Education

KwaZulu-Natal Department of Education
REPUBLIC OF SOUTH AFRICA

PHYSICAL SCIENCES P1

MARKING GUIDELINES

EXAMINATION

NOVEMBER 2025



NATIONAL

SENIOR CERTIFICATE

GRADE 11

NB: This marking guideline consists of 10 pages.

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QUESTION ONE

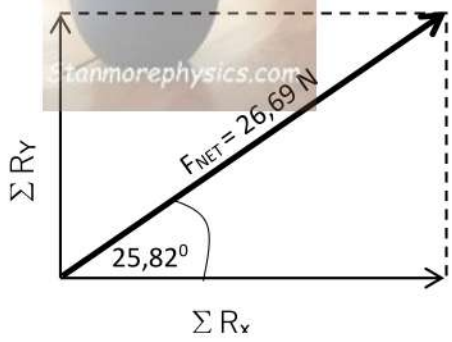
1.1 C ✓✓
1.2 A ✓✓
1.3 C ✓✓
1.4 B ✓✓
1.5 D ✓✓
1.6 A ✓✓
1.7 D ✓✓
1.8 C ✓✓
1.9 B ✓✓
1.10 C ✓✓

[20]

QUESTION TWO

2.1 It is that single vector that has the same effect as two or more vectors acting together. ✓✓ (2 or 0) (2)

2.2



$\underline{\Sigma Rx}$ = 26,69 cos 25,82° ✓
ΣRx = 24,025 N

$\underline{\Sigma Ry}$ = 26,69 sin 25,82° ✓
ΣRy = 11,625 N

ΣRx : ✓
$\underline{24,025 = (-B\cos\Theta + 44\cos 28°)}$
$B\cos\Theta = 14,825$ N

ΣRy : ✓
$\underline{11,625 = 44\sin 28° + (B\sin\Theta) + (-31)}$
$B\sin\Theta = 21,968$ N

OR $\underline{24,025 = (-B\cos\Theta + 44\sin 62°)}$
$B\cos\Theta = 14,825$ N

$\underline{11,625 = 44\cos 62° + (B\sin\Theta) + (-31)}$
$B\sin\Theta = 21,968$

$R_B^2 = B_X^2 + B_Y^2$
$R_B^2 = (14,825)^2$✓ $+(21,968)^2$✓
$R_B = 26,502$ N✓ (7)

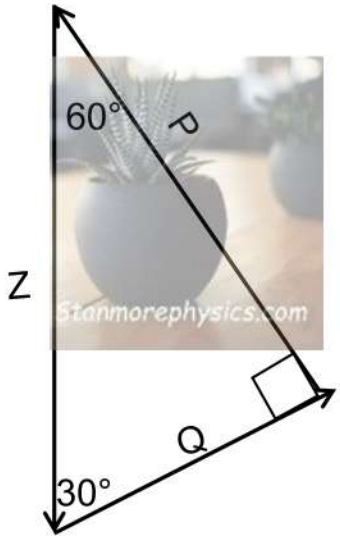
2.3 $\text{Tan } \Theta = \frac{21,968}{14,825}$ ✓
$\Theta = 55,99^0$✓ (2)
[11]

QUESTION 3

3.1 The net force acting on an object is zero ✓✓ (2)

3.2

3.2.1



Marking Rubric: Force diagram	
Criteria	Mark allocation
Three forces correctly drawn and labeled, in right-angled triangle.	1
Direction of forces correctly shown.	1
Any two angles correctly shown in diagram.	1

(3)

3.3.1

OPTION 1:	**OPTION 2**:
$\tan 30° \checkmark = \frac{50}{T_Q}\checkmark$ $T_Q = 86{,}60\ N\checkmark$	$T_P \cos 30° = T_Q \cos 60°\checkmark$ $T_Q = \frac{50 \cos 30°}{\cos 60°}\checkmark$ $T_Q = 86{,}60\ N\checkmark$

(3)

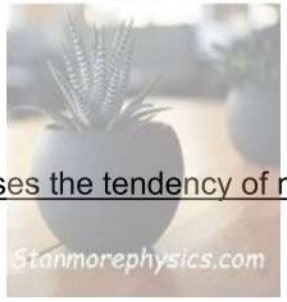
3.3.2

OPTION 1:	**OPTION 2**:
$\sin 30° = \frac{50}{T_Z}\checkmark$ **OR** $\cos 60° = \frac{50}{T_Z}$ $T_Z = 100\ N$ $W = mg$ $100\checkmark = m\ (9{,}8)\ \checkmark$ $m = 10{,}20\ kg\checkmark$	**OPTION 2**: $T_Z^2 = T_P^2 + T_Q^2 = (50)^2 + (86{,}6)^2\ \checkmark$ $T_Z = 100\ N$ $W = mg$ $100\checkmark = m\ (9{,}8)\ \checkmark$ $m = 10{,}20\ kg\checkmark$

(4)

3.4 Z .✓ It is opposite the largest angle✓ **OR** it is the hypotenuse of the triangle (2)

[14]



QUESTION 4

4.1 Force that opposes the tendency of motion ✓of a stationary object relative to a surface. ✓ (2)

4.2 $F_{NET} = ma$
$F_{gl\,l} + f_S = ma$ } ✓ (Any one)
$mg \sin\Theta\checkmark - \mu_s \cdot mg \cos\Theta\ \checkmark = 0\ \checkmark$
$\mu_s = \tan\Theta$ (4)

4.3 X : $\mu_s = \tan\Theta$
$= \tan 32°\checkmark$
$= 0{,}62\checkmark$
Y : $\frac{0{,}60 + 0{,}70 + 0{,}68 + 0{,}62}{4}\ \checkmark\ = 0{,}65\checkmark$ (4)

4.4 LESS THAN✓✓ (2)

[12]

QUESTION 5

5.1.1 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)

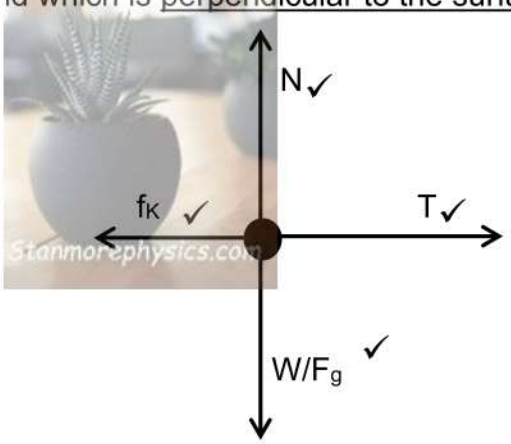
5.1.2 $F_{NET} = ma$
$T + (-W) = ma$ ✓ (Any one)
$17000 - (1500 + 80)(9,8) = 1580\ a$ ✓
$a = 0,96\ m \cdot s^{-2}$ ✓ (4)

5.1.3 Greater than. ✓ As the lift accelerates upwards,
$F_{scale} = W + F_{net}$ ✓✓ ∴ Reading on the scale = $F_{scale} > W$ (3)

5.1.4 $F_{scale} = W - F_{net}$
$= 80(9,8)$ ✓ $- (80)(1)$ ✓
$= 704$ N ✓ (3)

5.2.1 The force or the component of a force which a surface exerts on an object in contact with it, and which is perpendicular to the surface. ✓✓ (2)

5.2.2



(4)

5.2.3 $f_k = \mu_k \cdot F_N$ ✓
$= 0,25 \times (20)(9,8)$ ✓
$= 49$ N
$F_{NET} = ma$
$T + (-f_k) = ma$ ✓ (Any one)
$T - 49 = 20\ a$ ✓ .....(1)

$mg - T = ma$
$10(9,8) - T = 10a$ ✓
$T = -10a + 98$ .....(2)

From (1) and (2):
$a = 1,63\ m \cdot s^{-2}$. ✓ (6)

5.2.4 Increases. ✓

F_{NET} acting on the system decreases, while m_{TOT} increases ∴ a decreases. ✓

For the 10 kg block, $T = m_2(g - a)$

$m_2(g - a)$ increases when a decreases and m_2 and g remain constant. ✓

∴ T increases.

(3)

[27]

QUESTION 6

6.1 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. Any reference to charge: 0/2))

(2)

6.2

OPTION 1:

$W = mg$

$= 120(9,8)$ ✓

$= 1176$ N

$F_{Earth} = \frac{Gm_1m_2}{r^2}$

$= 1176$ N

$F_{Jupiter} = \frac{G300\ m_1m_2}{(11r)^2}$ ✓

$= \frac{300}{121}(1176)$ ✓

$= 2915,70$ N ✓

OPTION 2:

$g = \frac{G300\ M_E}{(11R_E)^2}$ ✓

$= \frac{300}{121}(9,8)$ ✓

$= 24,3\ m \cdot s^{-2}$

$W = mg$

$= 120(24,3)$ ✓

$= 2916$ N ✓

OPTION 3:

$F = G\frac{m_1m_2}{r^2}$ ✓

$= \frac{6,67 \times 10^{11} \times 300 \times 5,98 \times 10^{24} \times 120}{(11 \times 6,38 \times 10^6)^2}$ ✓ ✓

$= 2915,43$ N ✓

(4)

[6]

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QUESTION 7

7.1.1 So that there is no conduction of the charge to or from the sphere. ✓ (1)

7.1.2 Q to P✓ . Sphere Q has an excess of electrons✓ (2)

7.1.3 $Q_{\text{AFTER CONTACT}} = \frac{Q1+Q2}{2}$

$= \frac{(+5)+(-8)}{2}$✓

$= -1,5\ \mu C$

Sphere P gains charge :

$\Delta Q = -1,5 - 5$✓

$= -6,5\ \mu C$

OR

Sphere Q loses charge :

$\Delta Q = -1,5 - (-8)$✓

$= 6,5\ \mu C$

$n = \frac{Q}{e}$

$= \frac{6,5\times10^{-6}}{1,6\times10^{-19}}$ ✓ ✓

$= 4,063 \times 10^{13}$ electrons✓ (5)

7.1.4 Law of Conservation of Charge✓. The total electric charge in an isolated system remains constant. ✓✓ (3)

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7.2

7.2.1



- Correct pattern✓
- Field lines directed outwards✓

(2)

7.2.2 The magnitude of the <u>electrostatic force</u> exerted by one point charge (Q_1) on another point charge (Q_2) is <u>directly proportional to the product of the</u> magnitudes of the <u>charges</u> ✓<u>and inversely proportional to the square of the distance (r) between them</u>✓. (2)

7.2.3 $F = \frac{kQ_1Q_2}{r^2}$ ✓

$= \frac{9\times10^9\left(6\times10^{-9}\right)\left(9\times10^{-9}\right)}{(0,025)^2}$ ✓

$= 7,78 \times10^{-4}$ N ✓ (4)

7.2.4 $E_{R\rightarrow z} = \frac{kQ}{r^2}$ ✓

$= \frac{9\times10^9\left(6\times10^{-9}\right)}{(0,025+x)^2}$ ✓

$= \frac{54}{(0,025+x)^2}$

$E_{S\rightarrow z} = \frac{kQ}{r^2}$

$= \frac{9\times10^9\left(9\times10^{-9}\right)}{x^2}$ ✓

$= \frac{81}{x^2}$

$E_{NET} = E_{R\rightarrow z} + E_{S\rightarrow z}$

$-7,66\times10^5 = \frac{54}{(0,025+x)^2} - \frac{81}{x^2}$ ✓ OR $7,66\times10^5 = -\frac{54}{(0,025+x)^2} + \frac{81}{x^2}$

X = 0,01 m ✓

If the substitution for the fourth mark is correct with the correct signs, and if the final answer is incorrect, ignore the incorrect answer and award the fifth mark.

(5)
[24]

QUESTION 8

8.1 The magnitude of the induced emf across the end of a conductor is directly proportional to the rate of change in the magnetic flux linked with the conductor. ✓✓ (2)

8.2 $\frac{\Delta\phi}{\Delta t} = \frac{6}{4}$ ✓ (or any ordered pair from the graph)

$= 1,5$ (Wbs^{-1}) ✓ (3)

8.3 **POSITIVE MARKING FROM QUESTION 8.2**

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

$= -120$ ✓ (1,5) ✓

$= -180$ V ✓ (Ignore the negative sign) (4)

8.4 **ANY 2**: Increase the:

- speed with which the bar magnet moves through the solenoid. ✓
- number of turns in the solenoid. ✓
- strength of the magnetic field. ✓

(2)
[11]

QUESTION 9

9.1.1 X and Y are equal bright. ✓ They have the same resistance and current ✓
OR Power dissipated by each bulb is the same. (2)

9.1.2 A_1✓ (1)

9.1.3 The current through Z is half the current through X
$V_1 = IR$ ✓
$V_2 = ½ IR$ ✓
$V_1 = 2 V_2$ (2)

9.1.4 Increases. ✓
When Y burns out, R_{TOT} increases, and I_{TOT} decreases.✓
I_X decreases, hence V_1 decreases,✓ while V_{TOT} remains constant.
$V_{TOT} = V_1 + V_2$✓ ∴ V_2 increases. (4)

9.2 **OPTION 1**
$W = P \cdot \Delta t$
$= 2000 (15X60) / 2 \times 0,25$✓ OR $= 2 \times 0,25$
$= 1,8000 X10^6$ J $= 0.5$ kWh
$= 0,5$ kWh

Cost of using the iron for 15 minutes = 0,5 x R2,80✓
= R 1,40✓

OPTION 2
Cost = P x Δt x tarrif
= 2 x 0,25✓ x R2,80✓
= R1,40✓ (3)
[12]

QUESTION 10

10.1 $R = \frac{V}{I}$ ✓

$10 = \frac{8}{I}$ ✓

$I = 0,8$ A ✓ (3)

10.2 **POSITIVE MARKING FROM QUESTION 10.1**

OPTION 1

$V_{EXT} = IR$ ✓

$11,8$ ✓ $= 0,8\ (10 + \frac{20R}{20+R})$ ✓

$R = 6,23\ \Omega$ ✓

OPTION 2

$V_p = 11,8 - 8$ ✓

$= 3,8$ V

$I_{20\Omega} = \frac{V}{R}$

$= \frac{3,8}{20}$ ✓

$= 0,19$ A

$I_R = 0,8 - 0,19$ ✓

$= 0,61$ A



$R = \frac{V}{I}$

$= \frac{3,8}{0,61}$ ✓

$= 6,23\ \Omega$ ✓ (5)

10.3

OPTION 1	**OPTION 2**
$\frac{1}{R_p} = \frac{1}{6,23} + \frac{1}{20}$ ✓ $R_p = 4,75\ \Omega$ $\varepsilon = I(R + r)$ ✓ $12 = 0,8(4,75 + 10 + r)$ ✓ $r = 0,25\ \Omega$ ✓	$V_{lost} = 12 - 11,8$ ✓ $= 0,2$ V ✓ $V_{lost} = Ir$ ✓ $0,2 = 0,8r$ ✓ $r = 0,25\ \Omega$ ✓

(5)

[13]

TOTAL: 150