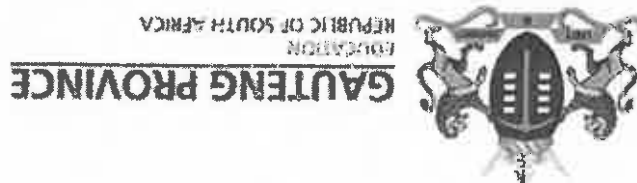


PHYSICAL SCIENCES: PHYSICS (PAPER 1) (10841)
FISISE WETENSKAPPE: FISIKA (VRAESTEL 1) (10841)

**PREPARATORY EXAMINATION
VOORBEREIDENDE EKSAMEN
2020
MARKING GUIDELINES /
NASIENRIGLYNE**



QUESTION / VRAAG 1

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

QUESTION / VRAAG 2

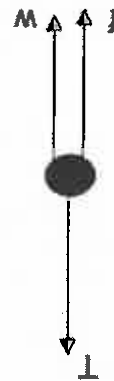
2.1 When a net force acts on an object, the object will accelerate in the direction of the force and the acceleration is directly proportional to the force ✓ and inversely proportional to the mass of the object. ✓

Wanneer 'n netto krag op 'n voorwerp inwerk sal die voorwerp in die rigting van die krag versnel en die versnelling sal direk eweredig wees aan die krag en omgekeerd eweredig aan die massa van die voorwerp.

The net (or resultant) force acting on an object is equal to the rate of change of momentum of the object in the direction of the net force. ✓✓

Die netto (of resultante) krag wat inwerk op 'n voorwerp is gelyk aan die tempo van die verandering van momentum van die voorwerp in die rigting van die netto krag.

2.2



Accepted labels/Aanvaarde benoemings	
w	F_g / F_{weight} / mg / $gravitational$ force
f	F_{friction} / F_{friction} / f_k
T	F_{tension} / F_{normal} / $normal$ force
	Deduct 1 mark for any additional force. / Trek een punt af vir enige ekstra krag.
	Mark is given for both arrow and label / Punt word toegeken vir beide 'n pyl en byskrif

(3)

Handwritten note: krag v. bew. op massa.

2.3

For drone / Vir hommeluig
 $F_{net} = ma \checkmark$
 $F_{lift} - T - f - F_g = ma$

For m / Vir m
 $F_{net} = ma$
 $T - f - F_g = ma$

$$180 - T - f - (5,8)(9,8) \checkmark = (5,8)(0,9) \checkmark$$

$$T - f - (3,2)(9,8) \checkmark = (3,2)(0,9) \checkmark$$

$$T = -f + 117,94 \dots (1)$$

$$T = f + 34,24 \dots (2)$$

1 = 2

$$-f + 117,94 = f + 34,24 \checkmark$$

$$-2f = -83,67$$

$$\text{Magnitude / Grootte } 2f = 83,7 \text{ N} \checkmark$$

$$f = 41,85 \text{ N}$$

(7)

2.4

Positive marking from 2.3 / Positiewe nasien vanaf 2.3

✓	Formula for $F_{net} = ma$
✓	Formula vir $F_{net} = ma$
✓	Substitution left side for drone
✓	Inverangting linkerkant vir hommeluig
✓	Substitution right side for drone with $ma = (5,8)(0,9)$
✓	Inverangting regterkant vir hommeluig met $ma = (5,8)(0,9)$
✓	Substitution left side for m
✓	Inverangting linkerkant vir m
✓	Substitution right side for m with $ma = (3,2)(0,9)$
✓	Inverangting regterkant vir m met $ma = (3,2)(0,9)$
✓	Equate 1 and 2
✓	Stel 1 en 2 gelyk aan mekaar
✓	Final answer and unit
✓	Finale antwoord en eenheid

$$T = -(41,85 \checkmark) + 117,94$$

$$T = f + 34,24$$

$$= 41,85 \checkmark + 34,24$$

$$= 76,09 \text{ N} \checkmark$$

or / of

(2)

2.5

$$P = Fv \checkmark$$

$$= (180)(19,7) \checkmark$$

$$= 3546 \text{ W} \checkmark$$

(3) [17]

QUESTION / VRAAG 3

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3.1 A moving object upon which the only force acting is the force of gravity. ✓✓ (2)

n Bewegende voorwerp waarop slegs gravitasiekrag inwerk. (1)

3.2.1 A ✓ (1)

3.2.2 The initial velocity is not zero. ✓

(1) *Die beginsnelheid (aanvaanklike snelheid) is nie nul nie.*

Because the graph is given the learners should take down as positive only. The graph determines the direction of the ball and down is positive in the graph.

Omdat die grafiek gegee is behoort die leerders slegs afwaarts as positief te neem. Die grafiek bepaal die rigting van die bal en afwaarts is dan positief in die grafiek.

3.3.1
OPTION 1 / OPSIE 1
 $\Delta y = v_i \Delta t + \frac{1}{2} a \Delta t^2$
 $8 \checkmark = 0 + \frac{1}{2} (9,8) (\Delta t)^2$
 $\Delta t = 1,28 \text{ s} \checkmark$

OPTION 2 / OPSIE 2
 $v_f^2 = v_i^2 + 2a\Delta y$
 $= 0 + 2(9,8)(8) \checkmark$
 $v_f = 12,52 \text{ m} \cdot \text{s}^{-1}$
 $v_f = v_i + a\Delta t \checkmark$
 $12,52 = 0 + 9,8\Delta t \checkmark$
 $t = 1,278 \text{ s} \checkmark$

(4)

3.3.2 Positive marking from 3.3.1 / Positiewe nasien vanaf 3.3.1:

OPTION 1 / OPSIE 1 (Downwards as positive) / Afwaarts as positief
 $\Delta y = v_i \Delta t + \frac{1}{2} a \Delta t^2 \checkmark$
 $8 \checkmark = v_i (1,28 - 0,6) + \frac{1}{2} (9,8) (1,28 - 0,6)^2 \checkmark$
 $v_i = 8,43 \text{ m} \cdot \text{s}^{-1}$ downwards / afwaarts ✓

OPTION 2 / OPSIE 2 (Downwards as positive) / Afwaarts as positief
 $v_f^2 = v_i^2 + 2a\Delta y$
 $v_f^2 = (0)^2 + 2(9,8)(8) \checkmark$
 $v_f = 12,52 \text{ m} \cdot \text{s}^{-1}$
 $v_f = v_i + a\Delta t \checkmark$
 $12,52 = v_i + (9,8)(1,28 - 0,6) \checkmark$
 $v_i = 8,34 \text{ m} \cdot \text{s}^{-1}$ downwards / afwaarts ✓

(4)

3.4 Same as ✓. They fall from the same height / change in position is the same for A and B. ✓

Dieselfde as. ✓ Beide balle val van dieselfde hoogte / verandering in posisie is dieselfde vir beide A en B. ✓

(2)

OR / OF

[16]
(2)

Area under the graph indicates the total displacement. It was the same height for both the objects.
Die oppervlakte onder die grafiek dui die totale verplasing aan. Dit was dieselfde hoogte vir beide die voorwerpe.

3.5

$9,8 \text{ m}\cdot\text{s}^{-2}$ ✓ downwards / afwaarts ✓

QUESTION / VRAAG 4

4.1 It is the product of the net force acting on an object and the time that the net force acts on the object. ✓ ✓

(2)

Dit is die produk van die netto krag wat inwerk op die voorwerp en die tyd waarin die netto krag op die voorwerp inwerk.

4.2

$$\left. \begin{aligned} F_{\text{net}} \Delta t &= \Delta p \\ F_{\text{net}} \Delta t &= m \Delta v \end{aligned} \right\} \text{any one of the equations}$$

(4)

$$F_{\text{net}} (1,5) = 50(700 - 0) \quad \checkmark \quad F_{\text{net}} = 23\,333,33 \text{ N} \quad \checkmark$$

4.3

$$\sum p_{\text{before}} = \sum p_{\text{after}} \quad \checkmark$$

Any one / Enige een

$$(m_1 + m_2)v_i = m_1v_{1f} + m_2v_{2f}$$

$$(5\,000 + 50)(275) = 5\,000v_{1f} + (50)(700) \quad \checkmark$$

$$v_{1f} = 270,75 \text{ m}\cdot\text{s}^{-1} \quad \checkmark$$

in original direction of motion of missile /

in oorspronklike rigting van beweging van missiel

(5)

4.4 Momentum is only conserved ✓ in a closed/isolated system. ✓

Momentum bly slegs behoue ✓ in 'n geslote sisteem. ✓

[13]
(2)

QUESTION / VRAAG 5

5.1

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

Die arbeid verrig op 'n voorwerp deur 'n netto krag is gelyk aan die verandering in die voorwerp se kinetiese energie. **OF**
 Die netto arbeid verrig op die voorwerp is gelyk aan die verandering in kinetiese energie van die voorwerp.

(2)

5.2.1

OPTION 1 / OPSIE 1

For diagram 1:

$$W_{nc} = \Delta K + \Delta U$$

$$f_k^i \Delta x \cos \theta = (0 - 0) + 0 - mgh_i$$

$$f_k^i (5,5) \cos 180^\circ = -50(9,8)(5,5 \sin 15^\circ)$$

$$f_k^i = 126,821 \text{ N}$$

$$f_k^i = \mu_k N$$

$$126,821 = \mu_k (50)(9,8) \cos 15^\circ$$

$$\mu_k = 0,26$$

OPTION 2 / OPSIE 2

Diagram 1

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

$$W_{Fg(\text{parallel})} + W_f = 0 \quad (\Delta E_k = 0)$$

$$0 = (m \sin \theta) \Delta x \cos \theta + f_k^i \Delta x \cos \theta$$

$$0 = (50)(9,8)(\sin 15^\circ)(\cos 0^\circ) + (f_k^i)(5,5)(\cos 180^\circ)$$

$$f_k^i = 126,88 \text{ N}$$

$$f_k^i = \mu_k N$$

$$126,88 = \mu_k (50)(9,8)(\cos 15^\circ)$$

$$\mu_k = 0,27$$

OPTION 3 / OPSIE 3

Diagram 1

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

$$W_{Fg(\text{parallel})} + W_f = 0 \quad (\Delta E_k = 0)$$

$$0 = (m \sin \theta) \Delta x \cos \theta + f_k^i \Delta x \cos \theta$$

$$0 = (50)(9,8)(\sin 15^\circ)(\cos 0^\circ) + (f_k^i)(50)(\cos 0^\circ)$$

$$\mu_k = 0,27$$

(6)

OPTION 1 / OPSIE 1

Diagram 2

$$f_{k2} \text{ (at } \theta=30^\circ) = 0,27(50)(9,8 \cos 30^\circ) = 114,58 \text{ N}$$

$$W_{\text{net}} = \Delta E_k \quad \checkmark$$

$$W_{Fg} + W_{f_{k2}} = \Delta E_k$$

$$(mg \sin \theta) \Delta x \cos \theta + f_{k2} \Delta x \cos \theta = \frac{1}{2} m v_2^2 - \frac{1}{2} m v_1^2$$

$$(50)(9,8)(\sin 30^\circ)(5,5) \cos 0^\circ \checkmark + (114,58)(5,5)(\cos 180^\circ) \checkmark = \frac{1}{2}(50)(v_2^2) - (0) \checkmark$$

$$v_1 = 5,35 \text{ m} \cdot \text{s}^{-1} \quad \checkmark$$

OPTION 2 / OPSIE 2

For diagram 2:

$$W_{nc} = \Delta K + \Delta U \quad \checkmark$$

$$F_{k2} \Delta x \cos \theta = \frac{1}{2} m v_2^2 - 0 + 0 - mgh_1$$

$$[0,26(50)(9,8)](5,5) \cos 180^\circ \checkmark = \frac{1}{2}(50)v_2^2 \checkmark - 50(9,8)(5,5) \sin 30^\circ \checkmark$$

$$v_1 = 5,44 \text{ m} \cdot \text{s}^{-1} \quad \checkmark$$

OPTION 3 / OPSIE 3

Diagram 1

$$W_{nc} = \Delta K + \Delta U$$

$$f_{k1} \Delta x \cos \theta = 0 - 0 + 0 - mgh_1$$

$$\mu_k N_1 \Delta x \cos \theta = -mgh_1$$

$$\mu_k = \frac{N_1 \Delta x \cos \theta}{-mgh_1} \quad \text{--- (1)}$$

Diagram 2

$$W_{nc} = \Delta K + \Delta U$$

$$f_{k2} \Delta x \cos \theta = \frac{1}{2} m v_2^2 - 0 + 0 - mgh_2$$

$$\mu_k N_2 \Delta x \cos \theta = \frac{1}{2} m v_2^2 - mgh_2$$

$$\mu_k = \frac{N_2 \Delta x \cos \theta}{\frac{1}{2} m v_2^2 - mgh_2} \quad \text{--- (2)}$$

$$(1) = (2)$$

$$\frac{-mgh_1}{N_1 \Delta x \cos \theta} = \frac{\frac{1}{2} m v_2^2 - mgh_2}{N_2 \Delta x \cos \theta}$$

$$\frac{N_1}{-g h_1} = \frac{N_2}{\frac{1}{2} v_2^2 - g h_2}$$

$$\frac{(50)(9,8)(\cos 15^\circ)}{-(9,8)(5,5) \sin 15^\circ} = \frac{(50)(9,8)(\cos 30^\circ)}{\frac{1}{2} v_2^2 - (9,8)(5,5) \sin 30^\circ}$$

$$v_1 = 5,30 \text{ m} \cdot \text{s}^{-1}$$

(5) [13]

- Nasiemnglyne:
- ✓ energie formule
 - ✓ invangning van $\mu_k N$ vir nuwe f_k
 - ✓ invangning vir finale E_k in diagram 2
 - ✓ invangning W_{Fg} en $W_{f_{k2}}$ in diagram 2
 - ✓ antwoord met korrekte eenheid

- Marking guideline:
- ✓ energy formula
 - ✓ substitution of $\mu_k N$ for new f_k
 - ✓ substitution for final E_k in diagram 2
 - ✓ substitution W_{Fg} and $W_{f_{k2}}$ in diagram 2
 - ✓ answer with correct unit

QUESTION / VRAAG 6

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- 6.1 It is the (apparent) 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. ✓
 Dit is die waarneembare verandering in frekwensie (of toonhoogte) van die klank deur die luisteraar waargeneem as gevolg van die beweging van die klankbron en die luisteraar relatief tot mekaar en die voortplanting van die klank.
 (2)
- 6.2.1 1 200 Hz ✓
 (1)
- 6.2.2 1 120 Hz ✓
 (1)
- 6.3 **OPTION 1 / OPSIE 1**
 Towards the source / na die bron
 $f_L = \frac{v \pm v_L}{v \pm v_S} f_S$ ✓
 $1200 \checkmark = \frac{340 + v_L \checkmark}{340 + 0} 1160 \checkmark$
 $v = 11,72 \text{ m} \cdot \text{s}^{-1} \checkmark$
OPTION 2 / OPSIE 2
 Away from the source / weg van die bron
 $f_L = \frac{v \pm v_L}{v \pm v_S} f_S$ ✓
 $1120 \checkmark = \frac{340 - v_L \checkmark}{340 + 0} 1160 \checkmark$
 $v = 11,72 \text{ m} \cdot \text{s}^{-1} \checkmark$
 (5)
- 6.4.1 velocity / speed of blood ✓ or rate of flow of blood in arteries
 6.4.1
 snelheid / spoed van die bloed / of tempo van vloei van bloed in are.
 (1)
- 6.4.2 Waves from the Doppler meter bounce off moving blood cells and are detected with a different frequency. ✓ The meter uses the changed frequency to calculate the velocity ✓ of the blood.
 Veins and arteries let blood flow in opposite directions. The Doppler flow meter detects the change in frequency of the flowing blood and shows the data on the monitors for doctors to interpret.
 Golwe van die Doppler meter weerkaats terug vanaf die bewegende bloedselle en word waargeneem as 'n sekere frekwensie. Die meter gebruik die verandering in frekwensie om die spoed van die bloed te bereken.
 OF
 Are en slagare laat bloed in teenoorgestelde rigtings vloei. Die Doppler vloeiometer neem die verandering in die frekwensie van die vloeiende bloed waar en toon dit op die monitors aan vir die dokters om te interpreteer.
 (2)

OPTION 1 / OPSIE 1

$$F_E = \frac{r^2}{(kQ_1Q_2)} \quad \checkmark$$

$$= \frac{(9 \times 10^9)(0,6 \times 10^{-6})(1 \times 10^{-6})}{(0,18)^2} \quad \checkmark$$

$$= 0,1667 \text{ N}$$

$$\frac{F_E \sin 70^\circ}{T} = \frac{\sin 90^\circ}{T}$$

$$T = \frac{\sin 70^\circ}{(0,1667 \sin 90^\circ)} \quad \checkmark$$

$$= 1,367 \text{ N} \quad \checkmark$$

OPTION 2 / OPSIE 2

$$F_E = \frac{r^2}{(kQ_1Q_2)} \quad \checkmark = \frac{(T \cos 83^\circ)}{(T \sin 70^\circ)} \quad \checkmark$$

$$T = \frac{(9 \times 10^9)(0,6 \times 10^{-6})(1 \times 10^{-6})}{(0,18^2)(\cos 83^\circ)} \quad \checkmark$$

$$= 1,367 \text{ N} \quad \checkmark$$

OPTION 3 / OPSIE 3

$$F_E = \frac{r^2}{(kQ_1Q_2)} \quad \checkmark$$

$$= \frac{(9 \times 10^9)(0,6 \times 10^{-6})(1 \times 10^{-6})}{0,18^2} \quad \checkmark$$

$$= 0,1667 \text{ N}$$

$$\tan 7^\circ = \frac{T_x}{T_y} = \frac{T_y}{0,1667} \quad \checkmark$$

$$T_y = 1,358$$

$$T = \sqrt{T_x^2 + T_y^2}$$

$$= \sqrt{0,1667^2 + 1,358^2}$$

$$= 1,368 \text{ N} \quad \checkmark$$

OPTION 4 / OPSIE 4**Horizontal components**

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

$$F_{\text{elYon x}} = T_x \quad \checkmark$$

$$\frac{kQ_1Q_2}{r^2} = T \cos 83^\circ$$

$$\checkmark = T \cos 83^\circ \quad \checkmark \frac{(9 \times 10^9)(0,6 \times 10^{-6})(1 \times 10^{-6})}{(18 \times 10^{-2})^2}$$

$$T = 1,37 \text{ N} \quad \checkmark$$

(4)

7.4.1 Increase ✓ (1)

Vermeerder (1)

7.4.2 The net field at X increases, resulting in an increase on the force attracting X to Y and Z hence the angle increases. ✓ (2)

Die netto veld by X verhoog, dit veroorsaak 'n toename in die aantrekkingskrag van X na Y en Z en daarom vergroot die hoek. (2)

7.4.3 The insulated stands prevent the negative charges from flowing to the earth and discharging the balls. ✓ (2)

Die geïsoleerde staanders voorkom dat die negatiewe ladinge na die aarde vloei en die balle ontlaa. (2)

[14]

QUESTION / VRAAG 8

8.1

A resistor which obeys Ohm's law at constant temperature. ✓
OR

A resistor for which the ratio V/I is a constant at constant temperature.

n Weerstand wat die wet van Ohm gehoorsaam by konstante temperatuur.

OF

n Weerstand waarvan die verhouding V/I konstante is by konstante

temperatuur.

(2)

8.2.1

OPTION 1 /

For R_1 :

$V = IR$ ✓

$= (1,15)(10)$ ✓

$= 11,5 \text{ V}$

But as in a parallel circuit the potential

difference stays the same the voltmeter

reading over both R_2 and R_3 is also $11,5 \text{ V}$

So for the two in series (R_2 and R_3):

$V = IR$

$11,5 = I(12+14)$ ✓

$I = 0,44 \text{ A}$ ✓

OPTION 2 / OPSIE 2

RATIO of $R_1 : R_2 + R_3$ ✓

$10 : 26$ ✓

RATIO of $I_1 : I_{2+3}$

$26 : 10$ ✓

$1,15 : 0,44$

$I_{2+3} = 0,44 \text{ A}$ ✓

(4)

OPSIE 1
Vir R_1 :
 $V = IR$ ✓
 $= (1,15)(10)$ ✓
 $= 11,5 \text{ V}$
Soos in 'n parallel stroombaan sal die potensiaalverskil dieselfde bly vir die voltmeterlesing oor beide R_2 en R_3 en is dus ook $11,5 \text{ V}$.
Dus vir die twee in serie (R_2 en R_3):
 $V = IR$
 $11,5 = I(12 + 14)$ ✓
 $I = 0,44 \text{ A}$ ✓

- 9.1.3 Remove the slipping ✓ and replace it with a splitting. ✓ (2)
- 9.1.2 Faraday's law (of electromagnetic induction) ✓ (1)
- * 9.1.1 B to A ✓ (1)

QUESTION / VRAAG 9

[15]
(2)

Wanneer stroom vloei deur die battery word elektriese energie omgeskakel na hitte energie as gevolg van die battery se interne weerstand.

8.3 When current flows through the battery, electrical energy is converted to heat energy ✓ due to the battery's internal resistance. ✓ This explains the lower potential difference.

(3)

OPTION 1 / OPSIE 1

$$E_{mf} = I(R + r) \quad \checkmark$$

$$24 = 1,592(13,51 + r) \quad \checkmark$$

$$r = 1,57 \Omega \quad \checkmark$$

OPTION 2 / OPSIE 2

$$r = \frac{V_{lost\ volts}}{I_{circuit}} \quad \checkmark$$

$$= \frac{24 - 21,5}{1,59} \quad \checkmark$$

$$= 1,570 \Omega \quad \checkmark$$

8.2.3 Positive marking from 8.2.2

(4)

OPTION 1 / OPSIE 1

$$I_{circuit/stroombaan} = 1,15 + 0,442 \quad \checkmark$$

$$= 1,592 \text{ A}$$

$$R_4 = \frac{V_{R_4}}{I_{circuit}} \quad \checkmark$$

$$= \frac{21,5 - 11,5}{1,59} \quad \checkmark$$

$$= 6,281 \Omega \quad \checkmark$$

OPTION 2 / OPSIE 2

$$I_{Total} = 1,15 + 0,44 = 1,592 \text{ A} \quad \checkmark$$

Whole Circuit:

$$V_{ext} = I \cdot R_T \quad \checkmark$$

$$21,5 = 1,59 \times R_T$$

$$R_T = 13,51 \Omega$$

$$R_T = R_p + R$$

$$\frac{1}{R_p} = \frac{R_2 + R_3}{1} + \frac{R_1}{1}$$

$$= \frac{12 + 14}{1} + \frac{10}{1}$$

$$R_p = 7,22 \Omega$$

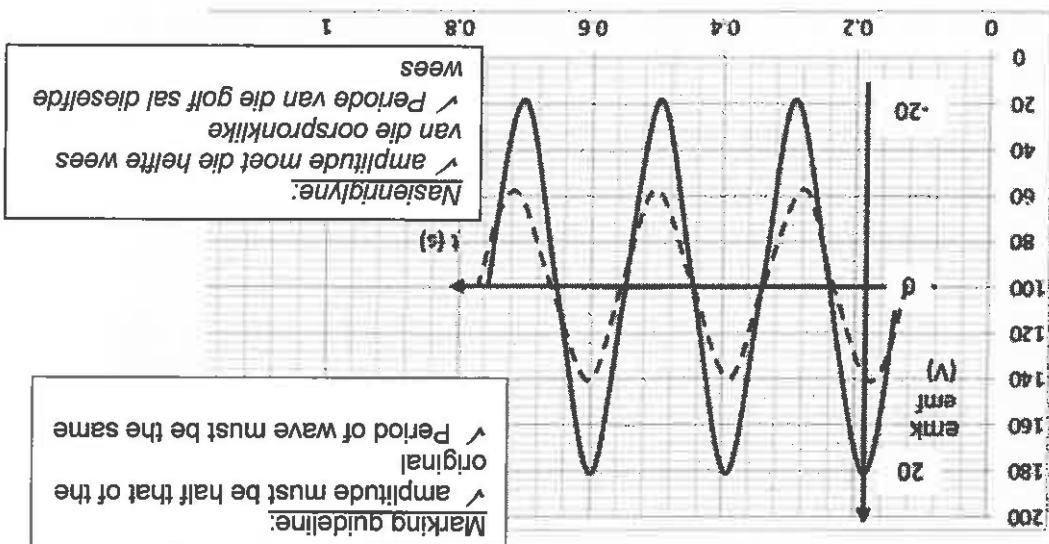
$$R_T = R_p + R_s$$

$$13,51 = 7,22 + R \quad \checkmark$$

$$R = 6,285 \Omega \quad \checkmark$$

8.2.2 Positive marking from 8.2.1

(2)



9.2.2

From Faraday's Law, induced emf is directly proportional to the rate of change of magnetic flux, ✓ hence halving speed halves the rate, hence V_{max} is halved

(2)

Vanuit Faraday se wet, die geïnduseerde emk is direk eweredig aan die tempo van verandering van die magnetiese vloedkoppeling, die halvering van die spoed sal die tempo halveer dus sal V_{maks} halveer word.

OPTION 2 / OPSIE 2

$$V_{rms} = \frac{V_{max}}{\sqrt{2}} = \frac{20}{\sqrt{2}} = 14,142 \text{ V}$$

$$P_{ave} = \frac{V_{rms}^2}{R} = \frac{14,142^2}{50} = 4,002 \text{ W}$$

(5) [13]

OPTION 1 / OPSIE 1

$$V_{rms} = \frac{V_{max}}{\sqrt{2}} = \frac{20}{\sqrt{2}} = 14,142 \text{ V}$$

$$I_{rms} = \frac{V_{rms}}{R} = \frac{14,142}{50} = 0,283 \text{ A}$$

$$P_{ave} = I_{rms} V_{rms} = 0,283 \times 14,142 = 4,002 \text{ W}$$

QUESTION / VRAAG 10

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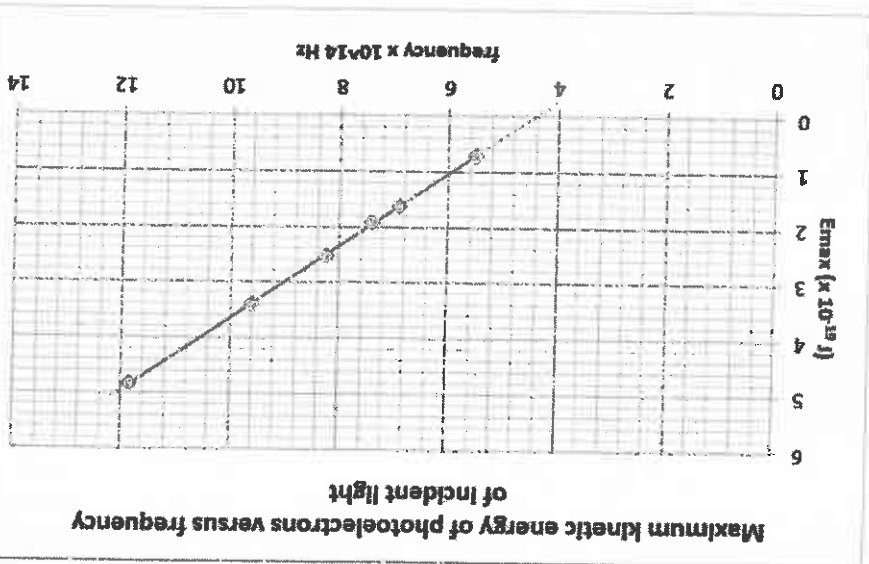
- 10.1 It is a phenomenon in which electrons are emitted from a metal surface. ✓✓
 when light of a suitable frequency is shone on the metal surface. ✓✓
 Dit is die verskynsel waar die elektrone vrygestel word vanuit die metaal
 se oppervlakte wanneer lig van 'n geskikte frekwensie op die metaal
 oppervlakte geskyn word. (2)
- 10.2 Example:
 What is the relationship between the frequency of light incident on the
 photocell and the maximum kinetic energy of the corresponding ejected
 photoelectrons?
 Voorbeeld:
 Wat is die verhouding tussen die frekwensie van die invallende lig op
 die fotosel en die maksimum kinetiese energie van die
 ooreenstemmende vrygestelde elektrone?
 Marking criteria
 The independent and dependent variables are stated ✓
 It must be a question about the relationship between the
 independent and dependent variables. ✓
 Marks
- 10.3.1 frequency of photons ✓ or frequency of incident light
 frekwensie van die fotone of frekwensie van invallende lig (1)
- 10.3.2 use the same metal ✓
 gebruik dieselfde metaal
 Mark positive from 10.3.1 (1)
- 10.4 (4)

Marking guideline:

- ✓ heading of graph
- ✓ labels on x and y axes and units
- ✓ all points plotted
- ✓ best fit line not through the origin

Nasientriglyne:

- ✓ opskrif vir grafiek
- ✓ byskrifte vir x en y asse en eenhede
- ✓ alle punte geploot
- ✓ beste paslyn maar nie deur die oorsprong



10.5.1 $4,2 \times 10^{14}$ Hz to $4,4 \times 10^{14}$ Hz ✓
 Mark positive from 10.3 and 10.4

(1)

Marking guidelines:

- ✓ Formula
- ✓ Substitution
- ✓ Answer with unit

Nasientriglyne:

- ✓ Formule
- ✓ Inveranging
- ✓ Antwoord met eenheid

<p>OPTION 1 By extrapolation from graph</p> <p>$W_0 = hf_0$ ✓</p> <p>$= 6,63 \times 10^{-34} \times 4,4 \times 10^{14}$ ✓</p> <p>$= 2,917 \times 10^{-19}$ J ✓</p>	<p>OPTION 2 Using any point on graph.</p> <p>OPSIE 2 Gebruik enige punt op grafiek.</p> <p>$hf = W_0 + E_k$</p> <p>$6,63 \times 10^{-34} \times 5,4 \times 10^{14} = W_0 + 0,72 \times 10^{-19}$</p> <p>$W_0 = 2,919 \times 10^{-19}$ J</p>	<p>OPTION 3</p> <p>$hf = W_0 + E_k$</p> <p>$6,63 \times 10^{-34} \times 6,91 \times 10^{14} = W_0 + 1,63 \times 10^{-19}$</p> <p>$W_0 = 2,951 \times 10^{-19}$ J</p>	<p>OPTION 4</p> <p>$hf = W_0 + E_k$</p> <p>$6,63 \times 10^{-34} \times 7,41 \times 10^{14} = W_0 + 1,92 \times 10^{-19}$</p> <p>$W_0 = 2,993 \times 10^{-19}$ J</p>
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10.5.2

(3)
 [15]
 150