

**PROVINCIAL PREPARATORY EXAMINATION/
PROVINSIALE VOORBEREIDINGSEKSAMEN**

GRADE/GRAAD 12

**PHYSICAL SCIENCES: PHYSICS P1
FISIESE WETENSKAPPE: FISIKA V1**

SEPTEMBER 2022

MARKING GUIDELINES/NASIENRIGLYNE

MARKS/PUNTE: 150

**These marking guidelines consist of 18 pages./
Hierdie nasienriglye bestaan uit 18 bladsye.**

QUESTION 1: MULTIPLE CHOICE-QUESTIONS
VRAAG 1: MEERVOUDIGE KEUSE VRAE

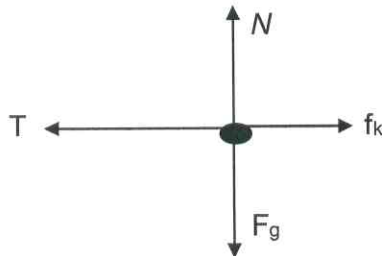
- | | | |
|------|------|-------------|
| 1.1 | D ✓✓ | (2) |
| 1.2 | B ✓✓ | (2) |
| 1.3 | C ✓✓ | (2) |
| 1.4 | B ✓✓ | (2) |
| 1.5 | C ✓✓ | (2) |
| 1.6 | A ✓✓ | (2) |
| 1.7 | D ✓✓ | (2) |
| 1.8 | A ✓✓ | (2) |
| 1.9 | A ✓✓ | (2) |
| 1.10 | D ✓✓ | (2) |
| | | [20] |

QUESTION 2/VRAAG 2

- 2.1 When object A exerts a force on object B, ✓ object B simultaneously exerts an oppositely directed force of equal magnitude on object A.

Wanneer voorwerp A 'n krag op voorwerp B uitoefen, ✓ sal voorwerp B gelyktydig 'n krag van gelyke grootte en in die teenoorgestelde rigting op voorwerp A uitoefen. ✓ (2)

2.2



Accepted labels/Aanvaarde benoemings		
T	F_T /tension force F_T /spanningskrag	✓
F_g	w/ F_w /weight/mg/gravitational force w/ F_w /gewig/mg/gravitasiekrag	✓
N	F_N /Normal/Normaal	✓
f_k	f/ f_f /Friction force f/ f_w /wrywingskrag	✓

Notes/Aantekeninge

- Marks awarded for label and arrow./Punt toegeken vir benoeming en pyltjie.
- Do not penalise for length of arrows since drawing is not to scale./Moenie vir die lengte van die pyltjies penaliseer nie aangesien die tekening nie volgens skaal is nie.
- Any other additional force(s)./Enige ander ekstra krag(te). Max/Maks $\frac{3}{4}$
- If force(s) do not make contact with body./Indien krag(te) nie met die voorwerp kontak maak nie: Max/Maks $\frac{3}{4}$
- If no arrows indicated and all forces correctly drawn/Indien geen pyltjies aangedui nie en al die kragte is korrek geteken: Max/Maks $\frac{3}{4}$

Do not penalise if vector notation is not used./

Moenie penaliseer indien vektor notasie nie gebruik is nie.

(4)

2.3 **Positive to the left/Positief na links**

On object A/Op voorwerp A

$$\sum F = 0 \text{ OR/OF } F_{\text{net}} = 0$$

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

✓Any one/Enige een

$$F_T - T - f = 0$$

$$900 - 0,45 \times 130 \times 9,8 - T \checkmark = 0$$

$$T = 326,7 \text{ N } \checkmark$$

OR

On object B/Op voorwerp B

$$T - f = 0$$

$$326,7 - f = 0 \checkmark$$

$$f = 326,7 \text{ N } \checkmark$$

$$F_T = f + T$$

$$900 = 0,45 \times 130 \times 9,8 + T \checkmark$$

$$T = 326,7 \text{ N } \checkmark$$

Positive to the right/Positief na regs

On object A/Op voorwerp A

$$\sum F = 0 \text{ OR/OF } F_{\text{net}} = 0$$

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

$$-F_T + T + f = 0$$

$$-900 + 0,45 \times 130 \times 9,8 + T \checkmark = 0$$

$$T = -326,7 \text{ N } \checkmark$$

On object B/Op voorwerp B

$$-T + f = 0$$

$$-326,7 + f = 0 \checkmark$$

$$f = 326,7 \text{ N } \checkmark$$

✓Any one/Enige een

(5)

2.4 $F_{\text{net}} = f/F_{\text{net}}$ to the right/ F_{net} no longer 0 N ✓

thus acceleration/acceleration opposite to motion/to the right. ✓

Slows down and stops ✓

$F_{\text{net}} = f/F_{\text{net}}$ na regs/ F_{net} is nie meer 0 N ✓

Dws versnelling/versnelling in die teenoorgestelde rigting as beweging/na regs.

✓

Beweeg stadiger en stop ✓

(3)

[14]

QUESTION 3/VRAAG 3

- 3.1 YES, ✓ the only force acting on the ball is gravitational force. ✓
JA, ✓ die enigste krag wat op die bal inwerk is gravitasie krag. ✓ (2)

3.2.1 Positive downwards/Positief afwaarts

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

$$16 = 0 + \frac{1}{2} \times 9,8 \times \Delta t^2 \quad \checkmark$$

$$\Delta t^2 = 3,265$$

$$\therefore t = 1,81 \text{ s } (1,807 \text{ s}) \quad \checkmark$$

Positive upwards/Positief opwaarts

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

$$-16 = 0 + \frac{1}{2} \times -9,8 \times \Delta t^2 \quad \checkmark$$

$$\Delta t^2 = 3,265$$

$$\therefore t = 1,81 \text{ s} \quad \checkmark$$

(3)

3.2.2 POSITIVE MARKING FROM 3.2.1

POSITIEWE NASIEN VANAF 3.2.1

OPTION 1/OPSIE 1

Positive downwards/Positief afwaarts

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

$$57,5 = 0 + \frac{1}{2} \times 9,8 \times \Delta t^2 \quad \checkmark$$

$$\Delta t^2 = 11,73$$

$$\therefore t = 3,43 \text{ s}$$

Time from Q to reach the ground/Tyd vanaf Q tot op die grond
 $= 3,43 - 1,81 = 1,62 \text{ s} \quad \checkmark$

Initial velocity of B/Aanvanklike snelheid van B

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

$$57,7 = v_i \times 1,62 + \frac{1}{2} \times 9,8 \times \Delta t^2 \quad \checkmark$$

$$v_i = 27,56 \text{ m} \cdot \text{s}^{-1} \text{ downwards/afwaarts} \quad \checkmark$$

vraag na spoed.

Positive upwards/Positief opwaarts

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

$$-57,5 = 0 + \frac{1}{2} \times -9,8 \times \Delta t^2 \checkmark$$

$$\Delta t^2 = 11,73$$

$$\therefore t = 3,43 \text{ s}$$

Time from Q to reach the ground/Tyd vanaf Q tot op die grond
 $= 3,43 - 1,81 = 1,62 \text{ s} \checkmark$

Initial velocity of B/Aanvanklike snelheid van B

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

$$-57,7 = v_i \times 1,62 + \frac{1}{2} \times -9,8 \times \Delta 1,62^2 \checkmark$$

$$v_i = 27,56 \text{ m} \cdot \text{s}^{-1} \text{afwaarts} \checkmark$$

OPTION 2/OPSIE 2

$$\begin{aligned} v_f &= v_i + a \Delta t \\ &= 0 + (9,8)(1,81) \\ &= 17,738 \text{ m} \cdot \text{s}^{-1} \end{aligned}$$

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

$$41,5 = (17,74) \Delta t + \frac{1}{2} (-9,8) \Delta t^2$$

$$\Delta t = 1,62 \text{ s}$$

Initial velocity of B/Aanvanklike snelheid van B

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

$$-57,7 = v_i \times 1,62 + \frac{1}{2} \times -9,8 \times \Delta 1,62^2 \checkmark$$

$$v_i = 27,56 \text{ m} \cdot \text{s}^{-1} \text{downwards/afwaarts} \checkmark$$

(5)

3.2.3 **POSITIVE MARKING FROM 3.2.2**
POSITIEWE NASIEN VANAF 3.2.2

OPTION 1/OPSIE 1

Positive downwards/Positief afwaarts

$$\vec{v}_f = \vec{v}_i + \vec{a}\Delta t \checkmark$$

$$\vec{v}_f = 27,56 + (9,8) \cdot 1,62 \checkmark$$

$$\vec{v}_f = 43,436 \text{ m.s}^{-1} \checkmark$$

Positive upwards/Positief opwaarts

$$\vec{v}_f = \vec{v}_i + \vec{a}\Delta t \checkmark$$

$$\vec{v}_f = -27,56 + (-9,8) \cdot 1,62 \checkmark$$

$$\vec{v}_f = -43,436$$

$$\vec{v}_f = 43,436 \text{ m.s}^{-1} \checkmark$$

OPTION 2/OPSIE 2

Positive downwards/Positief afwaarts

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

$$v_f^2 = (27,56)^2 + 2(9,8)57,7 \checkmark$$

$$\vec{v}_f = 43,436 \text{ m.s}^{-1} \checkmark$$

Positive upwards/Positief opwaarts

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

$$v_f^2 = (-27,56)^2 + 2(-9,8)57,7 \checkmark$$

$$\vec{v}_f = 43,436 \text{ m.s}^{-1} \checkmark$$

(3)

3.3 **POSITIVE MARKING FROM 3.2.3**
POSITIEWE NASIEN VANAF 3.2.3

For ball B/Vir bal B

$$\text{Impulse/Impuls} = \Delta p \text{ OR/OR } \vec{I} = \Delta \vec{p} \text{ OR/OR } \vec{J} = \Delta \vec{p}$$

$$\vec{I} = m_A(\vec{v}_{Af} - \vec{v}_{Ai}) \text{ OR/OR } \vec{I} = m_A(v_{Af} - v_{Ai})$$

$$\vec{J} = m_A(\vec{v}_{Af} - \vec{v}_{Ai}) \text{ OR/OR } \vec{J} = m_A(v_{Af} - v_{Ai})$$

} $\checkmark$ Any one/Enige een

Up as positive/Op as positief
OR/OR

$$\Delta p = 0,02[(20) - (-43,436)] \checkmark$$

$$\Delta p = 1,27 \text{ kgm.s}^{-1}$$

$\therefore$

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

$$F_{\text{net}} = \frac{1,27}{0,02} \checkmark$$

$$= 63,5 \text{ N upwards/opwaarts} \checkmark$$

Down as positive/Af as positief

$$\Delta p = 0,02[(-20) - (43,436)] \checkmark$$

$$\Delta p = -1,27 \text{ kgm.s}^{-1}$$

$\therefore$

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

$$F_{\text{net}} = \frac{-1,27}{0,02} \checkmark$$

$$= -63,5 \text{ N}$$

$$= 63,5 \text{ N upwards/opwaarts} \checkmark$$

(4)

3.4 9.8 m.s⁻² downwards/afwaarts $\checkmark$

(1)

[18]

QUESTION 4/VRAAG 4

4.1 The total linear momentum of an isolated system remains constant (is conserved) $\checkmark \checkmark$

Die totale lineêre momentum in 'n geïsoleerde sisteem bly konstant (behoue) $\checkmark \checkmark$

(2)

Marking criteria/Nasienkriteria

If any of the underlined key words/phrases in the correct context is omitted deduct 1 mark.

Indien enige van die onderstreepte sleutelwoorde/frases in die korrekte konteks uitgelaat is, trek 1 punt af.

4.2 $p_A = 6 \times 10^3 \text{ kg.m.s}^{-1}$ east/oos $\checkmark$

grootte?

(1)

4.3.1 **POSITIVE MARKING FROM 4.2**
POSITIEWE NASIEN VANAF 4.2

$$p = mv \checkmark$$

$$6 \times 10^3 = 2\,000 v \checkmark$$

$$\therefore v = 3 \text{ m.s}^{-1} \checkmark$$

(3)

4.3.2 **POSITIVE MARKING FROM 4.2 AND 4.3.1**
POSITIEWE NASIEN VANAF 4.2 EN 4.3.1
East as positive/Oos as positief

$$\sum p_{\text{before/voor}} = \sum p_{\text{after/na}} \checkmark$$

$$m_A v_{A(\text{before/voor})} + m_B v_{B(\text{before/voor})} = m_A v_{A(\text{after/na})} + m_B v_{B(\text{after/na})}$$

$$6 \times 10^3 + 1\,500 v_{B_i} \checkmark = 1 \times 10^3 + 2 \times 10^3 \checkmark$$

$$v_{B(\text{after/na})} = -2 \text{ m.s}^{-1}$$

$$v_{B(\text{after/na})} = 2 \text{ m.s}^{-1} \checkmark \text{ west/wes} \checkmark$$

(5)

[11]

QUESTION 5/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 the object's kinetic energy.
*Die arbeid verrig op 'n voorwerp deur 'n nettokrag is gelyk aan die verandering in kinetiese energie van die voorwerp. **OF** Die netto arbeid verrig op 'n voorwerp is gelyk aan die verandering in kinetiese energie van die voorwerp. ✓✓* (2)

Marking criteria/Nasienkriteria

If any of the underlined key words/phrases in the correct context is omitted deduct 1 mark.

Indien enige van die onderstreepte sleutelwoorde/frases in die korrekte konteks uitgelaat is, trek 1 punt af.

- 5.2 gravitational force/gravitasie krag ✓ (1)

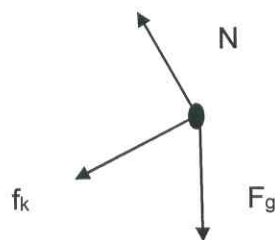
5.3 $\Sigma(E_{ki} + E_{pi}) = \Sigma(E_{kf} + E_{pf})$ ✓

$$\frac{1}{2} m v_A^2 + mgh_A = \frac{1}{2} m v_C^2 + mgh_C$$

$$\frac{1}{2} (80)(0)^2 + 80 \times 9,8 \times 50 \checkmark = \frac{1}{2} (80)(v_C)^2 + 80 \times 9,8 \times 0 \checkmark$$

$$v_C = 31,3 \text{ m} \cdot \text{s}^{-1} \checkmark$$
 (4)

5.4



(3)

Accepted labels/Aanvaarde benoemings		
F _g	w/F _w /weight/mg/gravitational force w/F _w /gewicht/mg/gravitasiekrag	✓
N	F _N /Normal/Normaal	✓
f _k	Friction force wrywingskrag	✓

Notes/Aantekeninge

- Marks awarded for label and arrow./Punt toegeken vir benoeming en pyltjie.
- Do not penalise for length of arrows since drawing is not to scale./Moenie vir die lengte van die pyltjies penaliseer nie aangesien die tekening nie volgens skaal is nie.

- Any other additional force(s)./Enige ander ekstra krag(te). Max/Maks $\frac{2}{3}$
- If force(s) do not make contact with body./Indien krag(te) nie met die voorwerp kontak maak nie: Max/Maks $\frac{2}{3}$
- If no arrows indicated and all forces correctly drawn/Indien geen pyltjies aangedui nie en al die kragte is korrek geteken: Max/Maks $\frac{2}{3}$

Do not penalise if vector notation is not used./Moenie penaliseer indien vector notasie nie gebruik is nie.

POSITIVE MARKING FROM 5.3
POSITIEWE NASIEN VANAF 5.3

5.5

$$\left. \begin{aligned} W_{net} &= \Delta E_k \checkmark \\ W_N + W_w + W_f &= \frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2 \end{aligned} \right\}$$

$$0 + 80 \times 9,8 \Delta x \cos 120^\circ + 160 \Delta x \cos 180^\circ \checkmark = 0 - \frac{1}{2}(80)(31,3)^2 \checkmark$$

$$\Delta x = 70,99 \text{ m}$$

$$\text{The height/Die hoogte} = x \sin 30^\circ$$

$$= 70,99 \sin 30^\circ$$

$$h = 35,50 \text{ m} \checkmark \quad (5)$$

5.6 DECREASES/VERMINDER $\checkmark$

(1)
[16]

QUESTION 6/VRAAG 6

6.1 $\lambda = 0,2 \text{ m} \checkmark \checkmark \quad (2)$

POSITIVE MARKING FROM 6.1
POSITIEWE NASIEN VANAF 6.1

6.2 $f = \frac{v}{\lambda} \checkmark$

$$f = \frac{340}{0,2} \checkmark \therefore f = 1\,700 \text{ Hz} \checkmark \quad (3)$$

6.3 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. $\checkmark \checkmark$
Die verandering in frekwensie (of toonhoogte) van die klank waargeneem deur 'n luisteraar omdat die klankbron en die luisteraar verskillende snelhede relatief tot die medium waarin klank voortgeplant word, het. $\checkmark \checkmark \quad (2)$

Marking criteria/Nasienkriteria

If any of the underlined key words/phrases in the correct context is omitted deduct 1 mark.

Indien enige van die onderstreepte sleutelwoorde/frases in die korrekte konteks uitgelaat is, trek 1 punt af.

POSITIVE MARKING FROM 6.2

POSITIEWE NASIEN VANAF 6.2

6.4 $f_L = \frac{v \pm v_L}{v \pm v_s} \times f_s \checkmark$

$$1\,620 = \frac{340 - 0}{340 + v_s} \checkmark \times 1\,700 \checkmark \text{ (both frequencies correct/}$$

beide frekwensies korrek)

$$\therefore v_s = 16,79 \text{ m.s}^{-1} \checkmark \quad (4)$$

- 6.5 The bird is flying away from the detector. $\checkmark$
Die voël vlieg ~~weg~~ van die detektor. $\checkmark$

(1)
[12]

QUESTION 7/VRAAG 7

- 7.1 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 between them. $\checkmark\checkmark$

Die grootte van die elektrostatiese krag wat een puntlading (Q_1) op 'n ander puntlading (Q_2) uitoefen, is direk eweredig aan die produk van die groottes van die ladings en omgekeerd eweredig aan die kwadraat van die afstand tussen hulle. $\checkmark\checkmark$

Marking criteria/Nasienkriteria

If any of the underlined key words/phrases in the correct context is omitted deduct 1 mark.

Indien enige van die onderstreepte sleutelwoorde/frases in die korrekte konteks uitgelaat is, trek 1 punt af. (2)

7.2.1 $F = \frac{kQq}{r^2} \checkmark$

$$F = \frac{9,0 \times 10^9 \times 1,52 \times 10^{-16} \times 1,6 \times 10^{-19} \checkmark}{(0,01)^2 (0,4)^2}$$

$$= \frac{9,0 \times 10^9 \times 1,2 \times 10^{-16} \times 1,6 \times 10^{-19} \checkmark}{(0,04)^2 (0,4)^2}$$

$$F = 2,1888 \times 10^{-23} - 1,08 \times 10^{-24} (+ - \checkmark)$$

$$\therefore F = 2,08 \times 10^{-23} \text{ N} \checkmark \quad (5)$$

7.2.2 **POSITIVE MARKING FROM 7.2.1**
POSITIEWE NASIEN VANAF 7.2.1

$$E_{\text{net}} = \frac{F_{\text{net}}}{q} \checkmark = \frac{2,08 \times 10^{-23}}{1,6 \times 10^{-19}} \checkmark = 1,3 \times 10^{-4} \text{ N.C}^{-1} \checkmark$$

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

$$E_B = \frac{(9 \times 10^9)(1,52 \times 10^{-16})}{(0,01)^2}$$

$$E_A = \frac{(9 \times 10^9)(1,2 \times 10^{-16})}{(0,04)^2} (3)$$

$$E_{\text{net}} = 0,000675 - 0,01368 \text{ (af trek)} \checkmark$$

$$= 1,3 \times 10^{-2} \text{ N.C}^{-1} \checkmark$$

7.3 No✓

According to $F_{\text{net}} = ma$, the net force is directly proportional to acceleration. ✓
The net force will increase as the electron moves nearer to the + charge. ✓
The acceleration will therefore increase.

~~No~~ ✓ *Toeneem*

Volgens $F_{\text{net}} = ma$, is die netto krag direk eweredig aan versnelling. ✓ Die netto krag sal groter word ✓ soos wat die elektron nader aan die + lading beweeg ✓ en daarom sal die versnelling toeneem.

(3)
[13]

QUESTION 8/VRAAG 8

8.1 The potential difference (voltage) across a conductor is directly proportional to the current through the conductor provided that the temperature remains constant. ✓✓

Die potensiaalverskil (spanning) oor 'n geleier is direk eweredig aan die stroom deur die geleier mits die temperatuur daarvan konstant bly. ✓✓

Marking criteria/Nasienkriteria

If any of the underlined key words/phrases in the correct context is omitted deduct 1 mark.

Indien enige van die onderstreepte sleutelwoorde/frases in die korrekte konteks uitgelaat is, trek 1 punt af. (2)

8.2 13,5 V ✓

(1)

8.3.1 **POSITIVE MARKING FROM 8.2**
POSITIEWE NASIEN VANAF 8.2

Option 1/Opsie 1

$$\varepsilon = I(R + r) \checkmark$$

$$13,5 = 1,5 [(R_p + 3) \checkmark + 1] \checkmark$$

$$\therefore 9 = R_p + 4$$

$$\therefore R_p = 5 \Omega \checkmark$$

Option 2/Opsie 2

$$R_t = \frac{V}{I} \checkmark$$

$$= 13,5 \div 1,5 \checkmark$$

$$\therefore R_t = 9 \Omega$$

(4)

$$R_p = 9 - 3 - 1 \checkmark = 5 \Omega \checkmark$$

8.3.2 POSITIVE MARKING FROM 8.3.1
POSITIEWE NASIEN VANAF 8.3.1

$$\frac{1}{R_1} = \frac{1}{R_{front}} + \frac{1}{R_{back}} \checkmark$$

$$\frac{1}{5} \checkmark = \frac{1}{6} + \frac{1}{12+R} \checkmark$$

$$\therefore \frac{1}{30} = \frac{1}{12+R}$$

$$\therefore R = 18 \Omega \checkmark$$

(4)

$$\begin{aligned} R &= \frac{V}{I} \checkmark \\ (12 + R) \checkmark &= \frac{7,5}{0,25} \checkmark \\ R &= 18 \Omega \checkmark \end{aligned}$$

8.3.3 POSITIVE MARKING FROM 8.3.1
POSITIEWE NASIEN VANAF 8.3.1

$$V_6 = I_p \times R_p = 1,5 \times 5 = 7,5 \text{ V} \checkmark$$

$$I_6 = V_6 \div R_6 = 7,5 \div 6 = 1,25 \text{ A} \checkmark$$

Option 1/Opsie 1

$$P = VI \checkmark = 7,5 \times 1,25 = 9,375 \text{ W} \checkmark$$

Option 2/Opsie 2

V calculate/bereken $\checkmark$

$$P = V^2 \div R \checkmark = 7,5^2 \div 6 \checkmark = 9,375 \text{ W} \checkmark$$

Option 3/Opsie 3

I calculate/bereken $\checkmark$

$$P = I^2 \times R \checkmark = 1,25^2 \times 6 \checkmark = 9,375 \text{ W} \checkmark$$

(4)

8.4 DECREASES ✓

If the $3\ \Omega$ is removed, R_{ext} will decrease ✓ and total current will increase. ✓
As emf and r are fixed, the value for I_r will be more than before, which means the value for IR must be less than before to keep emf constant. ✓ The voltmeter reads IR and will therefore have a lower reading.

VERMINDER ✓

As die $3\ \Omega$ verwyder is sal R_{ekstern} verminder ✓ sodat die totale stroom sal vermeerder. ✓ Omdat emk en r vaste waardes is sal die waarde van I_r meer wees as tevore wat sal beteken dat IR minder moet wees om die emk konstant te hou. ✓ Die voltmeter lees IR en sal daarom 'n laer lesing hê.

(4)
[19]

QUESTION 9/VRAAG 9

9.1 Electrical energy to mechanical energy ✓ /
Elektriese energie na meganiese energie ✓

(1)

9.2 DC ✓, because of the splitting/commutator ✓
GS ✓, daar is 'n splitting/kommutator ✓

(2)

9.3 It ensures transfer of electricity from outside the motor to the centre.
Dit verseker oordrag van elektrisiteit vanaf die buitekant na die middel van die motor.

(1)

9.4 negative ✓ negatief ✓

(1)

9.5 The motor effect ✓
When a current carrying conductor is placed in a magnetic field it will experience a force. ✓
Die motor effek ✓
Wanneer 'n stroomdraende geleier in 'n magneetveld geplaas word ondervind dit 'n krag ✓

(2)

9.6.1 $V_{\text{wgk/rms}} = \frac{V_{\text{max/maks}}}{\sqrt{2}}$ ✓

$$230 = \frac{V_{\text{max/maks}}}{\sqrt{2}} \quad \checkmark$$

$$V_{\text{max/maks}} = 329,27 \text{ V}$$

$$V_{\text{max/maks}} = 240,03 \text{ V} \quad \checkmark$$

(3)

9.6.2 $P_{\text{ave/gem}} = \frac{V_{\text{wgk}}^2}{R}$ ✓

$$2\ 000 = (230) I_{\text{rms/wgk}} \quad \checkmark$$

$$\therefore I_{\text{rms/wgk}} = 8,70 \text{ A} \quad \checkmark$$

(3)

9.6.3 **POSITIVE MARKING FROM 9.6.2**
POSITIEWE NASIEN VANAF 9.6.2

$$R = \frac{V_{rms}}{I_{rms}} \checkmark$$

$$R = \frac{230}{8,7} \checkmark$$

$$R = 26,44 \Omega \checkmark$$

or $P_{gem} = \frac{V_{avg}^2}{R}$

$$2000 = \frac{(230)^2}{R}$$

$$R = 26,45 \Omega$$

or $P_{gem} = I_{avg}^2 R$

$$2000 = (8,7)^2 R$$

$$R = 26,42 \Omega$$

(3)
[16]

QUESTION 10/VRAAG 10

10.1 Threshold frequency $\checkmark$ /drumpelfrekwensie $\checkmark$ (1)

10.2 The minimum energy that an electron needs to be emitted from the metal surface. $\checkmark \checkmark$

Die minimum energie benodig om 'n elektron uit die oppervlak van 'n metaal vry te stel. $\checkmark \checkmark$

Marking criteria/Nasienkriteria

If any of the underlined key words/phrases in the correct context is omitted deduct 1 mark.

Indien enige van die onderstreepte sleutelwoorde/frases in die korrekte konteks uitgelaat is, trek 1 punt af. (2)

10.3 $W_0 = h \times f_0 \checkmark$
 $= 6,63 \times 10^{-34} \times 5 \times 10^{14} \checkmark$
 $= 3,315 \times 10^{-19} \text{ J } \checkmark$ (3)

10.4 **POSITIVE MARKING FROM 10.3**
POSITIEWE NASIEN VANAF 10.3

OPTION 1/OPSIE 1

Gradient $= 6,63 \times 10^{-34} \checkmark = \frac{\Delta E}{\Delta f} = \frac{11 \times 10^{-19} - 0}{f_1 - 5 \times 10^{14}} \checkmark \checkmark$
 $\therefore f_1 = 2,16 \times 10^{15} \text{ Hz } \checkmark$

OPTION 2/OPSIE 2

$E = W_0 + E_{k(max)} \checkmark$ (4)
 $6,63 \times 10^{-34} \times f_1 \checkmark = 3,315 \times 10^{-19} + 11 \times 10^{-19} \checkmark$
 $\therefore f_1 = 2,16 \times 10^{15} \text{ Hz } \checkmark$

10.5 INCREASE $\checkmark$ /VERMEERDER $\checkmark$ (1)
[11]

GRAND TOTAL/GROOTTOTAAL: 150