basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

See corrections below.

NATIONAL SENIOR CERTIFICATE
NASIONALE SENIOR SERTIFIKAAT

GRADE/*GRAAD* 11

PHYSICAL SCIENCES: PHYSICS (P1)
FISIESE WETENSKAPPE: FISIKA (V1)

NOVEMBER 2015

MEMORANDUM

MARKS/*PUNTE*: 150

This memorandum consists of 18 pages.
Hierdie memorandum bestaan uit 18 bladsye.

QUESTION 1/*VRAAG 1*

1.1 C ✓✓ (2)

1.2 D ✓✓ (2)

1.3 C ✓✓ (2)

1.4 B ✓✓ (2)

1.5 A ✓✓ (2)

1.6 B ✓✓ (2)

1.7 A ✓✓ (2)

1.8 D ✓✓ (2)

1.9 B✓✓ (2)

1.10 D ✓✓ (2)

[20]

QUESTION 2/*VRAAG 2*

2.1 Each of them has magnitude✓ and direction✓
Elk van hulle het grootte en rigting

> **NOTE:** 1 mark for: *they have arrows or any similar statement*.
> ***LET WEL:*** *1 punt vir: hulle het pyltjies of enige soortgelyke stelling.*
> ACCEPT: They have magnitude and arrows indicating direction for 2 marks.
> *AANVAAR: Hulle het grootte en pyltjies wat rigting aandui vir 2 punte.*

(2)

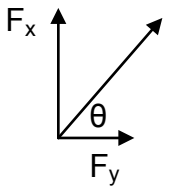
2.2 $F_x = P \cos 80^o + Q \cos 30^o + (-R \cos 60^o)$
$= 500 \cos 80^o + 200 \cos 30^o - 300 \cos 60^o]$✓

$\therefore F_x = 110{,}03$ N

$F_y = P \sin 80^o + Q \sin 30^o + (-R \sin 60^o)$
$= [500 \sin 80^o + 200 \sin 30^o - 300 \sin 60^o]$ ✓

$\therefore F_y = 332{,}60$ N

$F_R = \sqrt{(110{,}03)^2 + (332{,}60)^2}$ ✓



$= 350{,}33$ N

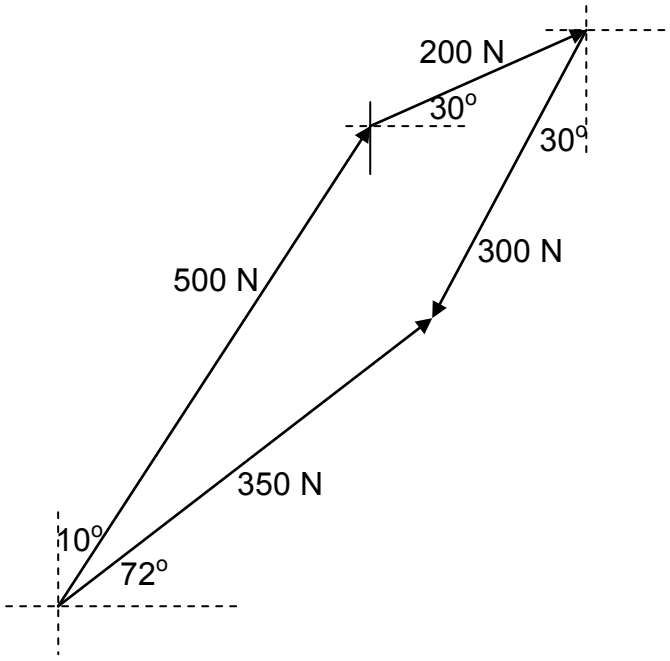
$\theta = \tan^{-1}\frac{(332,60)}{(110,03)}$ ✓✓ $= 71{,}69^o$ ✓$(71{,}7^O)$

Resultant force = 350,33 N✓ in direction N 18, 3(1)^o E(accept 71,69^o North of east✓) **[ACCEPT ANSWERS CORRECT TO 1 DEC PLACE FOR BEARING/ DIRECTION]**
Resulterende krag = 350,33 N in die rigting N 18,3(1)^{o}O (aanvaar 71,69^o Noord van oos) ***[AANVAAR ANTWOORDE KORREK NA 1 DES. PLEK VIR RIGTING]***

> **NOTE ALSO/*LET WEL OOK:***
> $F_x = P \sin 10^o + Q \sin 60^o + (-R \sin 30^o$
> $[500 \sin 10^o + 200 \sin 60^o - 300 \sin 30^o]$✓
>
> $F_y = P \cos 10^o + Q \cos 60^o + (-R \cos 30^o)$
> $[500 \cos 10^o + 200 \cos 60^o - 300 \cos 30^o]$✓
>
> Do not penalise if diagram is not drawn.
> *Moenie penaliseer as diagram nie geteken is nie.*

(8)

2.2 SCALE DRAWING/*SKAALTEKENING*

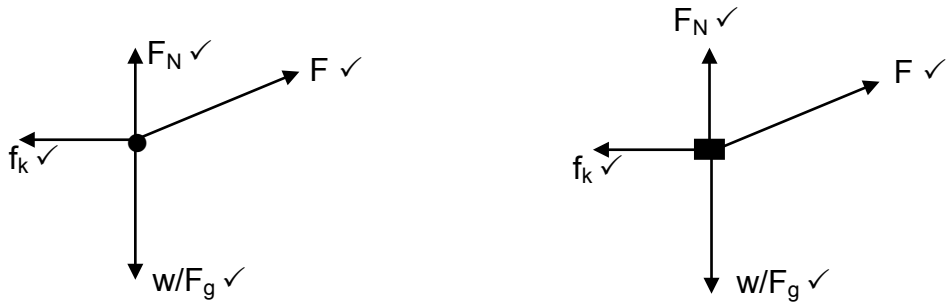


CRITERIA/*KRITERIA*	**MARK/*PUNT***
Each angle correctly measured *Elke hoek korrek gemeet*	(1x3)✓
Correct tail-to-head drawing of PQR *Korrekte stert-aan-kop tekening vir PQR*	(1 x3)✓
F_{res} both magnitude and direction correct starting from origin to meet 'head' of vector R *F_{res} beide grootte en rigting korrek. Begin vanaf oorsprong om 'kop' van vektor R te ontmoet*	(1x2)✓
ACCEPT P, Q and R in place of 500 N, 200 N and 300 N respectively. *Aanvaar P, Q en R in plaas van 500 N, 200 N en 300 N onderskeidelik.*	
Penalise ONE MARK if arrows are omitted. *Penaliseer EEN PUNT indien pylpunte uitgelaat word*	

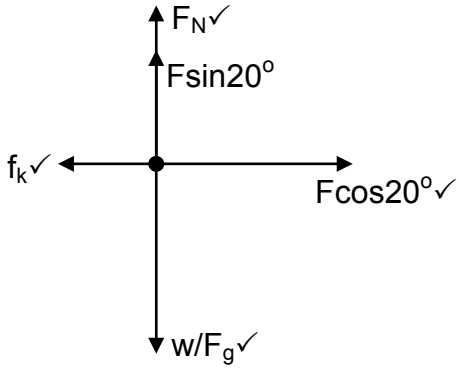
(8)
[10]

QUESTION 3/*VRAAG 3*

3.1



ACCEPT/*AANVAAR*



(4)

Notes: Accepted Labels/*Aanvaarde benoemings*	
w	F_g/F_w/force of Earth on block/weight/490 N/mg/gravitational force *F_g/F_w/krag van Aarde op blok/gewig/490 N/mg/gravitasiekrag*
f	F_f / f_k /friction/*wrywing*
N	F_N /Normal/*Normaal*
	Any additional force: deduct 1 mark (maximum ¾) *Enige addisionele krag: trek 1 punt af (maksimum ¾)*
	Lines must touch dot/square otherwise (maximum ¾) *Lyne moet kolletjie/vierkant raak anders(maksimum ¾)*
	Do not penalise if angle is shown/not shown. *Moenie penaliseer as hoek getoon/nie getoon is nie.*

3.2 A body will remain in its state of rest or motion at constant velocity unless a non-zero resultant/net force acts on it.✓✓
'n Liggaam sal in sy toestand van rus of beweging teen konstante snelheid bly, tensy 'n nie-nul resulterende / netto krag daarop inwerk. (2)

3.3 $F_{net} = ma$✓
$\underline{F\cos 20^o} \ \underline{- f_k}$ ✓$= 0$
$F\cos 20^o - \mu_k F_N = 0$
$0{,}94\ F - \underline{0{,}4(490 - 0{,}34F)}$ ✓ $= 0$✓
$F = 182{,}156$ N✓

$F_g = F_N + F\sin 20^o$ ✓
$mg = F_N + F\sin 20^o$
$(50)(9{,}8) = F_N + 0{,}34F$
$F_N = 490 - 0{,}34F$

(6)

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

$F_g = F_N + F\sin 20^o$
$mg = F_N + F\sin 20^o$
$(50)(9,8) = F_N + 0,34F$
$F_N = 490 - 0,34F$

MAY START FROM ANY OF THESE
KAN VAN ENIGE VAN HIERDIE BEGIN

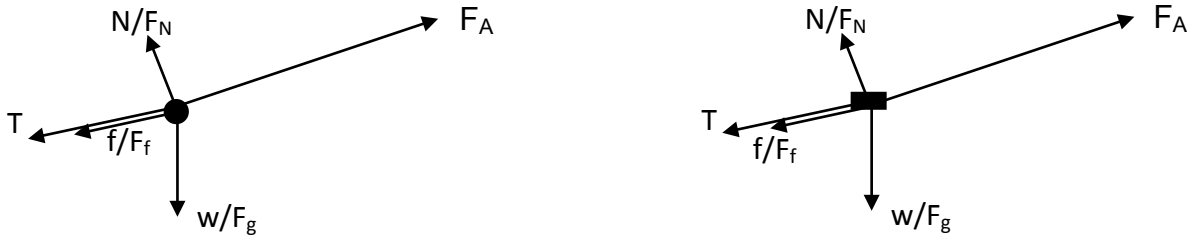
$F_N = 490 - 0,34(182,156)$✓
$= 428,07$ N✓ (2)

3.5 $f_k = \mu_k F_N = \mu_k N$
$f_k = 0,4(428,07)$✓
$= 171,23$ N✓ (2)

3.6 The normal force increases ✓, hence the frictional force increases,✓ making it harder to move the object forward.
Die normale krag neem toe, gevolglik neem die wrywingskrag toe, wat dit moeiliker maak vir die voorwerp om vorentoe te beweeg. (2)
[18]

QUESTION 4/*VRAAG 4*

4.1.1



Notes: Accepted Labels/*Aanvaarde benoemings*		**MARK/*PUNT***
w	F_g/F_w/force of Earth on block/weight/9,8 N/mg/gravitational force *F_g/F_w/krag van Aarde op blok/gewig/9,8 N/mg/gravitasiekrag*	✓
f	F_f/f_k/friction/*wrywing*	✓
N	F_N/Normal/*Normaal*	✓
T	F_T/Tension force/*Spanningskrag*	✓
F_A	30 N/F_{30N}	✓
	Any additional force: deduct 1 mark maximum (maximum ¾) *Enige addisionele krag: trek 1 punt af (maksimum ¾)*	
	Lines must touch dot/square otherwise (maximum ¾) *Lyne moet kolletjie/vierkant raak anders (maksimum ¾)*	
	Do not penalise if angle is shown/not shown *Moenie penaliseer as hoek getoon/nie getoon is nie.*	

(5)

4.1.2 When a net force is applied to an object (of mass m), it accelerates the object in the direction of the net force. The acceleration is directly proportional to the net force and inversely proportional to the mass of the object.✓✓
Wanneer 'n netto krag op 'n liggaam (met massa m) toegepas word, versnel dit in die rigting van die netto krag. Die versnelling is direk eweredig is aan die krag en omgekeerd eweredig is aan die massa van die voorwerp.

OR/*OF*
When a net force acts on an object of mass m, the acceleration that results is directly proportional to the net force, has a magnitude that is inversely proportional to the mass and a direction that is the same as that of the net force. ✓✓
Wanneer 'n netto krag op 'n liggaam met massa m inwerk, is die gevolglike versnelling direk eweredig aan die netto krag, het 'n grootte wat omgekeerd eweredig is aan die massa en 'n rigting wat dieselfde is as die van die netto krag. (2)

4.1.3 **OPTION 1/OPSIE 1**

$F_{net} = ma$✓
For the 1 kg block/*Vir die 1 kg-blok*
$30-(T+mg\sin 28^o + f_k) = ma$
$\underline{30 -\{T+(1)(9,8)(\sin 28^o) +4\}} = \underline{(1)(a)}$ ✓
$21,399 - T = a$……(1)

For the 2 kg block/*Vir die 2 kg blok*
$F_{net} = ma$
$T-(mg\sin 28^o + f_k) = ma$
$\underline{T-\{(2)(9,8)(\sin 28^o) + 8\} = (2)(a)}$ ✓
$T - 17,201 = 2a$ ……(2)
Substitute for T from equation (1)
Vervang T vanaf vergelyking (1)
$(21,4 - a) - 17,2 = 3a$✓
$4,198 = 3a$
$a = 1,4\ m\cdot s^{-2}$ $(1,399\ m\cdot s^{-1})$

OR from (1) & (2)/*Of vanaf (1) & (2)*
21,399 – T = a……..(1)
T – 17,201 = 2a……..(2)
$\underline{T – 17,201 = 2(21,399 – T)}$✓
T = 20 N (19,999 N)✓

Form (1)/*Vanaf (1)*
T = 21,399 – a
= 21,399 – 1,399
= 20 N ✓

OR/*OF*
From (2)
T = 17,201 + 2(1,399)✓
= 20 N✓

(5)

4.1.3 **OPTION 2 (AWARD 4 MARKS)**
OPSIE 2 (KEN 4 PUNTE TOE)

$F_{net} = ma$✓
For the 1 kg and 2 kg block taken together:
Vir die 1 kg- en 2 kg-blok saam geneem:
$F_A - m_1 g\sin 28^o - f_{1k} - m_2 g\sin 28^o - f_{2k} = (m_1 + m_2)a$
$30 - (1)9{,}8 \sin 28^o - 4 - 2(9{,}8)\sin 28^o - 8 = 3a$✓
$a = 1{,}399\ m\cdot s^{-1}$

For the 2 kg block/*Vir die 2 kg-blok*
$F_{net} = ma$
$T - (mg\sin 28^o + f_k) = ma$
$T - \{(2)(9{,}8)(\sin 28^o) + 8\} = (2)(1{,}399)$ ✓
$T = 20\ N$ ✓

OR/*OF*
For the 1 kg block/*Vir die 1 kg-blok*
$30 - (T + m_1 g\sin 28^o + 4) = m_1 a$
$30 - (T + 9{,}8\sin 28^o + 4) = 1{,}399$
$30 - T - 4{,}6 - 4 = 1{,}399$✓
$T = 20{,}001N\ (20\ N)$ ✓

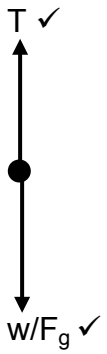
(4)

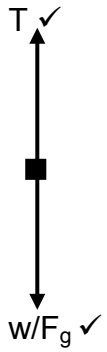
4.1.4 REMAINS THE SAME/*BLY DIESELFDE* ✓ (1)

4.1.5 DECREASES/*AFNEEM*✓ (1)

4.2.1

ACCEPT/*AANVAAR*





(2)

4.2.2

OPTION 1/OPSIE 1

$F_{net} = ma$✓

For the 1 kg block

$T - (1)(9,8) = (1)a$ ✓

$\therefore\ T - 9,8 = a$……(1)

1 mark for any of the 2/*1 punt vir enige van die 2*

For the 2 kg block

$(2)(9,8) - T = 2a$

$\therefore\ 19,6 - T = 2a$…… ✓(2)

1 mark for any of the 2/*1 punt vir enige van die 2*

From (1) and (2)*/Vanaf (1) en (2)*

$9,8 = 3a$

$\therefore\ a = 3,27\ m{\cdot}s^{-2}$✓

$\Delta y = v_i\Delta t + ½\ a\Delta t^2$ ✓

$-1 = 0 + ½\ (-3,27)\Delta t^2$✓

$\Delta t = 0,78$ s ✓

OR/*OF*

$\Delta y = v_i\Delta t + ½\ a\Delta t^2$ ✓

$1 = 0 + ½\ (3,27)\Delta t^2$✓

$\Delta t = 0,78$ s ✓ (7)

OPTION 2 (6 MARKS)/*OPSIE 2 (6 PUNTE)*

$F_{net} = ma$✓

For the SYSTEM/*Vir die SISTEEM*

$m_2g - m_1g = (m_1 + m_2)a$

$\underline{2(9,8) - 9,8 = 3a}$✓

$9,8 = 3a$

$a = 3,27 m{\cdot}s^{-2}$✓

$\Delta y = v_i\Delta t + ½\ a\Delta t^2$ ✓

$-1 = 0 + ½\ (-3,27)\Delta t^2$✓

$\Delta t = 0,78$ s ✓

OR/*OF*

$\Delta y = v_i\Delta t + ½\ a\Delta t^2$ ✓

$1 = 0 + ½\ (3,27)\Delta t^2$✓

$\Delta t = 0,78$ s ✓

[23]

QUESTION 5/*VRAAG 5*

5.1 Every body in the universe attracts every other body with a force that is directly proportional to the product of their masses✓ and inversely proportional to the square of the distance between their centres. ✓
Elke liggaam in die heelal trek 'n ander liggaam aan met 'n krag wat direk eweredig is aan die produk van hul massas en omgekeerd eweredig is aan die kwadraat van die afstand tussen hul middelpunte. (2)

5.2 $F = G\frac{m_1 m_2}{r^2}$ **OR/*OF*** $F = G\frac{M_E m}{R_E{}^2}$ ✓

$= 6,67\,10^{-11} \times \frac{(5,98 \times 10^{24})[(330000)(5,98 \times 10^{24})]}{[1,38 \times 10^{9}]^2}$ ✓ ✓

$= 4,13(3) \times 10^{26}$ N✓ (4)

5.3 Equal to/*Gelyk aan*✓
Newton's third law is obeyed✓
Newton se derde wet word gehoorsaam. (2)
[8]

QUESTION 6/*VRAAG 6*

6.1 The refractive index depends on the optical density of the medium relative to air. ✓✓
Die brekingsindeks hang af van die optiese digtheid van die medium relatief tot lig.

OR/*OF*
The amount (degree) of bending depends on the type of material.
Die mate (graad) van buiging, hang af van die soort materiaal

OR/*OF*
The medium with the highest refractive index has the greater bending effect on light.
Die medium met die hoogste brekingsindeks het die groter buigings effek op lig.

OR/*OF*
The greater the optical density, the slower light travels in the medium.
Hoe groter die optiese digtheid, hoe stadiger beweeg lig in die medium. (2)

6.2 The change in direction of (a) light (ray) due to a change in speed when light travels from one medium into another of different optical density ✓✓
Die verandering in die rigting van ('n) lig (straal) as gevolg van 'n verandering in die spoed wanneer lig van een medium na 'n ander van die verskillende optiese digtheid beweeg.

OR/*OF*
A change in the direction of light when it travels from one medium into another optically different medium. ✓✓
'n Verandering in die rigting van die lig wanneer dit van een medium na 'n ander opties verskillende medium beweeg. (2)

6.3 $n_1 \sin\theta_1 = n_2 \sin\theta_2$ ✓
$n_1 \sin 20{,}28° ✓ = 1{,}33 \sin 35°$ ✓
$n_1 = 2{,}20$ ✓

Material is cubic zirconium/*Stof is kubiese sirkonium* ✓ (5)

6.4 Less than/*Minder as* ✓ (1)
[10]

QUESTION 7/*VRAAG 7*

7.1 Light must travel from a dense medium✓ into a less dense medium✓
The angle of incidence in the dense medium must be greater✓ than the critical angle ✓between the two media.
Lig moet vanaf 'n dig medium na 'n minder digter medium beweeg.
Die invalshoek in die digte medium moet groter wees as die grenshoek tussen die twee media.

NOTES/*AANTEKENINGE*:
The sequence must be correct for each of the conditions.
Die volgorde moet korrek vir elk van die toestande.

(4)

7.2 Core/*Kern*✓ (1)

7.3 $\sin c = \frac{1}{n}$✓

Cannot be solved - refractive index of cladding was not given.

$= \frac{1}{1,5}$✓

$c = 41,81^{o}$✓ (3)

7.4 They are thinner than copper cables.
They can carry more signals than copper cables.
They are lighter than copper cables.
They are not affected by electrical interference while copper cables can be affected by electrical interference.
Hulle is dunner as koperkabels.
Hulle kan meer seine as koperkabels dra.
Hulle is ligter as koperkabels.
Hulle is nie beïnvloed deur elektriese interferensie nie terwyl koperkabels beïnvloed kan word deur elektriese interferensie.

NOTE/*LET WEL*:
Any two/*Enige twee*

(2)
[10]

QUESTION 8/*VRAAG 8*

8.1.1 The bending of a wave as it passes around the edges of an object.
Die buiging van 'n golf soos dit om die kante van 'n voorwerp beweeg.

OR/*OF*
The bending of a wave around an obstacle or the corners of an narrow opening.
Die buiging van 'n golf om 'n versperring of deur die hoeke van 'n nou spleet/opening

OR/*OF*
The ability of a wave to spread out in wave fronts as they pass through a small aperture or around a sharp edge.
Die vermoë van 'n golf om in golffronte uit te sprei soos hulle deur 'n klein opening of om 'n skerp kant beweeg. (2)

8.1.2 The width of the opening must be less than, or of the order of the wavelength of the wave.✓✓
Die wydte van die opening moet minder as of van die orde van die golflengte van die golf wees (2)

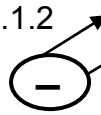
8.2.1 A broad central bright band ✓with alternating bright and dark bands (of decreasing intensity) on either side of the central band. ✓
'n Breë sentrale helder band met afwisselende helder en donker bande (van dalende intensiteit) aan weerskante van die sentrale band. (2)

8.2.2(a) Central pattern (X) becomes broader✓
Sentrale patroon (X) word breër. (1)

8.2.2(b) Central pattern (X) becomes broader✓
Sentrale patroon (X) word breër. (1)
[8]

QUESTION 9/*VRAAG 9*

9.1.1 To the left/*Na links*✓ (1)

9.1.2 

Removed/*Verwyder*✓
The net charge on P is positive ✓(+ 2 µC).
Die netto lading op P is positief (+ 2 µC)

OR/*OF*
Excess positive charge means electrons have been 'removed'
Oormaat positiewe lading beteken elektrone moes 'verwyder' word. (2)

9.1.3 $F = \frac{kQ_1Q_2}{r^2}$ ✓

$0,8 = 9 \times 10^9 \frac{(2 \times 10^{-6})(2 \times 10^{-6})}{(d)^2}$ ✓

d = 0,21 m✓ (3)

9.2.1 $E = k\frac{Q}{r^2}$ ✓

$E_4 = (9 \times 10^9)\frac{4 \times 10^{-6}}{(0,3)^2}$ ✓

E_4 = 4 x 10^5 N·C^{-1} to the right/*na regs*

$E_{-3} = (9 \times 10^9)\frac{3 \times 10^{-6}}{(0,1)^2}$ ✓

E_{-3} = 2,7 x 10^6 N·C^{-1} to the left/*na links*

$E_4 + E_3 = E_P$

E_P = (0,4 – 2,7) x 10^6 N·C^{-1} ✓

= 2,3 x 10^6 N·C^{-1} to the left/*na links* ✓ (5)

9.2.2 F = ma✓
∴ QE = ma
$m = \frac{QE}{a}$
Any of the three/*Enige van die drie*

$m = \frac{(6 \times 10^{-6})(2,3 \times 10^6)}{(5 \times 10^2)}$ ✓

= 2,76 x 10^{-2} kg✓ (3)

[14]

QUESTION 10/*VRAAG 10*

10.1.1 The magnitude of the induced emf (in a conductor) is equal to the rate of change of magnetic flux linkage. ✓✓
Die grootte van die geïnduseerde emk (in 'n geleier) is gelyk aan die tempo van verandering van magnetiese vloedkoppeling

OR/*OF*
The emf induced in a conducting loop is equal to the negative of the rate at which the magnetic flux through the loop is changing with time ✓✓
Die geïnduseerde emk in 'n geleidende lus is gelyk aan die negatiewe van die tempo waarteen die magnetiese vloedlyne deur die lus verander met tyd.

ACCEPT/*AANVAAR*
The emf induced in a conductor is proportional to the rate at which magnetic field lines are cut by a conductor. ✓✓
Die geïnduseerde emk in 'n geleier is eweredig aan die tempo waarteen die magneetveldlyne deur 'n geleier gesny word. (2)

10.1.2 Move the magnet quickly inside the coil.✓
Use a stronger magnet. ✓
Verhoog die sterkte van die magneet.
Gebruik 'n sterker magneet. (2)

10.2.1 $\Phi = BA\cos\theta$ ✓
Φ = (0,4)(0,6)cos 0° ✓
Φ = 0,24 Wb/T·m^2 ✓ (3)

10.2.2 $\Phi = BA\cos\theta$
$\Phi_{1/2}$ = (0,4)(0,3) cos 0°
= 0,12 Wb/T·m^2 ✓

$$\varepsilon = -N\frac{\Delta\Phi}{\Delta t} \quad \checkmark$$

$$= -N\frac{(\Phi_f - \Phi_i)}{\Delta t}$$

$$9 = -N\frac{(0{,}12 - 0{,}24)}{120} \quad \checkmark$$

N = 9 000 turns/*windings* ✓ (4)
[11]

QUESTION 11/*VRAAG 11*

11.1.1 The potential difference across a conductor is directly proportional to the current in the conductor ✓at constant temperature.✓
Die potensiaalverskil oor 'n geleier is direk eweredig aan die stroom in die geleier by konstant temperatuur

OR/*OF*
Provided temperature and other physical conditions are constant✓, the potential difference across a conductor is directly proportional to the current✓.
Mits die temperatuur en ander fisiese toestande konstant is, is die potensiaalverskil oor 'n geleier direk eweredig aan die stroom (2)

11.1.2

OPTION 1/*OPSIE 1*

$V_{tot} = IR_{tot}$✓
$12 = (0,5)R_{tot}$ ✓
$\therefore R_{tot} = 24\ \Omega$ ✓
$\therefore\ R_X = (24 - 8)$ ✓ $= 16\ \Omega$ ✓ (5)

OPTION 2/*OPSIE 2*

$V_8 = IR_{8\Omega}$✓
$= (0,5)(8)$ ✓
$= 4$ V
$\therefore\ V_X = (12 - 4)$ ✓ $= 8$ V
$V_X = IR_x$
$8 = (0,5)(R_X)$ ✓
$\therefore\ R_X = 16\ \Omega$✓ (5)

OPTION 3/*OPSIE 3*

$V_8 = IR_{8\Omega}$✓
$= 0,5\ (8)$ ✓
$= 4$ V
$\therefore\ V_X = (12 - 4)$ ✓ $= 8$ V

$$V_X = \frac{R_X}{R_{tot}} V_{tot}$$

$$8 = \frac{R_X}{(8 + R_X)}(12)$$✓

$\therefore\ R_X = 16\ \Omega$✓

OR/*OF*

$V_8 = IR_{8\Omega}$✓
$= 0,5\ (8)$ ✓
$= 4$ V
$\therefore\ V_X = (12 - 4)$ ✓ $= 8$ V

$$\frac{R_8}{R_X} = \frac{V_8}{V_X}$$

$$\therefore R_X = \frac{(8)(8)}{(4)}$$✓
$= 16\ \Omega$✓ (5)

11.2.1 12 V✓ (1)

11.2.2

OPTION 1/*OPSIE 1*

$V_4 = I_4\ R_{4\Omega}$ ✓
$12 = I_4(4)$ ✓
$I_{4\Omega} = 3$ A

$V_X = I_{16\Omega}R$
$12 = I_{16\Omega}16$ ✓
$I_{16\Omega} = 0{,}75$ A
$I_A = (3 + 0{,}75)$ ✓
$= 3{,}75$ A ✓ (5)

OPTION 2/*OPSIE 2*

$V_4 = I_4\ R_{4\Omega}$ ✓
$12 = I_4(4)$ ✓
$I_{4\Omega} = 3$ A

$I_4R_4 = I_{16\Omega}R_{16\Omega}$
$(3)(4) = I_{16\Omega}(16)$ ✓
$I_{16\Omega} = 0{,}75$ A
$I_A = (3 + 0{,}75)$ ✓
$= 3{,}75$ A ✓ (5)

OPTION 3/*OPSIE 3*

Combined resistance of the lower portion/*Gekombineerde weerstand van die onderste gedeelte*:

$$R = \frac{R_{16}R_4}{R_{16} + R_4} \quad ✓$$

$$R = \frac{16 \times 4}{20} ✓ = 3{,}2\ \Omega$$

$V = I_AR$
12 ✓ $= I_A\ (3{,}2)$ ✓
$I_A = 3{,}75$ A ✓ (5)

11.2.3

OPTION 1/*OPSIE 1*

$$V_{12} = \frac{R_{12}}{R_{tot}} V_{tot} ✓$$

$$V_{12} = \frac{12}{(8+12)}(12) ✓$$

$= 7{,}2$ V

$$\text{Energy/}\textit{Energie}\ W = \frac{V^2}{R}\Delta t ✓$$

$$= \frac{(7{,}2)^2}{12}(120) ✓$$

$= 518{,}4$ J ✓ (5)

OPTION 2/*OPSIE 2*	**OR/*OF***
$V_{8,12} = I(R_8 + R_{12})$✓ $12 = I(20)$ ✓ $I = 0,6$ A Energy/*Energie* $W = I^2 R\Delta t$✓ $= (0,6)^2(12)(120)$ ✓ $= 518,4$ J✓	$V_{8,12} = I(R_8 + R_{12})$✓ $12 = I(20)$ ✓ $I = 0,6$ A $V_{12} = IR_{12\Omega}$ $= 0,6(12)$ $= 7,2$ V Energy/*Energie* $W = VI\Delta t$✓ $= (7,2)(0,6)(120)$ ✓ $= 518,4$ J✓

(5)

OPTION 3/*OPSIE 3*

$$R = \frac{R_{16}R_4}{R_{16} + R_4}$$

$$R = \frac{(16)(4)}{20} = 3,2\ \Omega$$

$$R = \frac{R_{3,2}R_{20}}{R_{3,2} + R_{20}}$$

$$= \frac{(3,2)(20)}{(3,2 + 20)} = 2,758\ \Omega$$ ✓

$V_{tot} = I_{tot}R_{tot}$
$12 = I_{tot}(2,758)$✓
$I_{tot} = 4,351$ A
$I_{12\Omega} = 4,35 - 3,75 = 0,601$ A
Energy/*Energie* $W = I^2 R\Delta t$✓
$= (0,601)^2(12)(120)$ ✓
$= 520,13$ J $(518,4$ J$)$✓

(5)
[18]

TOTAL/*TOTAAL*: 150