



KWAZULU-NATAL PROVINCE

EDUCATION
REPUBLIC OF SOUTH AFRICA



**NATIONAL
SENIOR CERTIFICATE**

GRADE 10

**PHYSICAL SCIENCES
COMMON TEST
MARKING MEMORANDUM
SEPTEMBER 2023**



MARKS: 100

DURATION: 2 hours



QUESTION 1

- 1.1 B ✓✓ (2)
- 1.2 A ✓✓ (2)
- 1.3 C ✓✓ (2)
- 1.4 B ✓✓ (2)
- 1.5 B ✓✓ (2)
- 1.6 D ✓✓ (2)
- 1.7 D ✓✓ (2)
- 1.8 B ✓✓ (2)
- 1.9 B ✓✓ (2)
- 1.10 A ✓✓ (2)
- [20]**

QUESTION 2

- 2.1 The difference / change in position in space ✓✓ (2)
- 2.2 50 m ✓ east ✓ (2)
- 2.3 Distance = $50 + 50 + 90 + 40 = 230$ m
 speed = $\frac{\text{distance}}{\text{time}}$ ✓
 $= \frac{230}{30}$ ✓
 $= 7,67 \text{ m} \cdot \text{s}^{-1}$ ✓ (4)

2.4 POSITIVE MARKING FROM QUESTION 2.3


2.4.1 speed = $\frac{\text{distance}}{\text{time}}$
 $6,67 \checkmark = \frac{90+90+100 \checkmark}{\text{time}}$
 time = 41.98 s ✓



(3)

POSITIVE MARKING FROM QUESTION 2.4.1

2.4.2 $v = \frac{\Delta x}{\Delta t}$ ✓



$$v = \frac{100}{41.98} \quad \checkmark$$

$$= \underline{2.38 \text{ m}\cdot\text{s}^{-1} \text{ west}} \quad \checkmark$$

(4)
[15]

QUESTION 3

3.1

3.1.1 The velocity uniformly increased from 0 m·s⁻¹/ rest ✓ to 20 m·s⁻¹ (North) in 4 seconds ✓ (2)

3.1.2 The velocity uniformly decreased from 12 m·s⁻¹ South ✓ to 0 m·s⁻¹/ stop/rest in 3 seconds ✓ (2)

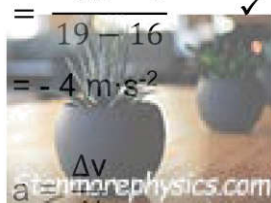
3.2

Displacement = $\frac{1}{2} \times 4 \times 20 \checkmark + 6 \times 20 \checkmark$
 Displacement = 160 m ✓ North ✓ (4)

3.3

3.3.1 The rate of ✓ change of velocity ✓ (2)

3.3.2 $a = \frac{\Delta v}{\Delta t}$ ✓ OR $a = \frac{y_2 - y_1}{x_2 - x_1}$ ✓

$$= \frac{-12 - 0}{19 - 16} \quad \checkmark$$


$$= -4 \text{ m}\cdot\text{s}^{-2}$$

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

$$-4 \checkmark = \frac{20 - 0}{10 - X} \quad \checkmark$$

$$X = 15 \text{ s} \checkmark$$

(5)
[15]



QUESTION 4

4.1 Car A

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

$$500 = 0 \Delta t + \frac{1}{2} (1,2) \Delta t^2 \quad \checkmark$$

$$\Delta t = 28,87 \text{ s} \quad \checkmark$$

Car B

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

$$500 = 27,78 \Delta t + \frac{1}{2} (0) \Delta t^2 \quad \checkmark$$

$$\Delta t = 18 \text{ s} \quad \checkmark$$

OR

Car B

$$\Delta x = v_i \Delta t$$

$$500 = 27,78 \Delta t \quad \checkmark$$

$$\Delta t = 18 \text{ s} \quad \checkmark$$

Car B will reach Robot 2 first. \checkmark

(6)

4.2 POSITIVE MARKING FROM 3.1

OPTION 1

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

$$v_f = 0 \quad \checkmark + 1,2(28,87) \quad \checkmark$$

$$v_f = 34,64 \text{ m} \cdot \text{s}^{-1} \text{ East} \quad \checkmark$$

OPTION 2

$$v_f^2 = v_i^2 + 2a \Delta x \quad \checkmark$$

$$v_f^2 = 0^2 \quad \checkmark + 2(1,2)(500) \quad \checkmark$$

$$v_f = 34,64 \text{ m} \cdot \text{s}^{-1} \text{ East} \quad \checkmark$$

(4)

[10]

QUESTION 5

5.1 The amount of substance having the same number of particles \checkmark as there are atoms in 12 g carbon-12 \checkmark .

(2)

$$5.2 \quad n(\text{Zn}) = \frac{m}{M} \quad \checkmark$$

$$n(\text{Zn}) = \frac{12,8}{65} \quad \checkmark$$

$$= 0,2 \text{ mol} \quad \checkmark$$

(3)

5.3 Zn : H₃PO₄

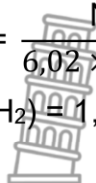
3 : 2 \checkmark

$$n(\text{H}_3\text{PO}_4) = 0,13 \text{ mol} \quad \checkmark$$

(2)



5.4 Zn : H₂
 3 : 3 ✓
 $n(\text{H}_2) = 0,2 \text{ mol}$
 $n(\text{H}_2) = \frac{N}{N_A}$ ✓
 $0,2 = \frac{N}{6,02 \times 10^{23}}$ ✓
 $N(\text{H}_2) = 1,204 \times 10^{23} \text{ H}_2 \text{ molecules}$ ✓



(4)
[11]

QUESTION 6

6.1

6.1.1 % O = 100 – (43,4 + 11,32) ✓ = 45,28% ✓ (2)

6.1.2 Consider 100g

Element	mass (g)	$n = \frac{m}{M}$	Simplest Ratio
Na	43,4	$\frac{43,4}{23} = 1,89$ ✓	$\frac{1,89}{0,94} = 2,01 \approx 2$
C	11,32	$\frac{11,32}{12} = 0,94$ ✓	$\frac{0,94}{0,94} = 1$
O	45,28	$\frac{45,28}{16} = 2,83$ ✓	$\frac{2,83}{0,94} = 3,01 \approx 3$



(Obtaining all simplest ratios)

Empirical Formula: Na₂CO₃ ✓

(5)

6.2 $M(\text{ZnSO}_4 \cdot x\text{H}_2\text{O}) = M(\text{ZnSO}_4) + x M(\text{H}_2\text{O})$
 $287 \checkmark = \underline{65+32+4(16)} \checkmark + \underline{x(2+16)} \checkmark$
 $x = 7 \checkmark$

(4)

6.3

6.3.1 The number of moles of solute ✓ per cubic decimetre of solution ✓ (2)

6.3.2 Option 1

$C(\text{H}_2\text{SO}_4) = \frac{m}{MV}$ ✓
 $1,5 \checkmark = \frac{m}{98 \times 0,25} \checkmark$
 $m = 36,75 \text{ g}$ ✓

Option 2

$C(\text{H}_2\text{SO}_4) = \frac{n}{V}$ ✓
 $1,5 = \frac{n}{0,25}$ ✓
 $n(\text{H}_2\text{SO}_4) = 0,375 \text{ mol}$
 $n(\text{H}_2\text{SO}_4) = \frac{m}{M}$
 $0,375 = \frac{m}{98}$ ✓
 $m = 36,75 \text{ g}$ ✓



(4)
[17]

QUESTION 7

$$7.1.1 \quad n(\text{Na}_2\text{CO}_3) = \frac{m}{M}$$

$$n(\text{Na}_2\text{CO}_3) = \frac{20}{23 \times 2 + 12 + 16 \times 3} \quad \checkmark$$

$$= 0,19 \text{ mol} \quad \checkmark \quad (3)$$

$$7.1.2 \quad \text{Na}_2\text{CO}_3 : \text{HNO}_3$$

$$1 : 2 \quad \checkmark$$

$$n(\text{HNO}_3) = 0,38 \text{ mol}$$

$$c(\text{HNO}_3) = \frac{n}{V} \quad \checkmark$$

$$1,5 = \frac{0,38}{V} \quad \checkmark$$

$$V(\text{HNO}_3) = 0,25 \text{ dm}^3 \quad \checkmark \quad (4)$$

$$7.2 \quad \text{Na}_2\text{CO}_3 : \text{CO}_2$$

$$1 : 1 \quad \checkmark$$

$$n(\text{CO}_2) = 0,19 \text{ mol}$$

$$n(\text{CO}_2) = \frac{V}{V_m} \quad \checkmark$$

$$0,19 = \frac{V}{22,4} \quad \checkmark$$

$$V(\text{CO}_2) = 4,256 \text{ dm}^3$$

$$\text{Actual Volume}(\text{CO}_2) = 4,256 \times 0,85 \quad \checkmark$$

$$\text{Actual Volume}(\text{CO}_2) = 3,62 \text{ dm}^3 \quad \checkmark \quad (5)$$

[12]

TOTAL: 100

