LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF
EDUCATION

MOGALAKWENA DISTRICT

PHYSICAL SCIENCES

NATIONAL SENIOR CERTIFICATE

Stanmorephysics.com

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.



SECTION A : PHYSICS (PAPER 1)

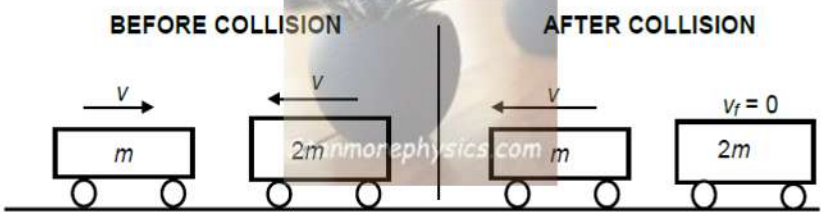
QUESTION 1

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.

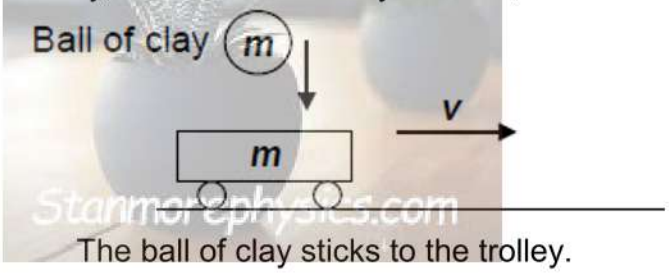


Ignore the effects of friction.
Which ONE of the following is CORRECT?

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

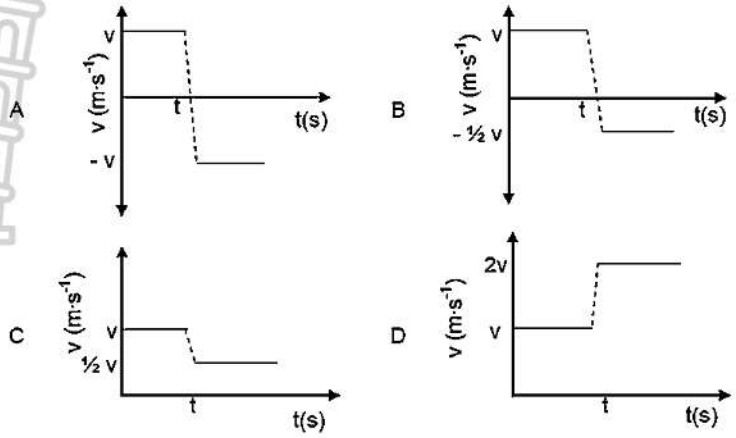
(2)

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?

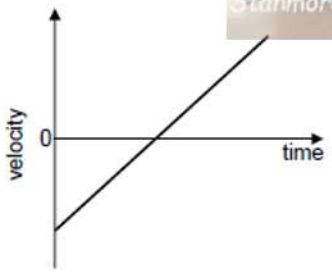


(2)

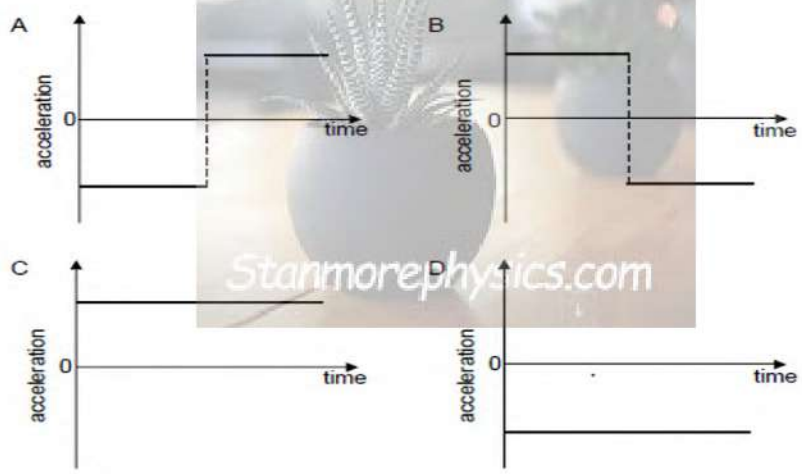
1.4 A ball is thrown vertically upward into the air. Ignore the effects of friction. THE NET FORCE acting on the ball when ball is at its highest point is …

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?

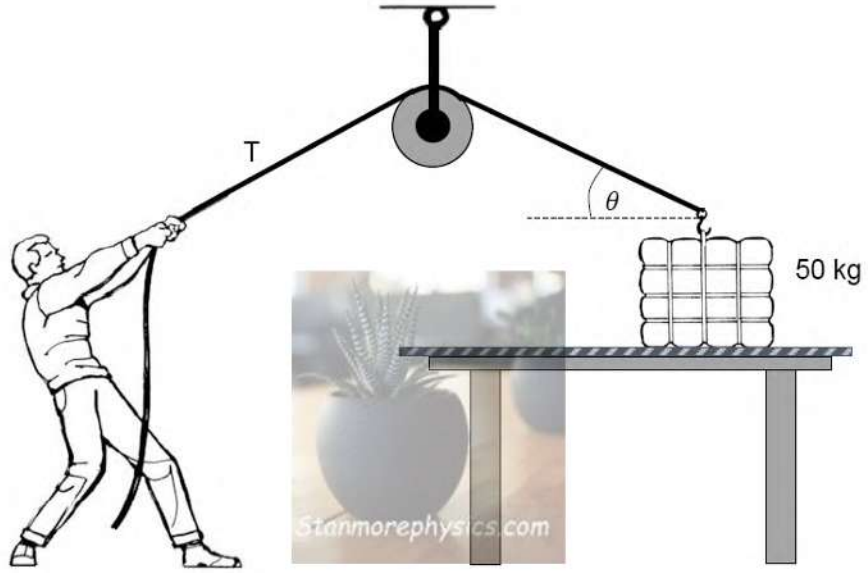


(2)

[10]

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 magnitude of the vertical component of the tension force in the rope is 137,06 N. (5)

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 slides across the table surface? State only INCREASES, DECREASES or REMAINS THE SAME. (1)

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

[12]

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.

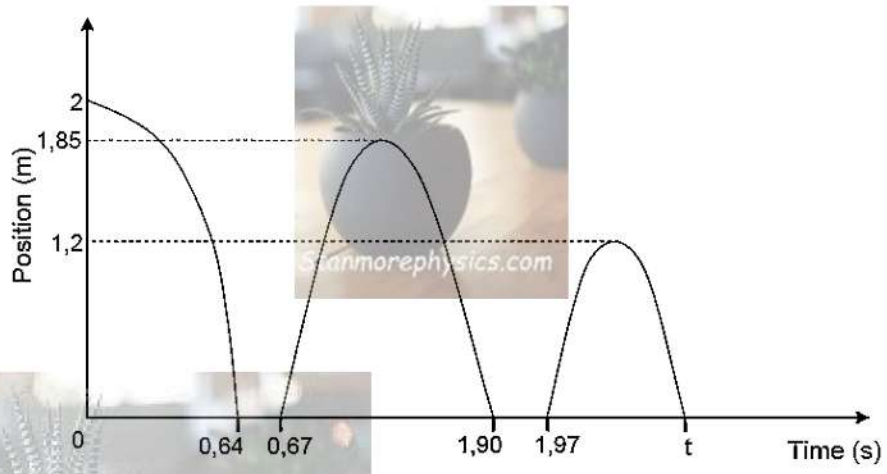
2.1 Explain what is meant by a projectile. (2)

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)

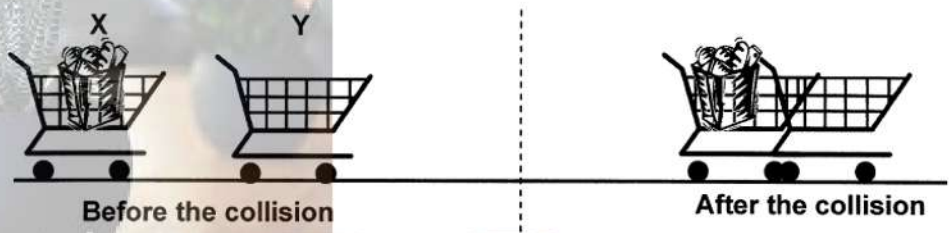
[15]

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.



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

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:

$CH_3CHCHCH_3 + H_2O \rightarrow$ major product

The CORRECT IUPAC name for the major product above is:

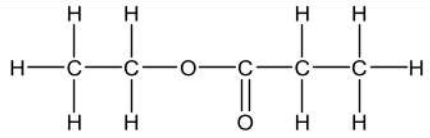
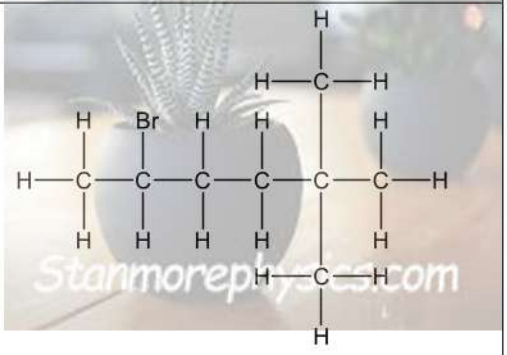
A Butanal
B Butan-2-ol
C Butan-3-ol
D Butan-2-one

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)

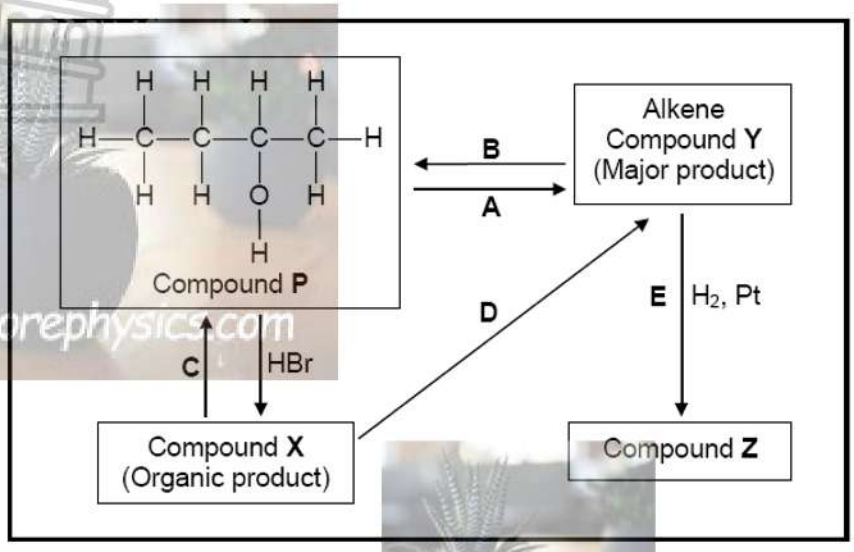
3.4.2 Is compound X a PRIMARY, SECONDARY or TERTIARY alcohol? Give a reason for the answer. (2)

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)

[15]

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 reaction **E**. (3)

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

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 $m \cdot s^{-2}$
Speed of light in a vacuum	c	3,0 x 10^{8} $m \cdot s^{-1}$
Planck's constant	h	6,63 x 10^{-34} $J \cdot s$
Coulomb's constant	k	9,0 x 10^{9} $N \cdot m^2 \cdot C^{-2}$
Charge on electron	e	-1,6 x 10^{-19} C
Electron mass	m_e	9,11 x 10^{-31} kg
Permittivity of free space	ε_0	8,85 x 10^{-12} $F \cdot m^{-1}$

Stanmorephysics.com

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

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*

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

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																	2 He 4
1,0 Li 7	1,5 Be 9											2,0 B 11	2,5 C 12	3,0 N 14	3,5 O 16	4,0 F 19	Ne 20
0,9 Na 23	1,2 Mg 24											1,5 Aℓ 27	1,8 Si 28	2,1 P 31	2,5 S 32	3,0 Cℓ 35,5	Ar 40
0,8 K 39	1,0 Ca 40	1,3 Sc 45	1,5 Ti 48	1,6 V 51	1,6 Cr 52	1,5 Mn 55	1,8 Fe 56	1,8 Co 59	1,8 Ni 59	1,9 Cu 63,5	1,6 Zn 65	1,6 Ga 70	1,8 Ge 73	2,0 As 75	2,4 Se 79	2,8 Br 80	Kr 84
0,8 Rb 86	1,0 Sr 88	1,2 Y 89	1,4 Zr 91	Nb 92	1,8 Mo 96	1,9 Tc	2,2 Ru 101	2,2 Rh 103	2,2 Pd 106	1,9 Ag 108	1,7 Cd 112	1,7 In 115	1,8 Sn 119	1,9 Sb 122	2,1 Te 128	2,5 I 127	Xe 131
0,7 Cs 133	0,9 Ba 137	La 139	1,6 Hf 179	Ta 181	W 184	Re 186	Os 190	Ir 192	Pt 195	Au 197	Hg 201	1,8 Tℓ 204	1,8 Pb 207	1,9 Bi 209	2,0 Po	2,5 At	Rn
0,7 Fr	0,9 Ra 226	Ac															

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