

SA's Leading Past Year

Exam Paper Portal



You have Downloaded, yet Another Great Resource to assist you with your Studies 😊

Thank You for Supporting SA Exam Papers

Your Leading Past Year Exam Paper Resource Portal

Visit us @ www.saexampapers.co.za



SA EXAM PAPERS

SA EXAM PAPERS
Proudly South African



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

**NATIONAL
SENIOR CERTIFICATE
NASIONALE
SENIOR SERTIFIKAAT**

GRADE/GRAAD 12

**TECHNICAL SCIENCES P1
TEGNIESE WETENSKAPPE V1**

NOVEMBER 2024

MARKING GUIDELINES/NASIENRIGLYNE

MARKS/PUNTE: 150

**These marking guidelines consist of 13 pages.
*Hierdie nasienriglyne bestaan uit 13 bladsye.***



SA EXAM PAPERS

QUESTION/VRAAG 1

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



QUESTION/VRAAG 2

2.1 Newton's Third law of motion. ✓ /Newton se Derde bewegingswet

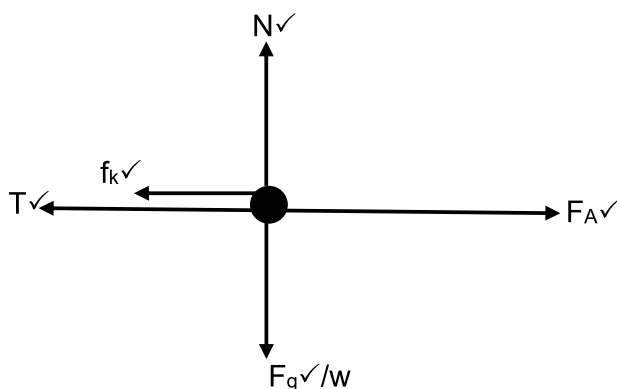


**(NEGATIVE MARKING FOR SECOND PART OF QUESTION 2.1/
NEGATIEWE NASIEN VIR TWEDE DEEL VAN VRAAG 2.1)**

When body A exerts a force on body B, body B simultaneously exerts a force on body A ✓ that has the same magnitude but acts in an opposite direction. ✓
Wanneer liggaam A 'n krag op liggaam B uitoefen, oefen liggaam B gelyktydig 'n krag op liggaam A uit wat gelyk is in grootte maar inwerk in die teenoorgestelde rigting.

(3)

2.2



ACCEPTABLE LABELS/ AANVAARBARE BYSKRIFTE:	NOTES/ AANTEKENINGE:
N/F_N : Normal/ <i>Normaal</i> F_g/w : Force due to gravity/weight/ <i>Krag weens swaartekrag/ gewig</i> $F_A/9\ 000\ \text{N}$: Applied force/ <i>Toegepaste krag</i> T /tension/ <i>spanning</i> / F_T : Force in string/ <i>Krag in tou</i> f_k, f, F_f : kinetic friction/frictional force/ <i>kinetiese wrywing/wrywingskrag</i>	ONE mark for each force represented by an arrow with a correct label./<i>EEN punt vir elke krag wat deur 'n pyltjie met 'n korrekte byskrif aangedui word.</i> <u>Penalise ONCE for each of the following:/<i>Penaliseer EEN KEER vir elk van die volgende:</i></u> - No arrows/<i>Geen pyltjies</i> - No dot/<i>Geen kolletjie</i> - Gap between the line and the dot/<i>Gaping tussen die lyn en kolletjie</i> - Dotted lines are used/<i>Stippellyne word gebruik</i> - A force diagram is given/ <i>'n Kragtediagram word gegee</i> - Additional (non-applicable) forces added/<i>Addisionele (nie-toepaslike) kragte bygevoeg</i>

(5)

- 2.3 The force parallel to the surface ✓ that opposes the motion of the object ✓ (and acts in the direction opposite to the motion of the object.) / *Die krag parallel tot die oppervlak wat die beweging van die voorwerp teenwerk (en dit werk in die teenoorgestelde rigting as die beweging van die voorwerp.)*

OR/OF

The force that acts between two surfaces in contact with each other, and always acts parallel to the surface and opposite in the direction of motion. / *Die krag wat inwerk tussen twee oppervlakke wat in kontak met mekaar is, en altyd parallel inwerk tot die oppervlak en teenoorgesteld in die rigting van beweging.*

(2)

2.4

OPTION/OPSIE 1 (Right is positive/Regs is positief)	OPTION/OPSIE 2 (Right is negative/Regs is negatief)
$\left. \begin{aligned} F_{\text{net/netto}} &= ma \\ F_{\text{engine/enjin}} - f_k - T &= ma \\ F_{\text{engine/enjin}} - \mu_k N - T &= ma \end{aligned} \right\} \begin{array}{l} \text{Any} \\ \text{one/} \\ \text{Enige} \\ \text{een} \end{array}$	$\left. \begin{aligned} F_{\text{net/netto}} &= ma \\ - F_{\text{engine/enjin}} + f_k + T &= ma \\ - F_{\text{engine/enjin}} + \mu_k N + T &= ma \end{aligned} \right\} \begin{array}{l} \text{Any} \\ \text{one/} \\ \text{Enige} \\ \text{een} \end{array}$
$9000 - 0,45(1300 \times 9,8) - T \checkmark = (1300)0 \checkmark$ $T = +3267 \text{ N}$ $= 3267 \text{ N} \checkmark \text{ (Left/Links)}$	$-9000 + 0,45(1300 \times 9,8) + T \checkmark = (1300)0 \checkmark$ $T = -3267 \text{ N}$ $= 3267 \text{ N} \checkmark \text{ (Left/Links)}$

(4)

- 2.5.1 The car will continue moving forward due to inertia/according to Newton's first law of motion. ✓ However, the frictional force (which serves as an external net force) will cause the car to slow down/come to rest. ✓ / *Die motor sal voortgaan om voorwaarts te beweeg as gevolg van traagheid/volgens Newton se eerste bewegingswet. Die wrywingskrag (wat dien as 'n eksterne netto krag) sal egter veroorsaak dat die motor stadiger beweeg/tot stilstand kom.*

(2)

2.5.2

$$\left. \begin{aligned} F_{\text{net/netto}} &= ma \\ \mu_k N &= ma \\ f_k &= ma \end{aligned} \right\} \checkmark \text{ Any one/Enige een}$$

$$-(0,35 \times 950 \times 9,8) \checkmark = 950a \checkmark$$

$$a = -3,43 \text{ m.s}^{-2}$$

$$= 3,43 \text{ m.s}^{-2} \checkmark \text{ (left/links)}$$

(4)

[20]



QUESTION/VRAAG 3

- 3.1 The total linear momentum of an isolated system ✓ remains constant/is conserved (in magnitude and direction). ✓ /Die totale lineêre momentum van 'n geïsoleerde sisteem bly konstant (word behou) in grootte en rigting. (2)

- 3.2
- | OPTION 1/OPSIE 1 | Take east as positive/Neem oos as positief |
|--|---|
| $\Sigma p_i = \Sigma p_f$ $(m_{(b)} + m_{(G)} + m_{(T)})v_i = m_{(b)}v_f + (m_{(T)} + m_{(G)})v_f$ $3,2(0) \checkmark = (0,157)(+400) \checkmark + (3,2 - 0,157)v_f \checkmark$ $v_f = 20,64 \text{ m.s}^{-1} \text{ west/wes} \checkmark$ | $\left. \begin{array}{l} \Sigma p_i = \Sigma p_f \\ (m_{(b)} + m_{(G)} + m_{(T)})v_i = m_{(b)}v_f + (m_{(T)} + m_{(G)})v_f \end{array} \right\} \checkmark \text{ Any one/Enige een}$ |
| OPTION 2/OPSIE 2 | Take east as negative/Neem oos as negatief |
| $\Sigma p_i = \Sigma p_f$ $(m_{(b)} + m_{(G)} + m_{(T)})v_i = m_{(b)}v_f + (m_{(T)} + m_{(G)})v_f$ $3,2(0) \checkmark = (0,157)(+400) \checkmark + (3,2 - 0,157)v_f \checkmark$ $v_f = 20,64 \text{ m.s}^{-1} \text{ west/wes} \checkmark$ | $\left. \begin{array}{l} \Sigma p_i = \Sigma p_f \\ (m_{(b)} + m_{(G)} + m_{(T)})v_i = m_{(b)}v_f + (m_{(T)} + m_{(G)})v_f \end{array} \right\} \checkmark \text{ Any one/Enige een}$ |
- (5)

- 3.3 **INELASTIC ✓ /ONELASTIES**

$\Sigma E_{K(i)} \neq \Sigma E_{K(f)} \checkmark$

(since v_i of gun-trolley system = 0 and v_f of gun-trolley system $\neq 0$)

(aangesien v_i van vuurwapen-trollie stelsel = 0 en v_f van vuurwapen-trollie stelsel $\neq 0$)

OR/OF

Energy was lost in the form of heat and sound. /Energie was verloor in die vorm van hitte en klank.

OR/OF

The sum of the initial kinetic energy is not equal to the sum of the final kinetic energy. /Die som van die aanvanklike kinetiese energie is nie gelyk aan die som van die finale kinetiese energie nie.

OR/OF

The initial velocities are zero and the final velocities are greater than zero. /Die aanvanklike snelhede is nul en die finale snelhede is groter as nul. (2)

- 3.4 The mass of the gun-trolley system is greater than that of the bullet. ✓✓ /Die massa van die vuurwapen-trollie-stelsel is groter as dié van die koeël.

OR/OF

The mass of the bullet is smaller than that of the gun-trolley system. / Die massa van die koeël is kleiner as dié van die vuurwapen-trollie-stelsel (2)



3.5.1	OPTION/OPSIE 1 (East is positive/Oos is positief) $\Delta p = m(v_f - v_i) \checkmark$ $= 0,157(0 - (+400)) \checkmark$ $= -62,80 \text{ kg.m.s}^{-1}$ $= 62,80 \text{ kg.m.s}^{-1} \text{ west} \checkmark$	OPTION/OPSIE 2 (East is negative/Oos is negatief) $\Delta p = m(v_f - v_i) \checkmark$ $= 0,157(0 - (-400)) \checkmark$ $= 62,80 \text{ kg.m.s}^{-1}$ $= 62,80 \text{ kg.m.s}^{-1} \text{ west} \checkmark$	(3)
-------	---	--	-----

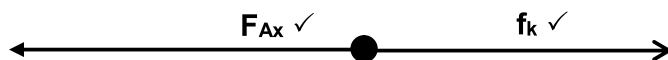
3.5.2 **POSITIVE MARKING FROM QUESTION 3.5.1/POSITIEWE NASIEN VANAF VRAAG 3.5.1**

OPTION/OPSIE 1 (East is positive/Oos is positief) $F_{\text{net/netto}} \Delta t = \Delta p \checkmark$ $(-1000) \Delta t \checkmark = -62,80 \checkmark$ $\Delta t = 0,06 \text{ s} \checkmark$	OPTION/OPSIE 2 (East is negative/Oos is negatief) $F_{\text{net/netto}} \Delta t = \Delta p \checkmark$ $(1000) \Delta t \checkmark = 62,80 \checkmark$ $\Delta t = 0,06 \text{ s} \checkmark$	(4)
OPTION/OPSIE 3 (East is positive/Oos is positief) $F_{\text{net/netto}} = ma$ $F_{\text{net/netto}} = m \frac{\Delta v}{\Delta t} \checkmark$ $-1000 \checkmark = \frac{0,157(0 - (+400))}{\Delta t} \checkmark$ $\Delta t = 0,0628$ $= 0,06 \text{ s} \checkmark$	OPTION/OPSIE 4 (East is negative/Oos is negatief) $F_{\text{net/netto}} = ma$ $F_{\text{net/netto}} = m \frac{\Delta v}{\Delta t} \checkmark$ $1000 \checkmark = \frac{0,157(0 - (-400))}{\Delta t} \checkmark$ $\Delta t = 0,0628 \text{ s}$ $= 0,06 \text{ s} \checkmark$	[18]



QUESTION/VRAAG 4

4.1.1



ACCEPTABLE LABELS/ AANVAARBARE BYSKRIFTE:	NOTES/ AANTEKENINGE:
$F_x / F_{Ax} / F_H / F_{ }$: Horizontal component of the applied force/ <i>Horisontale komponent van die toegepaste krag</i> $f_k / f / F_f$: kinetic friction/frictional force/ <i>kinetiese wrywing/wrywingskrag</i>	ONE mark for each force represented by an arrow with a correct label./EEN punt vir elke krag wat deur 'n pyltjie met 'n korrekte byskrif aangedui word. Penalise ONCE for each of the following:/Penaliseer EEN KEER vir elk van die volgende: - No arrows/Geen pyltjies - No dot/Geen kolletjie nie - Gap between the line and the dot/Gaping tussen die lyn en die kolletjie - Dotted lines are used/Stippellyne word gebruik - A force diagram is given/'n Kragtediagram word gegee - Additional force added/Addisionele krag bygevoeg

(2)

4.1.2 $W_{F_x} = F_x \Delta x \cos \theta$ ✓

$$W_{F_x} = (50 \cos 30^\circ)(30) \cos 0^\circ$$

$$= 1299,04 \text{ J}$$

(3)

- 4.2.1
- Energy is the ability to do work.✓✓ /Energie is die vermoë om werk/arbeid te verrig.
 - Power is the rate at which work is done.✓✓ /Drywing is die tempo waarteen werk/arbeid verrig word.

(4)

- 4.2.2 The total mechanical energy (sum of gravitational potential energy and kinetic energy) in an isolated system ✓ remains constant.✓ /Die totale meganiese energie (som van gravitasie-potensiële energie en kinetiese energie) in 'n geïsoleerde stelsel bly konstant.

(2)

4.2.3 $E_p = mgh$ ✓

$$= (0,06)(9,8)(0,9)$$

$$= 0,53 \text{ J}$$

(3)



4.2.4 **POSITIVE MARKING FROM QUESTION 4.2.3/POSITIEWE NASIEN VANAF VRAAG 4.2.3**

0,27 J ✓ (Accept/Aanvaar: 0,265 J) (1)

4.2.5 **POSITIVE MARKING FROM QUESTION 4.2.3/POSITIEWE NASIEN VANAF VRAAG 4.2.3**

$$\begin{aligned}
 M_{E(\text{top/bo})} &= M_{E(\text{bottom/onder})} \\
 (E_k + E_p)_{\text{top/bo}} &= (E_k + E_p)_{\text{bottom/onder}} \\
 (\frac{1}{2}mv^2 + mgh)_{\text{top/bo}} &= (\frac{1}{2}mv^2 + mgh)_{\text{bottom/onder}} \\
 \frac{1}{2}(0,06 \times 0^2) + 0,53 &\checkmark = \frac{1}{2}(0,06)v^2 + (0,06 \times 9,8 \times 0) \checkmark \\
 v_{\text{bottom/onder}} &= 4,20 \text{ m.s}^{-1} \checkmark
 \end{aligned}
 \quad \left. \vphantom{\begin{aligned} M_{E(\text{top/bo})} &= M_{E(\text{bottom/onder})} \\ (E_k + E_p)_{\text{top/bo}} &= (E_k + E_p)_{\text{bottom/onder}} \\ (\frac{1}{2}mv^2 + mgh)_{\text{top/bo}} &= (\frac{1}{2}mv^2 + mgh)_{\text{bottom/onder}} \end{aligned}} \right\} \checkmark \text{ Any one/Enige een}$$

(4)

4.3 Increases ✓ /Toeneem (1)
[20]

QUESTION/VRAAG 5

5.1 A property of the body by virtue of which the body regains its original shape and size completely when a deforming force is removed. ✓✓ /Die eienskap van die liggaam waardeur die liggaam in staat is om sy oorspronklike vorm en grootte te herstel wanneer die vervormingskrag verwyder word. (2)

5.2 To predict the behaviour of a material when being subjected to the force. ✓✓ / Om die neiging van 'n materiaal te voorspel wanneer dit aan die krag onderwerp word.

OR/OF

To predict how much the material extends under tension or contracts under compression./Om te voorspel die mate van 'n materiaal se uitrekking onder spanning en sametrekking onder drukking.

OR/OF

It shows stiffness or resistance to elastic deformation under stress./Dit toon styfheid of weerstand teen elastiese vervorming onder spanning.

OR/OF

It determines a material's ability to support loads and maintains shape./Dit bepaal 'n materiaal se vermoë om vrage te ondersteun en vorm te behou. (2)

5.3.1

$$\begin{aligned}
 K &= \frac{\sigma}{\epsilon} \checkmark \\
 &= \frac{150}{2} \checkmark \\
 &= 75 \text{ Pa} \checkmark
 \end{aligned}$$

(3)

5.3.2

$$\begin{aligned}
 K &= \frac{\sigma}{\epsilon} \\
 &= \frac{300}{2} \checkmark \\
 &= 150 \text{ Pa} \checkmark
 \end{aligned}$$

(2)



- 5.4 Material 2 has a higher ability to withstand changes in its length when subjected to lengthwise tension and compression ✓✓ /Materiaal 2 het 'n groter vermoë om veranderinge in lengte te weerstaan wanneer dit aan trekking of drukking in die lengte onderwerp word.

OR/OF

Material 1 has a lower ability to withstand changes in its length when subjected to lengthwise tension and compression. /Materiaal 1 het 'n kleiner vermoë om veranderinge in lengte te weerstaan wanneer dit aan trekking of drukking in die lengte onderwerp word.

OR/OF

Material 2 is stiffer than material 1. /Materiaal 2 is stywer as materiaal 1.

OR/OF

Material 1 is less stiff than material 2. /Materiaal 1 is minder styf as materiaal 2. (2)

- 5.5.1 AB ✓ (1)

- 5.5.2 E ✓ (1)

[13]

QUESTION/VRAAG 6

- 6.1 In a continuous liquid at equilibrium, the pressure applied at a point is transmitted equally to the other parts of the liquid. ✓✓ /In 'n kontinue vloeistof by ewewig, word die druk by 'n punt eweredig oorgedra na al die ander dele van die vloeistof. (2)

6.2

$$\frac{\frac{F_1}{A_1}}{\frac{37,8}{0,625 \times 10^{-4}}} \} \checkmark = \frac{\frac{F_2}{A_2}}{\frac{534,2 \times 10^{-4}}} \} \checkmark$$

$$F_2 = 32\,308,42 \text{ N } \checkmark \quad (4)$$

- 6.3.1 The depth of the fluid. ✓ /Die diepte van die vloeistof.
 The density of the fluid. /Die digtheid van die vloeistof.
 The acceleration due to gravity. /Die versnelling as gevolg van gravitasie.
 (ANY ONE/ENIGE EEN) (1)

- 6.3.2 $P = pgh$ ✓
 $P = 1\,000 \times 9,8 \times 5,2$ ✓
 $P = 50\,960 \text{ Pa}$ ✓ (3)

[10]



QUESTION/VRAAG 7

7.1 Total internal reflection. ✓ /Totale interne weerkaatsing

**(NEGATIVE MARKING FOR SECOND PART OF QUESTION 7.1/
NEGATIEWE NASIEN VIR TWEDE DEEL VAN VRAAG 7.1)**

When the angle of incidence is greater than the critical angle ✓, the ray of light reflects into the original medium. ✓/Wanneer die invalshoek groter is as die grenshoek, weerkaats die straal terug na die oorspronklike medium.

OR/OF

The physical phenomenon in which light rays reflect back into the incident medium so that the angle of incidence is greater than the critical angle for the medium. /Die fisiese verskynsel waar ligstrale terug weerkaats in die invalmedium, sodat die invalshoek groter as die grenshoek is vir die medium.

(3)

7.2.1 Equal to ✓ /Gelyk aan

(1)

7.2.2 **(NEGATIVE MARKING FROM QUESTION 7.2.1/NEGATIEWE NASIEN
VANAF VRAAG 7.2.1)**

The light ray is reflected on a smooth and flat surface ✓ (and the angle of incidence is therefore equal to the angle of reflection). /Die ligstraal word weerkaats op 'n gladde en plat oppervlak (en dus is die invalshoek gelyk aan die weerkaatsingshoek).

(1)

7.3 When a light ray strikes the diamond-air interface at an angle of $24,4^\circ$ ✓, it is refracted such that the refracted light ray is parallel to the interface / the angle of refraction is 90° . ✓ /Indien 'n ligstraal die diamand-lug interfase teen 'n hoek van $24,4^\circ$ tref, word dit gebuig sodat die gebreekte ligstraal parallel is met die interfase/die brekingshoek is 90° .

(2)

7.4.1 Emergent ray ✓ /Uitvalstraal

(1)

- 7.4.2
- The speed of light increases. ✓ /The wavelength increases. /Die spoed van lig neem toe. /Die golflengte neem toe.
 - The light ray bends away from the normal ✓ /The angle of refraction is greater than the angle of incidence. /Die ligstraal buig weg vanaf die normaal. /Die brekingshoek is groter as die invalshoek.

(2)

[10]

QUESTION/VRAAG 8

8.1.1 Radio waves ✓ /Radiogolwe (1)

8.1.2 $E = hf$ ✓
 $= (6,63 \times 10^{-34}) (94,5 \times 10^6)$ ✓
 $= 6,27 \times 10^{-26} \text{ J}$ ✓ (3)

8.2.1 A - Principal axis ✓ /Hoofas
 B - Focal length ✓ /Brandpuntlengte
 C - Optical centre ✓ /Optiese middelpunt (3)

8.2.2 Convex lens ✓ /Konvekse lens (1)

8.3.1 Beyond **2F** ✓ /Verder as **2F** (1)

- 8.3.2
- Real ✓ /Ware
 - Inverted ✓ /Omgekeerd
 - Larger than object ✓ /Groter as voorwerp
- (3)
[12]

QUESTION/VRAAG 9

- 9.1.1
- Distance between the plates ✓ /Afstand tussen die plate
 - Area of the plates ✓ /Oppervlakte van die plate
 - Dielectric material /Diëlektriese materiaal (ANY TWO/ENIGE TWEE) (2)

9.1.2 $C = \frac{Q}{V}$ ✓
 $60 \times 10^{-12} = \frac{Q}{10}$ ✓
 $Q = 6 \times 10^{-10} \text{ C}$ ✓ (3)

- 9.1.3
- The appliance can discharge during the service. ✓✓ /Die toestel kan ontlaaï tydens diens.
 - The high voltage can cause electrical shock or even death. / Die hoë spanning kan lei tot elektriese skok of selfs sterfte.
 - To prevent equipment from damage/fire risk./Om skade aan toestelle/brandgevaar te voorkom (2)

9.2.1 The rate of flow of charge. ✓✓ /Die tempo waarteen lading vloei. (2)



9.2.2

OPTION/OPSIE 1	OPTION/OPSIE 2
$P = VI \checkmark$ $80 = (20)I \checkmark$ $I = 4A \checkmark$	$R = \frac{V}{I} \checkmark$ $4 = \frac{16}{I} \checkmark$ $I = 4A \checkmark$

OPTION/OPSIE 3	OPTION/OPSIE 4
$P = \frac{V^2}{R}$ $80 = \frac{20^2}{R}$ $R = 5 \Omega$ $R = \frac{V}{I} \checkmark$ $5 = \frac{20}{I} \checkmark$ $I = 4A \checkmark$	$P = \frac{V^2}{R}$ $80 = \frac{20^2}{R}$ $R = 5 \Omega$ $P = I^2R \checkmark$ $80 = I^2(5) \checkmark$ $I = 4A \checkmark$

(3)

9.2.3

- The second speaker is connected in parallel, therefore external resistance decreases. $\checkmark$ /Die tweede luidspreker is gekoppel in parallel en dus neem interne weerstand af.
- Total current in the circuit increases. $\checkmark$ /Totale stroom in die stroombaan neem toe. $\left[I = \frac{V}{R} \right]$

Current becomes too high for the light bulb, hence it burns out. $\checkmark$ /Stroom word te hoog vir die gloeilamp en dus brand dit uit.

(3)

9.2.4 Fuse $\checkmark$

(accept: rheostat/resistor) /Smeltdraad (aanvaar: reostaat/resistor)

(1)

9.2.5

Series $\checkmark$ /Serie

(1)

[17]

QUESTION/VRAAG 10

- 10.1.1 Electromagnetic induction ✓ / Faraday's law of electromagnetic induction
/ *Elektromagnetiese induksie/ Faraday se wet van elektromagnetiese induksie* (1)
- 10.1.2 Motor effect ✓ / *Motor effek* (1)
- 10.1.3 Mechanical energy to electrical energy. ✓ / *Meganiese energie na elektriese energie.* (1)
- 10.1.4 Electrical energy to mechanical energy. ✓ / *Elektriese energie na meganiese energie.* (1)
- 10.2 The direction of the induced emf in the coil opposes the effect that produces it. ✓✓ / *Die rigting van die geïnduseerde emk in die spoel staan die effek teen wat dit produseer.* (2)
- 10.3 $\frac{N_s}{N_p} = \frac{V_s}{V_p}$ ✓
 $\frac{N_s}{800} \checkmark = \frac{18}{0,25 \times 10^3} \checkmark$
 $N_s = 57,60 \checkmark$ (windings/windings) (4)
- [10]**

TOTAL/TOTAAL 150