



KWAZULU-NATAL PROVINCE

EDUCATION
REPUBLIC OF SOUTH AFRICA

**NATIONAL
SENIOR CERTIFICATE**

GRADE 10

**PHYSICAL SCIENCES
PROVINCIAL STANDARDISED ASSESSMENT
SEPTEMBER 2026**

Stanmorephysics.com

MARKS: 100

DURATION: 2 hours

This question paper consists of 9 pages and 2 data sheets.

INSTRUCTIONS AND INFORMATION

1. This question paper consists of SEVEN questions. Answer ALL the questions in the ANSWER BOOK.
2. Start EACH question on a NEW page in the ANSWER BOOK.
3. Number the answers correctly according to the numbering system used in this question paper.
4. Leave ONE line between two sub-questions, for example between QUESTION 2.1 and QUESTION 2.2.
5. You may use a non-programmable calculator.
6. You may use appropriate mathematical instruments.
7. You are advised to use the attached DATA SHEETS.
8. Show ALL formulae and substitutions in ALL calculations.
9. Round off your final numerical answers to a minimum of TWO decimal places.
10. Give brief motivations, discussions et cetera where required.
11. Write neatly and legibly.

QUESTION 1: MULTIPLE-CHOICE QUESTIONS

Four options are provided as possible answers to the following questions. Each question has only ONE correct answer. Choose the answer and write only the letter (A–D) next to the question number (1.1–1.4) in the ANSWER BOOK, for example

1.5 E.

1.1 Which ONE of the following physical quantities is a vector?

A Distance

B force

C mass

D speed

(2)

1.2 An object moves along a horizontal line with **increasing** speed. Which one of the following choices could be the best description of the velocity and the acceleration for the object to achieve this motion?

	Velocity(m.s^{-1})	Acceleration(m.s^{-2})
A	positive	zero
B	positive	negative
C	negative	positive
D	negative	negative

(2)

1.3 What volume (in dm^3) does 1 g of hydrogen gas occupy at STP?

A 44,8

B 22,4

C 11,2

D 5,6

(2)

- 1.4 2,9 g of magnesium hydroxide is added to 500cm^3 distilled water. Which of the following is the CORRECT concentration of the solution in mol.dm^{-3} ?



- A 0,14
B 0,10
C $1,4 \times 10^{-4}$
D $1,0 \times 10^{-4}$

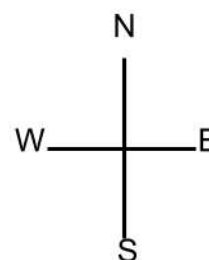
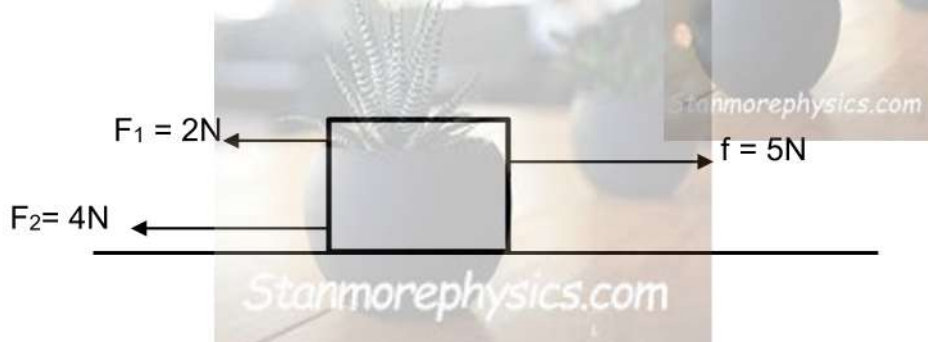
(2)

[8]

SECTION A: PHYSICS

QUESTION 2 (Start on a new page.)

Two forces, F_1 and F_2 of magnitudes 2N and 4N respectively act on a box in a westerly direction as shown in the diagram below. A constant frictional force f , of 5N acts on the block in an easterly direction. The diagram is not drawn to scale.



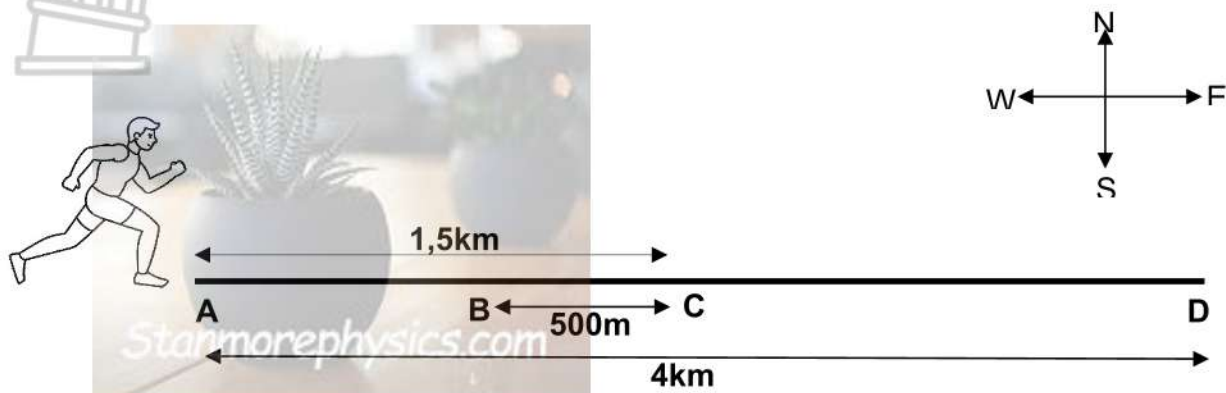
- 2.1 Define *resultant force*

(2)

- 2.2 Using a tail-to-head method and a scale of 1cm represents 1N, draw an accurate vector diagram to determine the resultant force acting on the box.

(5)

- 2.3 Jabu runs along a straight road from point A to point D, in an easterly direction. When he reaches point C, 1,5 km from point A, he realizes that his watch had fallen off. He turns around and runs back in a westerly direction, and finds the watch at point B, 500 m from point C. He then continues running towards point D according to the diagram below. His entire running route lasted him 30 minutes. **N.B** Diagrams are NOT drawn to scale.



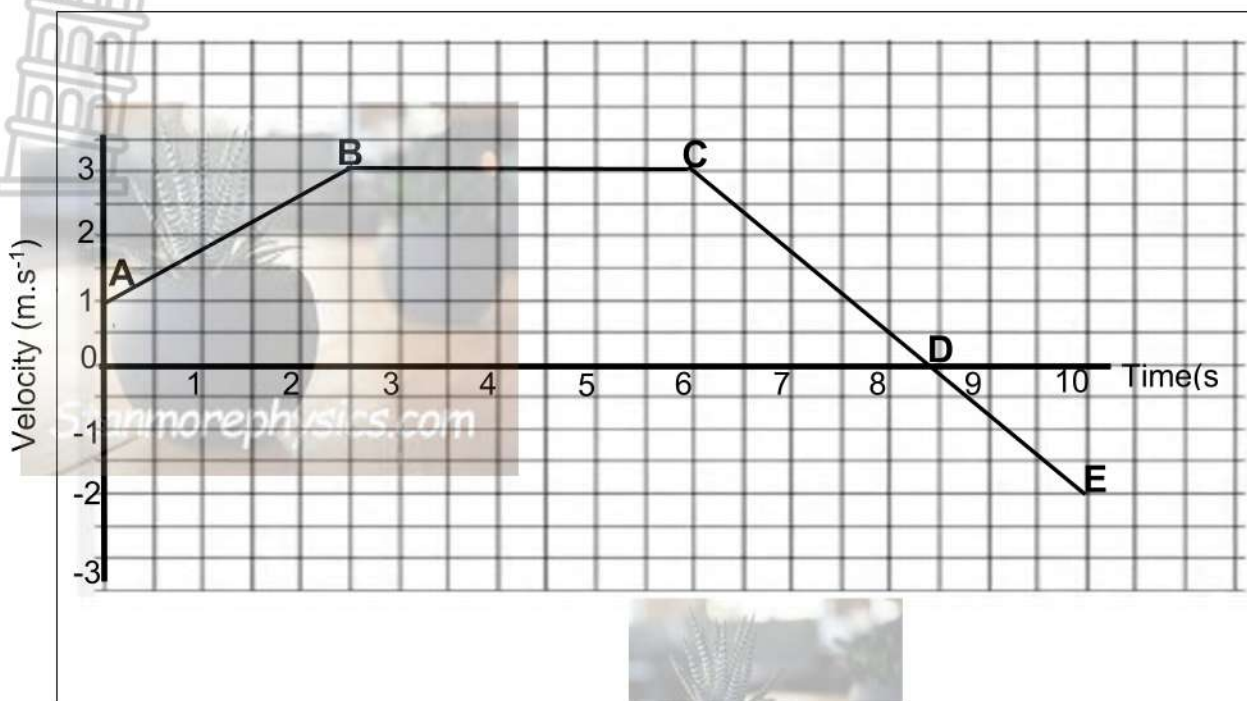
If point D is 4 km from point A, calculate :

- 2.3.1 His average speed in m.s^{-1} (4)
- 2.3.2 His average velocity for the entire route (3)
- 2.3.3 The time it would have taken Jabu to run from point A to point D if he had run at the same average speed, but did not drop his watch. (2)

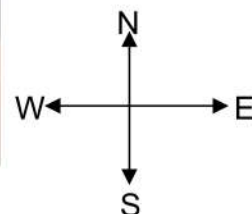
[16]

QUESTION 3 (Start on a new page.)

The velocity vs time graph below shows a cyclist riding north.



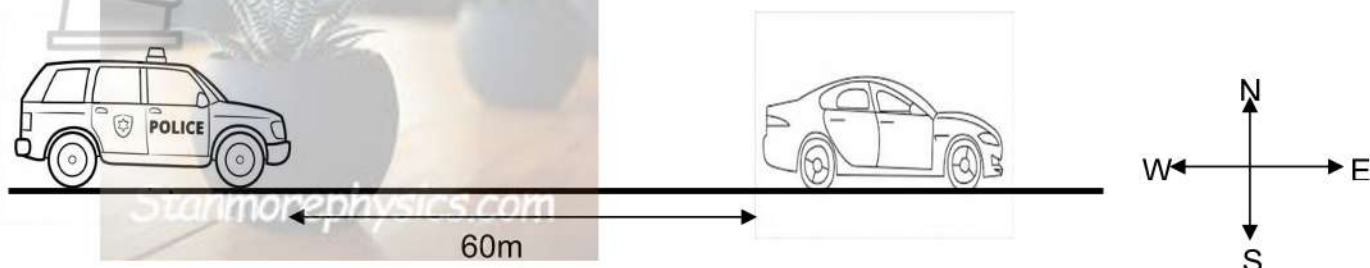
- 3.1 Define *velocity* (2)
- 3.2 Write down the : (2)
- 3.2.1 initial velocity of the cyclist (2)
- 3.2.2 speed of the cyclist at time $t = 2,5$ s (2)
- 3.3 Write down which interval (**AB, BC, CD, or DE**) where the cyclist is : (1)
- 3.3.1 travelling at constant downloaded from Stanmorephysics (1)
- 3.3.2 slowing down (1)
- 3.3.3 travelling south (1)
- 3.4 Calculate the acceleration of the cyclist between 6 s and 10 s. (4)
- 3.5 Determine the displacement of the cyclist after 10 s. (7)



[20]

QUESTION 4 (Start on a new page.)

A car, travelling at a constant velocity in an easterly direction, passes a stationary police car. 2 seconds after it is passed by the car, the police car accelerates at $0,8 \text{ m}\cdot\text{s}^{-2}$ in an attempt to catch up with the car. At this point, the police car is 60 m behind the car. Ignore the length of cars for the following questions.



4.1 Define *acceleration* (2)

4.2 If speed limit on the road is $60 \text{ km}\cdot\text{h}^{-1}$, determine, by means of a calculation if the driver was speeding? (4)

It took the traffic officer 77 s to catch the car.

4.3 Calculate the traffic officer's velocity when he caught the car? (4)

[10]

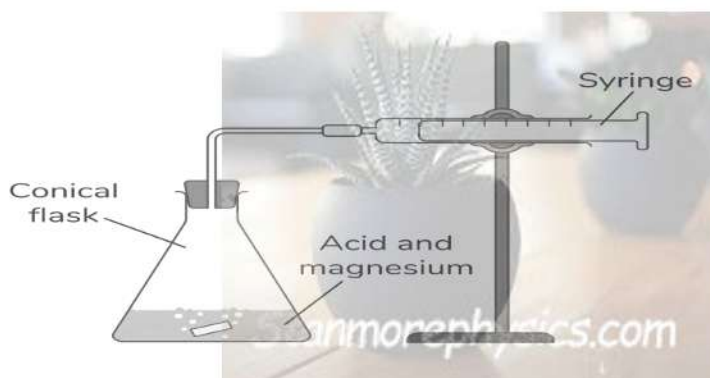
SECTION B: CHEMISTRY

QUESTION 5 (Start on a new page.)

Magnesium reacts with HCl(aq) according to the equation below.



In one such an experiment, 0,48 g of Magnesium is reacted with excess HCl(aq) in a conical flask as shown in the diagram below. The hydrogen produced is collected and measured in the syringe. downloaded from Stanmorephysics



5.1 Calculate the :



5.1.1 Initial number of moles of Mg(s) added into the conical flask . (3)

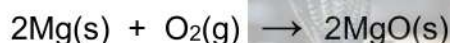
5.1.2 volume of H₂(g) produced at STP (4)

5.1.3 mass of MgCl₂ produced (3)

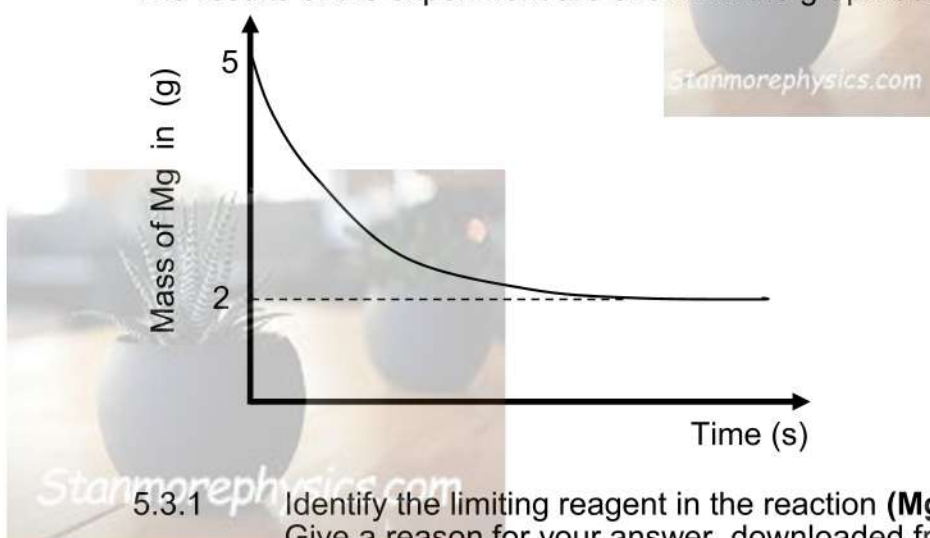
5.1.4 percentage yield of MgCl₂ , if the actual mass of MgCl₂ formed is 1.71 g. (3)

5.2 The chemical formula of hydrated copper II sulphate is CuSO₄.nH₂O. Given that molar mass of the hydrated copper II sulphate is 249,5 g·mol⁻¹, calculate the number of moles of water of crystallisation (n) in the compound (3)

5.3 In another experiment , grade 10 learners react 5 g of Mg(s) with O₂(g) . The amount of Mg(s) in the closed container is monitored over time until the reaction is complete. The balanced equation for the reaction is below.



The results of the experiment are shown in the graph below:



5.3.1 Identify the limiting reagent in the reaction (**Mg or O₂**).
Give a reason for your answer downloaded from Stanmorephysics (2)

5.3.2 Calculate the mass of the MgO(s) produced. (4)

[22]

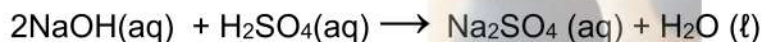
QUESTION 6 (Start on a new page.)

An unknown organic compound has a formula of C_xH_y . The molar mass of this compound is $42 \text{ g}\cdot\text{mol}^{-1}$.

- 6.1 Define the term *empirical formula* (2)
- 6.2 A 3,50 g sample of this compound reacts completely with oxygen to give 11,00 g of CO_2 and water. Calculate the : (2)
- 6.2.1 mass carbon in the 11,00 g of CO_2 (2)
- 6.2.2 mass hydrogen in the 3,50 g sample of C_xH_y (2)
- 6.2.3 empirical formula of the compound (4)
- 6.3 Determine the values of **x** and **y** in the compound C_xH_y (3)
- [13]**

QUESTION 7 (Start on a new page.)

Sodium hydroxide, $\text{NaOH}(\text{aq})$, reacts with sulphuric acid, $\text{H}_2\text{SO}_4(\text{aq})$ to produce water and **a salt** according to the balanced equation :



- 7.1 Write down the name of the salt produced. (1)

The $\text{NaOH}(\text{aq})$ used was prepared by dissolving 5 g of solid in distilled water to make a 250 ml solution. downloaded from Stanmorephysics

- 7.2 10ml of $\text{NaOH}(\text{aq})$ reacts completely with 15ml of $\text{H}_2\text{SO}_4(\text{aq})$.

Calculate the :

- 7.2.1 concentration of the $\text{NaOH}(\text{aq})$ (4)
- 7.2.2 number of moles of $\text{H}_2\text{SO}_4(\text{aq})$ that reacted with the 10ml of $\text{NaOH}(\text{aq})$ (5)
- 7.2.3 How does the number of moles of the salt produced compare with those in the 15ml of the $\text{H}_2\text{SO}_4(\text{aq})$? Choose from GREATER THAN, LESS THAN OR EQUAL TO . (1)

[11]

TOTAL: 100

DATA FOR PHYSICAL SCIENCES GRADE 10

PHYSICS

TABLE 1: PHYSICAL CONSTANTS

NAME	SYMBOL	VALUE
Acceleration due to gravity	g	$9,8 \text{ m}\cdot\text{s}^{-2}$
Speed of light in a vacuum	c	$3,0 \times 10^8 \text{ m}\cdot\text{s}^{-1}$
Planck's constant	h	$6,63 \times 10^{-34} \text{ J}\cdot\text{s}$
Charge on electron	q_e	$1,6 \times 10^{-19} \text{ C}$
Electron mass	m_e	$9,11 \times 10^{-31} \text{ kg}$

TABLE 2: FORMULAE

MOTION

$v_f = v_i + a\Delta t$	$\Delta x = v_i\Delta t + \frac{1}{2}a\Delta t^2$
$v_f^2 = v_i^2 + 2a\Delta x$	$\Delta x = \left(\frac{v_f + v_i}{2}\right)\Delta t$

CHEMISTRY

TABLE 1: PHYSICAL CONSTANTS

NAME	SYMBOL	VALUE
Standard pressure	p^θ	$1,013 \times 10^5 \text{ Pa}$
Molar gas volume at STP	V_m	$22,4 \text{ dm}^3\cdot\text{mol}^{-1}$
Standard temperature	T^θ	273 K
Avogadro's constant	N_A	$6,02 \times 10^{23} \text{ mol}^{-1}$

TABLE 2: FORMULAE

$n = \frac{m}{M}$	$n = \frac{N}{N_A}$
$c = \frac{n}{V}$ or $c = \frac{m}{MV}$	$n = \frac{V}{V_m}$

TABLE 3: THE PERIODIC TABLE OF ELEMENTS

1 (I)	2 (II)	3	4	5	6	7	8	9	10	11	12	13 (III)	14 (IV)	15 (V)	16 (VI)	17 (VII)	18 (VIII)
1 2,1 H 1																	2 He 4
3 1,0 Li 7	4 1,5 Be 9											5 2,0 B 11	6 2,5 C 12	7 3,0 N 14	8 3,5 O 16	9 4,0 F 19	10 Ne 20
11 0,9 Na 23	12 1,2 Mg 24											13 1,5 Al 27	14 1,8 Si 28	15 2,1 P 31	16 2,5 S 32	17 3,0 Cl 35,5	18 Ar 40
19 0,8 K 39	20 1,0 Ca 40	21 1,3 Sc 45	22 1,5 Ti 48	23 1,6 V 51	24 1,6 Cr 52	25 1,5 Mn 55	26 1,8 Fe 56	27 1,8 Co 59	28 1,8 Ni 59	29 1,9 Cu 63,5	30 1,6 Zn 65	31 1,6 Ga 70	32 1,8 Ge 73	33 2,0 As 75	34 2,4 Se 79	35 2,8 Br 80	36 Kr 84
37 0,8 Rb 86	38 1,0 Sr 88	39 1,2 Y 89	40 1,4 Zr 91	41 Nb 92	42 1,8 Mo 96	43 1,9 Tc	44 2,2 Ru 101	45 2,2 Rh 103	46 2,2 Pd 106	47 1,9 Ag 108	48 1,7 Cd 112	49 1,7 In 115	50 1,8 Sn 119	51 1,9 Sb 122	52 2,1 Te 128	53 2,5 I 127	54 Xe 131
55 0,7 Cs 133	56 0,9 Ba 137	57 La 139	72 1,6 Hf 179	73 Ta 181	74 W 184	75 Re 186	76 Os 190	77 Ir 192	78 Pt 195	79 Au 197	80 Hg 201	81 1,8 Tl 204	82 1,8 Pb 207	83 1,9 Bi 209	84 2,0 Po	85 2,5 At	86 Rn
87 0,7 Fr	88 0,9 Ra 226	89 Ac															
58 Ce 140	59 Pr 141	60 Nd 144	61 Pm	62 Sm 150	63 Eu 152	64 Gd 157	65 Tb 159	66 Dy 163	67 Ho 165	68 Er 167	69 Tm 169	70 Yb 173	71 Lu 175				
90 Th 232	91 Pa	92 U 238	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr				

KEY/SLEUTEL

Atomic number
*Atoomgetal*Electronegativity
*Elektronegatiwiteit*Symbol
*Simbool*Approximate relative atomic mass
Benaderde relatiewe atoommassa



KWAZULU-NATAL PROVINCE

EDUCATION
REPUBLIC OF SOUTH AFRICA

**NATIONAL
SENIOR CERTIFICATE**

GRADE 10

**PHYSICAL SCIENCES
PROVINCIAL STANDARDISED ASSESSMENT
MARKING MEMORANDUM
SEPTEMBER 2026**

MARKS: 100

DURATION: 2 hours

Stanmorephysics.com

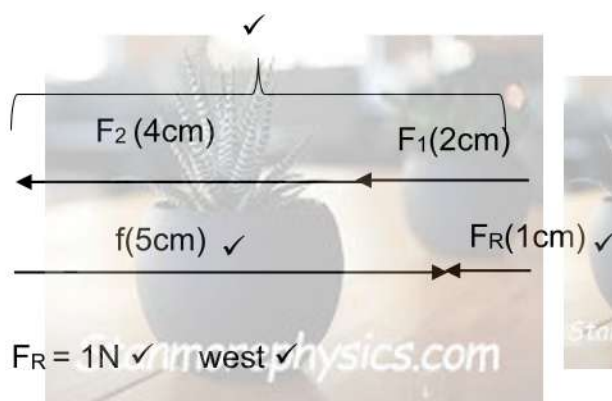
QUESTION 1

- 1.1 B ✓✓ (2)
- 1.2 D ✓✓ (2)
- 1.3 C ✓✓ (2)
- 1.4 B ✓✓ (2)
- [8]

QUESTION 2

- 2.1. A single force that has the same effect as two or more forces together ✓✓ (2 or 0)

2.2



CRITERIA

✓	F_1 and F_2 drawn head-to-tail with correct scale and direction
✓	f drawn with correct scale and direction
✓	F_R drawn with correct scale and direction
✓✓	Correct final answer in magnitude and direction

(5)

2.3.1 speed = $\frac{\text{distance}}{\text{time}}$ $v = \frac{\Delta x}{\Delta t}$

$$v = \frac{D}{\Delta t} = \frac{5000}{1800} = 2,78 \text{ m}\cdot\text{s}^{-1}$$

OR

2.3.2 $v = \frac{\Delta x}{\Delta t} = \frac{4000}{1800} = 2,22 \text{ m}\cdot\text{s}^{-1} \text{ East}$

$v = \frac{D}{\Delta t}$ POSITIVE MARKING FROM 2.3.1 (2)

2.3.3 $2,78 = \frac{4000}{\Delta t}$
 $\Delta t = 1438,85 \text{ s (23,98 mins) or}$

$$2,78 = \frac{1000}{\Delta t} = 1000/2,78$$

$$\Delta t = 359,71 \text{ s} / 60 = 5,99 \text{ min}$$

$$\Delta t = 30 - 5,99 = 24 \text{ min}$$

[16]

QUESTIONS

3.1 The rate of change of position/displacement ✓✓ (2 or 0) (2)

3.2.1 1 m.s^{-1} ✓north✓ (2)

3.2.2 3 m.s^{-1} ✓✓ (2)

3.3.1 BC ✓ (1)

3.3.2 CD ✓ (1)

3.3.3 DE ✓ (1)

3.4 **OPTION 1(Using gradient)**

a = gradient of a velocity –time graph

$$= \frac{\Delta Y}{\Delta X}$$

$$a = \frac{-2-3}{10-6}$$

$$= -1,25$$

$$= 1,25 \text{ ms}^{-2} \text{ south}$$

Note: Any two points on the graph between C and E may be used

OPTION 2(Using equations of motion)

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

$$-2 = 3 + a(4)$$

$$a = -1,25$$

$$= 1,25 \text{ ms}^{-2} \text{ south}$$

3.5 **OPTION 1**

Displacement = Area under a velocity-time graph

$$= (A_{\text{trapezium}} + A_{\text{rectangle}} + A_{\text{triangle1}}) - A_{\text{triangle2}}$$

$$= \left(\frac{1}{2} (1+3)(2,5) \right) + (3,5 \times 3) + \frac{1}{2} (3)(2,5) - \frac{1}{2} (1,5)(2)$$

$$= (5 + 10,5 + 3,75) - 1,5$$

$$= 17,75 \text{ m north}$$

OPTION 2

Displacement

= Area under a velocity-time graph

$$= (A_{\text{trapezium}} + A_{\text{rectangle}} + A_{\text{triangle1}}) - A_{\text{triangle2}}$$

$$= \left(\frac{1}{2} (6+3,5)(2) \right) + (1 \times 6) + \frac{1}{2} (3)(2,5) - \frac{1}{2} (1,5)(2)$$

$$= (9,5 + 6 + 3,75) - 1,5$$

$$= 17,75 \text{ m north}$$

Option 3: Equations of motion may be used as well

downloaded from Stanmorephysics

[20]

QUESTION 4

4.1 rate of change of velocity ✓✓ (2 or 0) (2)

4.2 speed limit = $\frac{60000}{3600} = 16,67 \text{ m.s}^{-1}$ ✓

$$\Delta x = v \times \Delta t \quad \checkmark$$

$$60 = v(2) \quad \checkmark$$

$$\therefore v_{\text{car}} = 30 \text{ m.s}^{-1}$$

or

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

$$60 = v_i(2) + \frac{1}{2}(0)(2)^2 \quad \checkmark$$

$$\therefore v_{\text{car}} = 30 \text{ m.s}^{-1}$$

$\therefore$ The car was speeding. ✓

4.3 $v_f = v_i + a \Delta t \quad \checkmark$
 $= 0 + (0,8)(77) \quad \checkmark$
 $= 61,6 \text{ m.s}^{-1} \quad \checkmark$ East ✓

Accept: $V_f = v_i + a \Delta t \quad \checkmark$
 $= 0 + (0,8)(75) \quad \checkmark$
 $60 \text{ ms}^{-1} \quad \checkmark$ East ✓

(4)

(4)

[10]

QUESTION 5

5.1.1 $n(\text{Mg}) = \frac{m}{M} \quad \checkmark$
 $= \frac{0,48}{24} \quad \checkmark$
 $= 0,02 \text{ mols} \quad \checkmark$



(3)

5.1.2 **POSITIVE MARKING FROM 5.1.1**

$$n(\text{H}_2) = n(\text{Mg}) = 0,02 \text{ mols} \quad \checkmark$$

$$n = \frac{v}{V_m} \quad \checkmark$$

$$0,02 = \frac{v}{22,4} \quad \checkmark$$

$$V(\text{H}_2) = 0,448 \text{ dm}^3 \quad \checkmark$$

(4)

5.1.3 $n(\text{MgCl}_2) = n(\text{Mg}) = 0,02 \text{ mols} \quad \checkmark$ **POSITIVE MARKING FROM 5.1.1**

$$n(\text{MgCl}_2) = \frac{m}{M}$$

$$0,02 = \frac{m}{95} \quad \checkmark$$

$$m(\text{MgCl}_2) = 1,9 \text{ g} \quad \checkmark$$

(3)

5.1.4 **POSITIVE MARKING FROM 5.1.3**

$$\% \text{ yield} = \frac{\text{actual yield}}{\text{theoretical yield}} \times 100 \quad \checkmark$$

$$= \frac{1,71}{1,9} \times 100 \quad \checkmark$$

$$= 90 \% \quad \checkmark$$

(3)

5.2 $M(\text{CuSO}_4 \cdot n\text{H}_2\text{O}) = 249,5$
 $63,5 + 32 + 64 + 18n \checkmark = 249,5 \checkmark$
 $n = 5 \checkmark$ (3)

5.3.1 $\text{O}_2 \checkmark$, reacts completely since some of the Mg did not react/Mg is in excess $\checkmark$ [Exclude this question] See conversion table for this question (2)

5.3.2 $m(\text{Mg})_{\text{reacted}} = 5 - 2 = 3 \text{ g} \checkmark$
 $n(\text{Mg}) = \frac{m}{M}$
 $= \frac{3}{24} \checkmark$
 $= 0,125 \text{ mols}$
 $n(\text{MgO}) = n(\text{Mg}) = 0,125 \text{ mols}$
 $m(\text{MgO}) = n \times M$
 $= 0,125 \times 40 \checkmark$
 $= 5 \text{ g} \checkmark$ (4)

[22]

QUESTION 6

6.1 The simplest whole-number ratio of atoms in a compound $\checkmark \checkmark$ (2 or 0) (2)

6.2.1 $m(\text{C}) = \left(\frac{12}{44} \times 11\right) \checkmark$
 $= 3 \text{ g} \checkmark$ (2)

6.2.2 $m(\text{H}) = 3,50 - 3,00 \checkmark$
 $= 0,5 \text{ g} \checkmark$ (2)

POSITIVE MARKING FROM 6.2.1

6.2.3 **POSITIVE MARKING FROM 6.2.1 and 6.2.2**

Element	mass (g)	$n = \frac{m}{M}$	Simplest Ratio	
C	3	$\frac{3}{12} \checkmark = 0,25$	$\frac{0,25}{0,25} = 1$	$\checkmark$ (both simplest ratios)
H	0,5	$\frac{0,5}{1} \checkmark = 0,5$	$\frac{0,5}{0,25} = 2$	

Empirical Formula: $\text{CH}_2 \checkmark$ (4)

6.3 $M(\text{molecular formula}) = M(\text{empirical formula}) \times n$
 $= M(\text{CH}_2)n$
 $42 = 14 \times n \checkmark$
 $n = 3 \checkmark$
 Molecular formula $= (\text{CH}_2)_3$
 $= \text{C}_3\text{H}_6$ And/Or $\therefore x = 3 \quad y = 6 \checkmark$

[Exclude this question] See conversion table for this question

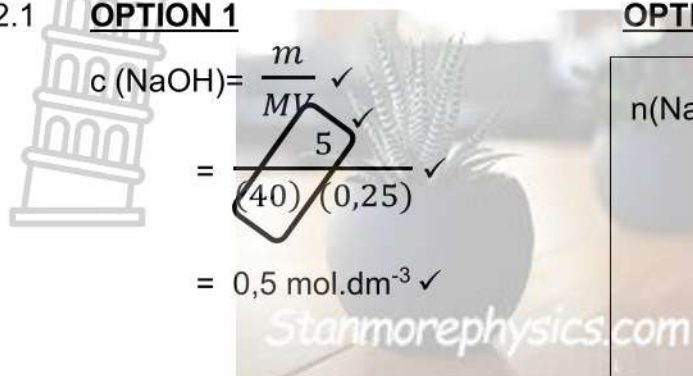
(3)
[13]

QUESTION 7

7.1 sodium sulphate ✓

(1)

7.2.1 **OPTION 1**

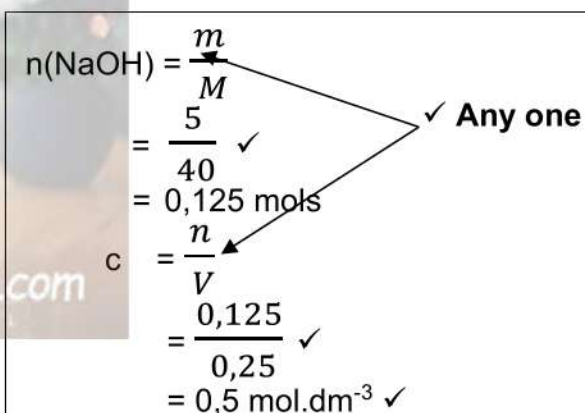


$$c(\text{NaOH}) = \frac{m}{MV}$$

$$= \frac{5}{(40)(0,25)}$$

$$= 0,5 \text{ mol.dm}^{-3}$$

OPTION 2



$$n(\text{NaOH}) = \frac{m}{M}$$

$$= \frac{5}{40}$$

$$= 0,125 \text{ mols}$$

$$c = \frac{n}{V}$$

$$= \frac{0,125}{0,25}$$

$$= 0,5 \text{ mol.dm}^{-3}$$

Any one

(4)

7.2.2 **POSITIVE MARKING FROM 7.2.1**

$$n(\text{NaOH}) = Cv$$

$$= (0,5)(0,01)$$

$$= 5 \times 10^{-3} \text{ mols}$$

$$n(\text{H}_2\text{SO}_4) = \frac{1}{2} n(\text{NaOH})$$

$$= (0,5)(0,005)$$

$$= 0,0025 \text{ moles}$$

CRITERIA

- Use of formula $c = \frac{n}{v}$ ✓
- Correct substitution of 0,01 ✓
- Correct Ratio of 1:2 ✓
- substitution ✓
- Answer only if its correct ✓

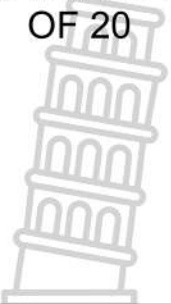
(5)

7.2.3 Equal to ✓

(1)

[11]

TOTAL: 100

CONVERSION TABLE FOR QUESTION 5.3.1		CONVERSION TABLE FOR QUESTION 6.3	
MARK OUT OF 20 	MARK OUT OF 22(this is the learners converted mark and must be adjusted accordingly)	MARK OUT OF 10	MARK OUT OF 13(this is the learners converted mark and must be adjusted accordingly)
0	0	0	0
1	1	1	1
2	2	2	3
3	3	3	4
4	4	4	5
5	6	5	7
6	7	6	8
7	8	7	9
8	9	8	10
9	10	9	12
10	11	10	13
11	12		
12	13		
13	14		
14	15		
15	17		
16	18		
17	19		
18	20		
19	21		
20	22		