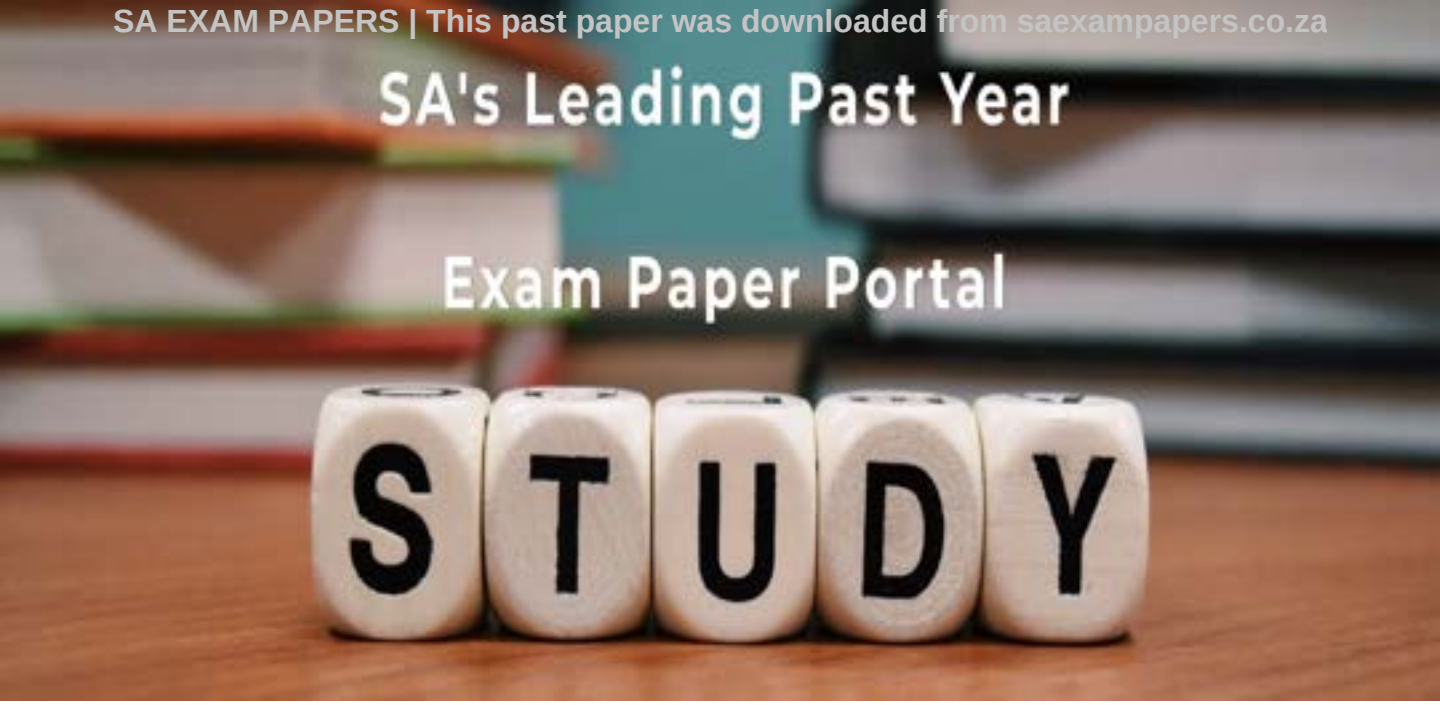
SA EXAM PAPERS | This past paper was downloaded from saexampapers.co.za



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 | This past paper was downloaded from saexampapers.co.za

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
Proudly South African

Copyright reserved/*Kopiereg voorbehou*

SA EXAM PAPERS | This past paper was downloaded from saexampapers.co.za

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]

SA EXAM PAPERS
Proudly South African

SA EXAM PAPERS | This past paper was downloaded from saexampapers.co.za

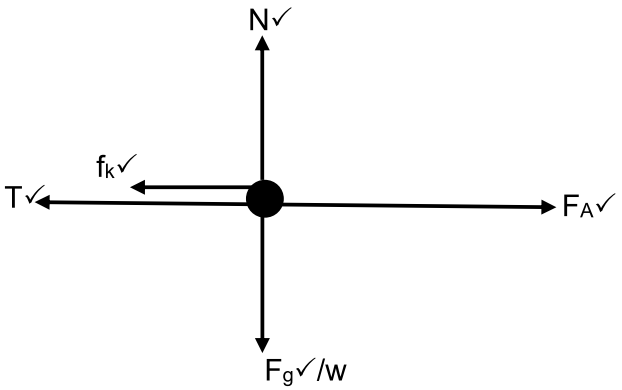
QUESTION/*VRAAG* 2

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

(NEGATIVE MARKING FOR SECOND PART OF QUESTION 2.1/ *NEGATIEWE NASIEN VIR TWEEDE 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/*Normaal* F_g/W: Force due to gravity/weight/ *Krag weens swaartekrag/ gewig* F_A/9 000 N: Applied force/ *Toegepaste krag* T/tension/*spanning*/F_T: Force in string/*Krag in tou* f_k, f, F_f : kinetic friction/frictional force/ *kinetiese wrywing/wrywingskrag*	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.* <u>Penalise ONCE for each of the following</u>:/*<u>Penaliseer EEN KEER vir elk van die volgende</u>:* • No arrows/*Geen pyltjies* • No dot/*Geen kolletjie* • Gap between the line and the dot/*Gaping tussen die lyn en kolletjie* • Dotted lines are used/*Stippellyne word gebruik* • A force diagram is given/ *'n Kragtediagram word gegee* • Additional (non-applicable) forces added/*Addisionele (nie-toepaslike) kragte bygevoeg*

(5)

SA EXAM PAPERS
Proudly South African

SA EXAM PAPERS | This past paper was downloaded from saexampapers.co.za

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*)**
$F_{net/netto} = ma$ $F_{engine/enjin} - f_k - T = ma$ $F_{engine/enjin} - \mu_k N - T = ma$ ✓ Any one/*Enige een*	$F_{net/netto} = ma$ $-F_{engine/enjin} + f_k + T = ma$ $-F_{engine/enjin} + \mu_k N + T = ma$ ✓ Any one/*Enige een*
$9000 - 0{,}45(1300 \times 9{,}8) - T$✓ $= (1300)0$✓ $T = +3267$ N $= 3267$ N✓ (Left/*Links*)	$-9000 + 0{,}45(1300 \times 9{,}8) + T$✓ $= (1300)0$✓ $T = -3267$ N $= 3267$ N✓ (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 $F_{net/netto} = ma$
$\mu_k N = ma$
$f_k = ma$
✓ Any one/*Enige een*

$-(0{,}35 \times 950 \times 9{,}8)$ ✓ $= 950a$ ✓
$a = -3{,}43\ m.s^{-2}$
$= 3{,}43\ m.s^{-2}$ ✓ (left/*links*) (4)

[20]

SA EXAM PAPERS
Proudly South African

SA EXAM PAPERS | This past paper was downloaded from saexampapers.co.za

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***
$\Sigma p_i = \Sigma p_f$ $(m_{(b)} + m_{(G)} + m_{(T)})v_i = m_{(b)}v_f + (m_{(T)} + m_{(G)})v_f$ ✓ Any one/*Enige een* $3{,}2(0)$ ✓ $= (0{,}157)(+400)$ ✓ $+ (3{,}2 - 0{,}157)v_f$ ✓ $v_f = 20{,}64\ m.s^{-1}$ west/*wes* ✓
OPTION 2/*OPSIE* 2 **Take east as negative/*Neem oos as negatief***
$\Sigma p_i = \Sigma p_f$ $(m_{(b)} + m_{(G)} + m_{(T)})v_i = m_{(b)}v_f + (m_{(T)} + m_{(G)})$ ✓ Any one/*Enige een* $3{,}2(0)$ ✓ $= (0{,}157)(+400)$ ✓ $+ (3{,}2 - 0{,}157)v_f$ ✓ $v_f = 20{,}64\ m.s^{-1}$ west/*wes*✓

(5)

3.3 INELASTIC ✓ /*ONELASTIES*

-

$\sum E_{K(i)} \neq \sum E_{K(f)}$ ✓

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

SA EXAM PAPERS
Proudly South African

SA EXAM PAPERS | This past paper was downloaded from saexampapers.co.za

3.5.1

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

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

(4)

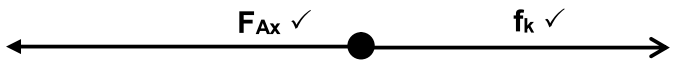
[18]

SA EXAM PAPERS
Proudly South African

SA EXAM PAPERS | This past paper was downloaded from saexampapers.co.za

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/*Horisontale komponent van die toegepaste krag* f_k / f / F_f : kinetic friction/frictional force/ *kinetiese wrywing/wrywingskrag*	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.* <u>Penalise ONCE for each of the following</u>:/*<u>Penaliseer EEN KEER vir elk van die volgende</u>:* • 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 $W_{F_x} = F_x \Delta x \cos\theta$ ✓

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

$= 1299{,}04 \text{ J}$ ✓ (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)

SA EXAM PAPERS
Proudly South African

SA EXAM PAPERS | This past paper was downloaded from saexampapers.co.za

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***

$M_{E(top/bo)} = M_{E(bottom/onder)}$
$(E_k + E_p)_{top/bo} = (E_k + E_p)_{bottom/onder}$
$(½\ mv^2 + mgh)_{top/bo} = (½\ mv^2 + mgh)_{bottom/onder}$
} ✓ Any one/*Enige een*

$½(0,06 \times 0^2) + 0,53$ ✓ $= ½(0,06)v^2 + (0,06 \times 9,8 \times 0)$ ✓

$v_{bottom/onder} = 4,20\ m.s^{-1}$ ✓ (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 deformimg 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 vragte te ondersteun en vorm te behou.* (2)

5.3.1 $K = \frac{\sigma}{\varepsilon}$ ✓

$= \frac{150}{2}$ ✓

$= 75$ Pa ✓ (3)

5.3.2 $K = \frac{\sigma}{\varepsilon}$

$= \frac{300}{2}$ ✓

$= 150$ Pa ✓ (2)

SA EXAM PAPERS
Proudly South African

SA EXAM PAPERS | This past paper was downloaded from saexampapers.co.za

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
$$\frac{F_1}{A_1} = \frac{F_2}{A_2} \checkmark$$

$$\left.\frac{37,8}{0,625 \times 10^{-4}}\right\} \checkmark = \left.\frac{F_2}{534,2 \times 10^{-4}}\right\} \checkmark$$

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

6.3.1 The depth of the fluid. ✓ /*Die diepte van die vloeistof.*
The density of the 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 x 9,8 x 5,2 ✓
P = 50 960 Pa ✓ (3)

[10]

SA EXAM PAPERS
Proudly South African

SA EXAM PAPERS | This past paper was downloaded from saexampapers.co.za

QUESTION/*VRAAG 7*

7.1 Total internal reflection. ✓ /*Totale interne weerkaatsing*

(NEGATIVE MARKING FOR SECOND PART OF QUESTION 7.1/ *NEGATIEWE NASIEN VIR TWEEDE 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 invalsmedium, 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 invlashoek gelyk aan die weerkaatsingshoek).* (1)

7.3 When a light ray strikes the diamond-air interface at an angle of 24,4°✓, 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° 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]

SA EXAM PAPERS
Proudly South African

SA EXAM PAPERS | This past paper was downloaded from saexampapers.co.za

QUESTION/*VRAAG* 8

8.1.1 Radio waves ✓ /*Radiogolwe* (1)

8.1.2 $E = hf$ ✓
$= (6{,}63 \times 10^{-34})(94{,}5 \times 10^{6})$ ✓
$= 6{,}27 \times 10^{-26}$ 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 $C = \frac{Q}{V}$ ✓
$60 \times 10^{-12} = \frac{Q}{10}$ ✓
$Q = 6 \times 10^{-10}$ C ✓ (3)

9.1.3
- The appliance can discharge during the service. ✓✓ /*Die toestel kan ontlaai 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)

SA EXAM PAPERS
Proudly South African

SA EXAM PAPERS | This past paper was downloaded from saexampapers.co.za

9.2.2

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

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

(3)

9.2.3
- The second speaker is connected in parallel, therefore external resistance decreases. ✓ /*Die tweede luidspreker is gekoppel in parallel en dus neem interne weerstand af.*
- Total current in the circuit increases. ✓ /*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. ✓ /*Stroom word te hoog vir die gloeilamp en dus brand dit uit.* (3)

9.2.4 Fuse ✓ (accept: rheostat/resistor) /*Smeltdraad (aanvaar: reostaat/resistor)* (1)

9.2.5 Series ✓ /*Serie* (1)

[17]

SA EXAM PAPERS
Proudly South African

SA EXAM PAPERS | This past paper was downloaded from saexampapers.co.za

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 $\frac{N_s}{N_p} = \frac{V_S}{V_P}$ ✓

$\frac{N_S}{800}$ ✓ $= \frac{18}{0,25 \times 10^3}$ ✓

$N_S = 57,60$ ✓ (windings/*windings*)

(4)
[10]

TOTAL/*TOTAAL* 150

Copyright reserved/*Kopiereg voorbehou*

SA EXAM PAPERS
Proudly South African