



# basic education

Department:  
Basic Education  
**REPUBLIC OF SOUTH AFRICA**

**NATIONAL  
SENIOR CERTIFICATE**

**GRADE 10**

**PHYSICAL SCIENCES: PHYSICS (P1)**

**NOVEMBER 2019**

**MARKS: 150**

**TIME: 2 hours**

**This question paper consists of 13 pages and 2 data sheets.**



**INSTRUCTIONS AND INFORMATION**

1. Write your name and class (e.g. 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.
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 subquestions, e.g. between QUESTION 2.1 and QUESTION 2.2.
6. You may use a non-programmable calculator.
7. You may use appropriate mathematical instruments.
8. 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, etc. where required.
12. Write neatly and legibly.



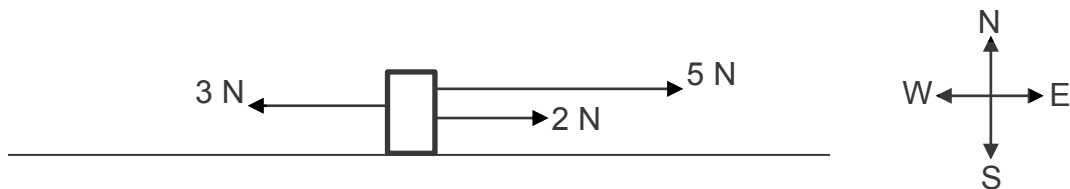
**QUESTION 1: MULTIPLE-CHOICE QUESTIONS**

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 1.10) in the ANSWER BOOK, e.g. 1.11 E. Each question has only ONE correct answer.

1.1 Which ONE of the following physical quantities is a scalar quantity?

- A A weight of 5 N
- B A velocity of  $10 \text{ m}\cdot\text{s}^{-1}$  east
- C A current of 2 A
- D A negative acceleration of  $0,4 \text{ m}\cdot\text{s}^{-2}$  (2)

1.2 Three forces act simultaneously on an object, as shown below.

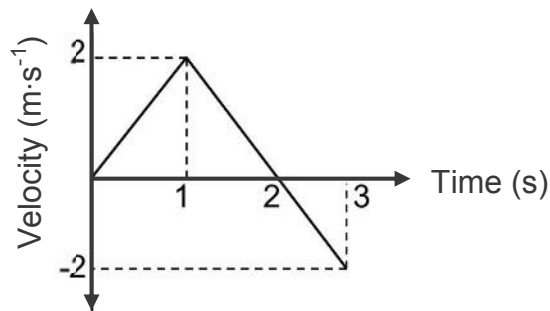


The resultant (net) force acting on the object is ...

- A 10 N west.
  - B 4 N west.
  - C 10 N east.
  - D 4 N east. (2)
- 1.3 An object accelerates uniformly when the ... of the object changes with the same amount in equal time intervals.
- A velocity
  - B displacement
  - C speed
  - D mechanical energy (2)



1.4 The velocity-time graph for the motion of an object is shown below.



The object changes direction at ...

- A 0,5 s
- B 1 s
- C 2 s
- D 3 s

(2)

1.5 An object moving at speed  $v$  has a kinetic energy  $E$ . The kinetic energy now changes to  $\frac{1}{4}E$ .

The speed of the object is now ...

- A  $\frac{1}{2}v$ .
- B  $2v$ .
- C  $\frac{1}{4}v$ .
- D  $4v$ .

(2)

1.6 The frequency of a wave is defined as the ...

- A lowest point on a wave.
- B time taken for one complete wave.
- C number of complete waves per second.
- D number of points in phase in a wavelength.

(2)

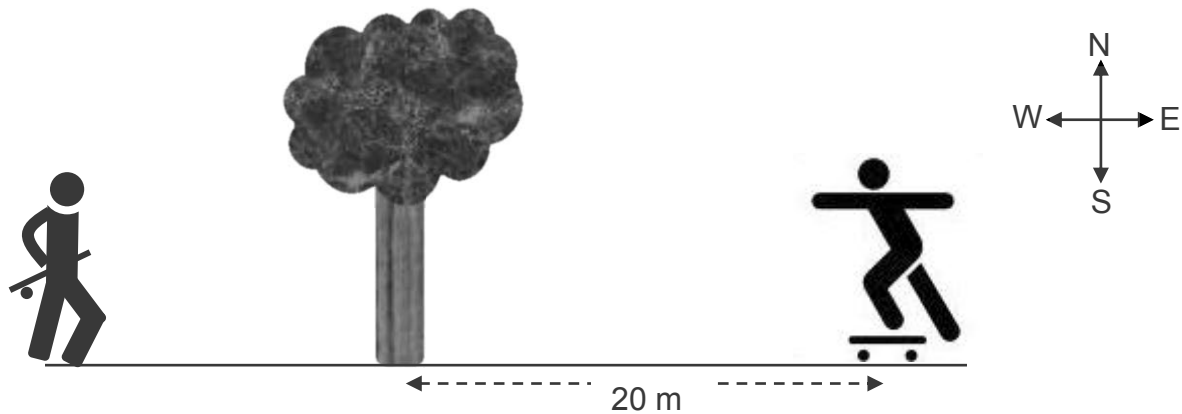


- 1.7 When two wave crests overlap, the increase in amplitude is due to ...
- A cancellation.
  - B two waves in phase.
  - C destructive interference.
  - D constructive interference. (2)
- 1.8 Which ONE of the following materials is a ferromagnetic material?
- A Chromium
  - B Carbon
  - C Cobalt
  - D Calcium (2)
- 1.9 The SI unit for charge is the ...
- A ampere.
  - B volt.
  - C ohm.
  - D coulomb. (2)
- 1.10 The maximum work done per unit charge by a battery is the ...
- A emf.
  - B current.
  - C resistance.
  - D terminal potential difference. (2)
- [20]**



**QUESTION 2 (Start on a new page.)**

A boy walks in an EASTERLY direction, as shown below. After he passes a tree, he continues in the same direction for another 20 m. He then stops, climbs on his skateboard and rides in a WESTERLY direction for 25 m before he finally stops.



The resultant displacement of the boy when he finally stops is 10 m EAST of his initial position.

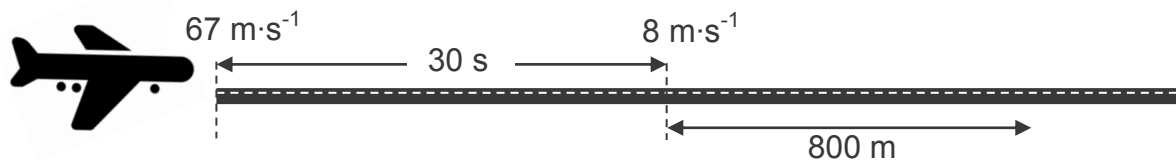
- 2.1 Define the term *distance*. (2)
- 2.2 Determine the initial position of the boy relative to the tree. (2)
- 2.3 Calculate the total distance that the boy moved. (2)
- 2.4 When the boy is on the skateboard, he skates at an average speed of  $5 \text{ m}\cdot\text{s}^{-1}$ .  
Calculate how long, in seconds, the boy is on the skateboard during the motion. (3)
- 2.5 The total time for the motion of the boy from his initial position until he finally stops is 40 s. Calculate his average velocity. (3)
- [12]**



**QUESTION 3 (Start on a new page.)**

An aeroplane touches down on a runway at a velocity of  $67 \text{ m}\cdot\text{s}^{-1}$ , as illustrated below. After 30 seconds the velocity of the aeroplane is  $8 \text{ m}\cdot\text{s}^{-1}$ .

The aeroplane then continues at a **CONSTANT VELOCITY** for a further 800 m before leaving the runway. The length of the runway is 2 000 m.

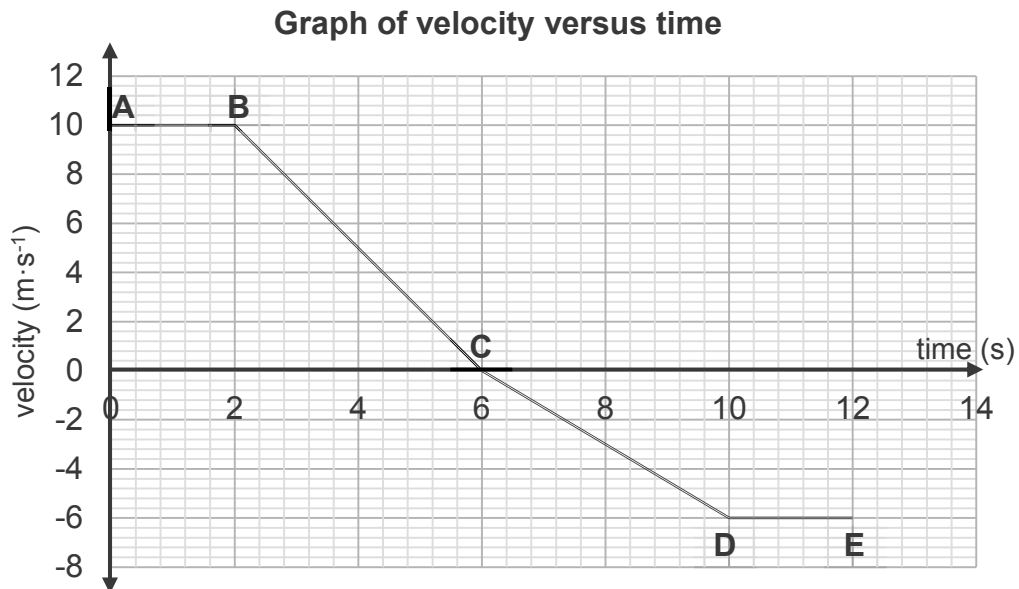


- 3.1 Define the term *vector*. (2)
- 3.2 Convert  $67 \text{ m}\cdot\text{s}^{-1}$  to  $\text{km}\cdot\text{h}^{-1}$ . (1)
- 3.3 Calculate the:
- 3.3.1 Acceleration of the aeroplane during the first 30 seconds (4)
- 3.3.2 Distance travelled by the aeroplane during the first 30 seconds (4)
- 3.3.3 Time taken by the aeroplane to travel the 800 m (3)
- 3.3.4 Length of the runway NOT USED when the aeroplane leaves the runway (2)
- 3.4 Pilots should take weather conditions, such as wind and rain, into account when they calculate landing speed.
- 3.4.1 How should a pilot adapt the landing speed if the surface of the runway is wet? Choose from INCREASES, DECREASES or REMAINS THE SAME. (1)
- 3.4.2 Explain the answer to QUESTION 3.4.1 by referring to the stopping distance in relation to the landing speed. (2)

**[19]**

**QUESTION 4 (Start on a new page.)**

The velocity-time graph below represents the motion of a car over a time period of 12 seconds. The car initially moves NORTH.



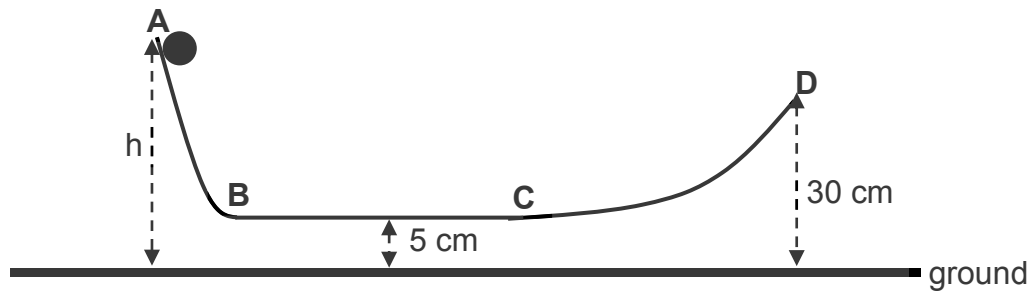
- 4.1 Define the term *velocity*. (2)
- 4.2 Describe the motion of the car from **C** to **E**. (3)
- 4.3 WITHOUT USING EQUATIONS OF MOTION, calculate the:
- 4.3.1 Distance that the car travels from **A** to **C** (4)
- 4.3.2 Acceleration of the car between **B** and **C** (4)
- 4.4 How does the magnitude of the acceleration of the car between **B** and **C** compare to the magnitude of its acceleration between **C** and **D**? Choose from GREATER THAN, SMALLER THAN or EQUAL TO. (1)
- 4.5 Refer to the graph and give a reason for the answer to QUESTION 4.4. (1)
- 4.6 Write down the direction of the resultant displacement of the car. (1)
- 4.7 Use an equation of motion to calculate the instantaneous velocity of the car at  $t = 5$  s. (4)
- [20]**





**QUESTION 5 (Start on a new page.)**

A 2 kg ball rolls from rest from point **A** on a frictionless track **ABCD**, as shown below. The horizontal section, **BC**, of the track is 5 cm above the ground. The ball reaches point **D**, 30 cm above the ground, at a speed of  $1,71 \text{ m}\cdot\text{s}^{-1}$ .



5.1 Write down ONE term for the following statement:

*The sum of gravitational potential energy and kinetic energy* (1)

5.2 Calculate the:

5.2.1 Mechanical energy of the ball at point **D** (4)

5.2.2 Initial height **h** of the ball at point **A** (3)

5.2.3 Speed of the ball while it moves between point **B** and point **C** (3)

5.3 The 2 kg ball is now replaced with a 4 kg ball.

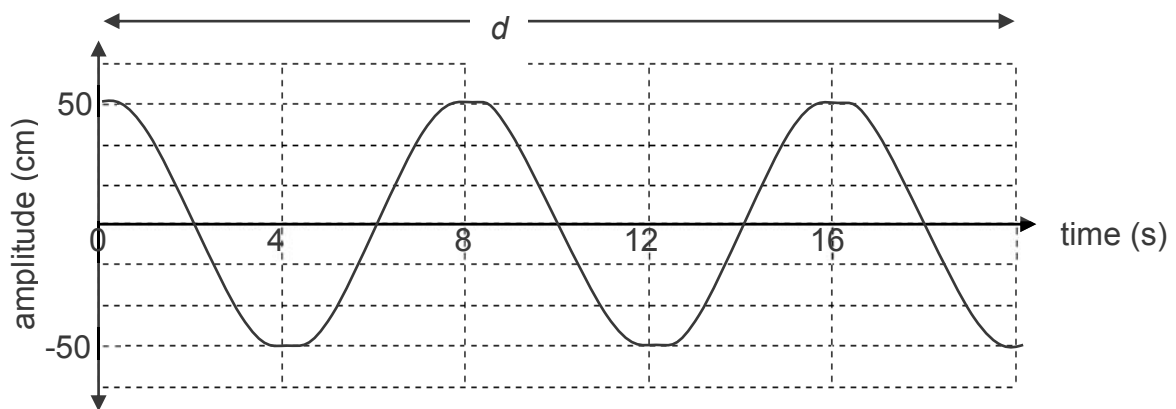
How will the speed of the 4 kg ball compare to the speed of the 2 kg ball at point **D**? Choose from GREATER THAN, SMALLER THAN or EQUAL TO. Give a reason for the answer.

(2)  
**[13]**



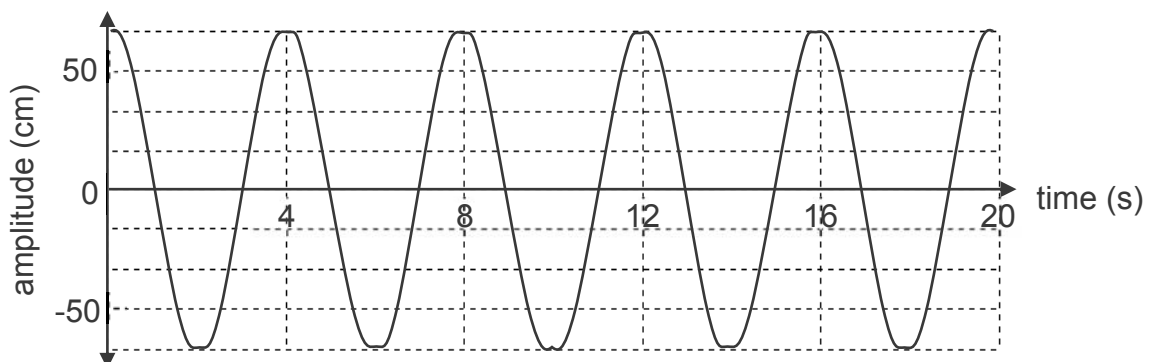
**QUESTION 6 (Start on a new page.)**

The diagram below represents a transverse wave produced by source **A**.



- 6.1 Define the term *amplitude of a wave*. (2)
- 6.2 Write down the amplitude, in metres, of this wave. (1)
- 6.3 Determine the period of this wave. (1)
- 6.4 Calculate the:
- 6.4.1 Speed of the wave if the wavelength is 0,8 m (5)
- 6.4.2 Distance *d* on the diagram (2)

The diagram below represents the transverse wave produced by source **B**.

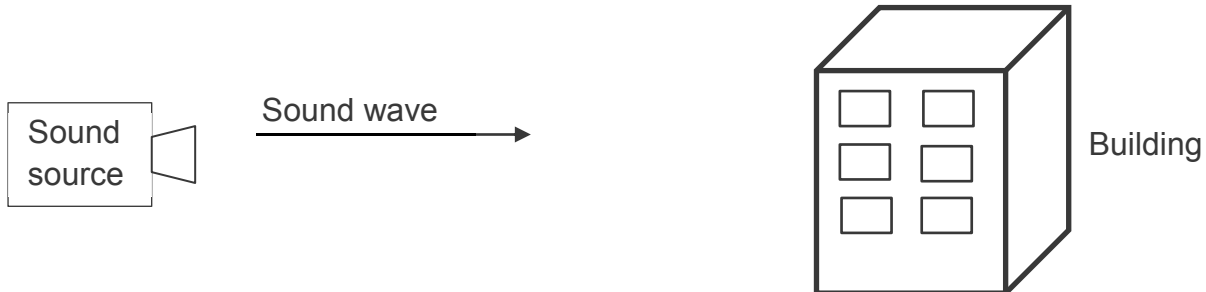


- 6.5 How does EACH of the following properties of the wave produced by source **B** compare to that of the wave produced by source **A**? Choose from GREATER THAN, SMALLER THAN or EQUAL TO.
- 6.5.1 Amplitude (1)
- 6.5.2 Frequency (1)
- 6.6 Calculate the frequency of the wave produced by source **B**. (3)

**[16]**

**QUESTION 7 (Start on a new page.)**

A sound wave is produced by a source placed a certain distance from a building as shown below. The echo reaches the source after 8 seconds. The speed of sound in air is  $340 \text{ m}\cdot\text{s}^{-1}$ .



- 7.1 Define the term *longitudinal wave*. (2)
- 7.2 Calculate the distance between the sound source and the building. (4)
- 7.3 Name the property of a sound wave that influences its pitch. (1)
- 7.4 Above which frequency is a sound wave classified as ultrasound? (1)
- 7.5 Name ONE use of ultrasound in the medical treatment of patients. (1)
- [9]**

**QUESTION 8 (Start on a new page.)**

The frequency and corresponding energy of electromagnetic waves are given in the table below.

WAVE	FREQUENCY (Hz)	ENERGY (J)
<b>A</b>	$2 \times 10^9$	$1,33 \times 10^{-24}$
<b>B</b>	$4 \times 10^{12}$	$2,65 \times 10^{-21}$
<b>C</b>	$3,5 \times 10^{15}$	$2,32 \times 10^{-18}$
<b>D</b>	$1,8 \times 10^{18}$	$1,19 \times 10^{-15}$
<b>E</b>	<b>f</b>	$4,97 \times 10^{-14}$

- 8.1 Describe how an electromagnetic wave propagates. (2)
- 8.2 What is the relationship between frequency and energy of an electromagnetic wave, as shown in the table above? (2)
- 8.3 Calculate the:
- 8.3.1 Frequency of wave **E** (3)
- 8.3.2 Wavelength of wave **D** (3)
- 8.4 Which wave, **A** or **B**, has the HIGHER penetrating ability? Give a reason for the answer. (2)

**[12]**

**QUESTION 9 (Start on a new page.)**

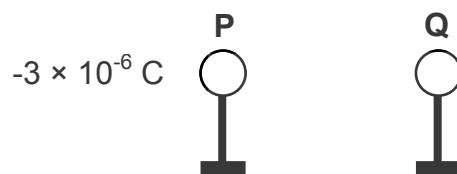
A compass is used to determine the poles of a magnet. The compass is placed in different positions around the magnet, as shown below. The dark arrow indicates the north pole of the compass.



- 9.1 Explain the term *ferromagnetic materials*. (2)
- 9.2 Is **X** a NORTH pole or a SOUTH pole? (1)
- 9.3 At which position, **1** or **2**, will the compass experience the strongest magnetic force? Give a reason for the answer. (2)
- 9.4 What is the direction of a magnetic field? Choose from NORTH TO SOUTH or from SOUTH TO NORTH. (1)
- 9.5 Give ONE term for each of the following descriptions:
- 9.5.1 The point in the Northern Hemisphere where the rotation axis of the Earth meets the surface (1)
- 9.5.2 The point where the magnetic field lines of the Earth enters the Earth (1)
- 9.6 State ONE advantage of the Earth's magnetosphere for life on Earth. (1)
- [9]**

**QUESTION 10 (Start on a new page.)**

The diagram below shows two small identical spheres, **P** and **Q**, on insulated stands. The charge on sphere **P** is  $-3 \times 10^{-6}$  C and the charge on sphere **Q** is unknown.

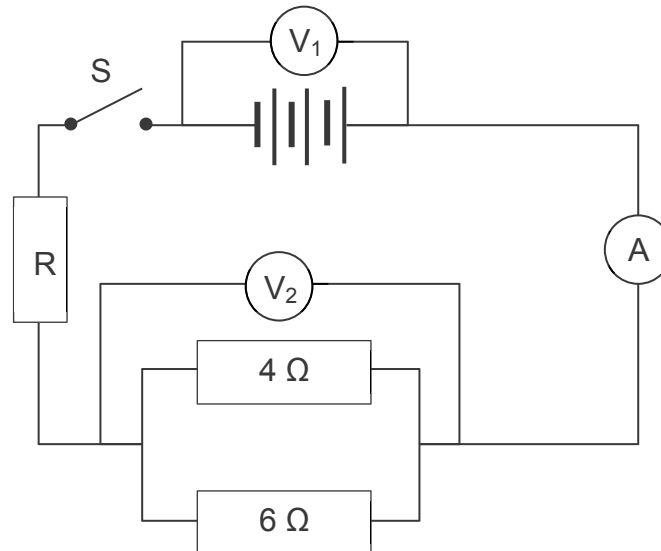


- 10.1 Calculate the number of electrons in excess on sphere **P**. (3)
- The two spheres are brought into contact and are then returned to their original positions. Each sphere now carries a charge of  $-1 \times 10^{-6}$  C.
- 10.2 Calculate the original charge on sphere **Q** before the spheres were brought into contact. (3)
- 10.3 Were electrons transferred from **P** TO **Q** or from **Q** TO **P** during contact? (1)
- [7]**



**QUESTION 11 (Start on a new page.)**

In the circuit diagram below, the resistance of the battery, ammeter and connecting wires are negligible.



- 11.1 Explain the meaning of the following:  
*A current of 5 A* (2)
- 11.2 Calculate the effective resistance of the parallel resistors. (3)
- 11.3 Which one of the voltmeters,  $V_1$  or  $V_2$ , will show a reading if the switch is open? (1)
- Switch **S** is now CLOSED.
- 11.4 How does the reading on voltmeter  $V_2$  compare to that on voltmeter  $V_1$ ?  
Choose from HIGHER THAN, SMALLER THAN or EQUAL TO. (1)
- 11.5 Calculate the current in the circuit if 0,3 C passes through the ammeter in 2 s. (3)
- 11.6 The potential difference across resistor R is 5 V when a charge of 0,3 C flows through it. Calculate the energy transferred in resistor R. (3)

**[13]****TOTAL: 150**



**DATA FOR PHYSICAL SCIENCES GRADE 10  
PAPER 1 (PHYSICS)  
GEGEWENS VIR FISIESTE WETENSKAPPE 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 <sup>-2</sup>
Speed of light in a vacuum <i>Spoed van lig in 'n vakuum</i>	c	3,0 x 10 <sup>8</sup> m·s <sup>-1</sup>
Planck's constant <i>Planck se konstante</i>	h	6,63 x 10 <sup>-34</sup> J·s
Charge on electron <i>Lading op elektron</i>	e	-1,6 x 10 <sup>-19</sup> C
Electron mass <i>Elektronmassa</i>	m <sub>e</sub>	9,11 x 10 <sup>-31</sup> 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**

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

**ELECTRIC CIRCUITS/ELEKTRIESE STROOMBANE**

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







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**NATIONAL  
SENIOR CERTIFICATE/  
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**GRADE/GRAAD 10**

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

**NOVEMBER 2019**

**MARKING GUIDELINES/NASIENRIGLYNE**

**MARKS/PUNTE: 150**

**These marking guidelines consist of 11 pages./  
Hierdie nasienriglyne bestaan uit 11 bladsye.**

**QUESTION 1/VRAAG 1**

- |      |      |             |
|------|------|-------------|
| 1.1  | C ✓✓ | (2)         |
| 1.2  | D ✓✓ | (2)         |
| 1.3  | A ✓✓ | (2)         |
| 1.4  | C ✓✓ | (2)         |
| 1.5  | A ✓✓ | (2)         |
| 1.6  | C ✓✓ | (2)         |
| 1.7  | D ✓✓ | (2)         |
| 1.8  | C ✓✓ | (2)         |
| 1.9  | D ✓✓ | (2)         |
| 1.10 | A ✓✓ | (2)         |
|      |      | <b>[20]</b> |

### QUESTION 2/VRAAG 2

#### 2.1 Marking guidelines/Nasienriglyne

If any of the underlined key words/phrases are omitted: minus 1 mark

*Indien enige van die onderstreepte sleutelwoorde/frases uitgelaat is: minus 1 punt*

Total path length travelled. ✓✓

Totale padlengte afgelê.

(2)

2.2 Original pos./Oorspronklike posisie = 10 + 5

= 15 m ✓ west of tree/wes van boom ✓

(2)

2.3 **POSITIVE MARKING FROM QUESTION 2.2.**

**POSITIEWE NASIEN VANAF VRAAG 2.2.**

(2)

Distance/Afstand = 15 + 20 + 25  
= 60 m ✓✓

**ACCEPT/AANVAAR:**

Any answer in Q2.2. + 45

Enige antwoord in Q2.2. + 45

2.4

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

$$5 = \frac{25}{\Delta t} \checkmark$$

$$\Delta t = 5 \text{ s } \checkmark$$

**Marking guidelines/Nasienriglyne**

- Formule/Formule:  $v = \frac{\Delta x}{\Delta t} / v = \frac{D}{\Delta t} \checkmark$
- Substitute 25 m and  $5 \text{ m}\cdot\text{s}^{-1} \checkmark$
- Final answer/Finale antwoord: 5 s ✓

(3)

2.5

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

$$= \frac{10}{40} \checkmark$$

$$= 0,25 \text{ m}\cdot\text{s}^{-1} \checkmark \text{ east/oos } \checkmark$$

**Marking guidelines/Nasienriglyne**

- Substitute 25 m and  $5 \text{ m}\cdot\text{s}^{-1} \checkmark$
- Final answer/Finale antwoord:  $0,25 \text{ m}\cdot\text{s}^{-1} \checkmark$
- Direction/Rigting: East/Oos ✓

(3)

[12]

### QUESTION 3/VRAAG 3

3.1 A physical quantity with magnitude and direction. ✓✓

*'n Fisiese hoeveelheid met grootte en rigting.*

(2)

3.2  $67 \times 3,6 = \underline{241,2 \text{ km}\cdot\text{h}^{-1}} \checkmark$

(1)

3.3

3.3.1  $v_f = v_i + a\Delta t \checkmark$

$$\underline{8 = 67 + a(30)} \checkmark$$

$$\therefore a = -1,97 \text{ m}\cdot\text{s}^{-2} \checkmark$$

$$\therefore a = \underline{1,97 \text{ m}\cdot\text{s}^{-2}} \text{ in the opposite direction/in die teenoorgestelde rigting } \checkmark$$

(4)

3.3.2

<p><b>Marking guidelines/Nasienriglyne</b></p> <ul style="list-style-type: none"> <li>• Formule/Formule: <math>\Delta x = \left(\frac{v_i + v_f}{2}\right)\Delta t</math> / <math>\Delta x = v_i t + \frac{1}{2} a \Delta t^2</math> / <math>v_f^2 = v_i^2 + 2a\Delta x</math> ✓</li> <li>• Substitute velocity in relevant formula./Vervang snelheid in geskikte formule. ✓</li> <li>• Substitute time/acceleration in relevant formula/Vervang tyd/versnelling in geskikte formule. ✓</li> <li>• Final answer/Finale antwoord: 1 125 m ✓ (Range/Gebied: 1 123,1 to/tot 1 125 m)</li> </ul>	
<p><b>POSITIVE MARKING FROM QUESTION 3.3.1. POSITIEWE NASIEN VANAF VRAAG 3.3.1.</b></p>	
<p><b>OPTION 1/OPSIE 1</b></p> $\Delta x = \left(\frac{v_f + v_i}{2}\right)\Delta t \checkmark$ $= \left(\frac{8 + 67}{2}\right)30 \checkmark$ $= 1125 \text{ m } \checkmark$	<p><b>OPTION 2/OPSIE 2</b></p> $\Delta x = v_i \Delta t + \frac{1}{2} a \Delta t^2 \checkmark$ $= (67)(30) \checkmark + \frac{1}{2}(-1,97)(30)^2 \checkmark$ $= 1123,5 \text{ m } \checkmark$
<p><b>OPTION 3/OPSIE 3</b></p> $v_f^2 = v_i^2 + 2a\Delta x \checkmark$ $(8)^2 = (67)^2 + 2(-1,97)\Delta x \checkmark$ $\Delta x = 1123,1 \text{ m } \checkmark$	

(4)

3.3.3

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

$$800 = 8\Delta t + \frac{1}{2}(0) \Delta t^2 \checkmark$$

$$\Delta t = 100 \text{ s } \checkmark$$

(3)

3.3.4

**POSITIVE MARKING FROM QUESTION 3.3.2.  
POSITIEWE NASIEN VANAF VRAAG 3.3.2.**

$$\text{Length/Lengte} = 2000 - 800 - 1125$$

$$= 75 \text{ m } \checkmark \checkmark$$

<p><b>ACCEPT/AANVAAR:</b> 2 000 – 800 - any answer in Q3.3.2 2 000 – 800 - enige antwoord in Q3.3.2</p>
---

(2)

3.4

3.4.1 Decreases/Verlaag ✓

(1)

3.4.2

On a wet runway, the tyres have less grip, ✓ and to stop within the same distance, ✓ the landing speed should be less.  
*Op 'n nat landingstrook het die bande minder greep en om in dieselfde afstand tot stilstand te kom, moet die landingspoed kleiner wees.*

(2)

**[19]**

**QUESTION 4/VRAAG 4**

4.1

**Marking guidelines/Nasienriglyne**

If any of the underlined key words/phrases are omitted: minus 1 mark  
*Indien enige van die onderstreepte sleutelwoorde/frases uitgelaat is: minus 1 punt*

Rate of change of position. ✓✓  
Tempo waarteen posisie verander.

(2)

4.2

**From C to D:**

The car turns around/moves south/moves in opposite direction/moves with velocity that increases from  $0 \text{ m}\cdot\text{s}^{-1}$  to  $6 \text{ m}\cdot\text{s}^{-1}$ . ✓  
at an increased velocity/constant acceleration. ✓

**From point D to E:**

The car travels at a constant velocity south. ✓

**Van C na D:**

Motor draai om/beweeg suid/beweeg in teenoorgestelde rigting/beweeg teen 'n snelheid wat van  $0 \text{ m}\cdot\text{s}^{-1}$  na  $6 \text{ m}\cdot\text{s}^{-1}$  toeneem.  
met 'n toename in snelheid/konstante versnelling.

**Van D tot E:**

Die motor beweeg teen 'n konstante snelheid suid.

(3)

4.3

4.3.1

**Marking criteria/Nasienriglyne**

- Any area formula/Enige oppervlak-formule:  
Area = L x B/Area =  $\frac{1}{2} b \perp h$ /Area  $\frac{1}{2}(\text{sum/som} \parallel \text{sides/sye}) \perp h$  ✓
- Substitution of values from graph./Vervanging van waardes vanaf grafiek. ✓✓
- Final answer/Finale antwoord: 40 m ✓

**OPTION 1/OPSIE 1**

Area A-B/Oppervlak A-B:

$$\begin{aligned} A &= L \times B \checkmark \\ &= 10 \times 2 \checkmark \\ &= 20 \text{ m} \end{aligned}$$

Area B-C/Oppervlak B-C:

$$\begin{aligned} A &= \frac{1}{2} b \perp h \\ &= \frac{1}{2}(4)(10) \checkmark \\ &= 20 \text{ m} \end{aligned}$$

Total distance/Totale afstand = 40 m ✓

**OPTION 2/OPSIE 2**

Area of trapezium/Oppervlak van trapesium:

$$\begin{aligned} A &= \frac{1}{2}(\text{sum/som} \parallel \text{sides/sye}) \perp h \checkmark \\ &= \frac{1}{2}(2 + 6) \checkmark (10) \checkmark \\ &= 40 \text{ m} \checkmark \end{aligned}$$

(4)

4.3.2

$$\begin{aligned} m &= \frac{\Delta v}{\Delta t} / \frac{\Delta y}{\Delta x} \\ &= \frac{0 - 10 \checkmark}{6 - 2 \checkmark} \\ &= -2,5 \checkmark \\ a &= \underline{2,5 \text{ m}\cdot\text{s}^{-2}} \underline{\text{south/suid}} \checkmark \end{aligned}$$

(4)

- 4.4 Smaller than/*Kleiner as* ✓
- 4.5 Slope of the graph at B-C is steeper than C-D. ✓  
*Die helling van die grafiek is steiler by B-C as by C-D.* (1)
- 4.6 North/*Noord* ✓ (1)
- 4.7 **POSITIVE MARKING FROM QUESTION 4.3.2.**  
**POSITIEWE NASIEN VANAF VRAAG 4.3.2.**  
 $v_f = v_i + a\Delta t$  ✓  
 $v_f = 10 + (-2,5)(5)$  ✓  
 $v_f = -2,5 \text{ m} \cdot \text{s}^{-1}$  ✓  
 $v_f = 2,5 \text{ m} \cdot \text{s}^{-1}$  north/*noord* ✓ (4)  
**[20]**


**QUESTION 5/VRAAG 5**

- 5.1 Mechanical energy ✓  
Meganiese energie (1)

- 5.2  
5.2.1  $E_m = E_k + E_p$  } ✓ Any one/*Enige een*  
 $= \frac{1}{2}mv^2 + mgh$  }  
 $= \frac{1}{2}(2)(1,71)^2 + (2)(9,8)(0,3)$  ✓  
 $= 8,8 \text{ J}$  ✓ (4)

- 5.2.2 **POSITIVE MARKING FROM QUESTION 5.2.**  
**POSITIEWE NASIEN VAN VRAAG 5.2.**  
 $E_{m_A} = E_{m_D}$  } ✓ Any one/*Enige een*  
 $\frac{1}{2}m_A v_A^2 + m_A gh = \frac{1}{2}m_D v_D^2 + m_D gh$  }  
 $0 + (2)(9,8)h = 8,8$  ✓  
 $h = 0,45 \text{ m}$  ✓ (3)

- 5.2.3 **POSITIVE MARKING FROM QUESTION 5.3.**  
**POSITIEWE NASIEN VAN VRAAG 5.3.**  
 $E_{m_A} = E_{m_B}$   
 $0 + (2)(9,8)(0,45) = \frac{1}{2}(2)v^2 + (2)(9,8)(0,05)$  ✓  
 $\therefore v = 2,8 \text{ m} \cdot \text{s}^{-1}$  ✓ (3)

- 5.3  Equal to/*Gelyk aan* ✓  
 The speed is independent of the mass of the object. ✓  
*Die spoed is onafhanklik van die massa van die voorwerp.*
- OR/OF**  
 Speed only depends on the initial height.  
*Spoed hang slegs van die aanvanklike hoogte af.* (2)  
**[13]**

**QUESTION 6/VRAAG 6**

6.1

**Marking guidelines/Nasienriglyne**

If any of the underlined key words/phrases are omitted: minus 1 mark  
*Indien enige van die onderstreepte sleutelwoorde/frases uitgelaat is: minus 1 punt*

The maximum disturbance of a particle from its rest position. ✓✓  
Maksimum versteuring van 'n deeltjie vanaf sy rusposisie.

(2)

6.2

0,5 m ✓

(1)

6.3

T = 8 seconds/sekondes ✓

(1)

6.4

**POSITIVE MARKING FROM QUESTION 6.3.**

**POSITIEWE NASIEN VAN VRAAG 6.3.**

6.4.1

$$f = \frac{1}{T} \checkmark$$

$$= \frac{1}{8} \checkmark$$

$$= 0,125 \text{ Hz}$$

$$v = f\lambda \checkmark \downarrow$$

$$= (0,125)(0,8) \checkmark$$

$$= 0,1 \text{ m} \cdot \text{s}^{-1} \checkmark$$

**Marking guidelines/Nasienriglyne**

- Formula/Formule:  $f = \frac{1}{T} \checkmark$
- Substitute time./Vervang tyd. ✓
- Formula/Formule:  $v = f\lambda \checkmark$
- Substitute f and  $\lambda$ ./Vervang f en  $\lambda$ . ✓
- Final answer/Finale antwoord:  $0,1 \text{ m} \cdot \text{s}^{-1} \checkmark$

(5)

6.4.2

**POSITIVE MARKING FROM QUESTION 6.4.1.**

**POSITIEWE NASIEN VAN VRAAG 6.4.1.**

**OPTION 1/OPSIE 1**

$$\text{Distance/Afstand} = (2\frac{1}{2})(0,8) \checkmark$$

$$= 2 \text{ m} \checkmark$$

**OPTION 2/OPSIE 2**

$$v = \frac{D}{\Delta t} / \text{speed} = \frac{\text{distance}}{\text{time}} / \text{spoed} = \frac{\text{afstand}}{\text{tyd}}$$

$$0,1 = \frac{D}{20} \checkmark$$

$$D = 2 \text{ m} \checkmark$$

(2)

6.5

6.5.1 Greater than/Groter as ✓

(1)

6.5.2 Greater than/Groter as ✓

(1)

6.6

**OPTION 1/OPSIE 1**

$$\begin{aligned} \text{Frequency} &= \frac{\text{vibrations}}{\text{time}} \quad | \quad \text{Frekwensie} = \frac{\text{vibrasies}}{\text{tyd}} \checkmark \\ &= \frac{5}{20} \checkmark \\ &= 0,25 \text{ Hz} \checkmark \end{aligned}$$

**OPTION 2/OPSIE 2**

$$\begin{aligned} f &= \frac{1}{T} \checkmark \\ &= \frac{1}{4} \checkmark \\ &= 0,25 \text{ Hz} \checkmark \end{aligned}$$

(3)  
[16]**QUESTION 7/VRAAG 7**

7.1

**Marking guidelines/Nasienglyne**

If any of the underlined key words/phrases are omitted: minus 1 mark

*Indien enige van die onderstreepte sleutelwoorde/frases uitgelaat is: minus 1 punt*A wave in which the particles of the medium vibrate parallel to the direction of motion of the wave. ✓✓*'n Golf waarin die deeltjies van die medium parallel vibreer met die rigting van beweging van die golf.*

(2)

7.2

**OPTION 1/OPSIE 1**

$$\begin{aligned} v &= \frac{\Delta x}{\Delta t} \checkmark \\ 340 &= \frac{\Delta x}{4} \checkmark \\ \Delta x &= 1360 \text{ m} \checkmark \end{aligned}$$

**OPTION 2/OPSIE 2**

$$\begin{aligned} v &= \frac{\Delta x}{\Delta t} \checkmark \\ 340 &= \frac{\Delta x}{8} \checkmark \\ \Delta x &= 2720 \text{ m} \\ D &= 2720 \div 2 \\ &= 1360 \text{ m} \checkmark \end{aligned}$$

**Marking guidelines/Nasienglyne**

- Formula/Formule:  $v = \frac{\Delta x}{\Delta t}$  ✓
- Substitute/Vervang  $340 \text{ m}\cdot\text{s}^{-1}$ . ✓
- Divide time or final distance by 2/Deel tyd of finale afstand deur 2. ✓
- Final answer/Finale antwoord: 1 360 m ✓

(4)

7.3 Frequency/Frekwensie ✓

(1)

7.4 20 kHz ✓

(1)

7.5 Diagnosis of medical condition/pregnancy. ✓  
*Diagnose van medies toestand/swangerskap.*(1)  
[9]



### QUESTION 8/VRAAG 8

8.1 An oscillating electric field in one plane produces an (oscillating) magnetic field ✓ at right angles/perpendicular to it. ✓  
'n Ossilerende elektriese veld in een vlak produseer 'n (ossilerende) magneetveld wat loodreg daarop is. (2)

8.2 The higher the frequency, the higher the energy of the wave. ✓✓  
Hoe hoër die frekwensie, hoe hoër is die energie van die golf.

**OR/OF**

Frequency is directly proportional to energy.  
Frekwensie is direk eweredig aan energie. (2)


8.3

8.3.1  $E = hf$  ✓  
 $4,97 \times 10^{-14} = 6,67 \times 10^{-34} f$  ✓  
 $f = 7,5 \times 10^{19} \text{ Hz}$  ✓ (3)

8.3.2

<u>OPTION 1/OPSIE 1</u>	<u>OPTION 2/OPSIE 2</u>
$c = f\lambda$ ✓ $3 \times 10^8 = (1,8 \times 10^{18})\lambda$ ✓ $\lambda = 1,67 \times 10^{-10} \text{ m}$ ✓	$E = \frac{hc}{\lambda}$ ✓ $1,19 \times 10^{-15} = \frac{(6,63 \times 10^{-34})(3 \times 10^8)}{\lambda}$ ✓ $\lambda = 1,67 \times 10^{-10} \text{ m}$ ✓

(3)

8.4  B ✓  
Highest frequency/energy ✓  
Hoogste frekwensie/energie.

(2)

[12]

**QUESTION 9/VRAAG 9**

9.1

Materials that are strongly attracted by magnets ✓ and are easily magnetised. ✓

*Materiale wat baie sterk aangetrek word deur magnete en wat maklik magnetiseer.*

(2)

9.2

South/Suid ✓

(1)

9.3

(Position) 1/Posisie 1 ✓

Magnetic field is strongest at the poles of a magnet. ✓

*Magneetveld is die sterkste by die pole van magneet.*

(2)

9.4

North to South ✓

Noord na Suid

(1)

9.5

9.5.1

Geographic north pole ✓

Geografiese noordpool

(1)

9.5.2

Magnetic north pole ✓

Magnetiese noordpool

(1)

9.6

Protection from solar winds. ✓

Beskerming teen sonwinde.

(1)

**[9]****QUESTION 10/VRAAG 10**

10.1

$$Q = nq_e \checkmark$$

$$3 \times 10^{-6} = n(1,6 \times 10^{-19}) \checkmark$$

$$n = 1,88 \times 10^{13} \checkmark$$

(3)

10.2

$$Q = \frac{Q_P + Q_Q}{2} \checkmark$$

$$-1 \times 10^{-6} = \frac{(-3 \times 10^{-6}) + Q_Q}{2} \checkmark$$

$$Q_Q = 1 \times 10^{-6} \text{ C} \checkmark$$

(3)

10.3

P to/na Q ✓

(1)

**[7]**

**QUESTION 11/VRAAG 11**

- 11.1 A charge of 5 C ✓ flows (past a point) in one second/per second. ✓  
'n Lading van 5 C vloei verby 'n punt in een sekonde/per sekonde. (2)
- 11.2  $\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2}$  ✓  
 $\frac{1}{R_p} = \frac{1}{4} + \frac{1}{6}$  ✓  
 $R_p = 2,4 \Omega$  ✓ (3)
- 11.3  $V_1$  ✓ (1)
- 11.4  $V_2$  is smaller than/ *kleiner as*  $V_1$ . ✓ (1)
- 11.5  $Q = I\Delta t$  ✓  
 $0,3 = I(2)$  ✓  
 $I = 0,15 \text{ A}$  ✓ (3)
- 11.6  $V = \frac{W}{Q}$  ✓  
 $5 = \frac{W}{0,3}$  ✓  
 $W = 1,5 \text{ J}$  (3)

**[13]****TOTAL/TOTAAL: 150**