KWAZULU-NATAL PROVINCE

EDUCATION

REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 11

PHYSICAL SCIENCES

COMMON TEST

MARCH 2023

MARKING GUIDELINE

NB: This marking guideline consists of 8 pages.

Stanmorephysics

QUESTION ONE

1.1 A ✓✓
1.2 C ✓✓
1.3 B ✓✓
1.4 D ✓✓
1.5 C ✓✓
1.6 D ✓✓
1.7 C ✓✓

7 x 2 = [14]

QUESTION TWO

2.1

2.1.1 It is a single force that can represent a number of forces acting on an object in both magnitude and direction. ✓✓ (2 or 0) (2)

2.1.2 **OPTION 1** : $\Sigma Rx = (-240) + (-200\cos 40^0) + (350\cos 70^0)$ ✓= - 273,502 N

OPTION 2 : $\Sigma Rx = (-240) + (-200\sin 50^0) + (350\sin 20^0)$ ✓= - 273,502 N

OPTION 3 : $\Sigma Rx = 240\cos 180^0 + 200\cos 220^0 + 350\cos 70^0$ ✓ = - 273,502 N

OPTION 1 : $\Sigma Ry = 350\sin 70^0 + (-200\sin 40^0)$ ✓= 200,335 N

OPTION 2 ; $\Sigma Ry = (350\cos 20^0) + (-200\cos 50^0)$ ✓= 200,335 N

OPTION 3 : $\Sigma Ry = 350\sin 70^0 + 200\sin 220^0$ ✓= 200,335 N

$R_{NET}^2 = R_X^2 + R_Y^2$

$= (-273,502)^2$ ✓+ $(200,335)^2$✓

R_{NET} = 339,02 N ✓ (Accept 339,024 N) (5)

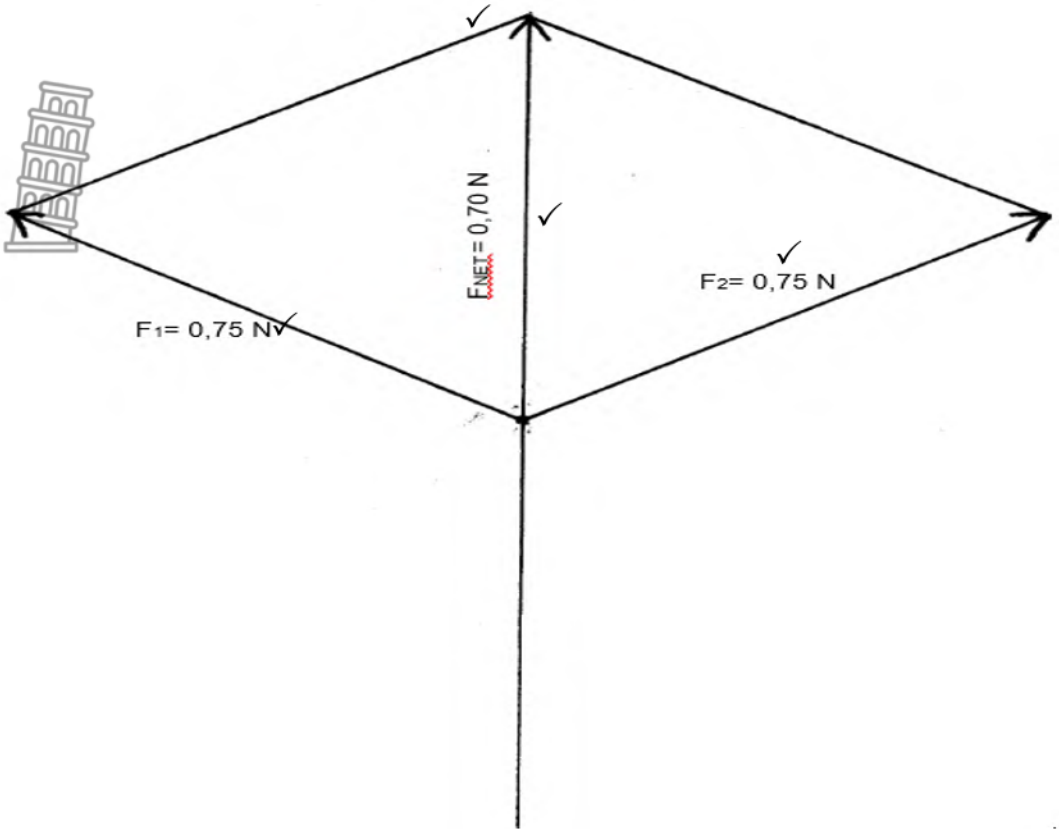
2.2

2.2.1 $F_1 = mg = (0,077)(9,8)$ ✓= 0,755 N✓ (2)

2.2.2 Using a mirror allows for a more accurate marking of the string. ✓ The shadow of the string (on the page) appears to change when viewed from different angles (Error of parallax) ✓. (2)

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2.2.3



Marking Rubric : Force diagram	
Criteria	Mark allocation
Both forces F_1 and F_2 drawn correctly	2 mark
Parallelogram completed	1 mark
Resultant force drawn correctly (Range 6,8 -7,2)	1 mark

(4)

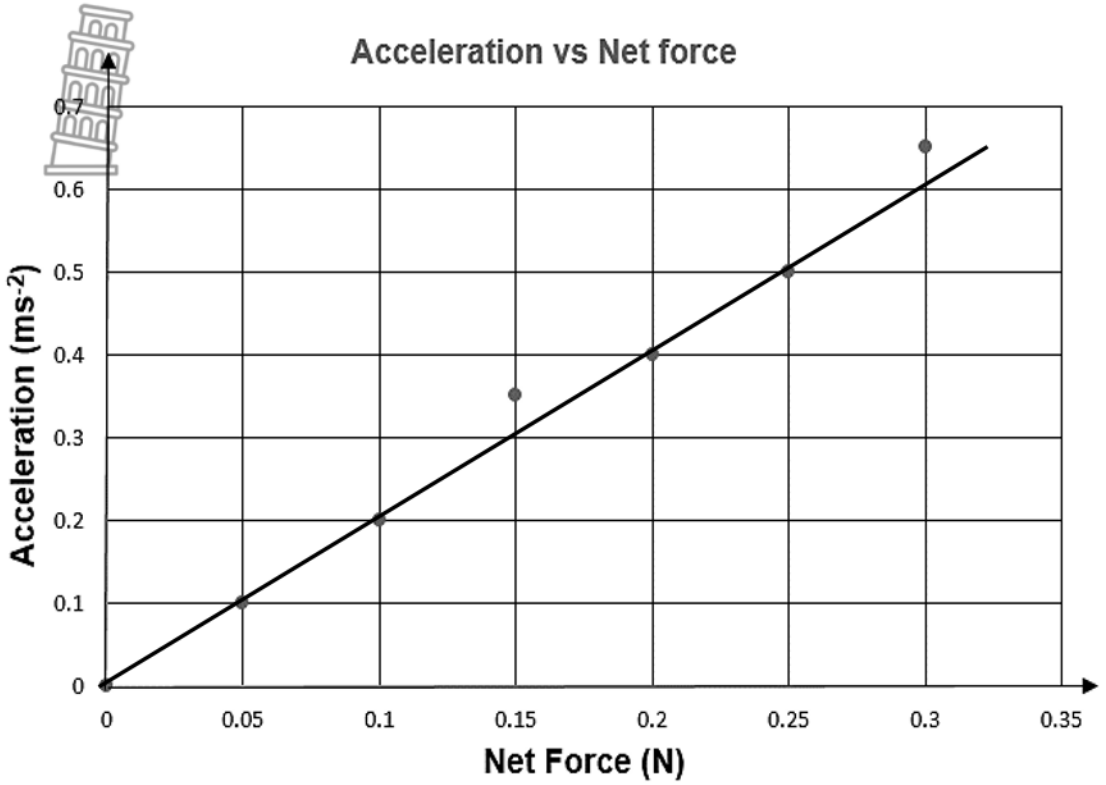
2.2.4 Mass of x = 0,086 kg✓✓ (2)

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QUESTION 3

3.1.1 mass✓ (1)

3.1.2



Criteria	Mark allocation
line of best fit correctly drawn through the points	1

(1)

3.1.3 Directly proportional ✓ (1)

3.1.4 0,5 ms^{-2} ✓✓ (2)

3.1.5 $\frac{1}{m} = \frac{\Delta a}{\Delta F_{net}}$

$\frac{1}{m} = \frac{0,7 - 0}{0,35 - 0}$ ✓✓

m = 0,5 kg ✓

OR

$F_{NET} = ma$

0,35 = m(0,7)

m = 0,5 kg

(3)

3.2.1 If a non zero <u>resultant force</u> acts on an object at rest, the object accelerates in the direction of the resultant force, this <u>acceleration is directly proportional to the force</u> ✓and <u>inversely proportional to the mass of the object.</u>✓ (2)

3.2.2



F_N / N/Normal ✓

T/F_T/Tension✓

✓

f_K/kinetic friction

W/F_g/Weight ✓

$F_{applied}$ /F/200 N ✓

(5)

3.2.3

50 kg block		**25 kg block**
$F_{Net} = ma$ ✓		$F_{Net} = ma$
$F_T + (-f_k) = 50(1,25)$ ✓		$200 + (-½ f_k) + (-F_T) = 25(1,25)$
$F_T = 62,5 + f_k$ …..(1)		$200 - ½ f_k - F_T = 31,25$ ✓….(2)
Substitute (1) in (2)		
$200 - ½ f_k - (62,5 + f_k) = 31,25$	**OR**	$200 - ½ f_k - (62,5 + f_k) = 31,25$
$f_k = 70,833$ N		$f_k = 70,833$ N

$f_k = \mu_k F_N$ ✓

70,833✓ = μ_k (50)(9,8)✓

$\mu_k = 0,144$

(6)

POSITIVE MARKING FROM Q 3.2.3

3.2.4

$F_T = 62,5 + f_k$	**OR**	$200 - ½ f_k - F_T = 31,25$
$= 62,5 + 70,833$ ✓		$200 - ½ (70,833) - F_T = 31,25$✓
$= 133,33$ N ✓		$F_T = 133,33$ N ✓

(2)

3.3.1 INCREASES✓ (1)

3.3.2 DECREASES ✓

Normal force increases✓

Frictional force increases✓

Net force decreases✓ (4)

POSITIVE MARKING from Q 3.3 to 3.4.1

3.4.1 $Fg_{//} = mg\sin\theta$

$= (5,8)(9,8)\sin 25^0$ ✓

$= 24,022$ N



$F_{Net} = ma$

$F + (-f_K) + (-Fg_{//}) = ma$

$F - (51,51) - (24,022)$✓ = 0 ✓

$F = 75,53$ N ✓

(4)

3.4.2 The block will continue in its original direction of motion ✓✓by virtue of its inertia. Thereafter it will come to rest ✓(since the kinetic friction is greater than the component of weight (Fg//) acting parallel and down the incline.) (3)

[35]

QUESTION 4

4.1 Every body in the universe attracts every other body with a gravitational force that is directly proportional to the product of their masses✓ and inversely proportional to the square of the distance between their centres. ✓
(Marks must only be awarded if the definition is in context with the gravitational law) (2)

4.2 $F = \frac{Gm_1m_2}{r^2}$✓

10500✓ $= \frac{6{,}67 \times 10^{-11} \cdot 6\,x10^{24} \cdot 1500}{(R)^2}$ ✓

R = 7,56 x 10^6 m

Distance above the surface of the Earth = 7,56 x10^6 – 6,38 x 10^6✓

= 1,18 x 10^6 m

= 1,18 x 10^3 km✓ (5)

[7]

QUESTION 5

5.1.1 Total charge in an isolated system remains constant (2)

5.1.2 $Q = \frac{Q_1+Q_2+Q_3}{3}$

$= \frac{(-2 \times 10^{-11}) + 6 \times 10^{-11} + (-5 \times 10^{-11})✓}{3✓\ (dividing\ by\ 3)}$

= – 3,33 X10 $^{-12}$ C✓ (3)

5.1.3 $6 \times 10^{-11} + x = -3{,}33 \times 10^{-12}$✓

x = – 6,33 x 10^{-11} C✓

During contact sphere B gains electrons (negative charge).✓ (3)

5.2.1 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✓. (2)

5.2.2 $F = \frac{k Q_1 Q_2}{r^2}$ ✓

$= \frac{9 \times 10^9 \cdot 4 \times 10^{-9} \cdot 8 \times 10^{-9}}{(0,25)^2}$ ✓✓

$= 4,61 \times 10^{-6}$ N✓ (4)

5.2.3 **POSITIVE MARKING FROM Q5.2.3**

$F = \frac{k Q_1 Q_2}{r^2}$

$= \frac{9 \times 10^9 \cdot 12 \times 10^{-9} \cdot 8 \times 10^{-9}}{(x)^2}$ ✓

$F_{NET} = 0$ ✓

$4,61 \times 10^{-6}$ ✓ $- \frac{9 \times 10^9 \cdot 12 \times 10^{-9} \cdot 8 \times 10^{-9}}{(x)^2}$ ✓ $= 0$

$4,61 \times 10^{-6} = \frac{9 \times 10^9 \cdot 12 \times 10^{-9} \cdot 8 \times 10^{-9}}{(x)^2}$

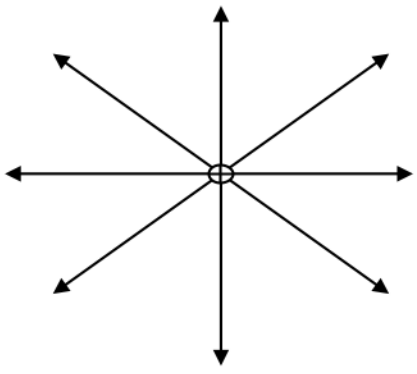
$x = 0,433$ m✓ (5)

[19]

QUESTION 6

6.1 Electric field is a region (in space)✓ where (in which) an (electric) charge experiences a (electric) force. ✓ (2)

6.2.1



Criteria	Mark allocation
All direction of arrows correctly drawn,field lines do not cross each other	1
Correct shape	1

(2)

6.2.2 $E = \frac{k \cdot Q}{r^2}$ ✓

$= \frac{9x10^{9} \cdot 8x10^{-9}}{(0,18)^2}$ ✓ ✓

$= 2222,22\ N \cdot C^{-1}$ ✓ (4)

[8]

TOTAL : 100