



**KWAZULU-NATAL PROVINCE**

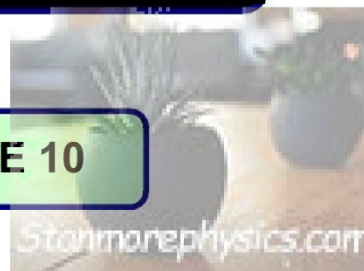
**EDUCATION**  
REPUBLIC OF SOUTH AFRICA



**PHYSICAL SCIENCES**  
**JUNE 2022**  
**COMMON TEST**  
**MARKING GUIDELINE**

**NATIONAL**  
**SENIOR CERTIFICATE**

**GRADE 10**



**NB: This marking guideline consists of 5 pages.**

### QUESTION ONE

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

[14]

### QUESTION TWO

2.1 Ability of a conductor to reduce the flow of current (2)

$$2.2 \quad \frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} \checkmark$$

$$R_p = \left( \frac{1}{24} + \frac{1}{12} \right)^{-1} \checkmark$$

$$= 8 \, \Omega$$

$$R_T = R_p + R_3 \checkmark$$

$$= 8 + 4 \checkmark$$

$$= 12 \, \Omega \checkmark$$

(5)

2.3.1  $V_1 = V - V_3$   
 $= 24 - 8 \checkmark$   
 $= 16V \checkmark$



(2)

2.3.2  $16 \, V \checkmark$

(1)

2.4  $A_2 \checkmark$  Resistance inversely proportional to current ✓ (2)

2.5  $Q = I \Delta t \checkmark$   
 $= 2A \times 120s \checkmark \checkmark$   
 $= 240C \checkmark$

(4)

2.6 Positive marking from Q 2.5

$$V = \frac{w}{q} \checkmark$$

$$8V = \frac{w}{240C} \checkmark$$

$$w = 1920 \, J \checkmark$$

(3)

2.7 REMAINS THE SAME ✓✓ (2)

2.8 Increases ✓

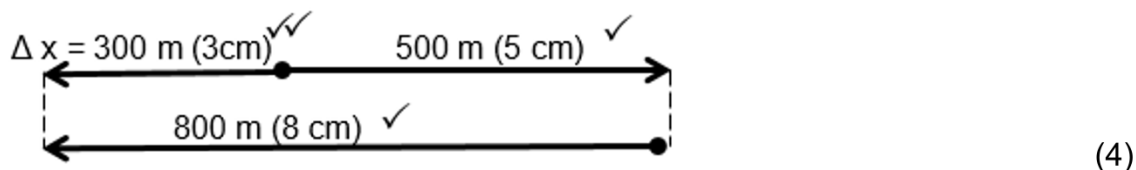
- R of circuit now decreases ✓ OR: there will be a short-circuit

(2)

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### QUESTION 3

3.1



3.2 Single vector that effectively replaces 2 or more vectors acting together ✓✓ (2)

3.3 300 m ✓ west ✓ (2)

3.4 
$$\text{Average speed} = \frac{\text{Total distance}}{\text{total time}} \checkmark$$
  

$$= \frac{1300}{270} \checkmark \checkmark$$
  

$$= 4.81 \text{ m} \cdot \text{s}^{-1} \checkmark$$

(4)  
[12]

### QUESTION 4

4.1 Rate of change of displacement (2)

4.2 
$$a = \frac{\Delta v}{\Delta t} \checkmark$$
  

$$= \frac{10 - 0}{3 - 0} \checkmark$$
  

$$= 3,33 \text{ ms}^{-2} \checkmark$$



4.3.1 Car is moving at constant velocity ✓ (1)

4.3.2 Car is slowing down (uniformly) ✓, stops at 6s, changes direction ✓ and accelerates uniformly ✓ (3)

4.4

$\Delta x = \text{area under the graph}$

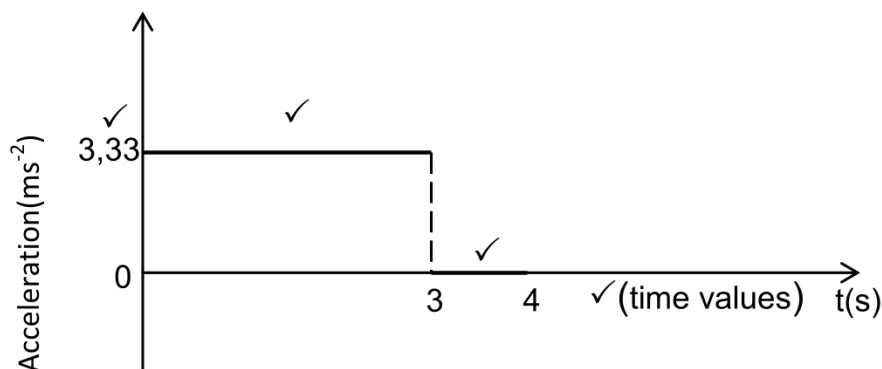
$$\Delta x = (\frac{1}{2} bxh) + (lxb) + (\frac{1}{2} bxh) + (\frac{1}{2} bxh)$$
  

$$= (\frac{1}{2} \times 3 \times 10) \checkmark + (1 \times 10) \checkmark + (\frac{1}{2} \times 2 \times 10) + (\frac{1}{2} \times 2 \times -10) \checkmark$$
  

$$= 25 \text{ m} \checkmark$$

✓ ANY ONE

4.5



Marking Criteria	Mark
• shape of graph correctly drawn	2
• both acceleration values shown	1
• both time values shown	1

(4)

[18]

### QUESTION 5

5.1 Car :  $\Delta x = v_i \Delta t + \frac{1}{2} a \Delta t^2$  (1 mark for both formulae)

$$= 10(40) + \frac{1}{2} (0) \Delta t^2 \checkmark$$

$$= 400 \text{ m}$$

Motor cycle :  $\Delta x = \left( \frac{v_i + v_f}{2} \right) \Delta t$

$$= \left( \frac{0 + 15}{2} \right) 40 \checkmark$$

$$= 300 \text{ m}$$

Car is ahead by  $400 - 300 = 100 \text{ m} \checkmark$

OR

Car :  $\Delta x = \text{Area} = \underline{L \times B}$  (1 mark for both area formulae)

$$= (10)(40) \checkmark$$

$$= 400 \text{ m}$$

Motor cycle :  $\Delta x = \text{Area} = \underline{\frac{1}{2} b \times h}$

$$= \frac{1}{2} (40)(15) \checkmark$$

$$= 300 \text{ m}$$

$400 - 300 \checkmark = 100 \text{ m Car is ahead} \checkmark$

(4)

5.2 Car :  $\Delta x = \text{Area of car} = 10 t \checkmark$

Motor cycle :  $\Delta x = \text{Area of motor cycle}$   
 $= \frac{1}{2}(40 \times 15) + 15(t-40) \checkmark$

$10 t = \frac{1}{2}(40 \times 15) + 15(t-40) \checkmark$   
 $t = 60 \text{ s} \checkmark$

OR

Car :  $\Delta x = 400 \text{ m at } t = 40 \text{ s}$

At  $t-40(\text{s})$  :  $\Delta x = v_i \Delta t + \frac{1}{2} a \Delta t^2$   
 $= 10(t-40) + 0$

$\Delta x = 400 + 10(t-40) \dots \dots (1) \checkmark$

Motor cycle :  $\Delta x = 300 \text{ m at } t = 40 \text{ s}$

At  $t-40(\text{s})$  :  $\Delta x = v_i \Delta t + \frac{1}{2} a \Delta t^2$   
 $= 15(t-40) + 0$

$\Delta x = 300 + 15(t-40) \dots \dots (2) \checkmark$

$\Delta x \text{ of car} = \Delta x \text{ of motor cycle}$

$400 + 10(t-40) = 300 + 15(t-40) \checkmark$   
 $t = 60 \text{ s} \checkmark$  (4)

### QUESTION 6

6.1 Rate of change of velocity (2)

6.2  $v_f = v_i + a \Delta t \checkmark$   
 $= 10 \checkmark + (0,5 \times 15) \checkmark$   
 $= 17,5 \text{ m} \cdot \text{s}^{-1} \checkmark$  (4)

6.3  $v_f^2 = v_i^2 + 2a \Delta x \checkmark$   
 $30^2 \checkmark = 10^2 + 2(0,5) \Delta x \checkmark$   
 $\Delta x = 800 \text{ m} \checkmark$  (4)

6.4  $v_f = v_i + a \Delta t \checkmark$   
 $0 = 30 + a 10 \checkmark$   
 $a = -3 \text{ m} \cdot \text{s}^{-2}$   
 $a = 3 \text{ m} \cdot \text{s}^{-2} \checkmark$  in opposite direction  $\checkmark$  (4)  
**[14]**

### QUESTION 7

7.1 Total mechanical energy  $\checkmark$  of an isolated system remains constant  $\checkmark$  (2)

7.2  $E_{\text{TOT}} = E_p + E_k \checkmark$   
 $= (0,2 \times 9,8 \times 1,5) \checkmark + 0 \checkmark$   
 $= 2,94 \text{ J} \checkmark$  (4)

7.3  $E_{\text{TOT}} = E_p + E_k$   
 $2,94 \text{ J} \checkmark = 0 \checkmark + \frac{1}{2}(0,2)(v^2) \checkmark$   
 $v = 5,42 \text{ m} \cdot \text{s}^{-1} \checkmark$  (4)

7.4 EQUAL TO  $\checkmark$  total mechanical energy is conserved.  $\checkmark$  (2)  
**[12]**

**TOTAL : 100 MARKS**