education

Department:
Education
North West Provincial Government
REPUBLIC OF SOUTH AFRICA

PROVINCIAL TASK

GRADE 10

PHYSICAL SCIENCES

16 MARCH 2026

Marks: 100

Time: 2 HOURS

This question paper consists of 11 pages, including a data sheet.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of SEVEN (7) questions. Answer ALL 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, e.g. 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 SHEETS.
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. Write neatly and legibly.

QUESTION 1: MULTIPLE-CHOICE QUESTIONS

Various options are provided as possible answers to the following questions. 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 crest is…

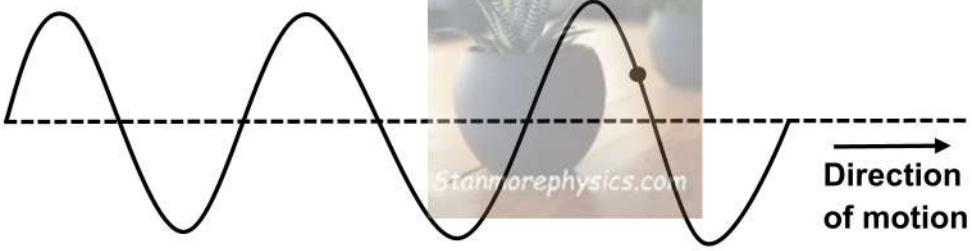
A a single disturbance in a medium.

B highest point in a wave.

C the lowest point in a wave.

D the distance between two points in a wave. (2)

1.2 The transverse wave, shown in the diagram below, moves from left to right. In which direction is particle A moving?



A Up

B Down

C Left

D Right (2)

1.3 What is the term used for the time taken by a wave to complete one complete wave pulse?

A Amplitude

B Wavelength

C Frequency

D Period (2)

1.4 The pitch of a musical sound depends on the sound wave's…

A wavelength.

B frequency.

C speed.

D amplitude. (2)

1.5 The electromagnetic waves with the lowest energy are…

A x-rays.

B microwaves.

C gamma rays.

D radio waves. (2)

1.6 A glass rod is charged positively by rubbing it with a silk cloth. During this process…

A electrons are transferred from the glass rod to the silk cloth.

B electrons are transferred from the silk cloth to the glass rod.

C protons are transferred from the silk cloth to the glass rod.

D protons are transferred from the glass rod to the silk cloth. (2)

1.7 10 C of charge passes a point in a circuit in 2 minutes. The current in the circuit is:

A 0,083 A

B 0,2 A

C 5 A

D 12 A (2)

[14]

QUESTION 2 (Start on a new page.)

Two transverse pulses, **A** and **B**, approach a point, **P,** in the same medium. Pulse **B** is travelling to the LEFT and has an amplitude three times larger than that of pulse **A**, both pulses have a wavelength of 5 cm. The pulses experience DESTRUCTIVE interference at point **P** where they form a trough with an amplitude of 6 cm.

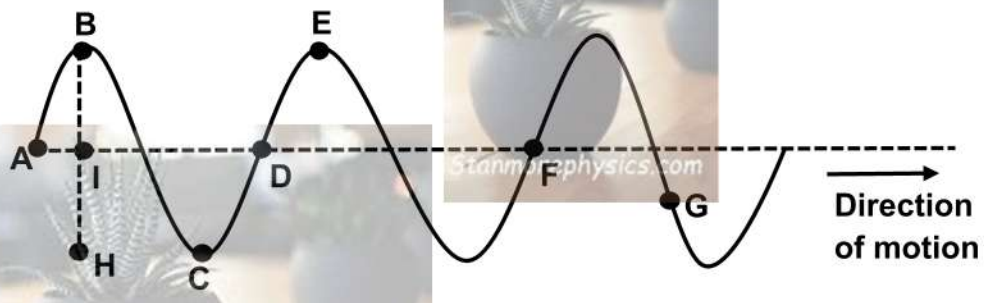
2.1 NAME and STATE the principle used to determine the resultant amplitude of the pulse formed at point **P**. (3)

2.2 Calculate the amplitude of pulse **B** before it reaches point **P**. (3)

2.3 Write down the wavelength of the pulse **A** at point **P**. (1)

2.4 Draw the pulses after they pass point **P**. Label each pulse clearly. (3)

2.5 Consider the following wave and answer the questions that follow.



2.5.1 Distinguish between a pulse and a wave. (4)

2.5.2 With reference to the diagram of the wave shown above, write down the letter(s) that indicate:

a) Amplitude (1)

b) One wavelength from position **B** (1)

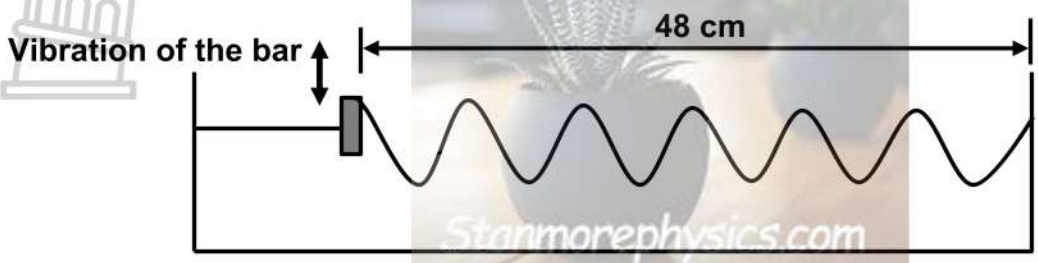
c) A point that is COMPLETELY out of phase with point **E** (1)

d) Two points that are in phase with point **A** (1)

[18]

QUESTION 3 (Start on a new page.)

Water waves can be made by vibrating a wooden bar up and down in a tray of water. The bar moves up and down at a frequency of 5 Hz.



3.1 How many complete waves are there in 48 cm? (1)

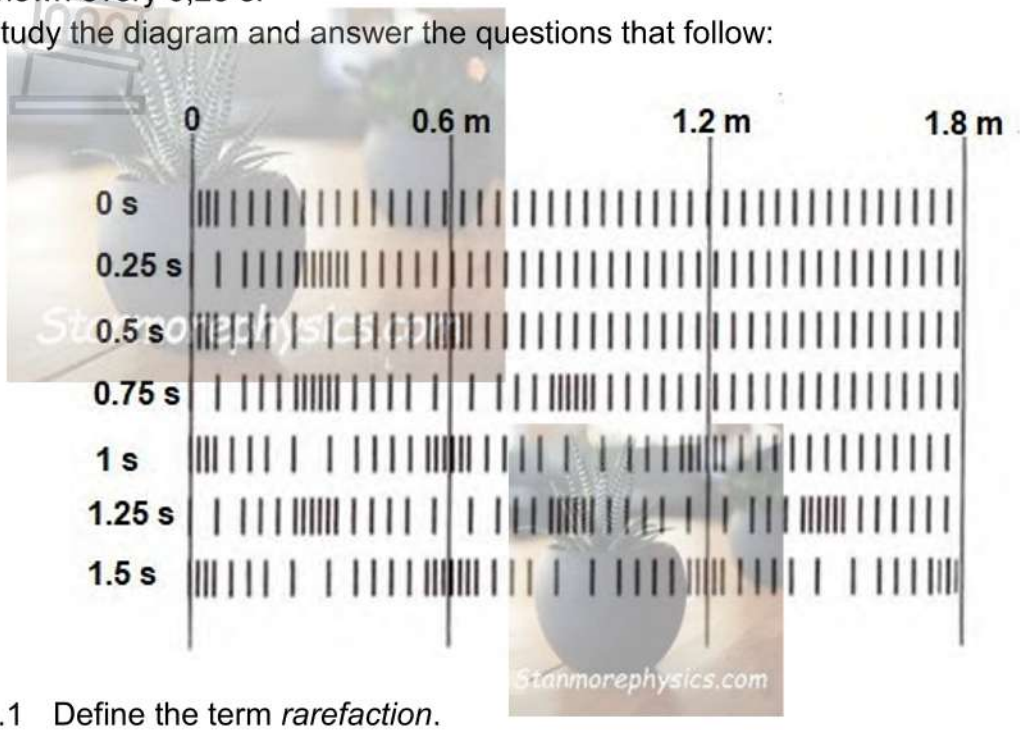
3.2 Are the water waves longitudinal or transverse? Explain briefly. (3)

3.3 Calculate the period of the waves. (3)

3.4 Calculate the speed of the water waves. (4)
[11]

QUESTION 4 (Start on a new page.)

The diagram below shows a series of compressions and rarefactions travelling through a slinky spring. The positions of the compressions and rarefactions is shown every 0,25 s.
Study the diagram and answer the questions that follow:



4.1 Define the term *rarefaction*. (2)

4.2 Determine the period of this wave. (2)

4.3 Determine the wavelength of the wave. (1)

4.4 How far did the first compression travel in 1,5 s? (1)

4.5 Calculate the speed of this wave. (3)
[9]

QUESTION 5 (Start on a new page.)

A wave source on a ship sends out sound waves of frequency 25 kHz to the bottom of the sea. A receiver on the ship detects these waves a short while later. The speed of sound in water is 1 500 $m \cdot s^{-1}$.

5.1 Describe an *echo*. (2)

5.2 Calculate the wavelength of these sound waves. (3)

5.3 Can these sound waves be heard by the human ear? Give a reason. (2)

5.4 Calculate the depth of the water beneath the ship if the waves are detected by the receiver 10 seconds after being emitted. (4)

Consider the electromagnetic spectrum below and answer the questions that follow.

Radio waves	Micro waves	Infrared	**A**	Ultraviolet	**B**	Gamma rays

5.5 Define the term *photon*. (2)

5.6 Give the NAMES of electromagnetic radiations:

5.6.1 **A** (1)

5.6.2 **B** (1)

5.7 Calculate the energy of a photon of radiation **A**, with a frequency of $2,5 \times 10^{16}$ Hz. (3)

5.8 Explain why electromagnetic radiation **B** is best suitable to scan bones and not radiation **A**. (2)

5.9 Calculate the wavelength of radiation **B** if its photons have an energy of $7,25 \times 10^{-13}$ J. (4)

[24]

QUESTION 6 (Start on a new page.)

Two identical spheres, **X** and **Y**, on an insulated surface, carry charges of $-5,3\times10^{-6}$ C and $+4,7\times10^{-6}$ C respectively. The spheres are brought into contact with each other and then separated.

6.1 State the *principle of charge quantisation*. (2)

6.2 Calculate the number of excess electrons in sphere **X** before contact. (3)

6.3 Give a reason why we place charges spheres on insulated stands. (1)

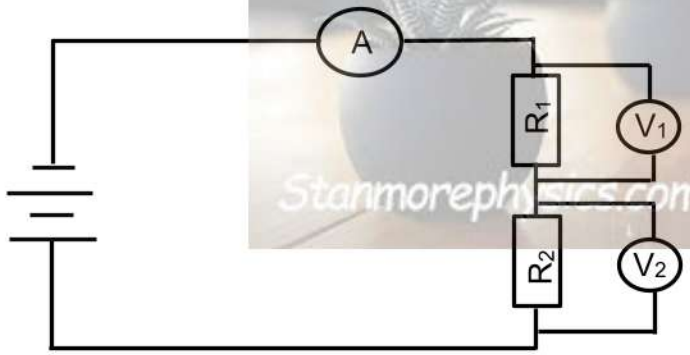
6.4 Will the electrons be transferred from **X** to **Y** or from **Y** to **X**? Give a reason for the answer. (2)

6.5 Calculate the charge on each sphere after they have moved away from each other. (3)

6.6 Calculate the number of electrons transferred from one sphere to the other during contact. (3)
[14]

QUESTION 7 (Start on a new page.)

Consider the circuit below. The reading on voltmeter V_1 is 6 V. The ammeter reading is 1,5 A.



7.1 Define the term *potential difference*. (2)

7.2 In 2 minutes, a charge of unknown magnitude passes through R_2.
Calculate the magnitude of the reading on V_2 if 8000 J of energy is used. (5)

7.3 A charge of 18 C flows through a battery in 6 s. Calculate the current passing through the battery. (3)
[10]

TOTAL : 100

DATA FOR PHYSICAL SCIENCES GRADE 10
PAPER 1 (PHYSICS)
GEGEWENS VIR FISIESE WETENSKAPPE
VRAESTEL 1 (FISIKA)

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

NAME/*NAAM*	SYMBOL/*SIMBOOL*	VALUE/*WAARDE*
Acceleration due to gravity *Swaartekragversnelling*	g	9,8 $m \cdot s^{-2}$
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·s
Charge on electron *Lading op elektron*	e	$1,6 \times 10^{-19}$ C
Electron mass *Elektronmassa*	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/*ELEKTROSTATIKA*

$n = \frac{Q}{e}$ or/*of* $n = \frac{Q}{q_e}$	$Q = \frac{Q_1 + Q_2}{2}$

ELECTRIC CIRCUITS/*ELEKTRIESE STROOMBANE*

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

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PROVINCIAL TASK/*PROVINSIALE TAAK*

GRADE/*GRAAD* 10

PHYSICAL SCIENCES

FISIESE WETENSKAPPE

16 MARCH/*MAART* 2026

MARKING GUIDELINES/*NASIENRIGLYNE*

Marks/*Punte*: 100

These marking guidelines consists of 6 pages.
Hierdie nasienriglyne bestaan uit 6 bladsye.

QUESTION/*VRAAG* 1

1.1 B ✓✓ (2)

1.2 B ✓✓ (2)

1.3 D ✓✓ (2)

1.4 B ✓✓ (2)

1.5 D ✓✓ (2)

1.6 A ✓✓ (2)

1.7 A ✓✓ (2)
[14]

QUESTION/*VRAAG* 2

Marking criteria/*Nasienkriteria:*
If any of the underlined key words/phrases in the correct context is omitted deduct 1 mark. */Indien enige van die onderstreepte sleutelwoorde/frases in die korrekte konteks uitgelaat is, trek 1 punt af.*

2.1 Principle of superposition.✓ The algebraic sum of the amplitudes of two pulses✓ that occupy the same space at the same time.✓

Beginsel van superposisie. Die algebraïese som van die amplitudes van twee pulse wat dieselfde ruimte op dieselfde tyd beslaan (3)

2.2

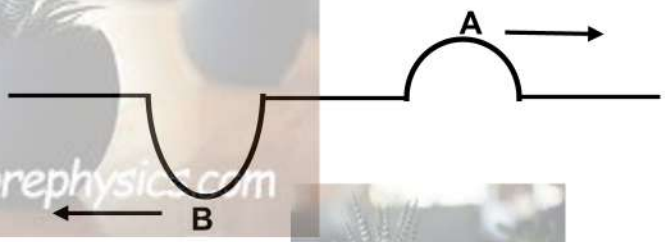
OPTION/*OPSIE* 1	**OPTION/*OPSIE* 2**
Let the amplitude of Pulse A=x The amplitude of Pulse B = -3x x + (-3x)✓= -6✓ x= 3 cm amplitude of Pulse B= 3(x) = 3(3) = 9 cm✓ *Laat die amplitude van Puls A=x* *Die amplitude van Puls B = -3x* *x + (-3x)✓= -6✓* *x= 3 cm* *amplitude van Puls B= 3(x)* *= 3(3)* *= 9 cm✓*	Let the amplitude of Pulse A=$\frac{1}{3}$x The amplitude of Pulse B= -x $\frac{1}{3}$x + (-x) ✓= -6 ✓ x= 9 cm ✓ *Laat die amplitude van Puls A=x*$\frac{1}{3}$ *Die amplitude van Puls B= -x* $\frac{1}{3}$*x + (-x) ✓= -6 ✓* *x= 9 cm ✓*$\frac{1}{3}$

(3)

2.3 5 cm ✓ (1)

2.4

CRITERIA/*Kriteria*	
Pulse A drawn as crest and pulse B drawn as trough with labels *Puls A geteken as 'n kruin en puls B geteken as 'n trog met byskrifte.*	✓
Pulse B has a greater amplitude than pulse A *Puls B het 'n groter amplitude as puls A*	✓
Pulse B drawn left of pulse A *Puls B is links van puls A*	✓



(3)

2.5.1 A pulse is a single disturbance ✓✓ whereas a wave is a series of disturbances.✓✓
'*n Puls as 'n enkele steuring in 'n medium, terwyl 'n golf 'n reeks versteurings is.* (4)

2.5.2 a) IB or/*of* IH ✓ (1)

b) E ✓ (1)

c) C ✓ (1)

d) D and/*en* F ✓ (1)
[18]

QUESTION/*VRAAG* 3

3.1 6 ✓ (1)

3.2 Transverse✓. The particles of the medium vibrate perpendicular to the direction of motion of the wave.✓✓

Transversale. Die deeltjies van die medium vibreer reghoekig met die bewegingsrigting van die golf. (3)

3.3 $T = \frac{1}{f}$ ✓

$= \frac{1}{5}$ ✓

$= 0,2$ s✓ (3)

3.4

OPTION/*OPSIE* 1	OPTION/*OPSIE* 2
$v = \frac{\text{distance/afstand/d}}{\text{time/tyd/t}}$ ✓ $v = \frac{0,48}{6 \times 0,2}$ ✓ $v = 0,4\ m \cdot s^{-1}$ ✓	$v = f \times \lambda$ ✓ $v = 5$ ✓$\times 0.08$ ✓ $v = 0,4\ m \cdot s^{-1}$ ✓

(4)
[11]

QUESTION/*VRAAG* 4

4.1 A rarefaction is a region of low pressure (in a longitudinal wave).✓✓
'n Verdigting is 'n gebied van hoë druk (in 'n longitudinale golf).
(2 or/*of* 0) (2)

4.2 0,25 x 2 = 0.5 s ✓✓
(One complete wavelength is generated at 0,5 s from the middle of one compression to the middle of the next successive compression/ *Een volledige golflengte is by 0,5 s gegenereer vanaf die middel van een verdigting tot die middel van die volgende opeenvolgende verdigting)*

OR/*OF*

$\text{Period/Periode} = \frac{\text{time/tyd/}}{\text{number of waves/aantal golwe}}$

$\text{Period/Periode} = \frac{1,5}{3}$ ✓

$= 0,5$ s ✓ (2)

4.3 0,6 m ✓ (1)

4.4 1,8 m ✓ (1)

4.5

OPTION/*OPSIE* 1	OPTION/*OPSIE* 2
$v = \frac{\text{distance/}afstand}{\text{time/}tyd}$ ✓ $= \frac{1.8}{1,5}$ ✓ $= 1,2\ m\cdot s^{-1}$ ✓	$f = \frac{1}{T}$ $= \frac{1}{0,5}$ $= 2\ s$ $v = f\lambda$ ✓ $= 2 \times 0.6$ ✓ $= 1,2\ m\cdot s^{-1}$ ✓

(3)
[9]

QUESTION/*VRAAG* 5

5.1 Reflection of sound waves.✓✓ (2)

5.2 $v = f \times \lambda$ ✓
$1500 = 25\,000 \times \lambda$ ✓
$\lambda = 0,06$ m ✓ (3)

5.3 No/*Nee* ✓
The frequency is beyond range for the human ear./*Die frekwensie is buite die hoorbare klank vir die menslike oor.* ✓

OR/*OF*

Frequency is greater than 20 kHz/*Frekwensie is groter as 20 kHz* (2)

5.4 $\text{Speed/}Spoed = \frac{\text{distance/}afstand}{\text{time/}tyd}$ ✓

1500 ✓ $= \frac{\text{distance/}afstand}{5}$ ✓
distance/*afstand* = 7500 m ✓ (4)

5.5 A photon is a quantum/packet of energy found in light. ✓✓
'n Foton is 'n kwantum/pakkie energie wat in lig voorkom. **(2 or/*of* 0)** (2)

5.6.1 A: Visible light/*Sigbare lig* ✓ (1)

5.6.2 B: X-rays/*X-strale* ✓ (1)

5.7 $E = hf$ ✓
$= (6,63 \times 10^{-34}) \times (2,5 \times 10^{16})$ ✓
$= 1,66 \times 10^{-17}$ J ✓ (3)

5.8 Radiation **B** has a higher frequency/energy✓ hence a higher penetrating ability.
*Straling **B** het 'n hoër frekwensie/energie en dus 'n hoër penetrasievermoë.*

OR/*OF*

X-rays are absorbed by bones to appear bright white ✓ but visible light is deflected by soft tissues of the body
X-strale word deur bene geabsorbeer om helder wit te lyk, maar sigbare lig word deur sagte weefsels van die liggaam weerkaats. (2)

5.9 $E = \frac{hc}{\lambda}$ ✓

$7,25 \times 10^{-13}$ ✓ $= \frac{6.63 \times 10^{-34}}{\lambda} (3 \times 10^{8})$ ✓

$\lambda = 2,74 \times 10^{-13}$ m ✓ (4)
[24]

QUESTION/*VRAAG* 6

6.1 All charges in the universe consists of an integer multiple of the charge of one electron. ✓✓
Alle ladings in die heelal bestaan uit 'n heelgetalveelvoud van die lading op een elektron. **(2 or/*of* 0)** (2)

6.2 $n = \frac{q}{e}$ ✓

$= \frac{-5,3 \times 10^{-6}}{-1,6 \times 10^{-19}}$ ✓

$= 3,3125 \times 10^{13}$ electrons/*elektrone* ✓ (3)

6.3 To prevent the loss of electrons or charges /*Om die verlies van elektrone of ladings te voorkom.* ✓
OR/*OF*
To prevent leakage of charges./*Om lekkasie van ladings te voorkom.* (1)

6.4 X to/*na* Y ✓
X has excess electrons./*het 'n oormaat elektrone* ✓ (2)

6.5 $Q = \frac{Q_1 + Q_2}{2}$ ✓

$= \frac{4,7 \times 10^{-6} + (-5,3 \times 10^{-6})}{2}$ ✓

$= -3 \times 10^{-7}$ C ✓ (3)

6.6 **POSITIVE MARKING FROM QUESTION 6.5/*POSITIEWE NASIEN VANAF VRAAG 6.5***

OPTION/*OPSIE* 1	OPTION/*OPSIE* 2
$\Delta Q = -3 \times 10^{-7} - (-5{,}3 \times 10^{-6})$ ✓ $= 5 \times 10^{-6}$ C	$\Delta Q = (-3 \times 10^{-7}) - 4{,}7 \times 10^{-6}$ ✓ $= -5 \times 10^{-6}$ C
$n = \frac{q}{e}$ $n = \frac{5 \times 10^{-6}}{1{,}6 \times 10^{-19}}$ ✓ $n = 3{,}125 \times 10^{13}$ electrons/ *elektrone* ✓	$n = \frac{q}{e}$ $n = \frac{-5 \times 10^{-6}}{-1{,}6 \times 10^{-19}}$ ✓ $n = 3{,}125 \times 10^{13}$ electrons/ *elektrone* ✓

(3)
[14]

QUESTION/*VRAAG* 7

7.1 The energy transferred per unit electric charge flowing through it. ✓✓
Die energie oorgedra per eenheidslading wat daardeur vloei. **(2 or/*of* 0)** (2)

7.2 $I = \frac{Q}{\Delta t}$ ✓
$1{,}5 = \frac{Q}{120}$ ✓
$Q = 180$ C

$V = \frac{W}{Q}$ ✓
$= \frac{8000}{180}$ ✓
$= 44{,}44$ V ✓ (5)

7.3 $I = \frac{Q}{\Delta t}$ ✓
$= \frac{18}{6}$ ✓
$= 3$ A ✓ (3)
[10]

TOTAL/*TOTAAL*: 100