GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

PROVINCIAL EXAMINATION

JUNE 2023

GRADE 10

MARKING GUIDELINES

| PHYSICAL SCIENCES (PHYSICS) (PAPER 1) |

7 pages

EXEMPLAR

SECTION A: MULTIPLE-CHOICE QUESTIONS

QUESTION 1

1.1   D   ✓✓   (2)

1.2   B   ✓✓   (2)

1.3   C   ✓✓   (2)

1.4   A   ✓✓   (2)

1.5   B   ✓✓   (2)

1.6   A   ✓✓   (2)

1.7   D   ✓✓   (2)

1.8   A   ✓✓   (2)

[16]

SECTION B: ELECTROSTATICS AND ELECTRICITY

QUESTION 2

2.1 Added ✓ (1)

2.2 Less than ✓, negatively charged ✓/has more electrons than protons/has less protons than electron. ✓ (3)

2.3 $n = \dfrac{Q}{e}$ ✓

10^{13} ✓ $= \dfrac{Q}{1,6 \times 10^{-19}}$ ✓

$Q = -1,6 \times 10^{-6}\ C$

$Q_{new} = -1,6 \times 10^{-6} + (-4 \times 10^{-9})$

$Q_{new} = -1,604 \times 10^{-6}\ C$ ✓ (4)

[8]

QUESTION 3

3.1 Principle of conservation of charge. The net charge of an <u>isolated system remains constant</u> during any physical process. ✓✓ (2)

3.2 Electrons move from C to B, ✓ until they are evenly distributed. ✓ The negative charges from B repel away towards the left while the positive charges migrate towards the right to attract the negative charges from C that have migrated towards the left and the positive charges from C migrate towards the left. ✓ Sphere B is attracted to sphere C because unlike charges attract one another. (3)

3.3 $n = \dfrac{Q}{e}$ ✓

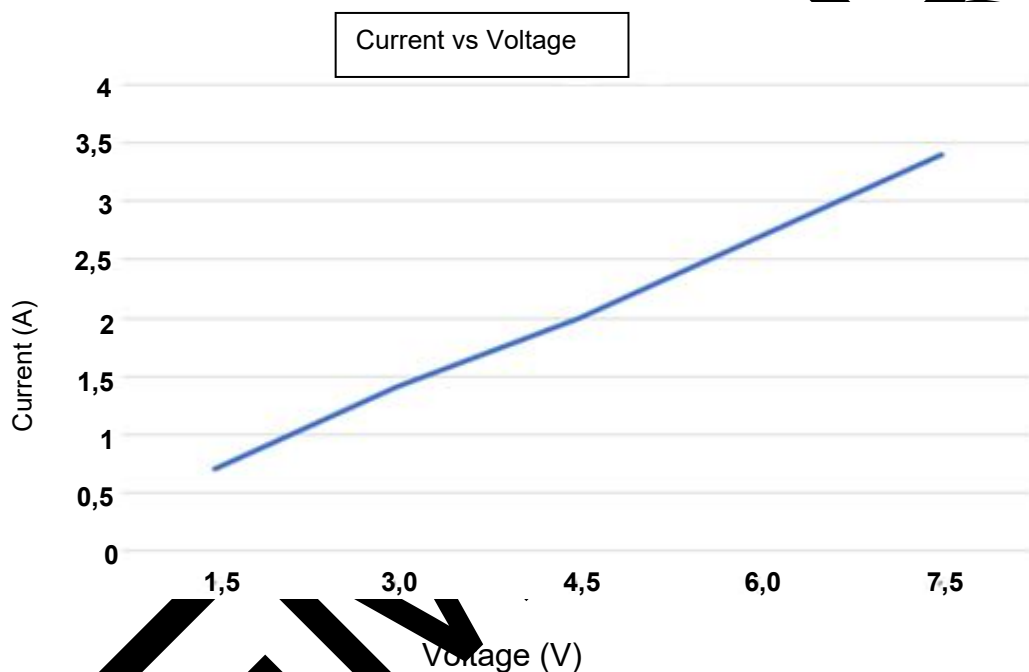$n = \dfrac{+\ \times 10^{-6} - \ \times 10^{-6}}{1,6 \times 10}$ ✓ ✓

$n = 25 \times 10^{13}$ ✓ (4)

[9]

QUESTION 4

4.1 What is the relationship between current and potential difference at constant temperature? ✓✓
(Accept any other relevant answer.) (2)

4.2 Current ✓✓ (2)

4.3 Temperature/Resistance ✓ (1)

4.4

Current vs Voltage

Criteria	Mark Allocation
Heading/Caption	(1)
Label (y-axis)	(1)
Label (x-axis)	(1)
Two points plotted correctly	(1)
Three or more points plotted correctly	(2)
Line of best fit	(1)

(7)

4.5 Current increases as potential differences increase./Current is directly proportional to potential difference. ✓✓ (2)

[14]

QUESTION 5

5.1 $\dfrac{1}{R_P} = \dfrac{1}{R_1} + \dfrac{1}{R_2}$ ✓

$\dfrac{1}{R_P} = \dfrac{1}{4} + \dfrac{1}{5}$

$R_P = 2{,}22\ \Omega$ ✓   (2)

5.2 $I = \dfrac{V}{R}$ ✓

$I = \dfrac{4{,}5}{2{,}22}$ ✓

$I = 2{,}03\ A$ ✓   (3)

5.3 $I = \dfrac{V}{R}$

$I = \dfrac{4{,}5}{4}$ ✓

$I = 1{,}13\ A$

$1{,}13 = \dfrac{Q}{10}$ ✓

$Q = 11{,}30\ C$ ✓   (3)

5.4   DECREASES ✓ Adding a resistor in series decreases the total current of the
circuit thus the total resistance increases. ✓/Resistance and current are inversely
proportional, thus increasing total resistance decreases the total current of the
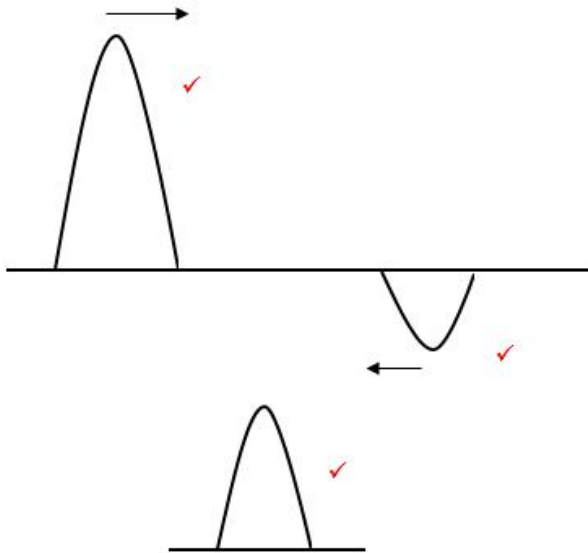circuit ✓   (3)
                                                                                        [11]

SECTION C: WAVES, SOUNDS AND LIGHTS

QUESTION 6

6.1 The principle of superposition states that when two disturbances occupy the same space at the same time, the resulting disturbance is the sum of two disturbances. ✓✓ (2)

6.2

(3)

6.3 $V = \dfrac{D}{t}$ ✓

$= \dfrac{0,375}{1,25}$ ✓✓

$0,3 \text{ m·s}^{-1}$ ✓ (4)

[9]

QUESTION 7

7.1 A transverse wave is a wave where the movement of the particles of the medium is perpendicular (at a right angle) to the direction of propagation of the wave. ✓✓ (2)

7.2 3 – waves ✓✓ (2)

7.3 1,6 cm **or** 0,016 m ✓✓ (2)

7.4 $T = \dfrac{0,21}{3}$ ✓

$= 0,07 \text{ s}$ ✓ (2)

7.5 $V = \dfrac{\lambda}{T}$ ✓ $V = F.\lambda$ ✓

$= \dfrac{0,4}{0,07}$ ✓✓   **OR** $= 14,29$ ✓ $\times 0,4$ ✓

$= 5,71$ m·s⁻¹ ✓ $= 5,71$ m·s⁻¹ ✓   (4)

[12]

QUESTION 8

8.1   8.1.1   Electromagnetic radiation is a self-propagating wave in space [with] electric and magnetic components. ✓✓   (2)

8.1.2   gamma rays ✓ > X-ray ✓ > ultraviolet light ✓ > visible light [>] infra-red ✓   (5)

8.1.3   These rays have a higher frequency(energy) thus a higher degree of penetration. ✓✓   (2)

8.2   8.2.1   X-rays – They are used to produce photographs of the internal organs such as bones. ✓   (1)

8.2.2   Microwaves – They can be used to heat/cook up food. ✓   (1)

8.3 $c = f\lambda$ ✓

$3 \times 10^8 = 2,1 \times 10^8$ ✓✓

$\lambda = 1,43$ m ✓   (4)

[15]

QUESTION 9

9.1   photon is a quantum (energy packet) of light. ✓✓   (2)

9.2 $E = \dfrac{hc}{\lambda}$ ✓

$E = \dfrac{(6,63 \times 10^{-34})(3 \times 10^8)}{1,3 \times 10^{-6}}$ ✓✓

$E = 1,53 \times 10^{-19}$ J ✓   (4)

[6]

TOTAL: 100