Province of the
EASTERN CAPE
EDUCATION

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Provinsie van die Oos Kaap: Department van Onderwys
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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 10 pages./
Hierdie nasienriglyn bestaan uit 10 bladsye.

QUESTION/*VRAAG* 1

1.1 C ✓✓ (2)

1.2 D ✓✓ (2)

1.3 B ✓✓ (2)

1.4 B ✓✓ (2)

1.5 C ✓✓ (2)

1.6 B ✓✓ (2)

1.7 A ✓✓ (2)

1.8 B ✓✓ (2)

1.9 A ✓✓ (2)

1.10 D ✓✓ (2)

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QUESTION/*VRAAG* 2

2.1 A body will remain at rest or continue moving with a constant velocity unless it is acted upon by a nett force. ✓✓
'n Liggaam sal in rus bly of aanhou beweeg met 'n konstante snelheid tensy 'n netto krag daarop inwerk. ✓✓ (2)

2.2 The young man has to overcome inertia. ✓✓ /
Die jongman moet eers traagheid oorkom. ✓✓ (2)

2.3 $F_f = F \cos \theta$ ✓
$= 75 \cos 60^\circ$ ✓
$= 37{,}50$ N ✓ (3)

2.4 2.4.1 Decrease/*Afneem* ✓ (1)

2.4.2 Decrease/*Afneem* ✓ (1)

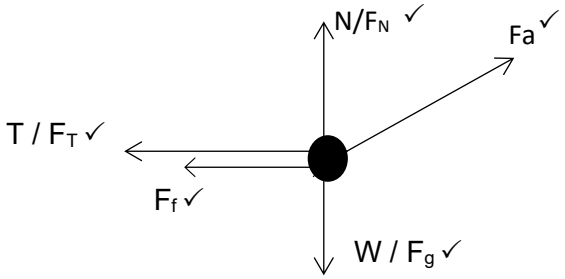
2.5 $F_f \propto N$ ✓✓

OR/*OF*

Normal force decreases/*Normaalkrag neem af* ✓✓ (2)

2.6 2.6.1 When a net force Fnet is applied to an object of mass (m) it accelerates in the direction of the net force. ✓✓ (This acceleration is directly proportional to the net force and inversely proportional to the mass of the object. /
Wanneer 'n netto krag Fnetto op 'n voorwerp van massa (m) inwerk, versnel die voorwerp in die rigting van die netto krag ✓✓*Hierdie versnelling is direk eweredig aan die netto krag en omgekeerd eweredig aan die massa van die voorwerp.* (2)

2.6.2



- Allocate a mark for an arrow and a label. / *Gee 'n punt vir pyl en byskrif*

Penalise if/ *Penaliseer indien:*

- No arrow (Penalise ONCE) / *Geen pyl (Penaliseer EENMAAL)*
- Gaps between the line and the dot / *Spasie tussen die lyn en die kol*
- Dotted lines are used / *Stippellyne gebruik is*
- Additional force is included (-1) / *Addisionele krag is ingesluit (-1)* (5)

2.6.3 **OPTION 1/*OPSIE 1***

For the 2 kg block/ *Vir die 2 kg-blok*

Fnet = ma
T = ma } ✓ for any formula/*vir enige formule*

T = 2a ✓

T = 2a ……..(1)

For the 4 kg block/*Vir die 4 kg blok*

F_{net} = ma

F_a + (-T) = ma

12 – T ✓= 4a ✓

12 - T = 4a……..(2)

} ✓one mark for either correct answer/*een punt vir enige korrekte antwoord*

Addition of equation: (1) and (2)/ *Optelling van vergelyking:* (1) en (2)

T = 2a ……..(1)

12 - T = 4a……(2)

12 = 6a ✓

a = 2 m.s^{-2} ; (to the right/*na regs*) ✓

OPTION 2/*OPSIE 2*

F_{net} = ma

F_A + T+ (- T) = (m_{2kg} + m_{4kg})a } ✓ for any formula/*vir enige formule*

12 ✓ + 0 ✓ = (2 + 4)a ✓

12 = 6a ✓

a = 2 m.s^{-2} ; (to the right/ *na regs*) ✓

(6 out 7 marks/*6 uit 7 punt*) (7)

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QUESTION/*VRAAG* 3

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

3.1.2 (Take towards the wall as positive/*Neem na die muur as positief*)
Impulse/*Impuls* = Δp
Impulse/*Impuls* = $mv_f - mv_i$
Impulse/*Impuls* = $m(v_f - v_i)$
✓any formula/*vir enige formule*
Impulse/*Impuls* = 0,15 ✓ (-16 - 20) ✓
Impulse/*Impuls* = - 5, 4
Impulse/*Impuls* = 5, 4 N.s (Away from the wall/ *Weg vanaf die muur af*). ✓

NOTE: Accommodate other means of direction correctly used: e.g towards the wall depending on the choice of direction. /
LET WEL: *Akkomodeer ander maniere van rigtings wat gebruik is korrek: b.v. na die muur afhangend van gekose rigting*. (4)

3.2.1 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 in grootte en rigting behou). ✓✓

ACCEPT/*AANVAAR*
In an isolated system, the total linear momentum before the collision/explosion is equal the total linear momentum after the collision/explosion. ✓✓
In 'n geïsoleerde sisteem is die totale lineêre momentum voor die botsing/ontploffing gelyk aan die totale lineêre momentum na die botsing/ontploffing. ✓✓ (2)

3.2.2 (Take east as positive/*Neem oos as positief*)

$m_1v_{1i} + m_2v_{2i} = (m_1+m_2)v_f$ ✓
(2500)(19) ✓ + (1 000)(-33) ✓ = (2500 + 800) v_f ✓

$$47500 - 33000 = 3300v_f$$
$$14500 = 3300v_f$$
$$v_f = 4,39\ m.s^{-1}$$; (due east/ reg oos) ✓

NOTE:
Accommodate other means of direction correctly used: e.g due east depending on the choice of direction./
***LET WEL*:**
Akkomodeer ander maniere van rigtings as korrek b.v. reg oos afhangend van gekose rigting (5)

3.2.3 $\sum E_{kbefore} = \frac{1}{2}m_1v_{1i}^2 + \frac{1}{2}m_2v_{2i}^2$

$\sum E_{kbefore} = \frac{1}{2}(2500)(19)^2 + \frac{1}{2}(1000)(33)^2$ ✓

$\sum E_{kbefore} = 99\ 5750\ J$

$\sum E_{kafter} = \frac{1}{2}m_1v_{1f}^2 + \frac{1}{2}m_2v_{2f}^2$

✓one mark for either/ *een punt vir albei*

Formula / *Formule*

$\sum E_{kafter} = \frac{1}{2}(2500)(4,39)^2 + \frac{1}{2}(1000)(4,39)^2$ ✓

$\sum E_{kafter} = 33\ 726,175\ J$

$\sum E_{kbefore} \neq \sum E_{kafter}$ ✓

∴ The collision is inelastic / *Die botsing is onelasties.* ✓ (5)

3.2.4 According to the formula Fnet.∆t = ∆p, the contact time between the driver and the airbag will be longer, ✓ while the change in momentum remains constant or remains the same.✓ Thus this effect will reduce the net/resultant force. ✓

Volgens die formule Fnet.∆t = ∆p, sal die kontaktyd tussen die bestuurder en die lugsak verleng, ✓ terwyl die verandering in momentum constant of dieselfde bly. ✓Dus sal die effek die netto/resultante krag verlaag. ✓ (3)

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QUESTION/*VRAAG* 4

4.1 4.1.1 Work done is defined as the product of the force acting on an object and the displacement in the direction of the force. ✓✓

Arbeid word gedefinieer as die produk van die krag wat op 'n voorwerp toegepas word en die verplasing in die rigting van die krag. ✓✓ (2)

4.1.2 W = F∆x cos θ ✓

W = (200)(5) cos 20° ✓

W = 939,69 J ✓ (3)

4.1.3 0 (J) ✓ (1)

4.1.4 Box moves with constant velocity. ✓ Net force is zero. ✓ (Hence the net work done is 0 J.)

Die houer beweeg teen 'n konstante snelheid. ✓*Netto krag is nul.* ✓ *(Die netto arbeid verrig is dus 0 J).* (2)

4.1.5 No. ✓ Force of gravity is perpendicular to the direction of motion. ✓✓

Nee. ✓ *Swaartekrag is loodreg tot die rigting van beweging.* ✓✓

OR/*OF*

W = F∆xcosθ ✓

= F∆xcos90° ✓

= 0 J ✓ (3)

4.2.1 Power is defined as the rate at which work is done **OR** rate at which energy is expended. ✓✓
*Drywing word gedefinieer as die tempo waarteen arbeid verrig word **OF** tempo waarteen energie verbruik word.* ✓✓ (2)

4.2.2 $P = \frac{W}{\Delta t}$ ✓
$P = \frac{(2000)(9.8)(20)}{60}$. ✓
P = 6533,33 W ✓
$P = \frac{6533,33}{746}$ = 8,76 hp/pk ✓ (4)

4.3.1 0 (J) ✓ (2)

4.3.2 Sum of gravitational potential energy and kinetic energy. ✓✓
Som van gravitasie potensiële energie en kinetiese energie. ✓✓ (2)

4.3.3 (a) Increases/*Vermeerder* ✓ (1)

(b) Remains the same/*Bly dieselfde* ✓ (1)

4.3.4 The total mechanical energy in an isolated system remains constant. ✓✓
Die totale meganiese energie in 'n geïsoleerde sisteem bly konstant. ✓✓ (2)

4.3.5 $ME_{(B)} = mgh + ½ mv^2$ ✓
$= m(9,8)(1,5) + m(8)^2$ ✓
= 46,7 m ✓

$ME_{(A)} = mgh + ½ mv^2$
$= m(9,8)h + 0$ ✓
$= 9,8 mh$ ✓

$ME_{(A)} = ME_{(B)}$ ✓
9,8 mh = 46,7 m
h = 4,77 m ✓ (7)
[32]

QUESTION/*VRAAG* 5

5.1 Deforming force: A force that changes the shape and size of a body. ✓✓
Restoring force: A force that develops in a body and tries to bring a body back to its original shape and size. ✓✓
Vervormingskrag: Die krag wat die vorm en grootte van 'n liggaam verander. ✓✓
Herstelkrag: 'n Krag wat binne in 'n liggaam ontwikkel en probeer om die liggaam na sy oorspronklike vorm en grootte terug te bring. ✓✓ (4)

5.2 Strain is the ratio of change in the dimension/length of objects to the original dimension/length. ✓✓
Vervorming is die verhouding van verandering in die dimensie van voorwerpe tot die oorspronklike dimensie lengte.✓✓

Accept/*Aanvaar*:
The change in length over the original length of an object. ✓✓
Die verandering in lengte oor die oorspronklike lengte van 'n voorwerp. ✓✓ (2)

5.3 $K = \frac{\sigma}{\varepsilon}$ ✓
$K - Young's\ Modulus$
$\sigma - Stress$ ✓
$\varepsilon - Strain$ ✓ (3)

5.4 5.4.1 $\sigma = \frac{F}{A}$ ✓
$1 \times 10^6 \surd = \frac{F}{2 \times 10^{-3}}$ ✓
F = 2000 N / 2 kN ✓ (4)

5.4.2 $\varepsilon = \frac{\Delta L}{L}$ ✓
$\varepsilon = \frac{1 \times 10^{-3}}{50}$ ✓
$\varepsilon = 2 \times 10^{-5}$ ✓ (3)

5.4.3 $K = \frac{\sigma}{\varepsilon}$ ✓
$K = \frac{1 \times 10^6}{2 \times 10^{-5}}$ ✓
$K = 5 \times 10^{10}\ \text{N.m}^{-2}/\text{Pa}$ ✓ (3)
[19]

QUESTION/*VRAAG* 6

6.1 Viscosity is defined as the property of a fluid to oppose relative motion between the two adjacent layers. ✓✓
Viskositeit word gedefinieer as die eienskap van 'n vloeistof om die relatiewe beweging tussen twee aangrensende vlakke teen te werk. ✓✓ (2)

6.2 6.2.1 Society of Automotive Engineers ✓✓ (2)

6.2.2 20W50 ✓✓ (2)

6.2.3 5W30 ✓✓ (2)

6.3 6.3.1 Pascal's law: In a continuous liquid at equilibrium, the pressure applied at a point is transmitted equally to the other parts of the liquid. ✓✓ **(2 OR 0)**
Pascal se wet: In 'n deurlopende vloeistof in ewewig word die druk wat by enige punt toegepas word eweredig na die ander dele van die vloeistof versprei. ✓✓ ***(2 OF 0)*** (2)

6.3.2 $\frac{F_1}{A_1} = \frac{F_2}{A_2}$ ✓
$\frac{100}{1{,}2 \times 10^{-3}}$ ✓$= \frac{1200}{A_2}$ ✓
$A_2 = 0.014 m^2$ ✓ (4)

6.3.3 Increase the area of piston **B**. ✓✓/
*Vermeerder die oppervlakte van suier **B**.* ✓✓ (2)

6.3.4 Bulldozer's working systems, hydraulic power brakes on automobiles, dentists' chairs, hydraulic lifts used to lift heavy loads, car jacks, or any other correct application. (ANY THREE) ✓✓✓
Stootskraper se werkende sisteme, hidrouliese kragremme op motors, tandartsstoele, hidrouliese hysers om swaar vragte op te tel, of enige ander korrekte toepassing. (ENIGE DRIE) ✓✓✓ (3)
[19]

QUESTION/*VRAAG* 7

7.1 The angle of incidence equals the angle of reflection. ✓✓/
Die invalshoek is gelyk aan die weerkaatsingshoek. ✓✓ (2)

7.2 Upright, ✓ Virtual, ✓ Same distance from the mirror as the object/ Same size as the object. ✓/
Regop, ✓ *Virtueel,* ✓ *Dieselfde afstand vanaf die spieël as die voorwerp / Dieselfde grootte as die voorwerp*. ✓ (3)

7.3 7.3.1 Bending of light as it moves from one medium to another where its speed is different. ✓✓

OR

Bending of light when it passes from one medium to another of different optical density. ✓✓
Buiging van lig soos dit van een medium na 'n ander beweeg, waar die spoed verskillend is. ✓✓

OF

Buiging van lig soos dit van een medium na ander met verskillende optiese digtheid beweeg. ✓✓ (2)

7.3.2 Critical angle ✓/*Grenshoek* ✓ (1)

7.3.3 Glass ✓/*Glas* ✓ (1)

7.3.4 3 ✓ the angle of incidence is greater than the critical angle. ✓✓ /
3, die invalshoek is groter as die grenshoek. (3)

7.3.5 Any 2 answers / *Enige 2 antwoorde:*
Binoculars / Periscopes / Optical fibres OR Any relevant answer. ✓✓
Verkykers / Periskope / Optiese vesels OF Enige relevante antwoord. ✓✓ (2)
[14]

TOTAL/*TOTAAL:* 150