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# basic education

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 2018**

**MARKING GUIDELINES/NASIENRIGLYNE**

**MARKS/PUNTE: 150**

**These marking guidelines consist of 12 pages.  
*Hierdie nasienriglyne bestaan uit 12 bladsye.***

## QUESTION 1/VRAAG 1

- 1.1 C✓✓
- 1.2 C✓✓
- 1.3 A✓✓
- 1.4 A✓✓
- 1.5 C✓✓
- 1.6 A✓✓
- 1.7 B✓✓
- 1.8 B✓✓
- 1.9 C✓✓
- 1.10 C/B✓✓

[20]

## QUESTION 2/VRAAG 2

- 2.1 The difference in position (in space). ✓✓/Die verskil in posisie in ruimte.

### OR/OF

The change in position (of an object.)✓✓/Die verandering in posisie van 'n voorwerp.

(2)

- 2.2 12 m ✓west/wes✓ or/of -12 m ✓✓

### IF/INDIEN

– 12 m West/Wes

(Award 1 mark only/Ken 1 punt toe)

### Accept/Aanvaar

12 m✓ left/links ✓

(2)

- 2.3 
$$v = \frac{\Delta x}{\Delta t}$$
$$= \frac{5}{30} \checkmark$$
$$= 0,17 \text{ m} \cdot \text{s}^{-1} \checkmark \text{ west/wes } \checkmark$$

### Accept/Aanvaar

0,17 m·s<sup>-1</sup>✓ left/links ✓

(4)

2.4 **POSITIVE MARKING FROM 2.2 and 2.3/POSITIEWE NASIEN VANAF 2.2.en2.3**

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

$$(0,17)(2) \checkmark = 0,34 \text{ m} \cdot \text{s}^{-1}$$

$$0,34 \checkmark = \frac{12}{\Delta t} \checkmark$$

$$\Delta t = 35,29 \text{ s} \checkmark$$

(4)  
[12]

**QUESTION 3/VRAAG 3**

3.1 **Motion with uniform velocity:** Motion at constant velocity. ✓✓/ Motion with zero or no acceleration.

**Beweging met uniforme snelheid:** Beweging teen konstante snelheid./ Beweging met nul of geen versnelling.

**Uniform accelerated motion:** Motion with constant acceleration. ✓✓/ Velocity changes with the same amount during each time interval. ✓✓/ Motion during which the velocity changes with a constant amount per unit time. ✓✓/

**Uniforme versnelde beweging:** Beweging met konstante versnelling/ Snelheid verander met dieselfde hoeveelheid gedurende elke tydinterval/ Beweging waartydens die snelheid met 'n konstante hoeveelheid per eenheid tyd verander.

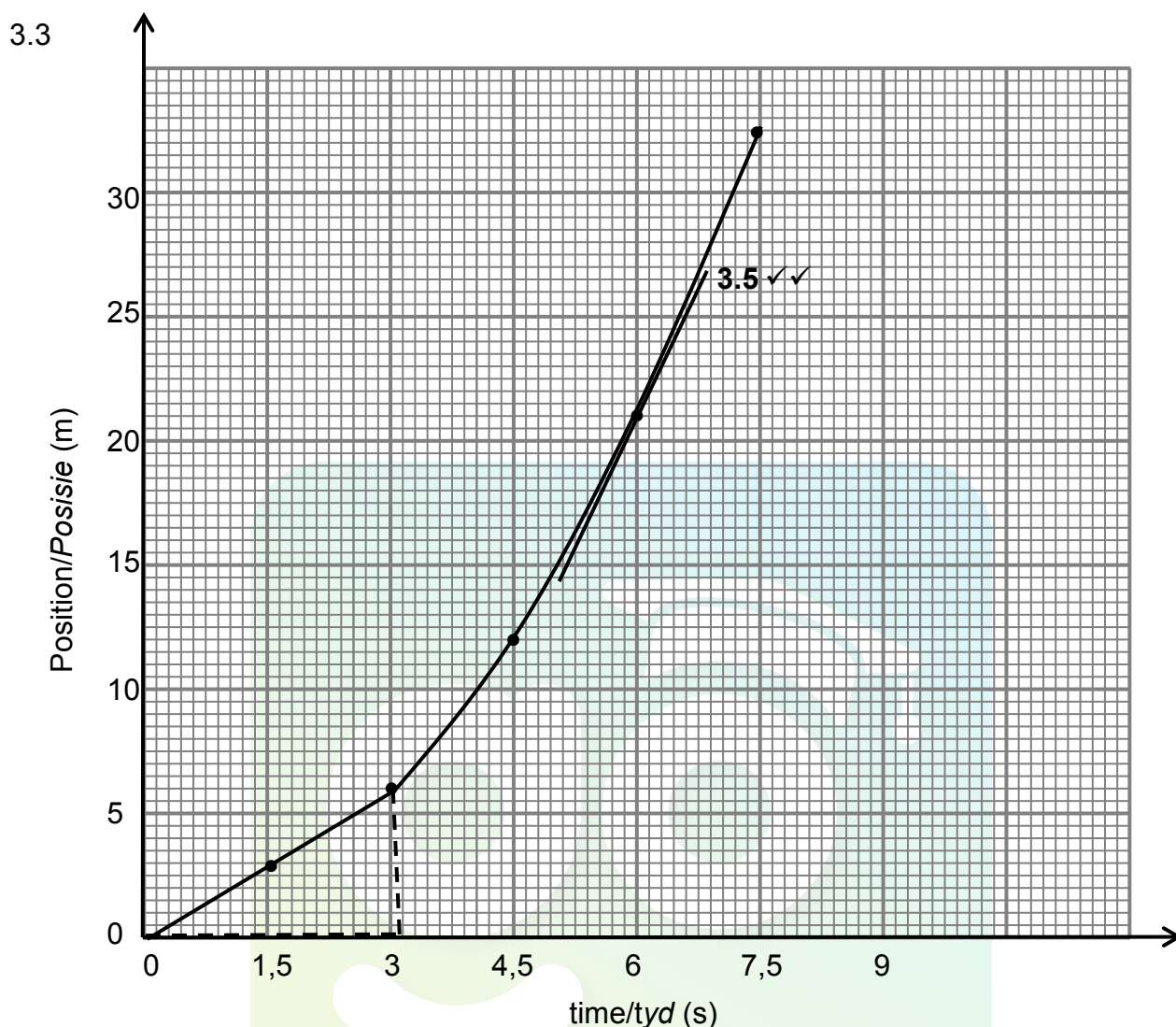
(4)

3.2.1 Motion with uniform velocity ✓/ Beweging met uniforme snelheid

(1)

3.2.2 Uniform accelerated motion ✓/ Uniforme versnelde beweging

(1)



### MARKING GUIDELINES/NASIENRIGLYNE

- ✓ x-axis and units correctly labelled/x-as en eenhede korrek gemerk
- ✓ y-axis and units correctly labelled/y-as en eenhede korrek gemerk
- ✓ 2 points correctly plotted and joined/2 punte korrek gestip en verbind
- ✓ shape of the graph (0 – 3 s/vorm van die grafiek(0 – 3s) / straight line/reguitlyn
- ✓ shape of graph 3 – 7,5 s curved / vorm van grafiek 3 – 7,5 s kurwe / tangent /raaklyn

(5)

- 3.4 Instantaneous velocity: rate of change in position. ✓✓/Oombliklike snelheid: tempo van verandering in posisie.

**OR/OF**

Displacement divided by a very small time interval. ✓✓/Verplasing gedeel deur 'n baie klein tydinterval.

**OR/OF**

Velocity at a particular time. ✓✓/Snelheid op 'n spesifieke tyd.

(2)

- 3.5 Refer to the graph./Verwys na die grafiek.  
(Tangent to the curve/ Raaklyn aan kurwe)

(2)

3.6

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

$$= \frac{6-0}{3-0} \checkmark$$

$$= 2 \text{ m} \cdot \text{s}^{-1} \checkmark \quad \text{right/regs} \checkmark$$

(4)

**[19]**

**QUESTION 4/VRAAG 4**

- 4.1 The rate of change of velocity. ✓✓/Die tempo van verandering van snelheid.

(2)

4.2.1

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

$$0 \checkmark = 15 + (-4,5)\Delta t \checkmark$$

$$\Delta t = 3,33 \text{ s} \checkmark$$

**OR/OF**

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

$$0 \checkmark = -15 + (4,5)\Delta t \checkmark$$

$$\Delta t = 3,33 \text{ s} \checkmark$$

(4)

4.2.2

**OPTION 1/OPSIE 1**

$$v_f^2 = v_i^2 + 2a\Delta x \checkmark$$

$$0^2 \checkmark = 15^2 + 2(-4,5)\Delta x \checkmark$$

$$\Delta x = 25 \text{ m} \checkmark$$

**OPTION 2/OPSIE 2**

**POSITIVE MARKING FROM 4.2.1/POSITIEWE NASIEN VANAF 4.2.1**

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

$$= \left( \frac{0 + 15}{2} \right) (3,33) \checkmark$$

$$= 24,98 \text{ m} \checkmark$$

**OPTION 3/OPSIE 3**

**POSITIVE MARKING FROM 4.2.1/POSITIEWE NASIEN VANAF 4.2.1**

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

$$= (15)(3,33) \checkmark + \frac{1}{2} (-4,5)(3,33)^2 \checkmark$$

$$\Delta x = 25 \text{ m} \checkmark$$

(4)

4.3 **OPTION 1/OPSIE 1**

$$v_f^2 = v_i^2 + 2a\Delta x \checkmark$$

$$0^2 \checkmark = 30^2 + 2(-4,5)\Delta x \checkmark$$

$$\Delta x = 100 \text{ m} \checkmark$$

Car B  $\checkmark$  has a larger stopping distance ( $100 \text{ m} > 25 \text{ m}$ )  $\checkmark$  / Kar B het 'n groter stopafstand ( $100 \text{ m} > 25 \text{ m}$ ).

**OPTION 2/OPSIE 2**

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

$$0 \checkmark = 30 + (-4,5)\Delta t \checkmark$$

$$\Delta t = 6,67 \text{ s} \checkmark$$

Car B  $\checkmark$  it takes longer to stop hence larger stopping distance  $\checkmark$  / Kar B dit neem langer om tot stilstand te kom dus 'n groter stopafstand

**IF/INDIEN**

Car B  $\checkmark$  it has a higher velocity than car A and therefore have a larger stopping distance at the same acceleration  $\checkmark$  Max: (2/6)

Kar B dit het 'n hoër snelheid as kar A en het dus 'n groter stopafstand met dieselfde versnelling Maks: (2/6)

(6)

- 4.4 The greater/larger the speed, the larger the stopping distance  $\checkmark$  if acceleration is constant.  $\checkmark$  / Hoe groter die speed, hoe groter die stopafstand indien versnelling konstant is.

(2)  
[18]**QUESTION 5/VRAAG 5**

- 5.1 The energy an object has because of its position in the gravitational field  $\checkmark$  relative to some reference point.  $\checkmark$  / Die energie wat 'n voorwerp het as gevolg van die posisie daarvan in die gravitasieveld relatief tot 'n sekere verwysingspunt.

(2)

- 5.2  $E_p = mgh \checkmark$   
 $= (65)(9,8)(4,5) \checkmark$   
 $= 2\,866,5 \text{ J} \checkmark$

(3)

- 5.3 The net/total mechanical energy (sum of kinetic and gravitational potential energy) in an isolated/closed system  $\checkmark$  remains constant/ is conserved  $\checkmark$  / Die netto/totale meganiese energie in 'n geïsoleerde/geslote sisteem bly konstant/bly konstant.

(2)

- 5.4 
$$\left. \begin{aligned} (E_p + E_k)_{\text{top/bo}} &= (E_p + E_k)_{\text{bottom/onder}} \\ mgh + 0 &= mgh + \frac{1}{2}mv^2 \end{aligned} \right\} \checkmark$$

$$(65)(9,8)(4,5) \checkmark = 0 + \frac{1}{2}(65)v^2 \checkmark$$

$$v = 9,39 \text{ m}\cdot\text{s}^{-1} \checkmark$$

**OR/OF**

$$\left. \begin{aligned} (E_p + E_k)_{\text{top/bo}} &= (E_p + E_k)_{\text{bottom/onder}} \\ mgh + 0 &= mgh + \frac{1}{2}mv^2 \end{aligned} \right\} \checkmark$$

$$2\,866,5 \checkmark = 0 + \frac{1}{2}(65)v^2 \checkmark$$

$$v = 9,39 \text{ m}\cdot\text{s}^{-1} \checkmark$$

(4)



5.5

**OPTION 1/OPSIE 1**

$$\begin{aligned} (E_p + E_k)_{\text{top/bo}} &= (E_p + E_k)_{\text{bottom/onder}} \\ mgh + 0 &= mgh + \frac{1}{2}mv^2 \\ (65)(9,8)h &+ 0 = 0 + \frac{1}{2} \times 65 \times (9,39)^2 \\ 637h &= 2\,865,6 \\ h &= 4,49 \text{ m} \end{aligned}$$

No✓/Nee.  $h = 4,49 \text{ m} < 6 \text{ m}$ ✓

**OPTION 2/OPSIE 2**

$$\begin{aligned} E_{p \text{ at } Y} &= mgh \\ &= (65)(9,8)(6) \\ &= 3\,822 \text{ J} \end{aligned}$$

$E_{\text{mech}} < E_{p \text{ at } Y}$  ✓ therefore he will not reach point Y ✓ /  $E_{\text{meg}} < E_{p \text{ by } Y}$  daarom sal hy nie punt Y bereik nie

(5)  
[16]

**QUESTION 6/VRAAG 6**

6.1

Difference/Verskil	Similarity/Ooreenkoms
Amplitudes✓	Wavelength✓/Golflengte Period/Tydperk Frequency/Frekwensie Transverse/Transversaal (Any one)/(Enige een)

(2)

6.2.1 A and/en B✓

**OR/OF**

C and/en D✓

**OR/OF**

B and/en C

**OR/OF**

A and/en D

(1)

6.2.2 15 (mm) ✓

(1)

6.3 The number of waves/wave pulses✓ passing a point per second.✓ / Die getal golwe/golfpulse wat per sekonde by 'n punt verby beweeg.

(2)

6.4.1

$$\begin{aligned} f &= \frac{1}{T} \\ &= \frac{1}{1,5} \\ &= 0,67 \text{ Hz} \end{aligned}$$

(3)



6.4.2

**POSITIVE MARKING FROM 6.4.1**  
**POSITIEWE NASIEN VANAF 6.1**  
**OPTION 1/OPSIE 1**

$$v = f\lambda \checkmark$$

$$= (0,67)(0,1) \checkmark$$

$$= 0,067 \text{ m}\cdot\text{s}^{-1} \checkmark$$

**OPTION 2/OPSIE 2**

$$v = \frac{\Delta x}{\Delta t} \text{ or/of speed} = \frac{\text{distance}}{\text{time}} \checkmark$$

$$= \frac{0,1}{1,5} \checkmark$$

$$= 0,067 \text{ m}\cdot\text{s}^{-1}$$

(3)  
[12]

## QUESTION 7/VRAAG 7

7.1.1 What is the relationship between the speed of sound and temperature? ✓✓/  
*Wat is die verband tussen die spoed van klank en temperatuur?*

**OR/OF**

How will the temperature affect the speed of sound? ✓✓/*Hoe sal die temperatuur die spoed van klank beïnvloed?*

**OR/OF**

What is the relationship between the time taken for the sound to travel and temperature? ✓✓/*Wat is die verband tussen die spoed van klank en temperatuur?*

(2)

**Marking criteria/Nasienriglyne:**

Dependent and independent variables correctly identified.

*Afhanklike en onafhanklike veranderlikes korrek geïdentifiseer.*

Ask a question about the relationship between the independent and dependent variables./*Vra 'n vraag oor die verwantskap tussen die afhanklike en onafhanklike veranderlikes.*

7.1.2 Temperature ✓/*Temperatuur*

(1)

7.1.3 Speed of sound ✓/Time taken for the sound to travel./*Spoed van klank/Tyd geneem vir die klank om te beweeg.*

(1)

7.2

$$v = \frac{\Delta x}{\Delta t} \text{ or/of speed} = \frac{\text{distance}}{\text{time}} \checkmark$$

$$= \frac{50}{0,146} \checkmark$$

$$= 342,47 \text{ m}\cdot\text{s}^{-1} \checkmark$$

(3)

7.3 The speed of sound increases / time taken for the sound to travel decreases / as the temperature increases. ✓✓/*Die spoed van klank neem toe / tyd geneem vir die klank om te beweeg neem af soos die temperatuur toeneem.*

(2)

7.4 Echo ✓/*Eggo*

(1)  
[10]

## QUESTION 8/VRAAG 8

8.1 Accelerating charges ✓/*Versnelde ladings*

(1)

8.2 Gamma rays ✓/*Gammastrale*

(1)

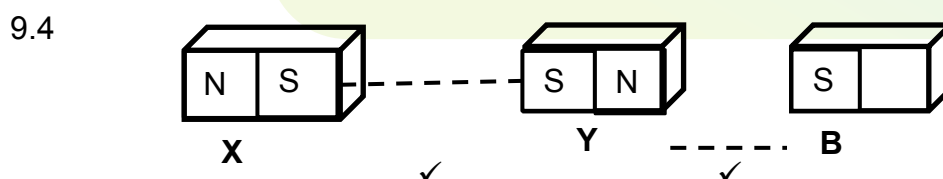
- 8.3 It has the highest frequency ✓ Energy is directly proportional to frequency ✓ /  
 $E \propto f$  /  
*Dit het die hoogste frekwensie. Energie is direk eweredig aan die frekwensie/*  
 $E \propto f$  (2)

- 8.4.1
- | <u>OPTION 1/OPSIE 1</u>   | <u>OPTION 2/OPSIE 2</u>  |
|---|--|
| $c = f\lambda$ ✓<br>$3 \times 10^8 = f(600 \times 10^{-10})$ ✓<br>$f = 5 \times 10^{15} \text{ Hz}$ ✓<br>Ultraviolet ✓ / <i>Ultraviolet</i> | $E = \frac{hc}{\lambda}$<br>$= \frac{(6,63 \times 10^{-34})(3 \times 10^8)}{600 \times 10^{-10}}$ ✓<br>$= 3,315 \times 10^{-18} \text{ J}$<br>$E = hf$<br>$3,315 \times 10^{-18} = (6,63 \times 10^{-34})f$<br>$f = 5 \times 10^{15} \text{ Hz}$ ✓<br>Ultraviolet ✓ / <i>Ultraviolet</i> |
- (4)

- 8.4.2 **POSITIVE MARKING FROM 8.4.1/POSITIEWE NASIEN VANAF 8.4.1**  
 Sterilisation of medical equipment. ✓ / *Sterilisasie van mediese toerusting*  
 Suntan beds / *Sonbeddens*  
 Security in currency / *Veiligheid in valuta*  
 Astronomy / *Astronomie*  
**(Any one/Any relevant use/Enige een/Enige relevante gebruik)** (1)  
**[9]**

## QUESTION 9/VRAAG 9

- 9.1 Ferromagnetic (material) ✓ / *Ferromagneties (materiaal)* (1)
- 9.2 B ✓ (1)
- 9.3 South ✓ / *Suid* (1)

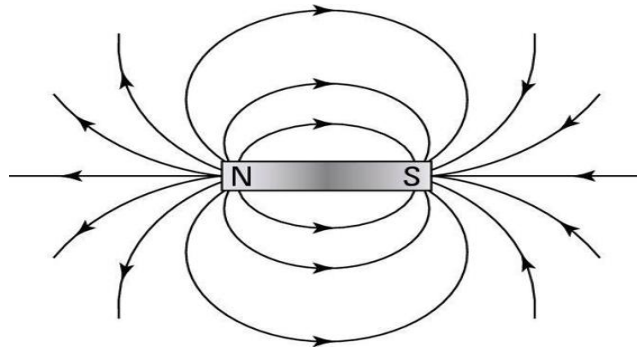


**OR/OF**

Magnets X repels Y/ South pole ✓ / *Magneet X stoot Y af / Suidpool*

Magnet Y attracts B/ South pole at B ✓ / *Magneet Y trek B aan / Suidpool by B* (2)

9.5



Marking criteria/Nasienkriteria	
Correct direction of field lines/Korrekte rigting van veldlyne	✓
Shape of the magnetic field/Vorm van die magneetveld	✓
No field lines crossing each other/Geen veldlyne kruis mekaar nie.	✓

(3)

9.6.1 Less than 5 cm ✓/ Minder as 5 cm

(1)

9.6.2 Magnitude of magnetic force is inversely proportional to the distance. ✓ B, is no longer attracting Y to the right ✓  
 Grootte van magnetiese krag is omgekeerd eweredig aan die afstand. B, trek nie meer Y na regs aan nie

**OR/OF**

A decrease in distance increases the magnetic force. ✓ B, is no longer attracting Y to the right ✓  
 'n Afname in afstand laat die magnetiese krag toeneem, B, trek nie meer Y na regs aan nie

(2)  
**[11]**

**QUESTION 10/VRAAG 10**

10.1  $n = \frac{Q}{e}$  ✓ or/of  $\frac{Q}{q_e}$   
 $30 = \frac{Q}{-1,6 \times 10^{-19}}$  ✓  
 $Q = -4,8 \times 10^{-18} \text{ C}$  ✓

**Accept/Aanvaar**

$n = \frac{Q}{e}$  ✓ or/of  $\frac{Q}{q_e}$   
 $30 = \frac{Q}{1,6 \times 10^{-19}}$  ✓  
 $Q = 4,8 \times 10^{-18} \text{ C}$  ✓

(3)

10.2 Unlike/opposite charges ✓ attract ✓ / Ongelyksoortige/teenoorgestelde ladings trek mekaar aan.

(2)

- 10.3 The net/total charge in an isolated/closed system remains constant/is conserved ✓✓ Die netto/totale lading in 'n geïsoleerde/geslote sisteem bly konstant. (2)

**NOTE/LET WEL:**

If any of the underlined words/phrases are omitted in the correct context: minus 1 mark.)

Indien enige van die onderstreepte woorde/frases in die korrekte konteks weggelaat is: minus een punt.)

- 10.4 **POSITIVE MARKING FROM 10.1/POSITIEWE NASIEN VANAF 10.1**

$$\begin{aligned} Q_{\text{net/netto}} &= \frac{Q_1 + Q_2}{2} \checkmark \\ &= \frac{4 \times 10^{-18} + (-4,8 \times 10^{-18})}{2} \checkmark \\ &= -4 \times 10^{-19} \text{ C } \checkmark \end{aligned}$$

(4)  
[11]

**QUESTION 11/VRAAG 11**

- 11.1.1 (a)  $V_1 = 24 \text{ (V)}$  ✓ (1)

- (b)  $A_1 = 0 \text{ (A)}$  ✓ (1)

11.1.2	<p><b>OPTION 1/OPSIE 1</b></p> $\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} \checkmark$ $= \frac{1}{8} + \frac{1}{8} \checkmark$ $R_p = 4 \Omega$ $R_T = R_s + R_p$ $= 8 + 4 \checkmark$ $= 12 \Omega \checkmark$	<p><b>OPTION 2/OPSIE 2</b></p> $R_p = \frac{\text{product / produk}}{\text{sum / som}} \checkmark$ $= \frac{(8)(8)}{8 + 8} \checkmark$ $= 4 \Omega$ $R_T = R_s + R_p$ $= 8 + 4 \checkmark$ $= 12 \Omega \checkmark$	(4)
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11.1.3

**OPTION 1/OPSIE 1**

V divides in a ratio 8 : 4 ✓ (series)/V verdeel in 'n verhouding 8 : 4 (serie)

$$V_2 = \frac{8}{12} \times 24 \checkmark \text{ or/of } V_2 = \frac{2}{3} \times 24 \\ = 16 \text{ V } \checkmark$$

**OPTION2 / OPSIE 2**

**POSITIVE MARKING FROM 11.1.2/POSITIEWE NASIEN VANAF 11.2.1**

$$V = IR$$

$$24 = I(12)$$

$$I = 2 \text{ A}$$

$$V = IR \checkmark \\ = (2)(8) \checkmark \\ = 16 \text{ V } \checkmark$$

(3)

11.1.4  $A_2 = A_3 \cdot \checkmark$

(1)

11.2.1 Resistance is directly proportional to the length of the conducting wire. ✓/  
*Weerstand is direk eweredig aan die lengte van die geleidingsdraad.*

**OR/OF**

As the length of the wire increases, the resistance increases./Soos die lengte van die geleidingsdraad toeneem, neem die weerstand toe

(1)

11.2.2  $1,35 \Omega \checkmark$  (Range/Variasiewydte:  $1,3 \Omega$  to/tot  $1,4 \Omega$ )

(1)

**[12]**

**TOTAL/TOTAAL: 150**