education

MPUMALANGA PROVINCE

REPUBLIC OF SOUTH AFRICA

EHLANZENI DISTRICT

PHYSICAL SCIENCES

GRADE 12

PHYSICS & CHEMISTRY (P1 & P2)

MARCH CONTROL TEST

2025

MARKS: 100

TIME: 2 hours

This question paper consists of 12 pages including data sheets

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INSTRUCTIONS AND INFORMATION

1. Write your name in the appropriate space on the FOLIO PAPER.
2. This question paper consists of SEVEN questions. Answer ALL the questions in the FOLIO PAPER.
3. Start EACH question on a NEW page in the FOLIO PAPER.
4. Number the answers correctly according to the numbering system used in this question paper.
5. Leave ONE line between two sub questions, for example between QUESTION 2.1 and QUESTION 2.2.
6. You may use a non-programmable calculator.
7. You may use appropriate mathematical instruments.
8. You are advised to use the attached DATA SHEETS.
9. Show ALL formulae and substitutions in ALL calculations.
10. Round off your final numerical answers to a MINIMUM of TWO decimal places.
11. Give brief motivations, discussions, et cetera where required.
12. Write neatly and legibly.

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QUESTION 1 : MULTIPLE-CHOICE QUESTIONS

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 – 1.4) in the ANSWER BOOK, for example, 1.5 E.

1.1 Impulse is equal to the …

A rate of change in momentum of an object.

B change in momentum of an object.

C Net force acting on the object.

D Product of mass and velocity of an object. (2)

1.2 A ball is thrown vertically upwards. Which ONE of the following physical quantities of the ball has a ZERO value at its highest point?

A Kinetic energy

B Acceleration

C Weight

D Potential energy (2)

1.3 The magnitude of the gravitational force exerted by one body on another body is **F**. When the distance between the centres of the two bodies is HALVED and the mass of one body is DOUBLED, the magnitude of the gravitational force, in terms of **F**, will now be …

A $\frac{1}{4}\mathbf{F}$

B $\frac{1}{8}\mathbf{F}$

C $2\mathbf{F}$

D $8\mathbf{F}$ (2)

1.4 Which ONE of the following organic compounds has NO structural isomers?

A Propan-1-ol

B Propanal

C Propane

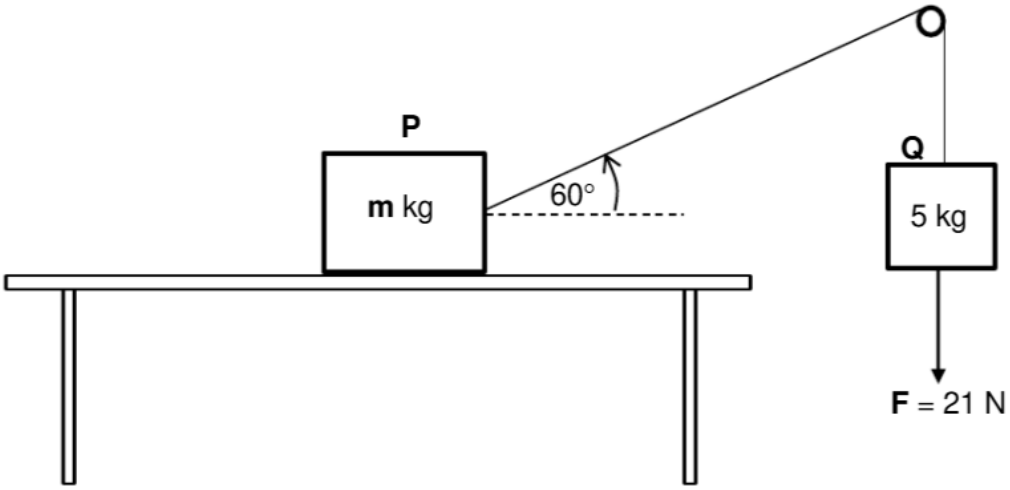
D Propanoic acid. (2)

[08]

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QUESTION 2

Two objects, **P**, and **Q**, of masses, m kg and 5 kg respectively are joined by a light inextensible string running over a frictionless pulley. When a force of 21 N is exeted on the 5 kg as shown in the diadram below, the two objects REMAIN STATIONARY. Ignore the effects of air friction.



The coefficient of STATIC FRICTION between the surface of the table and object, **P**, is 0,25.

2.1 State Newton's first law of motion in words. (2)

2.2 Write down the:

2.2.1 Magnitude of the net force acting on the 5 kg object. (1)

2.2.2 Direction of TENDENCY of motion of object, **P**, would move when a force greater than 21 N pulls the 5 kg. Choose EAST or WEST. (1)

2.3 Draw a labelled FREE-BODY diagram indicating all the forces acting on object, **P**. (4)

2.4 Draw a labelled FORCE diagram indicating all the forces acting on object, **Q**. (3)

2.5 Calculate the:

2.5.1 Magnitude of the tension in the string. (3)

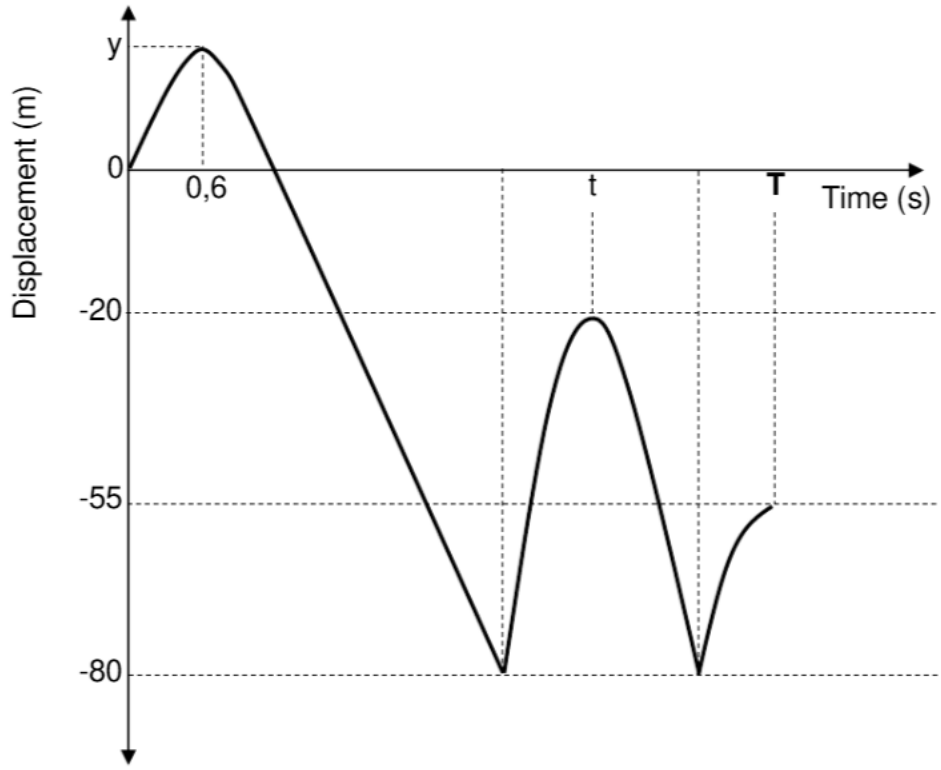
2.5.2 Mass of object, **P**. (3)

2.6 If the magnitude of the force exerted on the 5 kg is now increased to be greater than 21 N. What will happen to the magnitude of the acceleration of the 5 kg? Write down INCREASES, DECREASES or REMAINS THE SAME. Explain the answer. (2)

[19]

QUESTION 3

A ball is thrown vertically upwards from the edge (top) of a building and bounces a few times as it hits the ground. The displace-time graph below describes the motion of the ball from the time it is thrown, up to a certain time **T** (maximum height). The motion of the ball is observed from the point of launch. Ignore the effects of air friction.



3.1 Define the term *free fall*. (2)

3.2 Write down the:

3.2.1 Height above the ground from where the ball was thrown upwards. (1)

3.2.2 Acceleration of the ball at t = 0,6 s. (2)

3.3 Calculate the:

3.3.1 Velocity at which the ball is thrown upwards. (3)

3.3.2 Maximum height the ball reached above the ground after the SECOND bounce. (2)

3.3.3 Velocity at which the ball leaves the ground after the FIRST bounce. (3)

3.3.4 Numerical value of time, **t**, shown on the graph. (5)

3.4 Draw a velocity-time graph for the motion of the ball from the instant it is thrown upwards until it reaches its maximum height after the first bounce (time, **t**).

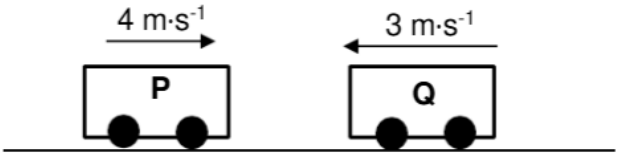
Indicate the following on the graph:

- Initial velocity of the ball.
- Velocity at which it leaves the ground after the first bounce.
- Time taken to reach maximum height for the first time.

(4)
[22]

QUESTION 4

Trolley, **P**, of mass 2 000 g travels at 4 m·s^{-1} east and collides with trolley, **Q**, of mass **m** kg which is moving at 3 m·s^{-1} west. The TOTAL KINETIC ENERGY of the two trolleys before the collision is 38,5 J. Ignore all frictional effects and consider the system isolated.



The change in momentum of trolley, **P**, immediately after the collision is 12,5 kg·s^{-1} west.

4.1 Explain what is meant by an *isolated system* (in Physics). (2)

4.2 Calculate the:

4.2.1 Mass of trolley, **Q**. (2)

4.2.2 Speed of trolley, **P**, immediately after the collision. (3)

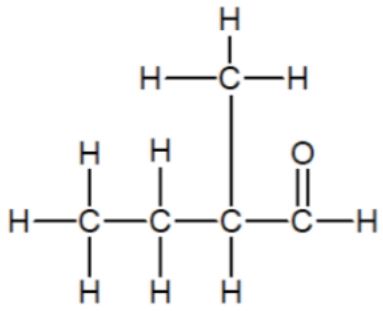
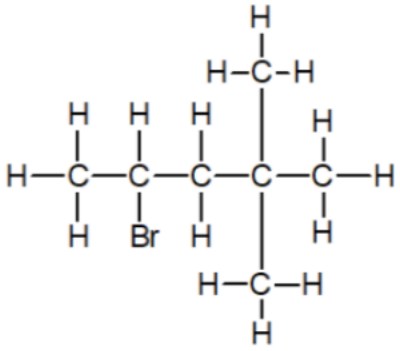
4.2.3 Velocity of trolley, **Q**, immediately after the collision. (3)

4.3 How does the magnitude of the impulse on trolley, **P**, compare to the impulse on trolley, **Q**, immediately after the collision? Write down GREATER THAN, LESS THAN or EQUAL TO. Explain the answer.

(2)
[12]

QUESTION 5

The letters **A** to **D** in the table below represent four organic compounds with different functional groups. Use the table to answer the questions that follow.

A		**B**	Propanoic acid
C		**D**	$CH_3(CH_2)_2CH_3$

5.1 Define the term *functional group.* (2)

5.2 For organic compound, **A**, write down:

5.2.1 Its CONDENSED STRUCTURAL FORMULA. (2)

5.2.2 The IUPAC name of its POSITIONAL ISOMER. (2)

5.3 For organic compound, **C**, write down the:

5.3.1 Type of alkyl halide (halo-alkane). Give a reason for the answer. (2)

5.3.2 IUPAC name. (3)

5.4 For compound, **D**:

5.4.1 Draw the STRUCTURAL FORMULA of its functional group. (1)

5.4.2 Write down a balanced chemical equation using molecular formula for the complete combustion of compound, **D**. (3)

5.5 For compound, **B**:

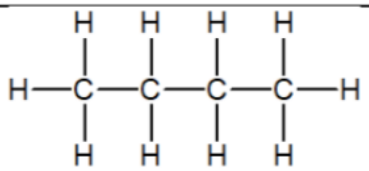
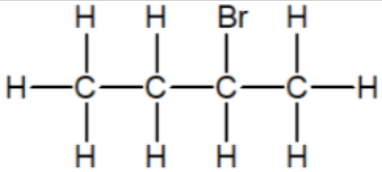
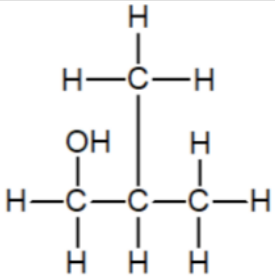
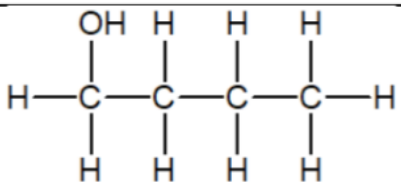
5.5.1 Name given to its functional group. (1)

5.5.2 Draw its STRUCTURAL FORMULA. (2)

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QUESTION 6

During a practical investigation the boiling points of four organic compounds (P, Q, R and S) were determined and boiling points of compound, **R** and **S** were recorded in the table below.

COMPOUND	STRUCTURAL FORMULA	BOILING POINT (°C)
P		x
Q		y
R		108
S		117,7

6.1 Define the term boiling point. (2)

6.2 Compound, **R** and **S** have different boiling points as shown in the table.

6.2.1 Write down the name of the type of intermolecular force responsible for this difference in boiling points of the two compounds. (1)

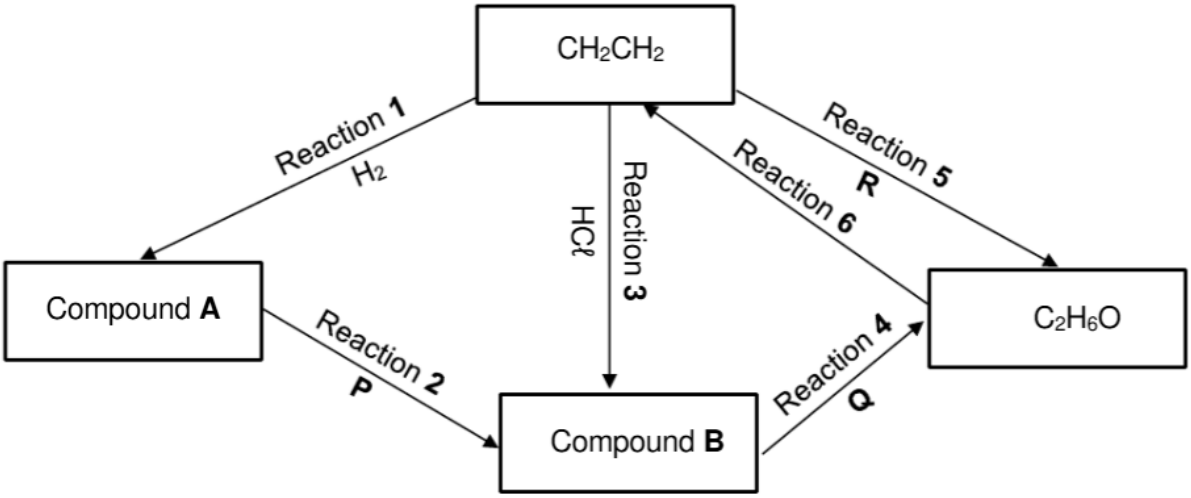
6.2.2 Which compound (**R** or **S**) will have a LOWER VAPOUR PRESSURE? Use the table to give a reason for the answer. (2)

6.3 The boiling points of compound, **P** and **Q** are compared. Which compound (**P** or **Q**) has a higher boiling point? Explain the answer. (4)

[09]

QUESTION 7

The flow diagram below shows various organic reactions using CH_2CH_2 as a starting reactant. **A**, and **B** represent different organic compounds and **P**, **Q** and **R** represent inorganic compounds.



7.1 For reaction **1**, write down:

7.1.1 The type of reaction. (1)

7.1.2 One reaction condition. (1)

7.1.3 A balanced chemical equation for the reaction USING STRUCTURAL FORMULA. (3)

7.2 For reaction **2**, write down the:

7.2.1 Type of reaction. (1)

7.2.2 Homologous series to which compound **B** belongs to. (1)

7.2.3 CHEMICAL NAME of the inorganic product formed during this reaction. (1)

7.3 For reaction **3**, write down the:

7.3.1 Type of addition reaction. (1)

7.3.2 IUPAC NAME of the organic product formed. (2)

7.4 Write down the type of reaction represented by reaction **6**. (1)

[12]

GRAND TOTAL: 100

DATA FOR PHYSICAL SCIENCES GRADE 12
PAPER 1 (PHYSICS)

GEGEWENS VIR FISIESE WETENSKAPPE GRAAD 12
VRAESTEL 1 (FISIKA)

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

NAME/*NAAM*	SYMBOL/*SIMBOOL*	VALUE/*WAARDE*
Acceleration due to gravity *Swaartekragversnelling*	g	$9,8\ m\cdot s^{-2}$
Universal gravitational constant *Universele gravitasiekonstant*	G	$6,67 \times 10^{-11}\ N\cdot m^2\cdot kg^{-2}$
Radius of the Earth *Radius van die Aarde*	R_E	$6,38 \times 10^6\ m$
Mass of the Earth *Massa van die Aarde*	M_E	$5,98 \times 10^{24}\ kg$
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	$6,63 \times 10^{-34}\ J\cdot s$
Coulomb's constant *Coulomb se konstante*	k	$9,0 \times 10^9\ N\cdot m^2\cdot C^{-2}$
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*

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

FORCE/*KRAG*

$F_{net} = ma$	$p = mv$
$f_s^{\ max} = \mu_s N$	$f_k = \mu_k N$
$F_{net}\Delta t = \Delta p$ $\Delta p = mv_f - mv_i$	$w = mg$
$F = G\frac{m_1 m_2}{d^2}$ or/*of* $F = G\frac{m_1 m_2}{r^2}$	$g = G\frac{M}{d^2}$ or/*of* $g = G\frac{M}{r^2}$

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