned}$$

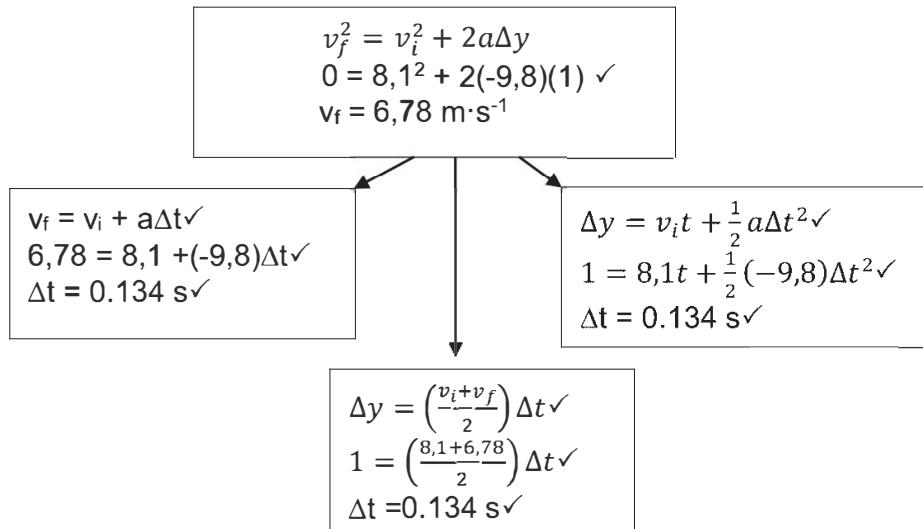
$$\begin{aligned} v_f &= v_i + a\Delta t \checkmark \\ 0 &= -12 + (9,8)\Delta t \checkmark \\ \Delta t &= 1,22 \text{ s} \checkmark \end{aligned}$$

(ii) (3)

$$\begin{aligned} v_f^2 &= v_i^2 + 2a\Delta y \checkmark \\ 0 &= 12^2 + 2(-9,8)\Delta y \checkmark \\ \Delta y &= 7,35 \text{ m} \checkmark \end{aligned}$$

$$\begin{aligned} v_f^2 &= v_i^2 + 2a\Delta y \checkmark \\ 0 &= -12^2 + 2(9,8)\Delta y \checkmark \\ \Delta y &= 7,35 \text{ m} \checkmark \end{aligned}$$

(iii) **UPWARDS AS POSITIVE/OPWAARTS AS POSITIEF**



**DOWNWARDS AS POSITIVE/AFWAARTS AS POSITIEF**

$$v_f^2 = v_i^2 + 2a\Delta y$$

$$0 = -8,1^2 + 2(9,8)(1) \checkmark$$

$$v_f = 6,78 \text{ m}\cdot\text{s}^{-1}$$

$$v_f = v_i + a\Delta t \checkmark$$

$$-6,78 = -8,1 + (9,8)\Delta t \checkmark$$

$$\Delta t = 0.134 \text{ s} \checkmark$$

$$\Delta y = v_i t + \frac{1}{2} a \Delta t^2 \checkmark$$

$$-1 = -8,1t + \frac{1}{2} (9,8)\Delta t^2 \checkmark$$

$$\Delta t = 0.134 \text{ s} \checkmark$$

$$\Delta y = \left(\frac{v_i + v_f}{2}\right) \Delta t \checkmark$$

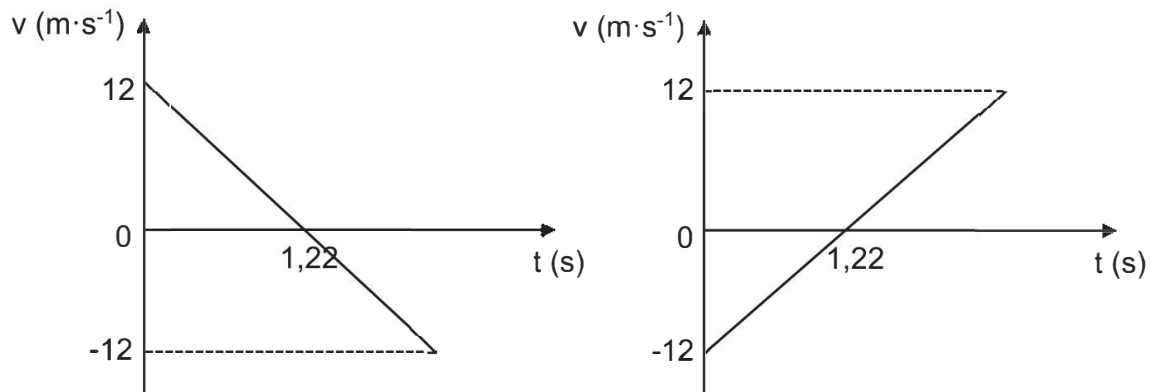
$$-1 = \left(\frac{-8,1 + (-6,78)}{2}\right) \Delta t \checkmark$$

$$\Delta t = 0.134 \text{ s} \checkmark$$

(4)

**4.2.3 POSITIVE MARKING FROM QUESTION 4.2.2/POSITIEWE NASIEN VANAF VRAAG 4.2.2**

<b>UPWARDS AS POSITIVE / OPWAARTS AS POSITIEF</b>	<b>DOWNWARDS AS POSITIVE / AFWAARTS AS POSITIEF</b>
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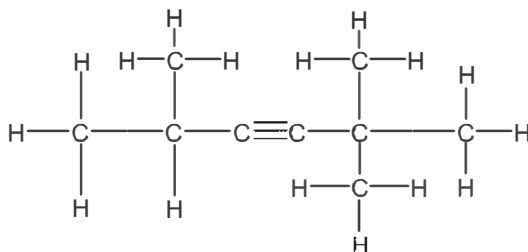


<b>Criteria for graph/Kriteria vir grafiek</b>	
Straight line starting at $v = 12 \text{ m}\cdot\text{s}^{-1}$ with a negative final velocity or straight line starting at $v = -12 \text{ m}\cdot\text{s}^{-1}$ with a positive final velocity./Reguitlyn wat begin by $v = 12 \text{ m}\cdot\text{s}^{-1}$ met negatiewe eindsnelheid of reguitlyn wat begin by $-12 \text{ m}\cdot\text{s}^{-1}$ met positiewe eindsnelheid.	✓
Straight line cuts time axis calculated in Question 4.2.2/Reguitlyn sny tyd-as by die tyd bereken in Vraag 4.2.2.	✓
Correct final velocity of $12 \text{ m}\cdot\text{s}^{-1}$ or $-12 \text{ m}\cdot\text{s}^{-1}$ /Korrekte eindsnelheid van $12 \text{ m}\cdot\text{s}^{-1}$ of $-12 \text{ m}\cdot\text{s}^{-1}$ .	✓

(3)  
**[24]**

**QUESTION 5/VRAAG 5**

- 5.1.1 B,E ✓ (NB: both compounds must be correct to award one mark./ beide verbindings moet korrek wees om een punt toe te ken). (1)
- 5.1.2 Chain isomers/Kettingisomere ✓ (1)
- 5.1.3  $C_nH_{2n+1}COOH$  ✓ (RCOOH) (1)
- 5.1.4 Ketone ✓ /Ketoon (1)
- 5.2.1 Pentane ✓ /Pentaan (1)
- 5.2.2 2,2-dimethyl ✓ hex-3 ✓ -ene ✓ /2,2-dimetiel ✓ heks-3 ✓ -een ✓ (3)
- 5.3



<b>Marking guideline/Nasienriglyn</b>	
Functional group (triple bond) in correct position/ <i>Funksionele groep (drievoudige binding) in korrekte posisie</i>	✓
The three methyl groups in correct positions/ <i>Die drie metielgroepe in korrekte posisies</i>	✓
Whole structure correct/ <i>Hele struktuur korrek</i>	✓

(3)  
[11]

**QUESTION 6/VRAAG 6**

- 6.1 **NB: Deduct 1 mark for omission of any of the underlined words in the correct context./Trek 1 punt af vir weglating van enige van die onderstreepte woorde in die korrekte konteks.**
- The temperature at which the vapour pressure of a liquid equals atmospheric pressure. ✓✓  
Die temperatuur waarteen die dampdruk van 'n vloeistof gelyk is aan die atmosferiese druk. ✓✓ (2)
- 6.2 C, ✓ Has the longest chain length/*Het die langste kettinglengte*. ✓ (2)
- 6.3.1 Chain length/*Kettinglengte* ✓ (1)
- 6.3.2 Boiling point (bp)/*Kookpunt (kp)* ✓ (1)



Fisiese Wetenskappe Kontrole toets 1 Grade/Graad 12 Memo

6.4 London forces ✓ (and) Hydrogen bonds ✓ / Londenkragte ✓ (en) waterstofbindings. ✓ (2)

6.5 Higher/Hoër. ✓

- The compounds have the same functional group and the same molecular mass.
- 2-methylpropanal has branching and hence a smaller surface area. ✓
- 2-methylpropanal has weaker intermolecular forces ✓
- Less energy is required to overcome (weaker) intermolecular forces. ✓

• *Die verbindings het dieselfde funksionele groep en dieselfde molekulêre massa.*

• *2-metielpropanaal het 'n vertakking en dus 'n kleiner oppervlakte.* ✓

• *2-metielpropanaal het swakker intermolekulêre kragte* ✓

• *Minder energie is nodig om (swakker) intermolekulêre kragte te oorkom.* ✓ (4)

6.6.1 Carboxyl group/Karboksielgroep. ✓ (1)

6.6.2 Hydroxyl group/Hidroksiëlgroep. ✓ (1)

6.7

- Both compounds D and E have hydrogen bonding between molecules. ✓
- Compound E has one site for hydrogen bonding, ✓
- while compound D has two sites for hydrogen bonding ✓ (can form dimers).
- More energy is needed to overcome intermolecular forces in compound D. ✓

• *Beide verbindings D en E het waterstofbinding tussen molekules.* ✓

• *Verbinding E het een plek/posisie vir 'n waterstofbinding,* ✓

• *terwyl verbinding D twee plekke/posisies het vir waterstofbindings* ✓ (kan dimere vorm).

• *Meer energie is nodig om die intermolekulêre kragte in verbinding D te oorkom.* ✓ (4)

[18]

**GRAND TOTAL: 150**  
**GROOTTOTAAL: 150**