

basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

PHYSICAL SCIENCES: PHYSICS (P1)
NOVEMBER 2016

**NATIONAL
SENIOR CERTIFICATE**

GRADE 10

MARKS: 150

TIME: 2 hours

This question paper consists of 16 pages, 1 answer sheet and 2 data sheets.



INSTRUCTIONS AND INFORMATION

1. Write your name and class (for example 10A) in the appropriate spaces on the ANSWER BOOK.
2. This question paper consists of 11 questions. Answer ALL the questions in the ANSWER BOOK, except QUESTION 7.3 which must be done on the graph on the attached ANSWER SHEET. Ensure that you hand in the ANSWER SHEET together with 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 subquestions, for example between QUESTION 2.1 and QUESTION 2.2.
6. You may use a non-programmable 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.
11. Give brief motivations, discussions et cetera where required.
12. Write neatly and legibly.



QUESTION 1: MULTIPLE-CHOICE QUESTIONS

Four options are provided as possible 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 number (1.1–1.10) in the ANSWER BOOK, for example 1.11 E.

1.1 Which ONE of the following physical quantities is a vector?

A Distance

B Displacement

C Mass

D Time

(2)

1.2 In the equation $v_f = v_i + a\Delta t$, the SI unit for $a\Delta t$ is ...

A m

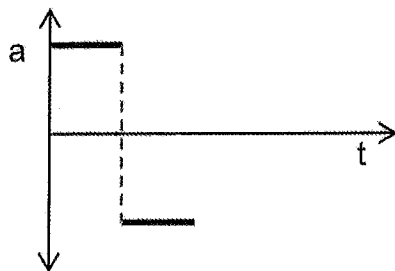
B $\text{m}\cdot\text{s}^{-2}$

C $\text{m}\cdot\text{s}^{-1}$

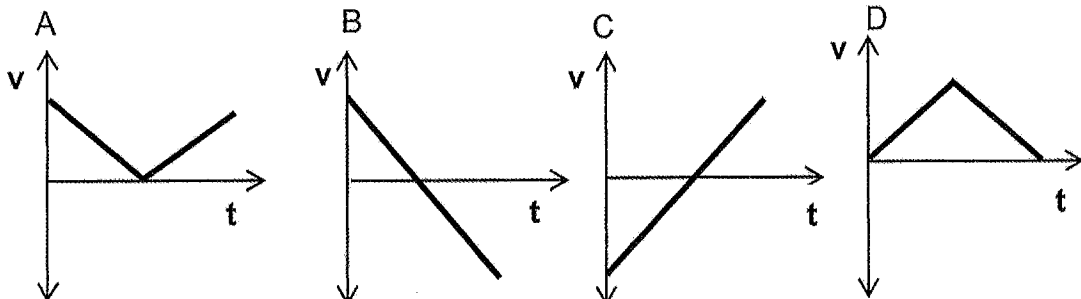
D s^{-1}

(2)

1.3 Consider the acceleration-time graph of an object in motion below.



Which ONE of the graphs below represents the velocity-time graph of the object?



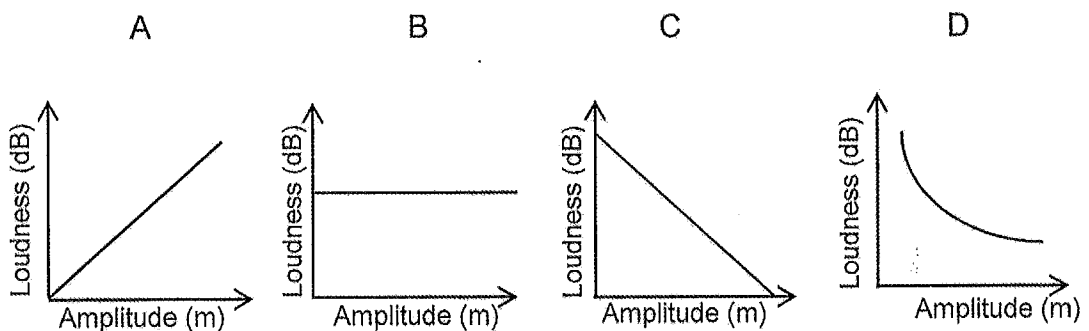
(2)



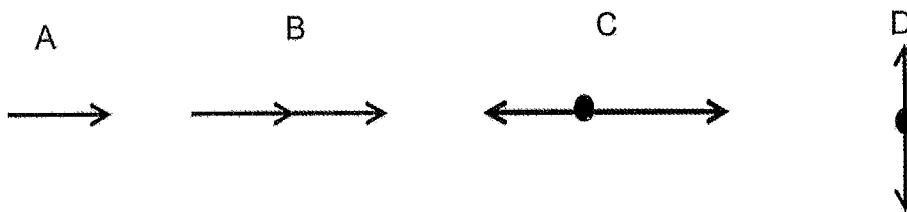
- 1.4 A wave in which the particles of the medium vibrate at right angles to the path along which the wave travels through the medium, is produced by ...
- A a bat.
B a car's hooter.
C an ambulance.
D an X-ray machine. (2)

- 1.5 The number of waves passing a point every second is defined as the ... of the wave.
- A speed
B amplitude
C wavelength
D frequency (2)

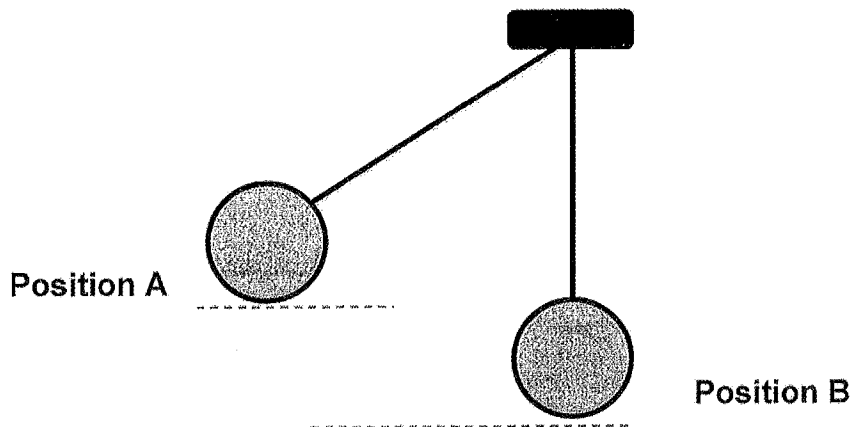
- 1.6 Which ONE of the graphs below best describes the relationship between loudness and the amplitude of a wave?



- 1.7 Which ONE of the vector diagrams below will result in the largest resultant vector?



- 1.8 A sphere is released from point A, as shown in the diagram below. It reaches point B, which is the lowest point of its swing. Ignore the effects of air friction.



Which ONE of the statements below regarding the energy of the system is CORRECT?

- A The kinetic energy at **A** is equal to the mechanical energy at **A**.
- B The gravitational potential energy at **A** is equal to the kinetic energy at **B**.
- C The sum of the kinetic energy and gravitational potential energy at **A** is equal to the sum of the kinetic energy and gravitational potential energy at **B**.
- D The kinetic energy at **A** is equal to the gravitational potential energy at **B**.

(2)

- 1.9 A rubber balloon obtains a negative charge after it has been rubbed against human hair.

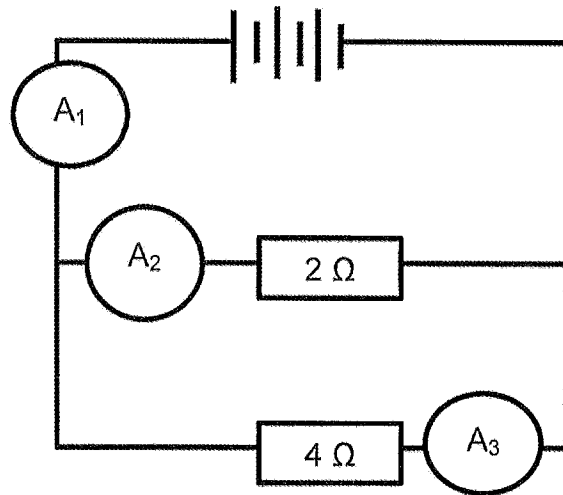
Which ONE of the statements below best explains why this happens?

- A Negative charges are transferred from the rubber balloon to the human hair.
- B Positive charges are transferred from the rubber balloon to the human hair.
- C Positive charges are transferred from the human hair to the rubber balloon.
- D Negative charges are transferred from the human hair to the rubber balloon.

(2)



1.10 Consider the circuit diagram below.



How will the readings on ammeters A_1 , A_2 and A_3 compare with each other?

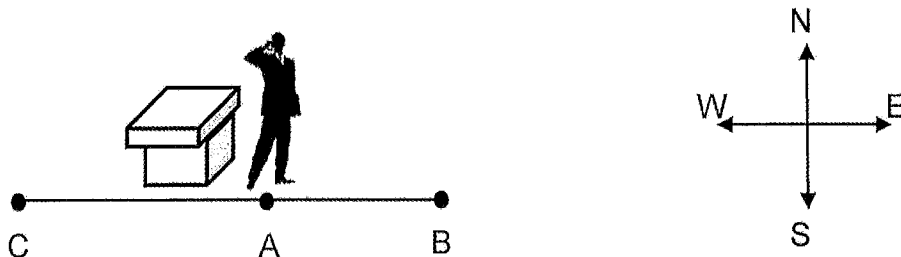
- A $A_1 = A_2 = A_3$
- B $A_1 = A_2 + A_3$
- C $(A_2 + A_3) > A_1$
- D $A_2 < A_3 < A_1$

(2)
[20]



QUESTION 2 (Start on a new page.)

An impatient businessman paces up and down while making a business call on his cellphone.

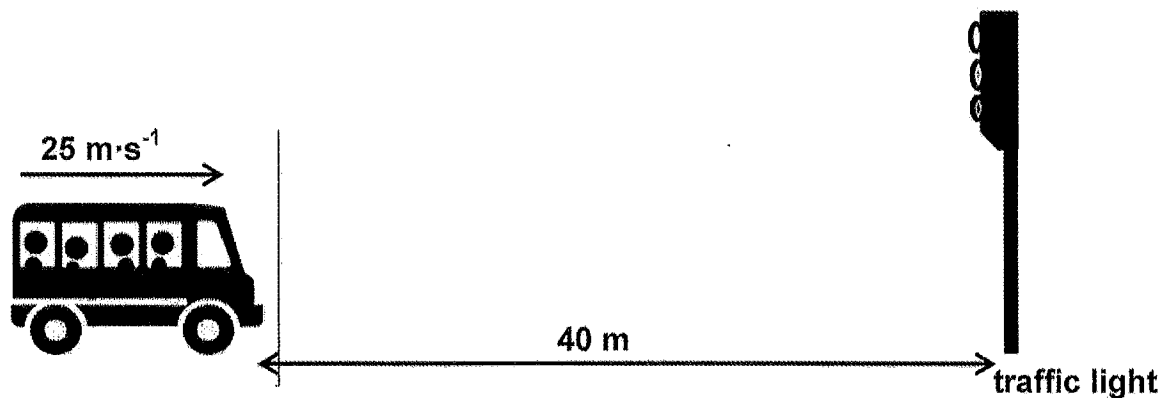


He starts at his desk and walks 5 m east (from A to B) and then walks 7 m west (from B to C). This process takes him 20 s.

- 2.1 Use a vector scale diagram and represent the two displacements of the man (from A to B AND from B to C). Label ALL the vectors clearly and write down the displacements next to the vectors.
Use a scale of 1 cm representing 1 m for your diagram. (2)
- 2.2 What is the businessman's *change in position* at C relative to A? (2)
- 2.3 Calculate the total distance the man covers. (2)
- 2.4 Explain why the value calculated in QUESTION 2.2 differs from the one calculated in QUESTION 2.3. (2)
- 2.5 Define the term *velocity*. (2)
- 2.6 Calculate the man's *average velocity*. (4)
- [14]**

QUESTION 3 (Start on a new page.)

A taxi is travelling at a speed of $25 \text{ m}\cdot\text{s}^{-1}$ when a traffic light, 40 m ahead, changes to red.



3.1 Define the term *acceleration*. (2)

The driver takes 1 s to react (reaction time) before he slams on the brakes. The taxi then stops within 2 s.

3.2 Is the velocity and acceleration of the *braking* taxi in the SAME DIRECTION as it moves towards the traffic light? (1)

3.3 Give a reason for the answer to QUESTION 3.2. (1)

3.4 Calculate the distance the taxi travels during the reaction time. (4)

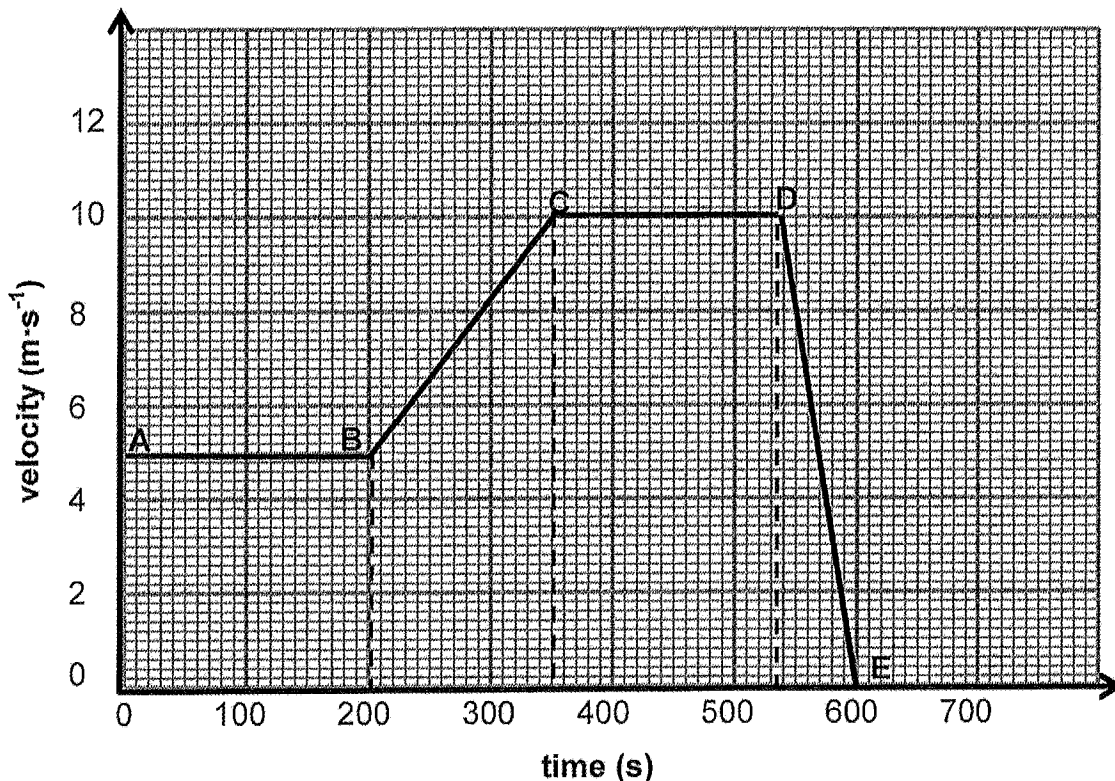
3.5 Will the taxi stop at the traffic light? Show ALL calculations. (5)

3.6 Draw a position versus time graph for the motion of the taxi. (4)

[17]

QUESTION 4 (Start on a new page.)

The velocity-time graph below represents the motion of a girl riding her bicycle in a northerly direction.

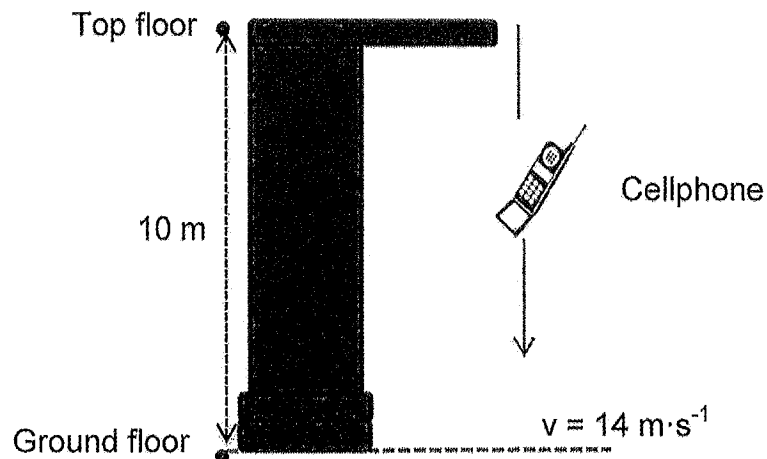


- 4.1 Write down the girl's initial velocity. (2)
- 4.2 Write down the magnitude of the girl's velocity at 300 s. (2)
- 4.3 Use the information on the graph to describe the motion of the girl:
- 4.3.1 From **B** to **C** (2)
- 4.3.2 From **C** to **D** (2)
- 4.4 WITHOUT USING EQUATIONS OF MOTION, calculate each of the following:
- 4.4.1 Distance covered by the girl from **A** to **C** (4)
- 4.4.2 Acceleration of the girl from **D** to **E** (4)
- 4.5 During which stages of the journey is the change in speed the greatest? (2)
- 4.6 Explain the answer to QUESTION 4.5. (2)

[20]

QUESTION 5 (Start on a new page.)

A woman is at the shopping mall 10 m above the ground. Her cellphone, with a mass of 0,01 kg, falls and hits the ground at a speed of $14 \text{ m}\cdot\text{s}^{-1}$. Ignore the effects of air resistance.



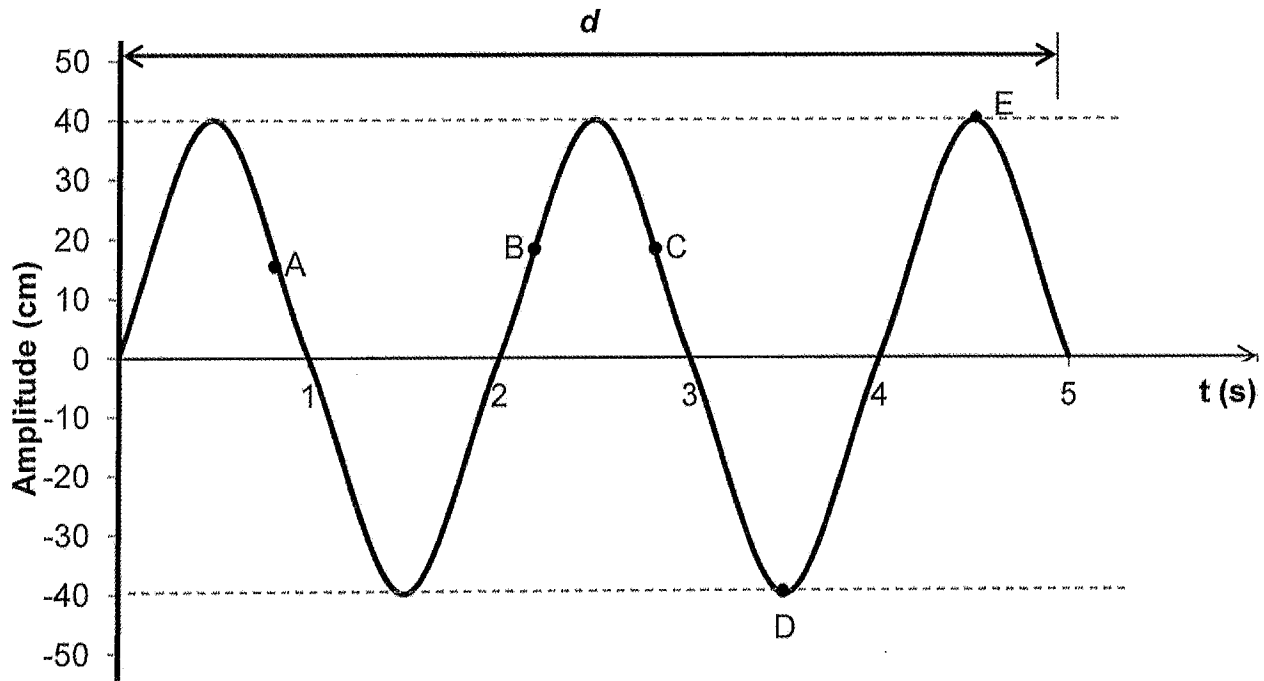
- 5.1 Convert $14 \text{ m}\cdot\text{s}^{-1}$ to $\text{km}\cdot\text{h}^{-1}$. (2)
- 5.2 Define the term *kinetic energy*. (2)
- 5.3 Calculate the gravitational potential energy of the cellphone at a height of 5 m above the ground. (3)
- 5.4 Calculate the velocity of the cellphone at a height of 5 m above the ground. (4)
- 5.5 Will the value of the cellphone's mechanical energy just before it hits the ground be GREATER THAN, LESS THAN or EQUAL TO the mechanical energy at a height of 5 m? Explain the answer. (3)

(3)
[14]



QUESTION 6 (Start on a new page.)

The diagram below is a graphical representation of a transverse wave moving from left to right across the page. The wave is moving at a speed of $0,4 \text{ m}\cdot\text{s}^{-1}$ and has a frequency of $0,5 \text{ Hz}$. A, B, C, D and E represent points on the wave.

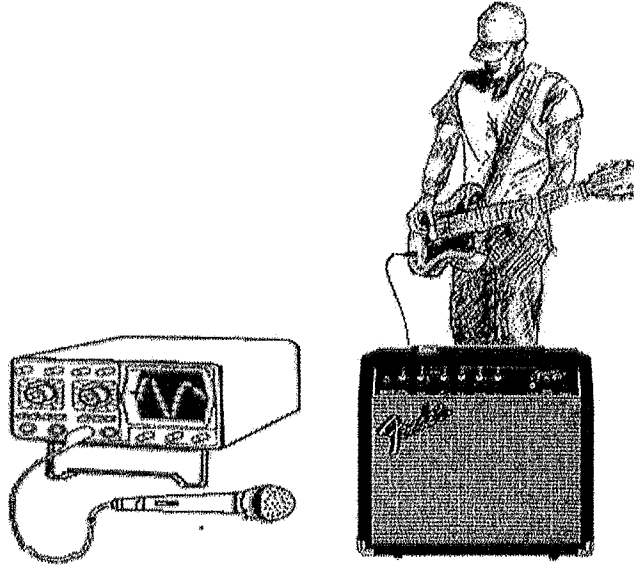


- 6.1 Write down the amplitude of the wave in metres. (2)
- 6.2 Label the points marked:
- 6.2.1 D (1)
- 6.2.2 E (1)
- 6.3 Write down TWO points on the graph above that are in phase. (1)
- 6.4 How many waves are represented in the diagram above? (2)
- 6.5 Calculate the wavelength of the wave. (3)
- 6.6 Determine distance d in the diagram. Show how you arrived at the answer. (2)
- [12]**



QUESTION 7 (Start on a new page.)

A band decides to do an experiment on sound during one of their practice sessions. The diagram below shows a musician playing specific notes on the electric guitar. The guitar is plugged into a speaker to amplify the sound.



[Source: goyalkunal91.deviantart.com]

A microphone is connected to an oscilloscope so that the frequency of the sound can be measured.

The table below represents the data of the notes played by the musician.

NOTE PLAYED BY THE MUSICIAN	WAVELENGTH OF THE NOTE (m)	FREQUENCY OF THE NOTE (Hz)
W	3	110
X	6	55
Y	9	37
Z	12	27

- 7.1 Write down the independent variable. (1)
- 7.2 Write down the dependent variable. (1)
- 7.3 Draw a graph of the data by plotting the frequency (y -axis) versus the wavelength (x -axis) of each note played by the musician. Use the graph paper provided on the attached ANSWER sheet. (4)
- 7.4 Use the graph in QUESTION 7.3 to determine the mathematical relationship between the frequency and wavelength of the notes. (1)
- 7.5 Use the information for note X to calculate the speed of the sound. (3)

[10]



QUESTION 8 (Start on a new page.)

Different types of electromagnetic radiation have different frequencies. This can influence their properties and what each could be used for in our daily lives.

- 8.1 Choose the frequency from COLUMN B that matches the type of electromagnetic radiation in COLUMN A. Write only the letter (A–C) next to the question number (8.1.1–8.1.3) in the ANSWER BOOK, for example 8.1.4 D.

COLUMN A TYPE OF RADIATION		COLUMN B FREQUENCY IN Hz	
8.1.1	Ultraviolet	A	10^{23}
8.1.2	Gamma	B	10^7
8.1.3	Radio	C	10^{16}

(3 x 1) (3)

- 8.2 Write down ONE use of each of the following types of radiation:

8.2.1 Infrared (1)

8.2.2 Microwaves (1)

- 8.3 When doctors need to establish the seriousness of a fracture, a picture is taken of the broken bone. The picture below shows a fracture.



[Source: learningradiography.com]

Write down the following:

8.3.1 Name of the type of radiation used for this procedure (1)

8.3.2 Property of this type of radiation which enables it to perform this procedure (1)

8.3.3 Danger of overexposure to this type of radiation (1)

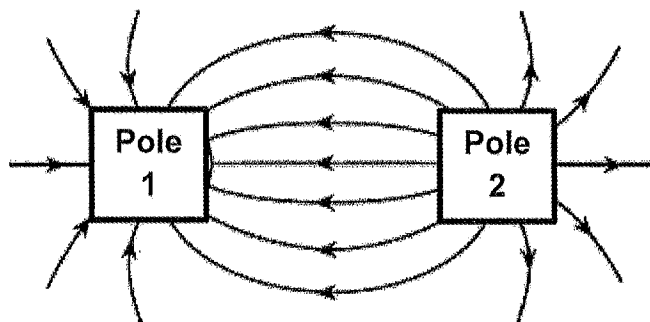
- 8.4 A radio programme is transmitted in the FM band on a wavelength of 3 m.

Calculate the energy of a photon of the radio wave. (4)
[12]



QUESTION 9 (Start on a new page.)

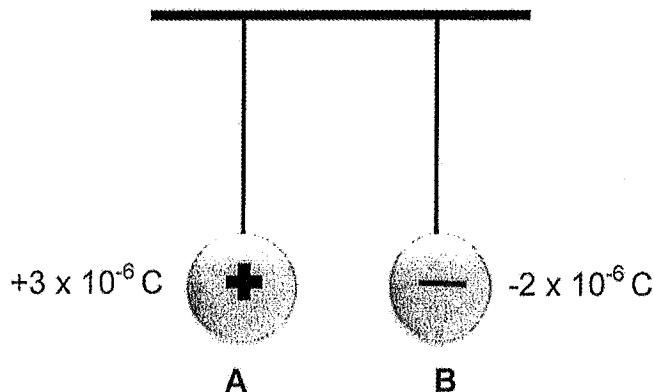
The magnetic field lines between two magnetic poles of a magnet are shown in the diagram below.



- 9.1 The magnetic force is a non-contact force. (2)
- 9.1.1 Define the term *non-contact force*. (1)
- 9.1.2 Give another example of a non-contact force. (1)
- 9.2 What is the nature of the force between the two poles? (1)
- 9.3 What is the polarity of pole 2? Give a reason for the answer. (2)
- [6]**

QUESTION 10 (Start on a new page.)

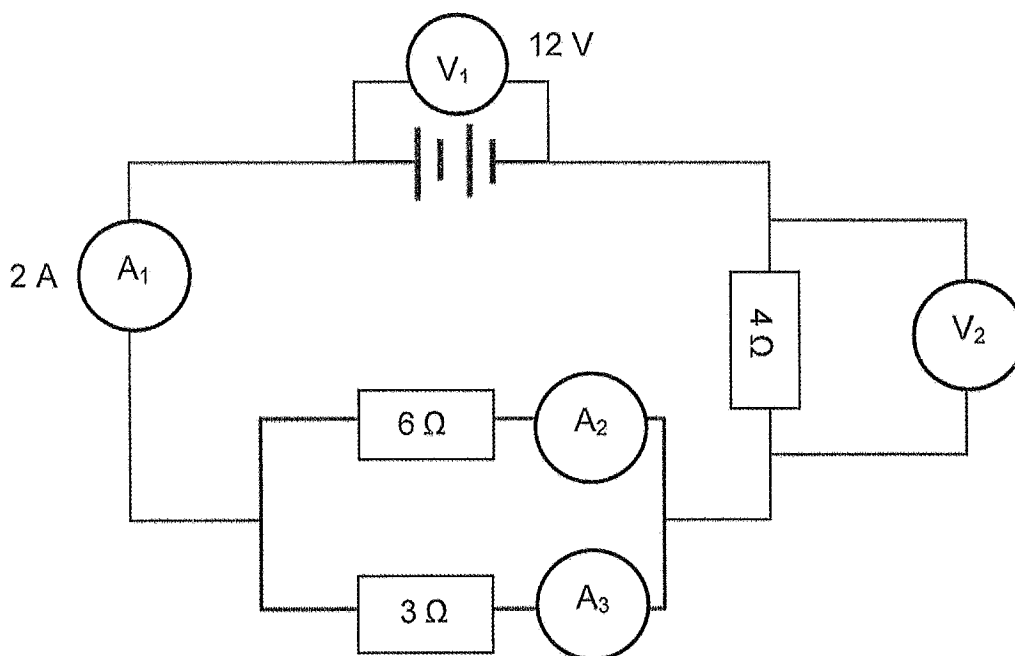
Two small identical spheres, **A** and **B**, are suspended on long silk threads, as shown in the sketch below. The spheres carry charges of $+3 \times 10^{-6} \text{ C}$ and $-2 \times 10^{-6} \text{ C}$ respectively.



- 10.1 Which sphere has an excess of electrons? (1)
- 10.2 The two spheres are allowed to touch. Will the electrons be transferred from **A to B** or **B to A**? (1)
- 10.3 The spheres are now separated.
Calculate the new charge on sphere **B**. (3)
- 10.4 Calculate the number of electrons transferred during contact. (3)
- [8]**

QUESTION 11 (Start on a new page.)

In the circuit diagram below the reading on voltmeter V_1 is 12 V and the reading on ammeter A_1 is 2 A.



11.1 Calculate the:

11.1.1 Total resistance of the circuit (4)

11.1.2 Reading on V_2 (3)

11.1.3 Reading on A_2 (3)

11.1.4 Amount of charge that flows through ammeter A_1 in 120 s (3)

11.2 How will the reading on ammeter A_1 be affected if the 6 Ω resistor is removed from the circuit?

Write down only INCREASE, DECREASE or REMAIN THE SAME. (1)

11.3 Explain the answer to QUESTION 11.2 WITHOUT any calculations. (3)
[17]

TOTAL: 150



**DATA FOR PHYSICAL SCIENCES GRADE 10
PAPER 1 (PHYSICS)**

**GEGEWENS VIR FISIESTE WETENSAPPE GRAAD 10
VRAESTEL 1 (FISIKA)**

TABLE 1: PHYSICAL CONSTANTS/TABEL 1: FISIESTE KONSTANTES

NAME/NAAM	SYMBOL/SIMBOOL	VALUE/WAARDE
Acceleration due to gravity <i>Swaartekragversnelling</i>	g	9,8 m·s ⁻²
Speed of light in a vacuum <i>Spoed van lig in 'n vakuum</i>	c	3,0 x 10 ⁸ m·s ⁻¹
Planck's constant <i>Planck se konstante</i>	h	6,63 x 10 ⁻³⁴ J·s
Charge on electron <i>Lading op elektron</i>	e	-1,6 x 10 ⁻¹⁹ C
Electron mass <i>Elektronmassa</i>	m _e	9,11 x 10 ⁻³¹ kg

TABLE 2: FORMULAE/TABEL 2: FORMULES

MOTION/BEWEGING

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

WORK, ENERGY AND POWER/ARBEID, ENERGIE EN DRYWING

U = mgh or/of E _p = mgh	K = $\frac{1}{2}mv^2$ or/of E _k = $\frac{1}{2}mv^2$
E _M = E _k + E _p . OR E _M = K + U	

WAVES, SOUND AND LIGHT/GOLWE, KLANK EN LIG

v = fλ	T = $\frac{1}{f}$
E = hf or/of E = h $\frac{c}{\lambda}$	



ELECTROSTATICS/ELEKTROSTATIKA

$n = \frac{Q}{e}$	$Q = \frac{Q_1 + Q_2}{2}$
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ELECTRIC CIRCUITS/ELEKTRIESE STROOMBANE

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

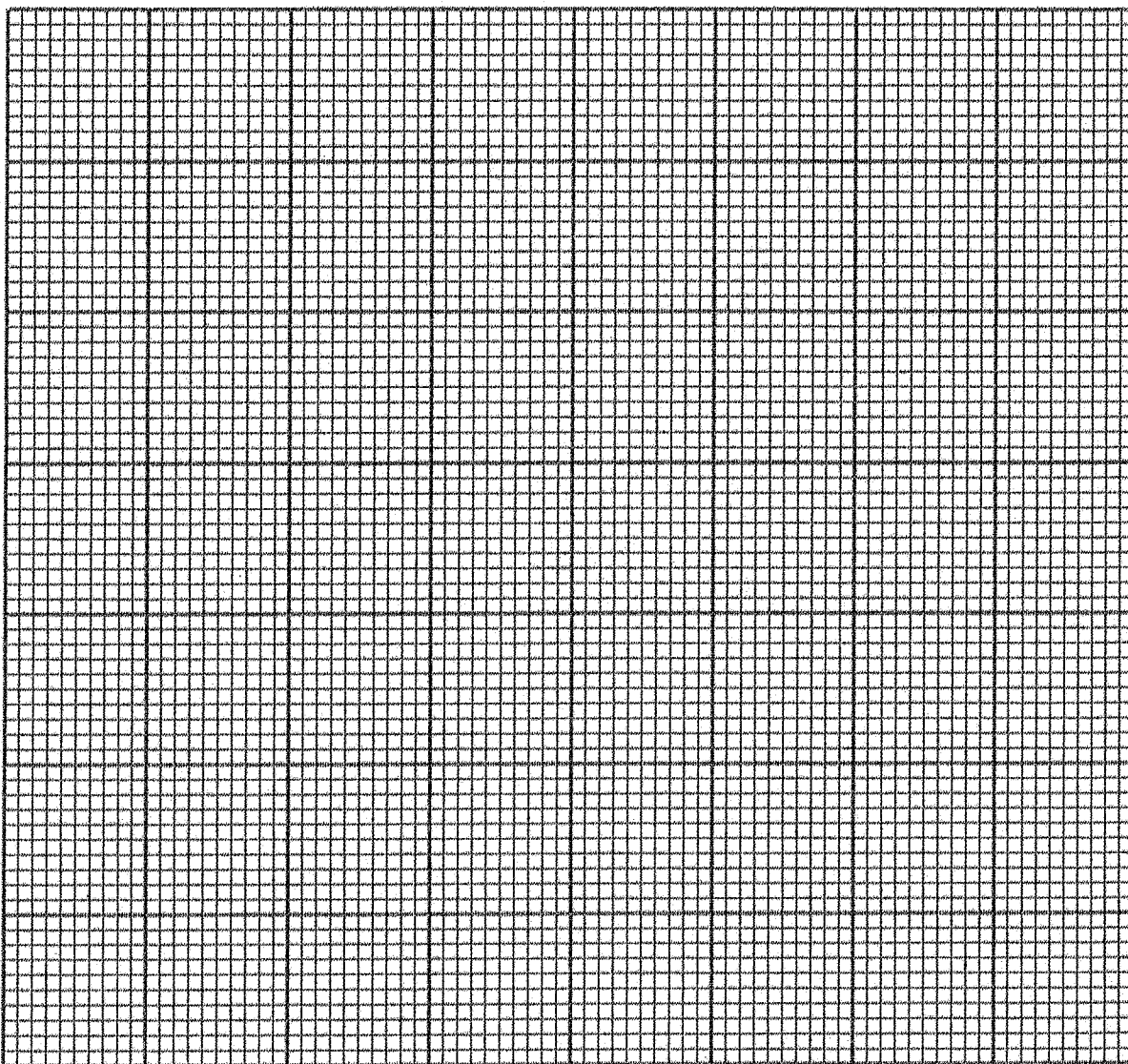


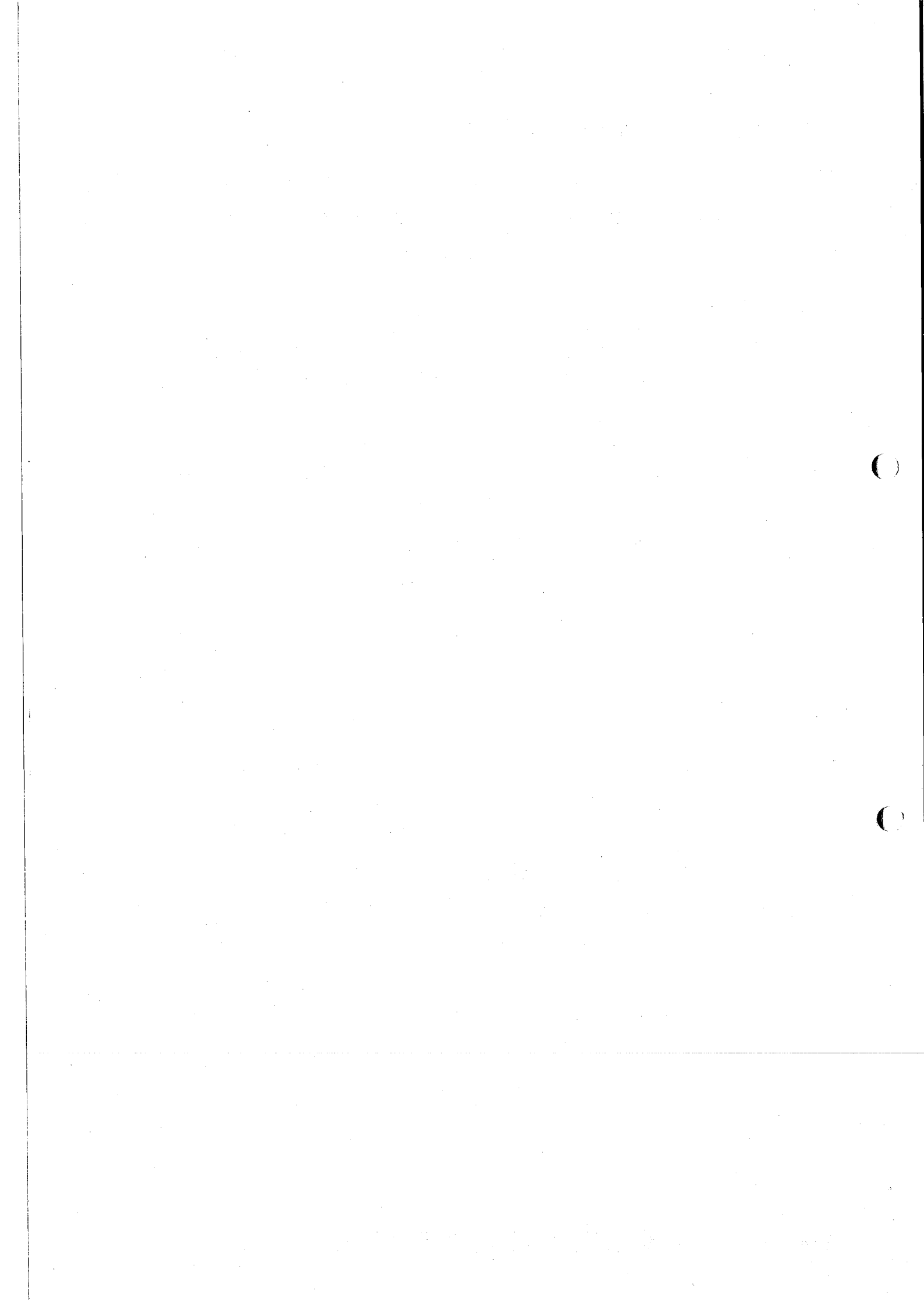
ANSWER SHEET FOR QUESTION 7.3

NAME: _____

CLASS: _____

Hand in this ANSWER SHEET together with the ANSWER BOOK.



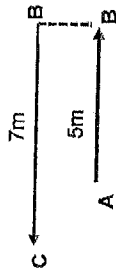


QUESTION 1/VRAAG 1

- 1.1 B ✓✓ (2)
 - 1.2 C ✓✓ (2)
 - 1.3 D ✓✓ (2)
 - 1.4 D ✓✓ (2)
 - 1.5 D ✓✓ (2)
 - 1.6 A ✓✓ (2)
 - 1.7 B ✓✓ (2)
 - 1.8 C ✓✓ (2)
 - 1.9 D ✓✓ (2)
 - 1.10 B ✓✓ (2)
- [20]

QUESTION 2/VRAAG 2

2.1



Mark allocation/Puntoekening:
 ✓ 1 x line AB: length, arrow, label
 1 x lyn AB: lengte, rigting, benoem
 ✓ 1 x line BC: length, arrow, label
 1 x lyn BC: lengte, rigting, benoem

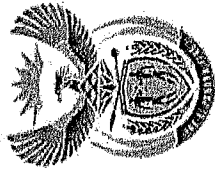
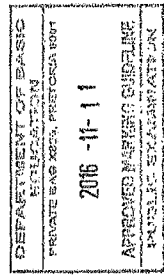
- 2.2 2 m ✓ west/to the left ✓ (2)
- 2 m ✓ wes/na links ✓ (2)

OR

If the learner has done 2.2 on the vector diagram above, allocate 1 mark for the resultant from A to C ✓ and 1 mark for the label of the magnitude of 2m. ✓

As leerder 2.2 op die bostaande vektordiagram aangedui het, ken 1 punt vir die resultant van A tot C toe, en 1 punt vir die benoeming van 2m

- 2.3 Total distance/Totale afstand = 5 + 7 ✓ (2)
- = 12 m ✓



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GRADE/GRAAD 10

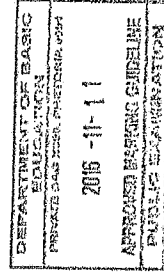
**PHYSICAL SCIENCES: PHYSICS (P1)
 FISIESE WETenskAPPE: FISIKA (V1)**

NOVEMBER 2016

MEMORANDUM

MARKS/PUNTE: 150

This memorandum consists of 14 pages.
 Hierdie memorandum bestaan uit 14 bladsye.



Signature 12/11

2.4 For the total distance, the whole path length travelled is considered. ✓
 For change in position, only the original position and final position ✓ of the man are considered.
 Vir die totale afstand word die totale padlengte afgeleë in berekening gebring, maar slegs die begin- en eindposisie word in berekening gebring vir verandering in posisie. (2)

2.5 Velocity is the rate of change of displacement. ✓✓
 Snelheid is die tempo waarteen verplasing (verandering in posisie) verander. (2)

ACCEPT:
 Change in displacement over change in time
 AANVAAR:
 Verandering in verplasing gedeel deur verandering in tyd

2.6 POSITIVE MARKING FROM 2.2
 POSITIEWE NASIEN VANAF 2.2

$$v = \frac{\Delta x}{\Delta t}$$

$$= \frac{2}{20}$$

= 0,1 m·s⁻¹ west to the left ✓
 wes na links

(4)
 [14]

QUESTION 3/VRAAG 3

3.1 Acceleration is the rate of change of velocity. ✓✓
 Versnelling is die tempo van snelheidsverandering.

OR/OF

Acceleration is the change in velocity per unit time ✓✓.
 Versnelling is die verandering in snelheid per tydsseenheid.

No ✓
 Nee

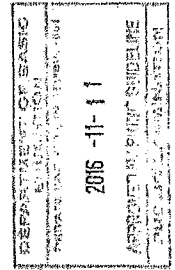
3.2 NEGATIVE MARKING FROM 3.2
 NEGATIEWE MERK VANAF 3.2

Velocity to the right, acceleration to the left ✓
 Snelheid na regs, versnelling na links.

OR/OF

Taxi slowing down so acceleration is in opposite direction ✓ to movement.
 Die taxi beweeg stadiger, dus is versnelling in die teenoorgestelde rigting van beweging.

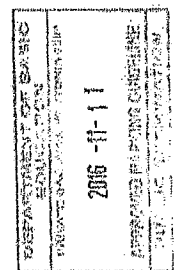
Please turn over/Blaai om asseblief



3.4

OPTION 1/OPSIE 1	OPTION 2/OPSIE 2
$v = \frac{D}{\Delta t}$ or $D = v \times \Delta t$ ✓ $25\sqrt{=} = \frac{D}{1}$ $D = 25 \text{ m } \checkmark$	$\Delta x = \frac{(v_i + v_f)}{2} \Delta t$ ✓ $= \frac{25 + 25}{2} \times 1$ ✓ $= 25 \text{ m } \checkmark$
OPTION 3/OPSIE 3 $\Delta x = v_i t + \frac{1}{2} a \Delta t^2$ ✓ $= 25 \times 1\sqrt{=} + \frac{1}{2} \times 0 \times 1^2 \checkmark$ $= 25 \text{ m } \checkmark$	

(4)



Please turn over/Blaai om asseblief

OPTION 1 OPSIE 4

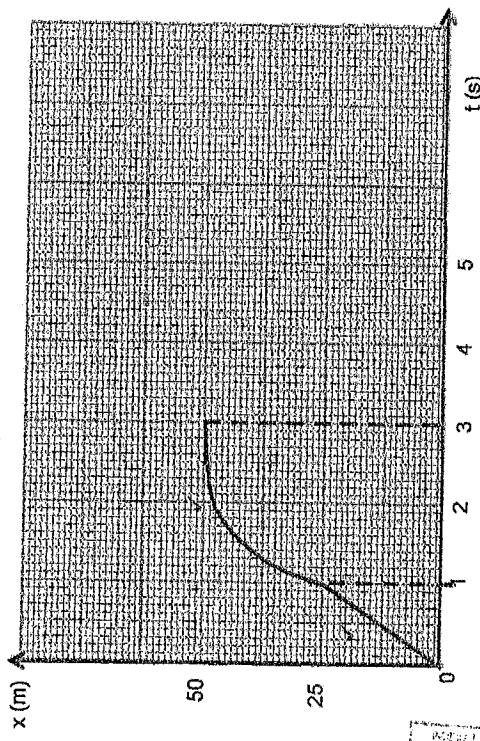
$$\Delta y = \frac{(v_f + v_i)}{2} \Delta t \checkmark$$

$$15 = \frac{25 + 0}{2} \checkmark \times \Delta t \checkmark$$

$$\Delta t = 1,2 \text{ s} \checkmark$$

Actual time to reach traffic light is 1,2s which is shorter than the 2s. Therefore the taxi will not stop in time. \checkmark
Eintlike tyd of verkeerslig te bereik is 1,2s wat korter is as 2s. Dus sal die taxi nie befyds stop nie.

3.6



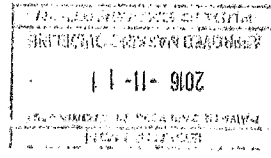
MARKING GUIDELINES/WASIEENRIGLYWE

- \checkmark Both axes correctly labelled with unit
- Beide asse korrek benoem met eenheid
- \checkmark Straight line (t = 0 s and t = 1 s)
- Reguitlyn (t = 0 s en t = 1 s)
- \checkmark Curve shape (t = 1 s and t = 3)
- Kunne (t = 1 s en t = 3)
- \checkmark values for displacement and time indicated
- Waardes vir verplasing en tyd aangedui

By me
(4)
[17]

**3.5 POSITIVE MARKING FROM 3.4
POSITIEWE NASIEN VANAF 3.4**

OPTION 1 OPSIE 1	OPTION 2 OPSIE 2
$\Delta x = \left(\frac{v_f + v_i}{2} \right) \Delta t \checkmark$ $= \frac{(0+25)}{2} \times 2 \checkmark$ $= 25 \text{ m}$ <p>\therefore total distance/total afstand = 25 + 25 \checkmark = 50 m \checkmark</p> <p>\therefore taxi will not stop at the traffic light as distance > 40 m \checkmark \therefore die taxi sal nie by verkeerslig stop nie, want die afstand is > 40 m \checkmark</p> <p>OR / OF</p> $\Delta x = \left(\frac{v_f + v_i}{2} \right) \Delta t \checkmark$ $= \frac{(0+25)}{2} \times 2 \checkmark$ $= 25 \text{ m} \checkmark$ <p>\therefore distance available for braking time is 40 – 25 = 15 m, therefore the taxi is short of 10 m to stop. \checkmark \therefore the taxi will not stop in time. \checkmark \therefore die beskikbare afstand vir brektyd is 40 – 25 = 15m, dus sal die taxi 10 m te min hê om te stop. \checkmark \therefore dus sal die taxi nie befyds stop nie \checkmark</p>	$v_f = v_i + a\Delta t \checkmark$ $a = \frac{v_f - v_i}{\Delta t}$ $a = \frac{(0 - 25)}{2} \checkmark$ $= -12,5 \text{ m} \cdot \text{s}^{-2}$ $v_f^2 = v_i^2 + 2a\Delta x$ $0 = 25^2 + 2 \times -12,5 \times \Delta x \checkmark$ $\therefore \Delta x = 25 \text{ m}$ <p>\therefore total distance/total afstand = 25 + 25 = 50 m \checkmark</p> <p>\therefore taxi will not stop at the traffic light as distance > 40 m \checkmark \therefore die taxi sal nie by verkeerslig stop nie, want die afstand is > 40 m \checkmark</p>
<p>OPTION 3 OPSIE 3</p> $a = \frac{v_f - v_i}{\Delta t}$ $= \frac{(0 - 25)}{2} \checkmark$ $= -12,5 \text{ m} \cdot \text{s}^{-2}$ $\Delta x = v_i t + \frac{1}{2} a t^2$ $= 25 \times 2 + \frac{1}{2} \times -12,5 \times 2^2 \checkmark$ $= 25 \text{ m}$ <p>\therefore total distance/total afstand = 25 + 25 = 50 m \checkmark</p> <p>\therefore taxi will not stop at the traffic light, as distance > 40 m \checkmark \therefore die taxi sal nie befyds stop nie, want die afstand is > 40 m \checkmark</p>	<p>Only one mark for either equation Slegs een punt vir enige een van die vergelykings.</p> <p>Only one mark for either equation Slegs een punt vir enige een van die vergelykings.</p>



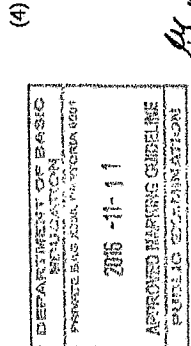
By me

QUESTION 4/VRAG 4

- 4.1 $5 \text{ m}\cdot\text{s}^{-1}$ ✓ north ✓ (accept range from 4,9 to 5,1)
 $5 \text{ m}\cdot\text{s}^{-1}$ noord ✓ (aanvaar vanaf 4,9 tot 5,1) (2)
- 4.2 $8,3 \text{ m}\cdot\text{s}^{-1}$ ✓ ✓ (accept range from 8,2 to 8,4)
 $8,3 \text{ m}\cdot\text{s}^{-1}$ (aanvaar vanaf 8,2 tot 8,4) (2)
- 4.3.1
- The velocity is uniformly increasing.
 - Velocity increases from $5 \text{ m}\cdot\text{s}^{-1}$ to $10 \text{ m}\cdot\text{s}^{-1}$ in 150 s.
 - Positive acceleration.
 - The girl is speeding up.
 - The girl is uniformly accelerating
- Any ONE of the options ✓
Enige EEN korrekte opsie
- Snelheid neem uniform toe.
 - Snelheid neem van $5 \text{ m}\cdot\text{s}^{-1}$ tot $10 \text{ m}\cdot\text{s}^{-1}$ in 150 s toe.
 - Positiewe versnelling.
 - Die meisie se speed neem toe.
 - Die meisie se versnelling is uniform.
- 4.3.2
- Uniform/constant velocity
 - Zero acceleration
 - Same speed / velocity
 - Uniforme/konstante snelheid
 - Nil versnelling
 - Dieselfde speed/ snelheid
- Any ONE of the options ✓
Enige EEN korrekte opsie

- 4.4.1
- | | |
|--|--|
| OPTION 1/OPSIE 1 | OPTION 2/OPSIE 2 |
| Distance A to C
Afstand A tot C
$= t \times b + \frac{1}{2} \times b \times h \checkmark$
$= 5 \times 350 \checkmark + \frac{1}{2} \times 150 \times 5 \checkmark$
$= 2\ 125 \text{ m} \checkmark$ | Distance A to C
Afstand A tot C
$= t \times b + \frac{1}{2} \times b \times h \checkmark$
$= 200 \times 5 + \frac{1}{2} \times 150 \times 5 \checkmark + \frac{1}{2} \times 150 \times 5 \checkmark$
$= 2\ 125 \text{ m} \checkmark$ |

- 4.4.2
- | |
|---|
| OPTION 3/OPSIE 3 |
| Distance A to C
Afstand A tot C
$= t \times b + \frac{1}{2} \times (\text{sum of parallel sides}) \times h \checkmark$
$= t \times b + \frac{1}{2} \times (\text{som van parallelle sye}) \times h \checkmark$
$= 5 \times 200 \checkmark + \frac{1}{2} \times (150 + 10) \times (150) \checkmark$
$= 2\ 125 \text{ m} \checkmark$ |
- Gradient of this graph is the acceleration
- $$\text{gradient} = \frac{y_2 - y_1}{x_2 - x_1} \checkmark \text{ or } \frac{v_f - v_i}{t_f - t_i}$$
- $$= \frac{(65 - 0)}{(0 - 10)} \checkmark$$
- $$= -(65 - 0) \checkmark$$
- $$= -0,15 \text{ m}\cdot\text{s}^{-2}$$
- ∴ $a = 0,15 \text{ m}\cdot\text{s}^{-2}$ South ✓ / Suid



AS NE
(4)
Please turn over/Blaai om asseblief

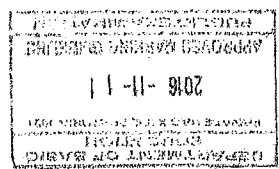
- 4.5 D to E. ✓ ✓
D tot E (2)
- 4.6 The change in speed from D to E is $(-10 \text{ m}\cdot\text{s}^{-1}) \checkmark$ and that occurs over (65 s) a shorter period. ✓
OR
From B to C, the change in speed is $5 \text{ m}\cdot\text{s}^{-1}$ over a period of 150 s. ✓ ✓
OR
Gradient is the steepest
- Die verandering is speed van D tot E is $(-10 \text{ m}\cdot\text{s}^{-1}) \checkmark$ en die beweging gebeur oor 'n korter tydperk. (65 s) ✓
OR
Vanaf B tot C is die verandering in speed $5 \text{ m}\cdot\text{s}^{-1}$ oor 'n tydperk van 150 s.
OR
Gradient is die steilste

QUESTION 5/VRAG 5

- 5.1 $14 \times \frac{3600}{1000} \checkmark$
 $= 50,4 \text{ km}\cdot\text{h}^{-1} \checkmark$ (2)
- OR/OF
- 5.2 The energy an object possesses as a result of its motion. ✓ ✓
Die energie van 'n voorwerp as gevolg van die beweging daarvan. (2)
- 5.3 $E_p = mgh \checkmark$
 $= 0,01 \times 9,8 \times 5 \checkmark$
 $= 0,49 \text{ J} \checkmark$ (3)

OPTION/OPSIE 1	$(E_p + E_k)_{\text{top/bo}} = (E_p + E_k)_{\text{bottom/onder}}$ $mgh + \frac{1}{2}mv^2 = mgh + \frac{1}{2}mv^2 \checkmark$ $(0,01)(9,8)(10) + 0 \checkmark = (0,01)(9,8)(5) + \frac{1}{2} \times 0,01 \times v^2 \checkmark$ $v = 9,89 \text{ m}\cdot\text{s}^{-1} \checkmark$
OPTION/OPSIE 2	$(E_p + E_k)_{\text{top/bo}} = (E_p + E_k)_{\text{bottom/onder}}$ $mgh + \frac{1}{2}mv^2 = mgh + \frac{1}{2}mv^2 \checkmark$ $(0,01)(9,8)(10) + 0 \checkmark = 0,49 + \frac{1}{2} \times 0,01 \times v^2 \checkmark$ $v = 9,89 \text{ m}\cdot\text{s}^{-1} \checkmark$

ACCEPT/ AANVAAR:
 $(E_p + E_k) = (E_p + E_k)$



AS NE
(4)
Please turn over/Blaai om asseblief

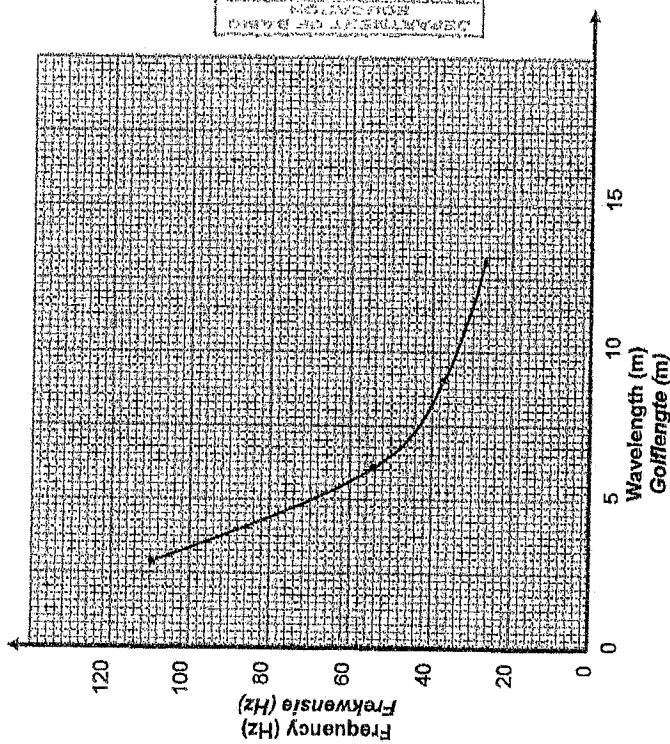
7.1 The wavelength of notes (played). ✓
 Die golflengte van note (gespeel)

(1)

7.2 The frequency. ✓
 Die frekwenste

(1)

7.3



2016 -11- 11
 APPROVED MARKING GUIDELINE

MARK ALLOCATION:
 ✓ correct y-axis label and unit
 ✓ correct x-axis label and unit
 ✓ all points plotted correctly
 ✓ And best fit line drawn
 ✓ shape of graph
 ✓ correct scales on axes

PUNTETOEKENNING:
 ✓ korrekte benoeming en eenheid op y-as
 ✓ korrekte benoeming en eenheid op x-as
 ✓ alle punte korrek gestip en beste lyn geteken
 ✓ vorm van grafiek
 ✓ korrekte skaal vir asse

7.4 Frequency and wavelength are inversely proportional ✓ to each other.
 Frekwensie en golflengte is omgekeerd eweredig aan mekaar.

OR $f \propto \frac{1}{\lambda}$

By Me (1)

5.5 Equal to ✓. Mechanical energy is conserved ✓, it is a closed system. ✓
 Gelyk aan. Meganiese energie word behou, dit is 'n geslote stelsel.

(3)
 [14]

QUESTION 6/VRAAG 6

6.1 0,4 m ✓✓ (2)

6.2.1 Trough ✓
 Trog/buik (1)

6.2.2 Crest ✓
 Kruin (1)

6.3 A and C ✓
 A en C (1)

6.4 $2\frac{1}{2}$ ✓✓ (2)

6.5 $v = f \times \lambda$ ✓
 $\frac{0,4}{2,5} = 0,5 \times \lambda$ ✓
 $\therefore \lambda = 0,8 \text{ m}$ ✓ (3)

6.6 $2\frac{1}{2} \times 0,8$ ✓
 $= 2 \text{ m}$ ✓ (3)

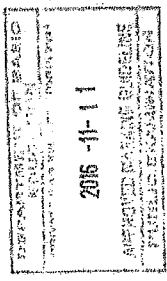
OR/OF

$v = \frac{d}{t}$
 $0,4 = \frac{d}{5}$
 $= 2 \text{ m}$ ✓

(2)
 [12]

2016 -11- 11

By Me



7.5 $v = f \times \lambda$ ✓
 $= 55 \times 6$ ✓
 $= 330 \text{ m} \cdot \text{s}^{-1}$ ✓

(3)
[10]

QUESTION 8/VRAG 8

- 8.1.1 C ✓
 8.1.2 A ✓
 8.1.3 B ✓

- 8.2.1
- Keeping food warm ✓
 - Remote controls ✓
 - Optical fibres ✓
 - Animals like snakes which hunt ✓
 - Infrared scanners (for picking up heat)

Any ONE ✓/Enige een

(1)

- 8.2.2
- Telephone OR satellite OR cellphone connections ✓
 - RADAR systems ✓
 - RADAR speed traps ✓
 - Microwave ovens ✓

Any ONE ✓/Enige een

(1)

- Telefoon- OF satelliet- OF selfoonkonneksies
- RADARstelsels
- RADARspoedkwalsteisels
- Mikrogoeltoonde

(1)

- 8.3.1 X-ray ✓
 X-strale

- 8.3.2 X-ray has a high frequency OR (high) penetration into soft tissues of humans, ✓
 but not bones.
 X-strale het 'n hoë frekwensie OF segte weefsel van mense (hoogindringing, maar nie been rite.

(1)

- 8.3.3 X-rays can:
- damage living tissue
 - cause cancer
- X-strale kan:
- weefsel beskadig
 - kanker veroorsaak

Any ONE ✓/Enige een

ly
ne
(1)

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8.4

OPTION/OPSIE 1	OPTION/OPSIE 2
$E = hf$ ✓ $= 6,63 \times 10^{-34} \times \frac{3 \times 10^8}{3}$ ✓ $= 6,63 \times 10^{-26} \text{ J}$ ✓	$f = \frac{c}{\lambda}$ $= \frac{3 \times 10^8}{3}$ ✓ $= 1 \times 10^8 \text{ Hz}$ E = hf ✓ (one mark for both equations/ een punt vir albei vergelykings) $= 6,63 \times 10^{-34} \times 1 \times 10^8$ ✓ $= 6,63 \times 10^{-26} \text{ J}$ ✓

(4)
[12]

QUESTION 9/VRAG 9

- 9.1.1 A force exerted on an object without touching the object. ✓✓
 OR
 A force exerted on an object that is at a distance. ✓✓

'n Krag wat op 'n voorwerp uitgeoefen word sonder om aan die voorwerp te raak.

(2)

OF
 'n Krag wat oor 'n afstand op 'n voorwerp uitgeoefen word.

- 9.1.2
- Gravity/Weight/Gravitational force ✓
 - Electrostatic/Coulombic force
 - Gravitasiekrag/Gewig/Gravitasie
 - Elektrostatiese/Coulomb-kragte

Any ONE ✓/Enige een

(1)

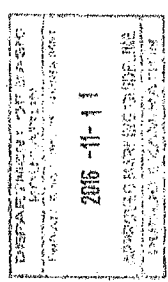
- 9.2 Attractive ✓
 Aantrekkend

(1)

- 9.3 North / N ✓
 The direction of magnetic field lines is from north to south ✓

- Noord/ N
 • Die rigting van magneetvelde lyne is van noord na suid

(2)
[6]



ly
ne

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11.1.3

<p>$R \propto \frac{1}{I}$ or in words: resistance is inversely proportional to current and \therefore ratio of resistors is 6 : 3 2 : 1</p> <p>\therefore ratio of current is 1 : 2 ✓ $A_2 : A_3$</p> <p>$\therefore I_{A2} = \frac{2}{3} \times 1$ $\therefore I_{A2} = 0,67 \text{ A}$ ✓</p> <p>$R \propto \frac{1}{I}$ in words: weerstand is omgekeer eweredig aan stroom \therefore verhouding van resistors is 6 : 3 2 : 1</p> <p>\therefore verhouding van stroom is 1 : 2 ✓ $A_2 : A_3$</p> <p>$\therefore I_{A2} = \frac{2}{3} \times 1$ $\therefore I_{A2} = 0,67 \text{ A}$ ✓</p>	<p>ACCEPTIAANVAAR:</p> <p>$I = \frac{V}{R}$ $= \frac{12-8}{6}$ $= 0,67 \text{ A}$ ✓</p>
---	---

(3)

11.1.4

$A_1 = 2 \text{ A}$
 $\therefore Q = I \Delta t$
 $= 2 \times 120$
 $= 240 \text{ C}$ ✓

11.2 Decrease ✓
Afneem

11.3 **NEGATIVE MARKING FROM 11.2**
NEGATIEWE MERK VANAF 11.2

- If the 6 Ω resistor is removed, the resistance of the whole circuit increases ✓
- Since $R \propto \frac{1}{I}$ ✓, if R increases, and V is constant ✓ and I of the circuit decreases
- Indien die 6 Ω-resistor verwyder word, sal die totale weerstand van die stroombaan verhoog.
- $R \propto \frac{1}{I}$ ✓, so indien R verhoog en V bly konstant ✓, sal die stroom (I) verlaag.

(3)

TOTAL/TOTAAL: 150

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ly me

QUESTION 10/VRAAG 10

10.1 B ✓ (1)

10.2 B to A ✓
B to A (1)

10.3 $Q_{\text{new/nuut}} = \frac{Q_1 + Q_2}{2}$
 $= \frac{(+3 \times 10^{-6} + (-2 \times 10^{-6}))}{2}$
 $= 5 \times 10^{-7} \text{ C}$ ✓ (3)

10.4

<p>OPTION 1/OPSIE 1</p> <p>$n = \frac{Q}{e}$ $= \frac{5 \times 10^{-7} (-2 \times 10^{-6})}{1,6 \times 10^{-19}}$ $= 1,56 \times 10^{13}$ elektrone ✓ elektrone</p>	<p>OPTION 2/OPSIE 2</p> <p>$n = \frac{Q}{e}$ $= \frac{5 \times 10^{-7} - (+3 \times 10^{-6})}{1,6 \times 10^{-19}}$ $= 1,56 \times 10^{13}$ elektrone ✓ elektrone</p>
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(3) [8]

QUESTION 11/VRAAG 11

11.1.1

<p>OPTION 1/OPSIE 1</p> <p>$\frac{1}{R_{\text{eff}}} = \frac{1}{R_1} + \frac{1}{R_2}$ $= \frac{1}{6} + \frac{1}{3}$ $\therefore R_{\text{eff}} = 2\Omega$</p> <p>$\therefore R_{\text{total/ totaal}} = 4 + 2$ $= 6 \Omega$ ✓</p>	<p>OPTION 2/OPSIE 2</p> <p>$R_{\text{eff}} = \frac{R_1 \times R_2}{R_1 + R_2}$ $= \frac{6 \times 3}{6+3}$ $= 2\Omega$</p> <p>$\therefore R_{\text{total/ totaal}} = 4 + 2$ $= 6 \Omega$ ✓</p>
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11.1.2

<p>$R_{\text{eff}} : R_{\text{series}}$ $2\Omega : 4\Omega$ ✓</p> <p>\therefore potential difference is also in ratio of Potensiaal verskil is ook in die verhouding 2: 4 or 1:2 ✓</p> <p>$\therefore 12\text{V} \div 3 \text{ parts/dele} = 4\text{V}$</p> <p>$\therefore V_{\text{series}} = 2 \times 4 = 8\text{V}$ ✓</p>	<p>ACCEPTI AANVAAR:</p> <p>$R_{\text{eff}} = \frac{V_2}{I}$ $4 = \frac{V_2}{2}$ $\therefore V_2 = 8\text{V}$ ✓</p>
---	--

(4)

