basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 10

PHYSICAL SCIENCES: PHYSICS (P1)

NOVEMBER 2017

MARKS: 150

TIME: 2 hours

This question paper consists of 14 pages, 1 data sheet and 1 answer sheet.

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 TEN questions. Answer ALL the questions in the ANSWER BOOK, except QUESTION 3.3 which has to be answered on the attached ANSWER SHEET.

3. Hand in the ANSWER SHEET together with the ANSWER BOOK.

4. Start EACH question on a NEW page in the ANSWER BOOK.

5. Number the answers correctly according to the numbering system used in this question paper.

6. Leave ONE line between two subquestions, for example between QUESTION 2.1 and QUESTION 2.2.

7. You may use a non-programmable calculator.

8. You may use appropriate mathematical instruments.

9. You are advised to use the attached DATA SHEET.

10. Show ALL formulae and substitutions in ALL calculations.

11. Round off your final numerical answers to a minimum of TWO decimal places.

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

13. Write neatly and legibly.

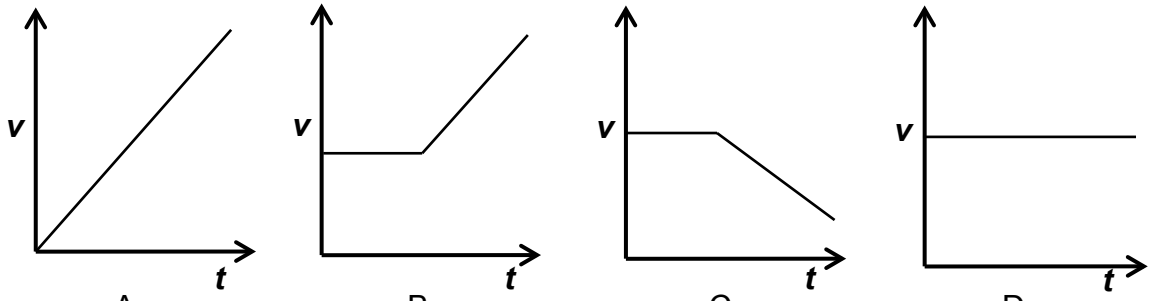
QUESTION 1: MULTIPLE-CHOICE QUESTIONS

Various 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 pairs of physical quantities consists of one scalar and one vector quantity?

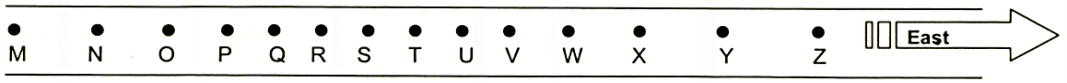
A Distance and speed
B Speed and acceleration
C Displacement and velocity
D Velocity and acceleration (2)

1.2 A car is travelling at a constant velocity along a straight road. It then slows down uniformly. Which ONE of the velocity-time graphs below best represents the motion of the car?



A B C D (2)

1.3 Oil dripping from a truck at equal time intervals leaves the pattern below on the road.



If the truck is moving eastwards, which ONE of the combinations below best describes the speed of the truck during the intervals M to Q, Q to V and V to Z?

	M TO Q	Q TO V	V TO Z
A	Decreases	Remains constant	Increases
B	Increases	Remains constant	Decreases
C	Remains constant	Increases	Increases
D	Increases	Decreases	Remains constant

(2)

1.4 A motorbike moving at a speed *v,* has a kinetic energy *E*. If the speed of the motorbike increases to *3v*, the kinetic energy will be …

A $3E$
B $\frac{1}{3}E$
C $6E$
D $9E$ (2)

1.5 The SI unit for gravitational potential energy is …

A $kg \cdot m \cdot s^{-1}$
B $kg \cdot m \cdot s^{-2}$
C $kg \cdot m^{2} \cdot s^{-2}$
D $kg \cdot m^{-1} \cdot s^{-1}$ (2)

1.6 The amplitude of a sound wave is increased without changing the frequency. How does this change affect the loudness and pitch of the sound?

	LOUDNESS	**PITCH**
A	Decreases	Decreases
B	Decreases	Increases
C	Increases	Unchanged
D	Increases	Increases

(2)

1.7 Which ONE of the combinations below is the CORRECT order of electromagnetic waves in INCREASING WAVELENGTHS?

A Gamma ray → X-ray → ultraviolet → visible light → infrared → microwave
B Radio wave → microwave → infrared → visible light→ ultraviolet → X- ray
C X-ray → ultraviolet → infrared → visible light → radio wave → microwave
D Gamma ray → X-ray → visible light → ultraviolet → infrared → microwave (2)

1.8 The force between two magnets decreases when …

A two like poles come closer together.
B two unlike poles come closer together.
C the distance between them increases.
D the distance between them decreases. (2)

1.9 Two identical spheres, X and Y, on insulated stands, carry charges of 3 µC and -5 µC respectively. The spheres are brought into contact with each other and returned to their original positions. The charge on EACH sphere after contact is …

A 8 µC
B -4 µC
C -2 µC
D -1 µC (2)

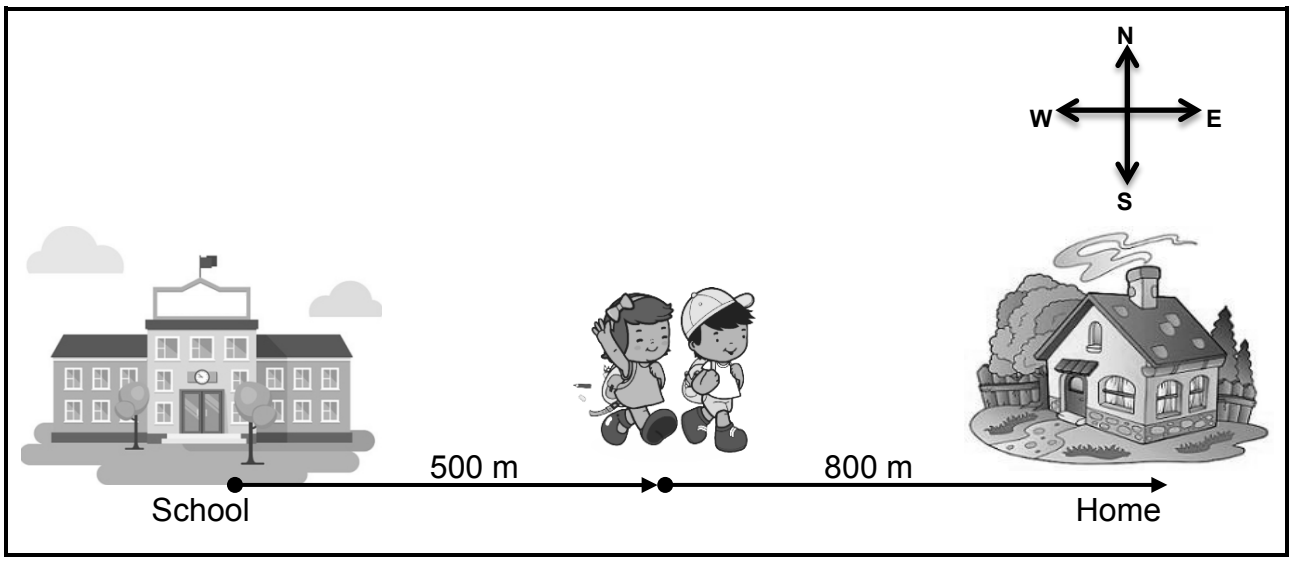
1.10 The energy transferred per unit electric charge in a circuit is …

A current.
B charge.
C power.
D potential difference. (2)

[20]

QUESTION 2 (Start on a new page.)

A brother and sister walk home from school. After walking 500 m eastwards, the brother realises that he has left a book at school and he returns to school. His sister continues walking another 800 m to their home. She arrives home 30 minutes after leaving school.



2.1 Define the term *average speed.* (2)

2.2 Calculate the average speed of the girl from the school to her home. (4)

2.3 Use a vector scale diagram and represent the displacement of the boy from the time he realised he left his book at school until he reached home. Include ALL relevant information in the diagram.

Use scale 1 cm = 100 m for the diagram. (3)

2.4 If the average speed of the boy is the same as that of the girl, calculate how long it would take the boy to reach home from the time they both left the school together. (4)
[13]

QUESTION 3 (Start on a new page.)

The engineers at a car company conduct various tests on their cars. During one of the tests they measure the change in position during equal time intervals. The results obtained are recorded in the table below.

TIME (s)	POSITION (m)
0	0
1	5
2	10
3	15
4	20

3.1 Give the correct term for *change of position per unit time.* (1)

3.2 For this test, write down the:

3.2.1 Independent variable (1)

3.2.2 Dependent variable (1)

3.3 Use the information in the table above and draw an accurate position-time graph on the graph paper on the attached ANSWER SHEET. (5)

3.4 Calculate the gradient of the graph. (4)

3.5 Draw (NOT to scale) a corresponding velocity-time graph for the motion of the car. Labels the axes. (2)

3.6 Hence, deduce the magnitude of the acceleration of the car. (2)
[16]

QUESTION 4 (Start on a new page.)

A car accelerates from rest at 15 $m \cdot s^{-2}$ for 2 s on a horizontal road.

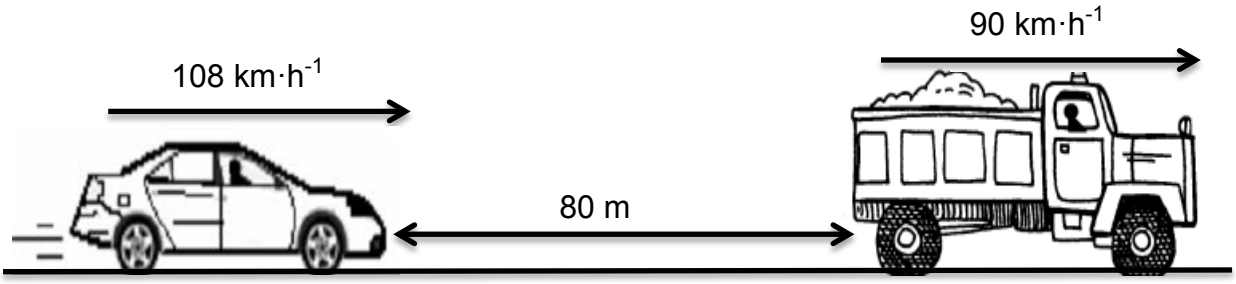
4.1 Define the term *acceleration.* (2)

4.2 Calculate the:

4.2.1 Distance covered by the car (3)

4.2.2 Velocity of the car (3)

While travelling at a constant velocity of 108 $km \cdot h^{-1}$, the driver of a car notices a sign warning motorists to keep a safe 2-second following distance. At that instant the car is 80 m behind a truck that is travelling at a constant velocity of 90 $km \cdot h^{-1}$.



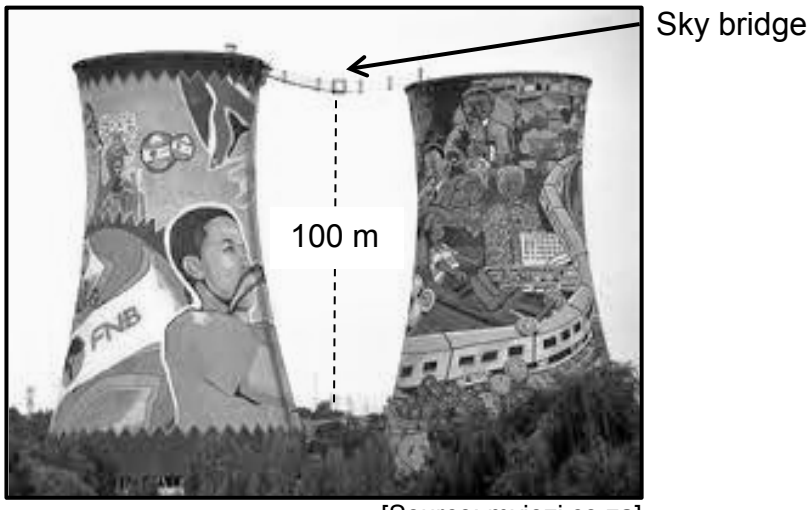
4.3 Explain the meaning of a *safe 2-second following distance.* (2)

4.4 Calculate the safe 2-second following distance behind the truck. (6)

4.5 Calculate how long it will take the motorist to get to a safe 2-second following distance behind the truck. (5)
[21]

QUESTION 5 (Start on a new page.)

A lift takes a man to a sky bridge, which is 100 m above the ground, as shown below. He makes a bungee jump from the sky bridge. Ignore the effects of air resistance.



[Source: myjozi.co.za]

5.1 Define the term *kinetic energy.* (2)

5.2 The man and his gear have a mass of 72 kg. Calculate the gravitational potential energy of the man just before he jumps from the sky bridge. (3)

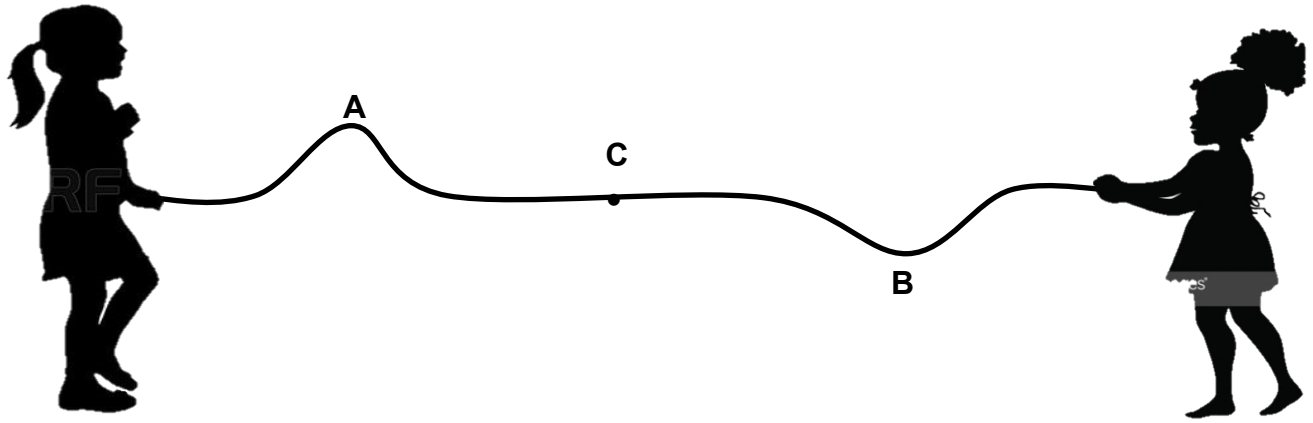
5.3 State the *law of conservation of mechanical energy.* (2)

5.4 Use the law in QUESTION 5.3 to calculate the velocity of the man at a height of 50 m above the ground. (5)

5.5 Draw a graph of E_p versus E_k for the motion of the man from the instant he jumps until he reaches the ground. (3)
[15]

QUESTION 6 (Start on a new page.)

Two girls, standing at opposite ends of a rope, each makes a pulse of the same speed. Pulse **A**, with an amplitude of 4 cm, moves to the right and pulse **B**, with an amplitude of -6 cm, moves to the left. The pulses meet at point **C**.



6.1 State the phenomenon observed when the two pulses meet at point **C**. (3)

6.2 Draw a labelled diagram to show the resultant pulse when the two pulses meet at point **C**. Label the pulses clearly. (2)

6.3 Name the type of interference that takes place when the pulses meet. (1)

6.4 Determine the resultant amplitude of the pulses at point **C**. (2)

6.5 How will the amplitude of pulse **A** be affected after passing point **C**? Write down only INCREASES, DECREASES or REMAINS THE SAME. (1)
[9]

QUESTION 7 (Start on a new page.)

Dolphins communicate through the emission and reception of sounds. A young dolphin was separated from its mother and started whistling at a frequency of 130 kHz to call her. The speed of sound in seawater is 1 480 $m \cdot s^{-1}$.

7.1 Explain the term *ultrasound*. (2)

7.2 Calculate the wavelength of the young dolphin's whistle. (4)

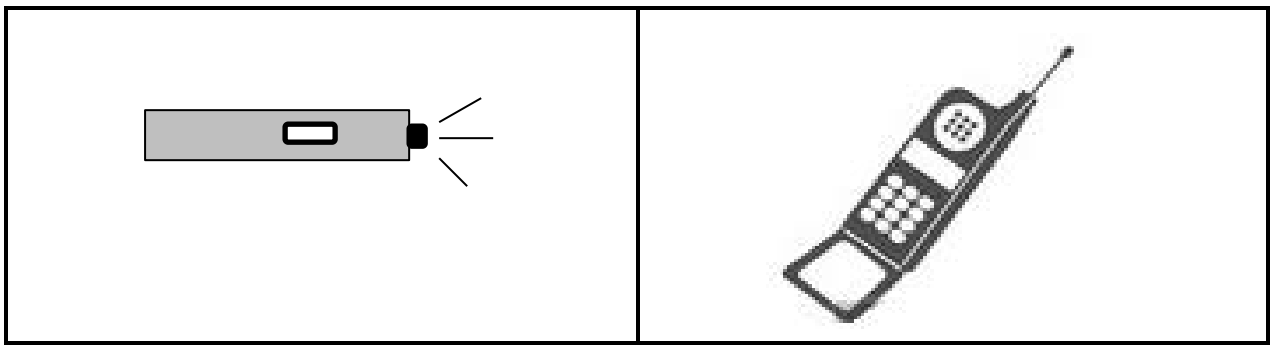
7.3 Another dolphin hears the distress call of the young dolphin 2 s later. How far apart are the two dolphins from each other? (4)

7.4 The speed of sound in air is 340 $m \cdot s^{-1}$. Briefly explain why the speed of sound in air is different from the speed of sound in seawater. (2)

7.5 Describe how dolphins use echolocation to hunt their prey. (3)
[15]

QUESTION 8 (Start on a new page.)

Consider a laser pointer and cellphone, as shown below.



Laser pointer Cellphone

8.1 State the type of electromagnetic radiation that is emitted by the:

8.1.1 Laser pointer (1)

8.1.2 Cellphone (1)

8.2 A laser pointer uses red light photons with a wavelength of 620 nm.

8.2.1 Define the term *photon.* (2)

8.2.2 Calculate the energy of a red light photon. (6)

8.2.3 Refer to the answer to QUESTION 8.2.2. Explain why it is very dangerous to shine a laser pointer into a person's eyes. (2)
[12]

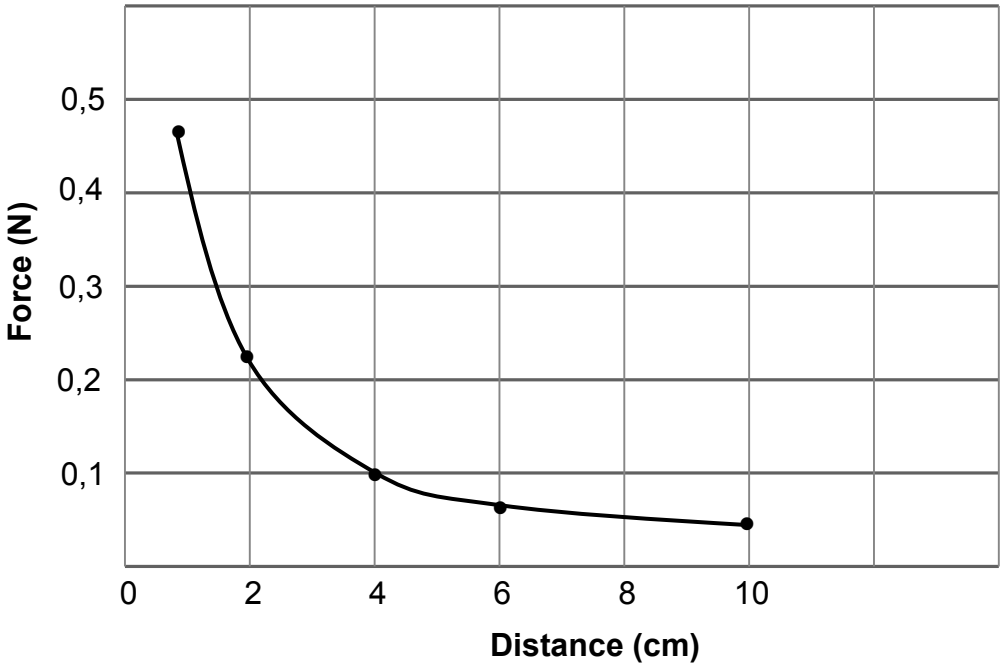
QUESTION 9 (Start on a new page.)

Two magnets are placed so that their north poles face each other.

9.1 Explain the term *magnetic field.* (2)

9.2 Draw the magnetic field pattern between the two north poles of the magnets. (3)

9.3 The graph below shows how the magnetic force varies with distance between the magnets.



9.3.1 What is the mathematical relationship between magnetic force and distance between the two magnets? (1)

9.3.2 What is the magnitude of the magnetic force between the two magnets when they are 4 cm apart? (1)

9.3.3 How far apart must the magnets be to experience a force of 0,05 N? (1)
[8]

QUESTION 10 (Start on a new page.)

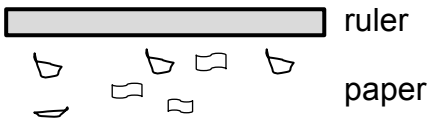
A neutral plastic ruler becomes charged when it is rubbed with a woollen cloth. After rubbing, the ruler has a charge of $-3,5 \times 10^{-15}$ C.

10.1 Distinguish between a *neutral object* and a *charged object*. (2)

10.2 Does the ruler GAIN or LOSE electrons? (1)

10.3 Calculate the number of electrons transferred during the process of rubbing. (3)

10.4 The charged ruler is now brought closer to pieces of paper. The pieces of paper are attracted to the ruler, as shown below.

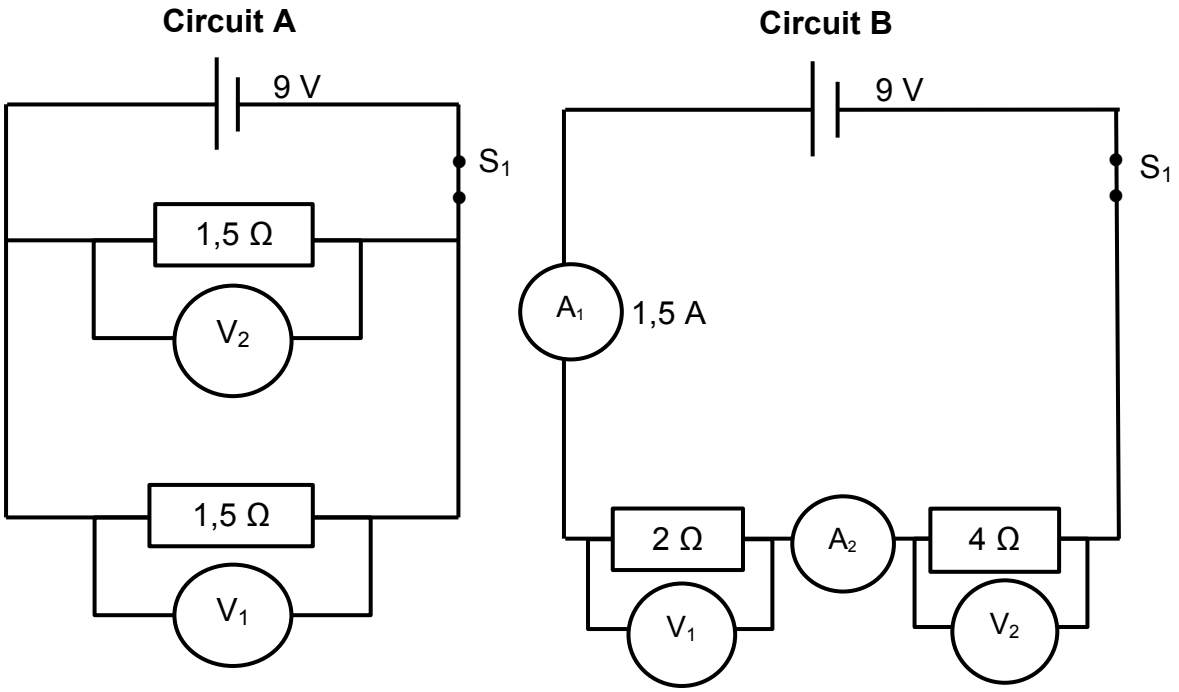


10.4.1 Explain why the pieces of paper are attracted to the ruler. (3)

10.4.2 Name ONE application of electrostatics in our daily lives. (1)
[10]

QUESTION 11 (Start on a new page.)

Refer to Circuits A and B below and answer the questions that follow.



11.1 Define the term *emf*. (2)

11.2 Calculate the total resistance of Circuit A. (2)

11.3 Consider Circuit B.

11.3.1 Write down the reading on A_2. (1)

11.3.2 Calculate the reading on V_1. (3)

11.4 If a third resistor (1,5 Ω) is placed in parallel with the existing resistors in Circuit A, would the total current in the circuit INCREASE, DECREASE or REMAIN THE SAME? Explain the answer. (3)

[11]

TOTAL: 150

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

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

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/*of* $E_M = K + U$	

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*

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

ELECTRIC CIRCUITS/*ELEKTRIESE STROOMBANE*

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

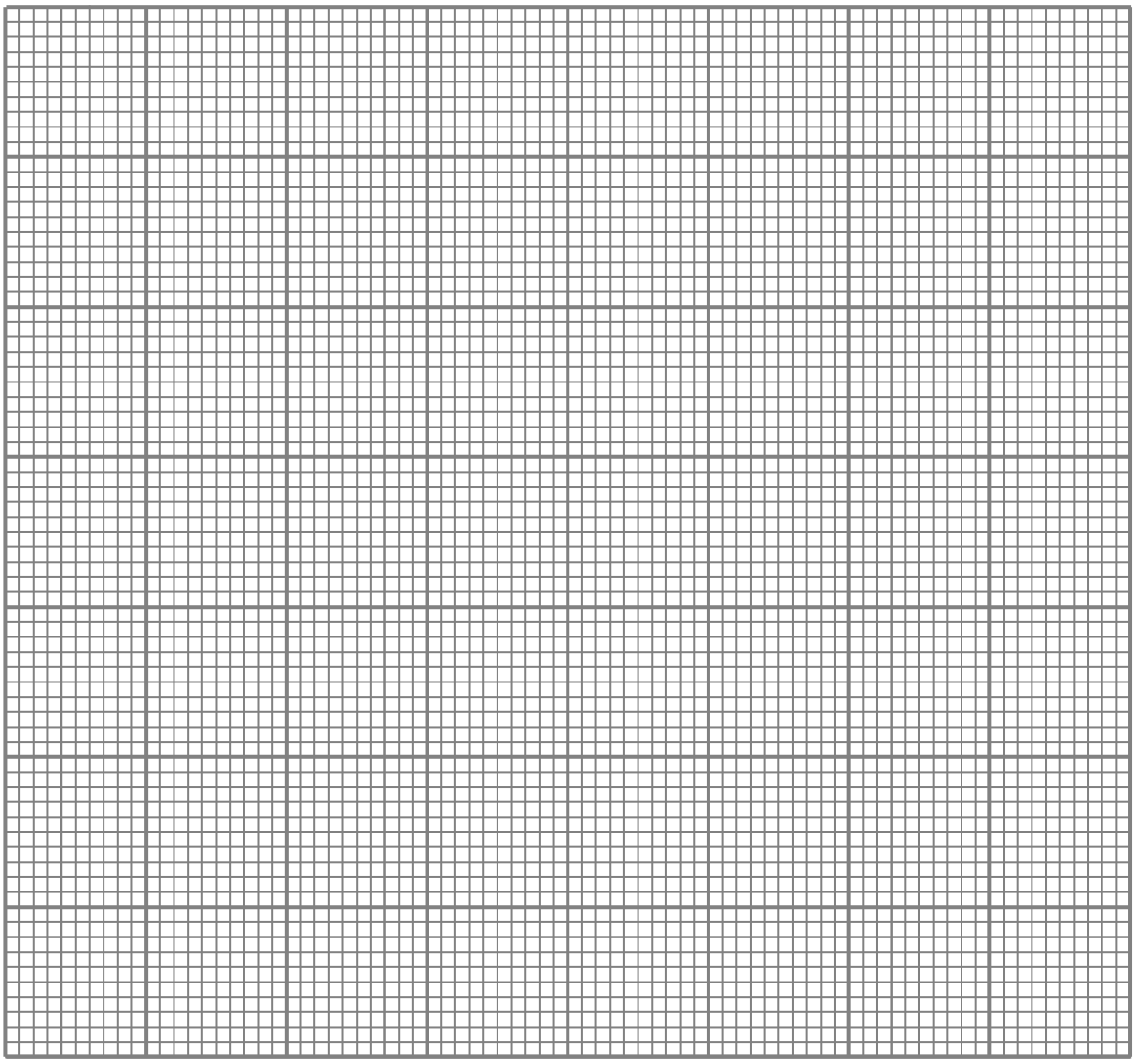
ANSWER SHEET

Hand in this ANSWER SHEET together with the ANSWER BOOK.

NAME: _____

CLASS:_____

QUESTION 3.3



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Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE/ *NASIONALE SENIOR SERTIFIKAAT*

GRADE/*GRAAD* 10

PHYSICAL SCIENCES: PHYSICS (P1)
FISIESE WETENSKAPPE: FISIKA (V1)

NOVEMBER 2017

MARKING GUIDELINES/*NASIENRIGLYNE*

MARKS/*PUNTE*: 150

These marking guidelines consist of 13 pages.
Hierdie nasienriglyne bestaan uit 13 bladsye.

Approved
Dayrangi
Internal Mod.
DBE
2017: 11: 12

CHIEF EXAMINER
2017 | 11 | 12

QUESTION/*VRAAG 1*

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

[20]

QUESTION/*VRAAG 2*

2.1 The total distance travelled per total time✓✓
Die totale afstand beweeg per totale tyd. ✓✓

OR/*OF*

The distance travelled divided by the total time✓✓
Die afstand beweeg gedeel deur die totale tyd. ✓✓ (2)

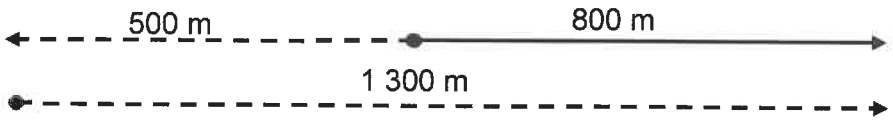
2.2 $$\text{Average speed/}\textit{Gemiddelde spoed} = \frac{\text{distance travelled/}\textit{afstand}}{\text{time taken/}\textit{tyd}} \checkmark$$

$$= \frac{(500 + 800)\checkmark}{(30 \times 60)\checkmark}$$

$$= 0{,}72 \text{ m·s}^{-1} \checkmark$$ (4)

2.3

MARK ALLOCATION:	***PUNTETOEKENNING:***
✓1 x correct scale length for 800 m	✓*1 x korrekte skaal vir 800 m*
✓1 x arrow and	✓*1 x pylpunt*
✓1 x 800 m (3)	✓*1 x 800 m*



(3)

2.4 **POSITIVE MARKING FROM QUESTION 2.2**
POSITIEWE NASIEN VANAF VRAAG 2.2

$$\text{Average speed/}\textit{Gemiddelde spoed} = \frac{\text{distance travelled/}\textit{afstand}}{\text{time taken/}\textit{tyd}} \checkmark$$

$$0{,}72\checkmark = \frac{(500 + 500 + 1\,300)}{\text{time taken/}\textit{tyd}} \checkmark$$

$$t = 3\,194{,}44 \text{ s} \checkmark$$ (4)
[13]

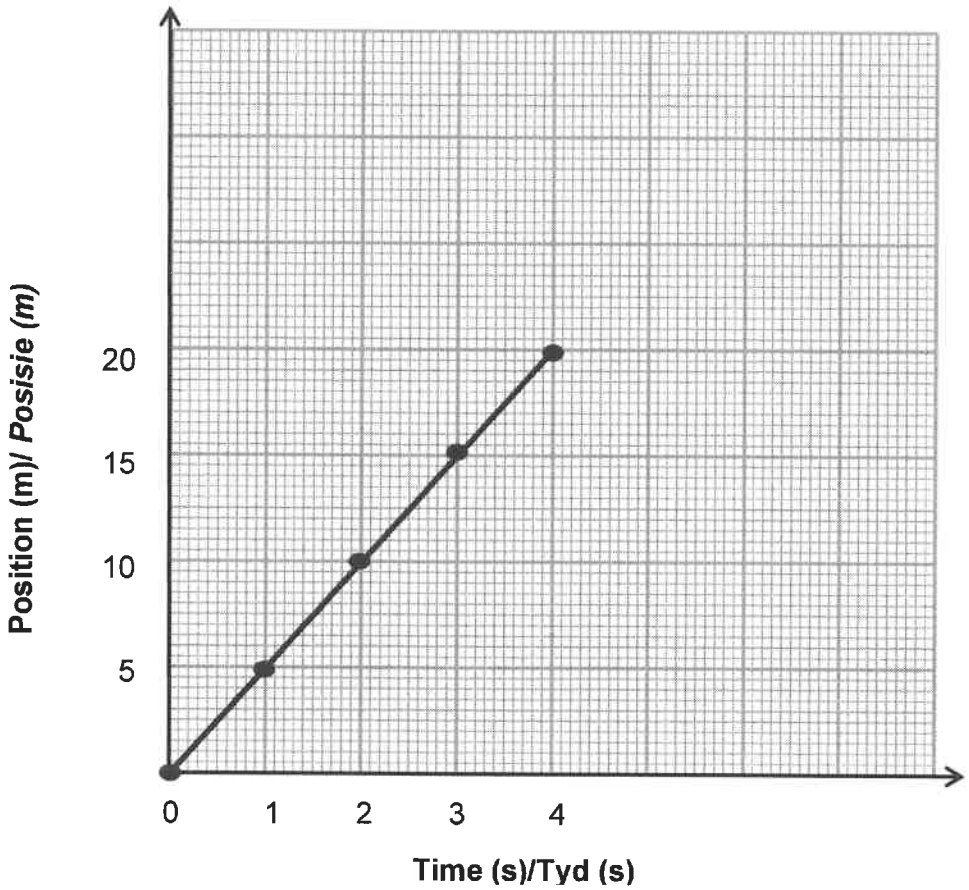
QUESTION/*VRAAG 3*

3.1 (Average) velocity ✓/*(Gemiddelde) snelheid* ✓ (1)

3.2.1 Time ✓/*Tyd* ✓ (1)

3.2.2 Position ✓/*Posisie* ✓ (Accept: Change in position/*Aanvaar verandering in posisie*)) (1)

3.3



MARK ALLOCATION:	***PUNTETOEKENNING:***
✓ 1 x correct y-axis label and unit	✓ *1 x y-as benoem en eenheid*
✓ 1 x correct x-axis label and unit	✓ *1 x x-as benoem en eenheid*
✓✓ 2 x points plotted and joined	✓✓ *2 x punte geplot en verbind*
✓ 1 x shape of graph	✓ *1 x vorm van grafiek*

(5)

3.4 Gradient/*Helling* = $\frac{\Delta y}{\Delta x}$ ✓

$= \frac{20 - 5}{4 - 1}$ ✓

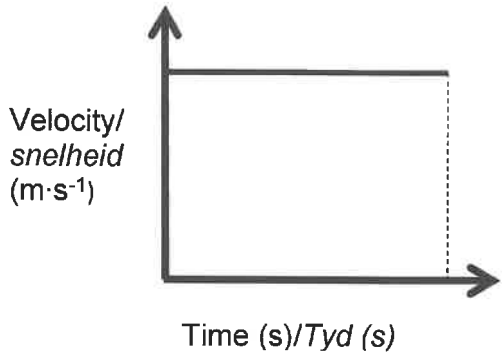
$= 5(\text{ m·s}^{-1})$ ✓

Accept: other sets of values/***Aanvaar***: *enige stel korrekte waardes*

(4)

ME

3.5



✓ Correct shape/*korrekte vorm*
✓ Axes/*Asse*

(2)

3.6 The car has zero (acceleration)/ 0 m·s^{-2} ✓✓as its velocity is constant.
Die motor het geen versnelling /0 m·s^{-2} ✓✓✓*nie as gevolg van 'n konstante snelheid.*

(2)
[16]

QUESTION/*VRAAG 4*

4.1 Rate of change of velocity ✓✓/*Tempo van verandering in snelheid* ✓✓ (2)

4.2.1 $\Delta x = v_i\Delta t + \frac{1}{2}a\Delta t^2$✓

$\Delta x = 0(2)$✓$+ \frac{1}{2}(15)2^2$✓

$\Delta x = 30$ m✓ (4)

4.2.2 **POSITIVE MARKING FROM QUESTION 4.2.1**
POSITIEWE NASIEN VANAF VRAAG 4.2.1

OPTION 1/*OPSIE 1*	**OPTION 2/*OPSIE 2***
$v_f^2 = v_i^2 + 2a\Delta x$✓ $v_f^2 = 0^2$✓$+2(15)(30)$✓ $v_f = 30$ m·s^{-1} to the right✓/*regs*	$v_f = v_i + a\Delta t$ $= 0$✓ $+ 15 \times 2$✓ $v_f = 30$ m·s^{-1} to the right✓/*regs*
OPTION 3/*OPSIE 3*	
$\Delta x = \left(\frac{v_i + v_f}{2}\right)\Delta t$✓ $30 = \left(\frac{0✓ + v_f}{2}\right)2$✓ $v_f = 30$ m·s^{-1} to the right✓/*regs*	

Accept: To the right/East/In the direction of motion
Aanvaar: *Regs/Oos/In die bewegingsrigting* (4)

4.3 When following a car, a motorist should keep a safe distance such that it takes more than 2s✓ to reach the same position ✓as the car in front.
Motoriste moet 'n veilige afstand tussen ander voertuie handhaaf, sodat dit meer as 2 sekondes ✓sal neem om dieselfde posisie✓ as die voertuig voor jou te bereik.

(2)

OR/*OF*

The car will need 2 s to stop in an emergency and not hit the car in front. ✓✓
Die motor het 2 sekondes nodig om in 'n noodsituasie tot stilstand te kom, sonder om die voertuig voor jou te stamp.✓✓

4.4 Convert 90 km·h^{-1} into m·s^{-1}/*Skakel 90 km·h^{-1} om na m·s^{-1}*

$$\frac{90\text{ km}}{1\text{ h}} = \frac{90 \times 10^3}{3600} = 25\text{ m·s}^{-1}\checkmark\checkmark$$

OPTION 1/*OPSIE 1*:

$\Delta x = v_i\Delta t + \frac{1}{2}a\Delta t^2$✓

$\Delta x = (25)(2)\checkmark + \frac{1}{2}(0)2^2\checkmark$

$\Delta x = 50$ m✓

OPTION 2/*OPSIE 2*:

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

$\Delta x = \left(\frac{25 + 25}{2}\right)\checkmark(2)\checkmark$

$\Delta x = 50$ m✓

(6)

4.5 **POSITIVE MARKING FROM QUESTION 4.4**
POSITIEWE NASIEN VANAF VRAAG 4.4

$$\frac{108\text{ km}}{1\text{ h}} = \frac{108 \times 10^3}{3600} = 30\text{ m·s}^{-1}\checkmark$$

Difference in speed/*Verskil in spoed*: 30 – 25
$= 5\text{ m·s}^{-1}\checkmark$

Car has to travel 30 m (80 – 50) at 5 m·s^{-1}to be at a 2 second distance behind the truck. Therefore: distance = (v) (t) ✓
30✓ = (5) (t)
t = 6 s✓

Motor moet 30 m (80 – 50) teen 5 m·s^{-1}ry om 2 sekonde-afstand agter trok te wees. Daarom: afstand = (v) (t) ✓
30 ✓= (5) (t)
t = 6 s✓

(5)
[21]

QUESTION/*VRAAG 5*

5.1 The energy an object has as a result of its motion. ✓✓
Die energie wat 'n voorwerp het as gevolg van sy beweging. ✓✓ (2)

5.2 $E_p = mgh$✓
$= 72 \times 9{,}8 \times 100$✓
$= 70\,560$ J✓ (3)

5.3 The sum of the gravitational potential energy and kinetic energy✓ in an isolated (2)

system is constant. ✓
Die som van die gravitasie-potensiële energie en kinetiese energie ✓ in 'n geïsoleerde/geslote stelsel bly behoue/konstant. ✓

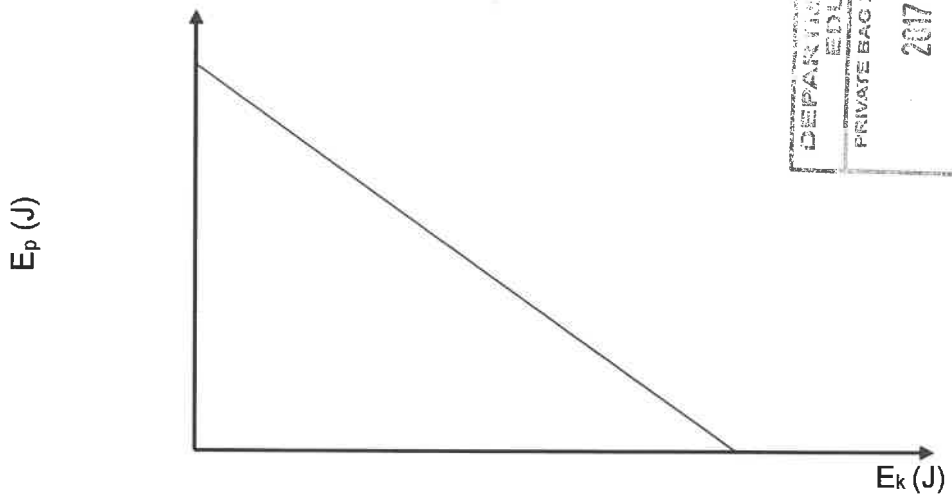
OR/*OF*

The total mechanical energy of an isolated system remains constant. ✓✓
Die totale meganiese energie in 'n geïsoleerde/geslote stelsel bly behoue/konstant. ✓✓

5.4 **POSITIVE MARKING FROM QUESTION 5.2**
POSITIEWE NASIEN VANAF VRAAG 5.2

$(E_p + E_k)_{top/bo} = (E_p + E_k)_{bottom/onder}$ ✓
$mgh + 0 = mgh + ½mv^2$
$70\,560$ ✓ $= \underline{(72)(9,8)(50)}$ ✓ $+ \underline{½ \times 72 \times v^2}$ ✓
$v = 31,3\ m{\cdot}s^{-1}$ ✓ (5)

5.5



Marking criteria for graph ***Nasienkriteria vir grafiek***	
Axes with correct/appropriate labels *Asse met korrekte/toepaslike byskrifte*	✓
Straight line with decreasing slope *Reguitlyn met afnemende helling* *Lines not touching (deduct a mark)* *Indien lyne nie die asse raak (trek een punt af)*	✓✓

(3)
[15]

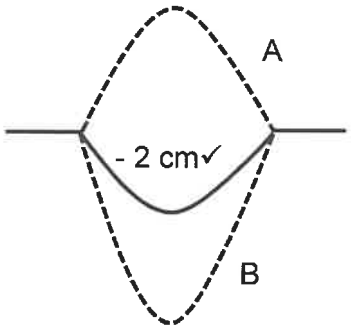
QUESTION/*VRAAG 6*

6.1 Superposition of pulses.✓ Algebraic sum of the amplitudes of two pulses that occupy the same space at the same time. ✓✓

Accept: Interference of waves✓ Phenomenon where the crest of one pulse overlaps with the trough of another, resulting in a pulse of reduced amplitude. ✓✓

Superposisie van pulse.✓ Die algabraïese som van die amplitudes van twee pulse wat in dieselfde ruimte op dieselfde tyd is. ✓✓
Aanvaar: Interferensie van pulse✓Die verskynsel waar die kruin van een puls kruis met die trog van 'n ander. Die gevolg is 'n pulse met 'n verminderde amplitude. ✓✓ (3)

6.2



(Shape/*Vorm*) ✓ (2)

6.3 Destructive (interference)✓/*Destruktiewe (interferensie)* ✓ (1)

6.4 Amplitude = (+4) + (-6)
= 2 cm✓✓ (Accept/*Aanvaar*: - 2 cm)
(Marks/*Punte*: 2 or/of 0) (2)

6.5 REMAINS THE SAME✓/*BLY DIESELFDE* ✓ (1)
[9]

QUESTION/*VRAAG 7*

7.1 Sound with frequencies that are higher than what is audible to the human ear. ✓✓
Klank met frekwensies wat hoër is as wat vir die menslike oor hoorbaar is. ✓✓ (2)

7.2 $v = f\lambda$ ✓
1480 ✓ $= 130\,000\,\lambda$ ✓
$\therefore \lambda = 0{,}011$ m✓ (4)

7.3 $$\text{Speed/}Spoed = \frac{\text{distance/}afstand}{\text{time/}tyd}$$ ✓

$$1\,480\checkmark = \frac{\text{distance/}afstand}{2\ \checkmark}$$

$\therefore$ distance/*afstand* = 2 960 m✓ (4)

7.4
- The speed of sound in air is slower✓, as air is less dense ✓and the particles are further apart.
  Die spoed van klank in lug is stadiger✓ as in water, omdat lug minder dig ✓ is/deeltjies is verder van mekaar af.

  OR/ OF

- The speed of sound in sea water is faster✓, as sea water is denser ✓and the particles are closer together.
  Die spoed van klank in water is vinniger✓ as lug, omdat water meer dig is✓/ die deeltjies nader aan mekaar is. (2)

7.5
- Dolphins send out a sound frequency✓/*Dolfyne stuur klankgolwe uit* ✓
- The sound reflects off the prey and returns to the dolphin✓
  Die klank weerkaats vanaf die prooi terug na die dolfyn toe.✓
- The dolphin estimates distance from prey by using time for echo to return✓
  Die dolfyn skat dan die afstand tussen sy prooi en homself deur die tyd te gebruik wat die eggo geneem het om te weerkaats. ✓ (3)

[15]

QUESTION/*VRAAG 8*

8.1.1 Infrared waves✓/*Infrarooi golwe* ✓ (1)

8.1.2 Radio waves **OR** microwaves✓/*Radiogolwe* ***OF*** *mikrogolwe* ✓ (1)

8.2.1 Packet of energy found in light✓✓
Pakkie energie wat in lig aangetref word. ✓✓ (2)

8.2.2

OPTION 1/*OPSIE 1*:	**OPTION 2/*OPSIE 2*:**
$c = f \times \lambda$✓	$E = \frac{hc}{\lambda}$ ✓✓
3×10^8 ✓$= f \times 620 \times 10^{-9}$✓	$E = \frac{6,63 \times 10^{-34} \checkmark \times 3 \times 10^8}{620 \times 10^{-9} \checkmark}$ ✓
$\therefore f = 4,84 \times 10^{14}$ Hz	
$E = hf$✓	$E = 3,21 \times 10^{-19}$ J ✓
$= 6,63 \times 10^{-34}$✓ $\times 4,84 \times 10^{14}$	
$= 3,21 \times 10^{-19}$ J✓	

(6)

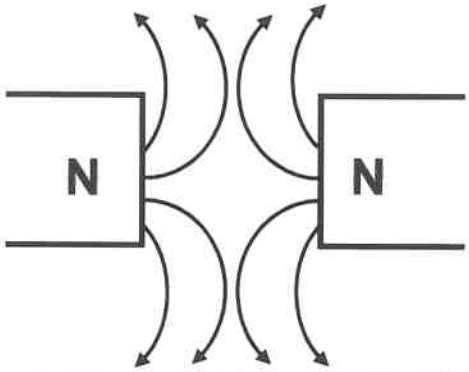
8.2.3
- Laser light has high frequency and can penetrate soft tissues of humans✓
  Laserlig het 'n hoër frekwensie✓ en kan sagte weefsel indring
- This can lead to damage of eye tissue✓
  Dit kan skade aan oogweefsel veroorsaak✓ (2)

[12]

QUESTION/*VRAAG 9*

9.1 Magnetic field: A region in space where another magnet or ferromagnetic substance can experience a magnetic force. ✓✓
Magneetveld: 'n Gebied in die ruimte waar 'n magneet of ferromagnetiese materiaal 'n magnetise krag sal ondervind.✓✓ (2)

9.2



MARK ALLOCATION:	***PUNTETOEKENNING:***
✓ 1 x lines not touching ✓ 1 x curved magnetic lines ✓ 1 x field direction away from north	✓ *1 x lyne raak nie* ✓ *1 x vorm van magneetveldlyne* ✓ *1 x veldrigting weg van die N-pool*

(3)

9.3.1 Magnetic force is inversely proportional ✓ to the distance (or square of the distance) between two magnets. **OR** If the distance between the magnets increases, the force decreases.
Magnetiese krag is omgekeerd eweredig ✓ *aan die afstand tussen twee magnete.* ***OF*** *Indien die afstand tussen die magnete toeneem, sal die krag afneem.* (1)

9.3.2 0,1 N ✓ (1)

9.3.3 10 cm ✓ (1)

[8]

QUESTION/*VRAAG 10*

10.1 Neutral object: Has equal amount of both protons and electrons✓
Charged object: Has either gained or lost electrons. ✓
Neutrale voorwerp: Gelyke hoeveelhede protone en elektrone. ✓
Gelaaide voorwerpe het elektrone gewen of verloor.✓ (2)

10.2 Gain ✓/*Bygevoeg* ✓ (1)

10.3 $n = \frac{Q}{e}$ ✓

$n = \frac{3,5 \times 10^{-15}}{1,6 \times 10^{-19}}$ ✓

$= 21875$ ✓ (electrons/*elektrone*) (3)

10.4.1 When the charged plastic ruler is brought closer to the uncharged pieces of paper, the paper is polarised. ✓ The negative charges on the paper are repelled by the negative charges on the ruler. ✓ This leaves the side of the paper closest to the ruler positive. ✓
Die stukkies papier word gepolariseer ✓ sodra die gelaaide liniaal nader gebring word. Die negatiewe ladings van die papiertjies word afgestoot ✓ deur die negatief gelaaide liniaal. Dit laat die kant van die papier wat na die liniaal toe wys positief ✓ en die papier word aangetrek. (3)

10.4.2 Photocopier✓/*Fotostaatmasjien* ✓
Finger printing/*Vingerafdrukke*
Spray painting/*Spuitverf* (Any one/*Enige een*) (1)
[10]

QUESTION/*VRAAG 11*

11.1 Work done per unit charge by the source (battery) ✓✓
Die arbeid verrig per eenheidslading deur die bron (battery) ✓✓ (2)

11.2 $\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2}$

$= \frac{1}{1,5} + \frac{1}{1,5}$ ✓

$= \frac{2}{3} + \frac{2}{3}$

$= \frac{4}{3}$

$\therefore R_P = \frac{3}{4} = 0,75\ \Omega$ ✓

$R_p = \frac{R_1 x\ R_2}{R_1 + R_2}$

$= \frac{1,5 \times 1,5}{1,5 + 1,5}$ ✓

$\therefore R_P = 0,75\ \Omega$ ✓

(2)

11.3.1 1,5 A ✓ (1)

11.3.2

$V_T = V_1 + V_2$

$9 = V_1 + 2V_1$ ✓

$9 = 3V_1$ ✓

$V_1 = 3$ V✓

Accept:/*Aanvaar*
V = IR ✓
V = 1,5(2) ✓
V= 3V✓ (3)

11.4
- INCREASE✓/*TOENEEM* ✓
- If 1,5 Ω resistor is added, the resistance of the whole circuit decreases ✓ *Indien 1,5 Ω resistor bygevoeg word, neem die totale weerstand van die stroombaan af.* ✓
- Since $R \alpha \frac{1}{I}$, if R decreases, ∴ V is constant and I of the circuit increases✓ *Aangesien* $R \alpha \frac{1}{I}$, *indien R afneem en V konstant bly, sal I van die stroombaan toeneem.* ✓ (3)

[11]

TOTAL/*TOTAAL*: 150

NOTE: Some provinces felt that 11.4 was an unfair question because it is not within the curriculum of grade 10 physical sciences. Therefore, these provinces can opt to exclude question 11.4 and mark the paper of the total of 147 and scale the total to 150.