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**MPUMALANGA PROVINCE
REPUBLIC OF SOUTH AFRICA**

NATIONAL SENIOR CERTIFICATE

BOHLABELA DISTRICT

GRADE 12

PHYSICAL SCIENCES

MARCH 2024

MARKING GUIDELINE

**MARKS: 100
DURATION: 1 HOUR**

This marking guideline consists of 10 pages

QUESTION 1: MULTIPLE CHOICE

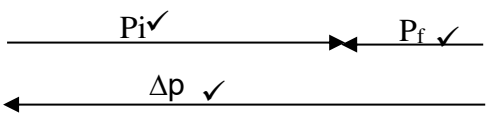
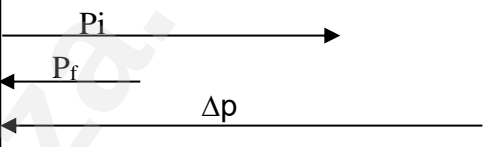
- | | | |
|-----|------|-----|
| 1.1 | C ✓✓ | (2) |
| 1.2 | A ✓✓ | (2) |
| 1.3 | A ✓✓ | (2) |
| 1.4 | C ✓✓ | (2) |
| 1.5 | D ✓✓ | (2) |
| 1.6 | B ✓✓ | (2) |

[12]

QUESTION 2

2.1 The product of an object's mass and its velocity. ✓✓ (2)

2.2 $\Delta p = mv_f - mv_i$ ✓
 $= (0,02) \checkmark (-3) \checkmark - (0,02)(7) \checkmark$
 $\Delta p = -0.2 \text{ kg} \cdot \text{m} \cdot \text{s}^{-1}$ (6)
 $\Delta p = -0.2 \text{ kg} \cdot \text{m} \cdot \text{s}^{-1} \checkmark$, away from the wall / W/ west/ to the left of the wall ✓

Option 1	Option 2
	
Criteria Mark is awarded correct for label and arrow.	

[11]

QUESTION 3

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

NOTE:

If learners write: In a closed/isolated system, the total momentum before a collision is equal to the total momentum after the collision is: $\frac{0}{2}$ (2)

- 3.2 $\sum p_i = \sum p_f$ ✓
 $m_A v_{iA} + m_B v_{iB} = (m_A + m_B) v_f$
 $(100)(5) + 75(-4)$ ✓ $= (100+75)v_f$ ✓
 $v_f = 1,14 \text{ m}\cdot\text{s}^{-1}$ ✓ to the right ✓

(5)

3.3

$$\begin{aligned}\sum E_{ki} &= \frac{1}{2} m_1 v_{i1}^2 + \frac{1}{2} m_2 v_{i2}^2 \checkmark \\ &= \frac{1}{2} (100)(5)^2 + \frac{1}{2} (75)(4)^2 \checkmark \\ &= 1850 \text{ J}\end{aligned}$$

$$\begin{aligned}\sum E_{kf} &= \frac{1}{2} (m_1 + m_2) v_f^2 \\ &= \frac{1}{2} (100 + 75)(1,14)^2 \checkmark \\ &= 113,72 \text{ J}\end{aligned}$$

(5)

$$\sum E_{ki} \neq \sum E_{kf} \checkmark$$

Collision is **inelastic** ✓

[12]

QUESTION 4

4.1 An object which has been given an initial velocity and then it moves under the influence of the gravitational force only ✓✓ (NOTE: 2 or 0) (2)

4.2 $9,8 \text{ m}\cdot\text{s}^{-2}$ ✓, downwards✓ (2)

4.3 Once✓ (1)

4.4.1

OPTION 1(downwards as positive)	OPTION 2(downwards as negative)
$V_f = V_i + a\Delta t$ ✓ $32 = V_i + (9,8)(2,7)$ ✓ $V_i = 5,54 \text{ m}\cdot\text{s}^{-1}$ downwards ✓	$V_f = V_i + a\Delta t$ ✓ $-32 = V_i + (-9,8)(2,7)$ ✓ $V_i = -5,54 \text{ m}\cdot\text{s}^{-1}$ $\therefore V_i = 5,54 \text{ m}\cdot\text{s}^{-1}$ downwards ✓

(3)

4.4.2 **POSITIVE MARKING FROM QUESTION 3.4.1**

Option 1 (downwards as positive)	(downwards as negative)
$V_f^2 = V_i^2 + 2a\Delta y$ ✓ $(32)^2 = (5,54)^2 + 2(9,8)\Delta y$ ✓ $\Delta y = 50,68 \text{ m}$ ✓	$V_f^2 = V_i^2 + 2a\Delta y$ ✓ $(-32)^2 = (-5,54)^2 + 2(-9,8)\Delta y$ ✓ $\Delta y = -50,68 \text{ m}$ $\therefore \Delta y = 50,68 \text{ m}$ ✓
Option 2 (downwards as positive)	downwards as negative)
$\Delta y = v_i \Delta t + \frac{1}{2} a \Delta t^2$ ✓ $= 5,54 \times 2,7 + \frac{1}{2} \times 9,8 \times 2,7^2$ ✓ $= 50,68 \text{ m}$ ✓	$\Delta y = v_i \Delta t + \frac{1}{2} a \Delta t^2$ ✓ $= -5,54 \times 2,7 + \frac{1}{2} \times -9,8 \times 2,7^2$ ✓ $= 50,68 \text{ m}$ ✓
OPTION 3	OPTION 4
$\Delta y = \left(\frac{v_f + v_i}{2} \right) \Delta t$ ✓ $= \left(\frac{5,54 + 32}{2} \right) \times 2,7$ ✓ $= 50,68 \text{ m}$ ✓	Height = Area under the graph Hoogte = Area onder die grafiek = Area of rectangle/van + Area of/van Δ $= 5,54 \times 2,7 + (\frac{1}{2})(1,63)(16)$ ✓ $= 50,68 \text{ m}$ ✓

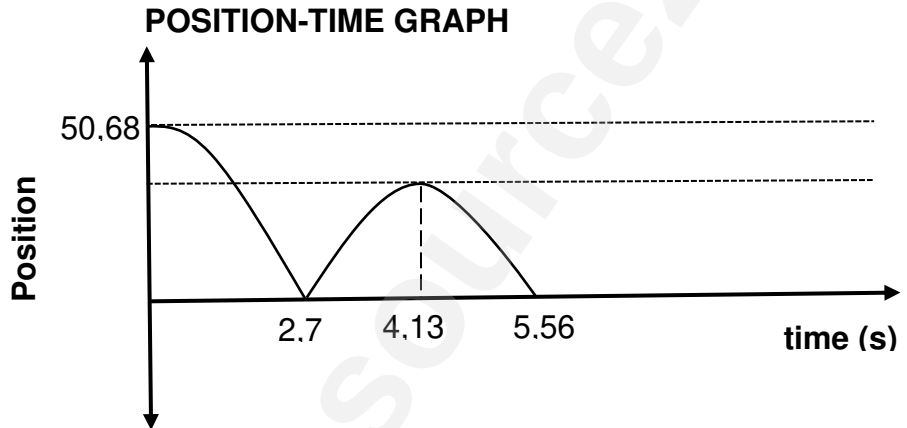
(3)

4.4.3

Option 1 (Downwards as positive)	Downward as negative
$V_f = V_i + a\Delta t \checkmark$ $0 = -14 + (9,8) \Delta t \checkmark$ $\Delta t = 1,43 \text{ s}$ $\Delta t = 2,7 + 1,43 \checkmark$ Or $5,56 - 1,43$ $\Delta t = 4,13 \text{ s} \checkmark$	$V_f = V_i + a\Delta t \checkmark$ $0 = 14 + (-9,8) \Delta t \checkmark$ $\Delta t = 1,43 \text{ s}$ $\Delta t = 2,7 + 1,43 \checkmark$ Or $5,56 - 1,43$ $\Delta t = 4,13 \text{ s} \checkmark$
Option 2	
$\Delta t = \frac{5,56 - 2,7\checkmark}{2\checkmark} = 1,43 \text{ s}$ $\Delta t = 2,7 + 1,43 \checkmark$ $\Delta t = 4,13 \text{ s} \checkmark$	

(4)

4.5

POSITIVE MARKING FROM QUESTION 3.4.2 AND QUESTION 3.4.3		
POSITION-TIME GRAPH 		
Criteria for graph	Marks	
The height from which the ball was thrown is clearly indicated.	✓	
Time t clearly shown	✓	
Shape of the graph	✓✓	
NB. Accept the graph sketched on the negative side.		

(5)

[20]

QUESTION 5

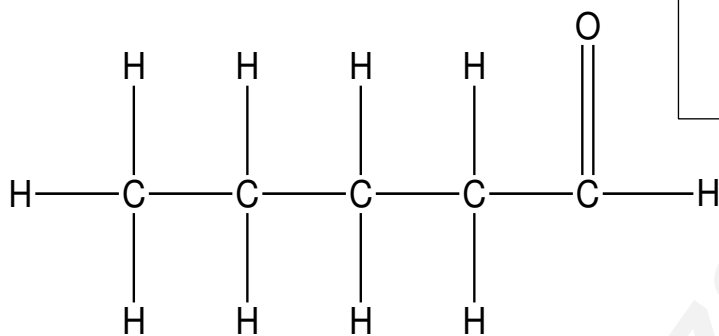
5.1.1 Carbonyl✓

(1)

5.1.2 Compound with the same molecular formula, but different functional group. ✓✓

(2)

5.1.3

**Marking criteria**

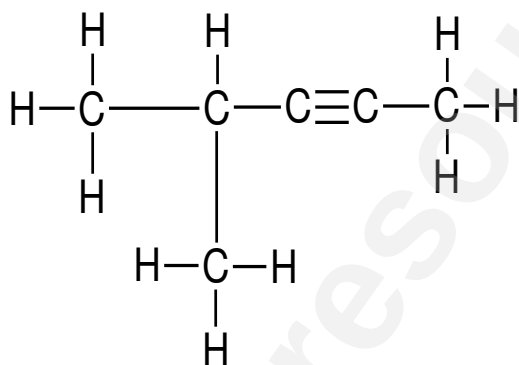
- Whole structure correct: 2/2
- Only correct functional group: 1/2

(2)

5.2.1 5-bromo✓-2,3-dimethyl✓hexane✓

(3)

5.2.2

**Marking criteria**

- Whole structure correct: 2/2
- Only correct functional group: 1/2

IF

More than one functional group: 0/2

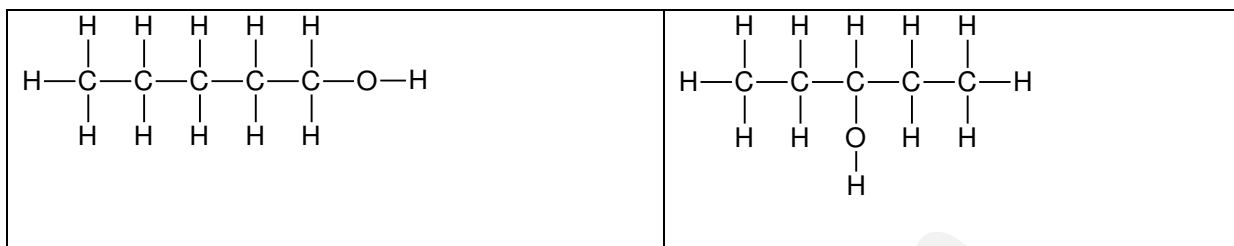
Molecular formula: 0/2

Molecular formula: 1/2

(2)

5.3.1 The C atom bonded to the hydroxyl group is bonded to two other C-atom. ✓✓ (2 or 0) (2)

5.3.2



Marking Criteria:

ANY of those structures

- Whole structure correct ✓
- Correct position of the functional group: ✓

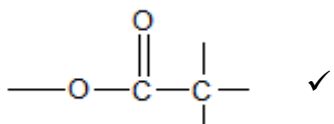
5.4.1 Ester ✓

(2)

5.4.2

(1)

(1)



5.4.3 Butanoic acids ✓✓

(2)

[18]

QUESTION 6

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

6.2 B✓,

- Butane/ B has longer chainlength/larger surface area/ greater number of carbon/greater molecular mass✓

OR

- Propane/ A has shorter chainlength/smaller surface area/ smaller number of carbon/lower molecular formula✓

- The strength of the London forces in B is stronger than in A

OR

- The strength of the London forces in A is weaker than in B.
- More energy is needed to overcome the intermolecular forces in B than A. ✓

OR

- Less energy is needed to overcome the intermolecular forces in A than B

(4)

6.3 -0,5✓

- A and B (Alkanes) have London forces. ✓
- C (Alcohol) has hydrogen bonding. ✓
- The strength of London forces in B is greater than in A ✓

OR

- The strength of the London forces in A is lower than in B.
- The strength of hydrogen bonding in C is stronger than the London forces in B. ✓

(5)

[11]

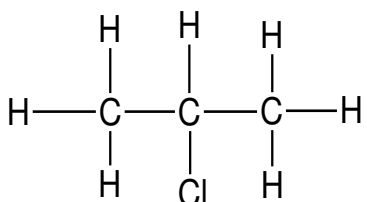
QUESTION 7

7.1.1 Addition (hydration)✓ (1)

7.1.2 Elimination (dehydration)✓ (1)

7.1.3 2-Bromopropane✓✓ (2)

7.1.4



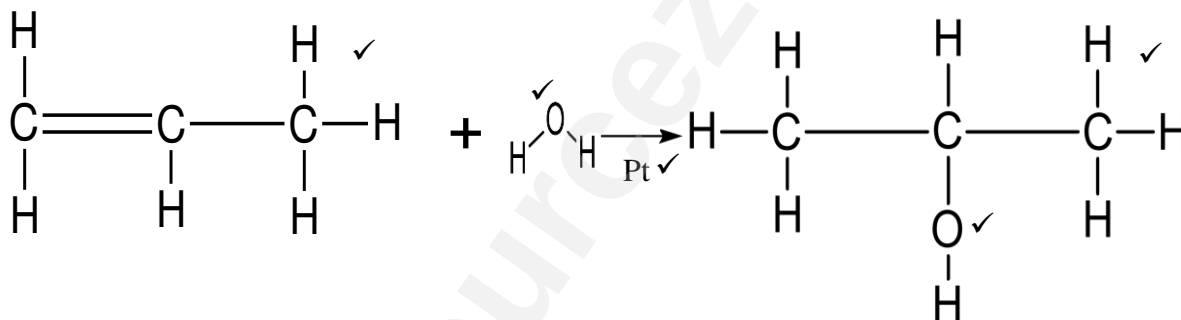
Marking Criteria:

ANY of the structures

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

(2)

7.1.5



(5)

Marking criteria for Question 7.1.5 above

- One mark for Structural formula of propene
- One mark for struture of water
- One mark for correct condition : Pt
- One mark for 2-propanol
- One mark for correct funtional group:Hydroxyl group

7.1.6 Concentrated sulphuric acid✓✓ (2)

7.2. $2\text{C}_4\text{H}_{10} + 13 \text{O}_2 \checkmark \rightarrow 10 \text{H}_2\text{O} + 8 \text{CO}_2 \checkmark$ (✓ bal) (3)

[16]

Total: 100