LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

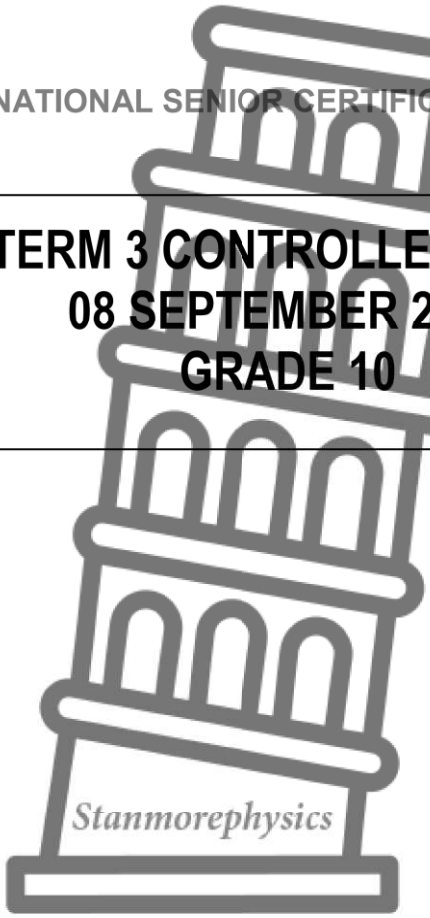
DEPARTMENT OF
EDUCATION

MOGALAKWENA DISTRICT

PHYSICAL SCIENCES

NATIONAL SENIOR CERTIFICATE

TERM 3 CONTROLLED TEST
08 SEPTEMBER 2023
GRADE 10



MARKS: 100 **TIME: 2 hours**

This question paper consists of 11 pages including this one

INSTRUCTIONS

1. This question paper consists of 11 pages including the cover page
2. Answer all the questions in the answer book
3. You are advised to use the attached DATA SHEETS.
4. Round off your final answer to a minimum of TWO decimal places
5. Show all your calculations including formulae where applicable.
6. Candidates may use non-programmable calculators.
7. Write neatly and legibly.

QUESTION 1: MULTIPLE-CHOICE QUESTIONS

Four options are provided as possible answers to the following questions. Each question has only ONE correct answer. Write only the letter (A-D) next to the question number (1.1 - 1.10) in the ANSWER BOOK

1.1 A car is travelling at a speed of 30 $m.s^{-1}$on a straight road. What would be the speed of the car in $km{\cdot}h^{-1}$?

A 30 $km{\cdot}h^{-1}$

B 130 $km{\cdot}h^{-1}$

C 8.33 $km{\cdot}h^{-1}$

D 108 $km{\cdot}h^{-1}$ (2)

1.2 The gravitational potential energy of an object relative to the ground is dependent on the object's

A velocity

B Position

C Change in velocity

D Speed (2)

1.3 What volume (in dm^3) does 1 gram of hydrogen gas occupy at STP?

A 11.2

B 44.8

C 22.4

D 5.6 (2)

1.4 The gradient of a velocity time graph is equivalent to the …

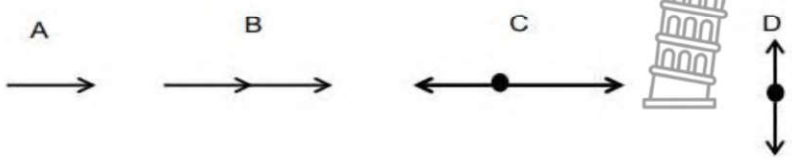
A Acceleration

B Position

C Total distance covered

D Displacement (2)

1.10 Which ONE of the vector diagrams below will result in the largest resultant vector?



(2)

[20]

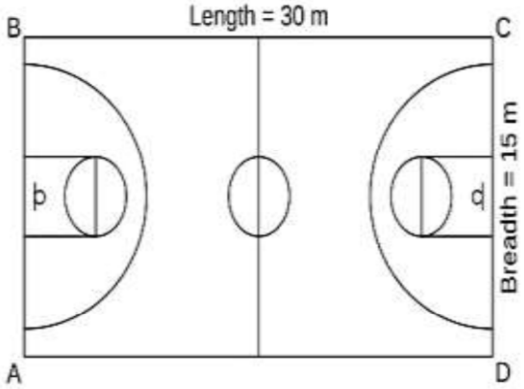
QUESTION 2

2.1 (2)

Define displacement

2.2

During a practice session, a basketball player runs around the basketball court starting from point A. He runs to point B, C, D and then returns to point A.



2.2.1 Draw the vector diagram the movement of the basketball player for one lab around the court. (Ensure that diagram is fully labelled). (2)

Using scale 1cm=5m

2.2.2 Calculate the distance he travelled for one lap (2)

2.3 If it took 19 seconds for the basketball player to complete lab around the court.

2.3.1 Calculate his average speed. (4)

[10]

QUESTION 3

3.1 Define empirical formula (2)

3.2 An inorganic substance was analyzed and found to be containing 65.31% of oxygen, 32.65% of Sulphur and **x** amount of hydrogen.

3.2.1 Calculate the percentage of hydrogen element in the substance (2)

3.2.2 Determine the empirical formula for the compound. (4)

3.3 6.257g of hydrated copper sulphate ($CuSO_4 \cdot \mathbf{n}H_2O$) was heated, and during the heating the mass was recorded. The mass of the content was decreasing and after a while the mass remained unchanged at 4g.

3.3.1 Give a reason why the mass decreased. (2)

3.3.2 Determine the value of **n** in the $CuSO_4 \cdot \mathbf{n}H_2O$ (4)

3.4 Define the term molar mass. (2)

3.5 Calculate the following for $A\ell_2(SO_4)_3$:

3.5.1 Its molar mass (2)

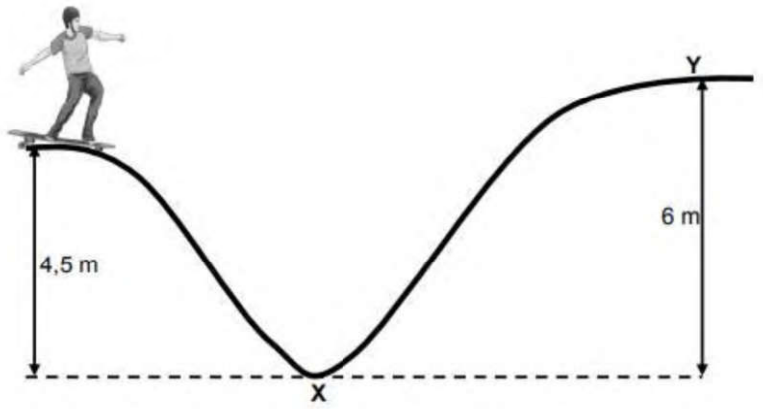
3.5.2 Its percentage composition (3)

3.5.3 The number of moles present in 85,5 g (3)

[24]

QUESTION 4

A skateboarder, starting from the top of a ramp 4,5 m above the ground, skates down the ramp, as shown in the diagram below. The mass of the skateboarder and his board is 65 kg. Ignore the effects of friction.



4.1 Define the term gravitational potential energy in words. (2)

4.2 Calculate the gravitational potential energy of the skater just before he skates down the ramp. (3)

4.3 State the principle of conservation of mechanical energy in words. (2)

4.4 Use the principle stated in QUESTION 4.3 to calculate the magnitude of the velocity of the skateboarder when he reaches the ground at point **X**. (4)

4.5 Will the skateboarder be able to reach point Y if he were to remain on his skateboard? Write YES or NO and support the answer with a relevant calculation. (5)

[16]

QUESTION 5

A car accelerates from rest at $15\ m.s^{-2}$ for 2 seconds on a horizontal road.

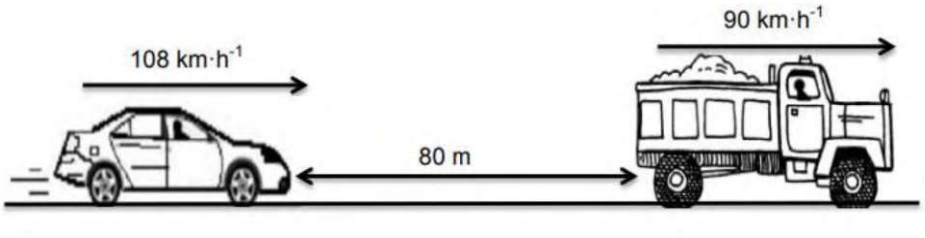
5.1 Define the term acceleration. (2)

5.2 Calculate the:

5.2.1 Distance covered by the car. (3)

5.2.2 Velocity of the car. (3)

While travelling at a constant velocity of $108\ km.h^{-1}$, the driver of a car notices a sign warning motorists to keep a safe 2-second following distance. At that instant the car is 80 m behind a truck that is travelling at a constant velocity of 90 $km.h^{-1}$.



5.3 Explain the meaning of a safe 2-second following distance. (2)

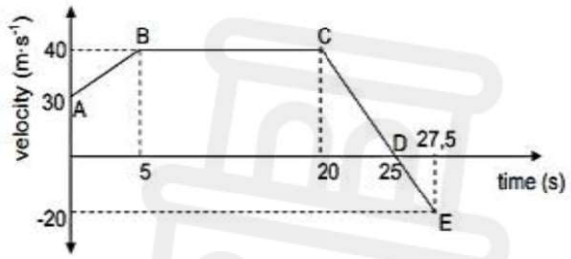
5.4 Calculate the safe 2-second following distance behind the truck. (6)

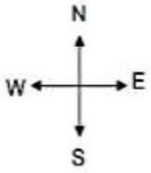
5.5 Calculate how long it will take the motorist to get to a safe 2-second following distance behind the truck. (5)

[21]

QUESTION 6

The velocity versus time graph for a racing car moving eastwards, is shown below.





6.1 Write down the initial velocity of the car. (2)

6.2 Write down the speed of the car at time t = 10 s (2)

6.3 Describe the motion of the car for the section labelled CD (2)

6.4 Support the answer to QUESTION 4.3 above by calculating the acceleration for section CD (4)

6.5 Without any calculation, compare the magnitude of the acceleration of the car in part DE with that of part CD of the journey. Write only GREATER THAN, LESS THAN or EQUAL TO. Give a reason for the answer. (2)

6.6 Determine the total displacement for the motion of the car. (7)

[19]

Total [100]

DATA FOR PHYSICAL SCIENCES GRADE 10
PAPER 1 (PHYSICS)
GEGEWENS VIR FISIESE WETENSKAPPE GRAAD 10
VRAESTEL 1 (FISIKA)

TABLE 1: PHYSICAL CONSTANTS/*TABEL 1: FISIESE KONSTANTES*

NAME/*NAAM*	SYMBOL/*SIMBOOL*	VALUE/*WAARDE*
Acceleration due to gravity *Swaartekragversnelling*	g	$9{,}8\ m\cdot s^{-2}$
Speed of light in a vacuum *Spoed van lig in 'n vakuum*	c	$3{,}0 \times 10^{8}\ m\cdot s^{-1}$
Planck's constant *Planck se konstante*	h	$6{,}63 \times 10^{-34}\ J\cdot s$
Charge on electron *Lading op elektron*	e	$-1{,}6 \times 10^{-19}\ C$
Electron mass *Elektronmassa*	m_e	$9{,}11 \times 10^{-31}\ kg$

TABLE 2: FORMULAE/*TABEL 2: FORMULES*

MOTION/*BEWEGING*

$v_f = v_i + a\Delta t$	$\Delta x = v_i\Delta t + \frac{1}{2}a\Delta t^2$
$v_f^{\,2} = v_i^{\,2} + 2a\Delta x$	$\Delta x = \left(\frac{v_f + v_i}{2}\right)\Delta t$

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

$U = mgh$ or/*of* $E_P = mgh$	$K = \frac{1}{2}mv^2$ or/*of* $E_k = \frac{1}{2}mv^2$
$E_M = E_k + E_p$. or/*of* $E_M = K + U$	

WAVES, SOUND AND LIGHT/*GOLWE, KLANK EN LIG*

$v = f\lambda$	$T = \frac{1}{f}$
$E = hf$ or/*of* $E = h\frac{c}{\lambda}$	

ELECTROSTATICS/*ELEKTROSTATIKA*

$n = \frac{Q}{e}$	$Q = \frac{Q_1 + Q_2}{2}$

ELECTRIC CIRCUITS/*ELEKTRIESE STROOMBANE*

$Q = I\Delta t$	$\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} + \ldots$
$R_s = R_1 + R_2 + \ldots$	$V = \frac{W}{q}$

DATA FOR PHYSICAL SCIENCES GRADE 10
PAPER 2 (CHEMISTRY)

GEGEWENS VIR FISIESE WETENSKAPPE GRAAD 10
VRAESTEL 2 (CHEMIE)

TABLE 1: PHYSICAL CONSTANTS/*TABEL 1: FISIESE KONSTANTES*

NAME/*NAAM*	SYMBOL/*SIMBOOL*	VALUE/*WAARDE*
Standard pressure *Standaarddruk*	p^{θ}	$1{,}013 \times 10^{5}$ Pa
Molar gas volume at STP *Molêre gasvolume by STD*	V_m	$22{,}4\ dm^3 \cdot mol^{-1}$
Standard temperature *Standaardtemperatuur*	T^{θ}	273 K
Charge on electron *Lading op elektron*	e	$1{,}6 \times 10^{-19}$ C
Avogadro's constant *Avogadro-konstante*	N_A	$6{,}02 \times 10^{23}\ mol^{-1}$

TABLE 2: FORMULAE/*TABEL 2: FORMULES*

$n = \frac{m}{M}$	$n = \frac{N}{N_A}$
$c = \frac{n}{V}$ or/*of* $c = \frac{m}{MV}$	$n = \frac{V}{V_m}$

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																	**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	1,8 **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**															

Ce 140	**Pr** 141	**Nd** 144	**Pm**	**Sm** 150	**Eu** 152	**Gd** 157	**Tb** 159	**Dy** 163	**Ho** 165	**Er** 167	**Tm** 169	**Yb** 173	**Lu** 175
Th 232	**Pa**	**U** 238	**Np**	**Pu**	**Am**	**Cm**	**Bk**	**Cf**	**Es**	**Fm**	**Md**	**No**	**Lr**

KEY/*SLEUTEL*

Atomic number *Atoomgetal*

Electronegativity *Elektronegatiwiteit* — 29 Cu 1,9 63,5 — Symbol *Simbool*

Approximate relative atomic mass *Benaderde relatiewe atoommassa*