education

Department of Education
FREE STATE PROVINCE

CONTROL TEST

GRADE 10

PHYSICAL SCIENCES

SEPTEMBER 2019

MARKS: 100

TIME: 2 HOURS

This paper consists of 10 pages and one data sheet.

INSTRUCTIONS AND INFORMATION

1. Write your name and other information in the appropriate spaces on the ANSWER BOOK.

2. This question paper consists of SIX questions. Answer ALL questions in the ANSWER BOOK.

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, for example between QUESTION 2.1 and QUESTION 2.2.

6. You may use a non-programmable pocket calculator.

7. You may use appropriate mathematical instruments.

8. You are advised to use the attached data sheets.

9. Show ALL formulae and substitutions in ALL calculations.

10. Round off your FINAL numerical answers to a minimum of TWO decimal places where applicable.

11. Give brief motivations, discussions, et cetera where required.

12. Write neatly and legibly.

QUESTION 1

Four options are provided as possible answers to the following questions. Each question has only ONE correct answer. Choose the answer and write down only the letter A, B, C or D next to the question number (1.1–1.10) in your ANSWER BOOK.

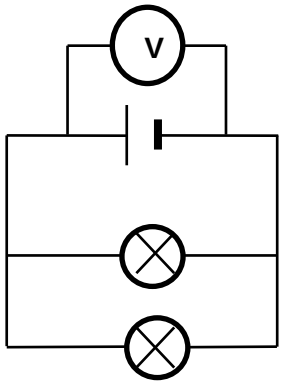
1.1 For which one of the following quantities is the CORRECT unit of measurement given?

	Quantity	**Unit**
A	Energy	$m \cdot s^{-1}$
B	Potential difference	A
C	Resistance	Ω
D	Current	V

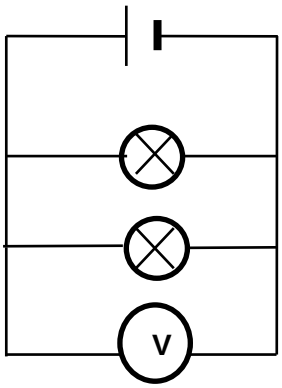
(2)

1.2 Which one of the following circuits can be used to measure the total current in the circuit?

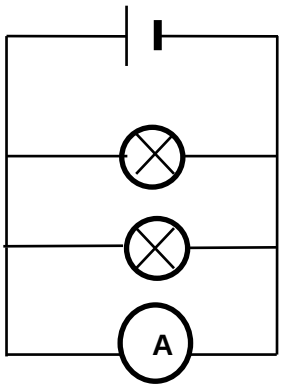
A



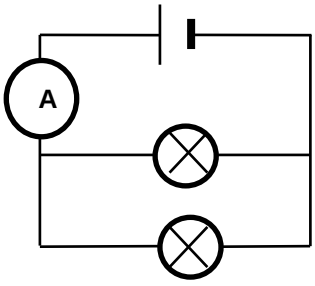
B



C



D



(2)

1.3 A uniform copper wire has a resistance of 100 Ω. If the wire is cut into ten equal lengths, the resistance, in Ω, of each piece is …

A 1.

B 10.

C 100.

D 1 000. (2)

1.4 A car travels from town **X** for 40 km along a straight road to town **Y**. The driver turns around and immediately drives back to town **X**. The whole trip takes 2 hours. What is the average speed, in $km \cdot h^{-1}$, for the whole journey?

A $\frac{2}{40}$

B $\frac{40}{2}$

C $\frac{80}{2}$

D $\frac{160}{2}$ (2)

1.5 Which one of the following combinations includes TWO scalar and ONE vector quantity?

A	Speed	Velocity	Distance
B	Force	Mass	Acceleration
C	Displacement	Acceleration	Speed
D	Displacement	Acceleration	Velocity

(2)

1.6 A boy walks 4 m in an easterly direction and then 1 m in a westerly direction. What is the DIFFERENCE, in m, between the distance he has walked and the magnitude of his displacement?

A 0

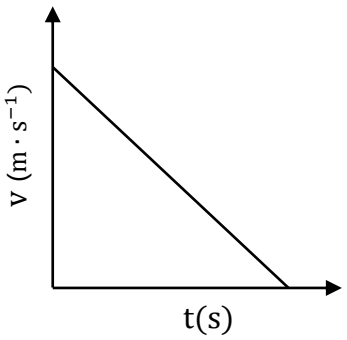
B 2

C 3

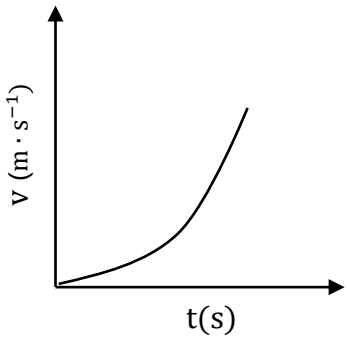
D 5 (2)

1.7 Which one of the following velocity-time graphs is correct for an object moving at constant velocity?

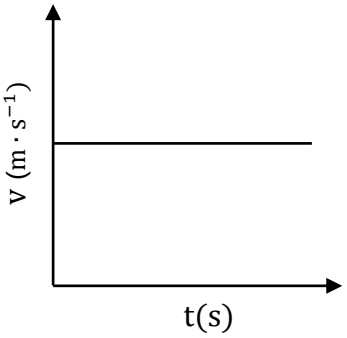
A



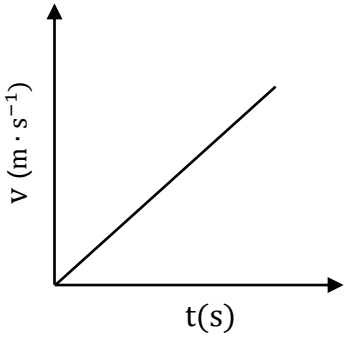
B



C



D



(2)

1.8 Which one of the following substances will NOT form a precipitate when it is added to a silver nitrate solution?

A Sodium iodide

B Copper chloride

C Sodium chloride

D Magnesium nitrate (2)

1.9 What type of reaction is represented by the following equation?

$HC\ell\,(aq) + NaOH\,(aq) \rightarrow NaC\ell\,(aq) + H_2O\,(\ell)$

A Redox

B Acid-base

C Gas-forming

D Precipitation (2)

1.10 When aqueous solutions of an acid and a base are mixed, …

A no reaction occurs.

B a salt and water are formed.

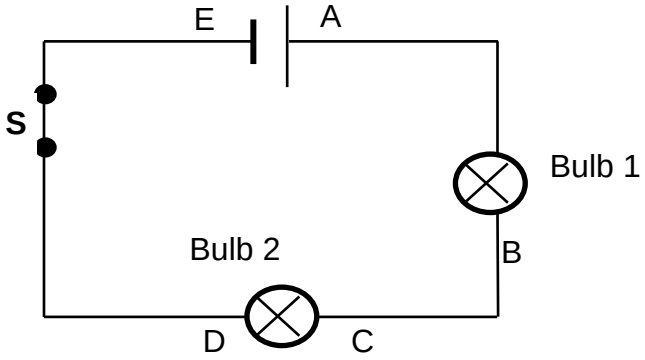
C an acid and a salt are formed.

D a new acid and a new base are formed. (2)

[20]

QUESTION 2

Consider the diagram of a circuit containing one cell connected to two bulbs in series with a switch that is closed.



2.1 Define *current* in words. (2)

2.2 Copy the circuit diagram to your answer book and add the following to it:
- An ammeter that measures the current in the wire at **A**.
- A voltmeter that measures the potential difference across points **A** and **B**. (2)

The magnitude of the current at point **A** is 0,6 A.

2.3 What is the magnitude of the current at point **C**? (1)

2.4 Calculate the amount of charge flowing past point **C** if the circuit is closed for 2 minutes. (3)

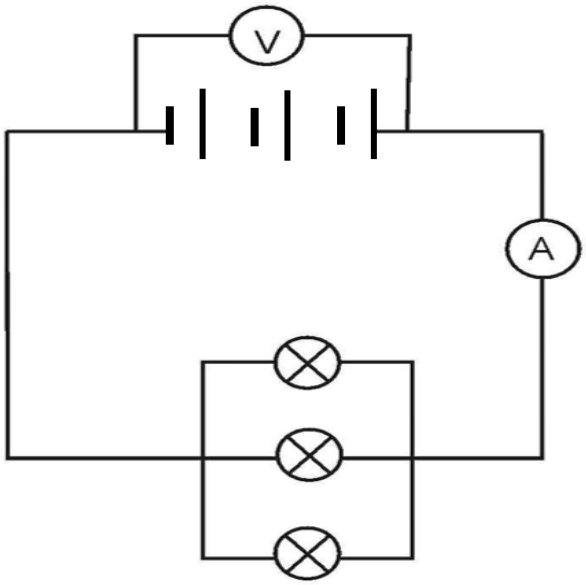
2.5 The emf of the battery is 3 V. The potential difference across **AB** is 1,8 V. What is the potential difference across **CD**, and explain why V_{AB} is different from V_{CD}. (2)

2.6 How does the brightness of bulb **1** compare with the brightness of bulb **2**? Explain your answer. (3)

[13]

QUESTION 3

Consider the circuit diagram below. The bulbs are IDENTICAL. The resistance of the battery, ammeter and connecting wires can be ignored.



3.1 Define the term *potential difference* in words. (2)

3.2 Calculate the reading on the voltmeter if the BATTERY can transfer a TOTAL of 90 J of energy to 20 C of charge. (3)

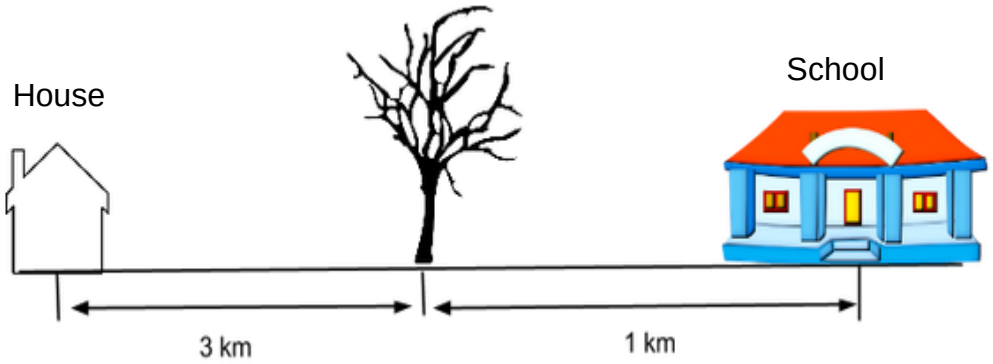
3.3 What is the emf of EACH cell? (1)

3.4 A charge of 30 C passes a point in the main circuit in 40 s. Calculate the current at that point. (3)

3.5 Determine the current in each individual light bulb. (2)
[11]

QUESTION 4

Mohale is walking to school from his house. After 30 minutes he reaches a tree that is 3 km away and realises that his science book is still at home. He walks back to his house in 20 minutes, fetches his book and then runs the 4 km to school in 15 minutes.



4.1 Define the following terms:

4.1.1 Displacement (2)

4.1.2 Average speed (2)

4.2 Is average speed a vector or scalar quantity? Give a reason for your answer. (2)

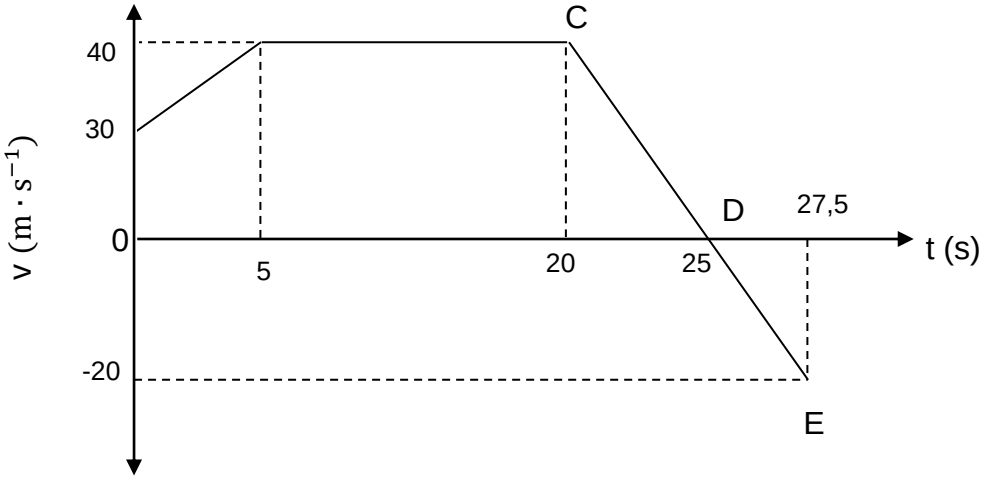
4.3 Calculate Mohale's average SPEED, in $m \cdot s^{-1}$, for the 65 minutes that he travels to school. (4)

4.4 Calculate Mohale's average VELOCITY, in $m \cdot s^{-1}$, for the time he WALKS BACK TO HIS HOUSE to fetch his book. (3)

4.5 Calculate Mohale's average VELOCITY, in $m \cdot s^{-1}$, for the time he RUNS TO SCHOOL. (2)
[15]

QUESTION 5

The velocity versus time graph for a racing car is shown below for the time interval t = 0 s until t = 27,5 s. At t = 0 s the racing car is moving EASTWARDS.



5.1 Write down the speed of the car at t = 10 s. (1)

5.2 Write down the VELOCITY of the car at t = 27,5 s. (2)

5.3 Describe the motion of the car for the section labelled **CD**. (3)

5.4 Calculate the acceleration from **C** to **D**. (4)

5.5 Calculate the VELOCITY of the car at t = 26,3 s. (4)

5.6 Without any calculation(s), compare the magnitude of the acceleration for **CD** with that of **DE**. Write only GREATER THAN, LESS THAN or EQUAL TO. (1)

5.7 Give a reason for your answer to question 5.6. (1)

5.8 Calculate the magnitude of the displacement of the car from t = 0 s to t = 27,5 s. (6)
[22]

QUESTION 6

6.1 Assume that the solid substances Na_2SO_4 and $A\ell_2(CO_3)_3$ can dissolve in WATER.

6.1.1 Define the term *solubility*. (2)

6.1.2 Define the term *hydration*. (2)

6.1.3 Write down a balanced chemical equation for the DISSOLUTION PROCESS of EACH of the two solid substances and indicate ALL the phases in your equations. (6)

6.2 Sugar dissolve in water, but a sugar solution DOES NOT CONDUCT electricity. Explain this phenomenon. (3)

6.3 How does each of the following affect the conductivity of a solution?

6.3.1 The concentration of the ions in a solution (2)

6.3.2 The type of substance in a solution (2)

6.4 What type of ion-exchange reaction is represented by the following chemical equation? Give a reason for your answer.

$2AgNO_3(aq) + CaC\ell_2(aq) \rightarrow 2AgC\ell(s) + Ca(NO_3)_2(aq)$ (2)

[19]

GRAND TOTAL: 100

GEGEWENS VIR FISIESE WETENSKAPPE GRAAD 10
VRAESTEL 1 (FISIKA)

TABLE 1: PHYSICAL CONSTANTS/*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	$6{,}63 \times 10^{-34}\ J{\cdot}s$
Charge on electron *Lading op elektron*	e	$-1{,}6 \times 10^{-19}\ C$
Electron mass *Elektronmassa*	m_e	$9{,}11 \times 10^{-31}\ kg$

TABLE 2: FORMULAE/*TABEL 2: FORMULES*

MOTION/*BEWEGING*

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

ELECTRIC CIRCUITS/*ELEKTRIESE STROOMBANE*

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