



Province of the
EASTERN CAPE
EDUCATION

**NATIONAL
SENIOR CERTIFICATE/
NASIONALE
SENIOR SERTIFIKAAT**

GRADE/GRAAD 12

SEPTEMBER 2019

**TECHNICAL SCIENCES P1/
TEGNIESE WETENSKAPPE V1
MARKING GUIDELINE/NASIENRIGLYN**

MARKS:/PUNTE: 150

This marking guideline consists of 8 pages./
Hierdie nasienriglyn bestaan uit 8 bladsye.

QUESTION 1/VRAAG 1

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

QUESTION 2/VRAAG 2

- 2.1 2.1.1 When a net force acts on an object, the object accelerates in the direction of the force. ✓ This acceleration is directly proportional to the net force and inversely proportional to the mass of the object. ✓
Indien 'n netto krag op 'n voorwerp inwerk, versnel die voorwerp in die rigting van die krag. ✓ Hierdie versnelling is direk eweredig aan die netto krag en omgekeerd eweredig aan die massa van die voorwerp. ✓ (2)
- 2.1.2 Normal/*Normaal* ✓
Force of gravity/*Gravitasiekrag* ✓
Tension/*Spanning* ✓ (3)
- 2.1.3 $F_{\text{net}} = ma$ ✓
 $T = (10)(0,3)$ ✓
 $T = 3 \text{ N}$ ✓ (3)
- 2.1.4
- A free-body diagram with a central black dot representing an object. Four arrows originate from this dot: one pointing vertically upwards labeled 'N ✓', one pointing horizontally to the right labeled 'F ✓', one pointing vertically downwards labeled 'F_g ✓', and one pointing horizontally to the left labeled 'T ✓'.
- (4)

- 2.1.5 $F_{\text{net}} = ma$ ✓
 $F - T = ma$
 $F - 3 \checkmark = (20)(0,3) \checkmark$
 $F = 9 \text{ N} \checkmark$ (4)
- 2.1.6 Increases/*Vermeerder* ✓ (1)
- 2.1.7 Increases/*Vermeerder* ✓ (1)
- 2.2 2.2.1 Pair 1 – Force exerted by the ring on the wall
 Force exerted by the wall on the ring.
 Pair 2 – Force exerted by the spring balance A on B
 Force exerted by the spring balance B on A
 Pair 3 – Force applied by learner on spring balance A
 Force exerted by the spring balance A on the learner
 (Any TWO sets)(Per set - ✓✓)
Paar 1 – Krag uitgeoefen deur die ring op die muur.
Krag uitgeoefen deur die muur op die ring.
Paar 2 – Krag uitgeoefen deur die trekskaal A op B
Krag uitgeoefen deur die trekskaal B op A
Paar 3 – Krag uitgeoefen deur die leerder op trekskaal A
Krag uitgeoefen deur trekskaal A op leerder
 (Enige TWEE stelle)(Per stel ✓✓) (4)
- 2.2.2 3 N ✓✓ (2)
- 2.2.3 Newton's third law/*Newton se derde wet.* ✓
 When object **A** exerts a force on object **B**, object **B** simultaneously exerts an oppositely directed force of equal magnitude on object **A**. ✓✓
Indien voorwerp A na krag op voorwerp B uitoefen, oefen voorwerp B gelyktydig 'n krag met dieselfde grootte maar in die teenoorgestelde rigting op voorwerp B. ✓✓ (3)

[27]

QUESTION 3/VRAAG 3

- 3.1 3.1.1 Impulse is defined as the product of the net force acting on an object and the time ✓✓ (the net force acts on the object.)
Impuls word gedefinieer as die produk van die netto krag wat op 'n voorwerp inwerk en die tyd wat (die netto krag op die voorwerp inwerk.) (2)

3.1.2	OPTION/OPSIE 1	OPTION/OPSIE 2
	Upward POSITIVE / <i>Opwaarts POSITIEF</i>	Downward POSITIVE / <i>Afwaarts POSITIEF</i>
	$F_{\text{net}}\Delta t = \Delta p$ ✓ $F_{\text{net}}(0,01) \checkmark = [0,06](8 - (-14)) \checkmark$	$F_{\text{net}}\Delta t = \Delta p$ ✓ $F_{\text{net}}(0,01) \checkmark =$ $[0,06](-8 - (14)) \checkmark$
	$F_{\text{net}} = 132 \text{ N} \checkmark$	$F_{\text{net}} = -132 \text{ N}$ $F_{\text{net}} = 132 \text{ N} \checkmark$

(4)

3.1.3 132 N ✓ (1)

3.1.4 Decreases/*Verminder* ✓ (1)

3.2 Air bags/*Lugsakke* ✓
Crumple zones/*Frommelsones* ✓
Arrestor beds/*Keerbeddens* ✓ (3)

3.3 3.3.1 An isolated system is one on which the net external force acting on the system is zero. ✓✓
’n Geïsoleerde sisteem is waar die netto eksterne krag wat op die sisteem werk, nul is. ✓✓ (2)

3.3.2 $\Sigma p_i = p_{i(car)} + p_{i(truck)} \quad / \quad \Sigma p_i = p_{i(motor)} + p_{i(trok)}$
 $= 5\,000 + 0$ ✓
 $= 5\,000 \text{ kg.m.s}^{-1}$ ✓ (2)

3.3.3 $5\,000 \text{ kg.m.s}^{-1}$ ✓ (1)

3.3.4 The total linear momentum of an isolated system remains constant (is conserved). ✓✓
Die totale lineêre momentum van ’n geïsoleerde sisteem bly konstant (bly behoue). ✓✓ (2)

3.3.5 $\Sigma p_i = \Sigma p_f$ ✓
 $5000 = p_{f(car/motor)} + p_{f(truck/trok)}$
 $5000 = (-500) + (1500)v_f$ ✓
 $v_f = 3,67 \text{ m.s}^{-1}$ due East/*Ooswaarts* ✓ (3)

3.3.6 $\Sigma E_{ki} = \frac{1}{2} m_c v_{ic}^2 + \frac{1}{2} m_T v_{iT}^2$ ✓ $m_c v_{ic} = 5000 \quad v_{ic} = 5 \text{ m.s}^{-1}$ }
 $= \frac{1}{2}(1\,000)(5)^2 + 0$ ✓ }
 $= 12\,500 \text{ J}$ ✓ }
 $\Sigma E_{kf} = \frac{1}{2} m_c v_{fc}^2 + \frac{1}{2} m_T v_{fT}^2$ $m_c v_{fc} = -500 \quad v_{fc} = -0,5 \text{ m.s}^{-1}$ }
 $= \frac{1}{2}(1\,000)(-0,5)^2 + \frac{1}{2}(1\,500)(3,67)^2$ ✓ }
 $= 10\,226,68 \text{ J}$ ✓ }
 $\Sigma E_{ki} \neq \Sigma E_{kf}$
 \therefore Collision is inelastic / *Botsing is onelasties* ✓ (7)

[28]

QUESTION 4/VRAAG 4

- 4.1 4.1.1 The sum of potential energy and kinetic energy.
Die som van potensiële energie en kinetiese energie ✓✓ (2)
- 4.1.2 B ✓ (1)
- 4.1.3 In an isolated system the total mechanical energy remains constant. ✓✓
In 'n geïsoleerde sisteem bly die totale meganiese energie konstant ✓✓ (2)
- 4.1.4 Mechanical energy at **A** = $E_P + E_K$ /
Meganiese energie by A = $E_P + E_K$
= $60 + \frac{1}{2}mv^2$
= $60 + \frac{1}{2}(0,2)(1,5)^2$ ✓
= $60,23 \text{ J}$ ✓
ME at/by A = ME at/by B ✓
 $60,23 = mgh + \frac{1}{2}mv^2$
 $60,23 = (0,2)(9,8)(4,5) + \frac{1}{2}(0,2)v^2$ ✓
 $v^2 = 514,05$ ✓
 $v = 22,67 \text{ m}\cdot\text{s}^{-1}$ ✓ (6)
- 4.2 4.2.1 (a) F_3 ✓ (1)
(b) F_{girl} ✓ (1)
- 4.2.2 **OPTION/OPSIE 1**
 $W_{\text{net}} = F_{\text{net}}\Delta x \cos\theta$ ✓
 $W_{\text{net}} = (42 - 1,2)(3) \cos 0^\circ$ ✓✓
 $W_{\text{net}} = 122,4 \text{ J}$ ✓
- OPTION/OPSIE 2**
 $W_{\text{net}} = W_{\text{girl}} + W_{F_3}$
 $W_{\text{net}} = F_{\text{girl}} \Delta x \cos \theta + F_3 \Delta x \cos\theta$ ✓
 $W_{\text{net}} = (42)(3) \cos 0^\circ + (1,2)(3)(\cos 180^\circ)$ ✓
 $W_{\text{net}} = 122,4 \text{ J}$ ✓ (4)
- 4.2.3 Power / *Drywing* ✓ (1)
- 4.2.4 Power/*Drywing* = 400 W
Work done per second/*Arbeid verrig per sekonde* = 400 W
 \therefore Time taken/*Tyd geneem* = 1 s ✓✓ (2)

[20]

QUESTION 5/VRAAG 5

- 5.1 5.1.1 A perfectly plastic body is a body which does not show a tendency to regain its original shape and size when the deforming force is removed. ✓✓
'n Volkome plastiese liggaam is 'n liggaam wat nie 'n neiging toon om sy oorspronklike vorm en grootte te herwin wanneer die vervormingkrag verwyder word nie. ✓✓ (2)
- 5.1.2 Modulus of elasticity / *Elastisiteitsmodulus* / K ✓ (1)
- 5.1.3 B ✓ (1)
- 5.1.4 A ✓ (1)
- 5.1.5 C ✓ (1)
- 5.2 5.2.1 Pascal's law states that in a continuous liquid at equilibrium, the pressure applied at a point is transmitted equally to the other parts of the liquid. ✓✓
Pascal se wet sê dat in 'n kontinue vloeistof in ewewig die druk wat by enige punt toegepas word, eweredig na die ander dele van die vloeistof versprei word. ✓✓ (2)
- 5.2.2 *Area/Oppervlakte* = πr^2
 $= \pi (13 \times 10^{-2})^2$ ✓
 $= 0,053 \text{ m}^2$ ✓
- $$\frac{F_1}{A_1} = \frac{F_2}{A_2} \quad \checkmark$$
- $$\frac{300}{0,053} \checkmark = \frac{18\,000}{A_2} \quad \checkmark$$
- $$A_2 = 3,18 \text{ m}^2 \quad \checkmark$$

(6)
[14]**QUESTION 6/VRAAG 6**

- 6.1 Capacitor is a device for storing electrical charge for a short time. ✓✓
'n Kapasitor is 'n elektroniese komponent wat in staat is om elektriese energie/lading vir 'n kort tydjie te stoor. (2)
- 6.2 Filter circuits in power supplies.
 Separation of frequencies between the woofer (base) speaker.
 Power factor correction/improvement in electrical transmission systems.
 (ANY TWO ✓✓)
- Filtreer stroombane in kragtoevoer.
 Skeiding van frekwensies tussen die bas-('woofer') luidspreker
 Verbeter drywing in elektriese aanskakeling(transmissie)stelsels.
 (Enige TWEE ✓✓) (2)*

- 6.3 $Q = CV$ ✓
 $Q = (10 \times 10^{-6})(5)$ ✓
 $Q = 50 \times 10^{-6} \text{ C}$ ✓ (3)
- 6.4 6.4.1 A semi-conductor is a material that has electrical conductivity between that of a conductor and an insulator. ✓✓
'n Halfgeleier is 'n materiaal wat 'n elektriese geleidingsvermoë tussen dié van 'n geleier en 'n isolator het. ✓✓ (2)
- 6.4.2 Silicon and Germanium/
Silikon en Germanium ✓✓ (2)
- 6.4.3 p-type / *p-tipe* ✓✓ (2)
- [13]

QUESTION 7/VRAAG 7

- 7.1 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 'n konstante temperatuur. ✓✓ (2)
- 7.2 $\frac{1}{R_{//}} = \frac{1}{R_1} + \frac{1}{R_2}$ ✓ **OR/OF** $R_p = \frac{R_1 R_2}{R_1 + R_2}$ ✓
 $\frac{1}{R_{//}} = \frac{1}{2,4} + \frac{1}{2,4}$ $R_{//} = 1,2 \Omega$ ✓ $R_p = \frac{(2,4)(2,4)}{2,4+2,4} = 1,2 \Omega$ ✓
- $R_T = R_s + R_{//} = 1,6 + 1,2 = 2,8 \Omega$ ✓
 $V = IR$ ✓
 $12 = I(2,8)$ ✓
 $I = 4,29 \text{ A}$ ✓ (6)
- 7.3 7.3.1 Decreases / *Verminder* ✓ (1)
- 7.3.2 Current decreases ✓ R_T increases when S_1 is open ✓
Stroom verminder ✓ R_T neem toe as S_1 oop is. ✓ (2)
- [11]

QUESTION 8/VRAAG 8

8.1 8.1.1 Faraday's law states that when the magnetic flux linked with the coil changes, an emf is induced in the coil. The magnitude of induced emf is directly proportional to the rate of change of magnetic flux. ✓✓
Faraday se wet stel dit dat wanneer die magnetiese vloed wat met die spoel verbind is verander, die emk in die spoel geïnduseer word. Die grootte van die geïnduseerde emk is direk eweredig aan die tempo waarteen die magneetvloed verander. ✓✓ (2)

$$8.1.2 \quad \varepsilon = -N \frac{\Delta\phi}{\Delta t} \quad \checkmark$$

$$\varepsilon = (300) \frac{(0,7-0,34)}{1} \quad \checkmark$$

$$\varepsilon = 108 \text{ V} \quad \checkmark \quad (3)$$

8.2 8.2.1 A transformer that increases the voltage is called a step-up transformer. ✓✓
 A transformer that decreases the voltage is called a step-down transformer. ✓✓
'n Transformator wat die potensiaalverskil vermeerder word 'n verhogingstransformator genoem. ✓✓
'n Transformator wat die potensiaalverskil verminder word 'n verlagingstransformator genoem. ✓✓ (4)

8.2.2 Step-up transformer/*Verhogingstransformator* ✓✓ (2)
[11]

QUESTION 9/VRAAG 9

9.1 DC generator. ✓ It has split ring commutator. ✓
GS generator. ✓ Dit het 'n split-ring kommutator. ✓ (2)

9.2 Mechanical energy to electrical energy.
Meganiese energie na elektriese energie ✓✓ (2)

9.3 Rectangular coil / Coil
Reghoekige spoel / Spoel ✓ (1)

9.4 Principle of electromagnetic induction. ✓
Beginsel van elektromagnetiese induksie ✓ (1)
[6]

TOTAL/TOTAAL: 150