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LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF
EDUCATION

NATIONAL SENIOR CERTIFICATE



GRADE 11



PHYSICAL SCIENCES: PHYSICS (P1)

JUNE 2025

MARKS: 100

TIME : 2 HOURS

This question paper consists of 14 pages including 2 data sheets.

INSTRUCTIONS AND INFORMATION

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

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QUESTION 1 (MULTIPLE CHOICE QUESTIONS)

Various 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 numbers (1.1 to 1.5) in the ANSWER BOOK, e.g. 1.11 E.

1.1. A bird-catcher observes a bird flying from A to B; B to C; and then from C to B. Which one of the following correctly describes the displacement of the bird?



A. A to B

B. B to A

C. C to A

D. A to C (2)

1.2. A roller coaster moves from rest at the bottom of a rail; and accelerates at a constant rate upwards. By the time it reaches the highest point of the rail, which one of the following will be correct?

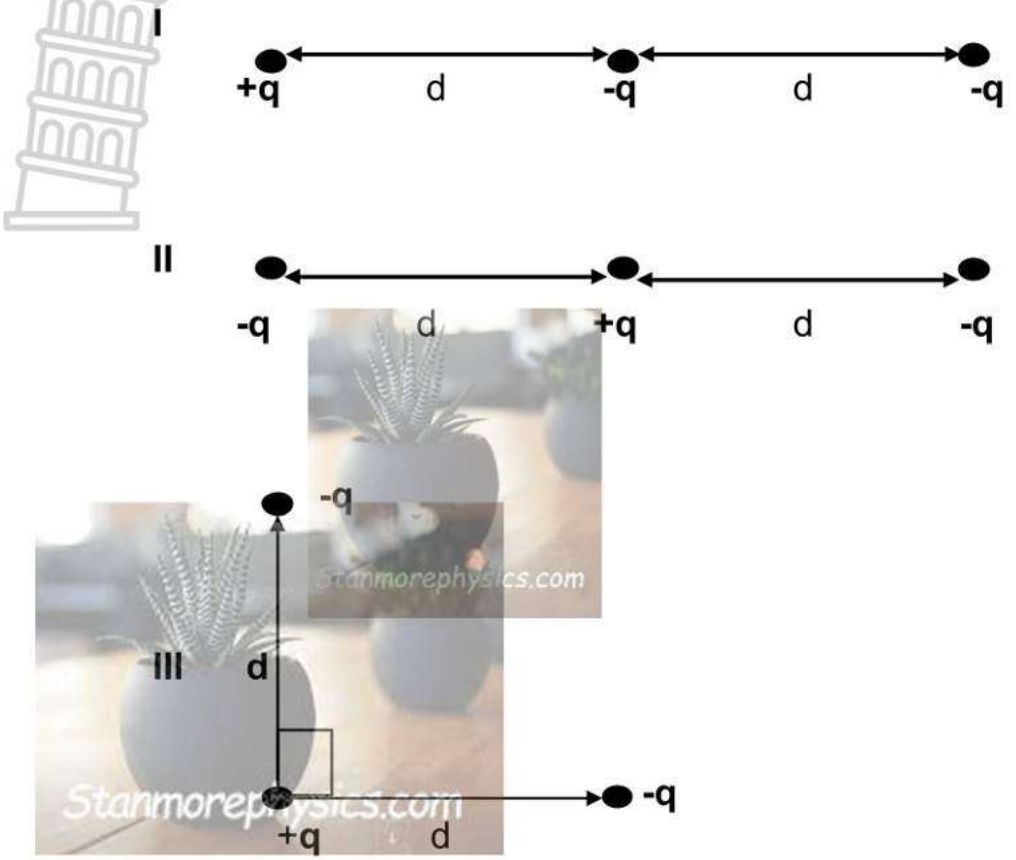
A. Both the mass and the net force shall have increased.

B. Both the velocity and the net force shall have increased.

C. The velocity and the net force shall have remained constant.

D. The velocity shall have increased while the net force shall have remained constant. (2)

1.3 Sketches **I, II** and **III**, not drawn to scale, are different ways in which these point charges are arranged. The charges are identical in MAGNITUDE and the distance d between the charges is the same.



In which of these arrangements will the magnitude of the NET electrostatic force experienced by the **+q** charge be the LARGEST and SMALLEST respectively?

	GREATEST NET FORCE on +q	**SMALLEST NET FORCE on +q**
A	**I**	**II**
B	**II**	**III**
C	**III**	**I**
D	**III**	**II**

(2)

1.4 The magnetic flux linkage through a coil depends on …

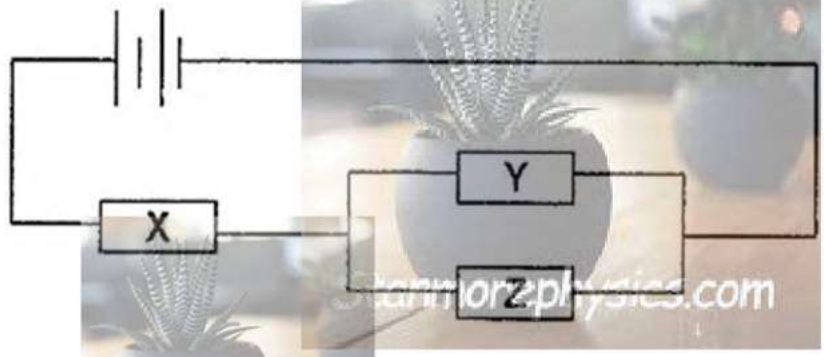
A. the thickness of the wire in the coil.

B. the angle between the coil and the magnetic field.

C. the direction of the magnetic field.

D. the material the coil is made of. (2)

1.5 Three identical resistors **X**, **Y** and **Z** are connected as shown in the circuit below.



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If the power in **X** is **P**, then the power in **Y** is…

A. 2P

B. P

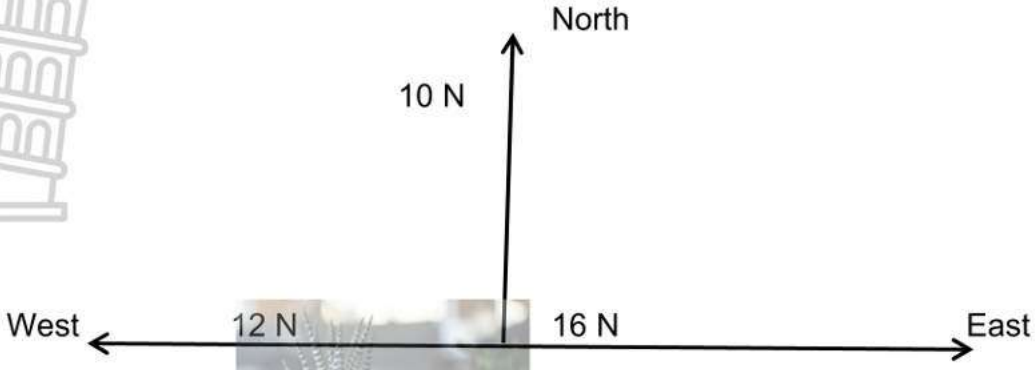
C. P/4

D. P/2 (2)

[10]

QUESTION 2 (Start on a new page)

The diagram below shows three forces of **10 N** north, **12 N** west and **16 N** east acting on an object on the same plane. The diagram is not drawn to scale.



2.1. Define the term *resultant force*. (2)

2.2. Calculate:

2.2.1 The magnitude of the resultant force acting on the object. (4)

2.2.2 The direction of the resultant force. (2)

2.3. A fourth force is added in the system, such that the resultant force is zero.

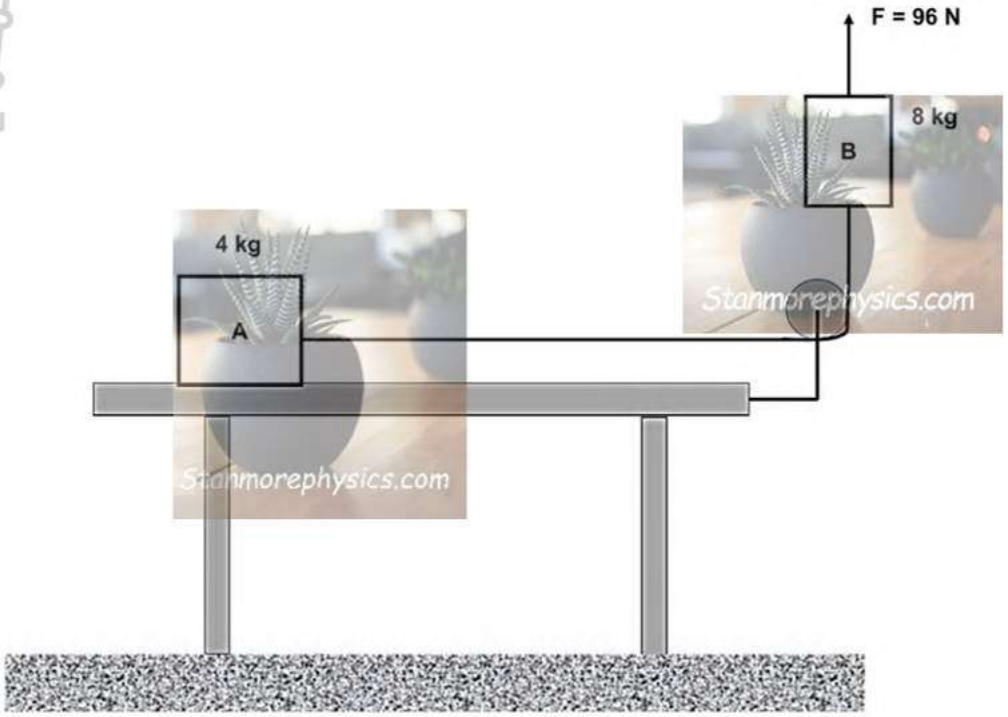
2.3.1. What is this fourth force called? (1)

2.3.2 Determine the magnitude and direction of the force. (2)

[11]

QUESTION 3 (Start on a new page)

Block **A** of mass 4 kg is moving with a constant velocity on a rough horizontal table and is connected to another block **B** of mass 8 kg by a light inextensible string which passes through a light frictionless pulley. A force of magnitude 96 N is applied vertically upwards on block **B**, as shown in the diagram below.



3.1. State *Newton's First Law of Motion* in words. (2)

3.2. Draw a free-body diagram for block **B**. (3)

3.3. Calculate the magnitude of the tension force acting on block **B**. (3)

The string connecting **A**, and **B** suddenly breaks while force **F** is still being applied.

3.4. Is the direction of the acceleration of block **A**, now towards the LEFT or the RIGHT? Explain your answer. (2)

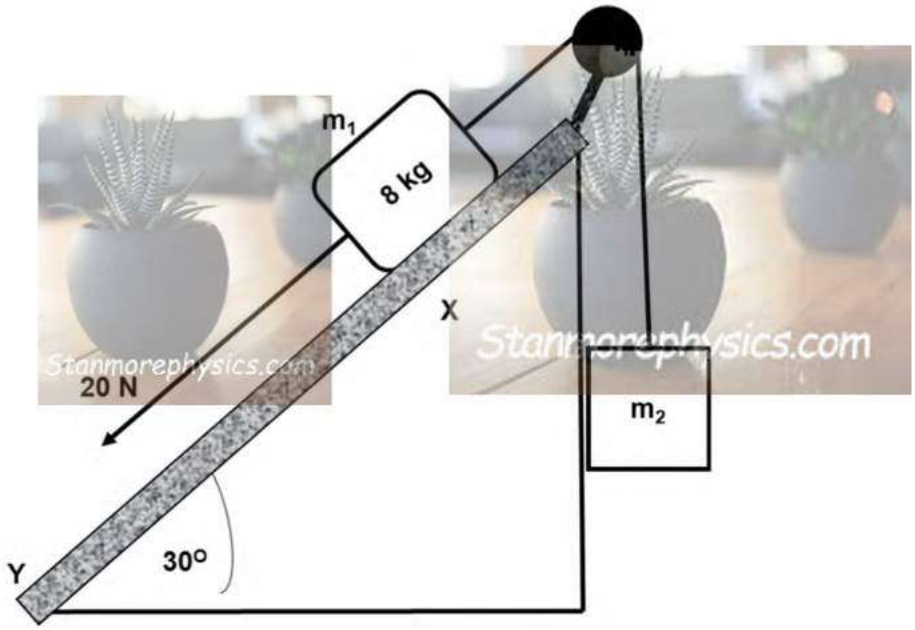
3.5. How will the net force acting on block **B** be affected.

Choose from INCREASES, DECREASES or REMAINS THE SAME. (1)

[11]

QUESTION 4 (Start on a new page)

A block m_1, with mass 8 kg, on an inclined plane with a rough surface, is attached by an inextensible string to an unknown hanging mass, m_2. A force of 20 N is applied to the m_1 down the plane from **X** to **Y** as shown in the figure below. Block m_1 is moving down the plane at a constant velocity. The coefficient of kinetic friction acting on the block between points **X** and **Y** is 0,2.



4.1.1 State *Newton's Second Law of Motion* in words. (2)

Consider the motion of block m_1 between **X** and **Y**.

4.1.2. Draw a free-body diagram for block m_1. (5)

4.1.3. Calculate the magnitude of the frictional force acting on m_1. (3)

4.1.4. Calculate the tension in the string. (3)

4.2 A man has a weight of 809,48 N on earth. He then travels to planet **X** whose diameter is 1,914 $x10^7$ m and the mass of 1,794 $x10^{25}$ kg.

4.2.1. State *Newton's Law of Universal Gravitation* in words. (2)

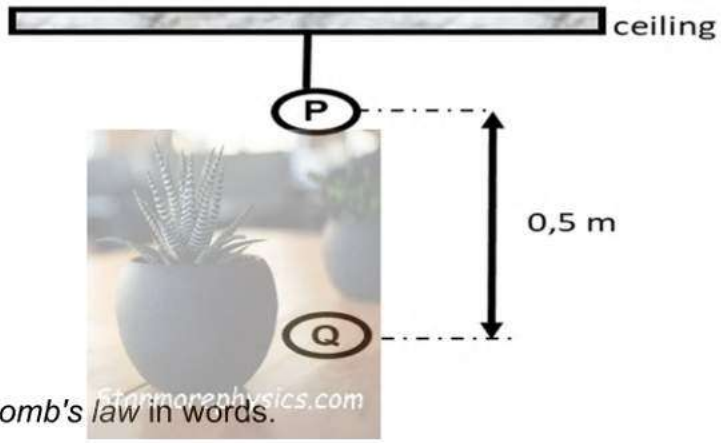
4.2.2. Calculate the man's weight on planet **X**. (4)

[19]

QUESTION 5 (Start on a new page)

A charged sphere **P** is suspended from a horizontal bar in a laboratory by a light inextensible, insulated string.

Another charged sphere **Q**, of mass 4,08 x 10^{-4} kg and carrying a charge of + 4,08 x 10^{-8} C, remains STATIONARY vertically below sphere **P**. The centres of the spheres are 0,5 m apart, as shown in the diagram below.



5.1. State *Coulomb's law* in words. (2)

5.2. State whether the charge on sphere **P** is POSITIVE or NEGATIVE. (1)

5.3. Draw a labelled free-body diagram for sphere **Q**. (2)

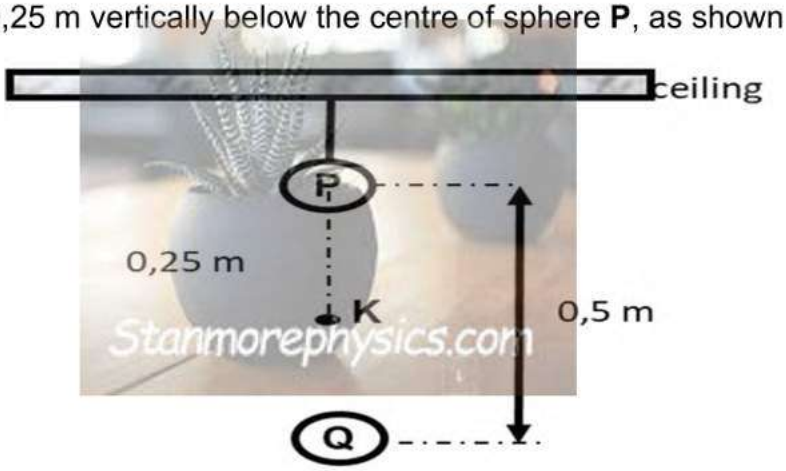
5.4. Calculate the magnitude of the charge on sphere **P**. (5).

5.5. How does the electrostatic force that sphere **P** exerts on sphere **Q** compare to that exerted by sphere **Q** on sphere **P** with respect to:

5.5.1. magnitude (1)

5.5.2. direction (1)

Point **K** lies 0,25 m vertically below the centre of sphere **P**, as shown below.

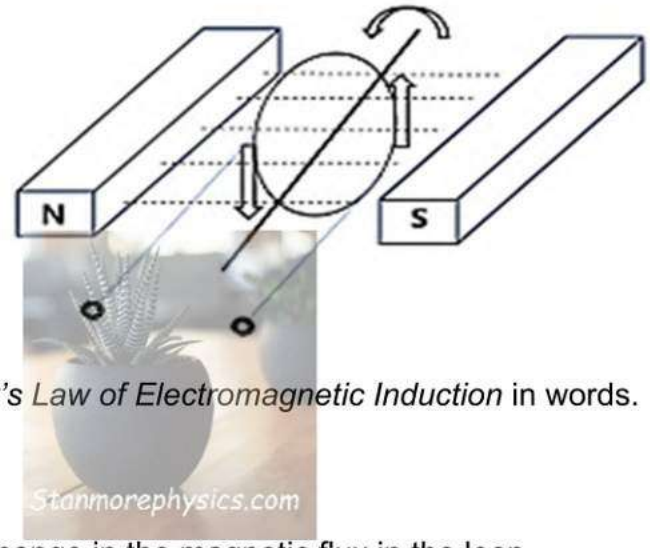


5.6. Calculate the net electric field at point **K**. (5)

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QUESTION 6 (Start on a new page)

A coil with a diameter of 0,6 m contains 60 turns and lies so that the magnetic field strength is at its maximum of +0,15 T. The field then changes to its minimum in 1,6 s. ($A = \pi r^2$)



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6.1 State *Faraday's Law of Electromagnetic Induction* in words. (2)

6.2 Calculate:

6.2.1 The change in the magnetic flux in the loop. (4)

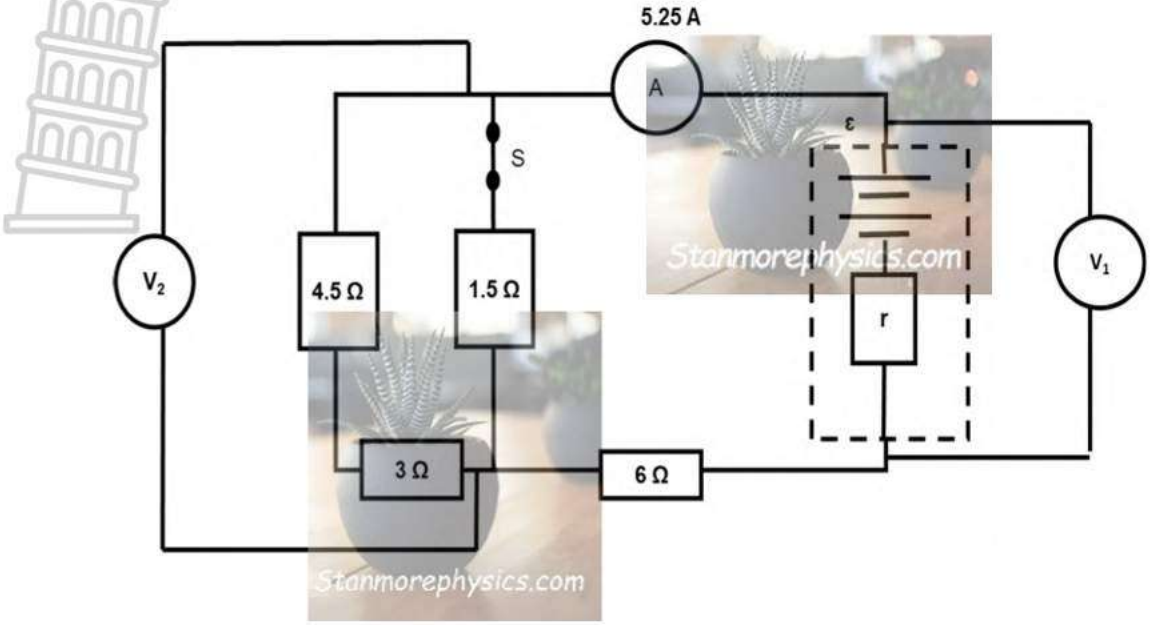
6.2.2 The average induced emf in the loop in 1,6 s. (3)

6.3 If the coil is now rotated in 1,8 s, how would it change the induced emf?
Write only INCREASE, DECREASE or REMAIN THE SAME.
Explain the answer. (3)

[12]

QUESTION 7 (Start on a new page)

The circuit diagram below shows four resistors connected to a battery of emf **ε** and internal resistance **r**. The resistances of the ammeter and the connecting wires are negligible, while the voltmeters have very high resistances.



7.1 State *Ohm's law* in words. (2)

Switch **S** is CLOSED.

7.2 The reading on the ammeter is 5,25 A.

7.2.1 Calculate the total external resistance of the circuit. (4)

7.2.2 Calculate the reading on voltmeter V_1. (3)

7.2.3 How does the reading on voltmeter V_2 compare to the reading on voltmeter V_1? Choose from SMALLER THAN, EQUAL TO or GREATER THAN. (1)

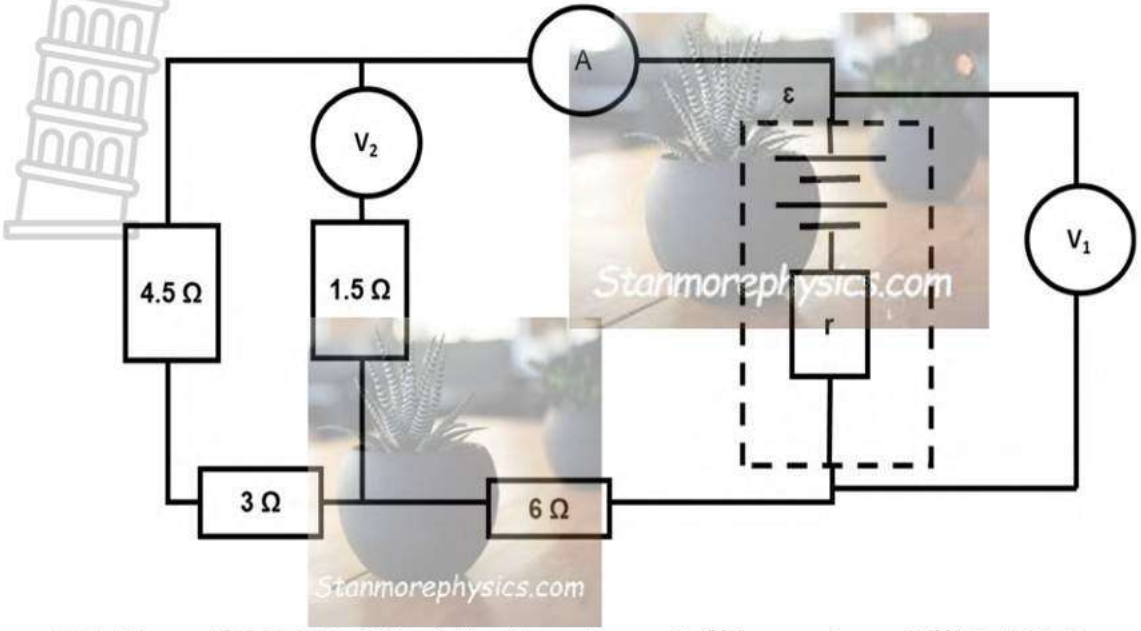
7.3 A learner concludes that the emf of the battery is equal to the reading on voltmeter V_1.

7.3.1 Define the term *emf.* (2)

7.3.2 Is the learner's conclusion CORRECT? Choose from YES or NO .(1)

7.3.3 Give a reason for the answer to QUESTION 7.3.2. (1)

Switch **S** is now removed and replaced by voltmeter V_2, as shown in the circuit diagram below.



7.4. How will EACH of the following change? (Choose from INCREASES, DECREASES or REMAINS THE SAME.)

7.4.1 The power dissipated by the 6 Ω resistor. (1)

7.4.2 The reading on voltmeter V_1. (1)

7.4.3 Explain the answer to QUESTION 7.4.2. (4)

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TOTAL: 100

Information sheets – Paper 1 (Physics)

TABLE 1: PHYSICAL CONSTANTS

NAME	SYMBOL	VALUE
Acceleration due to gravity	g	9,8 $m \cdot s^{-2}$
Universal gravitational constant	G	6,67 x 10^{-11} $N \cdot m^2 \cdot kg^{-2}$
Radius of Earth	R_E	6,38 x 10^6 m
Mass of Earth	M_E	5,98 x 10^{24} kg
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·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

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

FORCE

$F_{net} = ma$	$w = mg$
$f_s^{max} = \mu_s N$	$f_k = \mu_k N$
$F = G\frac{m_1 m_2}{d^2}$ or $F = G\frac{m_1 m_2}{r^2}$	$g = G\frac{M}{d^2}$ or $g = G\frac{M}{r^2}$

ELECTROMAGNETIC INDUCTION

$\varepsilon = -N\frac{\Delta\Phi}{\Delta t}$	Φ = BA cos θ

WAVES, SOUND AND LIGHT

$v = f\lambda$	$T = \frac{1}{f}$
$n_i \sin\theta_i = n_r \sin\theta_r$	$n = \frac{c}{v}$

ELECTROSTATICS

$F = \frac{kQ_1Q_2}{r^2}$	$E = \frac{kQ}{r^2}$
$E = \frac{F}{q}$	$V = \frac{W}{q}$
$n = \frac{Q}{e}$ OR $n = \frac{Q}{q_e}$	

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ELECTRIC CIRCUITS

$R = \frac{V}{I}$	emf (ε) = I(R + r)
$R_s = R_1 + R_2 + \ldots$ $\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} + \ldots$	$q = I\,\Delta t$
$W = Vq$ $W = VI\,\Delta t$ $W = I^2R\,\Delta t$ $W = \frac{V^2\Delta t}{R}$	$P = \frac{W}{\Delta t}$ $P = VI$ $P = I^2R$ $P = \frac{V^2}{R}$

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