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Department:
Education
PROVINCE OF KWAZULU-NATAL

**NATIONAL
SENIOR CERTIFICATE**

GRADE 12

PHYSICAL SCIENCES P1 (PHYSICS)

PREPARATORY EXAMINATIONS

SEPTEMBER 2020

MARKING GUIDELINE

Time: 3 Hours

Marks: 150

This marking guideline has 17 pages.

SECTION A**QUESTION 1**

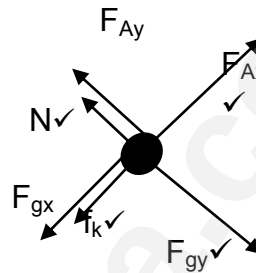
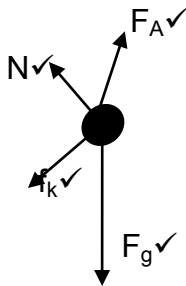
- 1.1 B✓✓ (2)
- 1.2 D✓✓ (2)
- 1.3 D✓✓ (2)
- 1.4 D✓✓ (2)
- 1.5 D✓✓ (2)
- 1.6 A✓✓ (2)
- 1.7 D✓✓ (2)
- 1.8 C✓✓ (2)
- 1.9 C✓✓ (2)
- 1.10 A✓✓ (2)

2 x 10 = **[20]**

SECTION B**QUESTION 2**

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

2.2



	Accept the following symbols
N ✓	F_N /Normal/Normal force
f_k ✓	Kinetic friction force/ f / F_f / f_r
F_A ✓	F / F_{applied}
F_g ✓	W /78,4 N

Notes

- Mark is awarded for label and arrow.
- Do not penalise for length of arrows.
- Deduct 1 mark for any additional force.
- If force(s) do not make contact with body/dot : *Max:3/4*
- If arrows missing but labels are there: *Max:3/4*

(4)

2.3 **Considering the forces parallel to the plane::**

$$\left. \begin{array}{l} F_{\text{net}} = ma \\ F_{\text{net}} = 0 \\ F_{Ax} - f_k - F_{gx} = 0 \\ F_A \cos \theta = f_k + F_{gx} \end{array} \right\} \checkmark$$

$$51 \cos \theta = 1 + 8(9,8) \sin 30^\circ \checkmark$$

$$\theta = 37,98^\circ \checkmark$$

(3)

2.4 POSITIVE MARKING FROM 2.3

Consider the forces perpendicular to the plane:

$$\left. \begin{array}{l} F_{\text{net}} = ma \\ F_{\text{net}} = 0 \\ F_{\text{Ay}} + N - F_{\text{gy}} = 0 \\ F_{\text{A}} \sin \theta + N = F_{\text{gy}} \end{array} \right\} \checkmark$$

$$51 \sin 37,98^\circ + N = 8 \times 9,8 \cos(30^\circ) \checkmark$$

$$\therefore N = 36,51 \text{ N} \checkmark \quad (3)$$

2.5 Increases $\checkmark$ (1)

[13]

QUESTION 3

3.1

3.1.1 UPWARDS IS POSITIVE

$$\begin{aligned} v_f &= v_i + a\Delta t \checkmark \\ 0 &= 12 - 9,8\Delta t \checkmark \\ \Delta t &= 1,2245 \text{ s} \checkmark \end{aligned}$$

UPWARDS IS NEGATIVE

$$\begin{aligned} v_f &= v_i + a\Delta t \checkmark \\ 0 &= -12 + 9,8\Delta t \checkmark \\ \Delta t &= 1,2245 \text{ s} \checkmark \end{aligned}$$

(3)

3.1.2

UPWARDS IS POSITIVE

$$\begin{aligned} v_f^2 &= v_i^2 + 2a\Delta y \checkmark \\ 0 &= 12^2 + 2(-9,8)\Delta y \checkmark \\ \Delta y &= 7,35 \text{ m} \end{aligned}$$

$$\begin{aligned} \therefore \text{Max height} &= 50 + \checkmark 7,35 \\ &= 57,35 \text{ m} \checkmark \end{aligned}$$

OPTION 1

UPWARDS NEGATIVE

$$\begin{aligned} v_f^2 &= v_i^2 + 2a\Delta y \checkmark \\ 0 &= (-12)^2 + 2(9,8)\Delta y \checkmark \\ \Delta y &= -7,35 \text{ m} \end{aligned}$$

$$\begin{aligned} \therefore \text{Maximum height} &= 50 + \checkmark 7,35 \\ &= 57,35 \text{ m} \checkmark \end{aligned}$$

OPTION 2

POSITIVE MARKING FROM 3.1.1

UPWARDS IS POSITIVE

$$\Delta y = \left(\frac{v_i + v_f}{2} \right) \Delta t \checkmark$$

$$[\Delta y = \left(\frac{12 + 0}{2} \right) 1,2245] \checkmark$$

$$\Delta y = 7,35 \text{ m}$$

$$\begin{aligned} \therefore \text{Max height} &= 50 + \checkmark 7,35 \\ &= 57,35 \text{ m} \checkmark \end{aligned}$$

UPWARDS IS NEGATIVE

$$\Delta y = \left(\frac{v_i + v_f}{2} \right) \Delta t \checkmark$$

$$[\Delta y = \left(\frac{-12 + 0}{2} \right) 1,2245] \checkmark$$

$$\Delta y = -7,35 \text{ m}$$

$$\begin{aligned} \therefore \text{Max height} &= 50 + \checkmark 7,35 \\ &= 57,35 \text{ m} \checkmark \end{aligned}$$

OPTION 3**POSITIVE MARKING FROM 3.1.1****UPWARDS IS POSITIVE**

$$\Delta y = v_i \Delta t + \frac{1}{2} a \Delta t^2 \checkmark$$

$$\Delta y = (12)(1,23) + \frac{1}{2}(-9,8)(1,23)^2 \checkmark$$

$$\Delta y = 7,35 \text{ m}$$

$$\begin{aligned} \therefore \text{Maximum height} &= 50 + \checkmark 7,35 \\ &= 57,35 \text{ m} \checkmark \end{aligned}$$

UPWARDS IS NEGATIVE

$$\Delta y = v_i \Delta t + \frac{1}{2} a \Delta t^2 \checkmark$$

$$\Delta y = (-12)(1,23) + \frac{1}{2}(9,8)(1,23)^2 \checkmark$$

$$\Delta y = -7,35 \text{ m}$$

$$\begin{aligned} \therefore \text{Maximum height} &= 50 + \checkmark 7,35 \\ &= 57,35 \text{ m} \checkmark \end{aligned}$$

OPTION 4

$$(K + U)_1 = (K + U)_2 \checkmark$$

$$\left(\frac{1}{2}mv^2 + mgh\right)_1 = \left(\frac{1}{2}mv^2 + mgh\right)_2$$

$$\frac{1}{2}m(12)^2 + m(9,8)(50) \checkmark = \frac{1}{2}m(0)^2 + m(9,8)h \checkmark$$

$$h = 57,35 \text{ m} \checkmark$$

(4)

3.1.3

OPTION 1**UPWARDS POSITIVE**

$$v_f = v_i + a \Delta t \checkmark$$

$$v_f = \frac{12 + (-9,8)(4)}{\checkmark} \checkmark$$

$$v_f = -27,20 \text{ m} \cdot \text{s}^{-1}$$

$$\therefore \text{velocity of the ball is } \underline{27,20 \text{ m} \cdot \text{s}^{-1} \text{ downwards}} \checkmark$$

UPWARDS NEGATIVE

$$v_f = v_i + a \Delta t \checkmark$$

$$v_f = \frac{-12 + (9,8)(4)}{\checkmark} \checkmark$$

$$v_f = 27,20 \text{ m} \cdot \text{s}^{-1}$$

$$\therefore \text{velocity of the ball is } \underline{27,20 \text{ m} \cdot \text{s}^{-1} \text{ downwards}} \checkmark$$

OPTION 2**UPWARDS POSITIVE**

$$\Delta y = v_i \Delta t + \frac{1}{2} a \Delta t^2$$

$$\Delta y = (12)(4) + \frac{1}{2}(-9,8)(4)^2$$

$$\Delta y = -30,40 \text{ m}$$

$$\Delta y = \left(\frac{v_i + v_f}{2}\right) \Delta t \checkmark$$

$$-30,40 = \left(\frac{12 + v_f}{2}\right)(4) \checkmark$$

$$v_f = -27,20 \text{ m} \cdot \text{s}^{-1}$$

$\therefore$ velocity of the ball is 27,20 m·s⁻¹ downwards ✓

UPWARDS NEGATIVE

$$\Delta y = v_i \Delta t + \frac{1}{2} a \Delta t^2$$

$$\Delta y = (-12)(4) + \frac{1}{2}(9,8)(4)^2$$

$$\Delta y = 30,40 \text{ m}$$

$$\Delta y = \left(\frac{v_i + v_f}{2}\right) \Delta t \checkmark$$

$$30,40 = \left(\frac{-12 + v_f}{2}\right)(4) \checkmark$$

$$v_f = 27,20 \text{ m} \cdot \text{s}^{-1}$$

$\therefore$ velocity of the ball is 27,20 m·s⁻¹ downwards ✓

OPTION 3

UPWARDS POSITIVE

$$\Delta y = v_i \Delta t + \frac{1}{2} a \Delta t^2$$

$$\Delta y = (12)(4) + \frac{1}{2}(-9,8)(4)^2$$

$$\Delta y = -30,40 \text{ m}$$

$$v_f^2 = v_i^2 + 2a\Delta y \checkmark$$

$$v_f^2 = (12)^2 + 2(-9,8)(-30,40) \checkmark$$

$$v_f = 27,20 \text{ m} \cdot \text{s}^{-1}$$

$\therefore$ velocity of the ball is 27,20 m·s⁻¹ downwards ✓

UPWARDS NEGATIVE

$$\Delta y = v_i \Delta t + \frac{1}{2} a \Delta t^2$$

$$\Delta y = (-12)(4) + \frac{1}{2}(9,8)(4)^2$$

$$\Delta y = 30,40 \text{ m}$$

$$v_f^2 = v_i^2 + 2a\Delta y \checkmark$$

$$v_f^2 = (-12)^2 + 2(9,8)(30,40) \checkmark$$

$$v_f = 27,20 \text{ m} \cdot \text{s}^{-1}$$

$\therefore$ velocity of the ball is 27,20 m·s⁻¹ downwards ✓

(3)

3.1.4

OPTION 1**UPWARDS POSITIVE**

$$\Delta y = v_i \Delta t + \frac{1}{2} a \Delta t^2 \checkmark$$

$$\Delta y = \frac{(12)(4) + \frac{1}{2}(-9,8)(4)^2}{} \checkmark$$

$$\Delta y = -30,40 \text{ m}$$

$$\therefore \text{Position above the ground} = \underline{50} - \checkmark 30,40 \\ = 19,60 \text{ m} \checkmark$$

UPWARDS NEGATIVE

$$\Delta y = v_i \Delta t + \frac{1}{2} a \Delta t^2 \checkmark$$

$$\Delta y = \frac{(-12)(4) + \frac{1}{2}(9,8)(4)^2}{} \checkmark$$

$$\Delta y = 30,40 \text{ m}$$

$$\therefore \text{Position above the ground} = \underline{50} - \checkmark 30,40 \\ = 19,60 \text{ m} \checkmark$$

OPTION 2**POSITIVE MARKING FROM 3.1.3****UPWARDS POSITIVE**

$$\Delta y = \left(\frac{v_i + v_f}{2} \right) \Delta t \checkmark$$

$$\Delta y = \left(\frac{12 + (-27,20)}{2} \right) (4) \checkmark$$

$$\Delta y = -30,40 \text{ m}$$

$$\therefore \text{Position above the ground} = \underline{50} - \checkmark 30,40 \\ = 19,60 \text{ m} \checkmark$$

UPWARDS NEGATIVE

$$\Delta y = \left(\frac{v_i + v_f}{2} \right) \Delta t \checkmark$$

$$\Delta y = \left(\frac{-12 + 27,20}{2} \right) (4) \checkmark$$

$$\Delta y = 30,40 \text{ m}$$

$$\therefore \text{Position above the ground} = \underline{50} - \checkmark 30,40 \\ = 19,60 \text{ m} \checkmark$$

If candidate calculated 30.40 m in Q 3.1.3. above award 2 marks here.

OPTION 3**POSITIVE MARKING FROM 3.1.3****UPWARDS POSITIVE**

$$v_f^2 = v_i^2 + 2a\Delta y \checkmark$$

$$(-27,20)^2 = (12)^2 + 2(-9,8) \Delta y \checkmark$$

$$\Delta y = -30,40$$

$$\begin{aligned} \therefore \text{Position above the ground} &= \underline{50} - \checkmark 30,40 \\ &= 19,60 \text{ m} \checkmark \end{aligned}$$

UPWARDS NEGATIVE

$$v_f^2 = v_i^2 + 2a\Delta y \checkmark$$

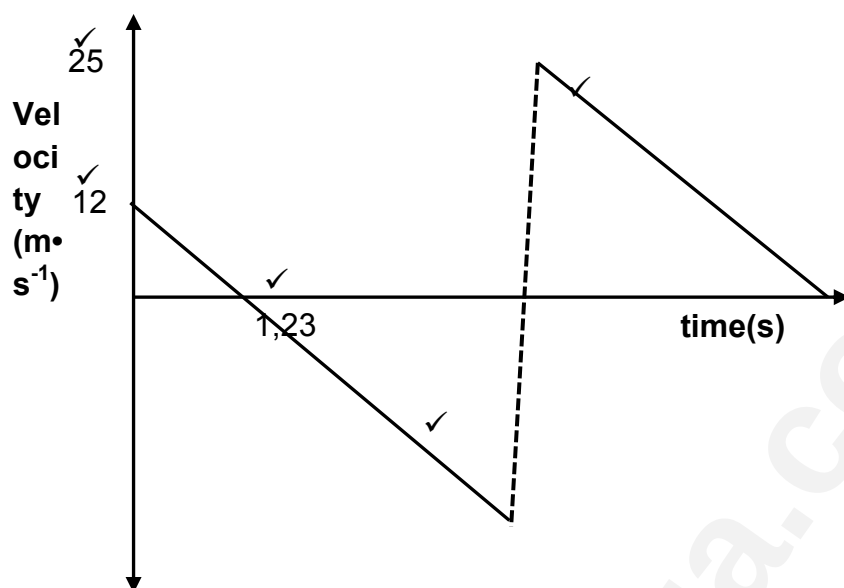
$$(27,20)^2 = (-12)^2 + 2(9,8) \Delta y \checkmark$$

$$\Delta y = 30,40$$

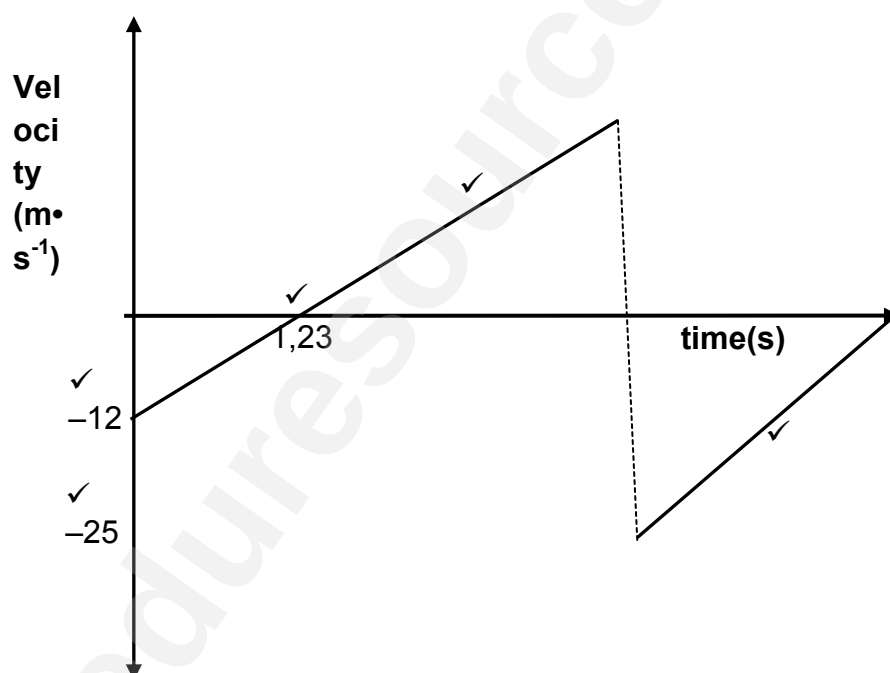
$$\begin{aligned} \therefore \text{Position above the ground} &= \underline{50} - \checkmark 30,40 \\ &= 19,60 \text{ m} \checkmark \end{aligned}$$

(4)

3.2



OR



CRITERIA FOR MARKING OF GRAPH	
Correct shape (the three lines must have same gradient)	✓
Indication of initial velocity (12 m.s^{-1})	✓
Indication of velocity of bounce (25 m.s^{-1})	✓
1.23s	✓
First line longer below x-axis than above	✓
If 25 m.s^{-1} line beyond x-axis then -1	
Do not penalise if dotted lines are solid	

(5)

[19]

QUESTION 4

- 4.1 The resultant/net force acting on an object is equal to the rate of change of momentum of the object in the direction of the resultant/net force. ✓✓ (2)

4.2

$$4.2.1 (K + U)_1 = (K + U)_2$$

$$\left. \begin{aligned} (\frac{1}{2}mv^2 + mgh)_1 &= (\frac{1}{2}mv^2 + mgh)_2 \\ (\frac{1}{2}(1,005)v^2 + 0) &= 0 + (1,005)(9,8)(0,5) \end{aligned} \right\} \checkmark$$

$$v_1 = 3,13 \text{ m}\cdot\text{s}^{-1}$$

∴ The velocity of the block – bullet system immediately after collision is $3,13 \text{ m}\cdot\text{s}^{-1}$ ✓ (3)

4.2.2 **POSITIVE MARKING FROM 4.2.1**

$$\Sigma p_i = \Sigma p_f$$

$$m_1 v_{1i} + m_2 v_{2i} = (m_1 + m_2) v_f$$

$$\left(\frac{0,005}{v_{1i}} + (1)(0) \right) \checkmark = \frac{(0,005 + 1)(3,13)}{v_f} \checkmark$$

$$v_{1i} = 629,13 \text{ m}\cdot\text{s}^{-1} \checkmark$$

(4)

- 4.3 Less than ✓ (1)

[10]**QUESTION 5**

- 5.1.1 Total mechanical energy of an isolated system remains constant ✓✓ (2)

- 5.1.2 No, ✓ (1)

- 5.1.3 **OPTION 1**

$$(K + U)_P = (K + U)_Q - W_f$$

OR

$$W_{nc} = \Delta E_p + \Delta E_k$$

$$(\frac{1}{2}mv^2 + mgh)_P = (\frac{1}{2}mv^2 + mgh)_Q - W_f$$

$$\left[\frac{1}{2}(1200)(0,8)^2 + (1200)(9,8)(1,8) \right]_P \checkmark = \left[\frac{1}{2}(1200)(4)^2 + 0 \right]_Q \checkmark - W_f$$

$$W_f = -11952 \text{ J}$$

$$W_f = F_f \Delta x \cos 180 \checkmark$$

$$-11952 = -F_f 2,2$$

$$F_f = 5432,73 \text{ N} \checkmark$$

OPTION 2

$$\left. \begin{aligned} W_{\text{net}} &= \Delta K \\ W_f + W_g &= \frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2 \\ W_f + mgh &= \frac{1}{2}m(v_f^2 - v_i^2) \\ W_f + mgh &= \frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2 \end{aligned} \right\} \checkmark$$

$$W_f + \frac{1200(9,8)(2,2) \cos 324,90^\circ}{(\text{accept } 35,1^\circ)} \checkmark = \frac{1}{2}(1200)(4)^2 - \frac{1}{2}(1200)(0,8)^2 \checkmark$$

$$W_f = -11952 \text{ J}$$

$$W_f = F_f \Delta x \cos 180^\circ \checkmark$$

$$-11952 = -F_f 2,2$$

$$F_f = 5432,73 \text{ N} \checkmark$$

(5)

5.2

5.2.1 The net/total work done on an object is equal to the change in the object's kinetic energy. $\checkmark\checkmark$.

OR

The work done on an object by a resultant/net force is equal to the change in the object's kinetic energy. $\checkmark\checkmark$

Note: -1 mark for each key word/phrase omitted in the correct context.

(2)

$$\left. \begin{aligned} 5.2.2 \quad W_{\text{net}} &= \Delta K \\ W_f + W_g + W_N &= \frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2 \end{aligned} \right\} \checkmark$$

$$\frac{8000 \cos 180^\circ \Delta x}{\checkmark} + 0 + 0 = \frac{1}{2}(1000)(0) - \frac{1}{2}(1000)(35^2) \checkmark$$

$$\Delta x = 76,56 \text{ m} \checkmark$$

(4)

$$5.2.3 \quad W_{\text{net}} = \Delta K$$

$$W_f + W_g + W_N = \frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2$$

$$\frac{8000 \cos 180^\circ (30) + 0 + 0}{\checkmark} = \frac{1}{2}(1000)v_f^2 - \frac{1}{2}(1000)(35^2) \checkmark$$

$$v_f = 27,29 \text{ m} \cdot \text{s}^{-1} \checkmark$$

(3)

5.2.4 INCREASE $\checkmark$

On a rainy day the road surface would have less frictional force needed for the braking. $\checkmark$

(2)

[19]

QUESTION 6

6.1 Doppler Effect. ✓

It is the change in frequency (or pitch) of the sound detected by a listener because the sound source and the listener have different velocities relative to the medium of sound propagation. ✓✓

OR

Doppler Effect. ✓

It is the change in the observed frequency of a sound wave when the source of sound is moving relative to the listener. ✓✓ (3)

6.2 Towards ✓ (1)

$$f_L = \frac{v \pm v_L}{v \pm v_s} f_s \quad \checkmark$$

$$(f_s + 50) \checkmark = \left(\frac{340 + 0 \checkmark}{340 - 20 \checkmark} \right) f_s \quad \text{OR } f_L \checkmark \left(\frac{340 + 0 \checkmark}{340 - 20 \checkmark} \right) (f_L - 50)$$

$$f_s = 800 \text{ Hz (range: } 800 - 833.33 \text{ Hz)}$$

$$v = f_s \lambda \checkmark$$

$$340 = 800 \lambda \checkmark$$

$$\lambda = 0,425 \text{ m} \checkmark \text{ (range: } 0,425 - 0,408 \text{)} \quad (7)$$

6.4 Greater than. ✓

The reflected waves are moving toward the ambulance. ✓ (2)

6.5 • blood flow meter ✓

• echocardiograms. ✓

• ultrasound technology

• monitor pregnancies

• examine soft tissue injuries. (any two) (2)

[15]

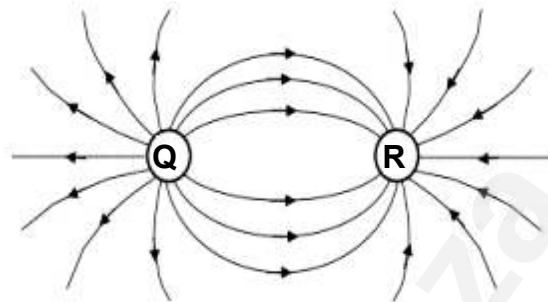
QUESTION 7

- 7.1.1 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)

Note: -1 mark for each key word/phrase omitted in the correct context.

7.1.2

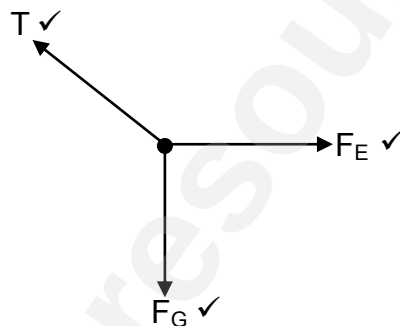


Accept:
Density around R
maybe greater
than Q

Marking Criteria	
Correct Shape	✓
Field lines do not cross	✓
Direction of field lines correct	✓

(3)

7.1.3



(3)

- 7.1.4 **CONSIDERING THE HORIZONTAL FORCES:**

$$F_{\text{net}} = 0$$

$$T \sin \theta = F_e \quad \checkmark$$

$$T \sin \theta = \left\{ 9 \times 10^9 \left[\frac{(0,6 \times 10^{-6})(0,9 \times 10^{-6})}{0,150^2} \right] \right\} \checkmark$$

$$T \sin \theta = 0,216 \dots\dots\dots \textcircled{1}$$

- CONSIDERING THE VERTICAL FORCES:**

$$F_{\text{net}} = 0$$

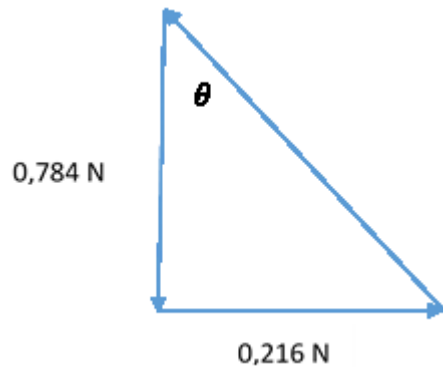
$$T \cos \theta = mg \quad \checkmark$$

$$T \cos \theta = 8 \times 10^{-2} (9,8) \quad \checkmark \dots\dots\dots \textcircled{2}$$

$$\textcircled{1} \div \textcircled{2}$$

$$\tan \theta = 0,26 / (8 \times 10^{-2} (9,8))$$

$$\theta = 15,40^\circ \checkmark$$

OPTION 2

$$F = \left\{ 9 \times 10^9 \left[\frac{(0,6 \times 10^{-6})(0,9 \times 10^{-6}) \checkmark}{0,150^2 \checkmark} \right] \right\}$$

$$= 0,216 \text{ N}$$

$$F_g = mg \checkmark$$

$$= 8 \times 10^{-2} \times 9,8 \checkmark$$

$$= 0,784 \text{ N}$$

$$\tan \theta = F/F_g$$

$$= 0,216/0,784 \checkmark$$

$$\theta = 15,40^\circ \checkmark$$

(6)

7.1.5 POSITIVE MARKING FROM 7.2

$$T \cos \theta = 8 \times 10^{-2} (9,8)$$

$$T \cos 15,40^\circ \checkmark = 8 \times 10^{-2} (9,8) \checkmark$$

$$T = 0,81 \text{ N} \checkmark$$

(3)

7.2.1 *Electric field* is a region of space in which an electric charge experiences a force. $\checkmark \checkmark$

(2)

(accept : force experienced per unit positive charged when placed at that point)

7.2.2 $E_1 = k \frac{q_1}{d^2} \checkmark$

$$E_{net} = \left[k \frac{q_1}{d^2} + k \frac{q_2}{(2d)^2} \right] \checkmark \quad \text{OR } (E_1 = E_2)$$

$$\checkmark 2E_1 = k \frac{q_1}{d^2} + k \frac{q_2}{(2d)^2}$$

$$2 k \frac{q_1}{d^2} = k \frac{q_1}{d^2} + k \frac{q_2}{(2d)^2}$$

$$2 k \frac{q_1}{d^2} = k \frac{q_1}{d^2} + k \frac{q_2}{4d^2}$$

$$k \frac{q_1}{d^2} = k \frac{q_2}{4d^2}$$

$$4q_1 = q_2$$

$$4 \times 0,5 \times 10^{-6} = q_2$$

$$q_2 = 2 \times 10^{-6} \text{ C} \checkmark$$

(4)

[21]

QUESTION 8

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

NOTE

If constant temperature is omitted -1 mark

(2)

8.2

8.2.1 Total Resistance = $R_{\text{series}} + R_{\text{parallel}}$

$$\text{Total Resistance} = 4 + \left(\frac{1}{12} + \frac{1}{18} \right)^{-1} \checkmark$$

$$\text{Total Resistance} = 11,20$$

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

$$I = \frac{12}{11,2} \checkmark$$

$$I = 1,07 \text{ A} \checkmark$$

(5)

8.2.2 POSITIVE MARKING FROM 8.2.1

$$V_{4\Omega} = IR$$

$$V_{4\Omega} = 1,07 \times 4 \checkmark$$

$$V_{4\Omega} = 4,28 \text{ V}$$

$$V_{//} = 12 - V_{4\Omega}$$

$$V_{//} = 12 - 4,28$$

$$V_{//} = 7,72 \text{ V}$$

$$I_{10\Omega} = \frac{V}{R}$$

$$I_{10\Omega} = \frac{7,72}{18} \checkmark$$

$$I_{10\Omega} = 0,43 \text{ A}$$

$P = I^2 R \checkmark$ $P = (0,43)^2 (10) \checkmark$ $P = 1,85 \text{ W} \checkmark$	$V_{10\Omega} = IR$ $V_{10\Omega} = 0,43 \times 10$ $V_{10\Omega} = 4,3 \text{ V}$ $P = \frac{V^2}{R} \checkmark$ $P = \frac{4,3^2}{10} \checkmark$ $P = 1,85 \text{ W} \checkmark$	$P = VI \checkmark$ $P = 4,3 \times 0,43 \checkmark$ $P = 1,85 \text{ W} \checkmark$
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(5)

8.2.3 POSITIVE MARKING FROM 8.2.1

$W = V \cdot I \Delta t \checkmark$ $= 12 \times 1,07 \times 30 \checkmark$ $= 385,20 \text{ J} \checkmark$	$W = I^2 R t \checkmark$ $= 1,07^2 \times 11,2 \times 30 \checkmark$ $= 384,69 \text{ J} \checkmark$	$W = \frac{V^2}{R} t$ $= \frac{12^2}{11,2} \times 30$ $= 385,71 \text{ J}$
---	--	--

(3)

8.3 Decreases ✓

If the 12 Ohm resistor stops working, the total resistance would increase ✓. Resistance is inversely proportional to the current ✓.

(3)

[18]

QUESTION 9

9.1 AC (generator) ✓ (1)

9.2 Slip rings ✓ (1)

9.3 The AC potential difference/voltage which dissipates the same amount of energy as DC. ✓✓

OR

(The rms value of AC is) the DC potential difference/voltage which dissipates the same amount of energy as AC. ✓✓ (2)

9.4

$$V_{RMS} = \frac{V_{Max}}{\sqrt{2}} \checkmark$$

$$V_{RMS} = \frac{1}{\sqrt{2}} \checkmark$$

$$V_{RMS} = 0,71 \text{ V} \checkmark \quad (3)$$

9.5 0,04 s. ✓ (1)

9.6 Positive marking from Q 9.4

$$\left. \begin{aligned} P_{Ave} &= V_{RMS} I_{RMS} \\ P_{Ave} &= V_{RMS} \left(\frac{I_{Max}}{\sqrt{2}} \right) \end{aligned} \right\} \checkmark$$

$$P_{Ave} = 0,71 \left(\frac{2}{\sqrt{2}} \right) \checkmark$$

$$P_{Ave} = 1,00 \text{ W} \checkmark \quad (3)$$

9.7 Any two:

- (i) easier to generate and transmit from place to place ✓
 - (ii) easier to convert from a.c. to d.c. than the reverse ✓
 - (iii) voltage can be easily changed by stepping it up or down
 - (iv) high frequency used in a.c. make it more suitable for electric motors
- (2)

[13]

TOTAL: 150