

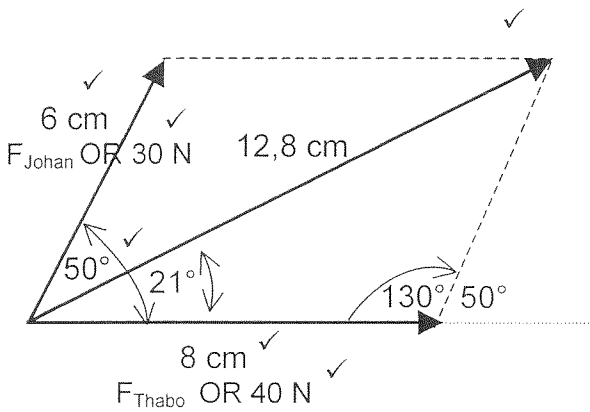
QUESTION 1 / VRAAG 1

1.1	A	1.2	C	1.3	C	1.4	A	1.5	A
1.6	D	1.7	B	1.8	B	1.9	C	1.10	B
1.11	A	1.12	C	1.13	B	1.14	C	1.15	D

[15x3 = 45]

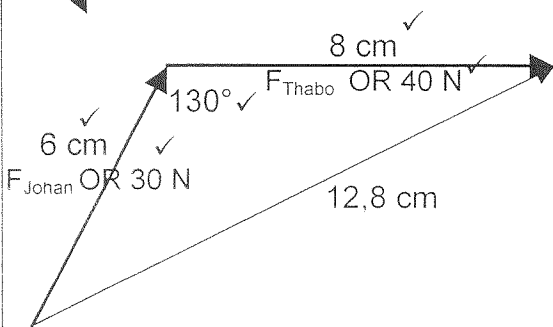
QUESTION 2 / VRAAG 2

2.1

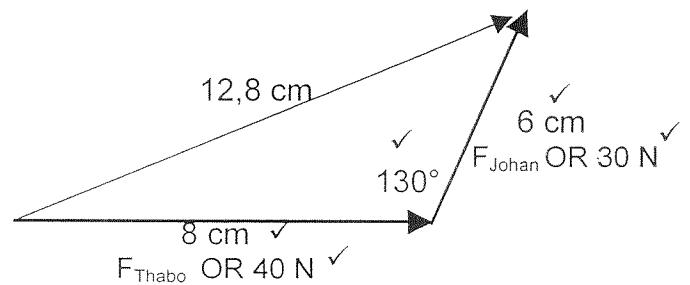


- ✓ accuracy 8 cm / akkuraatheid 8 cm (± 1 mm)
- ✓ 50° angle (or 130° angle) constructed accurately / 50° hoek (of 130° hoek) akkuraat ($\pm 0,5^\circ$)
- ✓ accuracy 6 cm / akkuraatheid van 6 cm (± 1 mm)
- ✓ completion of parm or correct triangle / voltooi parm of korrekte driehoek
- ✓ label and direction of F_{Thabo}
bykskrif en rigting van F_{Thabo}
- ✓ label and direction of F_{Johan}
bykskrif en rigting van F_{Johan}
- ✓ length of F_{res} / lengte van F_{res}
(128 mm = ± 2 mm)
- ✓ conversion of F_{res} / omskakeling F_{res}
(64 N = ± 1 N) (63 N – 65 N)
- ✓ direction of F_{res} / rigting F_{res}
(21° from 40 N force)

Magnitude / Grootte: $F_{res} = 64$ N ✓
 Direction: 21° from 40 N force or indicated on diagram or 29° from 50 N force ✓
 Rigting: 21° vanaf 40 N-krag of aangedui in diagram of 29° vanaf 50 N-krag



OR/ OF



completion of correct triangle ✓
voltooiing van korrekte driekhoek

NB

* 8 cm and 6 cm not necessary to be shown. It must be checked by measurement.
Hoef nie 8 cm en 6 cm te wys nie. Dit moet gekontroleer word deur meting


* 1 inaccuracy (either length or angle), marker must measure and positive marking on concersion of resultant force only → max. 6 marks
1 onakkuratheid (of lengte of hoek); nasiener moet meet en positiewe nasien op omskakeling van resulterende krag alleen → maks. 6 punte

* arrow for resultant incorrect or not indicated → max. 5 marks
pyl vir resultant verkeerd of nie aangedui → maks. 5 punte

* no arrows indicated → max. 3 marks
geen pyle aangedui → maks. 3 punte

* own scale used: lose accuracy mark → max. 6 marks
eie skaal gebruik: verloor akkuraatheidspunt → maks. 6 punte

* no compass or bearing direction in answer accepted
geen kompas- of peilingsrigting word in antwoord aanvaar nie

* incorrect triangle completed eg.  → max. 5 marks
verkeerde driehoek voltooi, bv. → maks. 5 punte

(8)

2.2.1 decreases / *neem af* ✓✓

(2)

2.2.2 increases / *neem toe* ✓✓

(2)

2.2.3 remains the same / *bly dieselfde* ✓✓

(2)

[14]

QUESTION 3 / VRAAG 3

3.1.1

$$\bar{v}_{AB} = \frac{s}{t} = \frac{6}{2} = 3 \text{ m.s}^{-1}$$

Accept:

$$v_{AB} = \frac{\Delta s}{\Delta t} \text{ OR } \frac{s}{\Delta t} \text{ OR } \frac{\Delta s}{t}$$

If / As
 * $v = \frac{d}{t}$ * but cont. to mark → max. 3 marks
 sien verder na → maks. 3 punte
 * No formula / geen formule
 lose formula mark but cont. to mark → max. 3 marks / verloor formulepunt maar sien verder na → maks. 3 punte

(4)

3.1.2

$$\bar{v}_{CD} = \frac{s}{t} = \frac{18}{2} = 9 \text{ m.s}^{-1}$$

(2)

3.2

No formula in 3.2 → no marks
 Geen formule in 3.2 → geen punte

$$a = \frac{\Delta v}{\Delta t} = \frac{9-3}{5-1} = 1,5 \text{ m.s}^{-2}$$

$$a = \frac{v-u}{t} = \frac{9-3}{4} = 1,5 \text{ m.s}^{-2}$$

$a = \frac{v}{t}$ * → 0 marks

(4)

3.3

constant change (increase) in displacement in each (consecutive) constant time interval
konstante verandering (toename) in verplasing in elke (opeenvolgende) konstante tydinterval
constant change (of 6 m) per constant time interval (every 2 s)
konstante verandering (of 6 m) per konstante tydinterval (elke 2 s).

(2)
 [12]

QUESTION 4 / VRAAG 4

4.1

$$v = u + at \quad \checkmark$$

$$\checkmark \quad \checkmark \quad \checkmark$$

$$12 = 0 + 10 \cdot t$$

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

$$v^2 = u^2 + 2as$$

$$12^2 = 0^2 + 2(10)s$$

$$s = 7,2 \text{ m}$$

$$s = ut + \frac{1}{2}at^2 \quad \checkmark$$

$$7,2 = 0 + \frac{1}{2}(10)t^2$$

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

$$s = \left(\frac{u+v}{2}\right)t \quad \checkmark$$

$$7,2 = \left(\frac{0+12}{2}\right)t$$

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

If/As s ≠ 7,2 m
Do not mark further → $\left(\frac{0}{5}\right)$
Moenie verder nasien nie

$$\left. \begin{aligned} F\Delta t &= mv - mu \\ mg\Delta t &= m(v - u) \end{aligned} \right\} \quad \checkmark$$

$$(0,36)(10)\Delta t = (0,36)(12 - 0)$$

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

u and v swapped/ u en v omgeruil
 $v = u + at$
 $0 = 12 + 10t$
 $t = 1,2 \text{ s}$
max. $\left(\frac{2}{5}\right)$

(5)

4.2

$$s = ut + \frac{1}{2}at^2 \quad \checkmark$$

$$s = 0 + \frac{1}{2}(10)(1,2)^2$$

$$= 7,2 \text{ m} \quad \checkmark$$

$$v^2 = u^2 + 2as \quad \checkmark$$

$$12^2 = 0^2 + 2(10)s$$

$$s = 7,2 \text{ m} \quad \checkmark$$

$$s = \left(\frac{u+v}{2}\right)t \quad \checkmark$$

$$= \left(\frac{0+12}{2}\right)(1,2)$$

$$= 7,2 \text{ m} \quad \checkmark$$

u and v swapped
max. $\left(\frac{2}{4}\right)$

$$(E_p + E_k)_{\text{TOP/BO}} = (E_p + E_k)_{\text{BOTTOM/ONDER}} \quad \checkmark$$

$$mgh + 0 = 0 + \frac{1}{2}mv^2$$

$$h = \frac{v^2}{2g} = \frac{12^2}{2(10)}$$

$$= 7,2 \text{ m} \quad \checkmark$$

$$(E_p)_{\text{lost}} = (E_k)_{\text{gained}} \quad \checkmark$$

$$mg\Delta h = \frac{1}{2}mv^2 \quad \checkmark$$

$$(0,36)(10)\Delta h = \frac{1}{2}(0,36)(12)^2$$

$$\Delta h = 7,2 \text{ m} \quad \checkmark$$

$(E_p)_{\text{top}} = (E_k)_{\text{bottom}} \quad \times$
but cont. to mark → max. $\left(\frac{3}{4}\right)$
maar sien verder na

$$s = \frac{v^2}{2g} \quad \times \quad \text{OR}$$

$$h = \frac{v^2}{2g} \quad \times \quad \rightarrow \left(\frac{0}{4}\right)$$

However if some energy statement /relationship is given and then/ *Hoewel, as 'n energiestelling/verband gegee is en dan*
 $h = \frac{v^2}{2g} \rightarrow \text{max. } \left(\frac{4}{4}\right)$

If only answer given because already done in 4.1 award full marks.

(4)

4.3

$$\Delta E_k = \frac{1}{2}mv^2 - \frac{1}{2}mu^2 \quad \checkmark$$

$$= \frac{1}{2}(0,36)(12)^2 - \frac{1}{2}(0,36)(0)^2 \quad \checkmark$$

$$= 25,92 \text{ J} \quad \checkmark (26 \text{ J})$$

$$\Delta E_k = \frac{1}{2}m(\Delta v)^2 \quad \checkmark$$

$$= \frac{1}{2}(0,36)[12^2 - 0^2] \quad \checkmark$$

$$= 25,92 \text{ J} \quad \checkmark (26 \text{ J})$$

u and v swapped /
u en v omgeruil
max. $\left(\frac{2}{5}\right)$

$$E_k = \frac{1}{2}mv^2$$

$$= \frac{1}{2}(0,36)(12)^2 \quad \checkmark$$

$$= 25,92 \text{ J} (26 \text{ J}) \quad \checkmark (\text{Max } 3)$$

(5)

4.4

$$p = mv \quad \checkmark$$

$$= (0,36)(12) \quad \checkmark$$

$$= 4,32 \text{ kg.m.s}^{-1} \quad \checkmark$$

$$E_k = \frac{1}{2}mv^2 \quad \checkmark$$

$$= \frac{1}{2}(mv)v \quad \checkmark$$

$$25,92 = \frac{1}{2}p(12) \quad \checkmark$$

$$p = 4,32 \text{ kg.m.s}^{-1} \quad \checkmark$$

(3)

[17]

QUESTION 5 / VRAAG 5

5.1

Inertia It is the ability / property of a body to resist any changes in its state of motion,

Traagheid is daardie eienskap van 'n liggaam wat dit instaat stel om enige verandering in sy toestand van beweging teen werk.

(4)

5.2

$$v^2 = u^2 + 2as$$

$$0 = 3^2 + 2 \cdot a \cdot (1,2)$$

$$a = -3,75 \text{ m.s}^{-2}$$

$= 3,75 \text{ m.s}^{-2}$; Opposite to the direction of motion
; In teenoorgestelde rigting van beweging

$$s = \left(\frac{u+v}{2} \right) t$$

$$1,2 = \left(\frac{3+0}{2} \right) t$$

$$t = 0,8 \text{ s}$$

If/As $t \neq 0,8 \text{ s}$

Do not mark further/ Moenie verder nasien nie

u and/en v swapped/omgeruil

$$v^2 = u^2 + 2as$$

$$3^2 = 0^2 + 2a(1,2) \quad \text{max} \left(\frac{2}{6} \right)$$

$$a = 3,75 \text{ m.s}^{-2}$$

$$v = u + at$$

$$0 = 3 + a(0,8)$$

$$a = -3,75 \text{ m.s}^{-2}$$

$= 3,75 \text{ m.s}^{-2}$; opposite to direction to motion
In teenoorgestelde rigting van beweging

$$s = ut + \frac{1}{2} at^2$$

$$1,2 = (3)(0,8) + \frac{1}{2} a(0,8)^2$$

$$a = -3,75 \text{ m.s}^{-2}$$

(6)

5.3

$$F_{\text{res}} = ma$$

$$= (40)(-3,75)$$

$$= -150 \text{ N}$$

$$\therefore F_{\text{res}} = 150 \text{ N}$$

Answer in 5.2	Subst. value in 5.3	mark in 5.3
- 3,75 m.s ⁻²	- 3,75 m.s ⁻²	max. 3 marks
- 3,75 m.s ⁻²	3,75 m.s ⁻²	max. 1 mark
3,75 m.s ⁻²	3,75 m.s ⁻²	max. 3 marks
3,75 m.s ⁻²	- 3,75 m.s ⁻²	max. 3 marks

(3)

[13]

QUESTION 6 / VRAAG 6

6.1

Every particle in the universe exerts a (gravitational) force (of attraction) on every other particle in the universe that is directly proportional to the product of their masses and inversely proportional to the square of the distance between them.

[Note: Every body/mass/object distance between their centres – must be used to get marks.]

Elke deeltjie in die heelal oefen 'n gravitasie krag uit op elke ander deeltjie in die heelal wat direk eweredig is aan die produk van hulle massas en omgekeerd eweredig aan die kwadraat van die afstand tussen hulle.

[Nota: As "elke voorwerp/massa/licgaam" gebruik word moet, "afstand tussen hulle middelpunte" gebruik word om punte te verdien.]

(4)

6.2

$$F = \frac{Gm_1 m_2}{r^2}$$

$$= \frac{(6,7 \times 10^{-11})(980)(5,98 \times 10^{24})}{(4,24 \times 10^7)^2}$$

$$= 218,4 \text{ N}$$

$$F = \frac{Gm_1 m_2}{r} \quad \times \rightarrow \left(\frac{0}{5} \right)$$

(5)

6.3

doubled (twice as big) ✓✓
verdubbel (tweekeer so groot) ✓✓

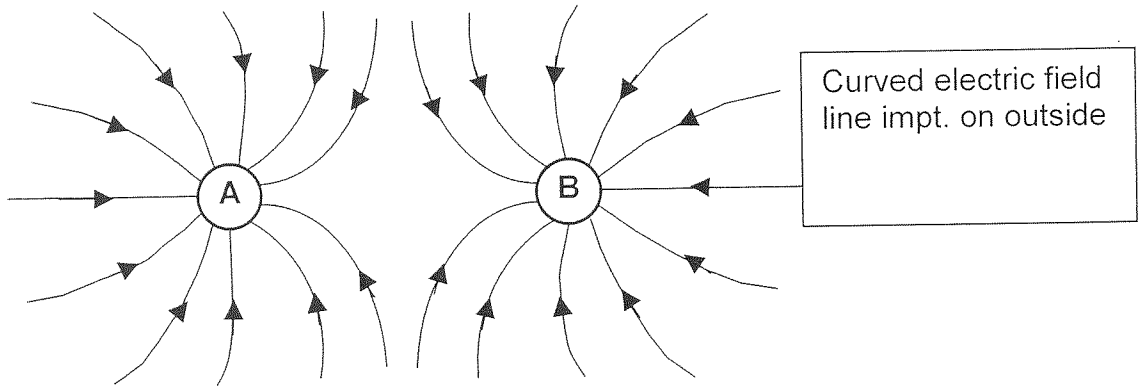
increases/ver groot ✓

(2)

[1-1]

QUESTION 7/ VRAAG 7

7.1



- ✓ field lines between charges / veldlyne tussen die ladings
- ✓ field lines outside the charges / veldlyne buite die ladings
- ✓ direction: towards A and B / rigting: na A en B toe
- ✓ field lines not going into spheres but touching surface and without touching each other / veldlyne nie binne sferie nie, maar raak oppervlak en sonder om aan mekaar te raak

(4)

7.2

$$F = \frac{k q_1 q_2}{r^2} \checkmark$$

$$= \frac{9 \times 10^9 \cdot (4 \times 10^{-12}) \cdot (3 \times 10^{-12})}{(5 \times 10^{-2})^2} \checkmark$$

$$= 4,32 \times 10^{-11} \text{ N repulsion/away from A / right. (NOT EAST)} \checkmark$$

$$= 4,32 \times 10^{-11} \text{ N afstotend/weg vanaf A / regs. (NIE OOS)} \checkmark$$

Mark direction independently
Merk rigting onafhanklik

(6)

r	F	mark
0,05 ✓	4,32 x 10 ⁻¹¹ N ✓	6 marks
5 cm ✓	4,32 x 10 ⁻¹¹ N ✓	6 marks
5 ✗	4,32 x 10 ⁻¹¹ N ✗	max 4 marks
5 ✗	4,32 x 10 ⁻¹⁵ N ✓	max 5 marks

$$F = \frac{kq_A q_B}{r} \text{ max } \frac{1}{6} \text{ for direction}$$

7.3

charge on each ball / lading op elke bal = $\frac{(-4 \times 10^{-12}) + (-3 \times 10^{-12})}{2} \checkmark$

$$= -3,5 \times 10^{-12} \text{ C } \checkmark$$

(3)

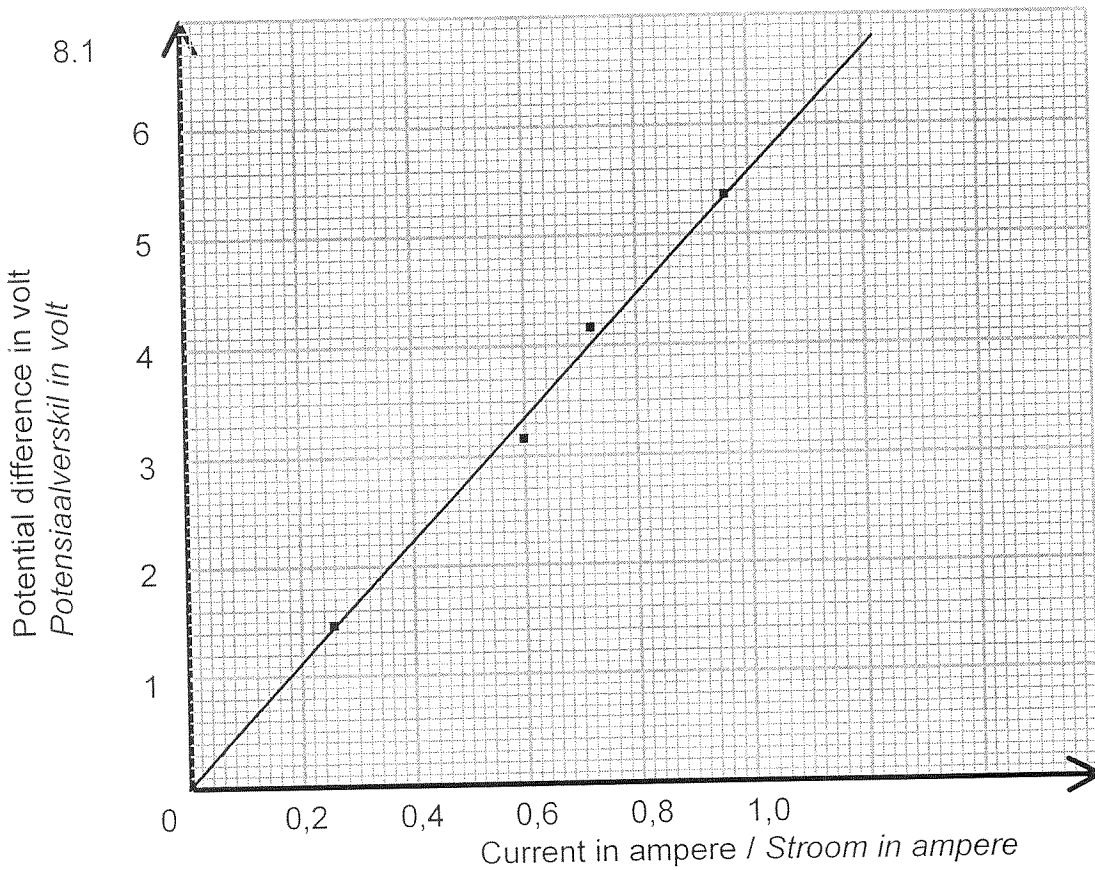
7.4

increases / toeneem ✓✓

(2)

[15]

QUESTION 8 / VRAAG 8



Labels	
X	Y
I	V
stroom	potensiaal verskil
current	potential difference

Not acceptable: Emf
Nie aanvaarbaar: Emk

Unit	
X	Y
ampere	volt
A	V

CRITERIA / KRITERIA

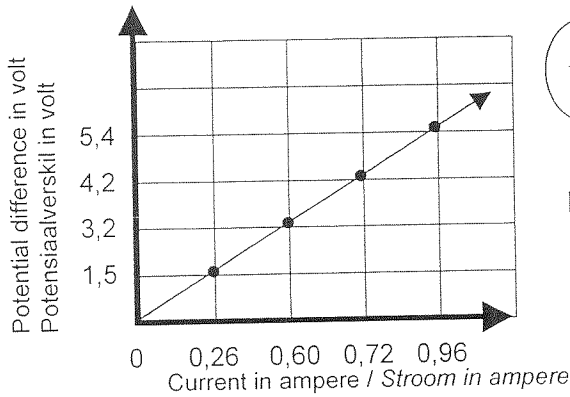
- ✓ { horizontal axis: label and unit / horisontale as: byskrif en eenheid
- { vertical axis: label and unit / vertikale as: byskrif en eenheid
- ✓ **suitable scale** on horizontal axis / **geskikte skaal** op horisontale as
- ✓ **suitable scale** on vertical axis / **geskikte skaal** op vertikale as
- ✓✓ points correctly plotted / punte korrek gestip
- 1 mark for any 3 points plotted correctly / 2 marks for 5 points plotted correctly
- 1 punt vir enige 3 punte korrek gestip / 2 punte vir 5 punte korrek gestip
- (Consider origin point as plotted if graph goes through origin)
- (Beskou oorsprongpunt as gestip indien grafiek deur oorsprong gaan)
- ✓ best fit / best straight line / beste passing / beste reguit lyn
- If plotted points too big (blobs > 2 x 2 small blocks):
- 1 for best fit & -1 for uncertainty in plotting
- As gestipte punte te groot is (kolle > 2 x 2 klein blokkies):
- 1 vir passing & -1 vir onsekerheid vir stip

Max/Maks $\left(\frac{4}{6}\right)$

(6)

Suitable: Evenly spread out so that all points can be plotted accurately
Geskikte: Eweredig verspreid sodat alle punte met akkuraatheid gestip kan word
 If scale (one or both) unsuitable - lose both marks for plotting
 As skaal (een of beide) nie geskik is nie - verloor beide punte vir stip

→ If points used from table / As punte vanaf tabel gebruik is:



$\frac{1}{6}$

For labels / Vir byskrifte

8.2 $V \propto I$ OR $I \propto V$ OR in words ✓✓
 $V \propto I$ OF $I \propto V$ OF in woorde ✓✓

(2)

8.3

$$\text{gradient / gradiënt} = \frac{\Delta V}{\Delta I} \checkmark$$

Any set from graph, e.g. Enige stel van grafiek, bv.	$= \frac{2,2}{0,4} \checkmark$
	$= 5,5 \Omega \checkmark$

Ω is important for the answer and the mark
 Ω is belangrijk vir die antwoord en die punt

$\frac{V}{A}$ not acceptable / nie aanvaarbaar nie

Any answer from 5,5 Ω to 5,8 Ω will be acceptable.
 Answers outside the range of 5,5 Ω to 5,8 Ω → max. 2 marks.
 1 mark for the formula
 1 mark for the substitution of a value

Learners need to use the values from the graph plotted and not the values in the given table.

→ If values/points used from the table; max $\left(\frac{2}{4}\right)$

Enige antwoord van 5,5 Ω tot 5,8 Ω sal aanvaar word;
 Antwoorde buite die gebied van 5,5 Ω tot 5,8 Ω → maks 2 punte.
 1 punt vir die formule
 1 punt vir 'n substitusie van 'n waarde

Leerdere moet die waardes vanaf die grafiek gebruik en nie die waardes in die tabel nie

→ As waardes vanaf tabel gebruik; maks $\left(\frac{2}{4}\right)$

(4)

8.4

Ohm's Law / Ohm se wet ✓✓

(2)
 [16]

8.1

If V and I swapped on graph, THEN lose 1 mark for axis, can get: 5

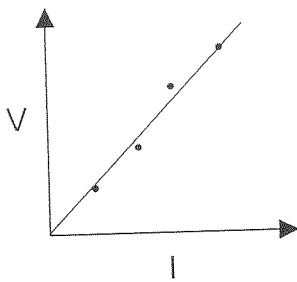
As V en I omgeruil word op die grafiek, DAN verloor 1 punt vir as, kan kry:5

8.3

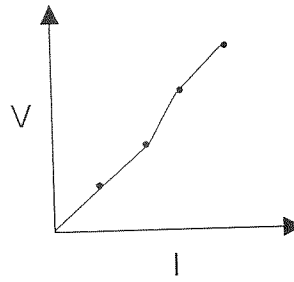
$$\text{Gradient} = \frac{\Delta I \checkmark}{\Delta V} = \frac{0,4 \checkmark}{2,2 \checkmark} = 0,18 \Omega^{-1} \checkmark$$

Range / gebied: 0,17 to 0,19

8.3 The following possibilities could be found in 8.1:
Die volgende moontlikhede kan in 8.1 gevind word:



OR / OF



straight line / reguit lyn

not straight line / nie reguit lyn nie

If straight line in 8.1 then:
Indien reguit lyn in 8.1, dan:

$$\text{gradient / gradiënt} = \frac{\Delta V \checkmark}{\Delta I}$$

Any set from graph, e.g. Enige stel van grafiek, bv.

$$\left(\frac{4}{4}\right) = \frac{2,2 \checkmark}{0,4 \checkmark} = 5,5 \Omega \checkmark$$

If not straight line in 8.1 then any set of TABLE values MUST be used, e.g. Indien nie reguit lyn in 8.1 nie, dan MOET enige stel TABELwaardes gebruik word, bv.

$$\text{gradient / gradiënt} = \frac{\Delta V}{\Delta I} \checkmark$$

$$\text{Max / Maks} \left(\frac{2}{4}\right) = \frac{1,5}{0,26} \checkmark$$

Even with V and I swapped / Selfs vir V en I omgeruil = 5,8 Ω

QUESTION 9 / VRAAG 9

9.1

$$\begin{aligned} \frac{1}{R_p} &= \frac{1}{R_1} + \frac{1}{R_2} \checkmark \\ &= \frac{1}{5} + \frac{1}{20} \checkmark \\ &= \frac{1}{4} \checkmark \\ R_p &= 4 \Omega \checkmark \end{aligned}$$

$$\begin{aligned} R_p &= \frac{\text{product}}{\text{sum}} \checkmark \\ &= \frac{5 \times 20}{5 + 20} \checkmark \\ &= 4 \Omega \checkmark \end{aligned}$$

$$\begin{aligned} \frac{1}{R_p} &= \frac{1}{5} + \frac{1}{20} \checkmark \\ &= \frac{1}{4} \checkmark \\ R_p &= 4 \Omega \checkmark \end{aligned}$$

$$R_p = \frac{1}{\frac{1}{5} + \frac{1}{20}} \times \rightarrow \left(\frac{0}{4} \right)$$

(4)

9.2

$$\begin{aligned} R_{\text{cir}} &= \frac{V_{\text{cir}}}{I_{\text{cir}}} \checkmark \\ &= \frac{12}{1,2} \checkmark \\ &= 10 \Omega \\ \therefore R &= R_{\text{cir}} - R_p \checkmark \\ &= 10 - 4 \checkmark \\ &= 6 \Omega \checkmark \end{aligned}$$

$$\begin{aligned} R_T &= R + R_p \checkmark \\ \frac{12}{1,2} &= R + 4 \checkmark \\ R &= 6 \Omega \checkmark \end{aligned}$$

$$\begin{aligned} R_p &= \frac{V_p}{I_p} \checkmark \\ 4 &= \frac{V_p}{1,2} \checkmark \\ V_p &= 4,8 \text{ V} \\ \therefore V_R &= 12 - 4,8 = 7,2 \text{ V} \\ R_R &= \frac{V_R}{I_R} = \frac{7,2}{1,2} = 6 \Omega \checkmark \end{aligned}$$

If this method of calc. done then:
 Calc. for section (a) max. 3 marks for either calc. R_{cir} or V_p .
 Calc. for section (b) max.2 marks
As hierdie metode of berekening gebruik is, dan:
Berekening vir deel (a) maks 3 punte vir of R_{cir} of V_p
Berekening vir deel (b) maks 2 punte

$$\begin{aligned} \text{(a)} \quad R_{\text{cir}} &= \frac{V_{\text{cir}}}{I_{\text{cir}}} & \text{and} & \quad R_p = \frac{V_p}{I_p} \\ &= \frac{12}{1,2} & & \quad 4 = \frac{V_p}{1,2} \\ &= 10 \Omega & & \quad V_p = 4,8 \text{ V} \\ & & & \quad \therefore V_R = 12 - 4,8 = 7,2 \text{ V} \end{aligned}$$

$$\text{(b)} \quad \therefore R = \frac{7,2}{1,2} \times 10 = 6 \Omega$$

(5)

[9]

TOTAL [150]