education

Department:
Education
North West Provincial Government
REPUBLIC OF SOUTH AFRICA

PROVINCIAL ASSESSMENT
PROVINSIALE ASSESSERING

GRADE/*GRAAD* 12

TECHNICAL SCIENCES P1/
TEGNIESE WETENSKAPPE V1

JUNE/*JUNIE* 2024

MARKING GUIDELINES/*NASIENRIGLYNE*

MARKS/*PUNTE*: 150

This marking guidelines consists of 13 pages.
Hierdie nasienriglyne bestaan uit 13 bladsye.

QUESTION 1: MULTIPLE–CHOICE QUESTIONS

1.1	D	✓✓	(2)
1.2	B	✓✓	(2)
1.3	C	✓✓	(2)
1.4	B	✓✓	(2)
1.5	B	✓✓	(2)
1.6	A	✓✓	(2)
1.7	D	✓✓	(2)
1.8	B	✓✓	(2)
1.9	C	✓✓	(2)
1.10	C	✓✓	(2)

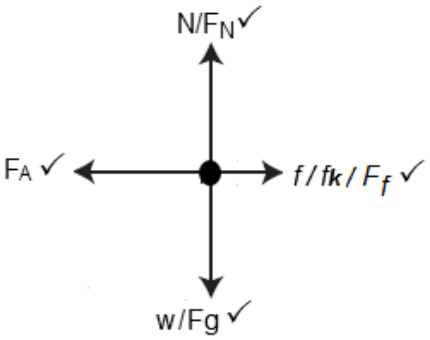
[20]

QUESTION 2 (Start on a new page.)

2.1.1 The force <u>parallel</u> to the surface that <u>opposes the motion</u> of object and acts in the direction opposite motion 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 (2)

2.1.2



Note: Allocate mark for arrow and label.

Penalise if:
- Arrows are not shown (-1)
- Gaps between the line and the dot (-1)
- Using broken lines (-1)
- Additional force is included (-1)
- Force diagram (-1)

Nota: *Gee punt vir pyl en benoeming*

Penaliseer wanneer:
- *Pyle nie aangedui nie* (-1)
- *Spasie tussen lyn en kolletjie* (-1)
- *Stippellyne gebruik word* (-1)
- *Addisionele kragte ingesluit is* (-1) (4)

2.1.3

OPTION 1

$f_k = \mu_k.N$
$f_k = \mu_k.F_N$ ✓ any formula / enige formule
$f_k = \mu_k.m.g$

f_k = <u>(0,833)</u> ✓ <u>(340) (9,8)</u> ✓

f_k = <u>2 775,56 N</u> (to the left) ✓

OPTION 2

Fg = w

w = mg

w = <u>(340) (9,8)</u> ✓

w = 3 332 N

$f_k = \mu_k.N$
$f_k = \mu_k.F_N$ ✓ any formula / enige formule

f_k = <u>(0,833)</u> (3 332) ✓

fk = <u>2 775,56 N</u> (to the left) ✓ (4)

2.1.4 The man will be able to move his motor vehicle as the applied force is greater than the kinetic frictional force. ✓✓

OR

The man will be able to move his vehicle as the kinetic frictional force is smaller than the applied force.

Die man sal die motor laat beweeg aangesien die toegepaste krag groter is as die kinetiese wrywingskrag

OF

Die man sal die motor laat beweeg aangesien die kinetiese wrywingskrag kleiner is as die toegepaste krag (2)

2.2.1 A force acting on a string or rope. ✓✓
'n Krag wat op 'n tou inwerk. (2)

2.2.2 $F_{net} = F_x$

$F_{net} = T.\cos\theta$ ✓

$= 125.\cos 35^o$ ✓

$= \underline{102,39 \text{ N to the left}}$ ✓

(3)
[17]

QUESTION 3 (Start on a new page.)

3.1.1 The property of a body to resist any change in its state of motion or rest. ✓✓

Die eienskap van 'n liggaam in 'n toestand van rus of beweging, wat enige beweging, verandering in beweging teenstaan. (2)

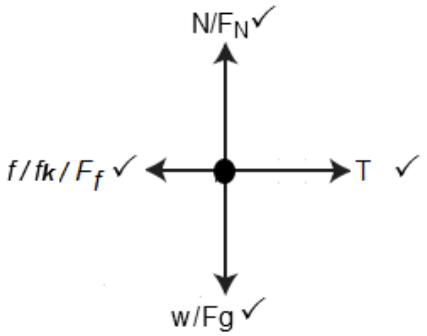
3.1.2 Newton's first law ✓ An object continues in a state of rest or uniform (moving with constant) velocity unless it is acted upon by a net (resultant/unbalanced force) force. ✓✓

Newton se eerste bewegingswet. 'n Liggaam sal in sy toestand van beweging (in rus of beweging teen uniforme (konstante) snelheid) volhard, totdat 'n netto (ongebalanseerde of resulterende) krag daarop inwerk. (3)

3.2.1 When a net/resultant force is applied to an object of mass, m, it accelerates the object in the direction of the net force. ✓✓ The acceleration is directly proportional to the net/resultant force and inversely proportional to the mass of the object.

Wanneer 'n resulterende/netto krag op 'n voorwerp met massa, m, inwerk, versnel die voorwerp in die rigting van die krag. Die versnelling is direk eweredig aan die resulterende/netto krag en omgekeerd eweredig aan die massa van die voorwerp. (2)

3.2.2



Note: Allocate mark for arrow and label.

Penalise if:
- Arrows are not shown (-1)
- Gaps between the line and the dot (-1)
- Using broken lines (-1)
- Additional force is included (-1)
- Force diagram (-1)

Nota: *Gee punt vir pyl en benoeming*

Penaliseer wanneer:
- *Pyle nie aangedui nie* (-1)
- *Spasie tussen lyn en kolletjie* (-1)
- *Stippellyne gebruik word* (-1)
- *Addisionele kragte ingesluit is* (-1) (4)

3.2.3

OPTION 1
To the right is positive

Boat / 430 kg	**Jeep / 650 kg**
$F_{net} = ma$ $T + f = ma$ ✓ any formula / *enige formule*	$F_{net} = ma$ $F_a + T + f = ma$ ✓ any formula / *enige formule*
$T - 380 = 430a$ ✓	$4\,750 - T - 750 = 650a$ ✓
$T = 430a + 380$	$4\,000 - T = 650a$ $T = 4\,000 - 650a$

$T = T$

$430a + 380 = 4\,000 - 650a$ ✓

$1\,080a = 3\,620$

$a = 3{,}351851852$

$a = 3{,}35\ m.s^{-2}$ to the right ✓ (5)

OPTION 2
To the right is negative

Boat / 430 kg	**Jeep / 650 kg**
$F_{net} = ma$ $T + f = ma$ ✓ any formula / *enige formule*	$F_{net} = ma$ $F_a + T + f = ma$ ✓ any formula / *enige formule*
$-T + 380 = 430a$ ✓	$-4\,750 + T + 750 = 650a$ ✓
$T = 380 - 430a$	$-4\,000 + T = 650a$ $T = 650a + 4\,000$

$T = T$

$380 - 430a = 4\,000 + 650a$ ✓

$-1\,080a = 3\,620$

$a = -3{,}351851852$

$a = 3{,}35\ m.s^{-2}$ to the right ✓

OPTION 3
To the right is positive

$T_{boat} = T_{Jeep}$

$Fnet = ma$

$F_a + f_{boat} + f_{Jeep} = (m_{boat} + m_{Jeep})\ a$ ✓ any formula / enige formule

$4\,750 - 380 - 750$ ✓ $= (650 + 430)\ a$ ✓

$3\,620 = 1\,080a$

$a = 3{,}35\ m.s^{-2}$ to the right ✓

3.2.4

POSITIVE MARKING FROM 3.2.3	
OPTION 1	**OPTION 2**
T = 430a + 380 ✓	T = 4000 – 650a ✓
T = (430)(3,35) + 380 ✓	T = 4000 – (650)(3,35) ✓
T = <u>1 820,5 N to the right</u> ✓	T = <u>1 822,5 N to the left</u> ✓

(3)

[19]

QUESTION 4 (Start on a new page.)

4.1.1 The product of the net force acting on an object and the time the net force acts on the object ✓✓

Die produk van die netto krag wat op 'n voorwerp inwerk en die tyd wat die netto krag op die voorwerp inwerk. (2)

4.1.2 **Downwards is positive**

$F_{net}\ \Delta t = \Delta p$
Impulse = Δp
$\Delta p = m\ \Delta v$
$\Delta p = m\ (v_f - v_i)$
✓ any formula / enige formule

Impulse = (<u>0,175</u>) ✓ (<u>– 10 – 12</u>) ✓ (4)

Impulse = 3,85 $kg.m.s^{-1}$ up ✓

4.1.3 **Positive marking from 4.1.2**

$F_{net}\ \Delta t = \Delta p$
Impulse = $F_{net}\ \Delta t$
✓ any formula / enige formule

- 3,85 = F_{net} <u>(0,3)</u> ✓

Fnet = <u>12,83 N upwards</u> ✓ (3)

4.1.4 DECREASE ✓
VERMINDER (1)

4.2.1 The <u>total</u> linear momentum of an <u>isolated system</u>✓ <u>remains constant</u> ✓ (is conserved) in magnitude and direction.

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

4.2.2 $\Sigma p_i = \Sigma p_f$

$(m_{boy} + m_{skateboard})v_i = m_{boy}v_f + m_{skateboard}v_f$ ✓ any formula *enige formule*

$\underline{(60 + 5)(4,17)}$ ✓ = $\underline{(60)(-3) + (5)v_f}$ ✓

$271,05 = -180 + 5v_f$

$451,05 = 5v_f$

$v_f = \underline{90,21\ m.s^{-1}\ east}$ ✓ (4)

4.2.3 **Positive marking from 4.2.2**

$E_{Kf} = ½\ m_{skateboard}v_i^2 + ½m_{boy}v_i^2$

$E_{Ki} = ½\ mv_i^2$ ✓ any formula *enige formule*

$E_{Ki} = ½\ (m_{skateboard} + m_{boy})v_i^2$

$E_{Ki} = \underline{½\ (5 + 60)(4,17)^2}$ ✓

$E_{Ki} = 565,14\ J$ ✓

$E_{Kf} = ½\ m_{skateboard}v_f^2 + ½m_{boy}v_f^2$

$E_{Kf} = \underline{½\ (5)(90,21)^2 + ½\ (60)(-3)^2}$ ✓

$E_{Kf} = 20\ 614,61\ J$ ✓

$\Sigma E_{Ki} \neq \Sigma E_{Kf}$ ✓

Inelastic collision */Onelastiese botsing* ✓ (7)

[23]

QUESTION 5 (Start on a new page.)

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

Die produk van die toegepaste krag op 'n voorwerp en die verplasing in die rigting van die krag. (2)

5.1.2

OPTION 1 (take left as positive)

$F_{net} = F_1 + F_2$ ✓ any formula
$F_{net} = F_a + F_f$ *enige formule*

$F_{net} = 220 – 40$ ✓

$F_{net} = 180$ N ✓ to the left ✓

OPTION 2 (take right as negative)

$F_{net} = F_1 + F_2$ ✓ any formula
$F_{net} = F_a + F_f$ *enige formule*

$F_{net} = 220 – 40$ ✓

$F_{net} = 180$ N ✓ to the left ✓

OPTION 3 (take left as positive)

$F_{net} = F_1 + F_2$ ✓ any formula
$F_{net} = F_a + F_f$ *enige formule*

$F_{net} = –220 + 40$ ✓

$F_{net} = 180$ N ✓ to the left ✓ (4)

5.1.3 **Positive marking from 5.1.2**

$W = F_{net} . \Delta x . \cos\theta$ ✓

$W = (180) (10) \cos 0^o$ ✓

$W = 1\ 800$ N.m ✓ (3)

5.2.1 The <u>total</u> mechanical energy (sum of gravitational potential energy and kinetic energy) <u>in an isolated system</u>✓ <u>remains constant.</u> ✓

Die totale meganiese energie (som van gravitasie- potensiële energie en kinetiese energie) in 'n geïsoleerde stelsel bly konstant. (2)

5.2.2 $E_P = mgh$ ✓

$E_P = (600) (9,8) (25)$ ✓

$E_P = 147\ 000$ J ✓ (3)

5.2.3 **Positive marking form 5.2.2**

$\Sigma M_{Eat\ A} = \Sigma M_{EatC}$
$E_{PatA} + E_{KatA} = E_{PatC} + E_{KatC}$
$mgh + ½mv^2 = mgh + ½mv^2$
✓ any formula
enige formule

$\underline{147\ 000 + 0}$ ✓ $= \underline{(600)\ (9,8)\ (5) + ½\ (600)\ v^2}$ ✓

$147\ 000 = 29\ 400 + 300v^2$

$117\ 600 = 300v^2$

$v = 19,8\ m.s^{-1}$ ✓ (4)

5.3.1 The rate at which work is done or energy is expended. ✓✓

Die tempo waarteen arbeid verrig of energie verbruik word. (2)

5.3.2

OPTION 1

$P = \frac{W}{\Delta t}$ ✓

7 460 ✓ $= \frac{W}{60}$ ✓

W = 44 760 J ✓

$W = E_P$

$E_P = mgh$

44 760 = m (9,8) (10) ✓

m = 4 567,35 kg ✓

OPTION 2

$P = \frac{mgh}{t}$ ✓

7 460 ✓ $= \frac{m\ (9,8)(10)✓}{60\ ✓}$

m = 4 567,35 kg ✓ (6)

[26]

QUESTION 6 (Start on a new page.)

6.1 A measure of the ability of material to withstand changes in length when subjected to lengthwise tension or compression. ✓✓

'n Meting van die vermoë van materiaal om veranderinge in lengte te weerstaan wanneer dit aan trekking of drukking in die lengte onderwerp word. (2)

6.2

OPTION 1

$\sigma = \frac{F}{A}$ ✓

$\sigma = \frac{3\ x\ 10^{6}\ ✓}{9{,}85\ x\ 10^{-5}\ ✓}$

σ = 3,05 x 10^{10} N.m^{-2} ✓ **OR** 3,05 x 10^{10} Pa

OPTION 2

$\sigma = \frac{F}{A}$ ✓

$\sigma = \frac{3\ x\ 10^{6}\ ✓}{\pi(5{,}6 \div 100)^{2}\ ✓}$

σ = 3,05 x 10^{10} N.m^{-2} ✓ **OR** 3,05 x 10^{10} Pa (4)

6.3

OPTION 1

$\varepsilon = \frac{\Delta L}{L}$ ✓

$\varepsilon = \frac{18}{3\ 000}$ ✓

ε = 6 x 10^{-3} ✓

OPTION 2

$\varepsilon = \frac{\Delta L}{L}$ ✓

$\varepsilon = \frac{3\ 018 - 3\ 000}{3\ 000}$ ✓

ε = 6 x 10^{-3} ✓ (3)

6.4 **Positive marking from 6.2 and 6.3**

$K = \frac{\sigma}{\varepsilon}$ ✓

$K = \frac{3{,}05\ x\ 10^{10}}{6\ x\ 10^{-3}}$ ✓

K = 5,08 x 10^{12} N.m^{-2} /Pa✓ (3)

[12]

QUESTION 7 (Start on a new page.)

7.1.1 The normal force exerted by a liquid at rest on a given surface in contact with it. ✓✓

Die normaalkrag wat uitgeoefen word deur 'n vloeistof in rus met 'n gegewe oppervlak wat daarmee in kontak is (2)

7.1.2 P = ρgh ✓

P = (1 025) (9,8) (120) ✓

P = 1 205 400 Pa ✓ **OR** 1,21 x 10^6 Pa (3)

7.2.1 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, die druk by 'n punt eweredig oorgedra word na al die ander dele van die vloeistof (2)

7.2.2 $\frac{F1}{A1} = \frac{F2}{A2}$ ✓

$\frac{50}{2\ x\ 10^{-2}}$ ✓ $= \frac{F2}{5,5}$ ✓

F_2 = 13 750 N ✓ (4)

7.2.3 The higher the temperature, the lower the viscosity. ✓
The lower the temperature, the higher the viscosity. ✓

OR

Temperature and viscosity are inversely proportional to each other.

Hoe hoër die temperatuur, hoe laer is die viskositeit.
Hoe laer die temperatuur, hoe hoër is die viskositeit.

OF

Temperatuur en viskositeit is indirek eweredig aan mekaar. (2)

7.2.4 Bulldozer's working system ✓
Hydraulic power brakes on automobiles, ✓
Hydraulic Dentists' chairs,
Hydraulic lifts used to lift heavy loads,
Car jacks **(any TWO relavent)**

Stootskraper se werksverrigtingstelsel,
Hidrouliese kragremme in motors,
Hidrouliese Tandartse se stoele,
Hidrouliese hysers wat gebruik word om swaar vragte te lig,
Motordomkragte ***(enige TWEE relevante)*** (2)

[15]

QUESTION 8 (Start on a new page.)

8.1.1 The change in direction of a wave upon striking the interface between two materials. ✓✓

Die verandering in rigting van 'n golf wanneer dit die vlak tussen twee materiale tref. (2)

8.1.2 Equal to each other / *Gelyk aan mekaar* ✓ (1)

8.1.3 Incident ray / *Invalstraal* ✓ (1)

8.1.4 Normal / *Normaal* ✓ (1)

8.2.1 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)

8.2.2 Convex lens / *Konfekslens* ✓ (1)

8.2.3 Real/Inverted image will form / *Reël/omgekeerde beeld sal vorm* ✓ (1)

8.3.1 A disturbance that transfers energy through matter or space. ✓✓

'n Versteuring wat energie deur materie en ruimte oordra (2)

8.3.2 Gamma ray ✓
Gamma rays have the most energy. ✓

Gamma golwe
Gamma golwe het die meeste energie. (2)

8.3.3 ***Negative marking from 8.3.2***

Medicine / Radiotherapy of cancer cells ✓
Sterilization of medical equipment ✓
Sterilization of foods **(any TWO)**

Medici / Radioterapie van kankerselle
Sterlisasie van mediese toerusting
Sterlisasie van voedsel ***(enige TWEE)*** (2)

8.4.1 $v = f.\lambda$ ✓
$v = (5{,}24 \times 10^{17})(1{,}72 \times 10^{-11})$ ✓
$v = 9{,}01 \times 10^{6}\ m.s^{-1}$ ✓ (3)
[18]

TOTAL: 150