basic education

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SENIOR CERTIFICATE EXAMINATIONS/
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TECHNICAL SCIENCES P1
TEGNIESE WETENSKAPPE V1

2021

MARKING GUIDELINES/*NASIENRIGLYNE*

MARKS/*PUNTE*: 150

These marking guidelines consist of 16 pages./
Hierdie nasienriglyne bestaan uit 16 bladsye.

QUESTION 1/ *VRAAG 1*

1.1   B ✓✓ (2)

1.2   C ✓✓ (2)

1.3   A ✓✓ (2)

1.4   D ✓✓ (2)

1.5   C ✓✓ (2)

1.6   B ✓✓ (2)

1.7   C ✓✓ (2)

1.8   A ✓✓ (2)

1.9   B ✓✓ (2)

1.10   D ✓✓ (2)

[20]

QUESTION 2/ *VRAAG* 2

2.1   An object will remain at rest, or continue moving at a constant velocity✓,
       unless acted upon by a/an unbalanced/resultant/net force. ✓

       'n Voorwerp sal in sy toestand van rus of uniforme snelheid in 'n reguitlyn teen
       konstante snelheid volhard tensy 'n ongebalanseerde / resulterende/netto
       krag daarop inwerk.   (2)

2.2   Tension is the force acting in a string or rope. ✓✓
       Spanning is 'n krag wat binne 'n tou of ketting voorkom.   (2)

2.3   Increases ✓✓
       Verhoog   (2)

2.4.1 Moves forward. ✓✓
       Beweeg vorentoe   (2)

2.4.2 According to Newton's first law of motion, the book will continue moving
       forward at a constant velocity (of 30 m·s⁻¹)✓ until a net force acts on it. ✓

       Volgens Newton se eerste bewegingswet sal die boek aanhou vorentoe
       beweeg teen 'n konstante snelheid (van 30 m·s⁻¹) totdat 'n netto krag daarop
       uitgeoefen word.

       OR/OF

       According to inertia, the book will continue moving forwards at a constant
       velocity (of 30 m·s⁻¹) as it resists a change in its state of motion.

       Volgens traagheid sal die boek aanhou vorentoe beweeg teen 'n konstante
       snelheid (van 30 m·s⁻¹) omdat dit weerstand bied teen die verandering in
       beweging.   (2)
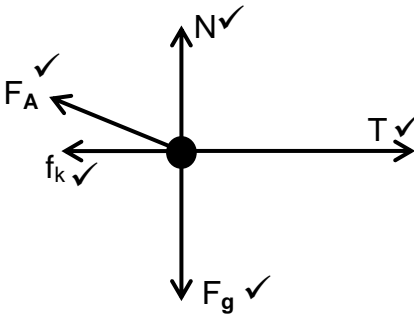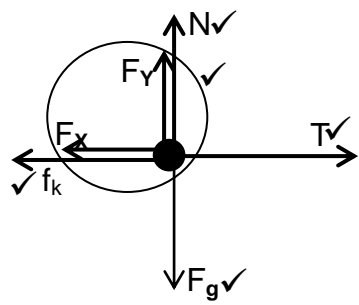
                                                                                      [10]

QUESTION 3/*VRAAG* 3

3.1   Normal force is the perpendicular force exerted by a surface on an object ✓✓
      that lies /rests on that surface.

      *Die normaalkrag is loodregte krag wat deur die oppervlakte op die voorwerp
      uitgeoefen word, wat op die oppervlakte rus.*   (2)

3.2

OPTION 1/*OPSIE* 1	OPTION 2/*OPSIE* 2
ACCEPTABLE LABELS: *AANVAARBARE BYSKRIFTE:* N/F_N: Normal/*Normaal* F_g/w: Force due to gravity/Weight 　　　*Gravitasiekrag/Gewig* F_f/f_k/f: 5,82 N/friction/*Wrywing* F_Y/F_V: Vertical component of F_A 　　　*Vertikale komponent* van F_A F_X/F_H: Horizontal component of F_A 　　　*Horisontale komponent van* F_A F_A: Applied force/50 N 　　*Toegepaste krag*/50 N T: Tension/force in the string 　　Spanning/*Krag in die tou*	**NOTES:/*NOTAS*** One mark for each force represented by an arrow with a correct label. *Een punt vir elke krag voorgestel deur 'n pyl met korrekte byskrif.* <u>Penalise (once) for each of the following:</u> *Penaliseer (een keer) vir elk van die volgende:* • No arrows/*Geen pylpunte* • There is no dot/*Geen kol* • Gap between the line and the dot/ *spasie tussen die lyn en kol.* • Dotted lines are used./ *Stippellyne gebruik* • Additional force is included./ *Addisionele krag is aangedui* • A force diagram is given./*Kragte-diagram gegee.*

(5)

3.3   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.

      *Wanneer 'n netto krag op 'n voorwerp, met massa m, toegepas word sal die
      voorwerp in die rigting van die netto krag versnel. Die versnelling is direk
      eweredig aan die netto krag en omgekeerd eweredig aan die massa.*   (2)

3.4.1

OPTION 1/*OPSIE* 1	**OPTION 2/*OPSIE* 2**
$N = W - F_V$ ✓any one *enige een* $= mg - F_A \sin 28°$ $= 25 \times 9,8 - 50\sin 28°$ ✓ $= 221,53$ N $f_k = \mu_k N$ ✓ $5,82 = \mu_k 221,53$ ✓ $\mu_k = 0,026$ ✓	$f_k = \mu_k N$ ✓ $= \mu_k(W - F_V)$ $= \mu_k(mg - F_A \sin\theta)$ ✓any one *enige een* $= \mu_k(mg - F_A \sin 28°)$ $\{5,82 = \mu_k\underline{(25 \times 9,8 - 50\sin 28°}$ ✓$)\}$✓ $\mu_k = 0,026$ ✓ **NOTE/*NOTA*:** • 1 mark for $f_k = \mu_k N$/*1 punt vir $f_k = \mu_k N$* • 1 mark for expanding N to $W - F_V$ **OR** $(mg - F_A \sin 28°)$/*1 punt vir uitbreiding van N na $W - F_V$* **OF** $(mg - F_A \sin 28°)$ • 1 mark for correct substitution: $25 \times 9,8 - 50\sin 28°$/ *1 punt vir korrekte vervang: $25 \times 9,8 - 50\sin 28°$* • 1 mark for the whole substitution: $5,82 = \mu_k(25 \times 9,8 - 50\sin 28°)$/*1 punt vir die hele vervang: $5,82 = \mu_k(25 \times 9,8 - 50\sin 28°)$* • 1 mark for the correct answer/*1 punt vir korrekte antwoord.*

(5)

3.4.2

OPTION 1/*OPSIE* 1	**OPTION 2/*OPSIE* 2**
Let east be positive/*Oos positief*	**Let east be positive/*Oos positief***
For block **A** / Vir *blok* ***A***	For block **A** / Vir *blok* ***A***
$F_{net} = ma$ $T + f_k + F_x = ma$ ✓any one *enige een* $T + f_k + F_A\cos 28° = ma$ $\underline{T - 5,82 - 50\cos 28° = 25a}$ ✓ $T - 49,97 = 25a$ $a = \dfrac{T - 49,97}{25}$ …………… (1) For block **B** / Vir *blok* ***B*** $F_{net} = ma$ $F_B + f_k + T = ma$ $\underline{350 - 8,35 - T = 45a}$ ✓ $341,65 - T = 45a$ ……… (2) Substitute a in (2)/*Vervang a in (2)*: $341,65 - T = 45(\dfrac{T - 49,97}{25})$ ✓ $T = 154,14$ N ✓	$F_{net} = ma$ $T + f_k + F_x = ma$ ✓any one *enige een* $T + f_k + F_A\cos 28° = ma$ $\underline{T - 5,82 - 50\cos 28° = 25a}$ ✓ $T - 49,97 = 25a$ ………… (1) For block **B** / Vir *blok* ***B*** $F_{net} = ma$ $F_B + f_k + T = ma$ $\underline{350 - 8,35 - T = 45a}$ ✓ ……. (2) Add equations (1) and (2) / *Tel vergelyking (1) en (2)*: $291,68 = 70a$ $a = 4,167$ m.s^{-2} $T - 49,97 = 25(4,167)$ ✓ $T = 154,15$ N ✓

(5)

[19]

QUESTION 4/*VRAAG* 4

4.1 Momentum is the <u>product</u> of an object's <u>mass and its velocity</u>. ✓✓
Momentum is die <u>produk</u> van 'n voorwerp se <u>massa en versnelling</u>. (2)

4.2 <u>The total linear momentum of an isolated system</u> ✓ <u>remains constant (is conserved)</u> ✓ in magnitude and direction.

<u>Die totale liniêre momentum van 'n geïsoleerde sisteem</u> <u>bly konstant (behoue)</u> in grootte en rigting. (2)

4.3 Zero ✓✓
OR/*OF*
0 N (2)

4.4

OPTION 1/*OPSIE* 1
$\Sigma p_i = \Sigma p_f$ $m_1v_{i1} + m_2v_{i2} = m_1v_{f1} + m_2v_{f2}$ ⎤ ✓any one / *enige een* $\underline{(1\,120)(25) + (m_2)(6{,}25)}$ ✓ $= \underline{(1\,120)(7{,}45) + (m_2)(8{,}45)}$ ✓ $(1\,120)(25) - (1\,120)(7{,}45) = (m_2)(8{,}45) - (m_2)(6{,}25)$ $19\,656 = 2{,}2\,m_2$ $m_2 = 8\,934{,}55$ kg $\therefore$ mass of the construction vehicle /*massa van die konstruksie voertuig* $= 8\,934{,}55 - 100$ ✓ $= 8\,834{,}55$ kg ✓
OPTION 2/*OPSIE* 2
$\Sigma p_i = \Sigma p_f$ $m_1v_{i1} + m_2v_{i2} = m_1v_{f1} + m_2v_{f2}$ ⎤ ✓any one / *enige een* $\underline{(1\,120)(25) + (m_{cv}+100)}$ ✓$(6{,}25)$ ✓ $= \underline{(1\,120)(7{,}45) + (m_{cv}+100)(8{,}45)}$ ✓ $19\,436 = 2{,}2\,m_{cv}$ $\therefore$ mass of the construction vehicle (m_{cv}) /   *massa van die konstruksie voertuig* $= 8\,834{,}55$ kg ✓

(5)

4.5 **Positive marking from 4.4/ *Positiewe nasien vanaf 4.4***

$\Sigma E_{ki} = \dfrac{1}{2}m_1v_{1i}^2 + \dfrac{1}{2}m_2v_{2i}^2$

$\quad = \dfrac{1}{2}(1\,120)(25)^2 + \dfrac{1}{2}(8\,934{,}55)(6{,}25)^2$ ✓

$\quad = 524\,502{,}93$ J

$\Sigma E_{kf} = \dfrac{1}{2}m_1v_{1f}^2 + \dfrac{1}{2}m_2v_{2f}^2$

$\quad = \dfrac{1}{2}(1\,120)(7{,}45)^2 + \dfrac{1}{2}(8\,934{,}55)(8{,}45)^2$ ✓

$\quad = 350\,056{,}0$ J

✓any one / *enige een*

$\Sigma E_{ki} \neq \Sigma E_{kf}$ ✓

$\Rightarrow$ collision was inelastic. ✓
Botsing was onelasties. (5)

[16]

QUESTION 5/ *VRAAG* 5

5.1   Impulse is the <u>product of the net/resultant force</u> acting on an object and <u>the time</u> the net/resulatant force acts (on the object).✓✓

Impuls is die <u>produk van die netto/resulterende krag</u> (op die voorwerp) en <u>die</u>   (2)
<u>tydsduur</u> dat die netto/resulterende krag op die voorwerp inwerk.

5.2

OPTION 1/*OPSIE* 1	**OPTION 2/*OPSIE* 2**
Let left to be positive/ *links positief* ✓any one / $F_{net} \Delta t = \Delta p$ *enige een* $F_{net} \Delta t = m(v_f - v_i)$ $F_{net}(1,28) = 950(-1,24 - 6)$ ✓ $F_{net} = -5\ 373,44$ N $= 5\ 373,44$ N ✓ backwards/to the right✓. *agtertoe/na regs*	**Let left to be negative/ *links positief*** $F_{net} \Delta t = \Delta p$ ✓any one / $F_{net} \Delta t = m(v_f - v_i)$ *enige een* $F_{net}(1,28) = 950\{1,24 - (-6)\}$ ✓ $F_{net} = 5\ 373,44$ N✓ backwards/to the right✓. a*gtertoe/na regs*

(4)

[6]

QUESTION 6/ *VRAAG* 6

6.1 Work is the <u>product</u> of <u>the force applied</u> on an object and <u>the displacement</u> in the direction of the force. ✓✓

Arbeid is die <u>produk</u> van <u>die toegepaste krag</u> op 'n voorwerp en <u>die verplasing</u> in die rigting van die krag. (2)

6.2

OPTION 1/*OPSIE* 1	**OPTION 2/*OPSIE* 2**
$W_{Fg} = F_g \Delta x \cos\theta$ $\quad = mg \Delta x \cos\theta$ ⎱ ✓ any one / $\quad = mg \Delta x \cos 180°$ ⎰ *enige een* $\quad = 0{,}145 \times 9{,}8 \times 0{,}5 \times \cos 180°$ ✓ $\quad = 0{,}145 \times 9{,}8 \times 0{,}5 \times -1$ $\quad = -0{,}71$ J ✓ $\therefore W_{Fg} = 0{,}71$ J against the motion of the phone/ *teen die bewegingrigting van die selfoon.*	Work done by F_g (W_{Fg}) = $-\Delta E_p$ / *Arbeid verrig deur F_g (W_{Fg}) = $-\Delta E_p$* $W_{Fg} = -mg(h_f - h_i)$ ✓ $\quad = -(0{,}145)(9{,}8)(0{,}5 - 0)$ ✓ $W_{Fg} = -0{,}71$ J ✓ $\therefore W_{Fg} = 0{,}71$ J against the motion of the phone/ *teen die bewegingrigting van die selfoon.*

OPTION 3/*OPSIE* 3

Work done by F_g (W_{Fg}) = $-\Delta E_p$ / *Arbeid verrig deur F_g (W_{Fg}) = $-\Delta E_p$*
$\Delta E_p = mg(h_f - h_i)$ ✓
$\Delta E_p = (0{,}145)(9{,}8)(0{,}5 - 0)$ ✓
$\Delta E_p = 0{,}71$ J
$W_{Fg} = -0{,}71$ J ✓
$\therefore W_{Fg} = 0{,}71$ J against the motion of the phone/*teen die bewegingrigting van die selfoon.*
 	
NOTE/NOTA:
     Penalise if the first statement is missing/
     Penaliseer indien die eerste stelling ontbleek.

(3)

6.3 Power is the rate at which work is done. ✓✓
Drywing is die tempo waarteen arbeid verrig word.
OR/*OF*
Power is the rate at which energy is expended/transferred.
Drywing is die tempo waarteen energie afgegee word.
OR/*OF*
Power is the rate at which energy changes/transferred.
Drywing is die tempo waarteen energieverandering plaasvind. (2)

6.4

OPTION 1/*OPSIE* 1	OPTION 2/*OPSIE* 2
$W = F \Delta x \cos\theta$ $= 4,9 \times 0,5 \times \cos 0° \checkmark$ $= 2,45 \text{ J}$ $P = \dfrac{W}{\Delta t} \checkmark$ $P = \dfrac{2,45}{4} \checkmark$ $P = 0,613 \text{ W} \checkmark$	$\left.\begin{array}{l} P = \dfrac{W}{\Delta t} \\[3mm] P = \dfrac{F \Delta x \cos\theta}{\Delta t} \end{array}\right\}$ $\checkmark$ any one / *enige een* $P = \left(\dfrac{(4,9 \times 0,5 \times \cos 0° \checkmark)}{4}\right) \checkmark$ $P = 0,613 \text{ W} \checkmark$

OPTION 3/*OPSIE* 3
Assume that the object moves at constant velocity. ***Veronderstel dat die voorwerp teen konstante snelheid beweeg.*** $P_{ave} = F v_{ave} \checkmark$ $\quad = 4,9 \checkmark \left(\dfrac{0,5}{4}\right) \checkmark$ $\quad = 0,613 \text{ W} \checkmark$ **If the assumption is not indicated: $\dfrac{3}{4}$ marks**   ***Indien die veronderstelling nie aangedui word nie: $\dfrac{3}{4}$ punte***

(4)

6.5 The total mechanical energy in an isolated system $\checkmark$ remains constant /is conserved. $\checkmark$
Die totale meganiese energie in 'n geïsoleerde sisteem bly konstant (behouë bly).

    OR/*OF*

The sum of gravitational potential energy and kinetic energy in an isolated system remains constant/ is conserved.
Die som van die potensiële en kinetiese energie van 'n geïsoleerde sisteem bly konstant (behouë bly). (2)

6.6 M_E at top/*bo* = M_E at bottom/*onder*
$(E_p + E_k)$ at top/*bo* = $(E_p + E_k)$ at bottom/*onder* $\left.\vphantom{\begin{array}{c}a\\b\\c\end{array}}\right\}$ $\checkmark$ any one /
$(mgh + \frac{1}{2}mv^2)$ at top/*bo* = $(mgh + \frac{1}{2}mv^2)$ at bottom/*onder* *enige een*

$(0,145 \times 9,8 \times 0,5 + \frac{1}{2} \times 0,145 \times 0^2) \checkmark = (0,145 \times 9,8 \times 0 + \frac{1}{2} \times 0,145 \times v^2) \checkmark$

$0,145 \times 9,8 \times 0,5 + 0 = 0 + \frac{1}{2} \times 0,145 \times v^2$

$\qquad\qquad v = 3,13 \text{ m.s}^{-1} \checkmark$

NOTE/*NOTA*: Do not penalize if zero substitution is not shown.
        Moenie penaliseer indien die nul nie in die vervanging wys nie. (4)

[17]

QUESTION 7/*VRAAG* 7

7.1.1

OPTION 1/*OPSIE* 1	**OPTION 2/*OPSIE* 2**
$A = \dfrac{\pi d^2}{4}$ $A = \dfrac{\pi \times (0,08)^2}{4}$ ✓ $A = 5,027 \times 10^{-3}\,m^2$ $\sigma = \dfrac{F}{A}$ ✓ $\sigma = \dfrac{30 \times 10^3}{5,027 \times 10^{-3}}$ ✓ $\sigma = 5\ 967\ 774,02\ Pa$ ✓ **Accept**:/***Aanvaar:*** 5 967 774,02 – 6 000 000,00 as a range/*as 'n gebied*.	$A = \pi r^2$ $A = \pi(0,04)^2$ ✓ $A = 0,005027/\ 0,005\ m^2$ $A = 5,027 \times 10^{-3}\,m^2$ $\sigma = \dfrac{F}{A}$ ✓ $\sigma = \dfrac{30 \times 10^3}{5,027 \times 10^{-3}}$ ✓ $\sigma = 5\ 967\ 774,02\ Pa$ ✓ **Accept**:/***Aanvaar* :** 5 967 774,02 – 6 000 000,00 as a range/*as 'n gebied*.
OPTION 3/*OPSIE* 3	**OPTION 4/*OPSIE* 4**
$\left.\begin{array}{l}\sigma = \dfrac{F}{A} \\[1em] = \dfrac{F}{\dfrac{\pi d^2}{4}}\end{array}\right\}$ ✓ any one *enige een* $\sigma = \left(\dfrac{30 \times 10^3}{\dfrac{\pi(0,08)^2}{4}\,✓}\right)$ ✓ $\sigma = 5\ 967\ 774,02\ Pa$ ✓ **Accept**:/***Aanvaar:*** 5 967 774,02 – 6 000 000,00 as a range/*as 'n gebied*.	$\left.\begin{array}{l}\sigma = \dfrac{F}{A} \\[1em] = \dfrac{F}{\pi r^2}\end{array}\right\}$ ✓ any one *enige een* $\sigma = \left(\dfrac{30 \times 10^3}{\pi(0,04)^2\,✓}\right)$ ✓ $\sigma = 5\ 967\ 774,02\ Pa$ ✓ **Accept**:/***Aanvaar* :** 5 967 774,02 – 6 000 000,00 as a range/*as 'n gebied*.

(4)

7.1.2

OPTION 1/*OPSIE* 1	**OPTION 2/*OPSIE* 2**
$\varepsilon = \dfrac{\Delta \ell}{L}$ ✓ $\varepsilon = \dfrac{0,4}{3000}$ ✓ $\varepsilon = 1,33 \times 10^{-4}\ /\ 0,000133$ ✓	$\varepsilon = \dfrac{\Delta \ell}{L}$ ✓ $\varepsilon = \dfrac{0,0004}{3}$ ✓ $\varepsilon = 1,33 \times 10^{-4}\ /\ 0,000133$ ✓
Note/*Nota*: Penalise if unit is included *Penaliseer as eenheid ingesluit is.*	

(3)

7.2.1   Perfect plastic body ✓
        Volkome plastiese voorwerp   (1)

7.2.2   Perfect plastic body ✓
        Volkome plastiese voorwerp   (1)

7.2.3   Perfect elastic body ✓
        Volkome elastiese voorwerp   (1)

7.2.4   Perfect plastic body ✓
        Volkome plastiese voorwerp   (1)

7.3   As the temperature of the liquid increases its viscosity decreases.✓✓
        Indien die temperatuur van 'n vloeistof toeneem sal die viskositeit afneem.

        OR/*OF*

        As the temperature of the liquid decreases its viscosity increases.
        Indien die temperatuur van 'n vloeistof afneem/verlaag sal die viskositeit toeneem/verhoog.   (2)

7.4   Pascal's law states that in a continuous liquid at equilibrium, the pressure applied at any point is transmitted equally to other parts of the liquid.✓✓

        Pascal se wet verklaar dat in 'n kontinue vloeistof by ewewig sal die druk wat op enige punt toegepas word eweredig versprei sal word reg deur die vloeistof.   (2)

7.5   ANY TWO/*ENIGE TWEE*
- Hydraulic Car lifts/*Hidrouliese hysers* ✓
- Hydraulic Jacks/*Domkrag* ✓
- Hydraulic brakes/*Hidrouliese remme*
- Dentist chairs/*Tandartsstoele*
- Forklifts/ *Hysers*
- Hydraulic press/ Hidrouliese pers

     (2)

7.6

OPTION 1/*OPSIE* 1	**OPTION 2/*OPSIE* 2**
$A = \dfrac{\pi d^2}{4}$ $A = \dfrac{\pi \times (0,12)^2}{4}$ ✓ $A = 1,13 \times 10^{-2}\, m^2$ $\dfrac{F_1}{A_1} = \dfrac{F_2}{A_2}$ ✓ $\dfrac{2 \times 10^3}{2,827 \times 10^{-3}}$ ✓ $= \dfrac{F_2}{1,13 \times 10^{-2}}$ ✓ $F_2 = 7\ 994,34\ N$ ✓ **Accept/*Aanvaar* :** 7 994,34 – 8 001,23 as a range/ *as 'n gebied.*	$A = \pi r^2$ $A = \pi(0,06)^2$ ✓ $A = 1,13 \times 10^{-2}\, m^2$ $\dfrac{F_1}{A_1} = \dfrac{F_2}{A_2}$ ✓ $\dfrac{2 \times 10^3}{2,827 \times 10^{-3}}$ ✓ $= \dfrac{F_2}{1,13 \times 10^{-2}}$ ✓ $F_2 = 7\ 994,34\ N$ ✓ **Accept/*Aanvaar* :** 7 994,34 – 8 001,23 as a range/ *as 'n gebied.*
OPTION 3/*OPSIE* 3	**OPTION 4/*OPSIE* 4**
$\dfrac{F_1}{A_1} = \dfrac{F_2}{A_2}$ $\dfrac{F_1}{A_1} = \dfrac{F_2}{\frac{\pi d^2}{4}}$ ⎫ ✓ any one *enige een* $\dfrac{2 \times 10^3}{2,827 \times 10^{-3}}$ ✓ $= \left(\dfrac{F_2}{\frac{\pi(0,12)^2}{4}}✓\right)$✓ $F_2 = 7\ 994,34\ N$ ✓ **Accept/*Aanvaar* :** 7 994,34 – 8 001,23 as a range/ *as 'n gebied.*	$\dfrac{F_1}{A_1} = \dfrac{F_2}{A_2}$ $\dfrac{F_1}{A_1} = \dfrac{F_2}{\pi r^2}$ ⎫ ✓ any one *enige een* $\dfrac{2 \times 10^3}{2,827 \times 10^{-3}}$ ✓ $= \left(\dfrac{F_2}{\pi(0,06^2)}✓\right)$✓ $F_2 = 7\ 994,34\ N$ ✓ **Accept/*Aanvaar* :** 7 994,34 – 8 001,23 as a range/ *as 'n gebied.*

(5)

[22]

QUESTION 8/ *VRAAG* **8**

8.1   The <u>outer electrons (valence electrons) in silicon are involved in perfect covalent bonds</u> ✓ while <u>metals have free (outer) electrons</u>✓ to conduct electricity

Die <u>buitenste elektrone (valensie elektrone) van silikon is almal in kovalente verbindings</u> terwyl metale 'vrye' elektrone het om elektrisiteit te gelei.   (2)

8.2   Doping. ✓
Dopering

It (doping) is the process of adding impurities to intrinsic semiconductors. ✓✓
Dit (dopering) is die proses waar onsuiwerhede by 'n intrinsieke halfgeleier gevoeg word.   (3)

8.3.   A p-n junction diode is a combination of p-type semiconductor material with n-type semiconductor material✓✓(to achieve its practical utility/ to make current to flow in one direction).

'n p-n vebinding diode is 'n kombinasie van p-tipe halfgeleier en n-tipe halfgeleier materiaal (om stroom in een rigting te laat vloei/om sy praktiese toepassing te bereik).

NOTE: 2 marks or nothing.
NOTA: *2 punte of geen.*   (2)

8.4.1
$$C = \frac{Q}{V} \checkmark$$
$$4 \times 10^{-6} = \frac{2}{V} \checkmark$$
$$V = 500\ 000\ V\checkmark$$ (3)

8.4.2
$$C = \frac{\varepsilon_0 A}{d} \checkmark$$
$$4 \times 10^{-6}\checkmark = \frac{8,85 \times 10^{-12}\ A}{0,0008} \checkmark$$
$$A = 361,58\ m^2 \checkmark$$ (4)

8.4.3   Capacitance is <u>directly proportional</u> to the area of the plates. ✓
Kapasitansie is <u>direk eweredig</u> aan die oppervlakte van die plate.
Accept/Aanvaar:
The capacitance will <u>increase</u> with an <u>increase</u> in the area of the plates.
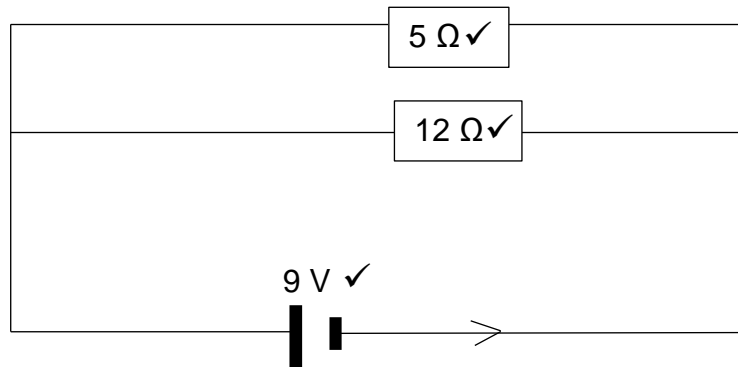*Die kapasitansie sal <u>verhoog</u> indien die plaatoppervlaktes <u>verhoog</u>.*

OR/ *OF*
The capacitance will <u>decrease</u> with an <u>decrease</u> in the area of the plates.
Die kapasitansie sal <u>afneem</u> indien die plaatoppervlaktes <u>afneem</u>.   (1)

8.5.1

Circuit: $5\,\Omega$ ✓ and $12\,\Omega$ ✓ in parallel branches, with $9\,V$ ✓ cell.

    NOTE/*NOTA*: Penalise once if the resistors and the cell are not connected in parallel
        Penaliseer een keer indien die resistors en die sel nie verbind is in parallel nie.

(3)

8.5.2

OPTION 1/*OPSIE* 1	**OPTION 2/*OPSIE* 2**	**OPTION 3/*OPSIE* 3**
$P = \dfrac{V^2}{R}$ $P = \dfrac{9^2}{5}$ ✓ $P = 16{,}2\ W$ ✓ $P = \dfrac{V^2}{R}$ $P = \dfrac{9^2}{12}$ ✓ $P = 6{,}75\ W$ ✓ any one ✓ / *enige een*	$I = \dfrac{V}{R}$ $= \dfrac{9}{5}$ $= 1{,}8\ A$ $P = VI$ $= 9 \times 1{,}8$ ✓ $= 16{,}2\ W$ ✓ $I = \dfrac{V}{R}$ $= \dfrac{9}{12}$ $= 0{,}75\ A$ $P = VI$ $= 9 \times 0{,}75$ ✓ $= 6{,}75\ W$ ✓ any one ✓ / *enige een*	$I = \dfrac{V}{R}$ $= \dfrac{9}{5}$ $= 1{,}8\ A$ $P = I^2R$ $= 1{,}8^2 \times 5$ ✓ $= 16{,}2\ W$ ✓ $I = \dfrac{V}{R}$ $= \dfrac{9}{12}$ $= 0{,}75\ A$ $P = I^2R$ $= 0{,}75^2 \times 12$ ✓ $= 6{,}75\ W$ ✓ any one ✓ / *enige een*

(5)

[23]

QUESTION 9/*VRAAG* 9

9.1 Magnetic flux density is the <u>number of field lines (perpendicular) to a given surface</u> . ✓✓

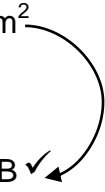*Magnetiese vloeddigterheid is <u>die hoeveelheid magnetiese lyne per oppervlate.</u>*

OR/OF

Magnetic flux density is the <u>number of (perpendicular) field lines per unit area</u>.
Magnetiese vloeddigterheid is <u>die hoeveelheid (loodreg) magnetiese lyne per eenheids oppervlate.</u> (2)

9.2

OPTION 1/*OPSIE* 1	OPTION 2/*OPSIE* 2
A = l x b	Φ= BA ⎤ any one
A= 0,09 x 0,15✓	⎥ ✓
A= 0,0135 m^2	Φ = B(lb) ⎦ *enige een*
Φ= BA ✓	9 = {B(0,09 x 0,15)✓ }✓
9 = 0,0135 B ✓	B = 666,67 T ✓
B = 666,67 T ✓	

(4)
[6]

QUESTION 10/*VRAAG* 10

10.1   A transformer is a <u>device</u> that is <u>used to step up or step down the voltage.</u>✓✓

   'n Transformator is 'n toestel wat <u>word gebruik om die potensiaalverskil te</u>
   <u>verhoog of te verlaag.</u>   (2)

10.2 $\dfrac{V_S}{V_P} = \dfrac{N_S}{N_P}$ ✓

   $\dfrac{V_S}{120} = \dfrac{1\,500}{80}$ ✓

   $V_S = 2\,250$ V ✓   (3)

10.3.1 Figure 1 – **<u>DC</u>** generator ✓/ *Figuur 1 – GS-generator*   (1)

10.3.2 Figure 2 – **<u>AC</u>** generator ✓/ *Figuur 2 – WS-generator*   (1)

10.3.3 **A** – Commutator ✓/ *kommutator*
   A**ccept/*Aanvaar* :** Split ring/*spleetring*   (1)

10.3.4 **B** - Slip ring✓/*sleepring*   (1)

10.3.5 **Positive marking from question 10.3.3/ *Positiewe nasien vanaf 10.3.3***

   Commutator <u>maintains electrical contact</u>✓ <u>between the load and the</u>
   <u>(rotating) coil</u> ✓ in a DC generator.

   Kommutator <u>behou elektriese kontak</u> <u>tussen die kragbron en die (roterende)</u>
   <u>spoel</u> in 'n GS-generator.

   OR/*OF*

   Commutator helps to <u>maintain polarity on a brush</u> (as the shaft rotates
   through the magnetic field).

   Kommutator help om die <u>polariteit te handhaaf tussen die borsels</u>(soos wat
   die spoel deur die magneetveld roteer.)

   OR/*OF*

   Commutator <u>ensures that current flows in one direction.</u>
   Kommutator <u>laat die stroom in een rigting vloei</u>.   (2)

                                                                                                            [11]

                                                                    TOTAL/*TOTAAL*:   150