KWAZULU-NATAL PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 10

PHYSICAL SCIENCES P1

PROVINCIAL STANDARDISED ASSESSMENT

JUNE 2026

MARKS: 75

DURATION: 1.5 hours

This question paper consists of 10 pages and a data sheet.

INSTRUCTIONS AND INFORMATION

1. This question paper consists of SEVEN questions. Answer ALL the questions in the ANSWER BOOK.
2. Start EACH question on a NEW page in the ANSWER BOOK.
3. Number the answers correctly according to the numbering system used in this question paper.
4. Leave ONE line between two sub-questions, for example between QUESTION 2.1 and QUESTION 2.2.
5. You may use a non-programmable calculator.
6. You may use appropriate mathematical instruments.
7. You are advised to use the attached DATA SHEET.
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 et cetera where required.
11. Write neatly and legibly.

QUESTION 1: MULTIPLE-CHOICE QUESTIONS

Various options are provided as possible answers to the following questions. Choose the correct answer and write only the letter (A to D) next to the question number(1.1 to 1.5) in your ANSWER BOOK, for example 1.6 D

1.1 A wave travels across the surface of water.

Which name is given to the number of wave crests passing a fixed point every second?

A amplitude
B period
C wavelength
D frequency (2)

1.2 Consider the following statements about sound waves.

(i) Sound waves cannot travel through a vacuum
(ii) Ultrasound is sound with a frequency of 20kHz to 1000Hz
(iii) The pitch of a sound wave depends on the amplitude of the wave.
(iv) Period is inversely proportional to frequency.

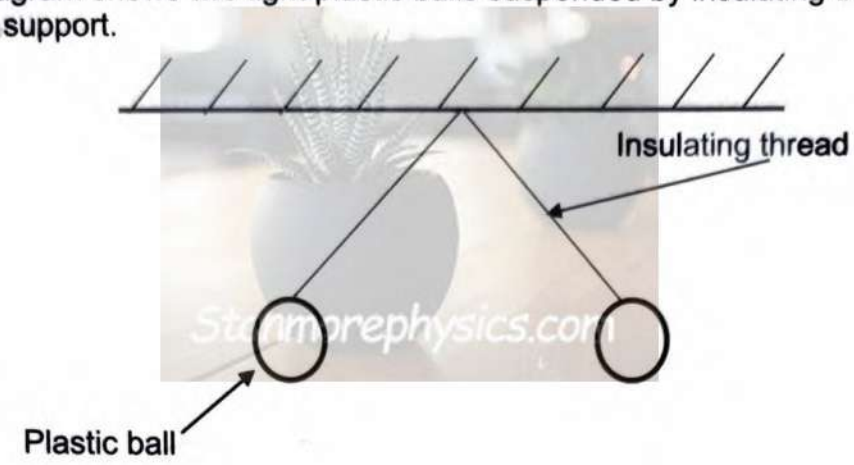
Which of the above statements is/are TRUE?

A (i), (ii) and (iv) only.
B (i) and (iv) only.
C (i) ,(ii) and (iii) only.
D (i) only. (2)

1.3 In a vacuum, all electromagnetic waves have the same……

A Energy.
B Frequency.
C Speed.
D Wavelength. (2)

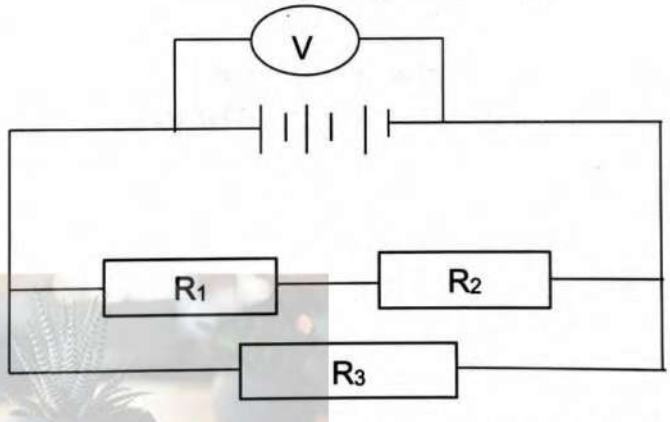
1.4 The diagram shows two light plastic balls suspended by insulating threads from a support.



Which statement explains why the plastic balls hang apart from each other?

1.5
A The balls have like charges
B One ball is charged and the other ball is uncharged
C The balls have unlike charges
D Both balls are uncharged (2)

The diagram below shows a circuit with a cell and 3 resistors with resistances of R_1, R_2 and R_3.The cell has negligible internal resistance.



The total resistances of the circuit is R_T. Which equation for R_T is correct?

A $R_T = R_1 + R_2 + R_3$

B $R_T = \frac{1}{R1+R2} + \frac{1}{R3}$

C $\frac{1}{RT} = \frac{1}{R1} + \frac{1}{R2} + \frac{1}{R3}$

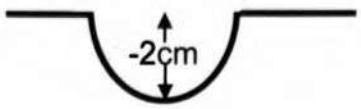
D $\frac{1}{RT} = \frac{1}{R1+R2} + \frac{1}{R3}$ (2)

[10]

m over

QUESTION 2 (Start on a new page.)

Pulses **A** and **B** travelling along a string in opposite directions superpose destructively. The resulting pulse has an amplitude of -2cm as shown in the diagram below. Pulse **A** has an amplitude of **+3cm**.



2.1 Define the underlined terms above. (2)

2.2 Calculate the amplitude of pulse **B**. (2)

2.3 After overlapping and separating with pulse **B**, pulse **A** continues to move in its original direction before superimposing with another pulse which is pulse **C**. **No pulse** was produced due to the meeting of the two pulses, **A** and **C**.

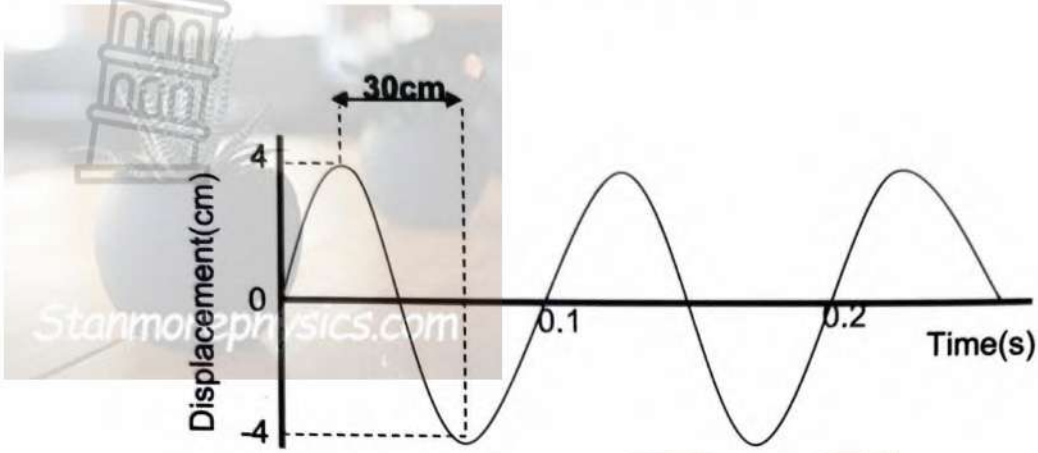
2.3.1 Give a reason why there was **no pulse** produced during the process described in 2.3 (1)

2.3.2 What type of interference occurred in 2.3 (1)

[6]

QUESTION 3 (Start on a new page.)

The diagram below represents a transverse wave, **X.**



3.1 Write down the :

3.1.1 Period (1)

3.1.2 Amplitude of the wave (1)

3.2 Calculate the :

3.2.1 wavelength (2)

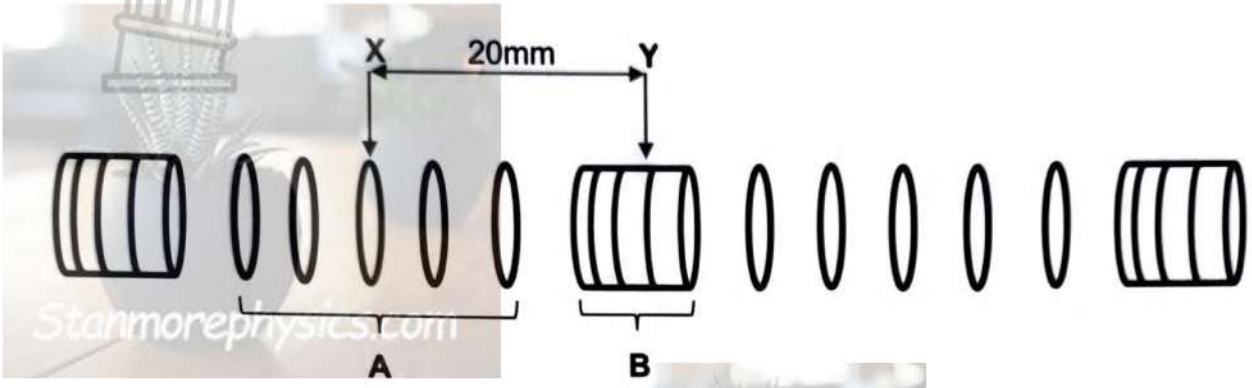
3.2.2 speed of the wave (3)

3.3 Another wave , **Y**, has an **amplitude half** that of wave **X** and **frequency twice** that of wave **X.** (2)
Draw a displacement versus time sketch graph for wave **Y** for time up to 0.1 seconds clearly showing the amplitude of wave .

[9]

QUESTION 4 (Start on a new page.)

Consider the longitudinal wave below.
The distance between points X and Y is 20mm. The wave is propagated through a slinky spring at a speed of 0.5 $m.s^{-1}$.



4.1 Write down the name of the label

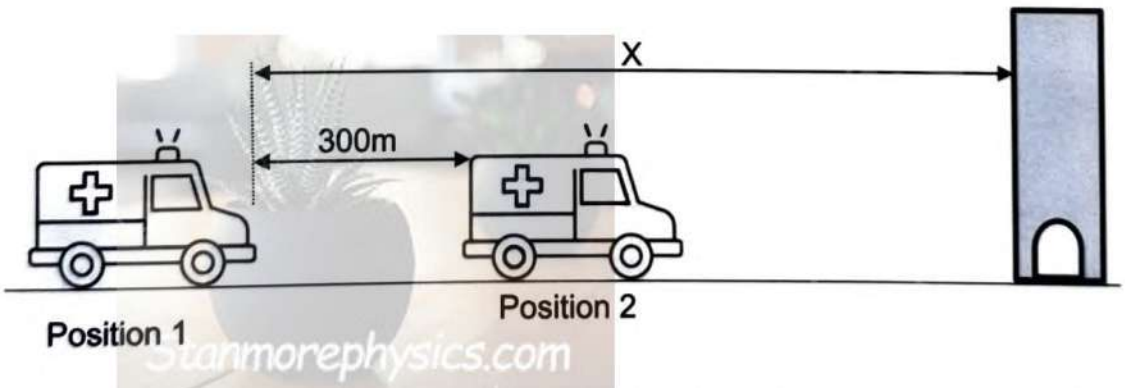
4.1.1 **A** (1)

4.1.2 **B** (1)

4.2 Determine the wavelength of the wave above. (2)

4.3 Calculate the period of the wave (4)

4.4 An ambulance moves with a constant velocity towards a building. When the ambulance is at position 1 which is x-metres away from the building, the driver sounds the siren and receives the echo 2 seconds later at position 2.Position 1 and 2 are 300m apart.



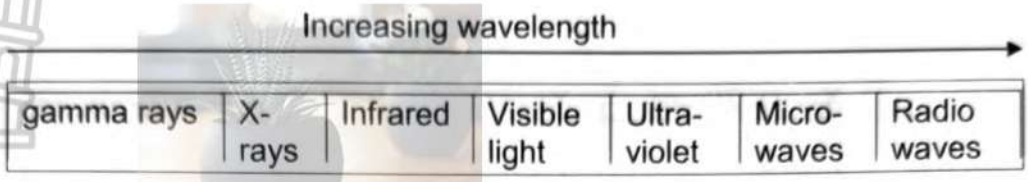
(6)

Calculate the distance between the ambulance and the building when the ambulance is at position 2. The speed of sound in air is 340$m.s^{-1}$.

[14]

QUESTION 5 (Start on a new page)

A student draws a diagram to show the bands of the electromagnetic spectrum in order of increasing wavelength.



The diagram is **not** correct.

5.1 Which **two** bands of the electromagnetic spectrum are in the wrong position (1)

5.2 A photon has a wavelength of 600nm.Calculate the :

5.2.1 Energy of the photon (4)

5.2.2 Frequency of the photon (3)

[8]

QUESTION 6 (Start on a new page.)

Two small identical spheres **X** and **Y** are initially suspended on long strings , as shown in the diagram below. Sphere **X** carries a charge of **+3nC** , and sphere **Y**'s charge is **UNKNOWN**.

The two spheres are brought into contact and separated again back to their original positions. After separation, the charge on sphere **X** is recorded to be **+1.6nC** .

6.1 State the principle of conservation of charge. (2)

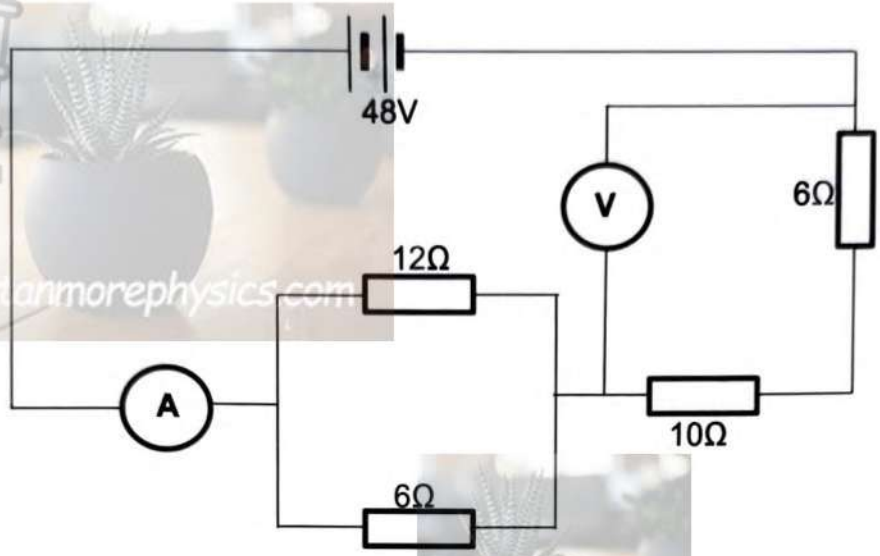
6.2 Calculate the original charge of sphere **Y.** (3)

6.3 Calculate the number of electrons transferred during contact. (3)

[8]

QUESTION 7 (Start on a new page.)

In the circuit below, the 48V battery has negligible resistance.



7.1 State Ohm's law in words (2)

7.2 Calculate the :

7.2.1 Total resistance of the circuit (4)

7.2.2 Reading on the ammeter (3)

7.2.3 Reading on the voltmeter (3)

7.2.4 The number of electrons that pass through the 12Ω resistor in 5 minutes (5)

7.3 What would happen to the ammeter reading if the 12Ω were to burn out. Write INCREASE, DECREASE or REMAINS THE SAME. Explain your answer. (3)

[20]

TOTAL: 75

DATA FOR PHYSICAL SCIENCES GRADE 10
PAPER 1 (PHYSICS)

TABLE 1: PHYSICAL CONSTANTS

NAME	SYMBOL	VALUE
Acceleration due to gravity	g	9,8 $m.s^{-2}$
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·s
Charge on electron	q_e	- 1,6 x 10^{-19} C
Electron mass	m_e	9,11 x 10^{-31} kg

TABLE 2: FORMULAE

WAVES, SOUND AND LIGHT

$v = f\lambda$ or $c = f\lambda$	$T = \frac{1}{f}$
E = hf	$E = \frac{hc}{\lambda}$
speed = $\frac{\text{distance}}{\text{time}}$	

ELECTROSTATICS

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

ELECTRIC CIRCUITS

$Q = I \times \Delta t$	$\frac{1}{Rp} = \frac{1}{R_1} + \frac{1}{R_2} + \cdots.$
$R_s = R_1 + R_2 + \cdots$	$V = \frac{W}{Q}$
V = I x R	

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MARKING MEMORANDUM
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QUESTION 1:

1.1 D ✓✓ (2)
1.2 B ✓✓ (2)
1.3 C ✓✓ (2)
1.4 A ✓✓ (2)
1.5 D ✓✓ (2)
[10]

QUESTION 2

2.1 The overlapping/occupying/addition of a crest of one pulse with the trough of another✓ resulting in a pulse of reduced amplitude✓ (2)

2.2 -2 = +3 + B✓
B = -5cm✓ (2)

FULL MARKS FOR CORRECT ANSWER ONLY

2.3.1 Pulse C has an amplitude of -3cm or Pulse C has a trough 3cm below rest position or Pulse C has a trough of equal amplitude ✓ (1)

2.3.2 Destructive (interference) ✓ (1)

[6]

QUESTION 3

3.1.1 0.1 s. ✓ (1)

3.1.2 4 cm✓ (1)

3.2.1 λ =30 × 2✓
= 60 cm✓ **accept 0.60m** (2)

FULL MARKS FOR ANSWER ONLY

3.2.2 **OPTION 1**

$f = \frac{1}{T}$
$= \frac{1}{0,1}$
= 10 Hz
V = f × λ ✓
= 10× 0.6✓
= 6m.s^{-1} ✓

OPTION 2

$V = \frac{1}{T} \times \lambda$ ✓
$= \frac{1}{0.1} \times 0.6$✓
= 6m.s^{-1} ✓

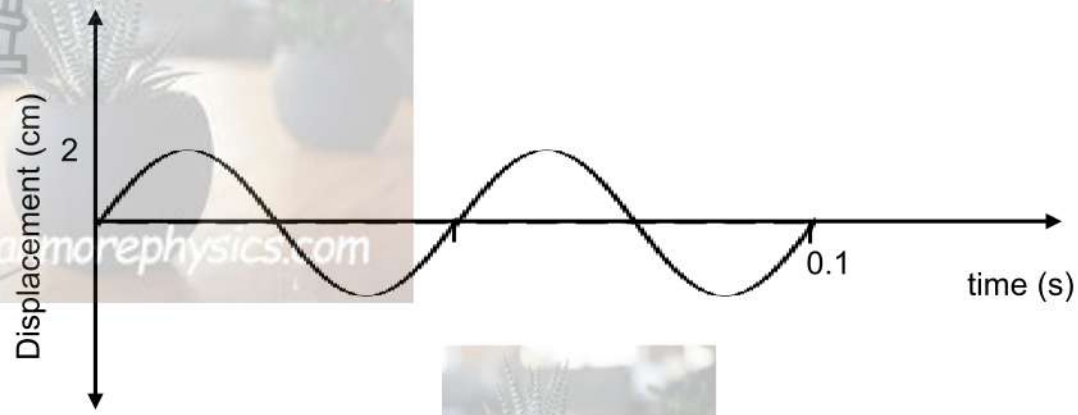
OPTION 3

speed = $\frac{\text{distance}}{\text{time}}$✓
$= \frac{0.6}{0.1}$ ✓
= 6m.s^{-1} ✓
(Accept $\Delta x = v \times \Delta t$)

(3)

3.3 **POSITIVE MARKING FROM QUESTION 3.2**

CRITERIA:
wave drawn with amplitude of 2 cm ✓
Two waves drawn for the 0.1 second interval ✓



(2)

[9]

QUESTION 4

4.1.1 rarefaction✓ (1)

4.1.2 compression✓ (1)

4.2 $\lambda = 20 \times 2$✓
$= 40$ mm✓ **FULL MARKS FOR ANSWER ONLY** (2)

4.3 **POSITIVE MARKING FROM QUESTION 4.2**

$v = f \times \lambda$
$0.5 = f \times 0.04$✓
$f = 12,5$ Hz

$T = \frac{1}{f}$ ✓
$= \frac{1}{12,5}$ ✓
$= 0,08$ s ✓

OR

$V = \Delta x/\Delta t$ ✓
$0,5$✓ $= 0,04/\Delta t$ ✓
$\Delta t = 0,08$s ✓

(4)

4.4

Accept $\Delta x = v \times \Delta t$

OPTION 1

Δt for sound to travel from position 1 to position 2:

Distance = speed x time

300 = 340 x t ✓

t = 0,88 s

Δt for sound to travel from position 2 to the building : ✓

$\Delta t = \frac{2-0.88✓}{2✓}$

= 0,56 s

Distance = speed x time

= 340 x 0,56✓

= 190,4m✓

OPTION 2

Δt for sound to travel from position 1 to position 2:

Distance = speed x time

300 = 340 x t ✓

t = 0,88 s

Δt for sound to travel from position 1 to the building: ✓

$\Delta t = \frac{2+0,88✓}{2✓}$

= 1,44 s

Distance = speed x time

= 340 x 1,44✓

= 489,6m

Distance from position 2 to the building :

489,6-300 =189,6m✓

OPTION 3

Distance = speed x time✓

2x-300 ✓ = 340 x 2 ✓

x = 490m ✓

= position 1 from the building

Position 2 from building = 490-300✓

= 190m✓

(outgoing distance =x. Return distance is x-300. Therefore x+ (x-300)= 680m. This equates to: 2x-300= 680m

(6)

[14]

QUESTION 5

5.1 Infrared and ultraviolet ✓ (1)

5.2.1 **OPTION 1**

$E = \frac{hc}{\lambda}$ ✓

$= \frac{6,63\times10^{-34}\times 3\times10^{8}}{600\times10^{-9}}$ ✓

= 3,32 x10^{-19} J✓

OPTION 2

c = f x λ

3 x 10^{8} = f x 600 x10^{-9}✓

f = 5 x10^{14}Hz

E = h x f ✓

= 6,63 x10^{-34} x 5 x10^{14} ✓

= 3,32 x10^{-19} J✓ (4)

5.2.2 **OPTION 1**

c = f x λ ✓

3 x 10^{8} = f x 600 x 10^{-9} ✓

f = 5 x10^{14}Hz✓

OPTION 2 POSITIVE MARKING FROM 5.2.1

E = h x f ✓

3.32 x10^{-19} =6,63 x10^{-34} x f ✓

f = 5 x10^{14}Hz ✓ (3)

[8]

QUESTION 6

6.1 Net/total charge remains constant✓ in an isolated system during any physical process. ✓

(2)

6.2 $Q = \frac{Q_1 + Q_2}{2}$ ✓

$[1.6 \times 10^{-9} = \frac{3 \times 10^{-9} + Q_Y}{2}]$ ✓

$Q_Y = +2 \times 10^{-10}$ C (or 0.2nC) ✓ (3)

6.3 $\Delta Q = + 1.6 \times 10^{-9} - 3 \times 10^{-9}$ OPTION 1

$= - 1.4 \times 10^{-9}$ C

$Q = n \times q_e$ ✓

$1.4 \times 10^{-9} = n \times 1,6 \times 10^{-19}$ ✓ accept: $-1.4 \times 10^{-9} = n \times -1,6 \times 10^{-19}$ ✓

$n = 8,75 \times 10^{9}$ (electrons) ✓ (3)

$\Delta Q = + 1.6 \times 10^{-9} - 2 \times 10^{-10}$ OPTION 2

$= 1,4 \times 10^{-9}$ C

$Q = n \times q_e$ ✓

$1.4 \times 10^{-9} = n \times 1,6 \times 10^{-19}$ ✓

$n = 8,75 \times 10^{9}$ (electrons) ✓ **[8]**

QUESTION 7

7.1 The potential difference across a conductor is directly proportional to the current✓ through the conductor at constant temperature ✓ (2)

7.2.1 $\frac{1}{R} = \frac{1}{R1} + \frac{1}{R2}$ ✓ **accept** $R_P = \frac{R1\ X\ R2}{R1+R2}$

$= \frac{1}{12} + \frac{1}{6}$ ✓

$R_P = 4\Omega$

$R_T = 4 + 10 + 6$✓

$= 20\ \Omega$ ✓ (4)

7.2.2 $R = \frac{V}{I}$ ✓

POSITIVE MARKING FROM 7.2.1

$20 = \frac{48}{I}$ ✓

$I = 2,4\ A$ ✓ (3)

7.2.3 $V = IR$✓ or $V=IR$✓

POSITIVE MARKING FROM 7.2.2

$= 2.4 \times 16$✓ $= 2,4 \times 4$✓

$= 38,4\ V$✓ $= 9,6V$ and $48V - 9,6V = 38,4V$✓ (3)

7.2.4

POSITIVE MARKING FROM 7.2.3

$V_P = V_T - V$

$= 48 - 38.4$✓

$= 9,6V$

$I_{12\ \Omega} = \frac{V}{R}$

$= \frac{9.6}{12}$ ✓

$= 0,8\ A$

Accept ratio method

$I_{12\ \Omega} = \frac{1}{3} \times 2.4$ ✓

$= 0,8\ A$✓

MARKING CRITERIA

- calculate $I_{12\ \Omega}$ ✓✓
- calculate charge through the $R_{12\ \Omega}$ using $Q = I \times \Delta t$ ✓
- calculate number of electrons using $Q = n \times q_e$ ✓✓

$Q = I \times \Delta t$

$= 0.8 \times (5 \times 60)$ ✓

$= 240\ C$

$Q = n \times q_e$

$240 = n \times 1.6 \times 10^{-19}$✓

$n = 1,5 \times 10^{21}$ (electrons) ✓ (5)

7.3 Decreases✓

Total resistance (in the circuit) increases✓

Current is inversely proportional to resistance, so total current decreases✓ (3)

($R = \frac{V}{I}$: Learners may also make use of the equation to explain)

[20]

TOTAL: 75