KWAZULU-NATAL PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 11

PHYSICAL SCIENCES

COMMON TEST

MARCH 2025

MEMORANDUM

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NB: This memorandum consists of 8 pages.

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QUESTION ONE

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

7 x 2 = [14]

QUESTION TWO

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

2.2.1 **OPTION 1**: Σ Rx = (250cos30^0) +(400 cos70^0) + (-300cos50^0)✓= +160,48N✓

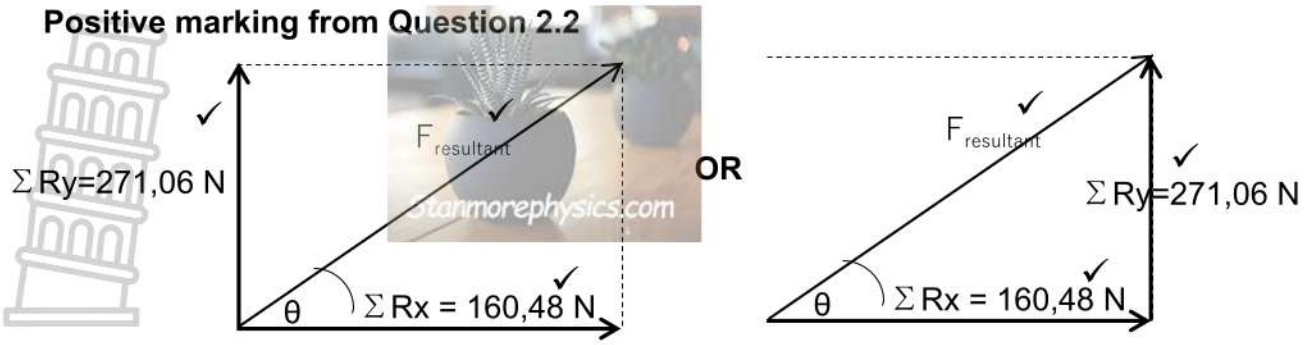
OPTION 2 : Σ Rx = (250 sin60^0) +(400 sin20^0) + (-300sin40^0) ✓= 160 ,48 N✓ (2)

2.2.2 **OPTION 1** : Σ Ry = 400 sin70^0 +250 sin30^0 + (- 300 sin50^0)✓= +271,06 N ✓

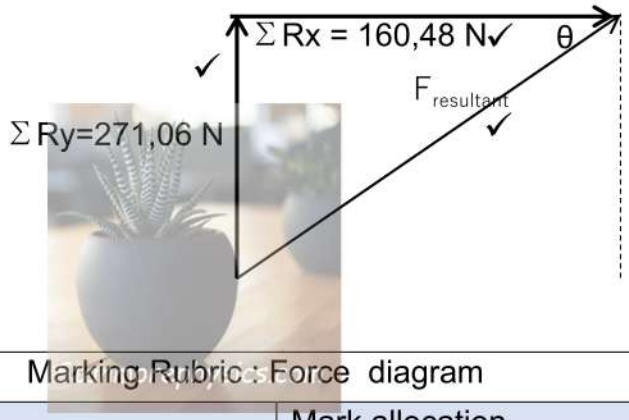
OPTION 2 ; Σ Ry = 400 cos20^0 +250 cos 60^0 + (- 300 cos 40^0)✓=271,06 N✓ (2)

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2.3 **Positive marking from Question 2.2**



OR



Marking Rubric : Force diagram	
Criteria	Mark allocation
ΣRx drawn correctly	1 mark
ΣRy drawn correctly	1 mark
Resultant force drawn correctly	1 mark

(3)

2.4 **POSITIVE MARKING FROM Q2.2**

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

$= (160,48)^2$ ✓ $+ (271,06)^2$ ✓

$R_{NET} = 315,00$ N ✓

$\tan \theta = \frac{271,06}{160,48}$ ✓

θ = 59,37^0 North of East ✓ **OR** at a bearing of 30,63°

OR 30,63° East of North

(5)

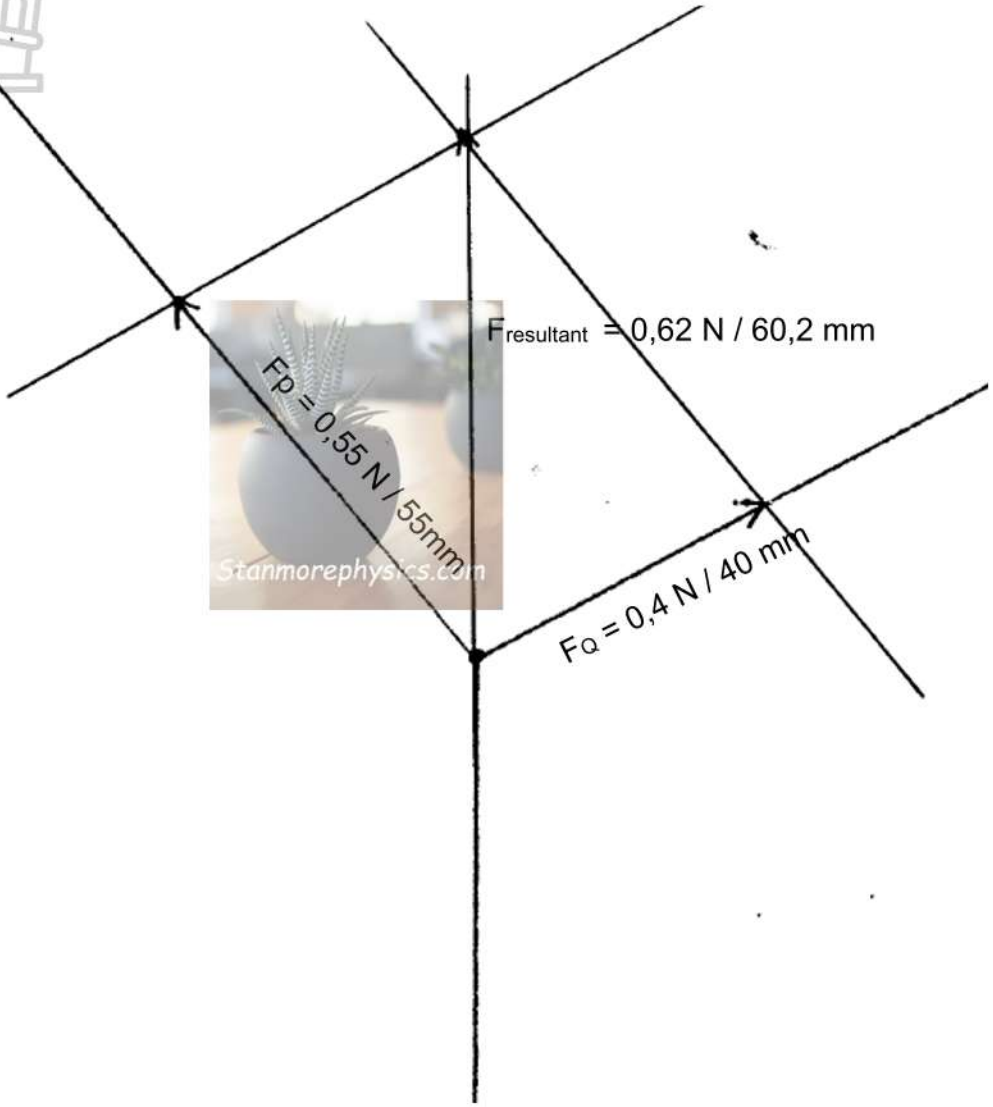
[14]

QUESTION 3

3.1 0 N / zero ✓ (1)

3.2 $F_P = mg$
$= (0,056 \times 9,8)$ ✓
$= 0,55$ N✓ (2)

3. 3.1



MARKING RUBRIC : FORCE DIAGRAM	
Criteria	Mark allocation
F_P and F_Q drawn correctly .	2 x 1 = 2 marks
Parallelogram completed correctly	1 mark
Resultant force drawn correctly	1 mark
Final answer: Resultant force (correct conversion using scale) Accept (0,58N – 0,64 N)	1 mark

(5)

POSITIVE MARKING FROM QUESTION 3.3.1

3.3.2 $W_X = mg$
$0,62$✓ $= X \times 9.8$✓
$X = 0,063$ kg or 63g✓ (3)

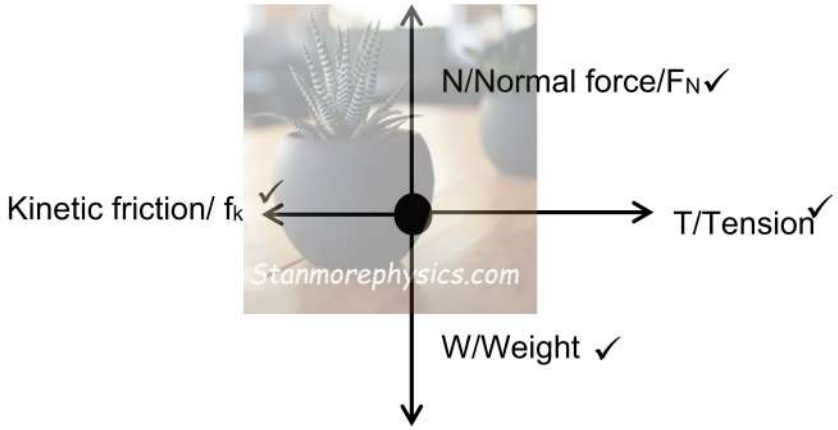
[11]

QUESTION 4

4.1 It is the force that opposes the motion of a moving object ✓relative to a surface. ✓ (2)

NOTE: Only award the second mark if the context is correct.

4.2



(4)

4.3 $v_f = v_i + a\Delta t$ ✓
$30 = 0 + a(25)$✓
$a = 1,2\ m \cdot s^{-2}$
$F_{net} = ma$
$T + (-fk) = ma$ ✓ (any one)
$T - 200 = 750(1,2)$ ✓
$T = 1100$ N ✓ (5)

4.4.1 0 N /zero✓ (1)

4.4.2 200 N✓ (1)

4.4.3 200 N✓ (1)

[14]

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QUESTION 5

5.1 When a net/resultant force acts on an object, the object accelerates in the direction of the resultant force. This acceleration is directly proportional to the force ✓ and inversely proportional to the mass of the object.✓ (2)

5.2.1 $F_{net} = ma$
$T + (-W_B) = ma$
$T = W_B$ ✓ (any one)

$T - (12 \times 9,8) = 12(0)$ **OR** $T = 12 \times 9.8$✓

$T = 117,60$ N✓ (3)

5.2.2 **POSITIVE MARKING FROM QUESTION 5.2.1**

$F_{net} = ma$
$F + (-f_K) + (-T) = 0$
$F = f_K + T$ ✓ (any one)

$125 + (-f_K) + (-117,60)$ ✓ $= 0$ **OR** $125 = f_K + 117,60$

$f_K = 7,40$ N✓ (3)

5.2.3 **POSITIVE MARKING FROM QUESTION 5.2.2**

$f_k = \mu_k N$✓

$7,40 = (0,25)(9,8X)$ ✓

$X = 3,02$ kg✓ (3)

5.3 Increases✓, acceleration increases since the net/resultant force increases.
Accept: $a \propto F_{net}$✓ (2)

[13]

QUESTION 6

6.1 It is the force that opposes the tendency of motion of a stationary object✓ relative to a surface. ✓

NOTE: Only award the second mark if the context is correct. (2)

6.2 $W_{//} = mg \sin\theta$

$= (35)(9,8)(\sin 20°)$ ✓

$= 117,31$ N✓ (2)

6.3 $f_s^{max} = \mu_s N$ ✓

$= \underline{0,3 \times (35 \times 9,8 \times \cos 20°)}$ ✓

$= 96,69$ N

$f_s^{max} \geq f_k$ ✓

$f_k = W_{//} - F_{net}$ ✓

$f_s^{max} \geq W_{//} - F_{net}$

$96,69 \geq 117,31 - 35a$ ✓

$\therefore a \geq 0,589\ m \cdot s^{-2}$ (5)

[9]

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QUESTION 7

7.1 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. ✓

NOTE: Marks must only be awarded if the definition is in context with the gravitational law) (2)

7.2 $F = \frac{Gm_1m_2}{r^2}$✓

$= \frac{(6,67 \times 10^{-11})(1,99 \times 10^{30})(5,98 \times 10^{24})}{(150 \times 10^{9}\checkmark)^2\checkmark}$ ✓

$= 3,53 \times 10^{22}$ N ✓

NOTE: If the conversion is incorrect, max $^3/_5$; Award a mark for squaring the incorrectly converted mark. (5)

[7]

QUESTION 8

8.1 The force experienced by a unit positive charge placed at the point. ✓✓ (2)

8.2.1 $E_P = \frac{kQ}{r^2}$ ✓

$= \frac{9\times10^9\times4\times10^{-9}}{(0{,}0125)^2}$ ✓

$= 230\ 400\ N\cdot C^{-1}$

$(2{,}30 \times 10^5\ N\cdot C^{-1})$

$E_Q = \frac{kQ}{r^2}$

$= \frac{9\times10^9\times12\times10^{-9}}{(0{,}0125)^2}$ ✓

$= 691\ 200\ N\cdot C^{-1}$

$(6{,}91 \times 10^5\ N\cdot C^{-1})$

$E_{NET} = 230\ 400 + 691\ 200$ ✓

$= 9{,}22 \times 10^5\ N\cdot C^{-1} / 921\ 600\ N\cdot C^{-1}$ ✓

NOTE: If an incorrect value is used for k, award the second and third marks if all other substitutions are correct, and for the final answer if it is computed correctly. This also applies for Question 8.5 (5)

8.2.2 **POSITIVE MARKING FROM QUESTION 8.2.1**

$F = Eq$ ✓

$= (9{,}22 \times 10^5)(1{,}6 \times 10^{-19})$ ✓

$= 1{,}47 \times 10^{-13}$ N ✓ (3)

8.3 $Q = \frac{Q_1 + Q_2}{2}$

$Q = \frac{-4 + 12}{2}$ ✓

$= 4$ nC ✓ (2)

8.4 $-4 - x = 4$ ✓ **OR** $12 + x = 4$

$x = -8$ nC ✓ $x = -8$ nC (2)

8.5 **POSITIVE MARKING FROM QUESTION 8.3**

$F = \frac{kQ_1Q_2}{r^2}$ ✓

$= \frac{9\times10^9\times4\times10^{-9}\ 4\times10^{-9}}{(0{,}025)^2}$ ✓ ✓

$= 2{,}30 \times 10^{-4}$ N away from each other ✓

ACCEPT: $2{,}30 \times 10^{-4}$ N repulsion (4)

[18]

TOTAL MARKS: 100

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