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PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF
EDUCATION

MOGALAKWENA DISTRICT

PHYSICAL SCIENCES

NATIONAL SENIOR CERTIFICATE

TERM 1 CONTROL TEST
07 MARCH 2023
GRADE 12

MARKS : 100   **DURATION: 2 hours**

STARTING TIME: 08H00

This question paper consists of 13 pages including this one

INSTRUCTIONS

1. This question paper consists of 13 pages including the cover page

2. Answer all the questions in the answer book

3. This question paper consists of TWO SECTIONS
   SECTION A: PHYSICS
   SECTION B: CHEMISTRY

4. Answer EACH section on a separate SHEET.

5. You are advised to use the attached DATA SHEETS.
6. Round off your final answer to a minimum of TWO decimal places

7. Show all your calculations including formulae where applicable.

8. Candidates may use non-programmable calculators.

9. Write neatly and legibly.

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SECTION A : PHYSICS (PAPER 1)

QUESTION 1

Four options are provided as possible answers to the following questions. Each question has only ONE correct answer. Choose the answer and write only the letter (A – D) next to the question number (1.1 -1.5) in the ANSWER SHEET

1.1   Which ONE of the following physical quantity represents the RATE OF CHANGE OF MOMENTUM of an object?

A   Force

B   Kinetic energy

C   Impulse

D   Acceleration   (2)

`1.2   An object of mass m moving at velocity v collides head-on with an object of mass 2m moving in the opposite direction at velocity v. Immediately after the collision the smaller mass moves at velocity v in the opposite direction and the larger mass is brought to rest. Refer to the diagram below.
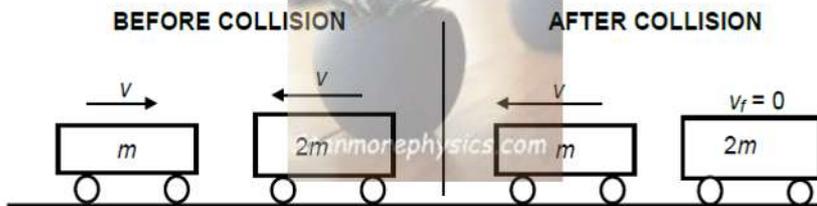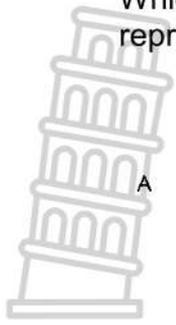

Ignore the effects of friction.
Which ONE of the following is CORRECT?

	MOMENTUM	MECHANICAL ENERGY
A	Conserved	Conserved
B	Not conserved	Conserved
C	Conserved	Not conserved
D	Not conserved	Not conserved

(2)

1.3   Trolley of mass m is moving at constant velocity v to the right on a frictionless horizontal surface. A ball of clay, also of mass m, dropped vertically, falls onto the trolley at time t, as shown in the diagram below.

The ball of clay sticks to the trolley.
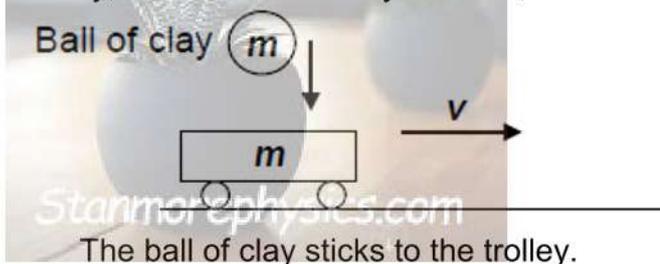
Which ONE of the velocity-time graphs below CORRECTLY represents the velocity of the trolley before and after time t?
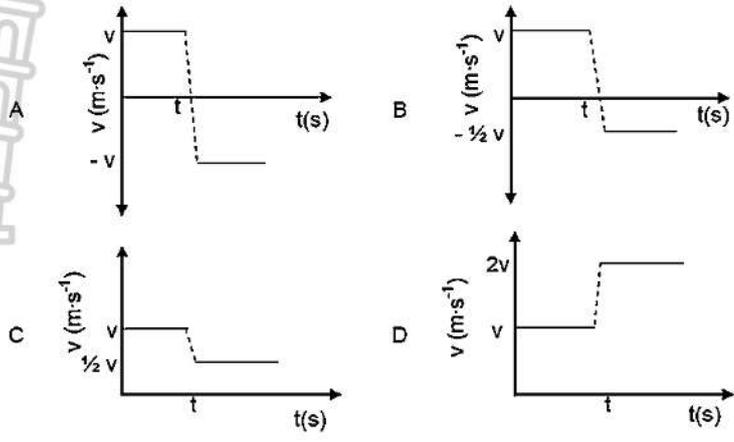
(2)

1.4   A ball is thrown vertically upward into the air. Ignore the effects of friction. THE NET FORCE acting on the ball when ball is at its highest point is …

A   Zero
B   Equal to the weight of the ball.
C   Less than the weight of the ball.
D   Greater than the weight of the ball.
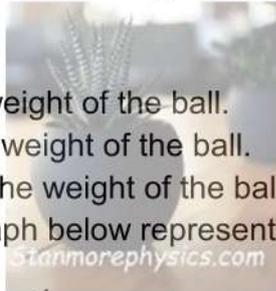
(2)

1.5   The velocity-time graph below represents the motion of an object.
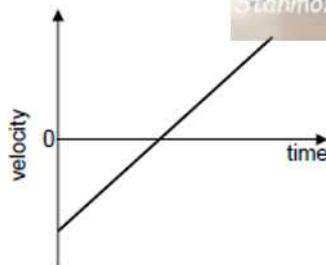
Which ONE of the following graphs represents the corresponding acceleration-time graph for the motion of this object?

(2)

[10]

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QUESTION 2

A man applies a constant pulling force on a heavy parcel of mass 50 kg using a light inextensible rope which passes over a light frictionless pulley as shown in the diagram below. The coefficient of static friction between the parcel and the rough table surface is 0,34. The magnitude of the maximum static frictional
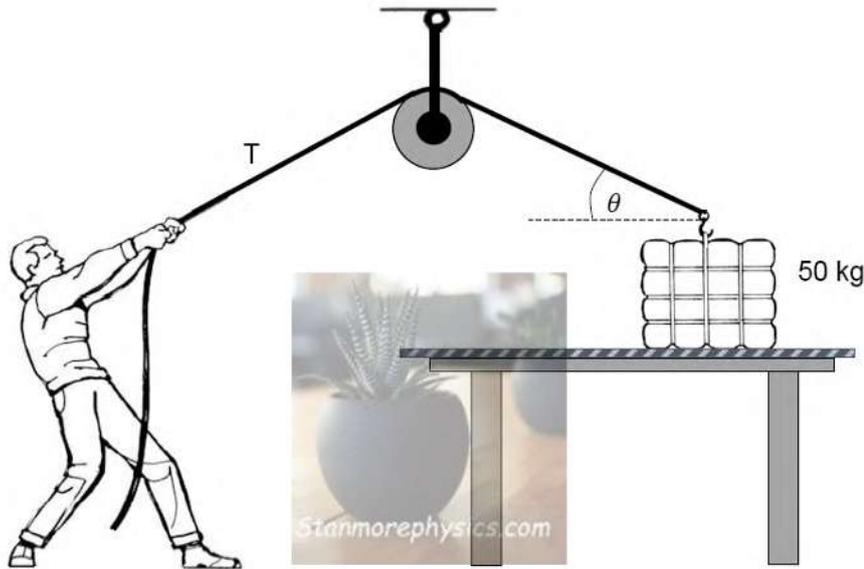
force is 120 N. Ignore the mass of the rope.

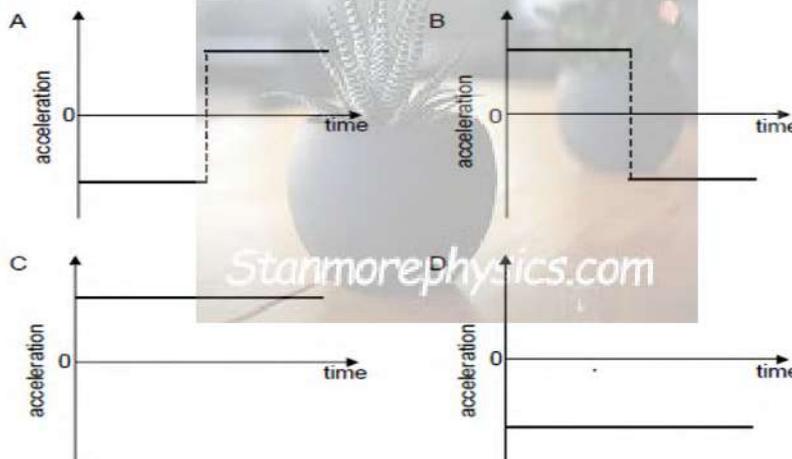2.1   Draw a free-body diagram showing all forces exerted on the parcel.   (4)

2.2   When the static frictional force is at its maximum, show that the   (5)
       magnitude of the vertical component of the tension force in the rope is
       137,06 N.

2.3   The man now increases the magnitude of his pulling force. Under the
       action of this new constant force, the parcel begins to slide horizontally
       along the table.

2.3.1   How will the magnitude of the normal force change as the parcel   (1)
         slides across the table surface? State only INCREASES,
         DECREASES or REMAINS THE SAME.

2.3.2   Give a reason for your answer to QUESTION 2.3.1.   (2)
                                                              [12]

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QUESTION 3

Ball **A** is projected vertically upward from the ground, near a tall building, with a speed of 30 $m.s^{-1}$. Ignore the effect of air friction.

2.1   Explain what is meant by a projectile.   (2)

2.2   Calculate:

     2.2.1   The total time that ball A will be in the air.   (4)

     2.2.2   The distance travelled by ball A during the last second of its fall.   (4)

2.3   A small ball is dropped from a height of 2 m and bounces few times after landing on a cement floor. Ignore air friction. The position-time graph below, not drawn to scale, represents the motion of the ball.
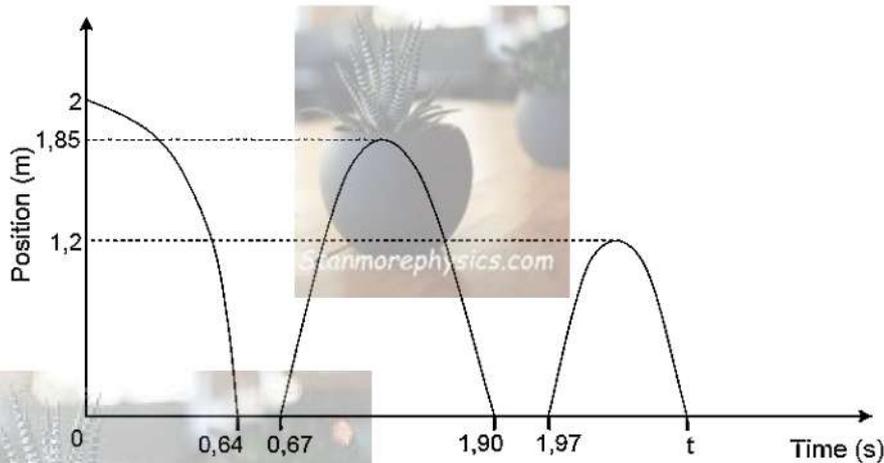
Use the graph to determine the:

     2.3.1   Write down the speed of a ball at position 1.85 m.   (1)

     2.3.2   The time that the ball is in contact with the floor before the first bounce.   (2)

     2.3.3   The time it takes the ball to reach its maximum height after the first bounce   (2)

                                                                                        [15]

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QUESTION 4

Two shopping trolleys, X and Y, are both moving to the right along the same straight line. The mass of trolley Y is 12 kg and its kinetic energy.

4.1   Calculate the speed of trolley Y.   (3)

Trolley **X** of mass 30 kg collides with trolley **Y** and they stick together on impact. After the collision, the combined speed of trolleys is $3,2 \, m.s^{-1}$. Ignore the effects of friction.

Before the collision   **After the collision**
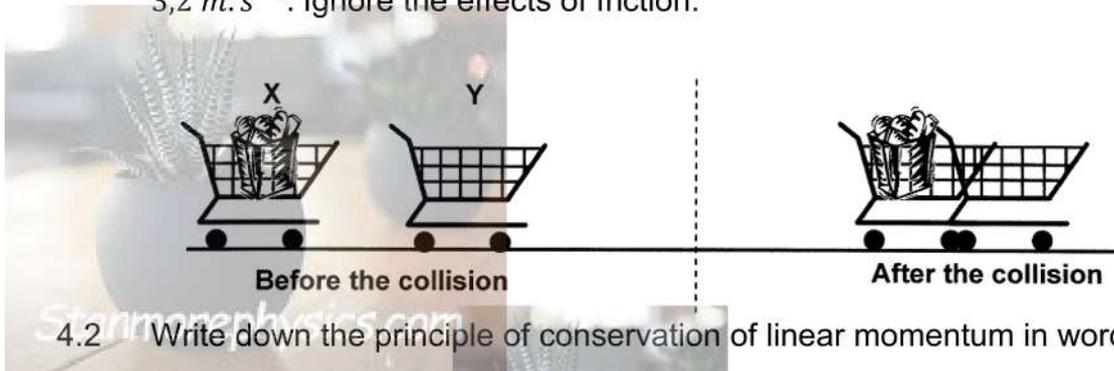
4.2   Write down the principle of conservation of linear momentum in words   (2)

4.3   Calculate the speed of trolley X before the collision.   (4)

During the collision, trolley **X** exerts a force on trolley **Y**. The collision time is 0,2 s.

4.4   Calculate the magnitude of the force trolley X exerts on trolley Y.   (4)

                                                                                            [13]

SECTION A [PHYSICS] TOTAL : 50 MARKS
END OF SECTION A

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SECTION B: CHEMISTRY (PAPER 2)

QUESTION 1

Four options are provided as possible answers to the following questions. Each question has only ONE correct answer. Choose the answer and write only the letter (A – D) next to the question number (1.1 -1.5) in the ANSWER SHEET

1.1   Which one of the following compounds is an ALDEHYDE?

A CH_3CHOCH_3
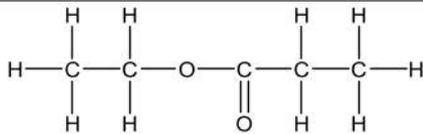
B $CH_3CH_2CH_2COOH$

C CH_3CH_2CHO

D $CH_3CH_2CH_2COOH$ (2)

1.2   The name of the functional group of propanoic acid is …

A   Formyl

B   Carboxyl.

C   Carbonyl.

D   Hydroxyl.   (2)

1.3   Which one of the compounds has mainly dipole-dipole forces between its molecules

A   Pentan-2-one

B   Pentanol

C   Pentane

D   Pent-1-yne   (2)

1.4   Consider the reaction below treated under diluted sulphuric acid:

$CH_3CHCHCH_3$+ H_2O→ major product

The CORRECT IUPAC name for the major product above is:

A   Butanal

B   Butan-2-ol

C   Butan-3-ol

D   Butan-2-one

1.5   A learner wants to experiment by making an alcohol from an haloalkane. Which are the conditions suitable for the reaction?

A   Concentrated base; high heat

B   Concentrated base: mild heat

C   Diluted base; high heat

D   Diluted base; mild heat   (2)

[10]

QUESTION 2

A. 2-methylbutanal	**B.** $CH_3CH_2CH_2CH_2CHO$
C. C_4H_6	**D.** $C_5H_{12}0$
E.	**F.**
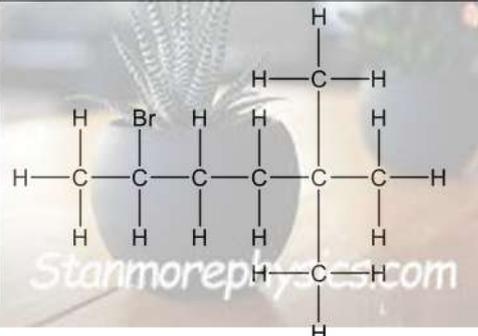
2.1 Write down the LETTER/S that represents

    2.1.1 Aldehyde (1)

    2.1.2 Alkyne (1)

    2.1.3 Saturated compound (1)

2.2 Give the IUPAC name for compound **F** (3)

2.3 **D** represents a tertiary alcohol

    2.3.1 Define the term tertiary alcohol (2)

    2.3.2 Draw the structural formula for compound **D**. (3)

2.4 An alcohol and an organic acid are heated in the presence of concentrated sulphuric acid to form compound **G**. Write down:

    2.4.1 Name of the alcohol and organic acid used to prepare compound **G**. (2)

    2.4.2 Name of the type of reaction that is taking place. (1)

[14]

QUESTION 3

The boiling points of different organic compounds are given below.

COMPOUND		BOILING POINT (^{0}C)
A	HCOOH	101
B	CH_3COOH	118
C	CH_3CH_2COOH	141
D	$CH_3CH_2CH_2COOH$	164

3.1 Define *boiling point.* (2)

3.2 Write down the:

    3.2.1 Name of the FUNCTIONAL GROUP of these compounds (1)

    3.2.2 IUPAC name of compound C (1)

    3.2.3 Structural formula of the FUNCTIONAL isomer of compound B (2)

3.3 Which ONE of the compounds, A or B or C, has the highest vapour pressure? Refer to the data in the table to give a reason for the answer. (2)

3.4 The boiling point of compound B is now compared with of compound X.

COMPOUND		BOILING POINT (^{0}C)
B	CH_3COOH	118
D	$CH_3CH_2CH_2OH$	98

    3.4.1 Besides the conditions used to determine boiling points, give a reason why this is a fair comparison. (1)

    3.4.2 Is compound X a PRIMARY, SECONDARY or TERTIARY alcohol? Give a reason for the answer. (2)

    3.4.3 Fully explain the difference between the boiling points by referring to the types of intermolecular forces present in each of these compounds. (4)

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QUESTION 4

The flow diagram below shows how an alcohol (compound P) can be used to prepare other organic compounds. The letters **A** to **E** represent different organic reactions. **X, Y** and **Z** are organic compounds.
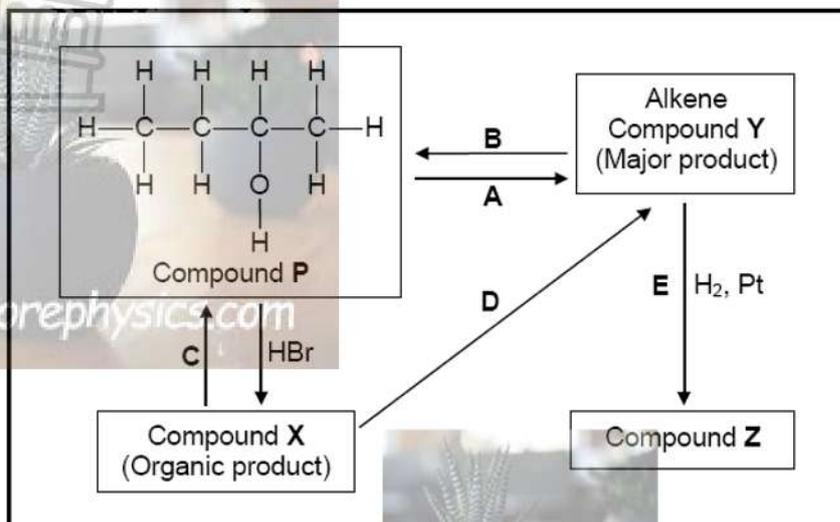
4.1   Write down the type of:

    4.1.1   Elimination reaction represented by **A**   (1)

    4.1.2   Addition reaction represented by **B**   (1)

    4.1.3   Elimination reaction represented by **D**   (1)

4.2   Sodium hydroxide is used as one of the reactants in reaction **C**.

    4.2.1   What type of reaction takes place here?   (1)

    4.2.2   State the TWO reaction conditions for this reaction.   (2)

4.3   Write down the FORMULA of an inorganic reactant needed for reaction **D**.   (1)

4.4   Using STRUCTURAL FORMULAE, write down a balanced equation for   (3)
     reaction **E**.

4.5   Write down the IUPAC name of compound **Z**.   (1)

SECTION B [CHEMISTRY] TOTAL : 50 MARKS   [11]

END OF SECTION B

TEST GRAND TOTAL: PHYSICS + CHEMISTRY =100 MARKS

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DATA FOR PHYSICAL SCIENCES GRADE 12

PAPER 1 (PHYSICS)

1 TABLE 1: PHYSICAL CONSTANTS

NAME/*NAAM*	SYMBOL/*SIMBOOL*	VALUE/*WAARDE*
Acceleration due to gravity	g	$9{,}8 \ \text{m·s}^{-2}$
Speed of light in a vacuum	c	$3{,}0 \times 10^{8} \ \text{m·s}^{-1}$
Planck's constant	h	$6{,}63 \times 10^{-34} \ \text{J·s}$
Coulomb's constant	k	$9{,}0 \times 10^{9} \ \text{N·m}^2\text{·C}^{-2}$
Charge on electron	e	$-1{,}6 \times 10^{-19} \ \text{C}$
Electron mass	m_e	$9{,}11 \times 10^{-31} \ \text{kg}$
Permittivity of free space	ε_0	$8{,}85 \times 10^{-12} \ \text{F·m}^{-1}$

TABLE 2: FORMULAE

MOTION

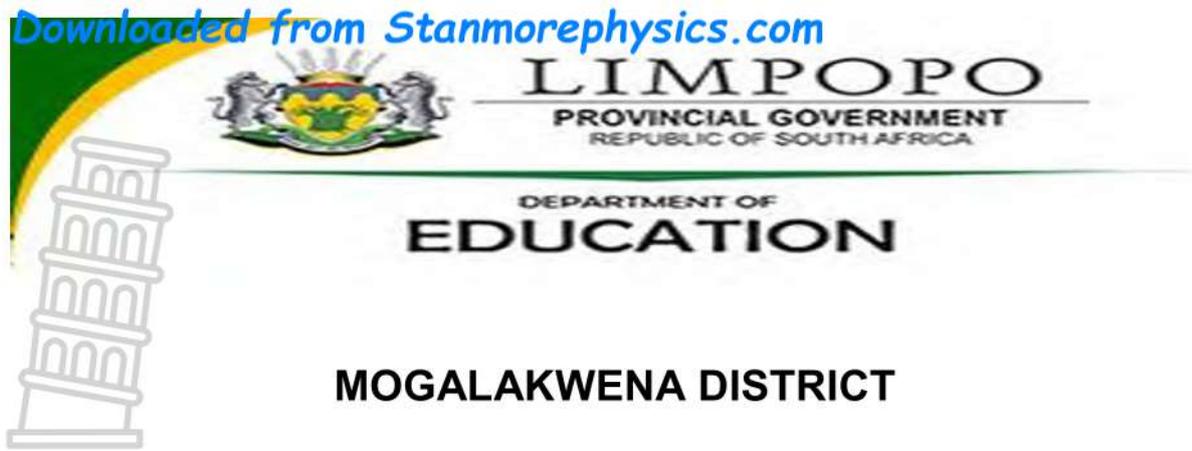|	
$v_f = v_i + a\,\Delta t$	$\Delta x = v_i\Delta t + \frac{1}{2}a\Delta t^2$ or/*of* $\Delta y = v_i\Delta t + \frac{1}{2}a\Delta t^2$
$v_f^2 = v_i^2 + 2a\Delta x$ or/*of* $v_f^2 = v_i^2 + 2a\Delta y$	$\Delta x = \left(\dfrac{v_f + v_i}{2}\right)\Delta t$ or/*of* $\Delta y = \left(\dfrac{v_f + v_i}{2}\right)\Delta t$

FORCE/*KRAG*

$F_{net} = ma$	$p = mv$
$F_{net}\Delta t = \Delta p = mv_f - mv_i$	$w = mg$

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

$W = F\Delta x \cos\theta$	$U = E_P = mgh$
$K = E_k = \frac{1}{2}mv^2$	$W_{net} = \Delta K = \Delta E_k = E_{kf} - E_{ki}$
$P = \dfrac{W}{\Delta t}$	$P = Fv$

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TABLE 3: THE PERIODIC TABLE OF ELEMENTS/*TABEL 3: DIE PERIODIEKE TABEL VAN ELEMENTE*

1 (I)	2 (II)	3	4	5	6	7	8	9	10	11	12	13 (III)	14 (IV)	15 (V)	16 (VI)	17 (VII)	18 (VIII)
2,1 **H** 1 1																	2 **He** 4
1,0 **Li** 3 7	1,5 **Be** 4 9											2,0 **B** 5 11	2,5 **C** 6 12	3,0 **N** 7 14	3,5 **O** 8 16	4,0 **F** 9 19	10 **Ne** 20
0,9 **Na** 11 23	1,2 **Mg** 12 24											1,5 **Aℓ** 13 27	1,8 **Si** 14 28	2,1 **P** 15 31	2,5 **S** 16 32	3,0 **Cℓ** 17 35,5	18 **Ar** 40
0,8 **K** 19 39	1,0 **Ca** 20 40	1,3 **Sc** 21 45	1,5 **Ti** 22 48	1,6 **V** 23 51	1,6 **Cr** 24 52	1,5 **Mn** 25 55	1,8 **Fe** 26 56	1,8 **Co** 27 59	1,8 **Ni** 28 59	1,9 **Cu** 29 63,5	1,6 **Zn** 30 65	1,6 **Ga** 31 70	1,8 **Ge** 32 73	2,0 **As** 33 75	2,4 **Se** 34 79	2,8 **Br** 35 80	36 **Kr** 84
0,8 **Rb** 37 86	1,0 **Sr** 38 88	1,2 **Y** 39 89	1,4 **Zr** 40 91	**Nb** 41 92	1,8 **Mo** 42 96	1,9 **Tc** 43	2,2 **Ru** 44 101	2,2 **Rh** 45 103	2,2 **Pd** 46 106	1,9 **Ag** 47 108	1,7 **Cd** 48 112	1,7 **In** 49 115	1,8 **Sn** 50 119	1,9 **Sb** 51 122	2,1 **Te** 52 128	2,5 **I** 53 127	54 **Xe** 131
0,7 **Cs** 55 133	0,9 **Ba** 56 137	**La** 57 139	1,6 **Hf** 72 179	**Ta** 73 181	**W** 74 184	**Re** 75 186	**Os** 76 190	**Ir** 77 192	**Pt** 78 195	**Au** 79 197	**Hg** 80 201	1,8 **Tℓ** 81 204	1,8 **Pb** 82 207	1,9 **Bi** 83 209	2,0 **Po** 84	2,5 **At** 85	86 **Rn**
0,7 **Fr** 87	0,9 **Ra** 88 226	**Ac** 89															

KEY/*SLEUTEL*

Atomic number / *Atoomgetal*: 29
Symbol / *Simbool*: Cu
Electronegativity / *Elektronegatiwiteit*: 1,9
Approximate relative atomic mass / *Benaderde relatiewe atoommassa*: 63,5

58 **Ce** 140	59 **Pr** 141	60 **Nd** 144	61 **Pm**	62 **Sm** 150	63 **Eu** 152	64 **Gd** 157	65 **Tb** 159	66 **Dy** 163	67 **Ho** 165	68 **Er** 167	69 **Tm** 169	70 **Yb** 173	71 **Lu** 175
90 **Th** 232	91 **Pa**	92 **U** 238	93 **Np**	94 **Pu**	95 **Am**	96 **Cm**	97 **Bk**	98 **Cf**	99 **Es**	100 **Fm**	101 **Md**	102 **No**	103 **Lr**

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TERM 1 CONTROL TEST
07 MARCH 2023
GRADE 12

MEMORANDUM

MARKS : 100   **DURATION: 2 hours**

STARTING TIME: 08H00

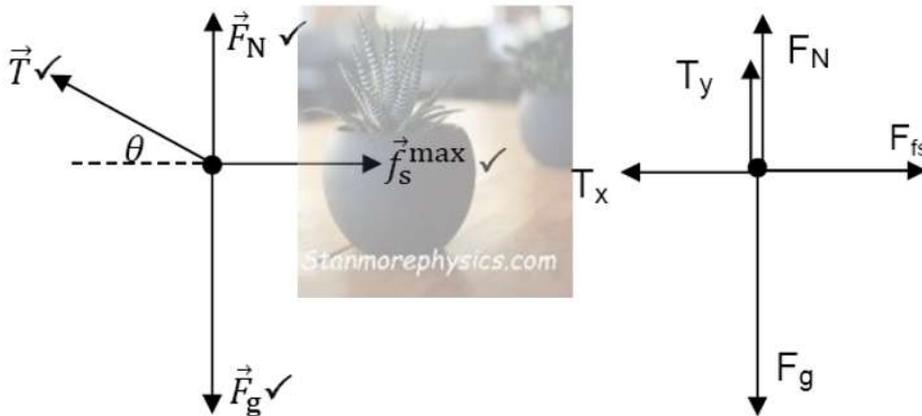**This question paper consists of 10 pages including this one**

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SECTION A : PHYSICS (PAPER 1)

QUESTION 1

1.1   A ✔✔   (2)

1.2   C ✔✔   (2)

1.3   C ✔✔   (2)

1.4   B ✔✔   (2)

1.5   C ✔✔   (2)

                                                                            [10]

QUESTION 2

2.1   (4)

| 1 mark per arrow and label |
| Subtract 1mark for each of the following errors: |
| • No dot shown |
| • T shown with its components (unless components in dashed lines) |

2.2   (5)

$f_s^{max} = \mu_s N$ ✔

$120 = (0,34)N$ ✔

$N = 352,9412 N$

Vertical forces; taking up as positive

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$F_{net}=0$

$\left.\begin{array}{l} T_y+N - F_g=0 \end{array}\right\}$ ✓

$T_y+352{,}9412$✓ $- (50)(9{,}8)$✓ $= 0$

$T_y=137{,}06N$

2.3

    2.3.1 DECREASES ✓   (1)

    2.3.2 From $T_y=T\sin\theta$ .The angle <u>(θ)increases</u>✓<u>,</u> the vertical   (2)
component of the tensional force <u>$T_y$will increase</u>✓

    OR

    From: $N+T_y=F_g$

    <u>(θ)increases/$T_y$will increase</u>✓

    <u>The parcel will not push as hard into the table surface</u> ✓so the
normal force will decrease in magnitude

                                                            [12]

QUESTION 3

2.1   An object which has been given an initial velocity and then it move   (2)
under the influence of the gravitational force only. ✓✓

2.2

    2.2.1   (4)

OPTION 1	
Upward positive	Downward positive
$v_f=v_i+a\Delta t$✓	$v_f=v_i+a\Delta t$✓
$-30 = 30$✓$ + (-9.8)\Delta t$✓	$30 = -30$✓$ + (9.8)\Delta t$✓
$\rule{2cm}{0.4pt}$	$\rule{2cm}{0.4pt}$
$\Delta t = 6,12\ s$✓	$\Delta t = 6,12\ s$✓

OPTION 2	
Upward positive	Downward positive
$v_f = v_i + a\Delta t$✓	$v_f = v_i + a\Delta t$✓
$0 = 30$✓$ + (-9.8)\Delta t$✓	$0 = -30$✓$ + (9.8)\Delta t$✓
$\rule{2cm}{0.4pt}$	$\rule{2cm}{0.4pt}$
$\Delta t = 3,06\ s$	$\Delta t = 3,06\ s$
Total time $=(2)(3,06)$	Total time $=(2)(3,06)$
$= 6,12\ s$✓	$= 6,12\ s$✓

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OPTION 3	
Upward positive	Downward positive
$\Delta y = v_i \Delta t + \frac{1}{2} a\Delta t^2$ ✔	$\Delta y = v_i \Delta t + \frac{1}{2} a\Delta t^2$ ✔
$0 = (30)\Delta t$ ✔ $+ \frac{1}{2}(-9,8)\Delta t^2$ ✔	$0 = (-30)\Delta t$ ✔ $+ \frac{1}{2}(9,8)\Delta t^2$ ✔
$\Delta t = 6,12\ s$ ✔	$\Delta t = 6,12\ s$ ✔

2.2.2   POSITIVE MARKING FROM QUESTION 2.2.1   (4)

OPTION 1
UPWARD POSITIVE
$\Delta y = v_i + \frac{1}{2} a\Delta t^2$ ✔
$\Delta y_{last} = \Delta y_{(6.12)} - \Delta y_{(5.12)}$
$\qquad = \{30(6,12) + \frac{1}{2}(-9,8)(6,12)^2\}$ ✔
$\qquad\qquad - \{30(5,12) + \frac{1}{2}(-9,8)(5,12)^2\}$ ✔
$\qquad = -25,076$
Distance$= 25,08$ m ✔

OR

DOWNWARD POSITIVE

$\Delta y = v_i + \frac{1}{2} a\Delta t^2$ ✔
$\Delta y_{last} = \Delta y_{(6.12)} - \Delta y_{(5.12)}$
$\qquad = \{-30(6,12) + \frac{1}{2}(9,8)(6,12)^2\}$ ✔
$\qquad\qquad - \{-30(5,12) + \frac{1}{2}(9,8)(5,12)^2\}$ ✔
$\qquad = 25,076$
Distance$= 25,08$ m ✔

OPTION 2	
UPWARD POSITIVE	DOWNWARD POSITIVE
$v_f = v_i + a\Delta t$	$v_f = v_i + a\Delta t$
$\quad = 0 + (-9,8)(2,06)$ ✔	$\quad = 0 + (9,8)(2,06)$ ✔
$\quad = -20,188\ m.s^{-1}$	$\quad = 20,188\ m.s^{-1}$

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

$= (-20,188)(1) + \frac{1}{2}(-9,8)(1)^2$ ✓

$= -25,09$ m

Distance $= 25,09$ m ✓

OR

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

$= \left(\frac{-20,188 + (-30)}{2}\right)(1)$ ✓

$= -25,09\ m$

Distance $= 25,09$ m ✓

OR

$v_f^2 = v_i^2 + 2a\Delta y$ ✓

$(-30)^2 = (-20,188)^2$

$\qquad + 2(-9,8)\Delta y$ ✓

$\Delta y = -25,12\ m$

Distance $= 25,12$ m ✓

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

$= (20,188)(1) + \frac{1}{2}(9,8)(1)^2$ ✓

$= 25,09$ m

Distance $= 25,09$ m ✓

OR

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

$= \left(\frac{20,188 + (30)}{2}\right)(1)$ ✓

$= 25,09\ m$

Distance $= 25,09$ m ✓

OR

$v_f^2 = v_i^2 + 2a\Delta y$ ✓

$(30)^2 = (20,188)^2$

$\qquad + 2(9,8)\Delta y$ ✓

$\Delta y = 25,12\ m$

Distance $= 25,12$ m ✓

2.3

2.3.1   0 ms⁻¹ ✓   (1)

2.3.2 $\Delta t = 0,76 - 0,64 = 0,33\ s$ ✓✓   (2)

2.3.3   (2)

OPTION 1	**OPTION 2**
$\Delta t = \frac{(1,90 - 0,67)}{2}$ ✓	$\Delta t = \frac{(1,90 + 0,67)}{2}$ ✓
$= 0,62$ s ✓ (0, 615 s)	$= 1,285$ s
	$\Delta t = 1,285 - 0,67$
	$= 0,62$ s ✓ (0, 615 s)
OPTION 3	**OPTION 4**
	$v_f^2 = v_i^2 + 2a\Delta y$
$\Delta y = v_i\Delta t + \frac{1}{2}a\Delta t^2$	$0 = v_i^2 + 2(-9,8)(1,85)$
$(-1,85) = 0 + \frac{1}{2}(-9,8)\Delta t^2$ ✓	$v_i = 6,02\ m.s^{-1}$
$\Delta t = 0,61\ s$ ✓ $(0,6145\ s)$	
	$v_f = v_i + a\Delta t$
	$0 = 6,02 + (-9,8)\Delta t$ ✓
	$\Delta t = 0,61\ s$ ✓

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Term 1 Control Test

QUESTION 4

4.1 $E_k = \frac{1}{2}mv^2$ ✔ (3)

$\quad\quad 37,5 = \frac{1}{2}(12)v^2$ ✔

$\quad\quad v = 2,5 \text{ m.s}^{-1}$ ✔

4.2 The total linear momentum of an isolated system remains constant/ (is conserved) ✔✔ (2)

4.3 **POSITIVE MARKING FROM QUESTION 3.1** (4)

$\quad\quad \sum p_i = \sum p_f$ ✔

$\quad\quad \underline{(30)v_i + (12)(2,5)}$ ✔ $= (30+12)(3,2)$ ✔

$\quad\quad \therefore v_i = 3,48 \text{ m.s}^{-1}$ ✔

4.4 (4)

OPTION 1	**OPTION 2**
$F_{net}\Delta t = \Delta p$ ✔ $F_{net}(0,2)$ ✔ $= 30(3,2 - 3,48)$ ✔ $F_{net} = -42 \text{ N}$ $\therefore F_{net} = 42 \text{ N}$ ✔	$F_{net}\Delta t = \Delta p$ ✔ $F_{net}(0,2)$ ✔ $= 12(3,2 - 2,4)$ ✔ $\therefore F_{net} = 42 \text{ N}$ ✔
OPTION 3	**OPTION 4**
$v_f = v_i + a\Delta t$ $3,2 = 3,48 + a(0.2)$ ✔ $a = -1,4 \ m.s^{-2}$ $F_{net} = ma$ ✔ $\quad\quad = (30)(-1,4)$ ✔ $\quad\quad = -42$ $\therefore F_{net} = 42 \ \text{N}$ ✔	$v_f = v_i + a\Delta t$ $3,2 = 2,5 + a(0.2)$ ✔ $a = 3,5 \ m.s^{-2}$ $F_{net} = ma$ ✔ $\quad\quad = (30)(-1,4)$ ✔ $\therefore F_{net} = 42 \ \text{N}$ ✔

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SECTION B : CHEMISTRY (PAPER 2)

QUESTION 1

1.1	C✔✔	(2)
1.2	B✔✔	(2)
1.3	A✔✔	(2)
1.4	B✔✔	(2)
1.5	D✔✔	(2)

[10]

QUESTION 2

2.1

2.1.1 A/B✔   (1)

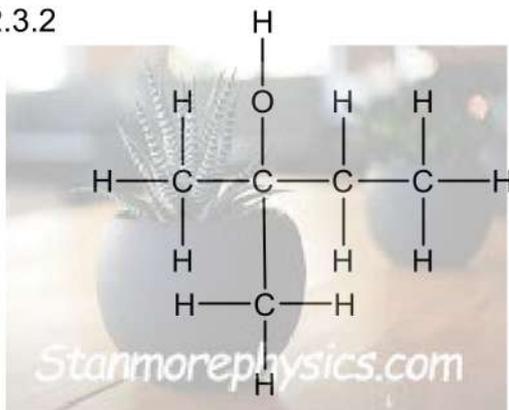2.1.2 F✔   (1)

2.1.3 C✔   (1)

2.2 5-bromo-2,2-dimethylhexane   (3)

> **Marking Criteria**
> ✔For identifying the main chain correctly (hexane)
>
> ✔ For identifying the branches correctly (bromo, methyl)
>
> ✔ For the correct IUPAC name

2.3

2.3.1 The C atom to which the hydroxyl group is bonded to is bonded   (2)
        to 3 carbons atoms✔✔

2.3.2   (3)

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Marking Criteria
✓For – OH
✓ For- Methyl (CH_3) on carbon number 2
✓-Whole structure is correct

2.4

    2.4.1 Ethanol and propanoic acid✓✓ (2)

    2.4.2 Esterification✓ (1)

[14]

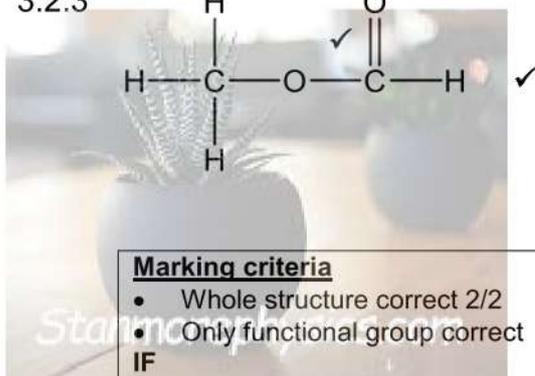## QUESTION 3

3.1 The <u>temperature</u> at which the <u>vapour pressure</u> of a substance <u>equals</u> <u>atmospheric/external pressure.</u> ✓ ✓ (2)

3.2

    3.2.1 Carboxyl (group) ✓ (1)

    3.2.2 Propanoic acid✓ (1)

    3.2.3 (2)

Marking criteria
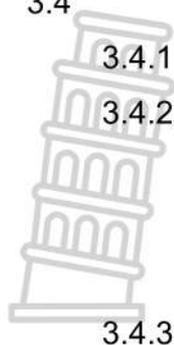- Whole structure correct 2/2
- Only functional group correct 1/2
IF
- More than one functional group/wrong functional group 0/2
- If condensed structural formulae used 1/2

3.3 A✓ (2)

Lowest boiling point./Shortest chain length✓

3.4

    3.4.1 The same molecular mass/molecular size. ✓   (1)

    3.4.2 Primary✓   (2)

           OH group is bonded to a C atom bonded to one other C atom. ✓

           OR

           OH group is bonded to a C atom that has two H atoms.

    3.4.3   (4)

Marking guidelines
• BOTH have hydrogen bonding. • Compare number of sites for hydrogen bonding. • Compare strength of IMFs. • Compare energy required.

- <u>Both compounds/X and B have</u> (in addition to London forces and dipole dipole forces) <u>hydrogen bonding</u>. ✓

- Compound **X**/$CH_3CH_2CH_2OH$/propan-1-ol/alcohol has <u>one site for hydrogen bonding</u> and compound **B**/ethanoic acid/carboxylic acid has <u>two/more sites for hydrogen bonding</u>✓

   OR

  B/ethanoic acid/carboxylic acid has <u>two/more sites for hydrogen bonding.</u>

- Intermolecular forces in compound **B**/ethanoic acid/carboxylic acid are <u>stronger</u> than intermolecular forces in compound X/$CH_3CH_2CH_2OH$/ propan-1-ol/alcohol. ✓

  OR

  Intermolecular forces in <u>compound X</u>/$CH_3CH_2CH_2OH$/ propan-1-ol/alcohol are <u>weaker</u> than intermolecular forces in compound B/ethanoic acid/carboxylic acid.

- <u>More energy is needed to overcome/break intermolecular forces in compound **B**/ethanoic acid/carboxylic acid</u> than in compound X/CH3CH2CH2OH/ propan-1-ol/alcohol. ✓

  OR

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Less energy is needed to overcome/break intermolecular forces in compound X/$CH_3CH_2CH_2OH$/propan-1-ol/alcohol than in compound **B**/ethanoic acid/carboxylic acid.

[15]

QUESTION 4

4.1

    4.1.1   Dehydration ✓   (1)

    4.1.2   Hydration ✓   (1)

    4.1.3   Dehydrohalogenation/ dehydrobromination ✓   (1)

4.2

    4.2.1   Substitution/Hydrolysis ✓   (1)

    4.2.2   •   Dilute base/sodium hydroxide/NaOH ✓   (2)

                     •   Moderate temperature/(mild) heat ✓

4.3   NaOH/KOH ✓   (1)

4.4   (3)

4.5   Butane ✓   (1)

[11]

GRAND TOTAL: 100 MARKS