GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

PROVINCIAL EXAMINATION/ *PROVINSIALE EKSAMEN*

NOVEMBER 2023

GRADE/*GRAAD* 11

MARKING GUIDELINES/ *NASIENRIGLYNE*

PHYSICAL SCIENCES: (PHYSICS) PAPER 1
FISIESE WETENSKAPPE: (FISIKA) VRAESTEL 1

13 pages/*bladsye*

EXEMPLAR

QUESTION/*VRAAG* 1

1.1 B ✓✓ (2)

1.2 A ✓✓ (2)

1.3 D ✓✓ (2)

1.4 D ✓✓ (2)

1.5 C ✓✓ (2)

1.6 B ✓✓ (2)

1.7 D ✓✓ (2)

1.8 B ✓✓ (2)

1.9 B ✓✓ (2)

1.0 B ✓✓ (2)

[20]

QUESTION/*VRAAG* 2

2.1 The vector sum of two or more vectors, i.e. a single vector having the same effect as two or more vectors together. ✓✓
Die vektorsom van twee of meer vektore, dit is 'n enkele vektor wat dieselfde effek het as twee of meer vektore saam. ✓✓

OR/*OF*

The single force that will have the same effect as all the other forces together. ✓✓
Die enkele krag wat dieselfde effek sal hê as al die ander kragte saam. ✓✓ (2)

2.2 $T_X = (250)\cos 45° = 176{,}78$ N right/*regs*
$T_y = (250)\sin 45° = 176{,}78$ N up/*opwaarts* ✓

$F_X = (150)\cos 20° = 140{,}95$ N left/*links*
$F_Y = (150)\sin 20° = 51{,}30$ N up/*opwaarts* ✓

$R_x = T_X - F_X$
$= +176{,}78 + (-140{,}95)$
$= 35{,}83$ N right/*regs* ✓
$R_y = T_y + F_Y - w$

$+ 176{,}78 + 51{,}30 - 100 = 128{,}08$ N up/*opwaarts* ✓ (4)

Marking criteria/*Nasienkriteria*	
Components of T and direction Komponente van T en rigting	✓
Components of F and direction Komponente van T en rigting	✓
F_{netx} and direction F_{netx} *en rigting*	✓
F_{nety} and direction F_{nety} *en rigting*	✓

EXEMPLAR

2.3 $R^2 = R_x^2 + R_y^2$

$= 128,08^2 + 35,83^2$ ✓

R = 133,00 N ✓

$\tan\theta = \frac{128,08}{35,83}$ ✓

$\theta = 74,37°$ ✓

R = 133,00 N at 74,37° above the horizontal/*bokant die horisontaal* ✓

OR/*OF*

R = 133,00 N at bearing of/*in die rigting van* 15,62° (5)

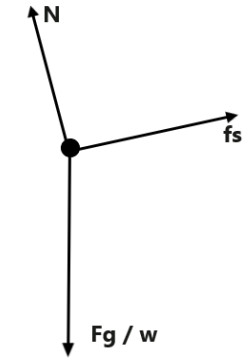
2.4 130,50 N ✓ at bearing of/*in die rigting van* 254,38° ✓ (2)

[13]

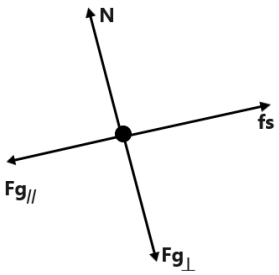
QUESTION/*VRAAG* 3

3.1 Static frictional force is the force that opposes the tendency of motion of a stationary object relative to a surface. ✓✓/*Statiese wrywingskrag is die krag wat die beweging van 'n stilstaande voorwerp relatief tot 'n oppervlak teenstaan.* ✓✓ (2)

3.2



OR/*OF*



(3)

Marking criteria/*Nasienkriteria*

- ✓ F_g/w (lower case) and direction of arrow OR its components. *F_g/w (klein letter), en rigting van pylpunt. OF sy komponente*
- ✓ f_s direction correct *f_s rigting korrek*
- ✓ N direction correct *N rigting korrek*

3.3 $f_s^{max/maks} = \mu s\ N$ ✓

$= \mu s\ F_{g\perp}$

$= 0,1x\ (80 \times 9,8)\cos 4,76°$ ✓

$= 78,13$ N ✓ (3)

EXEMPLAR

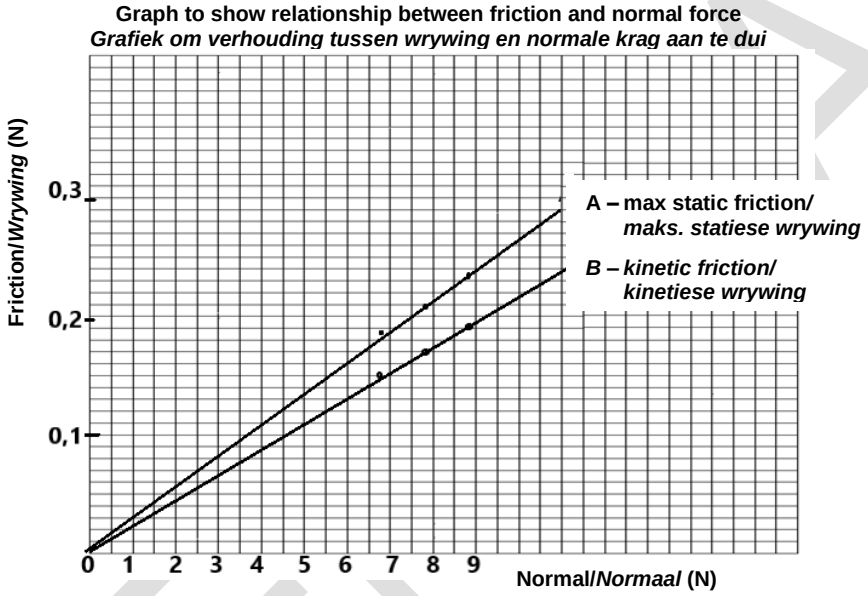
3.4 3.4.1 Remain the same ✓/*Bly dieselfde* ✓ (1)

3.4.2 • μs remains constant ✓/*μs bly constant* ✓ (1)

3.4.3 • The Normal will increase ✓ as the incline decreases, the mass will remain the same,
• Static frictional force is proportional to the normal force therefore static frictional force increases ✓ (Must answer IN WORDS)

• *Die normaal sal toeneem ✓as die helling afneem, die massa sal dieselfde bly.*
• *Statiese wrywingskrag is eweredig aan die normaalkrag daarom sal statiese wrywingskrag toeneem. ✓(Moet in WOORDE antwoord)* (2)

3.5 3.5.1



Marking criteria/*Nasienkriteria*

✓ Friction and units on y-axis./*Wrywing en eenhede op y-as*
✓ Normal and units on x-axis/*Normaal en eenhede op x-as*
✓✓ Two staight lines through the origin/*Twee reguitlyne deur die oorsprong* (4)

3.5.2 The gradient of the gradient. ✓
Die gradiënt van die helling. ✓ (1)

EXEMPLAR

3.5.3 The **coefficient of kinetic friction** is always smaller than **the coeffiecient of static friction.** ✓✓
(Award 1 mark for an answer if it is not stated exactly as above.)
Kinetic frictician is a constant for a specific surface. **OR**
Gradient = coefficient **OR**
Constant for a specific surface **OR**
At rest/wheels/walking = static friction.
Two flat surfaces moving towards each other is static friction.

*Die **koëffisiënt van kinetiese wrywing** is altyd kleiner as **die koëffisiënt van statiese wrywing.** ✓✓*
(Ken 1 punt vir die antwoord toe as dit nie presies soos hierbo gestel word nie.)
*Kinetiese wrywing is 'n konstante vir 'n spesifieke oppervlakte **OF***
*Gradiënt = koëffisiënt **OF***
*Konstant vir 'n spesifieke oppervlakte **OF***
In rus/wiele/loop = statiese wrywing.
Twee plat oppervlaktes wat teenmekaar beweeg is statiese wrywing. (2)
[19]

QUESTION/*VRAAG* 4

4.1 Newton's first law ✓✓/*Newton se eerste wet* ✓✓ (2)

4.2 The mass of the object ✓/*Die massa van die voorwerp* ✓ (1)

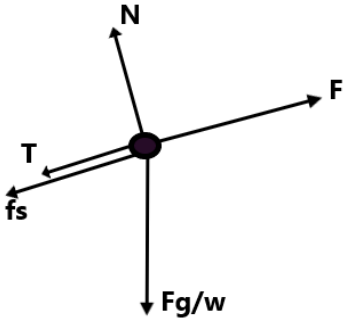
4.3 Seatbelts ✓/*Sitplekgordels*✓ (1)

4.4 $F_{net\ y}$ = 0N ✓✓/Zero/*Nul* (2)
[6]

QUESTION/*VRAAG* 5

5.1 A body will remain in its state of rest or motion at constant velocity unless a non-zero resultant/net force acts on it. ✓✓
'n Liggaam sal in sy toestand van rus of beweging teen 'n konstante snelheid bly tensy 'n nie-nul resultante/netto krag daarop inwerk. ✓✓ (2)

5.2



Marking criteria/*Nasienkriteria*
✓ F_g/w (lower case) and direction of arrow *F_g/w (klein letter) en rigting van pylpunt.*
✓ T direction correct/*T rigting korrek*
✓ F direction correct/*F rigting korrek*
✓ f_s direction correct/ *f_s rigting korrek*
✓ N direction correct/*N rigting korrek*

(5)

EXEMPLAR

5.3 5.3.1 For/*Vir* B: $F_{netY} = 0N$ ✓

$\therefore$ $N = F_{g\perp}$

$= 8 \times 9,8 \times \cos 15°$ ✓

$= 75,72$ N $\perp$ up incline/*op helling* ✓ (3)

5.3.2 $F_{net\ 0n\ A} = 0N$ ✓

$T = f_{s\ on\ A} + F_{g//A}$

$= 29,88 + (10 \times 9,8 \times \sin 15°)$ ✓

$= 55,24$ N up slope/*teen helling op* ✓ (3)

5.3.3 $F_{net\ 0n\ B} = 0N$ ✓

$F = T + f_{s\ on\ B} + F_{g//B}$

$= 55,26 + (0,21 \times 75,72)$ ✓ $+ (8 \times 9,8 \times \sin 15°)$ ✓

$= 91,43$ N up slope/*teen helling op* ✓ (4)

5.4 When a resultant/net force acts on an object, the object will accelerate in the direction of the force at an acceleration directly proportional to the force ✓ and inversely proportional to the mass of the object. ✓

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

5.5 29,88 N ✓ down slope/*teen die helling af* ✓

OR/*OF*

Same size ✓ but opposite direction. ✓
Dieselfde grootte ✓maar teenoorgestelde rigting. ✓ (2)

EXEMPLAR

5.6 $F_{net\ A} = m \times a$ ✓ $= + F_{g//} + f_k - T$

$10a = +(10 \times 9,8 \times \sin 15^\circ) + 29,88 - T$

$10\ a = +\ 55,24 - T$ …1✓

$F_{net\ B} = m \times a = +T - F_{g//} - f_{sB}$

$8a = +T - (8 \times 9,8 \sin 15°) - (0,31 \times 75,72)$

$8\ a = +T - 43,76$ …2 ✓

1 + 2 ✓

$10a = + 55,24 - T$

$\underline{8\ a = +T - 43,76}$

$18\ a = 11,48$

$a = 0,638\ m.s^{-2}$ down the incline/*teen die helling af*. ✓ (5)

5.7 5.7.1 INCREASES ✓/*NEEM TOE* ✓ (1)

5.7.2 The μk is constant ✓ thus,
the normal will increase, with a decrease of the incline. ✓
The normal is directly proportional to the frictional force. ✓

Die μk is konstant ✓ *dus,*
die normaal sal toeneem met 'n afname van die helling. ✓
Die normaal is direk eweredig aan die wrywingskrag. ✓ (3)

5.8 Block A on Block B and Block B on Block A. ✓✓
Block A on the earth and the Earth on block A.
ANY ONE RELEVANT Newton's third law pair. – **NOTE:** Normal force and the force of gravity is NOT a third law pair.

Blok A op Blok B en Blok B op Blok A. ✓✓
Blok A op die aarde en die aarde op blok A
*ENIGE RELEVANTE Newton se derde wet paar,. – **LET WEL:** Normaalkrag en swaartekrag is NIE 'n derde wetspaar nie.* (2)
[32]

EXEMPLAR

QUESTION/*VRAAG* 6

6.1 Charges cannot be created or destroyed but can only be transferred from one object to another. ✓✓

Ladings kan nie geskep of vernietig word nie maar kan slegs oorgedra word van een voorwerp na 'n ander. ✓✓ (2)

6.2 $n_{electrons/elektrone} = \frac{Q}{q_e}$ ✓

$= \frac{4\ x\ 10^{-9}}{1,6\ x\ 10^{-19}}$ ✓ OR/*OF* $\frac{-4\ x\ 10^{-9}}{-1,6\ x\ 10^{-19}}$

= 2,5 x 10^{10} (electrons/*elektrone*) ✓ (3)

6.3 The magnitude of the electrostatic force exerted by one point charge on another point charge is directly proportional to the product of the magnitudes of the charges ✓ and inversely proportional to the square of the distance between them. ✓

Die grootte van die elektrostatiese krag wat deur twee puntladings op mekaar uitgeoefen word is direk eweredig aan die produk van die grootte van die ladings ✓ *en omgekeerd eweredig aan die kwadraat van die afstand tussen hulle*. ✓ (2)

6.4 Attraction✓/*Aantrekkingskrag* ✓ (1)

6.5 $Q_{new/nuut} = \frac{Q_1+Q_2}{2}$

$= \frac{-4\ x\ 10^{-9} + 3\ x\ 10^{-9}}{2}$ ✓

= –5 x 10^{-10} C✓ (2)

6.6 $F = \frac{kQ_1Q_2}{r^2}$ ✓

$= \frac{(9\ x\ 10^{9})(5\ x\ 10^{-10})(5\ x\ 10^{-10})✓}{(4\ x\ 10^{-2})^2✓}$ OR/*OF* $\frac{(9\ x\ 10^{9})(5\ x\ 10^{-10})(5\ x\ 10^{-10})✓}{(0,04)^2✓}$

= 1,41 x 10^{-6} N ✓ (4)

6.7 Four time greater ✓/*Vier keer groter* ✓ (1)

[15]

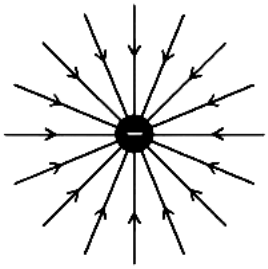
EXEMPLAR

QUESTION/*VRAAG* 7

7.1 Electric field at a point is the force per <u>unit positive</u> charge placed at that point. ✓✓

Elektriese veld by 'n punt is die krag per <u>eenheid positiewe</u> lading wat by die punt in die veld geplaas word. ✓✓ (2)

7.2



Marking criteria/*Nasienkriteria*	
✓	Correct shape as shown *Korrekte vorm*
✓	Direction towards negative *Rigting na negatief*

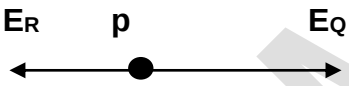
(2)

7.3 $E = \frac{kQ}{r^2}$ ✓

6×10^7 ✓ $= \frac{(9 \times 10^9)Q}{(1)^2}$ ✓

$Q = 6{,}67 \times 10^{-3}$ C✓ (4)

7.4



$E_R = \frac{k\,Q_R}{r^2}$ ✓

$E_{net} = E_Q - E_R$

$= 6 \times 10^7$ ✓ $- \frac{(9 \times 10^9)4 \times 10^{-3}}{(1{,}75)^2}$ ✓

$= 4{,}82 \times 10^{-7}$ N.C^{-1} ✓ to the right/*na regs* ✓ (5)

[13]

EXEMPLAR

QUESTION/*VRAAG* 8

8.1 The magnitude of the induced emf across the ends of a conductor is directly proportional to the rate of change in the magnetic flux linkage with the conductor. ✓✓

Die grootte van die geïnduseerde emk oor die ente van die geleier is direk eweredig aan die tempo van verandering van magnetiese vloedkoppeling met die geleier. ✓✓ (2)

8.2 Current is induced into the coil. ✓/*Stroom word in die spoel geïnduseer* ✓ (1)

8.3 The right-hand solenoid rule. ✓/*Die regterhand solenoïde reël.* ✓ (1)

8.4 Increase the number of turns/coils on the solenoid. ✓
Increase the current in the solenoid. ✓
Use a stronger magnet on the right. ✓
Use a soft metal bar inside the solenoid. (Any THREE)

Verhoog die aantal windinge in die solenoïde. ✓
Verhoog die stroom in die solenoïde. ✓
Gebruik 'n sterker magneet aan die regterkant. ✓
Gebruik 'n sagte metaalkern binne in die solenoïde. *(Enige DRIE)* (3)

8.5 $\varepsilon = N\frac{\Delta \Phi}{\Delta t}$ ✓

$= -200\frac{(1\ x\ 10^{-4} - 5\ x\ 10^{-4})}{0,2}$ ✓

= 0,4 V ✓

(3)
[10]

QUESTION/*VRAAG* 9

9.1 The potential difference across a conductor is directly proportional to the current in the conductor at constant temperature.✓ ✓

Die potensiaalverskil oor 'n geleier is direk eweredig aan die stroom in die geleier by 'n konstante temperatuur. ✓✓ (2)

9.2 The light bulb/*Die Gloeilamp*/15 Ω resistor ✓✓ (2)

EXEMPLAR

9.3 The temperature will increase as it heats up, the resistance will increase if the current is flowing for a long time. ✓✓

OR

The temperature will not be controlled thus resistance will increase.

Die temperatuur sal toeneem soos wat dit warm word, die weerstand sal toeneem indien die stroom vir 'n lang tyd vloei. ✓✓

OF

Die temperatuur sal nie gekontroleer word nie en daarom sal die weerstand toeneem. (2)

9.4 9.4.1 $R_T = R_1 + R_2 + R_3$

$= 5 + 15 + 10$ ✓

$= 30\ \Omega$ ✓ (2)

9.4.2 $I_{tot} = \frac{V_T}{R_T}$ ✓

$= \frac{15}{30}$ ✓

$= 0{,}5$ A ✓ (3)

9.4.3 $V = I \times R$

$= 0{,}5 \times 10$ ✓

$= 5$ V ✓ (2)

9.5 Brightness will increase ✓/*Helderheid sal toeneem* ✓ (1)

9.6
- Total resistance of the parallel connection decreases ✓
  Die totale weerstand van die paralleltak sal afneem. ✓

OR/*OF*

- More energy is available to the other two resistors in series. ✓
  Meer energie is beskikbaar vir die ander twee resistors in serie. ✓

OR/*OF*

- Power is directly proportional to the volts over the resistor and the current through the resistor. ✓
  Drywing is direk eweredig aan die potensiaalverskil oor die resistors en die stroom deur die resistors. ✓ (2)

EXEMPLAR

9.7 9.7.1 $V_{5\Omega}$ = I x R

= 0,58 x 5

= 2,9 V ✓

$V_{15\Omega}$ = I x R

= 0,58 x 15

= 8,7 V ✓

$V_T = V_1 + V_2 + V_P$

$15 = 2,9 + 8,7 + V_P$

V_P = 3,4 V ✓ (3)

9.7.2 $R_T = \frac{V}{I} = \frac{15}{0,58}$

= 25,86 Ω ✓

$R_P = R_T - R_s = 25,86 - 20 = 5,86\ \Omega$ ✓

$\frac{1}{R_p} = \frac{1}{R_{10}} + \frac{1}{R}$

$\frac{1}{5,86} = \frac{1}{10} + \frac{1}{R}$

R = 14,15 Ω ✓ (3)

[22]

TOTAL/*TOTAAL*: 150

EXEMPLAR

Taxonomy Grid

Recall		Comprehension		Analysis		Evaluation	
Q no:	**Mark**	**Q no:**	**Mark**	**Q no:**	**Mark**	**Q no:**	**Mark**
1.1	2	1.3	2	1.4	2		
1.2	2	1.5	2	1.6	2		
		1.7	2	1.9	3		
		1.8	2				
		1.10	2				
2.1	2	2.4	2	2.2	4		
				2.3	5		
3.1	2	3.2	3			3.3.2	3
		3.3.1	1			3.4.3	2
		3.4.1	4				
		3.4.2	1				
4.1	2	4.4	2				
4.2	1						
4.3	1						
5.1	2	5.2	5	5.3	10		
5.4	2	5.5	2	5.6	5	5.7	4
		5.8	2				
6.1	2			6.2	3		
6.3	2	6.4	1	6.5	2		
				6.6	4		
				6.7	1		
7.1	2	7.2	2	7.3	4		
				7.4	5		
8.1	2	8.2	1	8.5	3		
8.3	1	8.4	3				
9.1	2	9.2	2	9.4	7	9.5	2
		9.3	2	9.7	6	9.6	3

Total marks	**18%**	**27**	**28**	**43**	**44%**	**66**	**9%**	**14**
Total %/**100%**	**P1&2: 15%**		**P1:35%/P2:40%**		**P1:40%/P2:35%**		**P1&2: 10%**	

EXEMPLAR