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

$$\text{speed} = \frac{\text{distance}}{\text{time}} \checkmark$$

$$= \frac{230}{30} \quad \checkmark \checkmark$$

$$= 7{,}67 \text{ m·s}^{-1} \checkmark$$ (4)

2.4 POSITIVE MARKING FROM QUESTION 2.3

2.4.1

$$\text{speed} = \frac{\text{distance}}{\text{time}}$$

$$6{,}67 \checkmark = \frac{90+90+100 \checkmark}{\text{time}}$$

time = 41.98 s ✓ (3)

POSITIVE MARKING FROM QUESTION 2.4.1

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

$v = \frac{100}{41.98}$ ✓ ✓

= 2.38 m·s^{-1} west ✓ (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 $= \frac{1}{2} \times 4 \times 20$ ✓ $+ 6 \times 20$ ✓

Displacement = 160 m ✓ North ✓ (4)

3.3

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

$= \frac{-12 - 0}{19 - 16}$ ✓

= - 4 m·s^{-2}

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

- 4 ✓ $= \frac{20 - 0}{10 - X}$ ✓

X = 15 s ✓ (5)

[15]

QUESTION 4

4.1 Car A

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

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

$\Delta t = 28{,}87$ s ✓

Car B

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

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

$\Delta t = 18$ s ✓

OR

Car B

$\Delta x = v_i\Delta t$

$500 = 27{,}78\Delta t$ ✓

$\Delta t = 18$ s ✓

Car B will reach Robot 2 first. ✓ (6)

4.2 POSITIVE MARKING FROM 3.1

OPTION 1

$v_f = v_i + a\Delta t$ ✓

$v_f = 0$ ✓ $+ 1{,}2(28{,}87)$ ✓

$v_f = 34{,}64$ m·s^{-1} East ✓

OPTION 2

$v_f^2 = v_i^2 + 2a\Delta x$ ✓

$v_f^2 = 0^2$ ✓ $+ 2(1{,}2)(500)$ ✓

$v_f = 34{,}64$ m·s^{-1} East ✓ (4)

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QUESTION 5

5.1 The amount of substance having the same number of particles ✓ as there are atoms in 12 g carbon-12 ✓. (2)

5.2 $n(Zn) = \frac{m}{M}$ ✓

$n(Zn) = \frac{12{,}8}{65}$ ✓

$= 0{,}2$ mol ✓ (3)

5.3 $Zn : H_3PO_4$

3 : 2 ✓

$n(H_3PO_4) = 0{,}13$ mol ✓ (2)

5.4 Zn : H_2

3 : 3 ✓

n(H_2) = 0,2 mol

$n(H_2) = \frac{N}{N_A}$ ✓

$0,2 = \frac{N}{6,02 \times 10^{23}}$ ✓

N (H_2) = 1,204 x 10^{23} H_2 molecules ✓ (4)

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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	$\frac{43,4}{23} = 1,89$ ✓	$\frac{1,89}{0,94} = 2,01 \approx 2$	✓ (Obtaining all simplest ratios)
C	11,32	$\frac{11,32}{12} = 0,94$ ✓	$\frac{0,94}{0,94} = 1$	
O	45,28	$\frac{45,28}{16} = 2,83$ ✓	$\frac{2,83}{0,94} = 3,01 \approx 3$	

Empirical Formula: Na_2CO_3 ✓ (5)

6.2 $M(ZnSO_4.xH_2O) = M(ZnSO_4) + x\ M(H_2O)$

287 ✓ = 65+32+4(16) ✓ + x(2+16) ✓

x= 7 ✓ (4)

6.3

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

6.3.2

Option 1	Option 2
$C(H_2SO_4) = \frac{m}{MV}$ ✓	$C(H_2SO_4) = \frac{n}{V}$ ✓
$1,5$ ✓ $= \frac{m}{98 \times 0,25}$ ✓	$1,5 = \frac{n}{0.25}$ ✓
m = 36,75 g ✓	$n(H_2SO_4)$ = 0,375 mol
	$n(H_2SO_4) = \frac{m}{M}$
	$0,375 = \frac{m}{98}$ ✓
	m = 36,75 g ✓

(4)

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QUESTION 7

7.1.1 $n(Na_2CO_3) = \frac{m}{M}$

$n(Na_2CO_3) = \frac{20}{23\times2 + 12 + 16\times3}$ ✓✓

= 0,19 mol ✓ (3)

7.1.2 $Na_2CO_3 : HNO_3$

1 : 2 ✓

$n(HNO_3) = 0,38$ mol

$c(HNO_3) = \frac{n}{V}$ ✓

$1,5 = \frac{0,38}{V}$ ✓

$V(HNO_3) = 0,25\ dm^3$ ✓ (4)

7.2 $Na_2CO_3 : CO_2$

1 : 1 ✓

$n(CO_2) = 0,19$ mol

$n(CO_2) = \frac{V}{V_m}$ ✓

$0,19 = \frac{V}{22,4}$ ✓

$V\ (CO_2) = 4,256\ dm^3$

Actual Volume (CO_2) = 4,256 x 0,85 ✓

Actual Volume $(CO_2) = 3,62\ dm^3$ ✓ (5)

[12]

TOTAL: 100