LIMPOPO

PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF
EDUCATION

NATIONAL SENIOR CERTIFICATE

GRADE 11

Stanmorephysics.com

PHYSICAL SCIENCES

CONTROL TEST 1

TERM 1

17 MARCH 2025

Stanmorephysics.com

MARKS: 100

TIME: 2 hours

This question paper consists of **11** pages and **2** data sheets

INSTRUCTIONS AND INFORMATION

1. Write your name and surname on the ANSWER BOOK.

2. This question paper consists of 6 questions. Answer ALL the questions in the ANSWER BOOK

3. Start EACH question on a NEW page in the ANSWER BOOK.

4. Number the answers correctly according to the numbering system used in this question paper.

5. Leave ONE line between two sub-questions, e.g. between QUESTION 2.1 and QUESTION 2.2.

6. You may use a non-programmable calculator.

7. You may use appropriate mathematical instruments.

8. You may use appropriate mathematical instruments.

9. Round off your FINAL numerical answers to a minimum of TWO decimal places.

10. Give brief motivations, discussions, etc. where required.

11. You are advised to use the attached DATA SHEETS.

12. Write neatly and legibly

QUESTION 1: MULTIPLE-CHOICE QUESTIONS

Various options are provided as possible answers to the following questions. Each question has only ONE correct answer. Choose the answer and write only the letter (**A – D**) next to the question numbers (**1.1 – 1.10**) in the ANSWER BOOK, e.g. 1.11 E.

1.1   Vector P and vector –P are acting on a common point O. The angle between the two vectors is ...

        A 0^0

        B 90^0

        C 180^0

        D 270^0 (2)

1.2   Which ONE of the following pairs of physical quantities is vector quantities?

        A   Force and distance

        B   Velocity and speed

        C   Charge and electric field

        D   Electric field and force   (2)

1.3   A person stands on a bathroom scale that is fixed to the floor of a lift, as shown in the diagram below.


lift cable
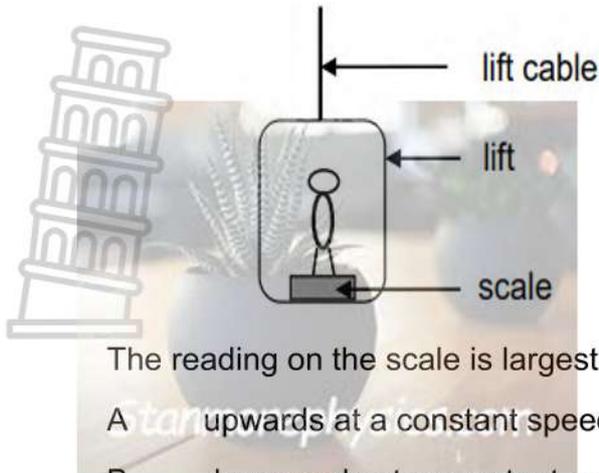
lift

scale

The reading on the scale is largest when the lift moves …

A   upwards at a constant speed.

B   downwards at a constant speed.

C   upwards at an increasing speed

D   downwards at an increasing speed.   (2)

1.4   Which ONE of the following is an example of a CONTACT force?

A   Magnetic force

B   Frictional force

C   Electrostatic force

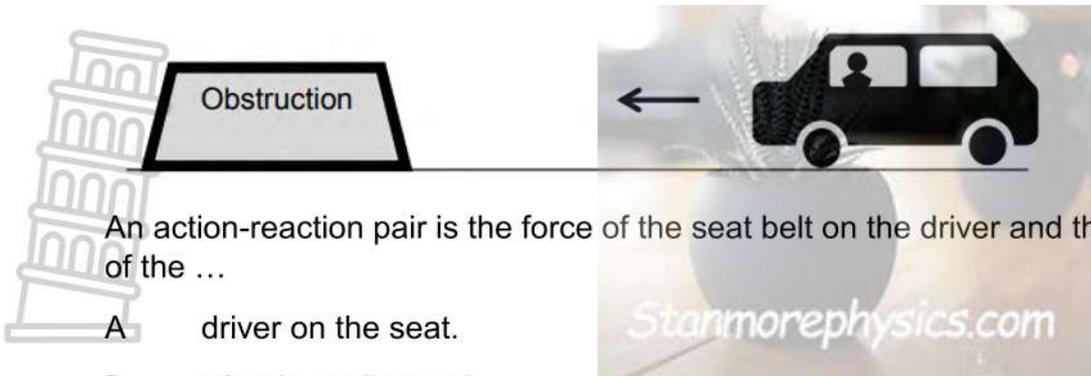D   Gravitational force   (2)

1.5   A block with a mass of 4 kg is pulled upwards along a frictionless slope,
        inclined at an angle θ, with a force F, as shown in the sketch below.
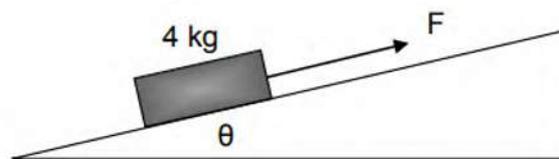
        Which ONE of the following equations can be used to calculate the
        magnitude of the normal force (N)?

A $N = (4)(9,8)\sin\theta$

B $N = F - (4)(9,8)\cos\theta$

C $N = F + (4)(9,8)\cos\theta$

D $N = (4)(9,8)\cos\theta$ (2)

1.6   A car is travelling along a road. The driver has his seat belt on. The driver
   sees an obstruction in the road ahead and suddenly applies the brakes.

Copyright reserved   Please turn over

Obstruction

An action-reaction pair is the force of the seat belt on the driver and the force of the …

A   driver on the seat.

B   wheels on the road.

C   driver on the seat belt.

D   seat belt on the seat.   (2)

1.7   The mass of an astronaut on EARTH is M. At a height above the Earth equal to twice the radius of the Earth, the mass of the astronaut will be…

A   M

B   ¼ M

C   2 M

D   1/9 M   (2)

1.8   The leaves of the electroscope in the diagram below are positively charged
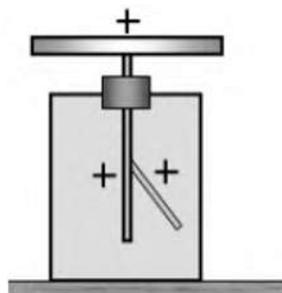
When an object is brought close to the plate, the leaves diverge more. We can therefore conclude that the object …

A   is positively charged.

B   is negatively charged.

C   is not charged at all.

D   releases positive charges.   (2)

1.9   Two charges of + 2 n C and - 2 n C are located on a straight line. **S** and **T** are two points that lie on the same straight line as shown in the diagram below.

Limpopo DoE/March 2025
NSC

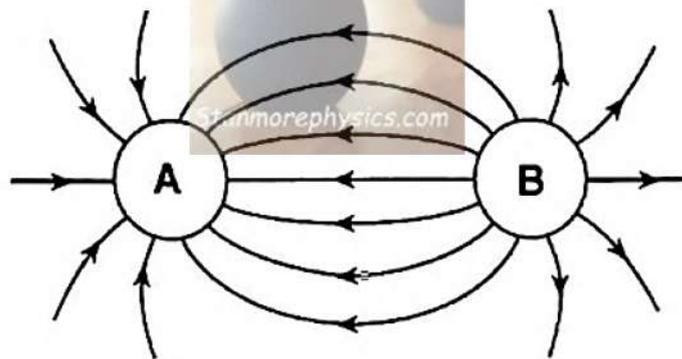+ 2 nC · — — — — — — — — S ✕ — — — — — — — — - 2 nC ● — — — — — — — — T ✕ — — — — — —

Which ONE of the following correctly represents the directions of the RESULTANT electric fields at **S** and at **T**?

	DIRECTION OF THE RESULTANT ELECTRIC FIELD AT POINT S	DIRECTION OF THE RESULTANT ELECTRIC FIELD AT POINT T
A	Right	Left
B	Left	Left
C	Right	Right
D	Left	Right

(2)

1.10 The electric field pattern between two charged spheres, **A** and **B**, is shown below.

Which ONE of the following statements regarding the charge on spheres **A** and **B** is CORRECT?

A   Sphere A is negatively charged, and sphere B is positively charged.

B   Sphere A is positively charged, and sphere B is negatively charged.

C   Sphere A and B are both negatively charged.

D   Sphere A and B are both positively charged.   (2)
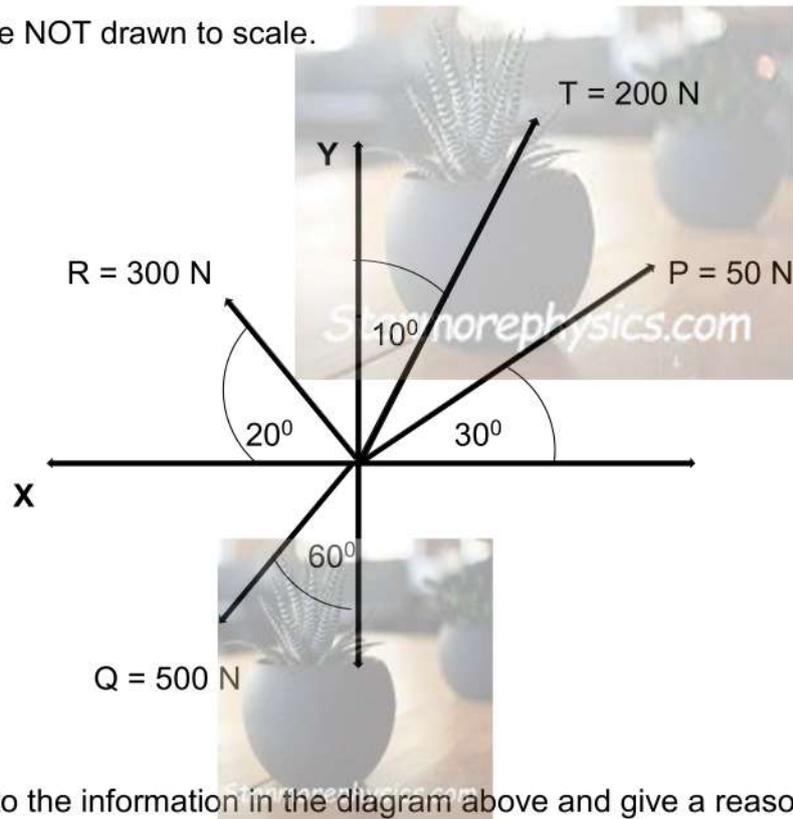
[20]

QUESTION 2 (Start on a new page)

Four forces, **T**, **P**, **Q** and **R**, of magnitudes 200 N, 50 N, 500 N and 300 N respectively, act on a point O in the directions shown in the diagram below.

The forces are NOT drawn to scale.

2.1 Refer to the information in the diagram above and give a reason why forces T, P, Q and R are classified as vectors. (2)

2.2 Determine the magnitude and direction of the resultant force, either by CALCULATION **or** by ACCURATE CONSTRUCTION AND MEASUREMENT. (Use scale 10 mm = 50 N.) (8)

[10]

QUESTION 3 (Start on a new page)

A box, with a mass of 50 kg, is pulled with a force of 80 N at an angle of 40° to the horizontal. The box moves at a CONSTANT VELOCITY
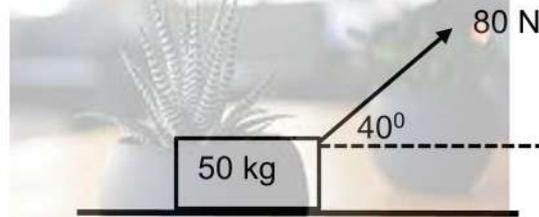
3.1   Define the term *kinetic frictional force*.   (2)

3.2   State *Newton's First Law of motion* in words.   (2)

3.3   Calculate the magnitude of the horizontal component of the applied force.   (2)

3.4   Calculate the magnitude of the normal force.   (4)

3.5   Calculate the coefficient of kinetic friction.   (4)

3.6   Will the coefficient of kinetic friction change if the angle of the applied

   force is decreased? Write only **YES** or **NO** and give a reason.   (2)

[16]

QUESTION 4 (Start on a new page)

Two blocks of mass 10 kg and 5 kg respectively, are joined with an inelastic string

of negligible mass. The string runs over a frictionless pulley. The 10 kg block is on a horizontal surface while 5kg block is on an inclined plane of 60^0 with the horizontal. The coefficient of kinetic friction for both blocks is 0,3. The 5 kg block accelerates down the slope.
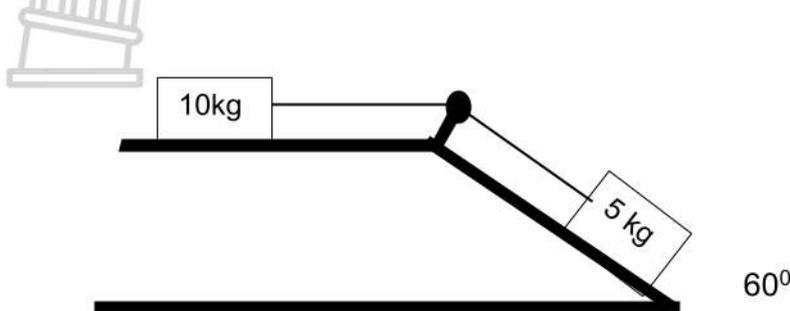
4.1 State *Newton's Second law of Motion* in words. (2)

4.2 Draw a labelled free-body diagram of ALL the forces acting on the 5 kg block. (4)

4.3 Calculate the frictional force between the surface and the 5 kg block (4)

4.4 Calculate the magnitude of the acceleration of the system. (6)

4.5 How will the acceleration compare if the positions of the 10 kg block and 5 kg are switched? Choose from GREATER THAN, LESS THAN or THE SAME. Explain your answer. (4)

[20]

QUESTION 5 (Start on a new page)

An object of mass 250 kg is orbiting the earth at a distance **d** from the earth's surface. The weight of the object at that position is 10% less than its weight on the earth's surface.

5.1   State *Newton's law of Universal Gravitation* in words.   (2)

5.2   Calculate the distance **d** from the earth's surface at which the satellite is

        orbiting.   (7)

5.3   The object is moved to a new position where the distance from the centre of the earth is twice the radius of the earth.

        5.3.1   Write down the mathematical relationship between the weight of the object and the distance at which it is placed from the centre of
                the earth.   (2)

   5.3.2   Determine the weight of the object at the new position.   (3)

                                                                                   [14]

QUESTION 6 (Start on a new page)

Two charged spheres, **P** and **K**, are both stationary on a smooth, insulated surface inclined at an angle of 30^0 to the horizontal. Sphere **K,** of mass 0,02 kg and carrying a charge of -7×10^{-9} C, is connected to a 0,04m long, light inextensible string attached to point **R** at the top of the incline.

Sphere **P**, carrying a charge of $+6 \times 10^{-9}$ C, is held such that the distance between the centres of the spheres is **r**, as shown in the diagram below.

Ignore the effects of friction. The diagram is not drawn to scale.
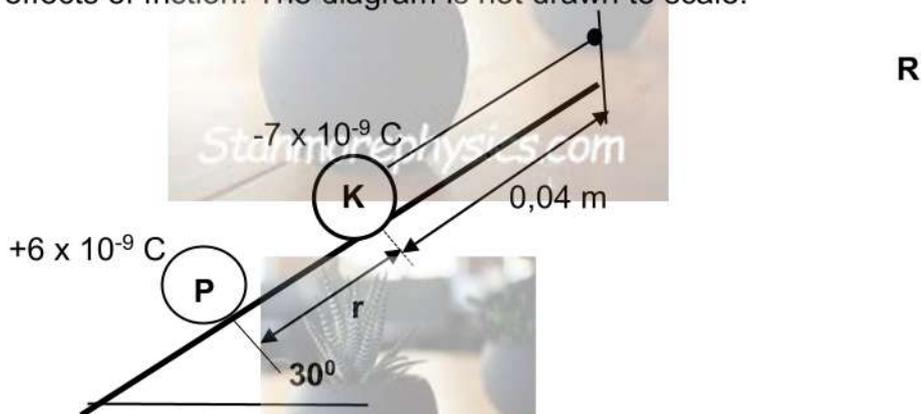
Sphere **P** exerts an electrostatic force of magnitude $1,4 \times 10^{-3}$ N on sphere **K**.

6.1   State *Coulomb's law* in words.   (2)

6.2   Calculate the distance **r** between the spheres.   (3)

6.3   Draw a labelled free- body diagram for sphere **K**.   (4)

6.4   Calculate the:

        6.4.1   tension in the string   (5)

        6.4.2   net electric field at point P   (6)

                                                                        [20]

                                                          TOTAL: 100

DATA FOR PHYSICAL SCIENCES GRADE 11

PAPER 1 (PHYSICS)

TABLE 1: PHYSICAL CONSTANTS/*TABEL 1: FISIESE KONSTANTES*

NAME/*NAAM*	SYMBOL/*SIMBOOL*	VALUE/*WAARDE*
Acceleration due to gravity *Swaartekragversnelling*	g	$9,8 \text{ m·s}^{-2}$
Gravitational constant *Swaartekragkonstante*	G	$6,67 \times 10^{-11} \text{ N·m}^2\text{·kg}^{-2}$
Radius of Earth *Straal van Aarde*	R_E	$6,38 \times 10^6 \text{ m}$
Coulomb's constant *Coulomb se konstante*	k	$9,0 \times 10^9 \text{ N·m}^2\text{·C}^{-2}$
Speed of light in a vacuum *Spoed van lig in 'n vakuum*	c	$3,0 \times 10^8 \text{ m·s}^{-1}$
Charge on electron *Lading op elektron*	e	$-1,6 \times 10^{-19} \text{ C}$
Electron mass *Elektronmassa*	m_e	$9,11 \times 10^{-31} \text{ kg}$
Mass of the Earth *Massa van die Aarde*	M	$5,98 \times 10^{24} \text{ kg}$

TABLE 2: FORMULAE/*TABEL 2: FORMULES*

MOTION/*BEWEGING*

$v_f = v_i + a\,\Delta t$	$\Delta x = v_i \Delta t + \frac{1}{2} a \Delta t^2$
$v_f^2 = v_i^2 + 2a\Delta x$	$\Delta x = \left(\dfrac{v_f + v_i}{2} \right) \Delta t$

FORCE/*KRAG*

$F_{net} = ma$	$w = mg$
$F = \dfrac{Gm_1 m_2}{r^2}$	$\mu_s = \dfrac{f_{s(max)}}{N}$
$\mu_k = \dfrac{f_k}{N}$	

ELECTROSTATICS/ELEKTROSTATIKA

$F = \dfrac{kQ_1Q_2}{r^2}$	($k = 9{,}0 \times 10^9 \, \text{N·m}^2\text{·C}^{-2}$)	$E = \dfrac{F}{Q}$
$E = \dfrac{kQ}{r^2}$	($k = 9{,}0 \times 10^9 \, \text{N·m}^2\text{·C}^{-2}$)	$V = \dfrac{W}{Q}$

ELECTROMAGNETISM/ELEKTROMAGNETISME

$\varepsilon = -N\dfrac{\Delta\Phi}{\Delta t}$	$\Phi = BA\cos\theta$

ELECTRIC CIRCUITS/ELEKTRIESE STROOMBANE
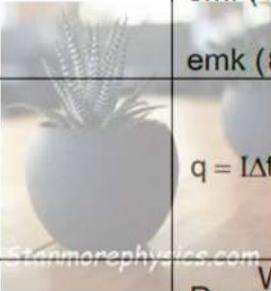
$R = \dfrac{V}{I}$	emf $(\varepsilon) = I(R + r)$ emk $(\varepsilon) = I(R + r)$
$R_s = R_1 + R_2 + \ldots$ $\dfrac{1}{R_p} = \dfrac{1}{R_1} + \dfrac{1}{R_2} + \ldots$	$q = I\Delta t$
$W = Vq$ $W = VI\Delta t$ $W = I^2R\Delta t$ $W = \dfrac{V^2\Delta t}{R}$	$P = \dfrac{W}{\Delta t}$ $P = VI$ $P = I^2R$ $P = \dfrac{V^2}{R}$

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PHYSICAL SCIENCES/FISIESE WETENSKAPPE

CONTROL TEST 1/KONTROLE TOETS 1

MARKING GUIDELINES/NASIENRIGLYNE

17 MARCH/MAART 2025

Stanmorephysics.com

MARKS/PUNTE: 100

This marking guideline consists of 11 pages/*Hierdie nasienriglyne bestaan uit 11 bladsye*

QUESTION 1/*VRAAG 1*

1.1   C✔✔

1.2   D✔✔

1.3   C✔✔

1.4   B✔✔

1.5   D✔✔

1.6   C✔✔

1.7   D✔✔

1.8   A✔✔

1.9   A✔✔

1.10   A✔✔   [20]

QUESTION 2/*VRAAG 2*

2.1 Each of them has magnitude and direction✓✓/ *Elkeen van hulle het grootte en rigting* (2)

2.2 F_x = T cos 80° + P cos 30° +(- R cos 20°)+ (- Q cos 60°)

= 200 cos 80° + 50 cos 30° - 300 cos 20° - 500 cos 30°✓

F_x = - 636,89 N

F_y = T sin 80° + P sin 30° + R sin 20° + (- Q sin 30°)

= 200 sin 80° + 50 sin 30° + 300 sin 20° - 500 sin 30°✓

F_y = 74,57 N

F^2_R = (-363,89)² + (74,57)² ✓

F_R = 641,24 N

θ = tan⁻¹ ($\frac{74,57}{636,89}$) ✓✓

= 6,68° ✓ accept/*aanvaar* (6,67)
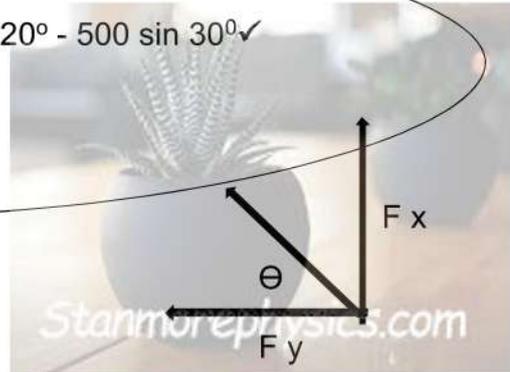
Resultant force = 641,24 N ✓ in direction of (270 + 6.68) = 276,68° or 6,68° north of west✓ / *Resulterende krag = 641,24 N in die rigting (270 + 6.68) = 276,68° of 6,68° noord van wes.* (8)

NOTE ALSO/*LET WEL*:

F_x = T sin 10° + P sin 60° + - R sin 70° + (- Q sin 30°)
= 200 sin 10° + 50 sin 60° - 300 sin 80° - 500 sin 30°✓

F_x = T cos 10° + P cos 60° + R cos 70° + (- Q cos 60°)
= 200 cos 10° + 50 cos 60° + 300 cos 70° - 500 cos 60°✓

Do not penalise if diagram is not drawn. /*Moenie penaliseer as die diagram nie geteken is nie*

QUESTION 3/VRAAG 3

3.1   The force that opposes the motion of a moving object relative to a surface ✓✓/
      Die krag wat die beweging van 'n bewegende voorwerp relatief tot 'n oppervlak
      teëwerk   (2)

3.2   A body will remain in its <u>state of rest or motion at constant velocity</u> ✓ unless

      a <u>non-zero resultant/net force acts on it</u>. ✓ / 'n Liggaam sal in sy <u>toestand van</u>

      <u>rus of beweging teen konstante snelheid bly</u> tensy 'n <u>nie-nul resulterende/netto</u>

      <u>krag daarop inwerk.</u>   (2)

3.3 $F_x = 80 \cos 40^0$ ✓ or $80 \sin 50^0$

      $= 61,28 \text{ N}$ ✓   (2)

3.4 $N = F_g - F_x$ ✓

      $= 50(9,8)$ ✓ $- 80 \sin 40^0$ ✓

      $= 438,58 \text{ N}$ ✓   (4)

NOTE/LET WEL:
Weight and the vertical component can be calculated separately, award one mark each even if the formula for N is incorrect / Gewig en die vertikale komponent kan afsonderlik bereken word, ken een punt elk toe selfs al is die formule vir N verkeerd

3.5   **POSITIVE MARKING FROM QUESTION 3.3 and 3.4 / POSITIEWE NASIEN**
      VANAF 3.3 EN 3.4

      $f_k = \mu_k N$ ✓

      $61,28$ ✓ $= \mu_k (438,58)$ ✓

      $\mu_k = 0,14$ ✓   (4)

3.6   No ✓ The coefficient is dependent on the (nature of) the surfaces /

      type of material in contact. ✓ / Nee. Die koëffisiënt is afhanklik van die (aard

      van) die oppervlakts/tipe materiaal waarmee dit in kontak is.   (2)

                                                                            [16]

QUESTION 4/*VRAAG 4*

4.1   When a net force acts on an object, it will accelerate in the direction of the (net) force. The acceleration is directly proportional to the (net) force and inversely proportional to the mass of the object✓✓ / *Wanneer 'n netto krag op 'n voorwerp inwerk, sal dit in die rigting van die (netto) krag versnel. Die versnelling is direk eweredig aan die (netto) krag en omgekeerd eweredig aan die massa van die voorwerp.*   (2)

4.2

Notes: Accepted Labels/*Nota: Aanvaarde byskrifte*		Mark/*punt*
N	Normal force / F_N / *Normaalkrag*	✓
W	Weight / Fg / *Gewig*	✓
T	Tension / F_N / *Spanning*	✓
f	Friction / F_f / *Wrywing*	✓
PENALISE ONCE IF/*PENALISEER EEN KEER AS:*		
• Any non-applicable force(s) drawn/*enige nie-toepaslike krag(te) geteken*		
• Is both weight and its components are shown/*as beide gewig en sy komponente getoon word*		
• If lines do not touch the dot/*as lyne nie aan die kol raak nie*		
Ignore the comparative lengths of the arrows/*Ignoreer die vergelykende lengtes van die pyle.*		

                                                                          (4)

4.3 $f_k = \mu k N$ ✓

$f_k = \mu k . m . g . Cos\theta$

$f_k = 0{,}3(5)\ (9{,}8)\ \cos 60^0$ ✓

$f_k = 7{,}35\ N$ ✓ up the slope ✓ /*teen die helling op*   (4)

4.4 $F_{net} = ma$ ✓   ✓

For the 10 kg block   **For the 5 kg block**

T – f = ma   Fg// - T – f = ma

T – 0,3(10)(9,8) ✓ = 10a   5(9,8)sin 60^0 – T – 7,35 ✓ = 5a

T = 10a + 29,4 …..(1)   35,08 – 5a = T …..(2)

Combining equations (1) and (2)/*kombineer vergelykings (1) en (2)*

10a + 29,4 = 35,08 – 5a ✓

a = 0,37 m.s^{-2} ✓

Mark allocation/*Punte toekenning*	
Formula / *Formule*	✓
Left side substitution for 10kg and left side substitution for 5 kg / *linkerkant vervanging vir 10 kg en linkerkant vervanging vir 5 kg*	✓✓
Substitution of both 10 kg and 5 kg / *substitusie van beide 10 kg en 5 kg*	✓
Combination of equations / *kombinering van vergelykings*	✓
Answer and correct SI units / *antwoord en korrekte SI eenheid*	✓

(6)

4.5   Greater than ✓/*Groter as*

Explanation/*Verduideliking:*

- The total mass remains the same ✓/*Die totale mass ably dieselfde*
- Component of weight parallel to the slope increases ✓/*komponent van gewig parallel aan die helling neem toe*
- The force of friction increases ✓ /*die wrywingskrag neem toe*   (4)

[20]

QUESTION 5/VRAAG 5

5.1 Every particle <u>attracts</u> every other particle in the universe <u>with a force that is</u> <u>directly proportional to the products of their masses and inversely proportional to</u> <u>the square of the distance between their centres.</u> ✓✓ / <u>Elke deeltjie trek elke</u> <u>ander deeltjie in die heelal aan</u> <u>met 'n krag wat direk eweredig is aan die produkte</u> <u>van hul massas en omgekeerd eweredig aan die kwadraat van die afstand</u> <u>tussen hul middelpunte.</u> (2)

5.2

OPTION 1/OPSIE 1
W = mg
W = 250 x 9.8 ✓
= 2450 N
W $_{new}$ = 0, 9 x 2450✓
= 2205 N
$F = G\frac{m_1 m_2}{d^2}$✓
2205 ✓ $= \frac{(6,67 \times 10^{-11})(5,98 \times 10^{24} \times 250)}{d^2}$ ✓
d = 6724797,58m
d from surface/vanaf die oppervlak = 6724797,58 − 6,38 x 10^6 ✓
= 3,45 x10^5 m✓

OPTION 2/OPSIE 2
10% of weight/van gewig = 0,1 x 2450✓
= 245 N
W $_{new}$ = 2450 − ✓ 245
= 2205 N✓
$F = G\frac{m_1 m_2}{d^2}$
2205✓ $= \frac{(6,67 \times 10^{-1})(5,98 \times 10^{24} \times 250)}{d^2}$ ✓
d = 6724797,58m
d from surface/vanaf oppervlak = 6724797,58 − 6,38 x 10^6 ✓
= 3,45 x10^5 m✓
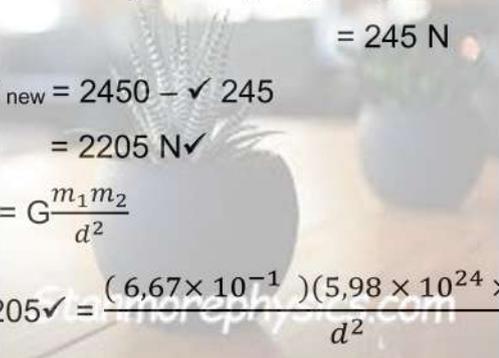
OPTION 3/OPSIE 3

g_e = 9,8 m.s⁻²

g_{new} = (0,9) (9,8) ✓✓

= 8,82 m.s⁻²

$g = G\dfrac{M}{d^2}$ ✓

$8,82$ ✓ $= \dfrac{(6,67\times 10^{-11})(5,98 \times 10^{24})}{d^2}$ ✓

d = 6,72479 x 10⁶ m

d from surface/*vanaf oppervlakte* = 6724797,58 – 6,38 x 10⁶ ✓

= 3,45 x10⁵ m ✓

(7)
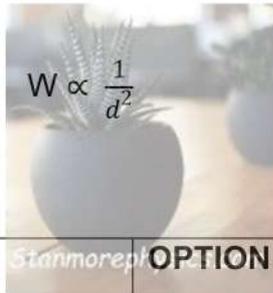
5.3.1 $F \propto \dfrac{1}{d^2}$ ✓✓ OR/*OF* $W \propto \dfrac{1}{d^2}$ (2)

5.3.2

OPTION 1/*OPSIE 1*	OPTION 2/*OPSIE 2*
	POSITIVE MARKING FROM 5.2/ **POSITIEWE NASIEN VANAF 5.2**
$F_{NEW/NUUT}$ = ¼ F ✓ $F_{NEW/NUUT}$ = ¼ x 2450 ✓ = 612,5 N ✓	$F = G\dfrac{m_1 m_2}{d^2}$ ✓ $F = \dfrac{(6,67\times 10^{-11})(5,98 \times 10^{24} \times 250)}{(3,45 \times 10^5)^2}$ ✓ F = 612,5 N ✓

(3)

[13]

QUESTION 6/*VRAAG 6*

6.1

> **NOTE/*NOTA***: -1 mark for each key word/ phrase omitted in the correct definition. If the word "force" is omitted 0 marks / *-1 punt vir elke sleutelwoord/-frase wat in die korrekte definisie weggelaat is. As die woord "krag" weggelaat word 0 punte*

The magnitude of the electrostatic **<u>force</u>** exerted by one point charge (Q_1) on another point charge (Q_2) <u>is directly proportional to the product of the (magnitudes) of the charges</u> ✓and <u>inversely proportional to the square of the distance (r) between them.</u> ✓ / *Die grootte van die elektrostatiese **krag** wat deur een puntlading (Q1) op 'n ander puntlading (Q2) uitgeoefen word, <u>is direk eweredig aan die produk van die (groottes) van die ladings</u> en <u>omgekeerd eweredig aan die kwadraat van die afstand (r) tussen hulle.</u>*   (2)
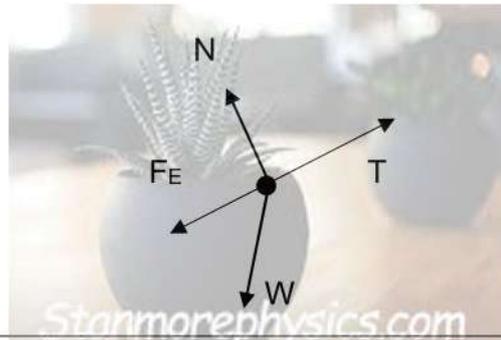
6.2

> NOTE/*NOTA*:
> - 1 mark for all substitutions/*1 punt vir alle substitusies*
> - If negative charge substituted max 2/3 / *As negatiewe lading in vervang is, maks 2/3*

$$F = k \frac{Q_1 Q_2}{r^2} \quad ✓$$

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

$$r = 0{,}0164 \text{ m} \checkmark \text{ or/of} \quad (0.02\text{m})$$ (3)

6.3

Accept the following symbols/*aanvaar die volgende simbole*	
N ✔	F_N / normal force / *normaalkrag*
W ✔	F_g /mg / weight / *gewig*
T ✔	Tension / *spanning* / F_T / F_A / F_K / F_P
F_E ✔	F_K / F / coulombic force / electrostatic force / *coulombiese krag / elektrostatiese krag*

Notes/Nota:
- Mark awarded for label and arrow/*Punt toegeken vir byskrif en pyl*
- Do not penalise for length of arrows since drawing is not to scale/*moenie lengtes van pyle penaliseer nie. Skets was nie volgens skaal nie.*
- Any other additional force(s) Max ¾/*enige addisionele krag(te) Maks ¾*
- If force(s) do not make contact with body max ¾/*As krag(te) nie kontak maak met liggaam nie, maks ¾*
- If w is not shown but w// and w are shown give 1 mark for both/ *As w nie getoon word nie, maar w// en w getoon word, gee 1 punt vir albe*i

6.4.1

F_{net} = ma

T - F_E – $W_{//}$ = ma   ✔any one/*enige een*

T - F_E – $W_{//}$ = 0

T – 1,4 x 10^{-3} ✔ - (0.02)(9,8)sin 30^0✔ =0 ✔

T = 0,10 N ✔ or/*of* (0.0994 N)

OR/*OF*

F_{net} = ma

T - F_E – $W_{//}$ = ma   ✔ any one/*enige een*

T - F_E – $W_{//}$ = 0

T – 1,4 x 10^{-3}✔ - (0.02)(9,8)cos 60^0 ✔=0 ✔

T = 0,10 N ✔ or/*of* (0.0994 N)   (5)

6.4.2 **POSITIVE MARKING FROM QUESTION 6.2/POSITIEWE NASIEN VANAF 6.2**

$$E = k\frac{Q}{r^2}$$

$$E_{net} = E_R + E_K$$

$$E_{net} = E_R + E_K \qquad \checkmark \text{ any one/enige een}$$

$$E_{net} = k\frac{Q_P}{r^2} + k\frac{Q_K}{r^2}$$

$$= \frac{(9 \times 10^9)(6 \times 10^{-9})}{(0,0164 + 0,04)^2} \checkmark\checkmark - \frac{(9 \times 10^9)(7 \times 10^{-9})}{(0,04)^2} \checkmark$$

$$= -22\,398,99$$

$$= 22\,398,99 \text{ N.C}^{-1} \checkmark \text{down (the incline)/towards the}$$
charges$\checkmark$ /(teen die helling) afwaarts/na die ladings

(6)