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education
Department:
Education
North West Provincial Government
REPUBLIC OF SOUTH AFRICA

PROVINCIAL ASSESSMENT

GRADE 10

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PHYSICAL SCIENCES (P2): CHEMISTRY

NOVEMBER 2026

POINTS : 100

TIME : 2 hours

This question paper consists of 12 pages, including information sheets.

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INSTRUCTIONS AND INFORMATION

1.	Write your NAME and SURNAME in the appropriate space on the ANSWER BOOK.
2.	This question paper consists of SEVEN questions. Answer ALL the questions in the ANSWER BOOK.
3.	Start EACH question on a NEW page in the ANSWER BOOK.
4.	Number the answers correctly according to the numbering system used in this question paper.
5.	Leave ONE line open between two sub-questions, e.g. between QUESTION 2.1 and QUESTION 2.2.
6.	You may use a non-programmable calculator.
7.	You may use appropriate mathematical tools.
8.	Show ALL the formulas and substitutions in ALL calculations.
9.	Round your FINAL numerical answers to a minimum of TWO decimal places.
10.	Give brief motivations, discussions, etc. where necessary.
11.	It is recommended that you use the attached DATA SHEETS.
12.	Write neatly and legibly.

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QUESTION 1: MULTIPLE CHOICE QUESTIONS

Various options are given 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 numbers (1.1–1.7) in the ANSWER BOOK, e.g. 1.11 E.

1.1. A bottle is dropped from a certain height and breaks when it hits the floor, as shown in the picture below.



The best statement that explains why the bottle breaks is that the bottle is ...

A flexible
B stretchable
C brittle
D malleable (2)

1.2. A teacher demonstrates one of the concepts to grade 10 learners. She adds several drops of blue ink to a glass of water. It is observed that the color of the water changes completely blue after a while during the demonstration.

The teacher demonstrated the concept of ....

A diffusion
B physical change
C chemical change
D change of condition (2)

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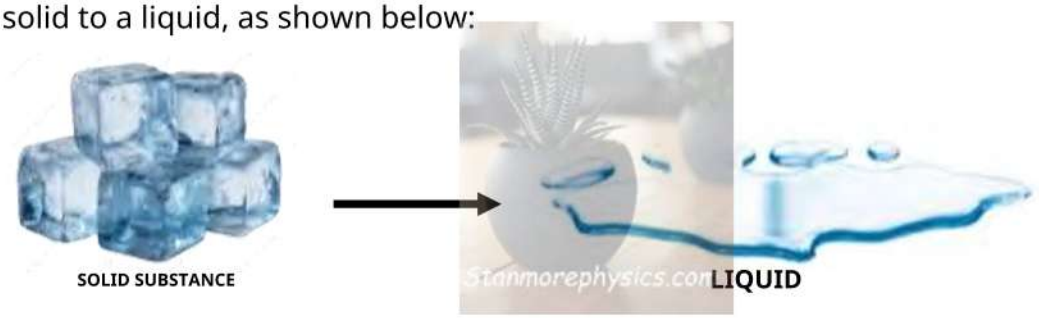
1.3. A neutral atom of the element nickel has a notation as shown below:

$$^{59}_{28}Ni$$

Which one of the following is the correct number of neutrons for nickel?

A 59
B 31
C 87
D 28 (2)

1.4. Ice cubes are taken out of the freezer and after 30 minutes change from a solid to a liquid, as shown below:



The above change is an example of ...

A chemical change
B physical change
C mechanical change
D electrical change (2)

1.5. The ratio of atoms in ( ) in the order B : S : O is ...

A 2 : 3 : 12
B 2 : 1 : 4
C 2 : 4 : 3
D 1 : 2 : 3 (2)

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1.6. A reaction between aluminium nitrate, and potassium hydroxide, deliver **TWO** products.

The following are chemical formulas of the products formed.

A $Al(NO_3)_3$ and KOH

B $Al(OH)_2$ and ENT_3

C $Al(OH)_2$ and K_2NO_3

D $Al(OH)_3$ and ENT_3 (2)

1.7. Solid calcium carbonate with a mass of 2 g reacts completely with excess hydrochloric acid according to the following balanced equation:

( ) + 20( ) → ( ) + ( ) + (l)

Select the volume of carbon dioxide that will be formed at STD. A

0.089 dm^3

B 44.8 dm^3

C 0.045 dm^3

D 0.448 dm^3 (2)

[14]

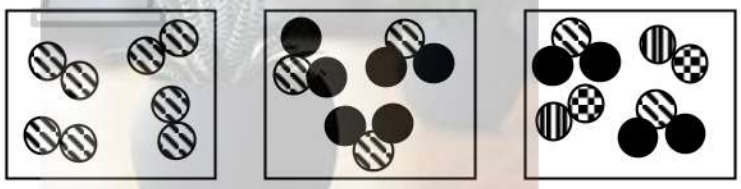
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QUESTION 2

2.1 Three diagrams below show different representations of mixtures, compounds and elements. Study the diagrams and answer the questions.

DIAGRAM A **DIAGRAM B** **DIAGRAM C**



KEY:

: Oxygen
: Hydrogen
: Sodium
: Chlorine

2.1.1. Define the term *element*. (2)

2.1.2. Identify the diagram that shows only one element. (1)

2.1.3. Identify the diagram that shows a mixture and determine whether the mixture is HOMOGENEOUS or HETEROGENEOUS. (2)

2.1.4. Write down TWO chemical formulas of compounds, which are shown in Diagram **C** prevent. (2)

2.1.5. Identify the diagram that shows the product(s) of the following synthesis reaction:

$$2H_{2(g)} + Oh_{2(g)} \rightarrow 2H_2Oh_{(l)}$$ (2)

2.2. Electricians wear gloves when handling heavy-current electrical cables. This is one of the safety precautions that any electrician must adhere to to prevent injuries during service.



2.2.1. Identify a material that acts as a: electrical conductor (1)

2.2.2. electrical insulator (1)

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2.2.3. Briefly explain your answers to QUESTIONS 2.2.1. and 2.2.2. by distinguish between the two materials. (4)

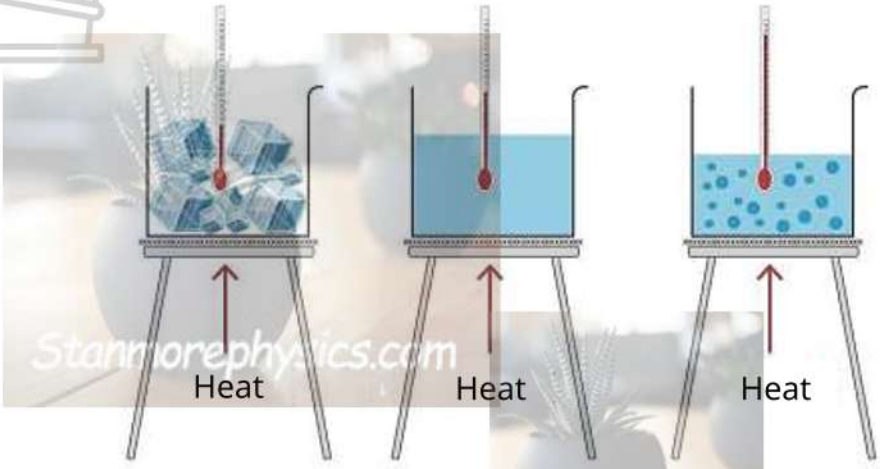
[15]



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QUESTION 3

Grade 10 learners conducted an experiment to investigate the melting and boiling points of an unknown substance. During the experiment, they heated 20 g of the unknown substance over a period of time with a constant flame.



The temperature of the substance was recorded over time as shown below:

Time (few)	0	3	6	9	12	15	18	21	24	27	30	33
Temp (^{o}C)	- 20	- 10	0	0	0	30	60	100	100	100	120	140

Use the information in the table above to answer 3.1.

Define *boiling point*. (2)

3.2. Identify the state(s) of matter in:

3.2.1. 3 minutes (1)

3.2.2. 24 minutes (2)

3.3. Write down the name of the process between 6 and 12 minutes. (1)

3.4. Write down the value in SI units of:

3.4.1. melting point (1)

3.4.2. boiling point (1)

3.5. Briefly explain your answer to QUESTION 3.4.2 using the kinetic molecular theory. (3)

3.6. Identify the name of the substance used in the above investigation.

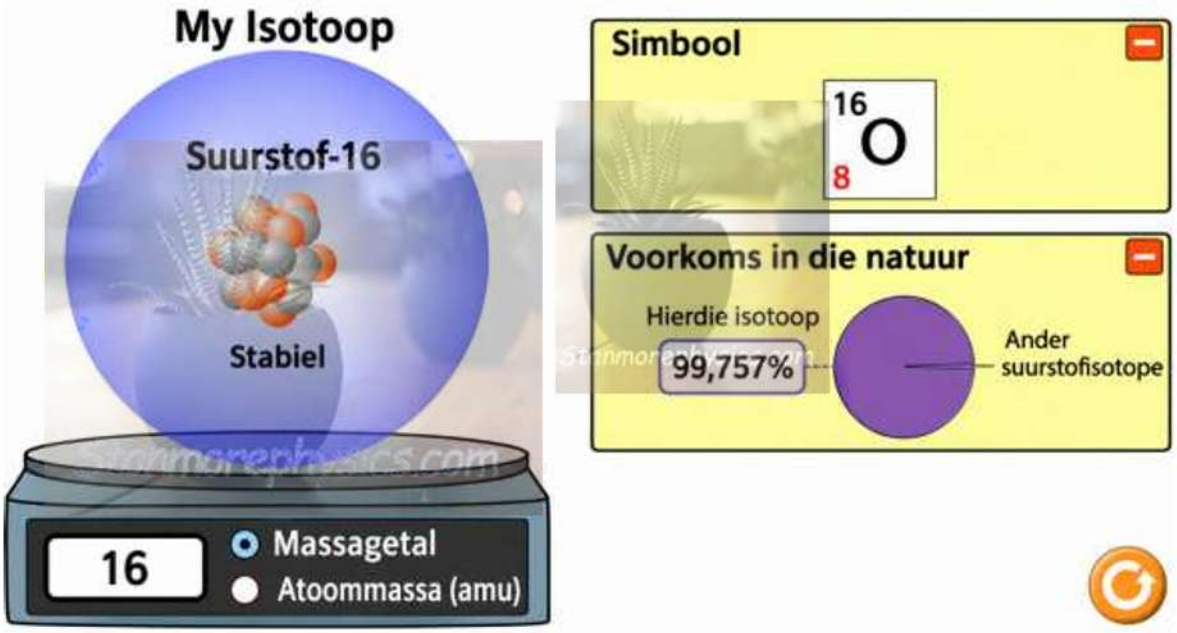
(1)

[12]

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QUESTION 4

4.1. A Grade 10 learner, Boitumelo, was studying for a chemistry paper for the final examination. In one of the topics, she discovered that oxygen has three isotopes, namely**Oxygen-16**,**Oxygen-17**and **Oxygen-18**She discovered this through a phone app called PhET simulation. She found that**Oxygen-16**'a natural occurrence of 99.757%, as shown below, **Oxygen-17**'a natural occurrence of 0.038% and**Oxygen-18**'has a natural occurrence of 0.205%.



4.1.1. Define*relative atomic mass*. (2)

4.1.2. Calculate the relative atomic mass (RAM) of oxygen. (5)

4.2. A compound ($CaSX_4$) with an unknown element**X**, has a molar mass of 136 $g.mol^{-1}$The percentage composition of**X**in the compound is 47.06%.

Determine the unknown element X. (5)

[12]

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QUESTION 5

A reaction of methane (**CH_4**) with excess oxygen to produce carbon dioxide and water is an example of a combustion reaction that is exothermic.

5.1. Describe *exothermic reaction*. (1)

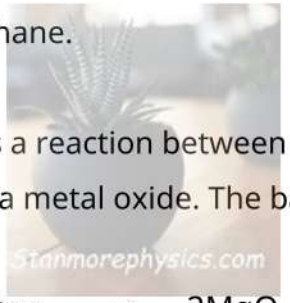
5.2. Name the type of bond that exists between the atoms in methane. (1)

5.3. Is the above reaction an example of PHYSICAL or CHEMICAL CHANGE?

Explain your answer. (2)

5.4. Write down a BALANCED chemical equation for the above combustion reaction. (3)

5.5. Draw a Lewis dot diagram of methane. (2)



Another combustion reaction involves a reaction between a metal that is burned in the presence of air to form a metal oxide. The balanced chemical equation is given below:

$$2Mg_{(s)} + Oh_{2(g)} \rightarrow 2MgO$$

5.6. Use a calculation to prove whether the mass of the above reaction is conserved or not. (4)

[13]

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QUESTION 6

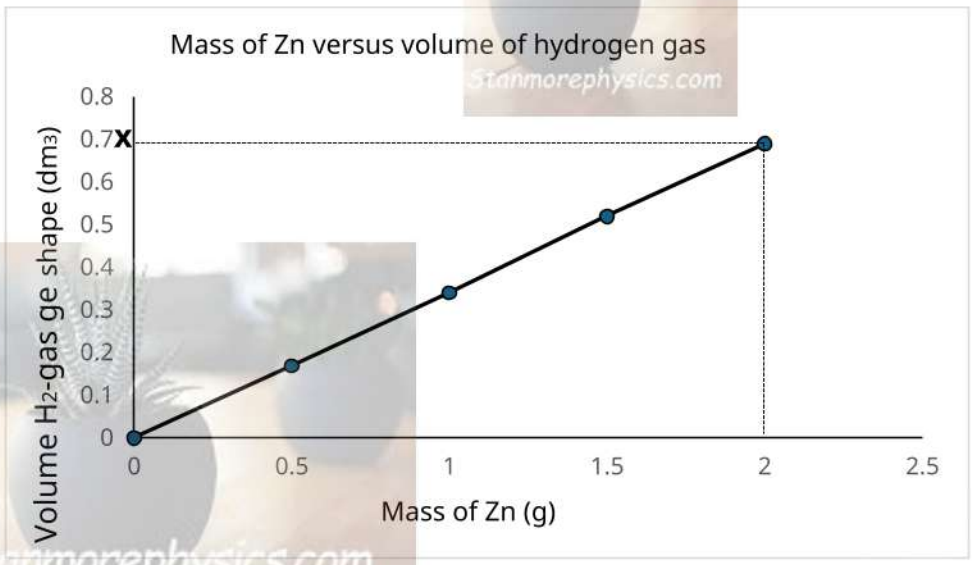
A group of learners conducted an experiment to investigate the relationship between the mass of zinc used and the volume of hydrogen gas formed. Hydrochloric acid was in excess, and its concentration was kept constant for all trials. The balanced equation for the reaction is:

$$Zn_{(s)} + 2HCl_{(aq)} \rightarrow ZnCl_{2(aq)} + H_{2(g)}$$

The following results were obtained:

Probation	Mass of Zn (g)	Volume H_2 formed (dm^3)
1	0.5	0.17
2	1	0.34
3	1.5	0.52
4	2	**x**

Learners used the results to draw the graph below.



Use the information above to answer the questions: 6.1.

Identify the following variable:

6.1.1. Dependent variable (1)

6.1.2. Independent variable (1)

6.2. Write down an investigative question for the above investigation. (2)

6.3. Use the graph to draw a conclusion from the investigation. (2)

6.4. Use a calculation to find the value of **x** (volume H_2-gas formed) when 2 g of Zn is used at STD. (5)

[11]

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QUESTION 7

7.1. An organic compound called ester consists of 40% Carbon, 6.67% Hydrogen and 53.33% Oxygen.

7.1.1. Define the term *empirical formula*. (2)

7.1.2. Determine the empirical formula of the above ester. (5)

7.1.3. Determine the molecular formula of the above ester if the molar mass is 60 g.mol.$^{-1}$is. (2)

7.2. A learner has a standard solution of sulfuric acid (H_2SO_4) prepared where she dissolved 0.025 moles of the acid in a volume of 50 cm^3used. 7.2.1. Define *molar mass*. (2)

7.2.2. Calculate the molar mass of H_2SO_4. (2)

7.2.3. Define *concentration*. (2)

7.2.4 Switch 50 $cm^3$to DM^3. (1)

7.2.5. Calculate the concentration of the standard solution. (3)

7.3.Water is stoichiometrically bound to a crystal of $CaSO_4$The ratio of the molar mass of water (H_2O) to calcium sulfate ($CaSO_4$) in the hydrated crystal is**1 : 4.25**The formula of the hydrated crystal is $CaSO_4$**x**H_2Oh

•

7.3.1. Write down the term for the underlined phrase. (1)

7.3.2. Determine the value of**x**. (3)

[23]

TOTAL: [100]

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Information sheet

TABLE 1: PHYSICAL CONSTANTS/ *TABLE 1: PHYSICAL CONSTANTS*

NAMES/ *NAME*	SYMBOL/ *SYMBOL*	VALUE/ *VALUE*
Standard pressure *Standard pressure*	p^{-}	1.013×10^{5} Dad
Molar gas volume at STP *Molar gas volume at STD*	V_m	$22.4\ dm^3 \cdot mole^{-1}$
Standard temperatures *Standard temperature*	T^{-}	273 K
Charge on electron *Charge on electron*	e	-1.6×10^{-19} C
Avogadro's constant *Avogadro constant*	A_A	$6.02 \times 10^{23}\ mole^{-1}$

TABLE 2: FORMULAS/ *TABLE 2: FORMULAS*

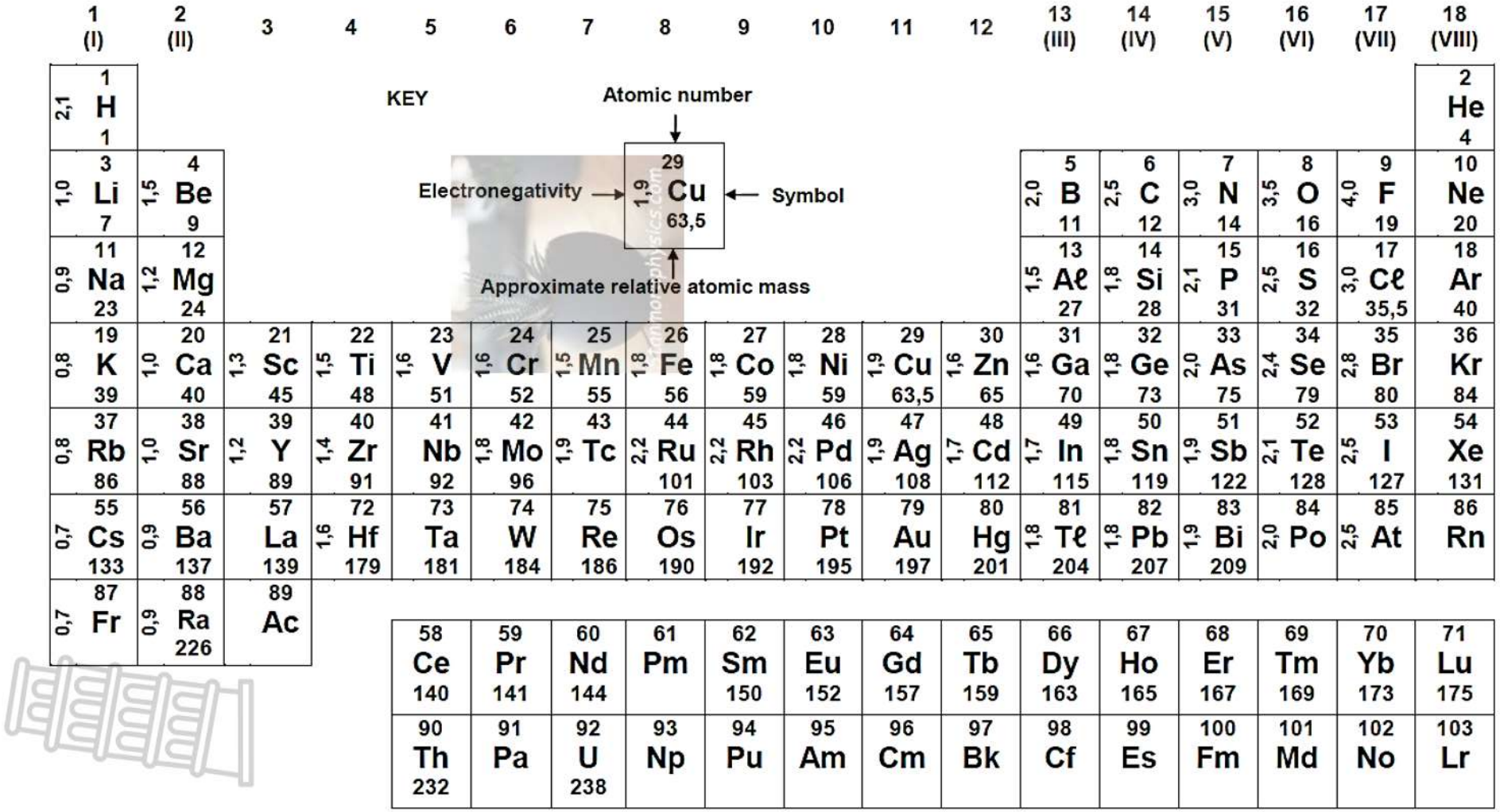
$n = \frac{m}{M}$	$n = \frac{A}{A_A}$
$n = \frac{V}{V_m}$	$c = \frac{a}{V}$
$c = \frac{m}{MV}$	

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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)
2,1 H 1																	2 He 4
1,0 Li 7	1,5 Be 9											2,0 B 11	2,5 C 12	3,0 N 14	3,5 O 16	4,0 F 19	10 Ne 20
0,9 Na 23	1,2 Mg 24											1,5 Aℓ 27	1,8 Si 28	2,1 P 31	2,5 S 32	3,0 Cℓ 35,5	18 Ar 40
0,8 K 39	1,0 Ca 40	1,3 Sc 45	1,5 Ti 48	1,6 V 51	1,6 Cr 52	1,5 Mn 55	1,8 Fe 56	1,8 Co 59	1,8 Ni 59	1,9 Cu 63,5	1,6 Zn 65	1,6 Ga 70	1,8 Ge 73	2,0 As 75	2,4 Se 79	2,8 Br 80	36 Kr 84
0,8 Rb 86	1,0 Sr 88	1,2 Y 89	1,4 Zr 91	41 Nb 92	1,8 Mo 96	1,9 Tc	2,2 Ru 101	2,2 Rh 103	2,2 Pd 106	1,9 Ag 108	1,7 Cd 112	1,7 In 115	1,8 Sn 119	1,9 Sb 122	2,1 Te 128	2,5 I 127	54 Xe 131
0,7 Cs 133	0,9 Ba 137	57 La 139	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	1,8 Tℓ 204	1,8 Pb 207	1,9 Bi 209	2,0 Po	2,5 At	86 Rn
0,7 Fr 87	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

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TAXONOMY GRID

CRITERIA/ DESCRIPTION	COGNITIVE LEVELS			
	LEVEL 1 Remember / Recall	**LEVEL 2** Understanding	**LEVEL 3** Application and Analysis	**LEVEL 4** Evaluation and Creation
WEIGHING	**15%**	**40%**	**35%**	**10%**
QUESTION 1		1.1(2), 1.2(2)	1.3(2), 1.4(2), 1.7(2)	1.6(2)
QUESTION 2	2.1.1(2)	2.2.1(1), 2.2.2(1), 2.2.3(4)	2.1.2(1), 2.1.3(2), 2.1.4(2), 2.1.5(2)	
QUESTION 3	3.1(2)	3.2.1(1), 3.2.2(2), 3.3(1), 3.4.1(1), 3.4.2(1)	3.5(3), 3.6(1)	
QUESTION 4	4.1.1(2)		4.1.2(5)	4.2(5)
QUESTION 5	5.1(1)	5.2(1), 5.3(2), 5.5(2), 5.6(4)	5.4(3)	
QUESTION 6		6.1.1(1), 6.1.2(1)	6.2(2), 6.3(2), 6.4(5)	
QUESTION 7	7.1.1(2), 7.2.1(2), 7.2.3(2), 7.2.4(1), 7.3.1(1)	7.1.2(5), 7.1.3(2), 7.2.2(2), 7.2.5(3)		7.3.2(3)
SUBTOTAL	**15**	**41**	**34**	**10**
TOTAL	**100**			

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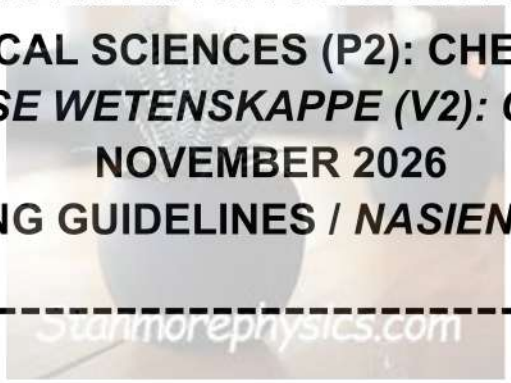
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PROVINCIAL ASSESSMENT/
PROVINSIALE ASSESSERING



GRADE/*GRAAD* 10

PHYSICAL SCIENCES (P2): CHEMISTRY
FISIESE WETENSKAPPE (V2): CHEMIE
NOVEMBER 2026
MARKING GUIDELINES / *NASIENRIGLYNE*



MARKS/ *PUNTE*: 100

This marking guidelines consists of 8 pages.
Hierdie nasienriglyne bestaan uit 8 bladsye.

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QUESTION 1/*VRAAG 1*

1.1	C✓✓	(2)
1.2	A✓✓	(2)
1.3	B✓✓	(2)
1.4	B✓✓	(2)
1.5	A✓✓	(2)
1.6	D✓✓	(2)
1.7	D✓✓	(2)
		[14]



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QUESTION 2/*VRAAG 2*

2.1.1 A pure substance consisting of one type of atom✓✓
'n Suiwer stof wat uit een tipe atoom bestaan. (2)

2.1.2 Diagram A✓ (1)

2.1.3 Diagram C✓, Homogenous (mixture)✓/*Homogeen (mengsel)* (2)

2.1.4 H_2O✓ and/*en* NaCl✓ (2)

2.1.5 Diagram B✓✓ (2)

2.2.1 Copper wire(s) ✓ /*Koperdraad(-drade)* (1)

2.2.2 Glove✓ /*Handskoen* (1)

2.2.3 Copper wires/Electrical condductor allows the flow of charge✓✓
Koperdrade/Elektriese geleier laat die vloei van lading toe

Glove/Electrical insulator prevents the flow of charge✓✓
Handskoen/Elektriese isolator verhoed die vloei van lading (4)
[15]

QUESTION 3/*VRAAG 3*

3.1 The temperature of a liquid at which its vapour pressure equals the external (atmospheric) pressure✓✓
Die temperatuur van 'n vloeistof waarby sy dampdruk gelyk is aan die eksterne (atmosferiese) druk (2)

3.2.1 Solid✓ /*Vaste stof* (1)

3.2.2 Liquid✓ and Gas✓ /*Vloeistof en Gas* (2)

3.3 Melting✓ /*Smelt(ing)* (1)

3.4.1 0˚✓ (1)

3.4.2 100˚✓ (1)

3.5 -The temperature of a substance remains constant
-Die temperatuur van 'n stof bly konstant✓
-The particles use the kinetic energy to overcome the intermolecular forces
-Die deeltjies gebruik die kinetiese energie om die intermolekulêre kragte te oorkom✓
-The substance changes the state from liquid to gas
-Die stof verander van toestand van vloeistof na gas✓ (3)

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3.6 Water /H_2O✓ (1)
[12]

QUESTION 4/*VRAAG 4*

4.1.1 The mass of a particle on a scale where an atom of carbon-12 has a mass of 12✓✓
Die massa van 'n deeltjie op 'n skaal waar 'n atoom van koolstof-12 'n massa van 12 het (2)

4.1.2 $$\text{RAM} = \frac{(99.757 \times 16)✓ + (0.038 \times 17)✓ + (0.205 \times 18)✓}{100✓}$$
=16.004 amu/ *ame*✓ (5)

4.2 **Option 1/*Opsie 1***

$$\text{M}(X_4) = \frac{47.06}{100}✓ \times 136✓$$
=64.0016 g.mol^{-1}
$$M(X) = \frac{64.0016}{4}✓$$
=16.00 g.mol^{-1}✓
X is oxygen / *X is suurstof* ✓

Option 2/*Opsie 2*

M(CaS)=40+32✓
=72 g.mol^{-1}
M(X_4)=136-72✓
=64 g.mol^{-1}
$$M(X) = \frac{64.0016}{4}✓$$
=16.00 g.mol^{-1}✓
X is oxygen / *X is suurstof*✓

Option 3/*Opsie 3*

$$\%\ comp\ of\ CaS = 100 - 47.06$$
=52.94
$$\text{M(CaS)} = \frac{52.94}{100}✓ \times 136$$
=72 g.mol^{-1}
M(X_4)=136-72✓
=64 g.mol^{-1}
$$M(X) = \frac{64.0016}{4}✓$$
=16.00 g.mol^{-1}✓
X is oxygen / *X is suurstof*✓ (5)
[12]

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QUESTION 5/*VRAAG 5*

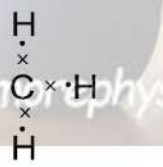
5.1 Energy is released during the reaction✓
Energie word tydens die reaksie vrygestel (1)

5.2 Covalent bond / *Kovalente binding*✓ (1)

5.3 Chemical change✓,New chemical substances are formed/ Energy changes are much larger than those of the physical change✓
Chemiese verandering, Nuwe chemiese stowwe word gevorm/ Energieveranderinge is veel groter as dié van fisiese verandering (2)

5.4 $\underline{CH_4 + 2O_2}$ ✓⟶ $\underline{CO_2 + 2H_2O}$ ✓ bal.✓ **use marking rule 6.3.10/ *gebruik nasienreël 6.3.10*** (3)

5.5



✓✓ **(2 or/ *of* 0)** (2)

5.6

Option 1/*Opsie 1*	**Option 2/*Opsie 2***
$2(24) + (16\times2)$✓ ⟶ $2(24+16)$✓	Mass of reactants / *Massa van reaktanse*
$\underline{80\ g.mol^{-1}}$ $\underline{80\ g.mol^{-1}}$✓	$2(24) + (16\times2)$ ✓= $80\ g.mol^{-1}$
Mass is conserved✓ / *Massa bly behoue*	Mass of the products / *Massa van die produkte*
	$2(24+16)$✓= $80\ g.mol^{-1}$
	$80\ g.mol^{-1}$=$80\ g.mol^{-1}$✓
	Mass is conserved / *Massa bly behoue*✓ (4)

[13]

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QUESTION 6/*VRAAG 6*

6.1.1 Volume of H_2 / Volume H_2✓
Volume van H_2 / Volume H_2✓ (1)

6.1.2 Mass of Zn✓ / Massa Zn
Mass van Zn✓ */ Massa Zn* (1)

6.2 What is the relationship between the mass of zinc and volume of hydrogen gas produced ?✓✓
Wat is die verwantskap tussen die massa sink en die volume waterstofgas wat geproduseer word?
Or How does the mass of zinc affect the volume of hydrogen gas produced?
Of Hoe beïnvloed die massa sink die volume waterstofgas wat geproduseer word?

Marking criteria / *Nasienkriteria*	
• Both variables must be correctly identified *Beide veranderlikes moet korrek geïdentifiseer word*	✓
• Everything correct with question mark included *Alles korrek met vraagteken ingesluit*	✓
• Note if question mark is omitted max 1/2 *Let wel: indien die vraagteken weggelaat is, maks 1/2*	

(2)

6.3 As the mass of Zinc increases, the volume of Hydrogen gas increases✓✓
Soos die massa sink toeneem, neem die volume waterstofgas toe

Note: if proportionality is used *Let wel: indien eweredigheid gebruik word* $^0/_2$ e.g mass of Zn is directly propotional to volume of H_2 produced *bv. massa Zn is direk eweredig aan volume H_2 gevorm*

(2)

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6.4 $n(Zn) = \frac{m}{M}$

$= \frac{2}{65}$✓

$= 0.03$ mol

$n(Zn) = n(H_2) = 0.03$ mol✓ **use of ratio 1:1/ *gebruik van verhouding* 1:1**

$n = \frac{V}{V_m}$ ✓

$0.03 = \frac{V}{22.4}$✓

=0.69 (dm^3)✓

Note / Let wel
If proportionality used to calculate volume of **x** *Indien eweredigheid gebruik word om die volume van **x** te bereken* $^1/_5$

(5)
[11]

QUESTION 7/*VRAAG 7*

7.1.1 simplest whole-number ratio of atoms in a compound✓✓
eenvoudigste heelgetalverhouding van atome in 'n verbinding (2)

7.1.2

$n = \frac{m}{M}$✓	C $\frac{40}{12}$✓	H $\frac{6.67}{1}$ ✓	O $\frac{53.33}{16}$ ✓
	$\frac{3.33}{3.33}$	$\frac{6.67}{3.33}$	$\frac{3.33}{3.33}$
	1	2	1

CH_2O✓ (5)

7.1.3 $n = \frac{M(molecular/molekulêr)}{M(empirical/empiries)}$

$= \frac{60}{30}$✓

$= 2$

$C_2H_4O_2$✓ (2)

7.2.1 mass of one mole of a substance measured in g·mol^{-1}
massa van een mol van 'n stof gemeet in g·mol^{-1}✓✓ (2)

7.2.2 $M(H_2SO_4) = (1 \times 2 + 32 + 16 \times 4)$✓

=98 g.mol^{-1}✓ (2)

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7.2.4 $= \frac{50}{1000}$
$=0.05\ (dm^3)$✓ (1)

7.3.1 water of crystallisation✓ / *kristalwater* (1)

7.3.2 $M(CaSO_4)=136\ g.mol^{-1}$

$M(H_2O)$in hydrated crystals/ *$M(H_2O)$ in gehidreerde kristalle* $=\frac{136}{4.25}$✓

$= 32\ g.mol^{-1}$

Value of x = / *Waarde van x* = $\frac{32}{18}$✓

= 2✓ (3)

[23]

TOTAL: / *TOTAAL:* **100**

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