



# 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 2017**

**MARKING GUIDELINES/NASIENRIGLYNE**

**MARKS/PUNTE: 150**

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

**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**

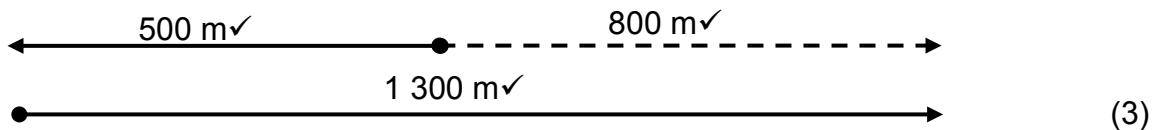
- 2.1 The total distance travelled per total time ✓✓  
Die totale afstand beweeg per totale tyd. ✓✓

**OR/OF**

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

2.2 Average speed/Gemiddelde spoed =  $\frac{\text{distance travelled/afstand}}{\text{time taken/tyd}}$  ✓  
$$= \frac{(500 + 800)}{(30 \times 60)} \checkmark \checkmark$$
$$= 0,72 \text{m}\cdot\text{s}^{-1} \checkmark$$
 (4)

2.3	<b>MARK ALLOCATION:</b>	<b>PUNTETOEKENNING:</b>
	✓ 1 x line, arrow and 500 m	✓ 1 x Lyn, pyl en 500 m
	✓ 1 x line, arrow and 800 m	✓ 1 x Lyn, pyl en 800 m
	✓ 1 x line, arrow and 1 300 m	✓ 1 x Lyn, pyl en 1 300 m



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

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

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

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

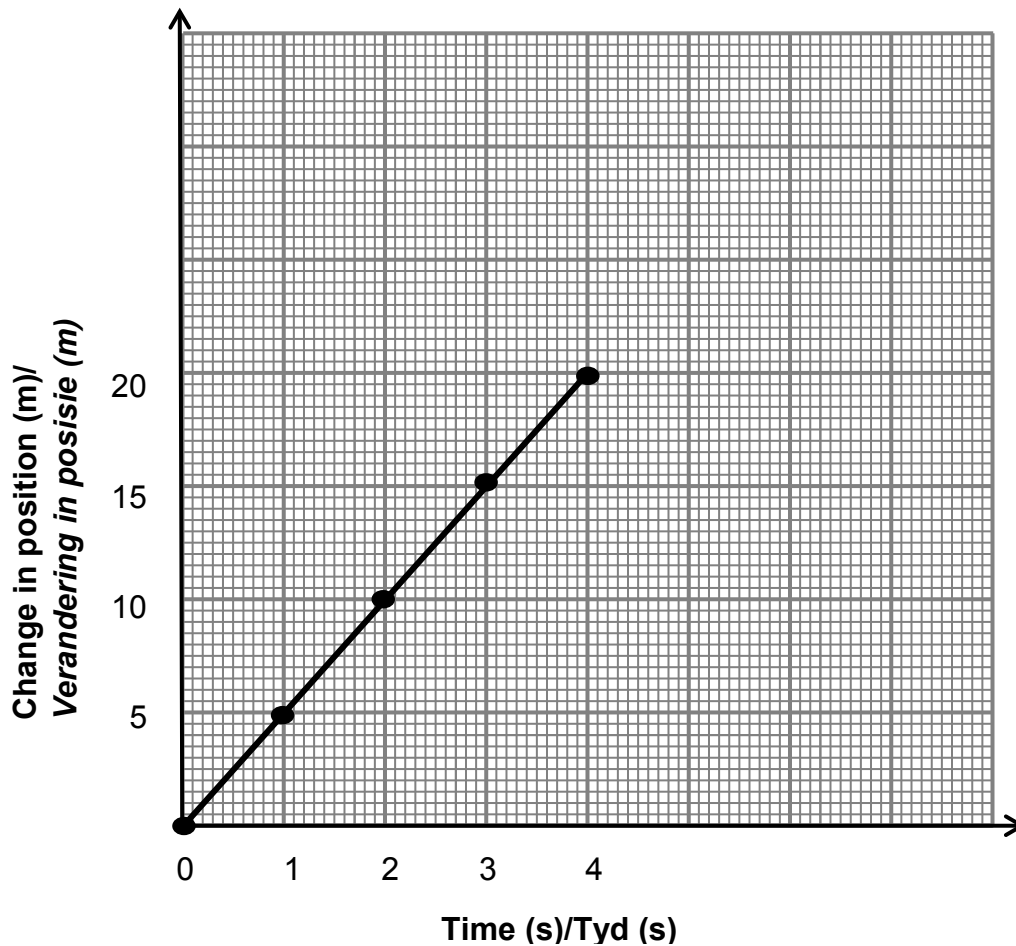
**QUESTION/VRAAG 3**

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

3.2.1 Time ✓/Tyd ✓ (1)

3.2.2 Position ✓/Posisie ✓ (1)

3.3



**MARK ALLOCATION:**

- ✓ 1 x correct y-axis label and unit
- ✓ 1 x correct x-axis label and unit
- ✓✓ 2 x points plotted and joined
- ✓ 1 x shape of graph

**PUNTETOEKENING:**

- ✓ 1 x y-as benoem en eenheid
- ✓ 1 x x-as benoem en eenheid
- ✓✓ 2 x punte geplot en verbind
- ✓ 1 x vorm van grafiek

(5)

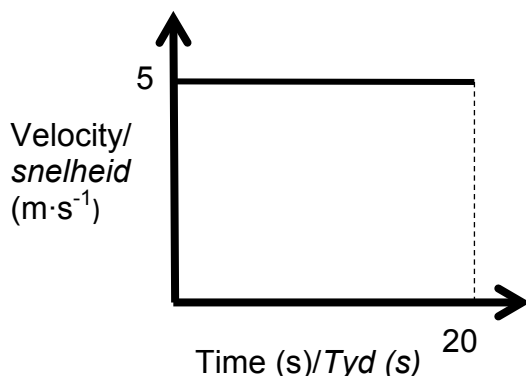
3.4 Gradient/Helling =  $\frac{\Delta y}{\Delta x}$  ✓

$$= \frac{20 - 5}{4 - 1} \checkmark$$

$$= 5 \text{ m} \cdot \text{s}^{-1} \checkmark$$

(4)

3.5



(2)

3.6 The car has zero acceleration ✓ as its velocity is constant. ✓

*Die motor het geen versnelling ✓ 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  $\Delta x = v_i \Delta t + \frac{1}{2} a \Delta t^2$  ✓

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

$\Delta x = 30 \text{ m}$  ✓

(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
$v_f^2 = v_i^2 + 2a\Delta x$ ✓ $v_f^2 = 0^2 + 2(15)(30)$ ✓ $v_f = 30 \text{ m} \cdot \text{s}^{-1}$ to the right ✓ / regs	$v_f = v_i + a\Delta t$ $= 0 + 15 \times 2$ ✓ $v_f = 30 \text{ m} \cdot \text{s}^{-1}$ 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.*

**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.* ✓✓

(2)

4.4 Convert  $90 \text{ km}\cdot\text{h}^{-1}$  into  $\text{m}\cdot\text{s}^{-1}$ /Skakel  $90 \text{ km}\cdot\text{h}^{-1}$  om na  $\text{m}\cdot\text{s}^{-1}$

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

**OPTION 1/OPSIE 1:**

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

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

$$\Delta x = 50 \text{ m} \checkmark$$

**OPTION 2/OPSIE 2:**

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

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

$$\Delta x = 50 \text{ m} \checkmark$$

(6)

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

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

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

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

$$30 = (5) (t)$$

$$t = 6 \text{ s}$$

Motor moet 30 m ( $80 - 50$ ) teen  $5 \text{ m}\cdot\text{s}^{-1}$  ry om 2 sekonde-afstand agter trok te wees. Daarom: afstand = (v) (t)

$$30 = (5) (t)$$

$$t = 6 \text{ s}$$

(5)  
[21]

**QUESTION/VRAAG 5**

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

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

5.3 The sum of the gravitational potential energy and kinetic energy  $\checkmark$  in an isolated system is constant.  $\checkmark$   
*Die som van die gravitasie-potensiële energie en kinetiese energie  $\checkmark$  in 'n geïsoleerde/geslote stelsel bly behoue/konstant.*  $\checkmark$

**OR/OF**

The total mechanical energy of an isolated system remains constant.  $\checkmark \checkmark$   
*Die totale energie in 'n geïsoleerde/geslote stelsel bly behoue/konstant.*  $\checkmark \checkmark$  (2)

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

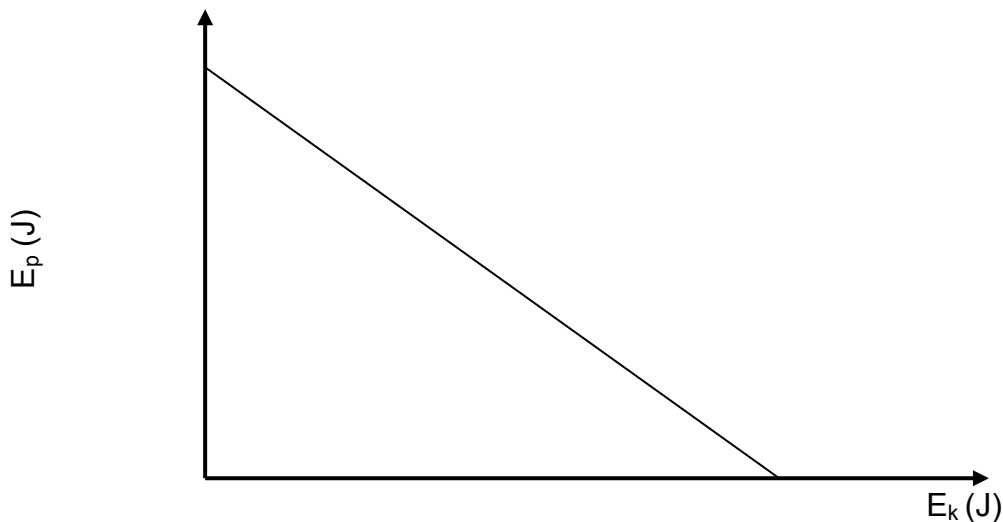
$$\left. \begin{aligned} (E_p + E_k)_{top/bo} &= (E_p + E_k)_{bottom/onder} \\ mgh + 0 &= mgh + \frac{1}{2}mv^2 \end{aligned} \right\} \checkmark$$

$$70\,560 \checkmark = \underline{(72)(9,8)(50)} \checkmark + \underline{\frac{1}{2} \times 72 \times v^2} \checkmark$$

$$v = 31,3 \text{ m}\cdot\text{s}^{-1} \checkmark$$

(5)

5.5



Marking criteria for graph <i>Nasienkriteria vir grafiek</i>	
Axes with correct/appropriate labels <i>Asse met korrekte/toepaslike byskrifte</i>	✓
Straight line with decreasing slope <i>Reguitlyn met afnemende helling</i>	✓✓

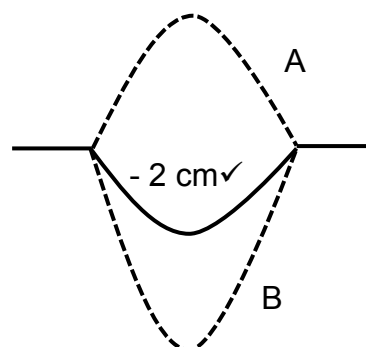
(3)  
[15]

**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. ✓✓  
*Superposisie van pulse. ✓ Die algebraïese som van die amplitudes van twee pulse wat in dieselfde ruimte op dieselfde tyd is. ✓*

(3)

6.2



(Both A and B/Beide A en B ✓)

(2)

- 6.3 Destructive (interference)✓/Destruktiewe (interferensie) ✓ (1)
- 6.4 Amplitude = (+4) + (-6)  
= - 2 cm✓✓  
(Marks/Punte: 2 or/of 0) (2)
- 6.5 REMAIN 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  $\lambda$  ✓  
 $\therefore \lambda = 0,011 \text{ m}$  ✓ (4)
- 7.3 
$$\text{Speed/Spoed} = \frac{\text{distance/afstand}}{\text{time/tyd}} \checkmark$$
$$1\,480 \checkmark = \frac{\text{distance/afstand}}{2} \checkmark$$
  
 $\therefore \text{distance/afstand} = 2\,960 \text{ m}$  ✓ (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 water, omdat lug minder dig ✓ is/deeltjies is verder van mekaar af.*
  - 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)

<p><b><u>OPTION 1/OPSIE 1:</u></b></p> $c = f \times \lambda$ $3 \times 10^8 \checkmark = f \times 650 \times 10^{-9} \checkmark$ $\therefore f = 4,615 \times 10^{14} \text{ Hz}$ $E = hf \checkmark$ $= 6,63 \times 10^{-34} \checkmark \times 4,615 \times 10^{14} \checkmark$ $= 3,06 \times 10^{-19} \text{ J} \checkmark$	<p><b><u>OPTION 2/OPSIE 2:</u></b></p> $E = \frac{hc}{\lambda} \checkmark \checkmark$ $E = \frac{6,63 \times 10^{-34} \checkmark \times 3 \times 10^8 \checkmark}{650 \times 10^{-9} \checkmark}$ $E = 3,06 \times 10^{-19} \text{ J} \checkmark$
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(6)

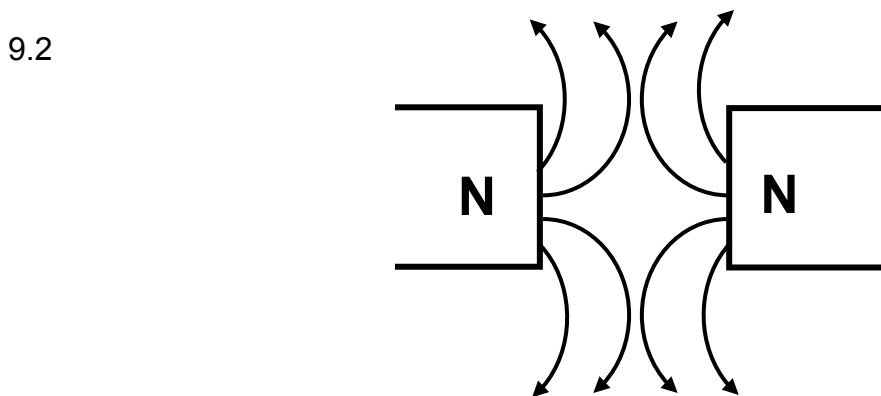
8.2.3

- Laser light has high intensity and can penetrate soft tissues of humans ✓  
*Laserlig het 'n hoër deudringingsvermoë* ✓ *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: an area or 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 krag sal ondervind.* ✓✓ (2)



<p><b><u>MARK ALLOCATION:</u></b></p> <ul style="list-style-type: none"> <li>✓ 1 x two north poles facing</li> <li>✓ 1 x curved magnetic lines</li> <li>✓ 1 x field direction away from north</li> </ul>	<p><b><u>PUNTETOEKENNING:</u></b></p> <ul style="list-style-type: none"> <li>✓ 1 x twee aangrensende N-pole</li> <li>✓ 1 x magneetveldlyne</li> <li>✓ 1 x rigting weg van die N-pool</li> </ul>
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(3)

- 9.3.1 Magnetic force is inversely proportional ✓ to 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 Added to ✓/Bygevoeg ✓ (1)
- 10.3  $n = \frac{Q}{e}$  ✓  
 $n = \frac{3 \times 10^{-6}}{1,6 \times 10^{-19}}$  ✓  
 $= 1,88 \times 10^{13}$  ✓ (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 charge by the source (battery) ✓✓  
*Die arbeid verrig per eenheidslading deur die bron (battery) ✓✓* (2)

11.2 
$$\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2}$$
$$= \frac{1}{3} + \frac{1}{3} \checkmark$$
$$= \frac{2}{3} + \frac{2}{3}$$
$$= \frac{4}{3}$$
$$\therefore R_p = \frac{3}{4} = 0,75\Omega \checkmark$$
 (2)

11.3.1 1,5A✓ (1)

11.3.2  $V = IR \checkmark$   
 $V = 1,5(2) \checkmark$   
 $V = 3V \checkmark$  (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  $R \propto \frac{1}{I}$ , if R decreases, ∴ V is constant and I of the circuit increases✓  
*Aangesien  $R \propto \frac{1}{I}$ , indien R afneem en V konstant bly, sal I van die stroombaan toeneem. ✓*

(3)  
[11]

**TOTAL/TOTAAL: 150**