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EASTERN CAPE
EDUCATION

**NATIONAL
SENIOR CERTIFICATE/
NASIONALE
SENIOR SERTIFIKAAT**

GRADE/GRAAD 12

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

MARKS/PUNTE: 150

This marking guideline consists of 11 pages./
Hierdie nasienriglyn bestaan uit 11 bladsye.

QUESTION/VRAAG 1

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



QUESTION/VRAAG 22.1 F ✓ Net force / *Netto krag*2.2 A ✓ Impulse / *Impuls*2.3 G ✓ Stress / *Druk*2.4 B ✓ Thrust / *Stukrag*2.5 C ✓ Optic axis / *Optiese-as*2.6 I ✓ Electric motor / *Elektriese motor*2.7 E ✓ Tension / *Spanning*2.8 D ✓ Capacitor / *Kapasitor*

(8 x 1) [8]

QUESTION/VRAAG 3

| 3.1 | Action force / Aksie krag | Reaction force / Reaksie krag | |
|-------|--|--|-----|
| 3.1.1 | Weight of the boy <i>Gewig van seun</i> | Force of boy on the earth <i>Krag van die seun op die aarde</i> ✓ | (1) |
| 3.1.2 | Normal force of ground on the trolley <i>Normaalkrag van die grond op die trollie</i> | Force of the trolley on the ground. <i>Krag van die trollie op die grond.</i> ✓ | (1) |

3.2 West / *Weswaarts* ✓

(1)

3.3 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 'n krag op voorwerp B uitoefen, sal voorwerp B gelyktydig dieselfde grootte krag in die teenoorgestelde rigting op voorwerp A uitoefen. ✓✓

(2)

[5]

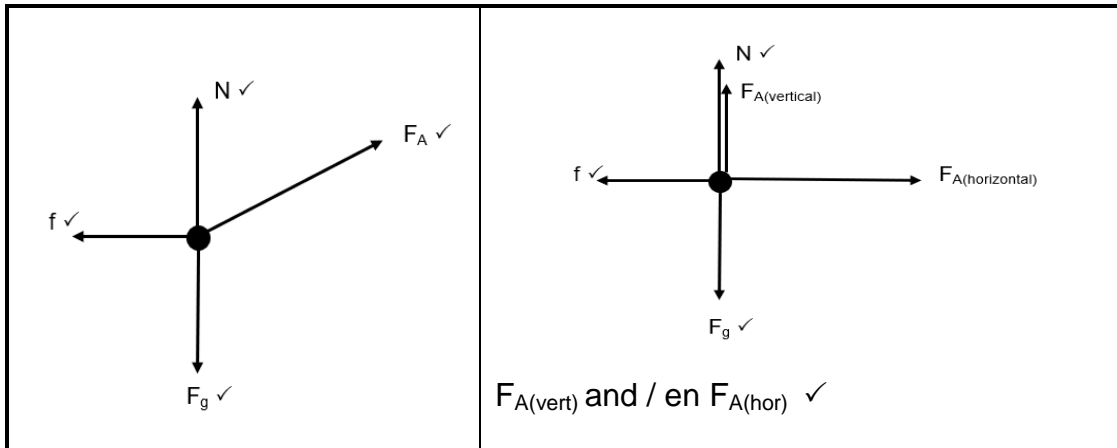
QUESTION/VRAAG 4

- 4.1 When a non-zero resultant force acts on an object, the object accelerates in the direction of the resultant force. This acceleration is directly proportional to the resultant force and inversely proportional to the mass of the object. ✓✓

Indien 'n nie-nul resulterende krag toegepas word op 'n voorwerp met massa (m), versnel die voorwerp in die rigting van die krag. Hierdie versnelling is direk eweredig aan die resulterende krag en omgekeerde eweredig aan die massa van die voorwerp. ✓✓

(2)

4.2



(4)

4.3 $f_k = \mu_k N$ ✓
 $f_k = (0,2)(473,28)$ ✓
 $f_k = 94,66 \text{ N}$ ✓

$F_g = N + F_v$
 $(60)(9,8) = N + 200 \sin 35^\circ$
 $N = 473,28 \text{ N}$ ✓

(4)

4.4 $F_{\text{net}} = ma$ ✓
 $F_{A(\text{hor})} + f_k = ma$
 $(200 \cos 35^\circ) + (-94,66) = (60)(a)$ ✓
 $a = 1,15 \text{ m}\cdot\text{s}^{-2}$ ✓

(3)

- 4.5 Decreases ✓
 $F_{\text{horizontal}}$ of 200 N and f_k decrease as the angle increases.
 Decrease in $F_{\text{horizontal}}$ is greater than decrease in f_k . ✓
 $\therefore F_{\text{net}}$ decreases.
 $F_{\text{net}} \propto a$ ✓
Neem af ✓
 F_{hor} van 200 N en f_k neem af soos hoek groter word.
 Afname in F_{hor} is groter as afname in f_k . ✓
 $\therefore F_{\text{net}}$ neem af
 $F_{\text{net}} \propto a$ ✓

(3)

[16]

QUESTION/VRAAG 5

5.1 5.1.1 Yes / Ja ✓ (1)

5.1.2 $p_i = mv = 20\,000 \text{ kg}\cdot\text{m}\cdot\text{s}^{-1}$
 $K = \frac{1}{2}mv^2 = 200\,000 \text{ J}$
 $\frac{1}{2}(mv)v = 200\,000 \checkmark$
 $\frac{1}{2}(20\,000)v = 200\,000$
 $v = 20 \text{ m}\cdot\text{s}^{-1} \checkmark$ due east/ooswaarts ✓ (4)

5.1.3 **Mark positive from Ques 5.1.2**
Merk positief van Vraag 5.1.2

| OPTION/OPSIE 1 | OPTION/OPSIE 2 | OPTION/OPSIE 3 |
|---|--|--|
| $K = \frac{1}{2}mv^2$ $200\,000 = \frac{1}{2}m(20)^2 \checkmark$ $m = 1\,000 \text{ kg} \checkmark$ | $p = mv$ $20\,000 = m(20) \checkmark$ $m = 1\,000 \text{ kg} \checkmark$ | $\frac{1}{2}mv^2 = 200\,000 \dots$ $mv = 20\,000 \quad v = \frac{2\,000}{m}$ $\frac{1}{2}m\left(\frac{2\,000}{m}\right)^2 = 200\,000 \checkmark$ $m = 1\,000 \text{ kg} \checkmark$ |

(2)

5.2 5.2.1 Total linear momentum of an isolated system remains constant. ✓✓
 Totale lineêre momentum van 'n geïsoleerde sisteem bly konstant. (2)

5.2.2 **Right – Positive / Regs – Positief**

$\Sigma p_i = \Sigma p_f$ Any one / Enige een ✓
 $\Sigma p_i = (m_P + m_R)v_f + m_Qv_f$
 $0 \checkmark = (6)(2) \checkmark + (3 + 2)(v)$
 $v = 2,4 \text{ m}\cdot\text{s}^{-1}$ left / links ✓

(4)
[13]

QUESTION/VRAAG 6

6.1 6.1.1 Rate of transfer of energy / Rate at which work is done. ✓✓
Tempo waarteen energie omgesit word. /Tempo waarteen arbeid verrig word. ✓✓ (2)

6.1.2 $P = Fv$ ✓
 $P = (300)(0,5)$ ✓
 $P = 150 \text{ W}$ ✓ (3)

| 6.1.3 | OPTION/OPSIE 1 | OPTION/OPSIE 2 |
|-------|--|---|
| | $P = \frac{W}{\Delta t}$ ✓ $150 = \frac{W}{50}$ ✓ $W = 7\,500 \text{ J}$ ✓ | $\Delta x = v \Delta t = (0,5)(50) = 25 \text{ m}$ ✓ $W = F \Delta x \cos\theta$ $W = (300)(25)(1)$ ✓ $W = 7\,500 \text{ J}$ ✓ |

(3)

6.1.4 7500 J ✓
 Crate moves with constant velocity ✓
Krat beweeg met 'n konstante snelheid ✓ (2)

6.2 6.2.1 Total mechanical energy of an isolated system remains constant. ✓✓
Totale meganiiese energie van 'n geïsoleerde sisteem bly konstant. ✓✓ (2)

6.2.2 $(ME)_A = (ME)_B$
 $(U + K)_A = (U + K)_B$
 $(mgh + \frac{1}{2}mv^2)_A = (mgh + \frac{1}{2}mv^2)_B$
 $(2)(9,8)(10) + 0 = 0 + \frac{1}{2}(2)(v)^2$ ✓✓
 $v = 14 \text{ m}\cdot\text{s}^{-1}$ ✓ (4)

6.2.3 $(ME)_A = (ME)_C$
 $(U + K)_A = (U + K)_C$
 $(mgh + \frac{1}{2}mv^2)_A = (mgh + \frac{1}{2}mv^2)_C$
 $(2)(9,8)(10) + 0 = (2)(9,8)(h) + \frac{1}{2}(2)(7)^2$ ✓
 $h = 7,5 \text{ m}$ ✓ (4)

[20]

QUESTION/VRAAG 7

- 7.1 7.1.1 Hooke's law states that, within the limit of elasticity, stress is directly proportional to the strain. ✓✓
Hooke se wet sê dat binne die grense van elasticiteit, druk eweredig aan die rekking is. (2)
- 7.1.2 $\sigma = \frac{F}{A}$ ✓
 $\sigma = \frac{500}{0,01}$ ✓
 $\sigma = 50000 \text{ Pa}$ ✓ (3)
- 7.1.3 $K = \frac{\sigma}{\epsilon}$ ✓
 $200 \times 10^9 = \frac{50000}{\epsilon}$ ✓
 $\epsilon = 2,5 \times 10^{-7}$ ✓
 $\epsilon = \frac{\Delta l}{L}$ ✓
 $2,5 \times 10^{-7} = \frac{\Delta l}{0,9}$ ✓
 $\Delta l = 2,25 \times 10^{-7} \text{ m}$ ✓ (6)
- 7.1.4 Decreases / *Neem af* ✓ (1)
- 7.2 As the temperature increases the viscosity decreases. ✓✓/
Soos die temperatuur toeneem, neem die viskositeit af. ✓✓ (2)
- 7.3 7.3.1 $\frac{F_1}{A_1} = \frac{F_2}{A_2}$ ✓
 $\frac{F_1}{0,04} = \frac{1200 \times 9,8}{0,7}$ ✓✓
 $F_1 = 672 \text{ N}$ ✓ (4)
- 7.3.2 Hydraulic brakes / car lifts / hydraulic jacks / forklifts /
dentist chairs (ANY TWO) ✓✓
Hidroliese remme / motorhysers / vurkhyser / tandarts-stoele
(ENIGE TWEE) ✓✓ (2)

[20]

QUESTION/VRAAG 8

- 8.1 8.1.1 Same as the object / *Dieselfde as die voorwerp* ✓ (1)
- 8.1.2 $50 + 50 = 100$ cm ✓✓ (2)
- 8.2 8.2.1 $48,8^\circ$ ✓ (1)
- 8.2.2 The ray will be totally reflected on the water. ✓✓
Die straal sal heeltemal op die water weerkaats word. ✓✓ (2)
- 8.2.3 Total internal reflection/*Totale interne weerkaatsing* ✓ (1)
- 8.3 8.3.1 24 cm away on the other side of the lens ✓/
24 cm weg op die ander kant van die lens ✓ (1)
- 8.3.2 20 mm ✓ (1)
- 8.3.3 Real / *Reël* ✓ (1)
- 8.3.4 Cameras / projectors / spectacles / lighthouse / telescope /
microscope
(ANY ONE) ✓
Kameras / projektors / brille / lighuis / teleskoop / mikroskoop
(ENIGE EEN) ✓ (1)

[11]

QUESTION/VRAAG 9

9.1 9.1.1 Gamma rays/*Gamma-strale* ✓ (1)

9.1.2 To sterilise medical equipment/treatment of cancer/Detection of radioactive tracers (ANY ONE) ✓
Om mediese apparat se steriliseer/behandeling van kanker/Opsporing van radioaktiwiteit (ENIGE EEN) ✓ (1)

9.2 9.2.1 Wave packets/quantum packets are called photons. ✓✓
Pakkies liggolwe/deeltjies word fotone genoem. ✓✓ (2)

| 9.2.2 | OPTION/OPSIE 1 | OPTION/OPSIE 2 |
|-------|--|---|
| | $c = f\lambda$ ✓ $3 \times 10^8 = f(1 \times 10^{-10})$ ✓ $f = 3 \times 10^{18} \text{ Hz}$ ✓ $E = hf$ $E = (6,63 \times 10^{-34}) (3 \times 10^{18})$ ✓ $E = 1,99 \times 10^{-15} \text{ J}$ ✓ | $E = \frac{hc}{\lambda}$ ✓ $E = \frac{6,63 \times 10^{-34} \times 3 \times 10^8}{1 \times 10^{-10}}$ ✓✓✓ $E = 1,99 \times 10^{-15} \text{ J}$ ✓ |

(5)

[9]

QUESTION/VRAAG 10

10.1 10.1.1 A capacitor is a device for storing electrical charge. ✓✓/
'n Kapasitor is 'n toestel wat elektriese lading stoor. ✓✓ (2)

10.1.2
$$C = \frac{\epsilon_0 A}{d}$$

$$480 \times 10^{-9} = \frac{8,85 \times 10^{-12} \times A}{0,012 \times 10^{-3}}$$

$$A = 0,65 \text{ m}^2 \checkmark$$
 (3)

10.1.3 Decreases / *Neem af* ✓ (1)

10.2 10.2.1 $R_s = 3 + 6 = 9 \Omega \checkmark$
 $\frac{1}{R//} = \frac{1}{R_1} + \frac{1}{R_2}$ **OR/OF** $R// = R_1 R_2 / (R_1 + R_2)$
 $\frac{1}{R//} = \frac{1}{9} + \frac{1}{9} \checkmark$ $= 9 \times 9 / (9 + 9)$
 $R// = 4,5 \Omega \checkmark$ $= 4,5 \Omega$ (3)

10.2.2
$$W = \frac{V^2}{R} t \checkmark$$

$$W = \frac{24^2}{4,5} \times 120 \checkmark$$

$$W = 15\,360 \text{ J} \checkmark$$
 (3)

[12]



QUESTION/VRAAG 11

11.1 11.1.1 The process of generating electricity from motion. ✓✓/
Die proses waarby elektrisiteit deur beweging opgewek word. ✓✓ (2)

11.1.2 Galvanometer needle deflects. ✓
Galvanometer se naald wyk af. ✓ (1)

11.1.3 No deflection ✓/*Geen afwyking*
 A current is induced only when there is a relative motion. ✓
'n Stroom word slegs geïnduseer indien daar 'n relatiewe beweging is. ✓ (2)

11.2 $\epsilon = -N \frac{\Delta \phi}{\Delta t} \checkmark$
 $\epsilon = (2) \frac{(50 - 38)}{0,42} \checkmark$
 $\epsilon = 57,14 \text{ V} \checkmark$ (3)

[8]

QUESTION/VRAAG 12

- 12.1 12.1.1 $\frac{V_s}{V_p} = \frac{N_s}{N_p} \checkmark$
 $\frac{9}{230} = \frac{N_s}{400} \checkmark$
 $N_s = 15,65 \approx 16 \checkmark$ (3)
- 12.1.2 Step down / *Verlagings* \checkmark (1)
- 12.2 12.2.1 Electromagnetic induction / Faradays law \checkmark
Elektromagnetiese induksie / Faraday se wet \checkmark (1)
- 12.2.2 Brush / *Borsel* \checkmark (1)
- 12.2.3 Slip rings / *Sleepringe* \checkmark (1)
- 12.2.4 Replace slip rings with a split ring commutator. \checkmark
Vervang sleepringe met 'n splitring kommutator. \checkmark (1)
- [8]

TOTAL/TOTAAL: 150

