LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF EDUCATION

GRADE 10

PHYSICAL SCIENCES

CONTROL TEST 1

18 MARCH 2026

MARKS: 100

DURATION: 2 HOURS

This question paper consists of fourteen (14) pages including an information sheet.

INSTRUCTIONS AND INFORMATION

1. Answer ALL your question in your answer book
2. This question paper consists of eight questions
3. Start EACH question on a NEW page in the ANSWER BOOK
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 motivation, discussions, etc. where required.
11. You are advised to use the attached DATA SHEETS
12. Write neatly and legibly

QUESTION 1: MULTIPLE OF CHOICE QUESTIONS

Various options are provided as possible with 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 1.7) in the ANSWER BOOK, e.g. 1.8 E

1.1 A single disturbance in a medium is called

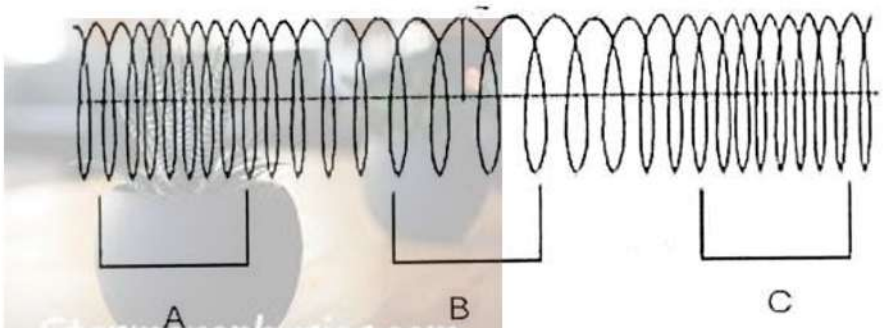
A. Transverse wave

B. Amplitude

C. Pulse

D. Longitudinal wave (2)

1.2 The diagram below shows a wave pattern produced on a slinky spring.



Which of the following, correctly compare the positions of points A, B, and type of wave?

	POINT A	POINT B	TYPE OF WAVE
A.	Rarefaction	Compression	Transverse
B.	Compression	Rarefaction	Longitudinal
C.	Rarefaction	Rarefaction	Transverse
D.	Compression	Compression	Longitudinal

(2)

1.3 In a longitudinal wave, such as a **sound wave** traveling through air, how do the particles of the medium move in relation to the direction of the wave's motion

A. The particles vibrate perpendicular (at 90°) to the direction of the wave.

B. The particles move in a circular motion as the wave passes.

C. The particles vibrate parallel to the direction of the wave.

D. The particles move permanently from the source to the listener. (2)

1.4 An equipment used to examine bones of a patient uses a certain type of electromatic radiation. Which one of the radiations is used:

A. X Rays

B. Radio waves

C. Microwaves

D. Gamma rays (2)

1.5 Which of the following factors DOES NOT influence the energy of a photon?

A. wavelength

B. Speed of light

C. Amplitude

D. Frequency (2)

1.6 A neutral object becomes negatively charged when ...

A. Protons are lost

B. Electrons are lost

C. Electrons are gained

D. Protons are gained

(2)

1.7 Which statement correctly describes the difference between the emf of a battery and the potential difference (V) measured across its terminals when the battery is connected to a working circuit?

A. Emf is the energy provided per coulomb of charge when no current is flowing, while potential difference is the energy transferred per coulomb when the circuit is closed.

B. Emf is measured in Amperes (A), while potential difference is measured in Volts (V).

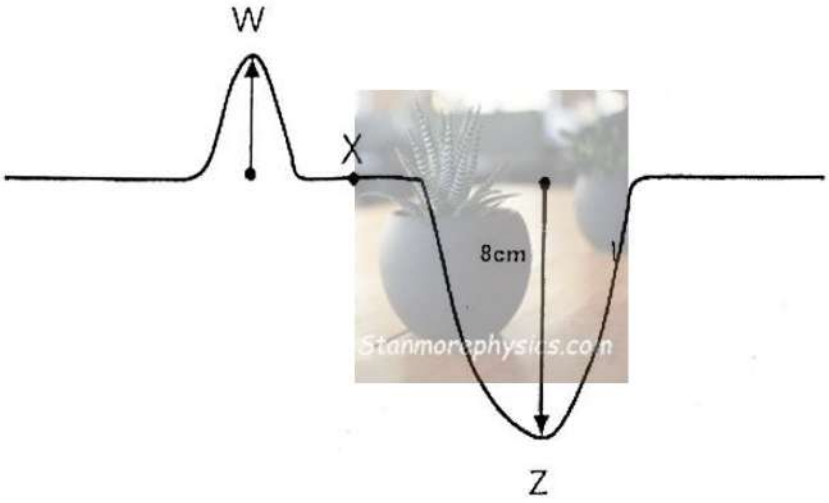
C. Emf is the work done to move a charge through the external circuit only, while potential difference is the work done through the entire circuit.

D. Emf is always smaller than the potential difference because of the resistance of the wires. (2)

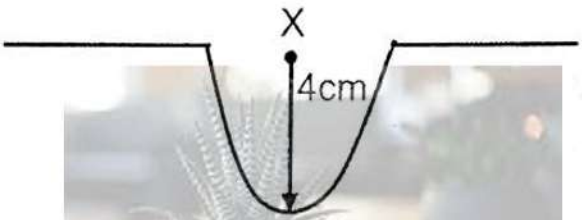
[14]

QUESTION 2

The diagram below shows two pulses **W** and **Z**, travelling in opposite direction in a rope. The amplitude of pulse **W** is UNKNOWN and that of pulse **Z** is 8cm



The two pulses meet at point **X** and the resulting amplitude is shown below



2.1 Define the *principle of superposition.* (2)

2.2 Write down the type of interference and explain it. (3)

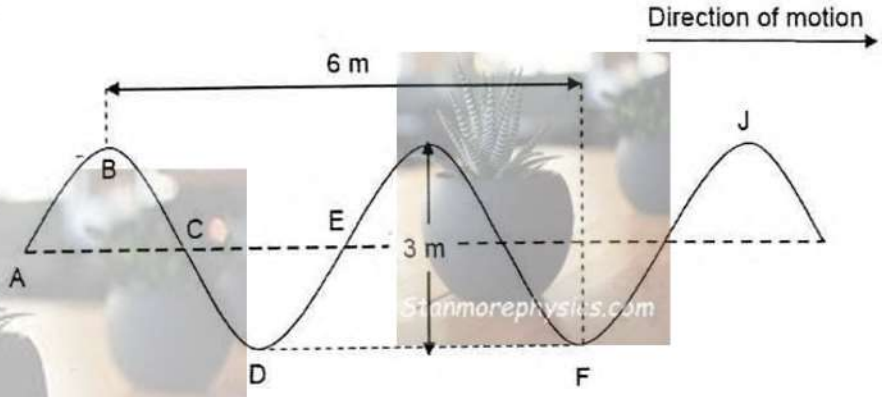
2.3 In which direction (Left or Right) will pulse **W** move after the two pulses pass each other? (1)

2.4 Determine the amplitude of pulse **W.** (2)

[08]

QUESTION 3

The diagram below represents a water wave moving from left to right. The time between two consecutive crests is 0,5 s.



3.1. What type of wave is a water wave? (1)

3.2. Write down the amplitude of the wave (1)

3.3. Define the term wavelength (2)

3.4 Determine the wavelength of the wave. (3)

3.5 Write down TWO points on the wave above that are in phase (1)

3.6 How many waves are represented in the diagram (1)

3.7 Calculate:

3.7.1 Frequency of the wave (3)

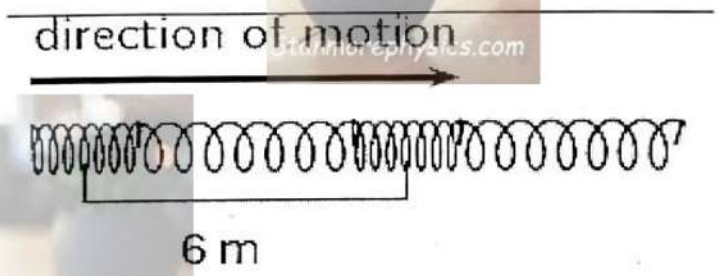
3.7.2 The speed of the wave (3)

[15]

QUESTION 4

A learner uses a slinky spring to produce a wave pattern below as shown in the diagram below.

A longitudinal wave in the slinky has a compression-to-compression distance of 6 m as shown below. It takes one complete wave 2 s to pass a point.



4.1. Define *longitudinal wave*. (2)

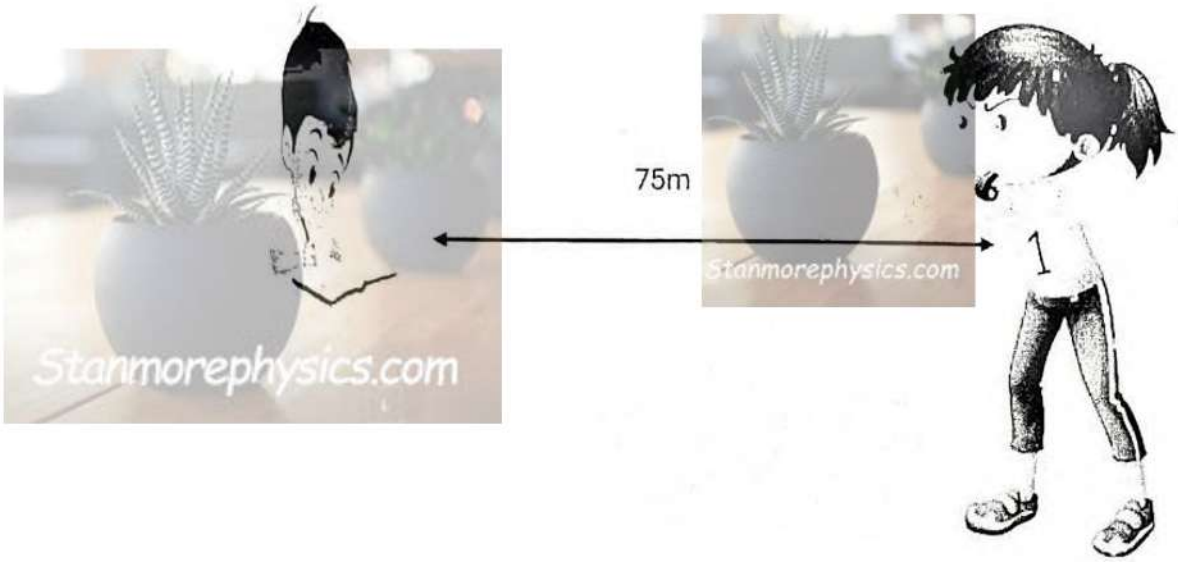
4.2. Differentiate between compression and rarefaction. (4)

4.3 Calculate the speed of the wave. (3)

[09]

QUESTION 5

The learners in grade 10 conducted an experiment to investigate the effect of temperature on the speed of sound. One of the learners blew a whistle, while another learner, 75 m away recorded the time travelled by the sound.



The experiments were repeated at different temperatures at different times of the day. They recorded their findings in the table below:

Temperature(°C)	Time(s)
5	0,250
10	0,240
15	0,238
20	0,237
25	0,236

5.1. For this investigation, write down the:

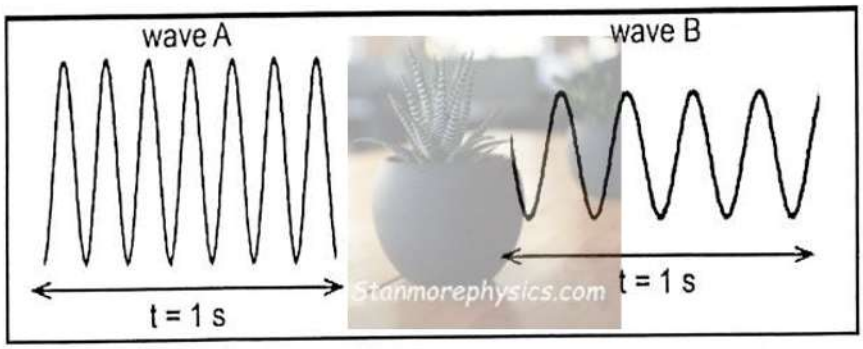
5.1.1. Controlled variable (1)

5.1.2. Dependent variable (1)

5.1.3. Investigative question (2)

5.2. Calculate the speed of sound at 25°C (3)

5.3. Consider the following diagrams that represent sound waves as shown on an oscilloscope:



5.3.1. Identify the wave with higher pitch.
Explain your answer. (2)

5.3.2. Identify the wave that produces the loudest sound (1)

5.4. A bat flying in a dark cave emits an ultrasonic pulse to locate a moth. The bat receives an echo 0,08 seconds after emitting the sound. Assume the speed of sound in the cave is 340 $m.s^{-1}$

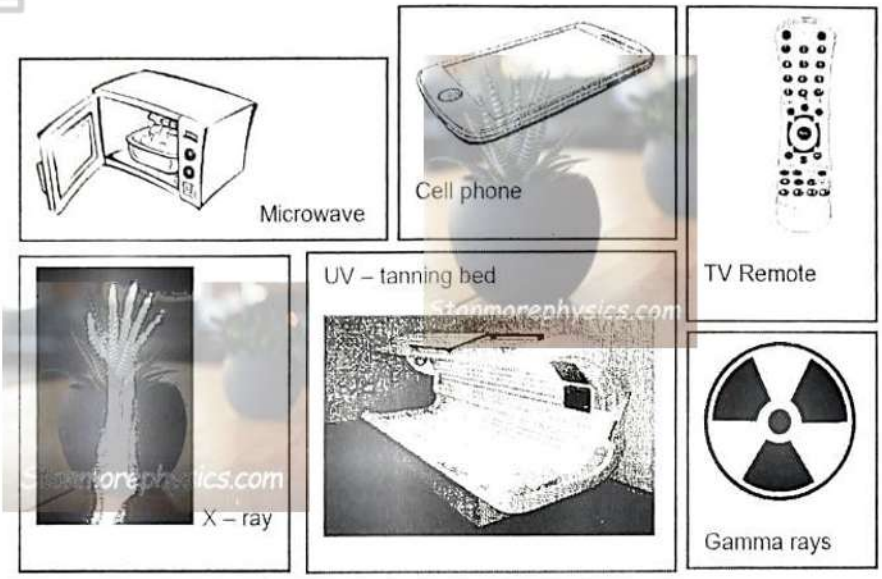
5.4.1. Define *ultrasound*. (2)

5.4.2 Calculate the distance between the bat and the moth. (3)

[15]

QUESTION 6

Consider the diagrams of different electromagnetic radiation and answer the questions that follow:



6.1. Explain the dual nature of electromagnetic radiation. (2)

6.2. What is the source of electromagnetic wave? (1)

6.3. List two properties of electromagnetic waves. (2)

6.4. Give the type of electromagnetic waves that are used in

6.4.1. TV remote (1)

6.4.2. Cell phone (1)

6.5. Write down one use of Gamma rays in the health industry. (1)

6.6. A photon has a wavelength of 850 nm

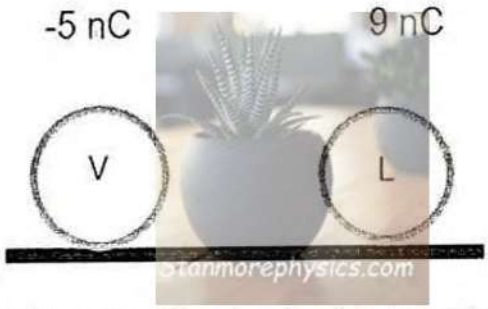
6.6.1. Define the term *photon*. (2)

6.6.2. Calculate the energy of this photon. (4)

[14]

QUESTION 7

Two identical spheres, **V** and **L** are placed on an insulated surface. They carry charges of -5nC and 9 nC respectively. The spheres are bought into contact.



7.1	Explain why the spheres are placed on insulated stands.	(1)
7.2	State the *principle of conservation of charge*.	(2)
7.3	Which one of the two spheres will gain electrons?	(1)
7.4	Calculate the following:	
	7.4.1 new charge on sphere **V** after contact	(3)
	7.4.2 the amount of charge transferred	(2)
	7.4.3 the number of electrons transferred	(3)
7.5	Write down the physics principle used to respond to question 7.4.3	(1)
		[13]

QUESTION 8

You are given the following materials to construct an electric circuit:

Wires, two cells, voltmeter, ammeter, resistor

8.1 Draw a labeled electric circuit diagram to show how you will use all the materials to construct a working circuit. (4)

8.2 A battery with an emf of 12 V is connected to a circuit. Current strength of 0,5 A flows through the circuit for 120 seconds.

8.2.1 Define the term current strength (2)

Calculate the following:

8.2.2 The total amount of charge passing through the circuit in 120 seconds (3)

8.2.3 The total energy transferred by the battery to the charges during this time. (3)

[12]

TOTAL: 100

DATA FOR PHYSICAL SCIENCES GRADE 10
PAPER 1 (PHYSICS)

TABLE 1: PHYSICAL CONSTANTS

NAME	SYMBOL	VALUE
Acceleration due to gravity	g	9,8 $m \cdot s^{-2}$
Speed of light in a vacuum	c	$3,0 \times 10^{8}$ $m \cdot s^{-1}$
Planck's constant	h	$6,63 \times 10^{-34}$ $J \cdot s$
Charge on electron	e^-	$-1,6 \times 10^{-19}$ C
Electron mass	m_e	$9,11 \times 10^{-31}$ kg

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

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

ELECTRIC CIRCUITS/*ELEKTRIESE STROOMBANE*

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

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DEPARTMENT OF EDUCATION

GRADE/*GRAAD* 10

PHYSICAL SCIENCES/*FISIESE WETENSKAPPE*

CONTROL TEST/*KONTROLE TOETS* 1

18 MARCH/*MAART* 2026

MARKING GUIDELINES/*NASIENRIGLYNE*

MARKS/*PUNTE* : 100

This marking guideline consists of 7 pages/*Hierdie nasienriglyne bestaan uit 7 bladsye*

Please turn over/*Blaai om asb*

QUESTION 1: MULTIPLE OF CHOICE QUESTIONS/*VRAAG 1: MEERVOUDIGE KEUSE VRAE*

1.1	C✓✓	(2)
1.2	B✓✓	(2)
1.3	C✓✓	(2)
1.4	A✓✓	(2)
1.5	C✓✓	(2)
1.6	C✓✓	(2)
1.7	A✓✓	(2)

[14]

QUESTION 2/*VRAAG 2*

2.1 The algebraic sum of the amplitudes of two pulses that occupy the same space at the same time. ✓✓/ *Die algebraïese som van die amplitudes van twee pulse wat dieselfde ruimte op dieselfde tyd beset* (2)

2.2 Destructive interference ✓/ *Destruktiewe interferensie*

The crest of one pulse from the left overlaps with the trough from the right, resulting in a pulse of reduced amplitude. ✓✓/ *Die kruin van een puls van links oorvleuel met die trog van regs, wat lei tot 'n puls van verminderde amplitude.* (3)

2.3 Right✓/*regs* (1)

2.4

$$W+(-8) = -4\checkmark$$
$$W = 4cm\checkmark$$

(2)

[8]

QUESTION 3/*VRAAG 3*

3.1. Transverse wave✓/ *Transversale golf* (1)

3.2. 1,5 m✓ (1)

3.3. The distance between two successive points in phase ✓✓/ *Die afstand tussen twee opeenvolgende punte in fase* (2)

3.4. $\lambda = \frac{distance}{number\ of\ waves}$ / $\lambda = \frac{\text{afstand}}{\text{aantal golwe}}$

$= \frac{6}{1,5}$✓

$= 4m$✓ (2)

3.5. A and/*en* E✓

OR/*OF*

D and/*en* F✓ (1)

3.6. 2,5 / $2\frac{1}{2}$ waves/*golwe*✓ (1)

3.7.

3.7.1 $f = \frac{1}{T}$✓

$= \frac{1}{0,5}$✓

$= 2Hz$✓ (3)

3.7.2 **POSITIVE MARKING FROM 3.4 AND 3.7.1/*POSITIEWE NASIEN VANAF 3.4 EN 3.7.1***

v = f.λ✓

$= 2 \times 4$✓

$= 8\ m.s^{-1}$✓

(3)

[15]

QUESTION 4/*VRAAG 4*

4.1. A wave in which the particles of the medium vibrate parallel to the direction of motion of the wave. ✓✓/ *'n Golf waarin die deeltjies van die medium parallel met die bewegingsrigting van die golf vibreer* (2)

4.2. Compression is a region of high pressure in a longitudinal wave. ✓✓/ *Verdigting is 'n gebied van hoë druk in 'n longitudinale golf*

Rarefaction is the region of low pressure in a longitudinal wave. ✓✓/ *Verdunning is die gebied van lae druk in 'n longitudinale golf* (4)

4.3. $v = \frac{Distance}{Time}$ / $v = \frac{afstand}{tyd}$

$= \frac{6}{2}$✓✓

$= 3\ m.s^{-1}$✓ (3)

[9]

QUESTION 5/*VRAAG 5*

5.1.

5.1.1 Distance travelled by the sound✓/ *Afstand wat deur die klank afgelê word* (1)

5.1.2 The speed of sound✓./ *Die spoed van klank*

Accept: The time taken for sound to travel✓/ *Aanvaar: Die tyd wat dit neem vir klank om te afstand af te lê* (1)

5.1.1. How does temperature affect speed of sound in air? ✓✓

OR

What is the effect of temperature on the speed of sound in air? ✓✓ (2)

5.2 $speed = \frac{Distance}{Time}$ /spoed $= \frac{afstand}{tyd}$

$= \frac{75}{0,236}$✓✓

$= 317,797\ m.s^{-1}$✓ (3)

5.3

5.3.1 Wave A✓/*golf A*

It has higher frequency✓/ *Dit het 'n hoër frekwensie* (2)

5.3.2 Wave A✓/ *golf A* (1)

5.4

5.4.1 It is a sound with frequency higher than 20 kHz up to about 100 kHz✓✓ / *Dit is 'n klank met 'n frekwensie hoër as 20 kHz tot ongeveer 100 kHz* (2)

5.4.2 Time taken for sound waves to travel towards the moth / Tyd *wat dit neem vir klankgolwe om na die mot te beweeg:*

$= \frac{0,08}{2}$✓

=0,04 m

$Distance = speed \times time$ /afstand = spoed x tyd

$= 340 \times 0,04$ ✓

$= 13,6\ m$ ✓ (3)

[15]

QUESTION 6/*VRAAG 6*

6.1. Electromagnetic radiation can best be explained as wave nature and as a particle nature✓✓/ *Elektromagnetiese straling kan die beste verduidelik word as golfaard en as 'n deeltjieaard* (2)

6.2. Acceleration of charges✓/ *Versnelling van ladings* (1)

6.3.
- Can travel through a vacuum✓/ *Kan deur 'n vakuum beweeg*
- Have a speed of $3\times 10^{8} m.s^{-1}$✓/ *Het 'n spoed van* $3\times 10^{8} m.s^{-1}$ (2)

6.4.

6.4.1. TV remote: Infrared waves✓/ *TV-afstandbeheer: Infrarooi golwe* (1)

6.4.2. Cellphone: Radio waves✓/ *Selfoon: Radiogolwe* (1)

6.5. Treatment of cancer✓/ *Behandeling van kanker* (1)

6.6.

6.6.1 Photon is a packet of energy found in light✓✓/ *Foton is 'n pakkie energie wat in lig voorkom* (2)

6.6.2 $E = \frac{hc}{\lambda}$✓

$E = \frac{(6.63\times10^{-34})(3\times10^{8})}{850\times10^{-9}}$✓✓

$E = 2{,}34 \times 10^{-19}\ J$✓ (4)

[14]

QUESTION 7/*VRAAG 7*

7.1. To prevent charges from leaking✓/ *Om te verhoed dat ladings lek* (1)

7.2. The net charge of an isolated system remains constant during any physical process. ✓✓/ *Die netto lading van 'n geïsoleerde stelsel bly konstant tydens enige fisiese proses* (2)

7.3. Sphere L✓/*Sfeer L* (1)

7.4 7.4.1 $Q_{NEW} = \frac{Q_V + Q_L}{2}$✓

$= \frac{(-5\times10^{-9})+(9\times10^{-9})}{2}$✓

$= 2 \times 10^{-9}\ C$✓ (3)

7.4.2 **POSITIVE MARKING FROM 7.4.1/ *POSITIEWE NASIEN VANAF 7.4.1***

$\Delta Q = Q_{new} - Q_{Initial}$

$= 2 \times 10^{-9} - (-5 \times 10^{-9})$ ✓

$= 7 \times 10^{-9}$✓ (2)

7.4.3 **POSITIVE MARKING FROM 7.4.2/ *POSITIEWE NASIEN VANAF 7.4.2***

$n = \frac{Q}{e^-}$✓

$= \frac{7\times10^{-9}}{1{,}6^{-1}}$✓

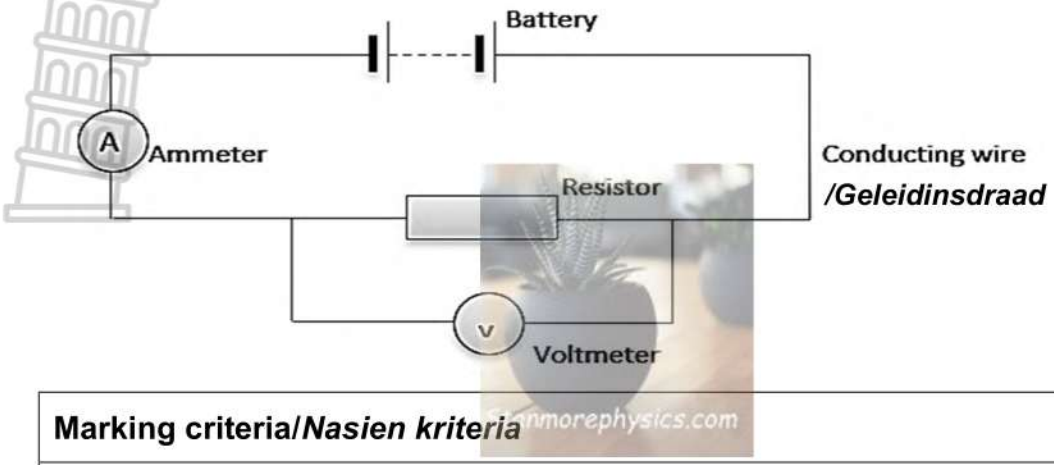
$= 4{,}375 \times 10^{10}\ (electrons/elekrone)$ ✓ (3)

7.5 Charge quantization✓/ *Ladingkwantisering* (1)

[13]

QUESTION 8/*VRAAG 8*

8.1



Marking criteria/*Nasien kriteria*	
Cells connected correctly/ *Selle korrek gekoppel*	✓
Voltmeter connected across the resistor/ battery/ *Voltmeter gekoppel oor die weerstand/battery*	✓
Ammeter connected correctly/ *Ampèremeter korrek gekoppel*	✓
All labels/ *Alle byskrifte*	✓

(4)

8.2

8.2.1 Current strength is the rate of flow of charge. ✓✓/ *Stroomsterkte is die tempo van vloei van lading* (2)

8.2.2 $Q = I\Delta t$✓

$= 0{,}5 \times 120$✓

$= 60\ C$✓ (3)

8.2.3 POSITIVE MARKING FROM 8.2.2/ *POSITIEWE NASIEN VANAF 8.2.2*

$v = \frac{W}{Q}$✓

$12 = \frac{W}{60}$✓

$= 720$ J✓ (3)

[12]

TOTAL/*TOTAAL* = 100 MARKS/*PUNTE*