basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE/*SENIOR SERTIFIKAAT*
NATIONAL SENIOR CERTIFICATE/
NASIONALE SENIOR SERTIFIKAAT

GRADE/*GRAAD* 12

TECHNICAL SCIENCES P1/
TEGNIESE WETENSKAPPE V1

NOVEMBER 2020

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

[20]

QUESTION 2/*VRAAG 2*

2.1 An object continues in a state of rest or uniform (moving with constant) velocity ✓ unless it is acted upon by a net (resultant) force ✓.
OR
An object will remain at rest or continue moving at a constant velocity ✓ unless a non-zero resultant /net force acts on it. ✓

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

2.2

OPTION/*OPSIE* 1	**OPTION/*OPSIE* 2**
$F_{net} = ma$ $F_{net} = 0$ N $F_{net} = F \cos 40° + f_k$ $F \cos 40° + f_k = 0$ N $F_{net} = F_H + f_k$ $F_H + f_k = 0$ N — Any one ✓ (Choose right to be positive) *(Kies regs as positief)* $F \cos 40° + f_k = 0$ $80 \cos 40° + f_k = 0$ ✓ $61{,}28 + f_k = 0$ $f_k = -61{,}28$ $f_k = 61{,}28$ N✓ (to the left) *(na links)*	$F_{net} = ma$ $F_{net} = 0$ N $F_{net} = F \cos 40° + f_k$ $F \cos 40° + f_k = 0$ N $F_{net} = F_H + f_k$ $F_H + f_k = 0$ N — Any one ✓ (Choose left to be positive) *(Kies links as positief)* $F \cos 40° + f_k = 0$ $-80 \cos 40° + f_k = 0$ ✓ $-61{,}28 + f_k = 0$ $f_k = 61{,}28$ N✓ (to the left) *(na links)*

(3)

2.3.1 Inertia is a property/tendency of an object/body to resist a change ✓ in its state of rest or motion✓ (in a straight line).

Traagheid is die eienskap van 'n voorwerp om die verandering in sy toestand van rus of beweging teen te staan. (2)

2.3.2 **Apply Negative marking/*Pas negatiewe nasien toe***
Increase. ✓
Inertia of an object is directly proportional to its mass. ✓
When the mass of an object increases, its inertia also increases. ✓

Verhoog
Traagheid van 'n voorwerp is direk eweredig aan sy massa.
Indien die massa van 'n voorwerp verhoog, sal die traagheid ook verhoog. (3)
[10]

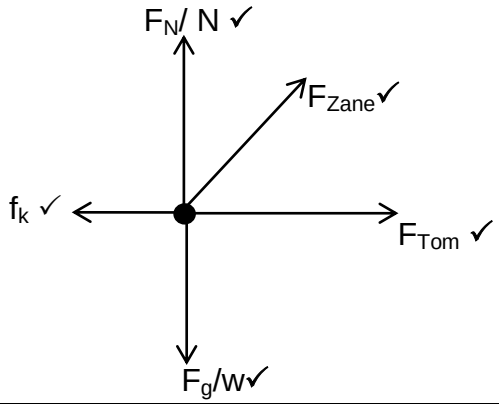
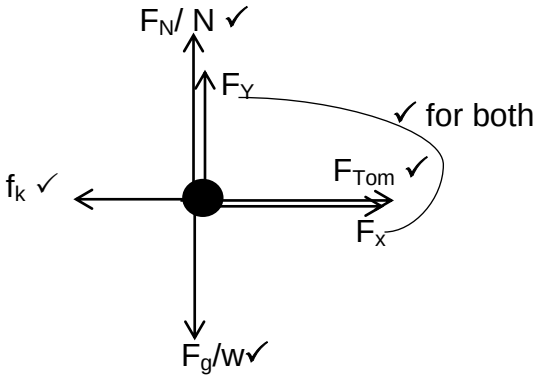
QUESTION 3/*VRAAG 3*

3.1.1
- Tension is a (pulling) force acting in a string or rope. ✓✓
- Force applied by Zane (F_{Zane})/F_{160}/160 N ✓

- *Spanning is 'n (trek)krag wat in 'n ketting of tou werk.*
- *Krag toegepas deur Zane* (F_{Zane})/F_{160}/160 N (3)

3.1.2 Decrease ✓✓/*Verlaag* (2)

3.1.3

OPTION 1/*OPSIE 1*	**OPTION 2/*OPSIE 2***
	

ACCEPTABLE LABELS: ***AANVAARBARE BYSKRIFTE:***	**NOTE:** ***LET OP:***
• F_g/w/weight/*Gewig* • f_k/*f*/friction/*Wrywing* • F_{Tom}/ F_{200}/ 200 N/Force by Tom/*Krag van Tom* • F_{Zane}/ Force by Zane/F_{160}/160 N/Tension /T/*Krag van Zane* • F_N/N/Normal force/*Normaalkrag* • F_Y/F_V/Vertical component of force by Zane/*Vertikale komponent van krag deur Zane* • F_X/F_H/ Horizontal component of force by Zane/*Horisontale komponent van krag deur Zane* • F_A /F_{zane}/F_{Tom}	Penalise once if • Force diagram used • Arrows are not shown • If force does not touch the dot • An additional force • Using broken lines *Penaliseer eenmalig indien:* • *Pyle nie aangedui nie* • *Kragtediagram geteken* • *Die krag raak nie die kol nie* • *Voeg 'n addisionele krag by* • *Gebruik stippellyne*

(5)

3.2

OPTION 1/*OPSIE 1*	**OPTION 2/*OPSIE 2***
Choose east to be positive *Kies oos as positief* $F_{net} = F_x + F_{Tom} + f_k$ $F_{net} = F_{Zane}\ Cos\ 65° + F_{Tom} + f_k$ ✓ $205 = 200$✓ + $160\ Cos\ 65°$✓ + f_k f_k = - 62,62 N $f_k = \mu_k N$ $f_k = \mu_k (F_g - F_{Zane}\ Sin\ 65°)$ Any one $f_k = \mu_k (mg - F_{Zane}\ Sin\ 65°)$ $62,62 = \mu_k (350 \times 9,8 – 160\ Sin\ 65°)$ ✓ $62,62 = \mu_k (3284,99)$ μ_k = 0,019/ 0,02 ✓	 $F_{net} = F_x + F_{Tom} + f_k$ $F_{net} = F_{Zane}\ Cos\ 65° + F_{Tom} + f_k$ ✓ $205 = 200$✓ + $160\ Cos\ 65°$✓ + f_k f_k = - 62,62 N $N = F_g - F_{Zane}\ Sin\ 65)$ $= mg - F_{Zane}\ Sin\ 65°)$ $= 350 \times 9,8 – 160\ Sin\ 65°$ ✓ $= 3284,99$ N $f_k = \mu_k N$ ✓ $62,62 = \mu_k (3284,99)$ μ_k = 0,019/ 0,02 ✓

OPTION 3/*OPSIE 3*
Choose east to be positive *Kies oos as positief* $f_k = \mu_k N$ ✓ $F_{net} – (F_{Zane}\ Cos\ 65° + F_{Tom})$ ✓$= \mu_k N$ $F_{net} – (F_{Zane}\ Cos\ 65° + F_{Tom}) = \mu_k (mg - F_{Zane}\ Sin\ 65°)$ $205 – 200$ ✓ $– 160\ Cos\ 65°$ ✓ $= \mu_k (350 \times 9,8 – 160\ Sin\ 65°)$ ✓ - 62,62 = μ_k (3284,99) (Ignoring direction/*Ignoreer rigting*) 62,62 = μ_k (3284,99) μ_k = 0,019 /0,02 ✓

(6)
[16]

QUESTION 4/*VRAAG 4*

4.1.1 Momentum (of an object) is the product of the object's mass ✓ and its velocity (in a straight line). ✓

Momentum (van 'n voorwerp) is die produk van die voorwerp se massa en sy snelheid (in 'n reguitlyn.) (2)

4.1.2

OPTION/*OPSIE* 1	**OPTION/*OPSIE* 2**
$v_{i\ truck/bakkie} = 120 \times \frac{1000}{3600}$ $= 33{,}33\ m.s^{-1}$ ✓**,** east ✓	$v_{i\ truck/bakkie} = 120 \times \frac{1}{3{,}6}$ $= 33{,}33\ m.s^{-1}$ ✓**,** east ✓

(2)

4.1.3 $p = m_{car}\, v_{i\ car}$ ✓
$= 1\,050 \times 16{,}67$ ✓
$= 17\,503{,}5\ kg.m.s^{-1}$, west/*wes* ✓ (3)

4.2.1 The total linear momentum of an isolated system✓ remains constant✓ (is conserved) in magnitude and direction.

Die totale liniëre momentum in 'n geïsoleerde sisteem is konstant.

OR/*OF*

The total linear momentum of an isolated system✓ before collision/explosion is equal to total linear momentum after collision/explosion✓.

In 'n geïsoleerde sisteem, is die totale liniêre momentum voor die botsing gelyk aan die totale liniêre momentum na die botsing. (2)

4.2.2 **POSITIVE MARKING FROM 4.1.2/*POSITIEWE NASIEN VAN 4.1.2***

$$\sum E_{ki} = \frac{1}{2} m_{truck/bakkie} v^2_{i\ truck/bakkie} + \frac{1}{2} m_{car} v^2_{i\ car}$$ ✓
$$= \frac{1}{2}(1\,350)(33{,}33)^2 + \frac{1}{2}(1\,050)(-16{,}67)^2$$ ✓
$= 895\,741{,}68$ J

$$\sum E_{kf} = \frac{1}{2} m_{truck/bakkie} v^2_{f\ truck/bakkie} + \frac{1}{2} m_{car} v^2_{f\ car}$$
$$= \frac{1}{2}(1\,350)(20{,}3)^2 + \frac{1}{2}(1050)(5{,}32)^2$$ ✓
$= 293\,019{,}51$ J

$\sum E_{ki} \neq \sum E_{kf}$ /(Kinetic energy is not conserved/*Kinetiese energie nie behoue nie*) ✓
Therefore, collision was inelastic ✓ **/** *Die botsing was dus onelasties.*

NOTE: If a learner starts: $\sum E_{ki} = \sum E_{kf}$ take 1 mark/ *Indien leerder met* $\sum E_{ki} = \sum E_{kf}$ begin gee 1 punt

(5)

4.3.1 Inversely proportional. ✓✓ *IOmgekeerd eweredig*

OR

$F_{net} \propto \frac{1}{\Delta t}$ (2)

OR

When the contact time increases/decrease, the net force decreases/increase.

Wanneer die kontaktyd verhoog, sal die netto krag verlaag.

NOTE/NB: GIVE full mark for mathematical expression/*Gee volpunte vir wiskundige uitdrukking*

4.3.2 Equal to ✓
Gelyk aan (1)

4.3.3
- Impulse remains constant. ✓
- Airbags increase the contact time during the crash. ✓
- The longer the contact time, the smaller the force ✓ exerted by the driver on the car and the lesser is the extent of injuries.

- *Impuls bly konstant.*
- *Lugsakke verleng die kontaktyd tydens die botsing.*
- *Hoe langer die kontaktyd, hoe kleiner die krag wat deur die drywer op die motor uitgeoefen word en hoe minder die beserings.* (3)

4.3.4

OPTION/*OPSIE* 1	**OPTION/*OPSIE* 2**
Let the direction towards the tree be positive ***Neem die rigting na die boom as positief***	**Let the direction towards the tree be negative** ***Neem die rigting na die boom as negatief***
$F_{net}\Delta t = \Delta p$ $F_{net}\Delta t = m(v_f - v_i)$ ✓ for any $-57\,500\Delta t$ ✓ $= 1\,150(0 - 15)$ ✓ $\Delta t = 0{,}30$ s ✓	$F_{net}\Delta t = \Delta p$ $F_{net}\Delta t = m(v_f - v_i)$ $57\,500\Delta t$ ✓ $= 1\,150\{0 - (-15)\}$ ✓ $\Delta t = 0{,}30$ s ✓

(4)
[24]

QUESTION 5/*VRAAG 5*

5.1.1 $W_{learner/leerder} = F_{app}\ \Delta y \cos\theta$ ✓

$= (25)(0,9)(\cos 0°)$
$= (25)(0,9)(1)$ ✓ for any
$= 22,5$ J ✓

(3)

5.1.2

OPTION 1/*OPSIE 1*	**OPTION 2/*OPSIE 2***
Choose up to be positive ***Kies op as positief***	**Positive marking from 5.1.1** ***Merk positief vanaf 5.1.1***
$F_{net} = F_a + F_g$ $F_{net} = F_a + mg$ $= 25 + 2(-9,8)$ ✓ $= 5,4$ N $W_{net} = F_{net}\ \Delta y \cos\theta$ ✓ $= (5,4)(0,9)(\cos 0°)$ $= (5,4)(0,9)(1)$ ✓ for any $= 4,86$ J ✓	$W_g = F_g\ \Delta y \cos\alpha$ $= mg\ \Delta y \cos\alpha$ $= (2)(9.8)(0,9)(\cos 180°)$ $= (2)(9.8)(0,9)(-1)$ ✓ for any $= -17,64$ J $W_{net} = W_{learner/leerder} + W_g$ ✓ $= 22,5 + (-17,64)$ ✓ $= 4,86$ J✓
OPTION 3/*OPSIE* 3	**OPTION 4/ *OPSIE* 3**
$W_{net} = F_{net}\ \Delta y \cos\theta$ $= (F_a + mg)\ \Delta y \cos\theta$ ✓ for any $= \{25 + 2(-9,8)$ ✓$\}\ (0,9)(\cos 0°)$ ✓ $= (5,4)(0,9)(1)$ $= 4,86$ J ✓	$W_{net} = W_{learner/leerder} + W_g$ $= W_{learner/leerder} + mg\ \Delta y \cos\alpha$ ✓ for any $= 22,5$ ✓$+ (2)(9.8)(0,9)(\cos 180°)$ ✓ $= 22,5 + (2)(9.8)(0,9)(-1)$ $= 4,86$ J ✓

(4)

5.2.1 The total mechanical energy of an isolated system✓ is constant. ✓
OR
The sum of gravitational potential energy and kinetic energy in an isolated system remains constant**.**

Die totale meganiese energie in 'n geïsoleerde sisteem bly konstant.
OF
Die som van die gravitasionele potensiele en kinetiese energie bly konstant in 'n geisoleerde sisteem. (2)

5.2.2

OPTION 1/*OPSIE* 1	**OPTION 2/*OPSIE* 2**
$M_E = E_p + E_k$ $= mgh + \frac{1}{2}mv^2$ } ✓ for any one $= (\underline{6)(9,8)(5)}$ ✓+ $\frac{1}{2}$ x 6 x 0^2✓ = 294 J ✓ **Accept/Aanvaar:** 0 for $\frac{1}{2}$ x 6 x 0^2	$E_k = \frac{1}{2}mv^2$ $= \frac{1}{2}$ x 6 x 0^2✓ = 0 J $E_p = mgh$ $= \underline{(6)(9,8)(5)}$ ✓ = 294 J $M_E = E_p + E_k$ ✓ = 294 + 0 = 294 J ✓

(4)

5.2.3 **POSITIVE MARKING FROM 5.2.2**
POSITIEWE MERK VANAF 5.2.2

OPTION 1/*OPSIE* 1	**OPTION 2/*OPSIE* 2**
In an isolated system/ *In 'n geisoleerde sisteem* $E_{p(Top)} = E_{k(Bottom)}$ **NOTE/NB:** If the above statement is omitted, learner will lose 1 mark/*Indien bogenoemde stelling nie ingesluit is nie sal leerder 1 punt verloor.* $E_k = \frac{1}{2}mv^2$ ✓ 294 ✓ = $\frac{1}{2}$ (6)(v^2) ✓ $v^2 = 98$ v = 9,90 $m.s^{-1}$ ✓	$M_{E(A)} = M_{E(B)}$ $M_{E(A)} = (E_p + E_k)_B$ $M_{E(A)} = (mgh + \frac{1}{2}mv^2)_B$ } ✓ for any 294 ✓ = 0 + $\frac{1}{2}$(6)(v^2) ✓ $v^2 = 98$ v = 9,90 $m.s^{-1}$ ✓

(4)

5.2.4 **POSITIVE MARKING FROM 5.2.2/*POSITIEWE NASIEN VANAF 5.2.2***

OPTION 1/*OPSIE* 1

$M_E = E_k + E_p$ (At C)
E_k at C = $M_E - E_p$ at C
= M_E – mgh ✓ for any one
= 294 - (6x9,8x3) ✓
= 294 - 176,4
= 117,6 J

$\frac{1}{2}$ mv^2 = 117,6 at point C /*by punt C*

$\frac{1}{2}$ (6)v^2 = 117,6✓

v^2 = 39,2
v = 6,26 $m.s^{-1}$ ✓ (4)

OPTION 2/*OPSIE* 2

M_E (At B) = M_E (At C)
$\frac{1}{2}$ mv^2 + mgh (At B) = $\frac{1}{2}$ mv^2 + mgh (At C) ✓ for any one

$\frac{1}{2}$ (6)$(9,9)^2$ + (6)(9,8)(0) ✓= $\frac{1}{2}$ (6)$(v)^2$ + (6)(9,8)(3) ✓

294 = 3$(v)^2$ + 176,4
v^2 = 39,2
v = 6,26 $m.s^{-1}$ ✓

OPTION 3/ *OPSIE* 3

M_E (At A) = M_E (At C)
$\frac{1}{2}$ mv^2 + mgh (At A) = $\frac{1}{2}$ mv^2 + mgh (At C) ✓ for any

$\frac{1}{2}$ (6)$(0)^2$ + (6)(9,8)(5) ✓= $\frac{1}{2}$ (6)$(v)^2$ + (6)(9,8)(3) ✓

294 = 3$(v)^2$ + 176,4
v^2 = 39,2
v = 6,26 $m.s^{-1}$ ✓

[21]

QUESTION 6/*VRAAG 6*

6.1.1 Stress is the internal restoring force per unit area of body✓✓.

Spanning is die interne herstelkrag per oppervlakte eenheid van 'n voorwerp. (2)

6.1.2 Strain is the ratio of change in dimension/length to the original dimension/length.✓✓

Vervorming is die verhouding van verandering in dimensie tot die oorspronklike dimensie. (2)

6.2.1

$$K = \frac{\sigma}{\varepsilon} \checkmark$$

$$190 \times 10^9 = \frac{250 \times 10^6}{\varepsilon} \checkmark$$

$$\varepsilon = 1{,}32 \times 10^{-3} / 0{,}00132 \checkmark$$

(3)

6.2.2

OPTION 1/*OPSIE 1*	**OPTION2/*OPSIE 2***
$\text{Area} = \frac{\pi d^2}{4}$ $\text{Area} = \frac{\pi(0{,}06)^2}{4}$ ✓ $= 2{,}827433 \times 10^{-3} m^2$ $\sigma = \frac{F}{A}$ ✓ $250 \times 10^6 = \frac{F}{2{,}8274333 \times 10^{-3}}$ ✓ F = 706 858,35 N ✓ **ACCEPT:** 706 500 N OR 707 500 N ***AANVAAR:*** 706 500 N OF 707 500 N	$\text{Area} = \pi r^2$ $\text{Area} = \pi(0{,}03)^2$ ✓ $= 2{,}827433 \times 10^{-3} m^2$ $\sigma = \frac{F}{A}$ ✓ $250 \times 10^6 = \frac{F}{2{,}8274333 \times 10^{-3}}$ ✓ F = 706 858,35 N ✓ **ACCEPT:** 706 500 N OR 707 500 N **AANVAAR:***706 500 N OF 707 500 N*

(4)

6.3 As the temperature increases, (viscosity of a fluid) decreases. ✓✓

Soos die temperatuur styg, verlaag die viskositeit (van 'n vloeistof). (2)

6.4 A body which does not show a tendency to regain its original shape and size✓ when the deforming force is removed. ✓

'n Voorwerp wat nie neig om sy oorspronklike vorm en grootte te herwin wanneer die vervormingskrag verwyder word nie. (2)

6.5
- Clay ✓
- Wax ✓

Any two and any other correct one
Enige twee en enige ander korrekte antwoord

- Putty
- Aluminium
- Mild Steel

- *Klei*
- *Was*
- *Stopverf*
- *Aluminium*
- Sagte staal

(2)

6.6 In a continuous liquid at equilibrium, the pressure applied at any point is transmitted equally to other parts of the liquid. ✓✓

In 'n kontinue vloeistof by ewewig, sal die druk wat by enige punt toegepas word eweredig na ander dele van die vloeistof versprei word. (2)

6.7

OPTION 1/*OPSIE 1*	**OPTION 2/*OPSIE 2***
$\frac{F_1}{A_1} = \frac{F_2}{A_2}$ ✓ $\frac{F_1}{0,05}$ ✓$= \frac{20\,000}{0,8}$ ✓ $F_1 = 1\ 250$ N✓ **NOTE**: Give full marks if F_2 is calculated. *Gee vol punte indien F_2 bereken was*.	$P_2 = \frac{F_2}{A_2}$ $P_2 = \frac{20\,000}{0,8}$ ✓ $P_2 = 25\,000$ Pa $P_2 = 25 \times 10^3$ Pa $P_2 = 25$ kPa But $P_1 = P_2$, then $P_1 = \frac{F_1}{A_1}$ $25 \times 10^3 = \frac{F_1}{0,05}$ ✓ $F_1 = 1\ 250$ N ✓ ✓ for both / *Vir beide*

(4)

6.8 The normal force exerted by a liquid at rest on a given surface in contact with it.✓✓

Die normaalkrag/stukrag wat deur 'n vloeistof in rus uitgeoefen word op 'n oppervlakte waarmee dit in kontak is. (2)

[25]

QUESTION 7/*VRAAG 7*

7.1.1 **A** is the p-type/ Positive type (semiconductor) ✓
***B** is an n-type*/ Negative type *(*semiconductor*)*✓

***A** is die p-tipe (halfgeleier)*
***B** is die n-tipe (halfgeleier)* (2)

7.1.2  ✓✓

ACCEPT: If the arrow is not shaded
***AANVAAR**: Indien die pyl nie ingekleur is nie*. (2)

7.1.3 Four/4 ✓ / *Vier/4* (1)

7.2 A device that stores electrical charge. ✓✓
'n Toestel wat elektriese lading stoor. (2)

7.3 The capacitance is <u>directly proportional</u> to the charge between the plates. ✓✓
OR
$C \propto Q$
Die kapasitansie is direk eweredig aan die lading tussen die plate. (2)

7.4
- Decrease surface area of the plates. ✓
- Increase distance between the plates.✓
- Use dielectric material with a low dielectric constant/ permittivity.

- *Verminder die plaatoppervlakte*
- *Verhoog die afstand tussen die plate.*
- *Gebruik diëlektriese stof met n lae diëlektriese konstante/lae permitiwiteit* (2)

7.5

OPTION 1/*OPSIE 1*	**OPTION 2/*OPSIE 2***	**OPTION 3/*OPSIE 3***
$P = \frac{V^2}{R}$ ✓ $P = \frac{120^2}{60}$ ✓ $P = 240\,W$ $P = 0{,}24\ kW$ Energy used: $E = Pt$ ✓ $E = 0{,}24 \times 2$ ✓ $E = 0{,}48\ kWh$ Cost of energy used: Cost = E used x tariff✓ Cost = 0,48x1,75 ✓ Cost = R0,84 ✓	$P = VI$ ✓ $P = 120 \times 2$ ✓ $P = 240\,W$ $P = 0{,}24\ kW$ Energy used: $E = Pt$ ✓ $E = 0{,}24 \times 2$ ✓ $E = 0{,}48\ kWh$ Cost of energy used: Cost = E used x tariff✓ Cost = 0,48x1,75 ✓ Cost = R0,84 ✓	$P = I^2R$ ✓ $P = 2^2 \times 60$ ✓ $P = 240\,W$ $P = 0{,}24\ kW$ Energy used $E = Pt$ ✓ $E = 0{,}24 \times 2$ ✓ $E = 0{,}48\ kWh$ Cost of energy used: Cost = E used x tariff✓ Cost = 0,48x1,75 ✓ Cost = R0,84 ✓

(7)

OPTION 4	**OPTION 5**	**OPTION 6**
$W = \frac{V^2\Delta t}{R}$ ✓ $= \frac{(120^2)✓(2)}{60}$ ✓ = 480 W = 0,48 kWh ✓ Cost = E_{used} x tariff ✓ = (0,48)(1,75) ✓ = R0,84 ✓	W = VIΔt ✓ = (120)(2) ✓(2) ✓ = 480 W = 0,48 kWh ✓ Cost = E_{used} x tariff ✓ = (0,48)(1,75) ✓ = R0,84 ✓	W = $I^2R\Delta t$ ✓ = $(2^2)(60)$ ✓ (2) ✓ = 480 W = 0,48 kWh ✓ Cost = E_{used} x tariff ✓ = (0,48)(1,75) ✓ = R0,84 ✓

[18]

QUESTION 8/*VRAAG 8*

8.1 This is the process of generating electricity from motion. ✓✓
OR
The production of an emf or voltage across an electrical conductor due to relative motion between the conductor and magnetic field.

Dit is die proses om elektrisiteit op te wek deur beweging.
OF
Die opwekking van 'n emk of spanning oor n geleier deur relatiewe beweging tussen die geleier en magneetveld. (2)

8.2
- The strength of the magnetic field. ✓
- The number of turns on the coil. ✓
- The speed at which the magnet and coil are moved relative to each other.

(ANY TWO)

- *Die sterkte van die magneetveld.*
- *Die aantal windings op die spoel.*
- *Die spoed waarteen die magneet en die spoel relatief tot mekaar beweeg word.*

(ENIGE TWEE) (2)

8.3 (Lenz's law states that) the direction of the induced emf (in the coil) opposes the effect that produces it. ✓✓

(Lenz se wet sê) dat die rigting van die geïnduseerde emk (in die spoel) die effek teenwerk wat dit opgewek het. (2)

8.4
- Electromagnetic braking in trains/rotating machinery. ✓
- Electric motors✓
- Electric generators. ✓
- Induction cooking pots where the pot is heated by magnetic induction.
(ACCEPT ANY OTHER CORRECT APPLICATIONS)

- *Elektromagnetiese remme in treine/roterende masjiene.*
- *Elektriese motors*
- *Generators.*
- *Induksiepotte waar die potte deur magnetiese induksie verhit word.*
(AANVAAR ENIGE ANDER KORREKTE TOEPASSINGS) (3)

[9]

QUESTION 9/*VRAAG 9*

9.1.1 **1** – (carbon) brushes✓
2 – commutator/ split ring ✓
3 – magnet ✓

***1** – borsels*
***2** – kommutator/ spleetring*
***3** – magneet* (3)

9.1.2 DC motor ✓
GS motor (1)

9.2

OPTION 1/*OPSIE 1*	**OPTION 2/*OPSIE 2***
$\frac{V_s}{V_p} = \frac{N_s}{N_p}$ ✓ $\frac{20}{V_P} = \frac{110}{1\,200}$ ✓ $V_P = \frac{1\,200 \times 20}{110}$ V_P = 218,18 V ✓	$\frac{V_P}{V_S} = \frac{N_P}{N_S}$ ✓ $\frac{V_P}{20} = \frac{1\,200}{110}$ ✓ $V_P = \frac{1\,200 \times 20}{110}$ V_P = 218,18 V ✓

(3)
[7]

TOTAL/*TOTAAL*: 150