GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

JUNE EXAMINATION
JUNIE EKSAMEN

GRADE/*GRAAD* 12

2023

MARKING GUIDELINES/
NASIENRIGLYNE

PHYSICAL SCIENCES: PHYSICS/
FISIESE WETENSKAPPE: FISIKA

(PAPER/*VRAESTEL* 1)

14 pages/*bladsye*

QUESTION/*VRAAG* 1

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

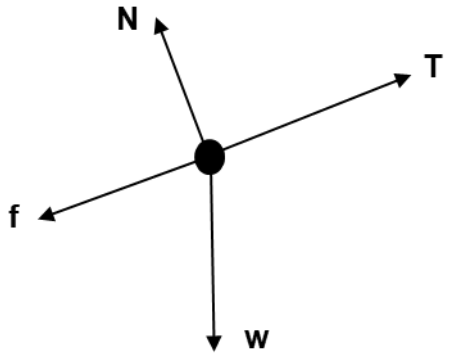
[20]

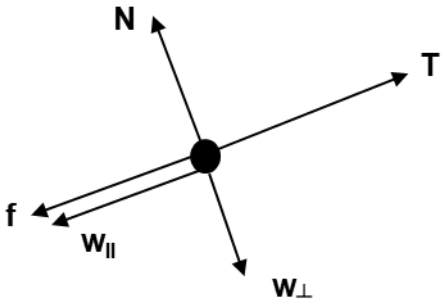
QUESTION/*VRAAG* 2

2.1 A body continues at rest or constant velocity unless acted on by a net (external) force. ✓✓

'n Liggaam bly in rus of beweeg teen konstante snelheid tensy 'n nie-nul resultante (netto eksterne) krag daarop inwerk. (2)

2.2





OR/*OF*

Accepted labels/*Aanvaarde byskrifte*	
w ✓	F_g/F_w/weight/mg/gravitational force *F_g/F_w/gewig/ gravitasiekrag*
f ✓	$F_{friction}$/F_f/friction/f_k *$F_{wrywing}$/F_f/ wrywing/f_k*
N ✓	F_N/F_{normal}/normal force *F_N/$F_{normaal}$/normaalkrag*
T ✓	F_T/tension *F_T/spanning/ spankrag*
	Deduct 1 mark for any additional force. Marks are given for both arrow and label. If everything is correct, but no arrows, deduct a mark.
	Trek een punt af vir enige addisionele kragte. Punte word gegee vir beide pylpunt en byskrif. Indien alles korrek is, maar geen pyle, trek 'n punt af.

(4)

2.3 In x-direction:/*In x-rigting:*

Fnet = ma ✓
$T - f_k - w_{II} = 0$
$1\,570 - 0{,}3(m)(9{,}8)\cos 12° ✓ - m(9{,}8)\sin 12° ✓ = 0$ ✓
$1\,570 = 2{,}876\ m + 2{,}039\ m$
$1\,570 = 4{,}914\ m$
$m = 319{,}495\ kg$ ✓ (5)

2.4 2.4.1 REMAINS THE SAME ✓ *BLY DIESELFDE* (1)

2.4.2 DECREASES ✓ *VERLAAG* (1)

2.5 There is an external force of friction exerted ✓ on the body and not only gravitational force. ✓

Daar word 'n eksterne krag van wrywing toegepas op die voorwerp en nie slegs gravitasiekrag nie. (2)
[15]

QUESTION/*VRAAG* 3

3.1 A moving object that is only influenced by gravity and starts with an initial velocity. ✓✓

'n Bewegende voorwerp wat slegs onder die invloed van gravitasie beweeg en begin met 'n aanvanklike snelheid. (2)

3.2 $v_f^2 = v_i^2 + 2a\Delta y$ ✓

$= (8,4)^2 + 2(9,8)(5)$ ✓

$v_f = 12,983\ m \cdot s^{-1}$ ✓ (3)

3.3 OPTION 1:/*OPSIE 1*

$\Delta y = v_i\Delta t + \frac{1}{2}a\Delta t^2$ ✓

5 ✓ $= 8,4t + \frac{1}{2}(9,8)t^2$ ✓

$t = 0,47\ s$

OPTION 2:/*OPSIE 2*

$\Delta y = (\frac{v_f + v_i}{2})\Delta t$ ✓

5 ✓ $= (\frac{8,4 + 12,983}{2})t$ ✓

$t = 0,47\ s$

OPTION 3:/*OPSIE 3* Positive marking from 3.2/*Positiewe nasien vanaf 3.2*

$v_f = v_i + a\Delta t$ ✓

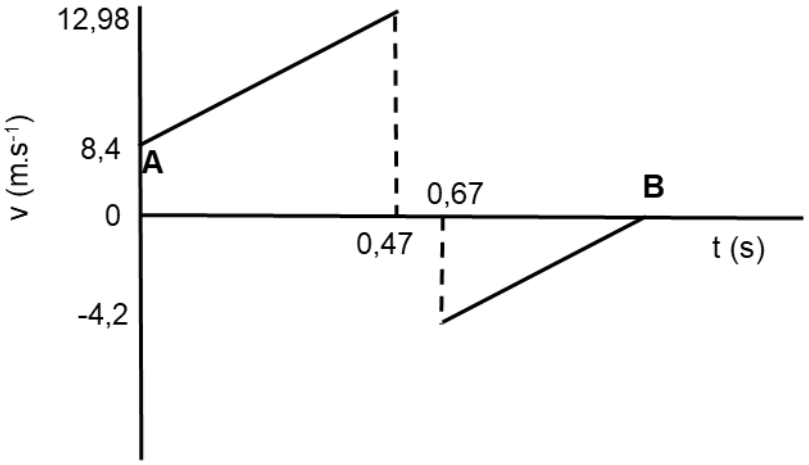
$12,983$ ✓ $= 8,4 + (9,8)t$ ✓

$t = 0,47\ s$ (3)

3.4 3.4.1 9,8 m•s^{-2} ✓ Downwards ✓
Afwaarts (2)

3.4.2 $v_f^2 = v_i^2 + 2a\Delta y$ ✓
$0 = (-4,2)^2 + 2(9,8)y$ ✓
$y = 0,9$ m ✓ (3)

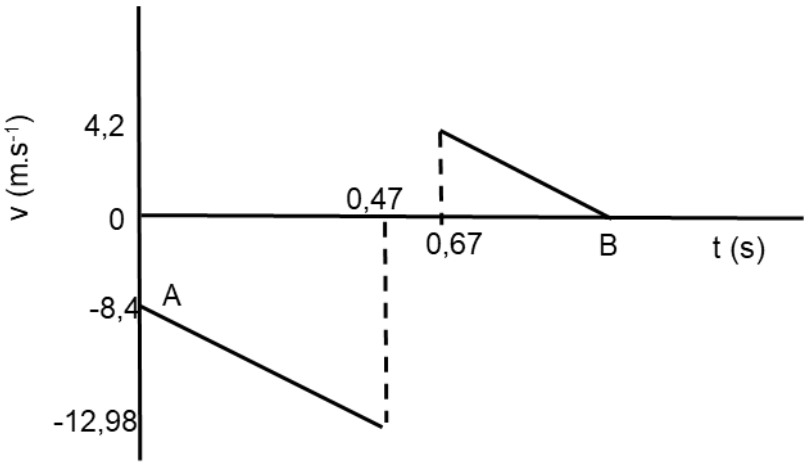
3.4.3 Taking down as positive/*Neem af as positief*



Marking guidelines:
✓ The velocity of the ball at **A**
✓ The velocity of the ball as it hits the ground
✓ Time taken for the ball to reach the ground **and** ✓ leave the ground
✓ The velocity at the maximum height of point **B**
✓ Correct shape – parallel lines

Nasienriglyne:
✓ *Die snelheid van die bal by **A**.*
✓ *Die snelheid van die bal wanneer dit die grond tref*
✓ *Die tyd wat dit neem vir die bal om die grond te bereik **en** ✓ verlaat die grond.*
✓ *Die snelheid by die maksimum hoogte van punt **B**.*
✓ *Korrekte vorm – parallel lyne.*

Taking down as negative./*Neem afwaarts as positief.* (6)



3.5.1 DECREASES ✓ *AFNEEM* (1)

3.5.2 INCREASES ✓
The contact time is less, the force is more, the final velocity is more.
Higher kinetic energy ✓ (any one of the answers)

TOENEEM
Die kontaktyd is minder, die krag is groter, die finale snelheid is meer.
Hoër kinetiese energie (enige een van die antwoorde) (2)
[22]

QUESTION/*VRAAG* 4

4.1 In an isolated system the total linear momentum remains constant. ✓✓

In 'n geïsolleerde sisteem bly die totale lineêre momentum konstant.

Marking criteria/*Nasienkriteria*
If any of the underlined key words/phrases in the correct context is omitted deduct 1 mark./*Indien enige van die onderstreepte sleutelwoorde/frases in die korrekte konteks uitgelaat is, trek 1 punt af.* (2)

4.2 OPTION 1:/*OPSIE 1:*

$$\Sigma p_{\text{before/ voor}} = \Sigma p_{\text{after/ na}} \checkmark$$

$$m_x v_{xi} + m_Y v_{Yi} = m_x v_{xF} + m_Y v_{Yf}$$

$$m(4,5) + 2m(-2,8) \checkmark = m(-2,1) + 2mv_{YF} \checkmark$$

$$V_{Yf} = 0,5 \text{ m.s}^{-1} \checkmark \text{ to the right } \checkmark$$

OPTION 2:/*OPSIE 2:*

$$\Sigma p_{\text{before/ voor}} = \Sigma p_{\text{after/ na}} \checkmark$$

$$m_x v_{xi} + m_Y v_{Yi} = m_x v_{xF} + m_Y v_{Yf}$$

$$0,05(4,5) + 0,1(-2,8) \checkmark = 0,05(-2,1) + 0,01v_{YF} \checkmark$$

$$V_{Yf} = 0,5 \text{ m.s}^{-1} \checkmark \text{ to the right } \checkmark$$

(5)

4.3 ΣEk before/ *voor* $= \frac{1}{2}mv^2 + \frac{1}{2}mv^2 \checkmark$

$= (0,5(m)(4,5)2 + (0,5(2\ m)(2,8)^2 \checkmark$

$= 10,125\ m + 7,84\ m$

$= 17,965\ m\ J$

ΣEk after/ *na* $= \frac{1}{2}mv^2 + \frac{1}{2}mv^2$

$= (0,5(m)(2,1)2 + (0,5(2\ m)(0,5)^2 \checkmark$

$= 2,205\ m + 0,25\ m$

$= 2,455\ m\ J$

ΣE_k before/ *voor* $\neq \Sigma E_k$ after/ *na* ✓

INELASTIC COLLISION ✓/ *ONELASTIESE BOTSING* (5)

4.4 REMAINS THE SAME ✓

The system remains isolated,✓ all momentum before and after the collisions will remain the same. There are no external forces. ✓

BLY DIESELFDE

Die sisteem bly geïsoleerd, al die momentum voor en na die botsings is dieselfde. Daar is geen eksterne kragte nie. (3)

[15]

QUESTION/*VRAAG* 5

5.1 The total mechanical energy at any given point is the same and conserved in a closed system. ✓✓

Die totale meganiese energie by enige gegewe oomblik is dieselfde en bly behoue in 'n geslote sisteem. (2)

5.2 $E_{mechanical\ /meganies} = E_{mechanical\ /meganies}$

$(E_k + E_p)_A = (E_k + E_p)_A$ ✓

$(\frac{1}{2}mv^2 + mgh)_A = (\frac{1}{2}mv^2 + mgh)_B$

✓$\frac{1}{2}(0,030)v^2 + (0,03)(9,8)(0,31) = 0,12 + 0$ ✓

$v = 1,387\ m.s^{-1}$ ✓

accept/ *aanvaar* $v = 1,39 m.s^{-1}$ (4)

5.3 5.3.1

$Ek = \frac{1}{2}mv^2$

$0,12 = \frac{1}{2}(0,03)v^2$

$v = 2,828\ m \cdot s^{-1}$

$F_{net}\Delta t = \Delta p$ ✓

$\Delta p = m(v_f - v_i)$

$-0,096$ ✓ $= 0,03(v_f - 2,828)$ ✓

$v_f = -0,372\ m \cdot s^{-1}$

$v = 0,372\ m \cdot s^{-1}$ ✓ (4)

5.3.2

$F_{net}\Delta t = \Delta p$ ✓

$F_{net}(0,02)$ ✓ $= 0,096$ ✓

$F_{net} = 4,8\ N$ ✓

OR/*OF*

$F_{net}\Delta t = \Delta p$ ✓

$F_{net}(0,02)$ ✓ $= -0,096$ ✓

$F_{net} = -4,8\ N$

$F_{net} = 4,8\ N$ ✓ (4)

[14]

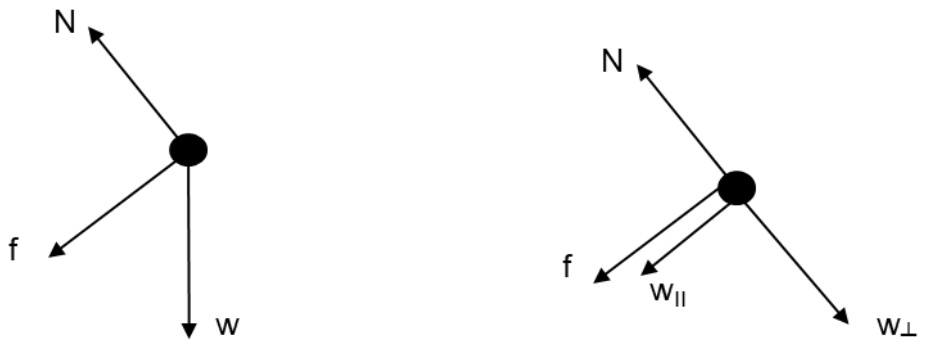
QUESTION/*VRAAG* 6

6.1 The work done on an object by a net force is equal to the change in the object's kinetic energy. ✓✓

Die arbeid verrig op 'n voorwerp deur 'n netto krag is gelyk aan die verandering in die voorwerp se kinetiese energie. (2)

6.2
$$K = \frac{1}{2}mv^2 \checkmark$$
$$= \frac{1}{2}(600)(9,5)^2 \checkmark$$
$$= 27\,075\ J \checkmark$$
(3)

6.3



Accepted labels/*Aanvaarde byskrifte*	
w ✓	F_g/F_w/weight/mg/gravitational force *F_g/F_w/gewig/ gravitasiekrag*
f ✓	$F_{friction}$/F_f/friction/f_k *$F_{wrywing}$/F_f/ wrywing/f_k*
N ✓	F_N/F_{normal}/normal force *F_N/$F_{normaal}$/normaalkrag*
	Deduct 1 mark for any additional force. Marks are given for both arrow and label. If everything is correct, but no arrows, deduct a mark.
	Trek een punt af vir enige addisionele kragte. Punte word gegee vir beide pylpunt en byskrif. Indien alles korrek is, maar geen pyle, trek 'n punt af.

(3)

6.4 OPTION 1:/*OPSIE 1*

$W_{nc} = \Delta K + \Delta U$ or/*of* $W_{nc} = \Delta E_k + \Delta E_p$ ✓

$$W_f = -\frac{1}{2}mv_i^2 + mgh$$

$$f\Delta x\cos\theta = -27\,075 + 600(9,8)(4,1)$$ ✓

$$f(\frac{h}{\sin 30^o})$$ ✓ $\cos 180^o$ ✓ $= -27\,075 + 24\,108$

$$f(\frac{4,1}{\sin 30^o})\cos 180^o = -2\,967$$

$$f = \frac{-2\,967}{-8,2}$$

$$= 361,83 \text{ N}$$ ✓

OPTION 2:/*OPSIE 2*

$$W_{net} = \Delta K$$ ✓

$$W_N + W_f + W_w = \frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2$$

$0 + f\Delta x\cos\theta + mg\Delta x\cos 120^o = 0 - 27\,075$ ✓

$$f(\frac{4,1}{\sin 30^o})$$ ✓ $\cos 180^o$ ✓ $+ (600)(9,8)(\frac{4,1}{\sin 30^o})\cos 120^o = -27\,075$

$f = 361,83$ N ✓

OPTION 3:/*OPSIE 3*

$$W_{net} = \Delta K$$ ✓

$$W_N + W_f + W_{w\perp} + W_{w\parallel} = \frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2$$

$0 + f\Delta x\cos\theta + 0 + mg\sin 30^o\Delta x\cos 0^o = 0 - 27\,075$

$$f(\frac{4,1}{\sin 30^o})$$ ✓ $\cos 180^o$ ✓ $+ (600)(9,8)(\frac{4,1}{\sin 30^o})\cos 120^o$ ✓ $= -27\,075$

$f = 361,83$ N ✓ (5)

6.5 6.5.1 A force for which the work done in moving an object between two points depends on the path taken. ✓✓

'n Krag waarvoor die arbeid wat verrig word om die voorwerp te beweeg tussen twee punte afhang van die padroete gevolg. (2)

6.5.2 $W_F = F\Delta x\cos\theta$

$= (300)(850)\cos 0^o$ ✓

$= 255\ 000\ J$

$P = \frac{W}{\Delta t}$ ✓

$9000 = \frac{255000}{t}$ ✓

$t = 28{,}33\ s$ ✓ (4)

6.5.3 DECREASES ✓
The work done on the carriage stays the same. ✓
The time and power are inversely proportional. If the power increases, then the time will decrease. ✓

VERLAAG
Die arbeid verrig op die karretjie bly dieselfde.
Die tyd en drywing is omgekeerd eweredig. Indien die drywing verhoog, dan sal die tyd verlaag. (3)
[22]

QUESTION/*VRAAG* 7

7.1 An electric field is a region or space in which an electric charge experiences a force. ✓✓

'n Elektriese veld is 'n area of gebied waarin 'n elektriese lading 'n krag sal ondervind. (2)

7.2
$$E_{net} = \frac{kQ_A}{r^2} - \frac{kQ_B}{r^2} \quad ✓$$
$$0 = \frac{9x10^9(3x10^{-12})}{(0,05)^2} ✓ - ✓ \frac{(9x10^9)Q_B}{(0,10)^2} ✓$$
$$Q_B = 1,2 \times 10^{-11} \text{ C} \quad ✓$$
(5)

7.3 The magnitude of the electrostatic force exerted by one point charge (Q_1) on another point charge (Q_2), is directly proportional to the product of the magnitudes of the charges and inversely proportional to the square of the distance (r) between them. ✓✓

Die grootte van die elektrostatiese krag uitgeoefen deur een puntlading (Q_1) *op 'n ander puntlading* (Q_2) *is direk eweredig aan die produk van die groottes van die ladings en omgekeerd eweredig aan die kwadraat van die afstand (r) tussen hulle.* (2)

7.4
$$F = \frac{kQ_AQ_B}{r^2} \quad ✓$$
$$= \frac{9x10^9(3x10^{-12})(12x10^{-12})}{(0,15)^2} \quad ✓$$
$$= 1,44 \times 10^{-11} \text{ N} \quad ✓$$
(3)

7.5 INCREASES ✓
The force is inversely proportional to the squared distance between the charges. ✓
The charges remain the same. ✓

VERHOOG
Die krag is omgekeerd eweredig aan die kwadraat van die afstand tussen die ladings.
Die ladings bly dieselfde. (3)
[15]

QUESTION/*VRAAG* 8

8.1 The electric field at a point is the electrostatic force experienced per unit of positive charge placed at that point. ✓✓

Die elektriese veld by 'n punt is die elektrostatiese krag ondervind per eenheid van positiewe lading geplaas by daardie punt. (2)

8.2 Force is directly proportional to charge. ✓
OR Charge is directly proportional to force.

Straight line through the origin. ✓

Krag is direk eweredig aan die lading.
OF *Lading is direk eweredig aan die krag.*

Reguit lyn deur die oorsprong. (2)

8.3 8.3.1 Any values in the table may be used./*Enige waardes in die tabel kan gebruik word.*

$$\text{gradient/g radiënt} = \frac{\Delta y}{\Delta x}$$
$$= \frac{0,35 - 0}{53,2\text{x}10^{-9} - 0} \checkmark\checkmark$$
$$= 6,58\text{x}10^{6}\ (\text{N.C}^{-1}) \checkmark$$

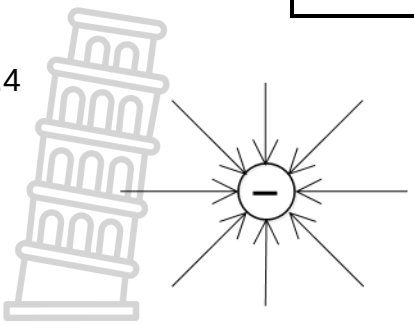
(3)

8.3.2 Positive marking from 8.3.1/*Positiewe nasien vanaf 8.3.1*

$$E = \frac{F_x}{q} \checkmark$$
$$6,58 \times 10^{6} \checkmark = \frac{F_x}{63,8 \times 10^{-9}} \checkmark$$
$$F_x = 0,42\ \text{N} \checkmark$$

(4)

8.4



Marking guidelines:
- ✓ Arrows towards the charge
- ✓ All lines touch the charge at an angle of 90°
- ✓ Correct pattern and around the charge.

Nasienriglyne:
- ✓ *Pyle na die lading*
- ✓ *Alle lyne raak die lading teen 'n hoek van 90°*
- ✓ *Korrekte patroon en rondom die lading* (3)

[14]

QUESTION/*VRAAG* 9

9.1 9.1.1 The change in the observed frequency (or pitch) of the sound detected by a listener✓ because the sound source and the listener have different velocities relative to the medium of sound propagation. ✓

Die verandering in die waarneembare frekwensie (of toonhoogte) van die klank waargeneem deur 'n luisteraar aangesien die klankbron en die luisteraar verskillende snelhede relatief tot die klankbeweging het. (2)

9.1.2 The mosquito is flying away from you. ✓ The observed frequency is ✓ lower than the actual frequency. ✓

Die muskiet vlieg weg van jou af. Die waargenome frekwensie is laer as die werklike frekwensie. (3)

9.1.3

$$f_L = \frac{v \pm v_L}{v \pm v_S} f_S \quad ✓$$

$$1034 ✓ = \frac{330 + 0}{330 + v_S} ✓ \; 1050 ✓$$

$$v_S = 5{,}106 \text{ m} \cdot \text{s}^{-1}$$

$$v_S = 5{,}11 \text{ m} \cdot \text{s}^{-1} ✓$$

(5)

9.2 9.2.1 Away from the earth ✓ *Van die aarde af weg te beweeg* (1)

9.2.2
- It monitors foetal heart beat ✓ (Do not accept observing the baby.)
  Dit monitor die fetus se hartklop. (Moenie aanvaar om baba te sien nie.)
- It detects flow of blood. ✓
  Dit neem bloedvloei waar. (2)

[13]

TOTAL/*TOTAAL*: 150