Province of the
EASTERN CAPE
EDUCATION

NATIONAL SENIOR CERTIFICATE/ *NASIONALE SENIORSERTIFIKAAT*

GRADE/*GRAAD* 12

JUNE 2024

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

MARKS/*PUNTE*: 150

This marking guideline consists of 12 pages./
Hierdie nasienriglyn bestaan uit 12 bladsye.

QUESTION/*VRAAG* 1

1.1 B ✓✓ (2)

1.2 D ✓✓ (2)

1.3 B ✓✓ (2)

1.4 A ✓✓ (2)

1.5 A ✓✓ (2)

1.6 B ✓✓ (2)

1.7 C ✓✓ (2)

1.8 C ✓✓ (2)

1.9 A ✓✓ (2)

1.10 A ✓✓ (2)

[20]

QUESTION/*VRAAG* 2

2.1 2.1.1 An object continues in its state of rest or uniform (moving with constant) velocity ✓ unless it is acted upon by a net (resultant) force.✓

'n Voorwerp bly in rus of bly beweeg teen 'n uniforme (konstante) snelheid ✓ tensy 'n netto (resultante) krag daarop dit inwerk. ✓ (2)

2.1.2 Gravitational force/*Gravitasiekrag* ✓ (1)

2.1.3

OPTION 1 / *OPSIE 1*

$F_{net} = ma$
$F_{net} = 0$ ✓
$F_H + f_k = 0$

$50\cos60° + f_k = 0$ ✓
$f_k = -25$ N

$f_k = \mu_k F_N$ ✓
$25 = \mu_k[(10 \times 9,8) - 50\sin60°]$ ✓
$\mu_k = 0,46$ ✓

OPTION 2 / *OPSIE 2*

$F_{net} = ma$
$F_{net} = 0$
$F_H + f_k = 0$ ✓

$50\cos60° + f_k = 0$ ✓ $f_k = -25$ N

$F_N = mg - F_V$
$F_N = mg - F\sin\theta$

$F_N = \frac{10 \times 9,8}{} = \frac{50\sin60}{}$ ✓
$= 54,69$ N

$f_k = \mu_k F_N$ ✓
$25 = \mu_k\ 54,69$
$\mu_k = 0,46$ ✓

OPTION 3 / *OPSIE 3*

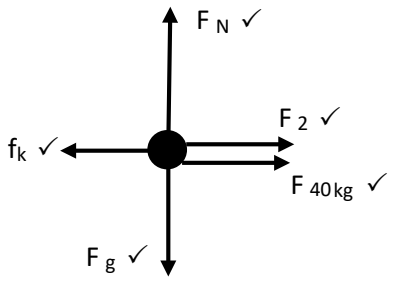
$F_H = -f_k$ ✓
$F_H = -50\cos60°$ ✓
$f_k = \mu_k F_N$ ✓
$25 = \mu_k[(10 \times 9,8) - 50\sin60°]$ ✓ $f_k = -25$ N
$\mu_k = 0,46$ ✓

(5)

2.2 2.2.1 When a force is exerted on an object, the object will accelerate in the direction of the force. ✓ This acceleration is directly proportional to the force, and indirectly proportional to the mass of the object. ✓

Indien 'n krag op 'n voorwerp inwerk sal die voorwerp versnel in die rigting van die krag. ✓ Hierdie versnelling is direk eweredig aan die krag op die voorwerp en omgekeerd eweredig aan die massa van die voorwerp. ✓ (2)

2.2.2



Acceptable labels/ a*anvaarbare byskrifte*	**MARK/ *PUNT***
F_g/F_w/weight/gravitational force *F_g/F_w/gewig/gravitasiekrag*	✓
f_k / F_f/Frictional force f_k / F_f/*Wrywingskrag*	✓
F_N/N/Normal Force *F_N/N/Normaalkrag*	✓
F_2/ applied force on object 2 *F_2/toegepaste krag op voorwerp 2*	✓
$F_{40\ kg}$ / applied force on 40 kg object *$F_{40\ kg}$/toegepaste krag op 40 kg voorwerp*	✓

(5)

Notes/*Notas*
✓One mark awarded for each label and arrow. *Een punt toegekem vir elke byskrif en pylpunt*
• Do not penalise for length of arrows. *Moet nie penaliseer vir die lengte van die pyle nie*
• Any additional forces: Maks -1 *Enige addisionele krag: Maks -1*

2.2.3 $F_1\ (y) = F_1 \sin\theta$
$= 40 \sin 35$ ✓
$= 22{,}94\ N$ ✓ (2)

2.2.4 **POSITIVE MARKING FROM 2.2.3/*POSITIEWE MERK VAN 2.2.3***

$FN = Fg + F_1\ (y)$
$= mg + F_1\ (y)$
$= (40)\ (9{,}8) + 22{,}94$ ✓
$= 414{,}94\ N$ ✓ (2)

2.2.5 **POSITIVE MARKING FROM 2.2.4/*POSITIEWE MERK VAN 2.2.4***

$f_k = \mu_k F_N$
$= \mu_k (F_g - F_{1(y)})$
$= \mu_k (mg - F_{1(y)})$ ✓
= (0,04) (414,94) ✓
= 16,60 N ✓ left/links ✓ (4)

2.2.6 **For 40 kg block/*Vir 40 kg blok***

✓ $Fnet = F1\ (x) - F10\ kg - fk$
$ma = F_1 \cos\theta - F_{10\ kg} - f_k$
$40a$ = 40 cos 35 − $F_{10\ kg}$ − 16,60 ✓

For 10 kg block/*Vir 10 kg blok*
$Fnet = F40\ kg + F2 - fk$
$ma = F_{40\ kg} + F_2 - f_k$
$10a = F_{40\ kg}$ + 20 − 2,5 ✓

$40a + 10a$ = 40 cos 35 − $F_{10\ kg}$ − 16,60 + $F_{40\ kg}$ + 20 − 2,5 ✓
a = 0,67 $m.\ s^{-2}$ ✓ (5)

2.2.7 Increase/*Neem toe* ✓✓ (2)

2.3 2.3.1 50 N ✓to the left/*na links* ✓ (2)

2.3.2 John's mass is greater than Mary's mass.
Therefore, John's inertia is greater than Mary's inertia. ✓
John's force on Mary is equal to Mary's force on John ✓
Therefore, John's acceleration is less than Mary's acceleration ✓

John se massa is groter as Mary se massa.
Dus is John se traagheid groter as Mary se traagheid. ✓
John se krag op Mary is gelyk aan die krag van Mary op John. ✓
Dus is die versnelling van John minder as die versnelling van Mary. ✓ (3)
[35]

QUESTION/*VRAAG* 3

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

3.1.2 **OPTION 1 *Away from batsman / OPSIE 1 Weg van die* kolwer**
$\Delta p = m\ v_f - v_i$ ✓
$= (0{,}175)\ (-30 - 12)$ ✓
$= -7{,}35\ N \cdot s$ ✓
$= 7{,}35\ N \cdot s$ ✓ away from the batsman/*weg van die kolwer* ✓

OPTION 2 *Towards the batsman / OPSIE 1 Na die* kolwer
$\Delta p = m\ v_f - v_i$ ✓
$= (0{,}175)\ (30 - (-12))$✓
$= 7{,}35\ N \cdot s$ ✓
$= 7{,}35\ N \cdot s$ ✓ away from the batsman/*weg van die kolwer* ✓ (5)

3.1.3 ***POSITIVE MARKING FROM 3.1.2/POSITIEWE MERK VAN 3.1.2***

$F_{net}\Delta t = \Delta p$ ✓

$F_{net}(0{,}05) = 7{,}35$ ✓

$F_{net}\Delta t = 147$ N ✓

OR /OF

$F_{net}\Delta t = \Delta p$ ✓

$F_{net}(0{,}05) = -7{,}35$ ✓

$F_{net}\Delta t = -147\ N$ ✓ (3)

3.1.4 $F_{net}\ \alpha \frac{1}{\Delta t}$ ✓ if Δp is constant ✓
crumple zones <u>increase the time</u> ✓
<u>F_{net} decreases</u>. ✓

$F_{net}\ \alpha \frac{1}{\Delta t}$ ✓ *as Δp konstant is.* ✓
Frommelsones veroorsaak <u>toename in tyd</u> ✓
<u>F_{net} neem af</u>. ✓ (4)

3.2 3.2.1 The total linear momentum of an isolated system ✓ remains constant (in magnitude and direction). ✓

Die totale lineêre momentum van 'n geïsoleerde sisteem ✓ bly konstant (in grootte en rigting). ✓ (2)

3.2.2 **OPTION 1 Right + / *OPSIE 1 Regs* +**

$\sum pbefore = \sum pafter$ ✓
$m_1v_1i + m_2v_2i = m_1v_{1f} + m_2v_{2f}$
(2) (3) + (3,5) (0) ✓ = (2) (−1) + 3,5v ✓
v = 2,29 $m \cdot s^{-1}$ ✓
v = 2,29 $m \cdot s^{-1}$; right/*regs* ✓

OPTION 2 Left + / *OPSIE 2 Links* +

$\sum p\ before = \sum p\ after$ ✓
$m_1v_1i + m_2v_2i = m_1v_{1f} + m_2v_{2f}$
(2) (−3) + (3,5) (0) ✓ = (2) (1) + 3,5v ✓
v = −2,29 $m \cdot s^{-1}$ ✓
v = 2,29 $m \cdot s^{-1}$; right/*regs* ✓ (5)
[21]

QUESTION/ *VRAAG* 4

4.1 4.1.1 The product of the force applied on an object ✓ and the displacement in the direction of the force. ✓

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

4.1.2 $W_F = F\Delta x cos\theta$ ✓
= (50) ✓(10) cos0° ✓
= 500 J ✓ (4)

4.1.3 $W_f = f\Delta x cos\theta$
= (20) ✓(10) cos180°✓
= −200 J ✓ (3)

4.1.4 **POSITIVE MARKING FROM 4.1.2 TO 4.1.3 FOR OPTION 1**
POSITIEWE MERK VAN VRAAG 4.1.2 NA 4.1.3 VIR OPSIE 1

OPTION/*OPSIE* 1
$Wnet = W_F + W_f$
= 500 ✓ + (−200) ✓
= 300 J ✓

OPTION/*OPSIE* 2
F_{net} = 50 − 20 = 30 N
$W_{net} = F_{net}\Delta x cos\theta$
= (30) ✓(10) cos0° ✓
= 300 J ✓ (3)

4.2 4.2.1

Acceptable labels ***Aanvaarbare byskrifte***	**MARK** ***PUNT***
F_g/F_w/weight/gravitational force *F_g/F_w/gewig/gravitasiekrag*	✓
F_T/tension/ force of rope on engine *F_T/spanning/ krag van tou op enjin*	✓

Notes/*Notas*
✓ One mark awarded for label and arrow. ✓ *Een punt toegeken vir byskrif en pylpunt*
• Do not penalise for length of arrows. • *Moet nie penaliseer vir die lengte van die pyle nie*
• Any additional forces: Max -1 • *Enige addisionele kragte: Maks -1*

(2)

4.2.2 $P_{ave} = F_{ave}v$ ✓
$P_{ave} = mgv$
7350 ✓$= (1\,500)(9{,}8)v$ ✓
$v = 0{,}5\ m\ s^{-1}$ ✓ (4)

4.2.3 $W_F = F\Delta x\cos\theta$ ✓
$W_F = (1\,500)(9{,}8)$ ✓$\cos 0^0$ ✓
$W_F = 7350\ J$ ✓ (3)

4.2.4 $E_P = mgh$ ✓
$E_p = (1\,500)(9{,}8)(0{,}5)$ ✓
$E_p = 7\,350\ J$ ✓ (3)
[24]

QUESTION/*VRAAG* 5

5.1 Within the limit of elasticity, stress is directly proportional to strain ✓✓/
Binne die grense van elastisiteit is druk eweredig aan rekking ✓✓ (2)

5.2 5.2.1 $\delta = \frac{F}{A}$ ✓

$\delta = \frac{3\,500}{5 \times 10^{-5}}$ ✓

$\delta = 7 \times 10^{7}\text{Pa}$ ✓ (3)

5.2.2 $\varepsilon = \frac{\Delta l}{L}$ ✓

$\varepsilon = \frac{12}{3\,350}$ ✓

$\varepsilon = 3{,}582 \times 10^{-3}$ ✓ (3)

5.2.3 **POSITIVE MARKING FROM /*POSITIEWE MERK VAN* 5.2.1 and/*en* 5.2.2**

$K = \frac{\partial}{\varepsilon}$ ✓

$K = \frac{7 \times 10^{7}}{3{,}582 \times 10^{-3}}$ ✓

$K = 1{,}95 \times 10^{10}\text{Pa}$ ✓ (3)

5.3 Clay, putty, wax, bread dough (any TWO) ✓✓/
Klei, putty, was, brooddeeg (Enige TWEE) (2)
[13]

QUESTION/*VRAAG* 6

6.1 6.1.1 It is the thrust acting on the unit area around that point. ✓✓/
Dit is die stukrag op die eenheidsoppervlakte rondom daardie punt ✓✓ (2)

6.1.2 $P = \frac{F}{A}$ ✓

$P = \frac{(250)(9,8)}{(3,15 \times 10^4)(10)^6}$ ✓ ✓

$P = 7,78 \times 10^4 \text{Pa}$ ✓ (4)

6.2 6.2.1 $P = \rho gh$ ✓

$P = (1\ 000)(9,8)$ ✓ $(2,5 - 0,9)$ ✓

$P = 1,57 \times 10^4 \text{Pa}$ ✓ (4)

6.2.2 Less Than / *Minder as* ✓
From/*Van* P = h ✓

P α ρ ✓ if g and h are constant/*Indien g en h konstant is*

$\rho_{petrol} < \rho_{water}$ ✓ (4)

6.3 6.3.1 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 is die druk wat by enige punt toegepas word ✓ *eweredig na die ander dele van die vloeistof versprei.* ✓ (2)

6.3.2 $\frac{F_1}{A_1} = \frac{F_2}{A_2}$ ✓

$\frac{F_1}{200 \times 10^{-4}}$ ✓ $= \frac{250}{5 \times 10^{-4}}$ ✓

$F_1 = 10\ 000$ N ✓ (4)

6.3.3 Liquid adapts to the form of the container.
Liquid is not compressible.
Liquid applies pressure in all directions.
(Any TWO ✓✓)

'n Vloeistof pas by dievorm van die houer aan.
'n Vloeistof kan nie saamgepers word nie.
'n Vloestof pas druk uit in alle rigtings.
(Enige TWEE ✓✓) (2)

[22]

QUESTION/*VRAAG* 7

7.1 The bending of light when it passes from one medium to another. ✓✓/
Die buiging van lig wanneer dit van een medium na 'n ander beweeg. ✓✓ (2)

7.2 7.2.1 Incident ray/*Invalsstraal* ✓ (1)

7.2.2 Normal/*Normaal* ✓ (1)

7.3 The angle of incidence in the denser medium ✓such that the refracted ray just passes through the surface of separation of the two mediums. ✓

OR

The angle of incidence in the optically dense medium ✓ for which the angle of refraction is 90˚. ✓

Die invalshoek in die digter medium ✓sodat die gebreekte straal net deur die oppervlakte van skeiding van die twee mediums beweeg. ✓

OF

Die invalshoek in die opties digte medium ✓waarvoor die brekingshoek 90˚ is. ✓ (2)

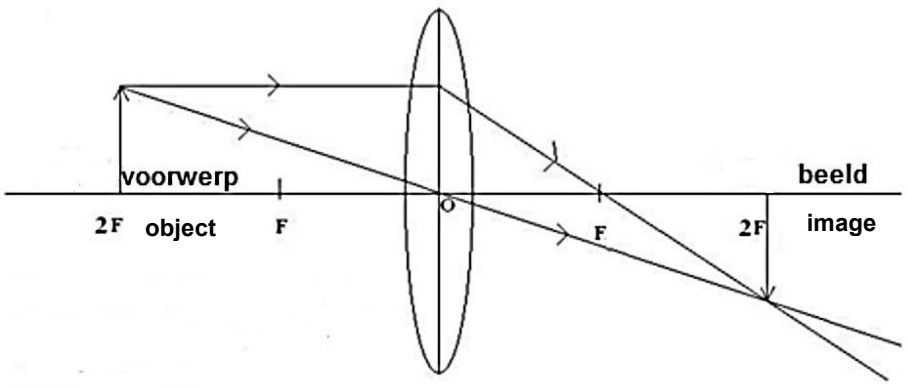
7.4 Total Internal Reflection/*Totale Interne Weerkaatsing* ✓ (1)

7.5 GREATER THAN / *GROTER AS* ✓ (1)

7.6 The ray moves from a more dense to a less dense medium ✓and will therefore be refracted away from the normal ✓ which will increase the angle.

Die straal beweeg van 'n digter medium na 'n minder digter medium ✓en sal dus weg van die normaal ✓ gebuig word en die hoek sal dus vergroot. (2)

7.7



Marking guidelines/*Nasienriglyne*

- Object at 2F / *Voorwerp by 2F* ✓
- Image at 2F / *Beeld by 2F* ✓
- Ray goes through optic centre / *Straal gaan deur optiese middelpunt* ✓
- Ray parallel with main axis / *Straal parallel aan die hoof-as* ✓
- Image the same size as object / *Beeld net so groot soos die voorwerp* ✓ (5)

[15]

TOTAL/*TOTAAL*: 150