

MARKING GUIDELINES / NASIENRIGLYNE

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SOUTH AFRICAN COMPREHENSIVE ASSESSMENT INSTITUTE
SUID-AFRIKAANSE KOMPREENSIEWE ASSESSERINGSINSTITUUT

FINAL APPROVED MARKING GUIDELINES / FINAAL GOEDGEKEURDE NASIENRIGLYNE	
DATE OF MEETING / VERGADERINGSDATUM	
UMALUSI MODERATOR / UMALUSI-MODERATOR	
CHIEF MARKER / HOOFNASIENER	
INTERNAL MODERATOR / INTERNE MODERATOR	



QUESTION / VRAAG 1

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

[20]



QUESTION / VRAAG 2

- 2.1 The **force transmitted through a rope**, string or wire when pulled by forces acting from opposite sides. (**Consider learners explanation**). ✓✓

*Die **krag** wat deur 'n tou, of draad oorgedra word wanneer dit getrek word deur kragte wat van teenoorgestelde kante inwerk. (Oorweeg leerders se verduideliking).* ✓✓

(2)

2.2

2.2.1 EQUAL TO / GELYK AAN ✓✓

(2)

2.2.2 LARGER THAN / GROTER AS ✓✓

(2)

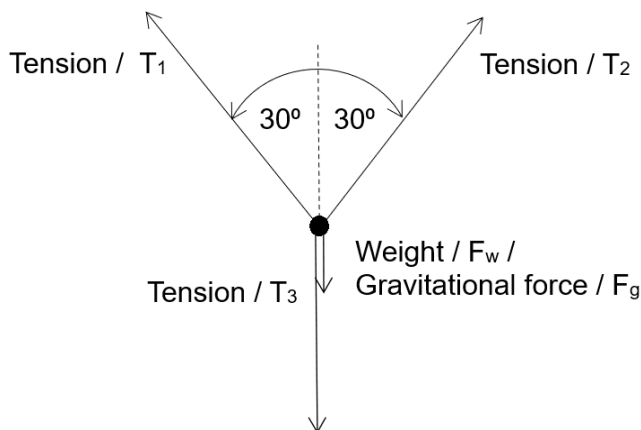
2.3 $T_3 = mg$ ✓

$$T_3 = (10)(9.8) \quad \checkmark$$

$$T_3 = 98 \text{ N} \quad \checkmark$$

(3)

2.4



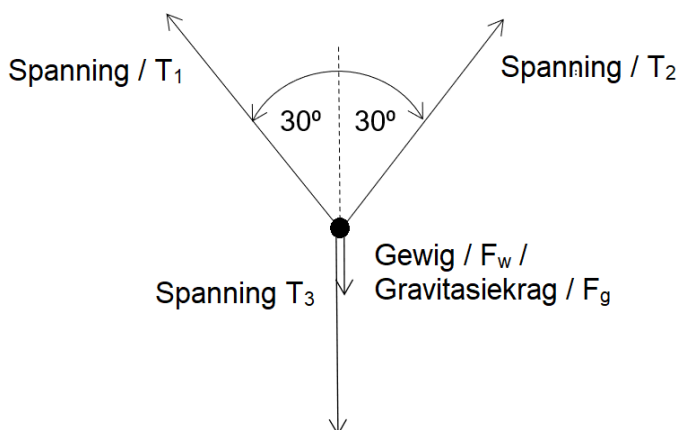
One mark per force

- F_{T1} ✓
- F_{T2} ✓
- F_{T3} ✓
- F_g ✓

-1 for extra forces

-1 for no arrows

-1 for not touching the arrows or the origin



Een punt per krag

- F_{T1} ✓
- F_{T2} ✓
- F_{T3} ✓
- F_g ✓

-1 vir ekstra kragte

-1 vir geen pyltjies nie

-1 vir pyltjies wat nie aan die oorsprong raak nie

(4)



2.5 $F_{y \text{ net}} = 0$

$$T_3 + F_{g(30\text{kg})} = T_{1y}\cos\theta + T_{2y}\cos\theta$$

$$F_{g(10\text{kg})} + F_{g(30\text{kg})} = T_{1y}\cos\theta + T_{2y}\cos\theta$$

$$mg + mg = T_1 \cos 30^\circ + T_2 \cos 30^\circ$$

$$(10)(9,8) \checkmark + (30)(9,8) \checkmark = T_1 \cos 30^\circ + T_2 \cos 30^\circ \checkmark \quad (T_1 \cos 30^\circ = T_2 \cos 30^\circ)$$

$$392 = 2(T_2 \cos 30^\circ)$$

$$T_2 = \frac{392}{2 \cos 30^\circ}$$

$$T_2 = 226.32 \text{ N} \checkmark$$

$$(F_{x \text{ net}} = 0)$$

✓F

2.6

2.6.1 DECREASES / VERLAAG ✓✓

(2)

2.6.2 REMAIN THE SAME / BLY DIESELFDE ✓✓

(2)

[22]



QUESTION / VRAAG 3

3.1 Displacement takes both magnitude and direction into consideration. ✓✓

Verplasing neem beide grootte en rigting in ag. ✓✓

(2)

3.2 $v_f^2 = v_i^2 + 2g\Delta y$ ✓

$(0)^2 \checkmark = (12)^2 + 2(-9,8)\Delta y$ ✓

$\Delta y = \frac{-144}{-19,6}$

$\Delta y = 7,35 \text{ m}$ ✓

OR/OF

$v_f^2 = v_i^2 + 2g\Delta y$ ✓

$(0)^2 \checkmark = (-12)^2 + 2(+9,8)\Delta y$ ✓

$\Delta y = \frac{-144}{19,6}$

$\Delta y = -7,35 \text{ m}$

$\therefore h = 7,35 \text{ m}$ ✓

(4)

Positive / Positief

3.3 $\Delta y = v_i t + \frac{1}{2}gt^2$ ✓

$(0) \checkmark = (12)t + \frac{1}{2}(-9,8)t^2$ ✓

$-12t = -4,9t^2$

$t = 2,45 \text{ s}$ ✓

$\Delta y = v_i t + \frac{1}{2}gt^2$ ✓

$(-7,35) \checkmark = (0)t + \frac{1}{2}(-9,8)t^2$ ✓

$-7,35 = -4,9t^2$

$t = 1,224 \text{ s}$

$\therefore t_T = 2(1,224)$

$t = 2(1,224)$

$t = 2,45 \text{ s}$ ✓

OR/OF

$v_f = v_i + at$ ✓

$0 \checkmark = 12 + (-9,8)t$ ✓

$t = 1,224 \text{ s}$

$\therefore t_T = 2(1,224)$

$t = 2(1,224)$

$t = 2,45 \text{ s}$

(4)

$v_f = v_i + at$ ✓

$-12 \checkmark = 0 + (-9,8)t$ ✓

$t = 1,224 \text{ s}$

$\therefore t_T = 2(1,224)$

$t = 2(1,224)$

$t = 2,45 \text{ s}$ ✓

3.4 $\Delta y = v_i t + \frac{1}{2}gt^2$

$\Delta y = (-2)(0,5) + \frac{1}{2}(-9,8)(0,5)^2$ ✓

$\Delta y = -2,23 \text{ m}$ ✓

Positive / Positief

OR/OF

$\Delta y = v_i t + \frac{1}{2}gt^2$

$\Delta y = (2)(0,5) + \frac{1}{2}(9,8)(0,5)^2$ ✓

$\Delta y = 2,23 \text{ m}$ ✓

(2)

3.5 Height above ground for object A:

Hoogte bo die grond vir voorwerp A:

$\Delta y = 10 - 2,23$ ✓

$\Delta y = 7,78 \text{ m}$

Height above ground for object B:

Hoogte bo die grond vir voorwerp B:

$\Delta y = v_i t + \frac{1}{2}gt^2$

$\Delta y = (12)(0,5) + \frac{1}{2}(-9,8)(0,5)^2$ ✓

$\Delta y = 4,78 \text{ m}$ ✓

Distance apart / Afstand uitmekaar = $7,78 - 4,78$ ✓m

= 3 m ✓

(5)

[17]



QUESTION / VRAAG 4

4.1 $E_{m \text{ (top/bo)}} = E_{m \text{ (bottom/onder)}}$

$$E_p + E_k = E_p + E_k$$

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

✓F (any)

$$(40)(9,8)(3) + \frac{1}{2}(40)(0)^2 = (40)(9,8)(0) + \frac{1}{2}(40)v^2 \checkmark$$

$$v = 7,67 \text{ m.s}^{-1} \checkmark$$

(3)

4.2 The total (linear) momentum of an isolated system remains constant (is conserved). ✓✓

Positive/
positief

Die totale (lineêre) momentum van 'n geïsoleerde stelsel bly konstant (behoue). ✓✓ (2)

4.3 $\Sigma p_i = \Sigma p_f$

$$mv_{i(A)} + mv_{i(B)} = v_f(m_{(A)} + m_{(B)})$$

✓F (any)

$$(40)(7,67) \checkmark + (55)(0) = v_f(40 + 55) \checkmark$$

$$v_f = 3,23 \text{ m.s}^{-1} \text{ Right/forward / Regs/vorentoe } \checkmark$$

(4)

[9]



QUESTION / VRAAG 5

- 5.1 The net/total work done on an object is equal to the change in the object's kinetic energy. ✓✓

Die netto/totale arbeid wat op 'n voorwerp gedoen (verrig) word, is gelyk aan die verandering in die voorwerp se kinetiese energie. ✓✓

OR / OF

The work done on an object by a resultant/net force is equal to the change in the object's kinetic energy. ✓✓

Die arbeid wat deur 'n resultante/netto krag op 'n voorwerp gedoen (verrig) word, is gelyk aan die verandering in die voorwerp se kinetiese energie. ✓✓

(2)

5.2 $W_{\text{net}} = \Delta E_k$

$$\left. \begin{aligned} F_{\text{net}} \Delta y \cos \theta &= E_k - E_{k_i} \\ ma \Delta y \cos \theta &= \frac{1}{2} m v_f^2 - \frac{1}{2} m v_i^2 \end{aligned} \right\} \checkmark F \text{ (any)}$$

$$(50)(0,2)(15) \cos 0^\circ \checkmark = \frac{1}{2} (50) v^2 - \frac{1}{2} (50)(0)^2 \checkmark$$

$$v_f = \sqrt{6}$$

$$v_f = \pm 2,45 \text{ m.s}^{-1}$$

$$\therefore v_f = 2,45 \text{ m.s}^{-1} \checkmark$$

Positive / Positief

(4)

5.3 $v_f^2 = v_i^2 + 2g\Delta y \checkmark$

$$v_f^2 = (2,45)^2 + 2(-9,8)(-15) \checkmark$$

$$v_f^2 = 300$$

$$v_f = \pm 17,32 \text{ m.s}^{-1}$$

$$\therefore v_f = 17,32 \text{ m.s}^{-1} \checkmark$$

OR/OF

$$\begin{aligned} v_f^2 &= v_i^2 + 2g\Delta y \checkmark \\ v_f^2 &= (-2,45)^2 + 2(9,8)(15) \checkmark \\ v_f^2 &= 300 \\ v_f &= \pm 17,32 \text{ m.s}^{-1} \\ \therefore v_f &= 17,32 \text{ m.s}^{-1} \checkmark \end{aligned}$$

(3)

5.4 $F_{\text{net}} \Delta t = \Delta p$

$$F_{\text{net}} = \frac{mv_f - mv_i}{\Delta t} \checkmark F(\text{any})$$

$$F_{\text{net}} = \frac{m(v_f - v_i)}{\Delta t}$$

$$F_{\text{net}} = \frac{(50)[0 - (-17,32)]}{0,85} \checkmark$$

$$F_{\text{net}} = \frac{866}{0,85}$$

$$F_{\text{net}} = 1018,82 \text{ N} \checkmark$$

Positive / Positief

$$F_{\text{net}} = F_{\text{ground on crate / grond op krat}} + F_g$$

$$F_{\text{net}} = F_{\text{ground on crate / grond op krat}} + mg$$

$$1018,82 = F_{\text{ground on crate / grond op krat}} + (50)(9,8)$$

$$F_{\text{ground on crate / grond op krat}} = 528,82 \text{ N} \checkmark$$

(5)

[14]



QUESTION / VRAAG 6

- 6.1 The change in frequency (or pitch) of the sound detected by a listener because the sound source and the listener have different velocities relative to the medium of sound propagation. ✓✓

Die verandering in frekwensie (of toonhoogte) van die klank wat deur 'n luisteraar waargeneem word omdat die klankbron en die luisteraar verskillende snelhede het relatief tot die medium van klankuitstraling. ✓✓

OR / OF

Apparent change in frequency due to the relative motion between the sound source and the listener. ✓✓

Oënskynlike verandering in frekwensie as gevolg van die relatiewe beweging tussen die klankbron en die luisteraar. ✓✓ (2)

6.2 $f_L = \frac{v + v_L}{v - v_s} f_s$ ✓F

$f_L = \frac{(340 + 0)}{(340 - 280)} \checkmark (6000) \checkmark$

$f_L = 34000 \text{ Hz} \checkmark$

Accept/Aanvaar

$$f_L = \frac{v \pm v_L}{v \pm v_s} f_s$$

(4)

- 6.3
 6.3.1 REMAIN THE SAME / BLY DIESELFDE ✓

No negative, mark separately /
 Geen negatief, merk apart

The wind only affects the sound on its way to the observer. It does not affect the sound as it is emitted. ✓

Die wind beïnvloed net die klank op pad na die waarnemer. Dit beïnvloed nie die klank soos wat dit uitgestraal word nie. ✓ (2)

No negative, mark separately /
 Geen negatief, merk apart

- 6.3.2 INCREASES (Becomes longer) / VERHOOG (Word langer) ✓

Wind affects the speed of sound relative to the air. The strong wind slows down the effective speed of the soundwaves approaching the detector. Since frequency of the source remains constant and the speed of the soundwaves decreases the wavelength must increase. ✓

Wind beïnvloed die spoed van klank relatief tot die lug. Die sterk wind vertraag die effektiewe spoed van die klankgolwe wat die opspoorder nader. Aangesien die frekwensie van die bron konstant bly en die spoed van die klankgolwe afneem, moet die golflengte toeneem. ✓

OR / OF



$$\lambda = \frac{v_{\text{relative to observer / relatief tot waarnemer}}}{f}$$

When frequency of the source remains constant and the speed of the observed soundwaves decreases.

Wanneer frekwensie van die bron konstant bly en die spoed van die waargenome klankgolwe afneem.

(2)

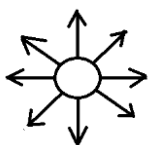
[10]



QUESTION / VRAAG 7

7.1

7.1.1



✓ Direction / Rigting ✓ Shape / Vorm

(-1 if the lines do not touch/not evenly spread)

(-1 as die lyne nie raak nie/nie eweredig versprei is nie)

(2)

7.1.2

$$E = \frac{kQ}{r^2} \quad \checkmark F$$

$$E = \frac{(9,0 \times 10^9)(8 \times 10^{-12})}{(0,007)^2} \quad \checkmark \text{ (all substitution / alle invervanging)}$$

$$E = 1469,39 \text{ N.C}^{-1} \quad \checkmark$$

(3)

7.2

7.2.1

The magnitude of the electrostatic **force** exerted by one point charge (Q_1) on another point charge (Q_2) is directly proportional to the product of the magnitudes of the charges ✓ and inversely proportional to the square of the distance (r) between them. ✓

*Die grootte van die elektrostatiese **krag** wat deur een puntlading (Q_1) op 'n ander puntlading (Q_2) uitgeoefen word, is direk eweredig aan die produk van die groottes van die ladings ✓ en omgekeerd eweredig aan die kwadraat van die afstand (r) tussen hulle. ✓*

(2)

7.2.2

$$F_{\text{net}} = 0$$

$$F_{Q_1 \text{ on } Q_2} = F_{Q_3 \text{ on } Q_2}$$

$$\frac{kQ_1Q_2}{r^2} = \frac{kQ_3Q_2}{x^2}$$

✓ Equilibrium / Ewewig

✓ Formula Coulomb / Formule Coulomb

$$\frac{(9 \times 10^9)(5 \times 10^{-9})Q_2}{(0,75)^2} \quad \checkmark = \frac{(9 \times 10^9)(10 \times 10^{-9})Q_2}{x^2} \quad \checkmark$$

$$\frac{(9 \times 10^9)(5 \times 10^{-9})Q_2}{(0,75)^2} = \frac{(9 \times 10^9)(10 \times 10^{-9})Q_2}{x^2}$$

$$x^2 = \frac{5,63 \times 10^{-9}}{5 \times 10^{-9}}$$

$$x = \sqrt{1,125}$$

$$x = 1,06 \text{ m} \quad \checkmark$$

$$\text{Distance / Afstand} = 0,75 + 1,06 \quad \checkmark \text{ m} \\ = 1,81 \text{ m} \quad \checkmark$$

(6)

[13]



QUESTION / VRAAG 8

8.1 $\varepsilon = I(R+r)$ ✓

$$24 = I[(R_1 + R_2) + r]$$

$$24 = I[(30 + 50) + 2]$$
 ✓

$$24 = I(80 + 2)$$

$$I = \frac{24}{82}$$

$$I = 0,29 \text{ A}$$
 ✓

(4)

8.2 The rate at which work is done. ✓✓

Die tempo waarteen werk verrig word. ✓✓

OR / OF

The rate at which energy is expended. ✓✓

Die tempo waarteen energie verbruik word. ✓✓

Positive / Positief

(2)

8.3 $P_1 = I^2 R_1$ ✓

$$P_1 = (0,29)^2 (30)$$
 ✓

$$P_1 = 2,52 \text{ W}$$
 ✓

(3)

8.4 $V_{R1} = I_{R1} R_1$ ✓

$$V_{R1} = (0,47)(30)$$
 ✓

$$V_{R1} = 14,10 \text{ V}$$
 ✓

(3)

8.5 $\varepsilon = V_{\text{ext}} + Ir$ ✓

$$24 = V_{\text{ext}} + (0,47)(2)$$
 ✓

$$24 = V_{\text{ext}} + 0,94$$

$$V_{\text{ext}} = 23,06 \text{ V}$$

Positive / Positief

$$V_{\text{ext}} = V_{R1} + V_p$$

$$23,06 = 14,10 + V_p$$
 ✓m

$$V_p = 8,96 \text{ V}$$
 ✓

(4)



8.6 $V_p = I_T R_p$

$$8,96 = (0,47)R_p$$

$$R_p = 19,06 \, \Omega \quad \checkmark$$

$$\frac{1}{R_p} = \frac{1}{R_2} + \frac{1}{R_3} \quad \checkmark$$

$$\frac{1}{19,06} = \frac{1}{50} + \frac{1}{R_3} \quad \checkmark$$

$$\frac{1}{R_3} = \frac{1547}{47650}$$

$$R_3 = 30,80 \, \Omega \quad \checkmark$$

(4)

[20]



QUESTION / VRAAG 9

9.1 DC/GS ✓

The entire plot is above the time axis **OR** voltage is always positive. ✓

*Die hele plot is bo die tyd-as **OF** spanning is altyd positief.* ✓

(2)

9.2 $V_{\text{rms/wgk}} = \frac{V_{\text{max}}}{\sqrt{2}}$ ✓

$V_{\text{rms/wgk}} = \frac{220}{\sqrt{2}}$ ✓

$V_{\text{rms/wgk}} = 155,56 \text{ V}$ ✓

(3)

9.3 $P_{\text{ave/gem}} = \frac{V_{\text{rms/wgk}}^2}{R}$ ✓

$P_{\text{ave/gem}} = \frac{155,56^2}{50}$ ✓

$P_{\text{ave/gem}} = 483,98 \text{ W}$ ✓

(3)

9.4 $I_{\text{rms/wgk}} = \frac{P_{\text{ave/gem}}}{V_{\text{rms/wgk}}}$

$I_{\text{rms/wgk}} = \frac{483,98}{155,56}$ ✓

$I_{\text{rms/wgk}} = 3,11 \text{ A}$ ✓

$I_{\text{max/maks}} = \sqrt{2} I_{\text{rms/wgk}}$ ✓

$I_{\text{max/maks}} = \sqrt{2}(3,11)$

$I_{\text{max/maks}} = 4,40 \text{ A}$ ✓

(4)

Positive / Positief

Positive/
Positief

OR/OF

$P_{\text{max/maks}} = (2)(P_{\text{ave/gem}}) = (2)(483,98)$

$P_{\text{max/maks}} = 967,96$

$P_{\text{max/maks}} = V_{\text{max/maks}} \cdot I_{\text{max/maks}}$ ✓

$967,96 \checkmark = (220) I_{\text{max/maks}}$ ✓

$I_{\text{max/maks}} = 4,40 \text{ A}$ ✓

[12]

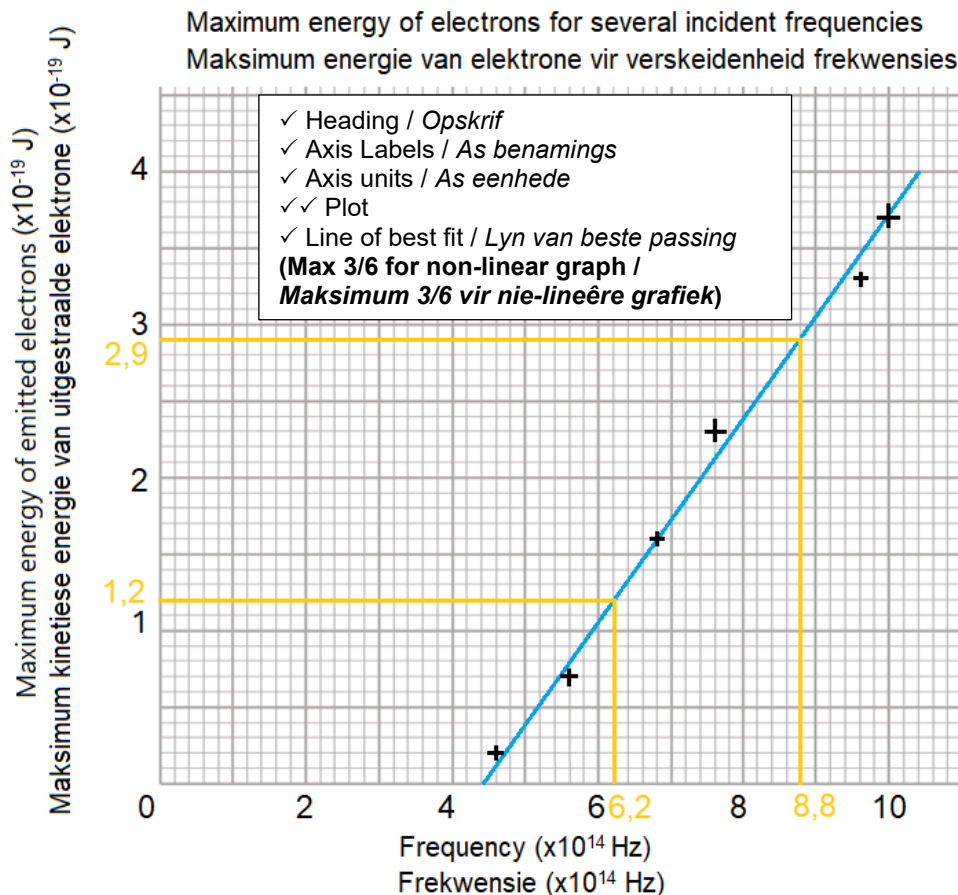


QUESTION / VRAAG 10

10.1 Energy / *Energie* ✓

(1)

10.2



(6)

10.3 10.3.1 $4,4 \times 10^{14}$ Hz ✓✓

(Accuracy of answers from learner's graph /
Akkuraatheid van antwoorde uit leerder se grafiek)

(2)

10.3.2 Gradient = $\frac{\Delta y}{\Delta x}$ ✓

$$\text{Gradient} = \frac{(2,9 \times 10^{-19}) - (1,2 \times 10^{-19})}{(8,8 \times 10^{14}) - (6,2 \times 10^{14})} \quad \checkmark \text{ (On graph / Op grafiek)}$$

$$\text{Gradient} = 6,54 \times 10^{-34} \quad \text{(Allow / Aanvaar } 6,50 \times 10^{-34} - 6,76 \times 10^{-34})$$

$$y = mx + c \quad \text{where / waar } c = 0$$

$$E_{k \max} = m f_0 + 0 \quad \checkmark \text{ (Link to straight line / Skakel na reguit lyn)}$$

$$m = \frac{E_{k \max}}{f_0}$$

$$\therefore \text{Gradient} = \text{Plank's constant} \quad \checkmark \text{ (Link to gradient / Skakel na gradiënt)}$$

(4)

[13]

GRAND TOTAL / GROOTTOTAAL: [150]