education

MPUMALANGA PROVINCE

REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

PHYSICAL SCIENCES

17 MARCH 2023

MARKING GUIDELINE

Stanmorephysics.com

MARKS: 100

This marking guideline consists of 10 pages

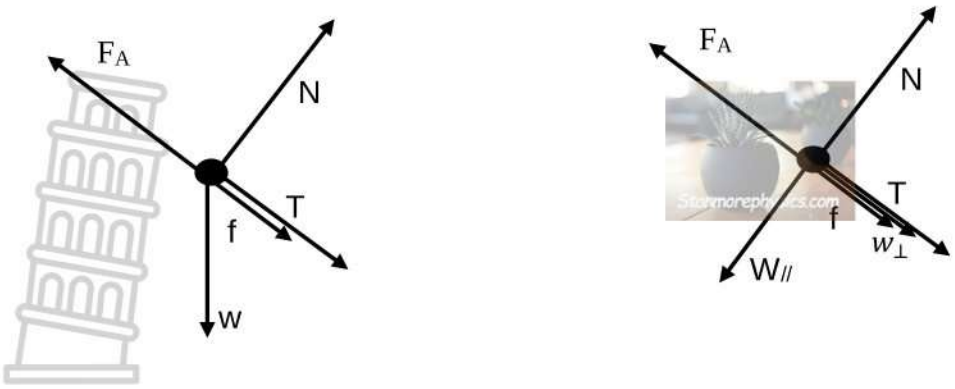
QUESTION 1: MULTIPLE CHOICE

1.1	B ✓✓	(2)
1.2	D ✓✓	(2)
1.3	C ✓✓	(2)
1.4	B ✓✓	(2)
1.5	A ✓✓	(2)
1.6	B ✓✓	(2)
		[12]

QUESTION 2

2.1	The force or the component of a force which a surface exerts on an object with which it is in contact, and which is perpendicular to the surface. ✓✓	(2)

2.2



Accept the following symbols/Aanvaar die volgende simbole.	
N✓	F_N/Normal/Normaal/Normal force/Normaalkrag /35 N
F_A✓	Applied force/ Fapplied/toegepas
f✓	F_f / f_k / f_r / frictional force/wrywingskag/kinetic frictional force/kinetiese wrywingskrag
T✓	Tension/Spanning/F_T / F / F_s
w✓	F_g/mg/weight/$F_{Earth\ on\ block}$/19,6 N/gravitational force/gewig/$F_{aarde\ op\ blok}$/ gravitasiekrag

Notes/Aantekeninge
• Mark is awarded for label and arrow. /Punt word toegeken vir byskrif en pyltjie • Do not penalise for length of arrows. /Moenie vir die lengte van die pyltjies penaliseer nie. • Deduct 1 mark for any additional force. /Trek 1 punt af vir enige addisionele krag. • If force(s) do not make contact with body/dot /Indien krag(te) nie met die voorwerp/ kolletjie kontak maak nie: Max./Maks: 4/5 • If arrows missing/Indien pyltjies uitgelaat is: Max./Maks: 4/5

(5)

2.3.1 $f_k=\mu_k N$✓

$=0,32\times2\times9,8\cos 25^\circ$✓

$=5,68N$✓

(3)

POSITIVE MARKING FROM 2.3.1

2.3.2 **For the 5 kg mass**

$F_{net}=ma$

$T-(f+mg\sin\theta)=ma$ ✓

$T-(14,21+ 5\times9,8\sin 25°)$✓$=5a$✓

$T-34,918 = 5a$.....(1)

For the 2 kg mass

$55 - (T+5,68+2\times9,8\sin 25°) = 2a$

$41,037-T = 2a$✓.....(2)

(1)+(2): $6,119 = 7a$

$a = 0,874\ m.s^{-2}$

Substitute the value a into (1):

$T-34,918 = 5\times0,874$ ✓

$T = 39,29$ N✓

OR

Substitute the value a into (2):

$41,037-T = 2\times0,874$ ✓

$T = 39,29$ N ✓

(6)

[16]

QUESTION 3

3.1 (Motion during which) the only force acting is the force of gravity/ gravitational force. ✓✓

(**NOTE: 2 or 0)**

3.2

OPTION 1	
$\triangle y = v_i \triangle t + \frac{1}{2} \triangle t^2$ ✓ $=5\times1,4 + \frac{1}{2}\times9,8\times1,4^2$✓ $=16,60$ m✓	$\triangle y=v_i\triangle t+\frac{1}{2}\triangle t^2$✓ $= -5\times1,4 + \frac{1}{2}\times-9,8\times1,4^2$✓ $=-16,60$ $\triangle y =16,60$ m✓
OPTION 2 $\triangle y=\left(\frac{v_f+v_i}{2}\right)\triangle t$✓ $=\left(\frac{18,72+5}{2}\right)\times1,4$✓ $\triangle y=16,60$ m✓	**OPTION 3** $v_f^2 = v_i^2 + 2a\triangle y$✓ $18,72^2= 5^2+ 2\times9.8\triangle y$✓ $\triangle y =16,60$ m✓
OPTION 4 Height = Area under the graph 16,60 m✓ Hoogte = Area onder die grafiek =Area of/van □+Area of/van Δ = (5)(1.4)+(½)(1,4)(18,72)✓ = 16,60 m✓	**OPTION 5** Height = Area of trapezium ✓ Hoogte = Area van trapesium = ½ (5 +18,72) ✓ x 1,4 = 16,60 m✓ Any one/Enige een

3.3

$0 = -14 + (9,8)\Delta t$ ✓

$\Delta t = 1,43$

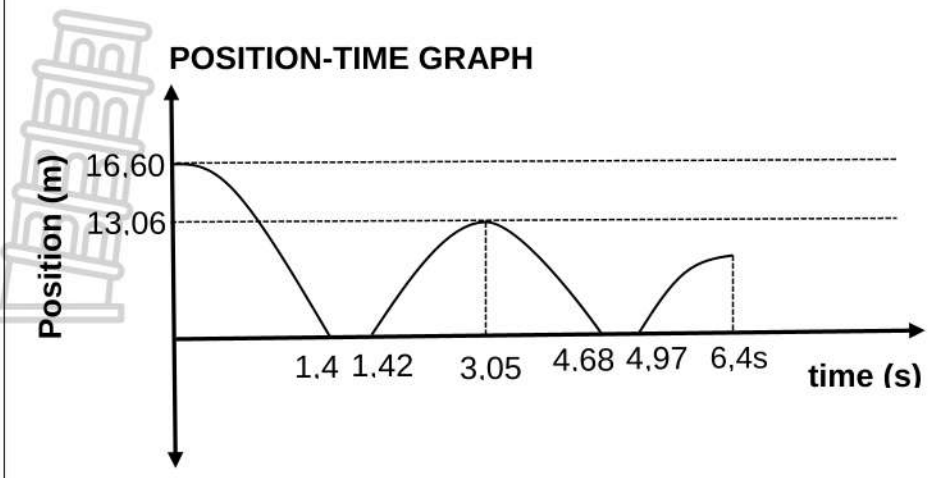
$\therefore T = 6,4s$✓

3.4 $-16\ (m \cdot s^{-1})$ ✓

3.5

OPTION 1	
$\triangle y = v_i \triangle t + \frac{1}{2}\triangle t^2$✓ $= -16 \times 1,63 + \frac{1}{2} \times 9,8 \times 1,63^2$✓ $= -13,06$ $= 13,06$ m✓	$\triangle y = v_i \triangle t + \frac{1}{2}\triangle t^2$✓ $= 16 \times 1,63 + \frac{1}{2} \times -9,8 \times 1,63^2$✓ $= 13,06$ m✓
OPTION 2 $\triangle y = \left(\frac{v_f + v_i}{2}\right)\triangle t$✓ $= \left(\frac{0+(-16)}{2}\right) \times 1,63$✓ $= -13,04$ $\triangle y = 13,04$ m✓	**OPTION 2** $v_f^2 = v_i^2 + 2a\triangle y$✓ $0^2 = (-16)^2 + 2 \times 9.8 \Delta y$✓ $\Delta y = 13,06$ m✓
OPTION 4 Height = Area under the graph 1✓ Hoogte = Area onder die grafiek =Area of/van Δ = (½)(1,63)(16)✓ = 13,04 m✓	RANGE [13,04 m-13,06 m]

3.6



Criteria for graph/Kriteria vir grafiek	Marks/Punte
The height from which the ball was thrawn is clearly indicted.	✓
The maximum height reached by the ball after the first bounce clearly indicated.	✓
Time T clearly shown	✓
Shape of the graph	✓✓
NB.Accept the graph sketched on the negative side.	

QUESTION 4

4.1 The total linear momentum in a closed system✓ remains constant./is Conserved. ✓

Die totale lineêre momentum in 'n geslote stelsel✓ bly konstant/bly behoue. ✓

OR/OF

In a closed/isolated system, ✓ the total momentum before a collision is equal to the total momentum after the collision. ✓

In 'n geslote/geïsoleerde stelsel is die totale momentum voor 'n botsing gelyk aan die totale momentum na die botsing. (2)

4.2 $\Sigma p_i = \Sigma p_f$

$m_1v_{1i} + m_2v_{2i} = m_1v_{1f} + m_2v_{2f}$

$(m_1 + m_2)v_i = m_1v_{1f} + m_2v_{2f}$

0✓ = $\underline{(0,4)v_{1f} + 0,6\ (4,5)}$ ✓

v_{1f} = - 6,75 $m \cdot s^{-1}$

= 6,75 $m \cdot s^{-1}$ to the left/na links✓ (4)

4.3

OPTION 1/OPSIE 1	**OPTION 2/OPSIE 2**
$\Delta p = F_{net}\Delta t$✓	$v_f = v_i + a\Delta t$
[(0,6)(4,5) – 0] ✓ = Fnet (0,32) ✓	4,5 = 0 + a(0,32) ✓
Fnet = 9 N✓	a = 14,0625 $m \cdot s^{-2}$
OR/OF	F_{net} = ma✓
$m(v_f - v_i) = F_{net}\Delta t$✓	= 0,6(14,0625) ✓
0,6(4,5 – 0) ✓= F_{net}(0,3) ✓	F_{net} = 8,44 N✓
F_{net} = 8,44 N✓	
OPTION 3/OPSIE 3	**OPTION 4/OPSIE 4**
$\Delta p = F_{net}\Delta t$✓	$v_f = v_i + a\Delta t$
[(0,4)(6,75) – 0] ✓ = F_{net} (0,32) ✓	6,75= 0 + a(0,32) ✓
F_{net} = 8,44 N✓	a = 21,09375$m \cdot s^{-2}$
OR/OF	F_{net} = ma✓
$m(v_f - v_i) = F_{net}\Delta t$✓	= 0,4(21,09375) ✓
0,4(6,75 – 0) ✓= Fnet(0,3) ✓	F_{net} = 8,44 N✓
Fnet = 8,44 N✓	

(4)

4.4 THE SAME ✓ (1)

QUESTION 5

5.1 Unsaturated✓

ANY ONE

- It has $\underline{\text{double/multi bond}}$ between C atoms. ✓
- It $\underline{\text{does NOT contain the maximum number of H atoms bonded to C atoms.}}$
- $\underline{\text{Compound B is an alkene.}}$

(2)

5.2.1 H✓

5.2.2 B✓

5.2.3 C and G✓

5.2.4 D✓

5.3.1 2,2-dimethylbutane

Marking Creteria:
- Stem, i.e. butan. ✓
- Two methyl groups ✓
- Correct numbering of substituents ✓

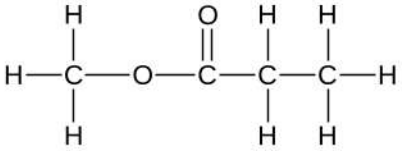
- IF/INDIEN: Any error e.g. hyphens omitted and/or incorrect sequence: Enige fout bv. koppeltekens weggelaat en/of verkeerde volgorde: Max./Maks. 2/3 (3)

5.3.2 2-chloro-5-methylheptane

Marking Creteria:
- Stem, i.e. heptan. ✓
- Bromo and methyl groups ✓
- Correct numbering of substituents ✓

- IF: Any error e.g. hyphens omitted and/or incorrect sequence: Enige fout bv. koppeltekens weggelaat en/of verkeerde volgorde: Max./Maks. 2/3 (3)

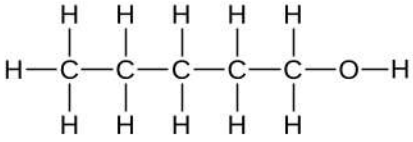
5.4.1

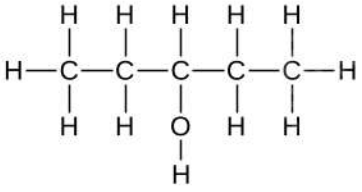


Marking Creteria:
- Whole structure correct: ✓
- Only functional group correct: ✓
- IF: More than one functional group: 1/2

(2)

5.4.2





Marking Creteria:
ANY of those structures
- Whole structure correct: ✓
- Correct position of the functional group: ✓

(2)

[16]

QUES

6.1 The temperature at which the vapour pressure equals atmospheric/external pressure. ✓✓ (2 or 0). (2)

6.2 Z✓ (1)

6.3 It has the highest boiling point✓✓ (2)

6.4 X- Aldehyde✓
Y-Alkane✓
Z- Alcohol ✓ (3)

6.5
- Alkane has London forces/dispersion/induced dipole forces. ✓
- Aldehyde has dipole-dipole forces✓
- Alcohol has hydrogen bonding. ✓
- Hydrogen bonding are stronger intermolecular than dipole-dipole and London forces/dispersion/induced dipole forces, and dipole-dipole forces are stronger than London forces/dispersion/induced dipole forces✓

(4)

[12]

QUESTION 7

7.1.1 Elimination (dehydrohalogenation)✓ (1)

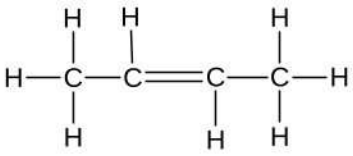
7.1.2 Substitution (hydrolysis)✓ (1)

7.1.3 Addition (hydration)✓ (1)

7.1.4 Elimination (dehydration)✓ (1)

7.1.5 But-2-ene✓ (1)

7.1.6



Marking Creteria:
ANY of the structures
- Whole structure correct: ✓
- Correct position of the functional group: ✓
- IF/INDIEN: More than one functional: group: 1/2

(2)

7.1.7 Strong heat✓ (1)

7.1.8
- Mild heat✓
- Dilute strong base✓

(2)

7.1.9 To speed up the reaction / acts as a catalyst / dehydrating agent. ✓ (1)

7.2.1 The are highly flamable✓ (1)

7.2.2 $C_3H_8 + 5O_2$ ✓ $\rightarrow 4H_2O + 3CO_2$ ✓ (✓ bal) (3)

[16]

Total: 100