



# MOPANI EAST EDUCATION DISTRICT

## PHYSICAL SCIENCES

### GRADE 10

### FORMAL TEST MEMORANDUM

2022 MAY

TERM 2

**MARKS: 100**

**TIME: 2 hours**

**This memorandum consists of 09 pages.**

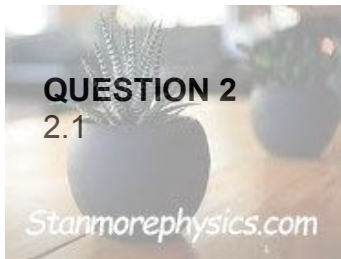
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### QUESTION 1: MULTIPLE-CHOICE QUESTIONS

- 1.1 B ✓✓  
 1.2 D ✓✓  
 1.3 C ✓✓  
 1.4 B ✓✓  
 1.5 B ✓✓

(2)  
 (2)  
 (2)  
 (2)  
 (2)  
**[10]**



### QUESTION 2

2.1



#### MARKING ALLOCATIONS

✓ X line AB: length, arrow, label

✓ x line BC: length, arrow, label

(2)

2.2 2 m ✓ to the left ✓ OR 2 m ✓ west ✓

(2)

2.3 Total distance  
 = 5 + 7 ✓  
 = 12 m ✓

(2)

2.4 For the total distance, the whole path length travelled is considered. ✓ For change in position, only the original position and final position ✓ of the man are considered.

(2)

2.5 Velocity is the rate ✓ of change of displacement. ✓

(2)

2.6  $v = \frac{\Delta x}{\Delta t}$  ✓

$$= \frac{2}{20} \checkmark$$

$$= 0,1 \text{ m} \cdot \text{s}^{-1} \checkmark \text{ west/to the left} \checkmark$$

(4)

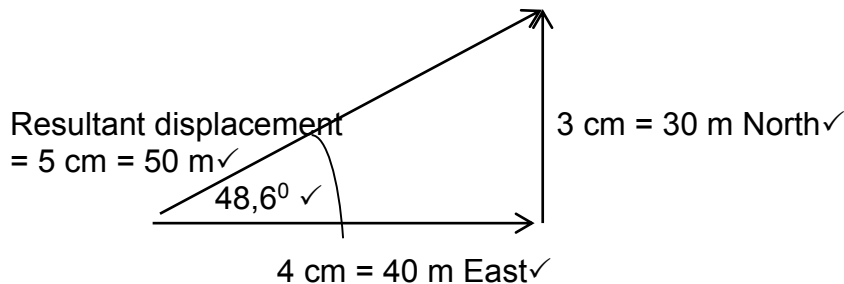
**[14]**

### QUESTION 3

3.1 A resultant vector is a single vector ✓ having the same effect as two or more vectors together ✓ (2)

3.2 Total distance = 40 m + 30 m ✓  
= 70 m ✓ (2)

3.3 Suitable scale: 1 cm = 10 m ✓



Therefore the man walked 50 m at 48,6° ✓

#### MARK ALLOCATION

- ✓ Choosing suitable scale
- ✓ Correct distance to North
- ✓ Correct distance to South
- ✓ Correct resultant displacement answer
- ✓ Correct drawing
- ✓ Correct angle

(6)  
[10]

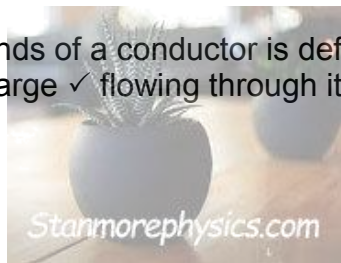
### QUESTION 4

4.1 Potential difference across the ends of a conductor is defined as the energy transferred ✓ per unit electric charge ✓ flowing through it. (2)

4.2

4.2.1 **OPTION 1**

$$\begin{aligned}\frac{1}{R_{//}} &= \frac{1}{R_1} + \frac{1}{R_2} \checkmark \\ &= \frac{1}{6} + \frac{1}{3} \checkmark \\ \therefore R_{//} &= 2\Omega\end{aligned}$$



$$\begin{aligned}\text{Therefore } R_{\text{total}} &= 4 + 2 \checkmark \\ &= 6\Omega \checkmark\end{aligned}$$

### OPTION 2

$$\begin{aligned}R_{//} &= \frac{R_1 \times R_2}{R_1 + R_2} \checkmark \\ &= \frac{6 \times 3}{6+3} \checkmark \\ &= 2\Omega\end{aligned}$$

$$\begin{aligned}\text{Therefore } R_{\text{total}} &= 4 + 2 \checkmark \\ &= 6\Omega \checkmark\end{aligned}$$

### OPTION 3

$$\begin{aligned}R &= \frac{V_1}{I_1} \checkmark \\ &= \frac{12}{2} \checkmark \\ &= 6\Omega \checkmark\end{aligned}$$

(4)

$$\begin{aligned}4.2.2 \quad R_{4\Omega} &= \frac{V_2}{I_T} \checkmark \\ 4 &= \frac{V_2}{2} \checkmark\end{aligned}$$

$$\therefore V_2 = 8\text{ V} \checkmark$$

(3)

### 4.2.3 OPTION 1

$$\begin{aligned}I &= \frac{V}{R} \checkmark \\ &= \frac{12-8}{6} \checkmark \\ &= 0,67\text{ A} \checkmark\end{aligned}$$

### OPTION 2

$R \propto \frac{1}{I}$  ✓ or in words:  
resistance is inversely proportional to current and

$\therefore$  ratio of resistors is  $6 : 3$   
 $2 : 1$

$\therefore$  ratio of current is  $1 : 2$  ✓  
 $A_2 : A_3$

$$\begin{aligned}\therefore I_{A2} &= \frac{2}{3} \times 1 \\ \therefore I_{A2} &= 0,67\text{ A} \checkmark\end{aligned}$$



(3)

4.2.4  $A_1 = 2 \text{ A}$   
 $\therefore Q = I \Delta t \checkmark$   
 $= 2 \times 120 \checkmark$   
 $= 240 \text{ C} \checkmark$  (3)

4.3 Decrease  $\checkmark$  (1)

4.4 • If the  $6 \Omega$  resistor is removed, the resistance of the whole circuit increases  $\checkmark$   
 • Since  $R \propto \frac{1}{I}$ , if  $R$  increases, and  $V$  is constant  $\checkmark$  and  $I$  of the circuit decreases  $\checkmark$  (3)  
**[19]**

## QUESTION 5

5.1  $5 \text{ m} \cdot \text{s}^{-1} \checkmark$  north  $\checkmark$  (accept range from 4,5 to 4,9) (2)

5.2  $8,1 \text{ m} \cdot \text{s}^{-1} \checkmark \checkmark$  (accept range from 8,0 to 8,6) (2)

5.3

- 5.3.1 • The velocity is uniformly increasing.  
 • Velocity increases from  $5 \text{ m} \cdot \text{s}^{-1}$  to  $10 \text{ m} \cdot \text{s}^{-1}$  in 350 s.  
 • Positive acceleration.  
 • The girl is speeding up.

Any ONE of the options  $\checkmark \checkmark$

(2)

- 5.3.2 • Uniform/constant velocity  
 • No acceleration  
 • Same speed

Any ONE of the options  $\checkmark \checkmark$

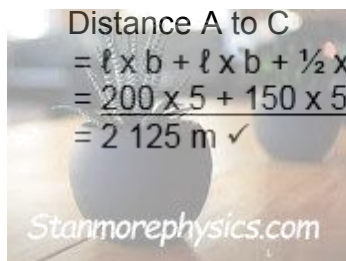
(2)

5.4

5.4.1 **OPTION 1**  
 Distance A to C  
 $= l \times b + \frac{1}{2} \times b \times h \checkmark$   
 $= \underline{5 \times 350} \checkmark + \underline{\frac{1}{2} \times 150 \times 5} \checkmark$   
 $= 2\,125 \text{ m} \checkmark$

### OPTION 2

Distance A to C  
 $= l \times b + l \times b + \frac{1}{2} \times b \times h \checkmark$   
 $= \underline{200 \times 5} + \underline{150 \times 5} \checkmark + \underline{\frac{1}{2} \times 150 \times 5} \checkmark$   
 $= 2\,125 \text{ m} \checkmark$



**OPTION 3**

Distance A to C

$$\begin{aligned} &= l \times b + \frac{1}{2} (\text{sum of parallel sides})h \checkmark \\ &= l \times b + \frac{1}{2} (\text{som van parallele sye})h \checkmark \\ &= \frac{5 \times 200}{2} \checkmark + \frac{1}{2} (5 + 10)(150) \checkmark \\ &= 2\,125 \text{ m } \checkmark \end{aligned}$$

(4)

$$5.4.2 \quad a = \frac{\Delta v}{\Delta t} \checkmark$$

$$= \frac{0-10}{600-535} \checkmark$$

$$= -0,154 \text{ m} \cdot \text{s}^{-2}$$

$$\therefore a = 0,154 \text{ m} \cdot \text{s}^{-2} \text{ South } \checkmark$$

(4)

5.5 D to E.  $\checkmark \checkmark$

(2)

5.6 The change in speed from D to E is  $(- )10 \text{ m} \cdot \text{s}^{-1} \checkmark$  and that occurs over (50 s) a shorter period.  $\checkmark$

**OR**

From B to C, the change in speed is  $5 \text{ m} \cdot \text{s}^{-1}$  over a period of 150 s.  $\checkmark \checkmark$

**OR**

Gradient is the steepest  $\checkmark \checkmark$

(2)

**[20]**

**QUESTION 6**

6.1 Acceleration is the rate  $\checkmark$  of change of velocity  $\checkmark$ .

**OR**

Acceleration is the change in velocity  $\checkmark$  per unit time  $\checkmark$ .

(2)

6.2 No  $\checkmark$

(1)

6.3 Velocity to the right, acceleration to the left  $\checkmark$ .

**OR**

Taxi slowing down so acceleration is in opposite direction  $\checkmark$  to movement.

(1)

6.4 **OPTION 1**



$$\begin{aligned}\Delta x &= v_i t + \frac{1}{2} a \Delta t^2 \checkmark \\ &= 25 \times 1 \checkmark + \frac{1}{2} \times 0 \times 1^2 \checkmark \\ &= 25 \text{ m} \checkmark\end{aligned}$$

**OPTION 2**

$$\begin{aligned}\Delta x &= \frac{(v_f + v_i)}{2} \Delta t \checkmark \\ &= \frac{25 + 25}{2} \checkmark \times 1 \checkmark \\ &= 25 \text{ m} \checkmark\end{aligned}$$

(4)

**6.5 POSITIVE MARKING FROM 6.4**

**OPTION 1**

$$\Delta x = \frac{(v_f + v_i)}{2} \Delta t \checkmark$$

$$\begin{aligned}&= \frac{(0+25)}{2} \times 2 \checkmark \\ &= 25 \text{ m}\end{aligned}$$

$$\begin{aligned}\therefore \text{total distance} \\ &= 25 + 25 \checkmark \\ &= 50 \text{ m} \checkmark\end{aligned}$$

$\therefore$  taxi will not stop at the traffic light as distance  $> 40 \text{ m} \checkmark$

**OPTION 2**

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

$$a = \frac{v_f - v_i}{\Delta t}$$

$$\begin{aligned}a &= \frac{(0 - 25)}{2} \checkmark \\ &= -12,5 \text{ m} \cdot \text{s}^{-2}\end{aligned}$$

$$\begin{aligned}v_f^2 &= v_i^2 + 2a\Delta x \\ 0 &= 25^2 + 2 \times -12,5 \times \Delta x \checkmark \\ \therefore \Delta x &= 25 \text{ m}\end{aligned}$$

$$\begin{aligned}\therefore \text{total distance} \\ &= 25 + 25 \\ &= 50 \text{ m} \checkmark\end{aligned}$$

Only one mark for either equation

∴ taxi will not stop at the traffic light as distance > 40 m ✓

### OPTION 3

$$a = \frac{(v_f - v_i)}{\Delta t} \checkmark$$

$$= \frac{(0 - 25)}{2} \checkmark$$

$$= -12,5 \text{ m} \cdot \text{s}^{-2}$$

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

$$= 25 \times 2 + \frac{1}{2} \times -12,5 \times 2^2 \checkmark$$

$$= 25 \text{ m}$$

∴ total distance

$$= 25 + 25$$

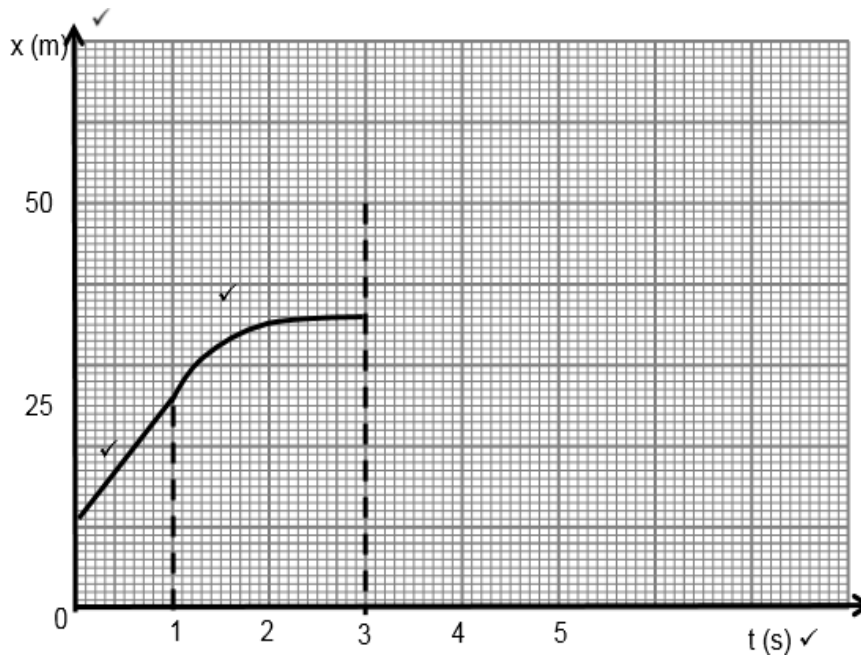
$$= 50 \text{ m} \checkmark$$

Only one mark for either equation

∴ taxi will not stop at the traffic light, as distance > 40 m ✓

(5)

6.6



#### MARK ALLOCATION

- ✓ Both axes correctly labelled
- ✓ Straight line (t = 0 s and t = 1 s)
- ✓✓ Curve shape (t = 1 s and t = 3)

(4)

[17]



**QUESTION 7**

7.1 Velocity is the rate of change in position, ✓✓

**OR**

Velocity is the displacement divided by a very small time interval ✓✓ (2)

7.2

7.2.1  $x = v_i t + \frac{1}{2}at^2$  ✓  
64 = (0 x 4) +  $\frac{1}{2}a(4)^2$  ✓  
64 = (8)a  
a = 8m.s<sup>-2</sup> ✓ east ✓ (4)

7.2.2  $v_f = v_i + at$  ✓  
 $v_f = 0 + (8)(4)$  ✓  
= 32 m.s<sup>-1</sup> ✓ east ✓ (4)

**[10]**

**TOTAL: 100 MARKS**