

**SENIOR CERTIFICATE EXAMINATION**  
**SENIORSERTIFIKAAT-EKSAMEN**



**OCTOBER / NOVEMBER**  
**OKTOBER / NOVEMBER**

**2004**

**PHYSICAL SCIENCE**

**NATUUR- EN**  
**SKEIKUNDE**

**(Second Paper: Chemistry)**  
**(Tweede Vraestel: Chemie)**

**LG**

**304-3/2 LS**

PHYSICAL SCIENCE LG: Paper 2

**11 pages**  
**11 bladsye**



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GAUTENGSE DEPARTEMENT VAN ONDERWYS  
SENIORSERTIFIKAAT-EKSAMEN

NATUUR- EN SKEIKUNDE LG  
(Tweede Vraestel: Chemie)

TYD: 2 uur

PUNTE: 150

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**ALGEMENE INSTRUKSIES:**

- Skryf jou **eksamennommer** (en **sentrumnommer** indien van toepassing) in die aangewese spasies op die antwoordboek.
  - Beantwoord AL die vrae.
  - Nie-programmeerbare sakrekenaars mag gebruik word.
  - Toepaslike wiskundige instrumente mag gebruik word.
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**AFDELING A**

**VRAAG 1**

Kies die korrekte antwoord en maak slegs 'n kruis oor die regte nommer in jou antwoordboek.

- 1.1 Die produkte van 'n neutralisasie-eksperiment is \_\_\_\_\_.
- A. sout + waterstof
  - B. sout + water + koolsuurgas
  - C. sout + water
  - D. sout + koolsuurgas
- 1.2 Wat is die uitwerking van 'n katalisator op 'n chemiese reaksie?
- A. Hou die temperatuur van die reaksiemengsel konstant.
  - B. Meer produkte as voorheen word gevorm.
  - C. Die produkte word gevorm in 'n korter tyd as voorheen.
  - D. Verander die kleur van die reaksiemengsel met 'n indikator.
- 1.3 Die brandstof in 'n motor se enjin ondergaan volledige ontbranding. Die produkte wat gevorm word is \_\_\_\_\_.
- A. CO + HO
  - B. CO<sub>2</sub> + H<sub>2</sub>O + ENERGIE
  - C. CO<sub>2</sub> + H<sub>2</sub> + ENERGIE
  - D. CO<sub>2</sub> + H<sub>2</sub>O

GAUTENG DEPARTMENT OF EDUCATION  
SENIOR CERTIFICATE EXAMINATION

Physical Science LG  
(Second Paper: Chemistry)

TIME: 2 hours

MARKS: 150

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**GENERAL INSTRUCTIONS:**

- Write your **examination number** (and **centre number** if applicable) in the appropriate spaces on the answer book.
  - Answer ALL the questions.
  - Non-programmable calculators may be used.
  - Appropriate mathematical instruments may be used.
- 
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**SECTION A**

**QUESTION 1**

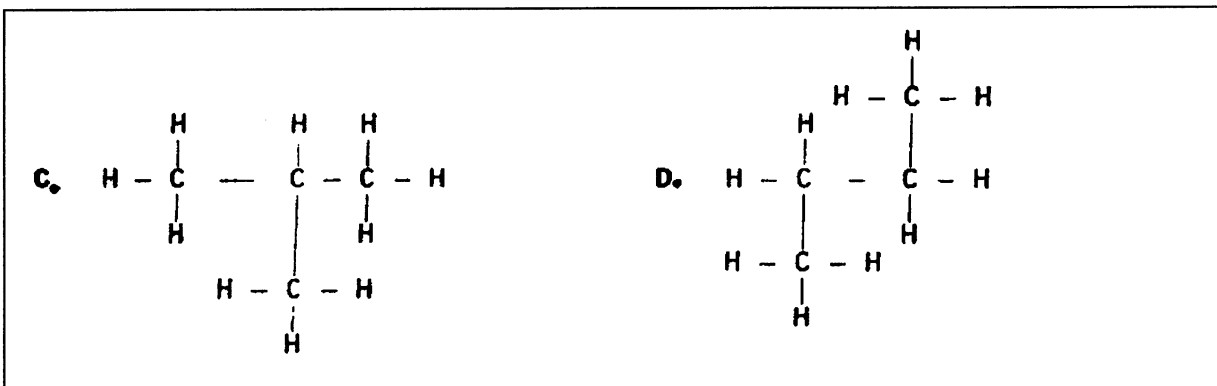
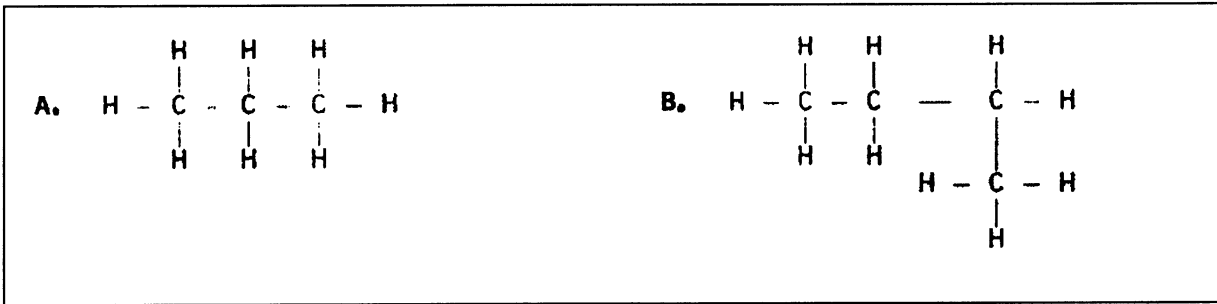
Choose the correct answer and make a cross over the correct letter in your answer book.

- 1.1 The products of a neutralisation reaction are \_\_\_\_\_.
- A. Salt + hydrogen
  - B. Salt + water + carbon dioxide
  - C. Salt + water
  - D. Salt + carbon dioxide
- 1.2 What is the effect of a catalyst on a chemical reaction?
- A. Keeps the temperature of the reaction mixture constant.
  - B. More products are formed than before.
  - C. The product is formed in a shorter time.
  - D. Changes the colour of the reaction mixture with an indicator.
- 1.3 The fuel in your car undergoes complete combustion. The products are \_\_\_\_\_.
- A. CO + HO
  - B. CO<sub>2</sub> + H<sub>2</sub>O + ENERGY
  - C. CO<sub>2</sub> + H<sub>2</sub> + ENERGY
  - D. CO<sub>2</sub> + H<sub>2</sub>O

1.4 Watter een van die volgende formules is NIE 'n alkaan nie?

- A.  $C_3H_6$
- B.  $C_4H_{10}$
- C.  $C_6H_{14}$
- D.  $C_8H_{18}$

1.5 Watter een van die volgende verteenwoordig die verbinding metiel-propaan?



1.6 Watter een van die volgende pare stowwe word in 'n neutralisasie-eksperiment gebruik?

- A. Natriumhidroksied en swawelsuur
- B. Soutsuur en koper
- C. Natriumkarbonaat en water
- D. Ammoniumsulfaat en natriumchloried

1.7 Watter een van die volgende stowwe is nie 'n suurbasis indikator nie?

- A. Universele indikator
- B. Broomtimolblou
- C. Metielpropaan
- D. Lakmoes

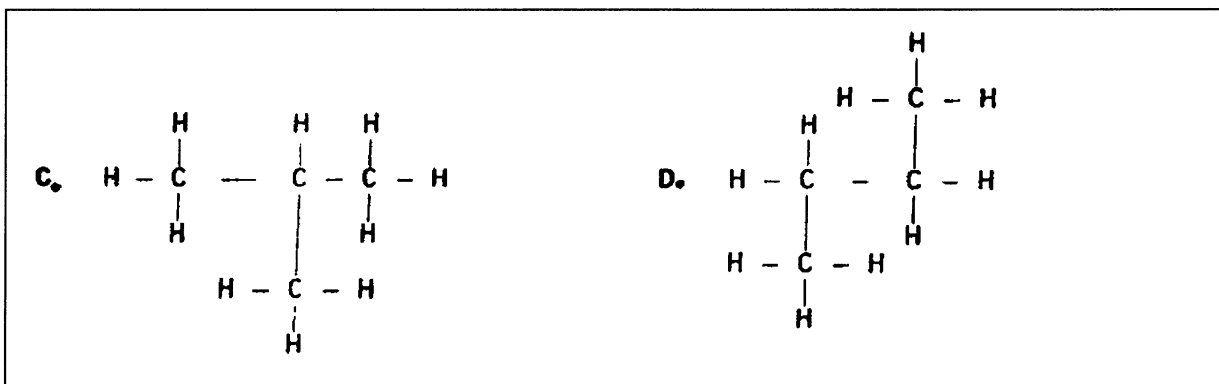
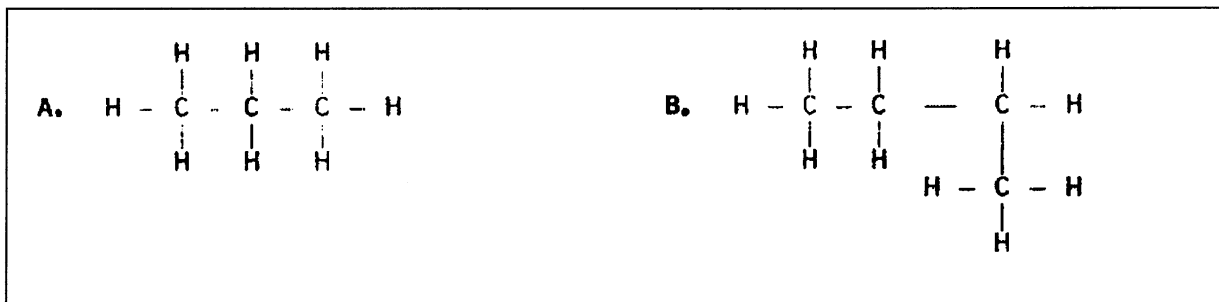
1.8 Wanneer 'n element geoksideer word, sal die element altyd \_\_\_\_\_.

- A. met suurstof verbind
- B. meer negatief word
- C. protone verloor
- D. elektrone verloor

1.4 Which one of the following formulae does NOT represent an alkane?

- A.  $C_3H_6$   
 B.  $C_4H_{10}$   
 C.  $C_6H_{14}$   
 D.  $C_8H_{18}$

1.5 Which of the following depicts the compound methyl-propane?



1.6 Which of the pairs of substances mentioned below are used in a neutralization experiment?

- A. Sodium hydroxide and sulphuric acid  
 B. Hydrochloric acid and copper  
 C. Sodium carbonate and water  
 D. Ammonium sulphate and sodium chloride

1.7 Which one of the following substances is not an acid-base indicator?

- A. Universal indicator  
 B. Bromothymol blue  
 C. Methyl propane  
 D. Litmus

1.8 When a substance is oxidized it will always \_\_\_\_\_.

- A. react with oxygen  
 B. become more negative  
 C. lose protons  
 D. lose electrons

1.9 Watter faktor sal gewoonlik nie die snelheid van 'n chemiese reaksie beïnvloed nie?

- A. As 'n katalisator bygevoeg word
- B. Temperatuur
- C. Die grootte van die houer wat 'n sekere massa van reagerende stowwe bevat
- D. Die konsentrasie van die reagerende stowwe

1.10 Die reaksie  $X \rightarrow X^+ + e^-$  is 'n voorbeeld van 'n \_\_\_\_\_.

- A. oksidasiereaksie
- B. reduksiereaksie
- C. suur-basisreaksie
- D. neutralisasie reaksie

Vraag 1.11 en Vraag 1.12 het betrekking op die volgende inligting:

'n Paar oplossings word aan 'n leerder gegee en hy het die pH van die oplossings bepaal en die volgende inligting is verkry:

<b>Oplossing:</b>	<b>P</b>	<b>Q</b>	<b>R</b>	<b>S</b>
pH	3	4	7	9

1.11 Watter oplossing is die meeste alkalies?

- A. P
- B. Q
- C. R
- D. S

1.12 Watter oplossing het die hoogste suurgehalte?

- A. P
- B. Q
- C. R
- D. S

1.13 Die formule wat reduksie voorstel is \_\_\_\_\_.

- A.  $2Cl^- - 2e^- \rightarrow Cl_2$
- B.  $Cu^{2+} + 2e^- \rightarrow Cu$
- C.  $Sn^{2+} - 2e^- \rightarrow Sn^{4+}$
- D.  $H + H \rightarrow H_2$

- 1.9 Which of the following factors does not usually affect the rate of a chemical reaction?
- A. If a catalyst is added
  - B. Temperature
  - C. Size of the container that contains a certain mass of the reacting substances
  - D. Concentration of the reacting substances

- 1.10 The reaction  $X \rightarrow X^+ + e^-$  is an example of a/an \_\_\_\_\_.
- A. oxidation reaction
  - B. reduction reaction
  - C. acid – base reaction
  - D. neutralization reaction

The following information is relevant to Questions 1.11 and 1.12.

A few solutions were given to a learner to measure the pH of these solutions and he came up with the following information:

<b>Solution:</b>	<b>P</b>	<b>Q</b>	<b>R</b>	<b>S</b>
pH	3	4	7	9

- 1.11 Which solution is the strongest alkali?

- A. P
- B. Q
- C. R
- D. S

- 1.12 Which solution is the strongest acid?

- A. P
- B. Q
- C. R
- D. S

- 1.13 The formula that represents reduction:

- A.  $2Cl^- - 2e^- \rightarrow Cl_2$
- B.  $Cu^{2+} + 2e^- \rightarrow Cu$
- C.  $Sn^{2+} - 2e^- \rightarrow Sn^{4+}$
- D.  $H + H \rightarrow H_2$

1.14 Die pH van 'n oplossing is 4. Die oplossing sal heel moontlik 'n \_\_\_\_\_.

- A. suikeroplossing wees
- B. seepoplossing wees
- C. soutoplossing wees
- D. asynsuuroplossing wees

1.15 Wat is die IUPAC-naam van die verbinding  $C_3H_8$ ?

- A. Pentaan
- B. Propaan
- C. Butaan
- D. Oktaan

15x3=(45)

TOTAAL VIR AFDELING A: [45]

### AFDELING B

Beantwoord AL die vrae in hierdie afdeling en doen elke vraag op 'n nuwe, skoon bladsy.

#### VRAAG 2

2.1 Rangskik **Kolom B** sodat dit by **Kolom A** pas. Skryf slegs die korrekte **alfabetletter** langs die nommer neer, bv. 2.1.11 – M.

Kolom A		Kolom B	
2.1.1	Koolsuur	A	$Br_2$
2.1.2	Yster(II)sulfaat	B	$HNO_3$
2.1.3	Kaliumhidroksied	C	Ne
2.1.4	Halogeen	D	Marmer
2.1.5	Edelgas	E	$FeSO_4$
2.1.6	Swawelsuur	F	Lakmoes
2.1.7	$CaCO_3$	G	$H_2CO_3$
2.1.8	Indikator	H	$CH_3COOH$
2.1.9	Salpetersuur	I	$C_2H_6$
2.1.10	Asetileen	J	KOH
		K	$H_2SO_4$
		L	$C_2H_2$

(10)



1.14 The pH of a solution is 4. The solution is most probably a \_\_\_\_\_.

- A. sugar solution
- B. soap solution
- C. salt solution
- D. solution of acetic acid

1.15 What is the IUPAC name of the compound C<sub>3</sub>H<sub>8</sub>?

- A. Pentane
- B. Propane
- C. Buthane
- D. Octane

15x3=(45)

**TOTAL FOR SECTION A: [45]**

**SECTION B**

Answer all the questions and do each question on a new page.

**QUESTION 2**

2.1 Find the correct answer in **Column B** to fit **Column A**. Only write the correct **alphabet letter** next to the correct number, e.g. 2.1.11– M.

<b>Column A</b>		<b>Column B</b>	
<b>2.1.1</b>	Carbonic acid	<b>A</b>	Br <sub>2</sub>
<b>2.1.2</b>	Iron(II)sulphate	<b>B</b>	HNO <sub>3</sub>
<b>2.1.3</b>	Potassium Hydroxide	<b>C</b>	Ne
<b>2.1.4</b>	Halogen	<b>D</b>	Marble
<b>2.1.5</b>	Noble gas	<b>E</b>	FeSO <sub>4</sub>
<b>2.1.6</b>	Sulphuric acid	<b>F</b>	Litmus
<b>2.1.7</b>	CaCO <sub>3</sub>	<b>G</b>	H <sub>2</sub> CO <sub>3</sub>
<b>2.1.8</b>	Indicator	<b>H</b>	CH <sub>3</sub> COOH
<b>2.1.9</b>	Nitric acid	<b>I</b>	C <sub>2</sub> H <sub>6</sub>
<b>2.1.10</b>	Acetylene	<b>J</b>	KOH
		<b>K</b>	H <sub>2</sub> SO <sub>4</sub>
		<b>L</b>	C <sub>2</sub> H <sub>2</sub>

(10)

- 2.2 Dui aan of die volgende stellings WAAR of ONWAAR is, bv. 2.2.11 – Waar.
- 2.2.1 Die pH van 'n baie sterk suur behoort 1 te wees.
- 2.2.2 Die formule van kalsiumkarbonaat is  $\text{CaCO}_3$ .
- 2.2.3 Universele indikator is 'n voorbeeld van 'n breë-spektrum suur-basis indikator.
- 2.2.4 Die kleur van die indikator metieloranje in 'n suur is rooi.
- 2.2.5 Wanneer 'n element met suurstof reageer om 'n oksied te vorm, staan dit bekend as reduksie.
- 2.2.6 Die konsentrasie van 'n standaard-oplossing in 'n koper-sink-sel moet altyd  $1 \text{ mol.dm}^{-3}$  wees.
- 2.2.7 Die verbranding van koolwaterstowwe verskaf die meeste energie wat deur die mens gebruik word. Wanneer alkane in suurstof brand, word water gevorm.
- 2.2.8 Wêreldaanvraag na motorbrandstof is baie groter as die hoeveelheid wat deur fraksionele distillasie van aardolie verkry kan word. Daarom word ook baie van gewone distillasie gebruik maak.
- 2.2.9 'n Verlaging in die temperatuur kan nie die tempo van 'n chemiese reaksie beïnvloed nie.
- 2.2.10  $\text{Ca(OH)}_2$  is 'n suur.

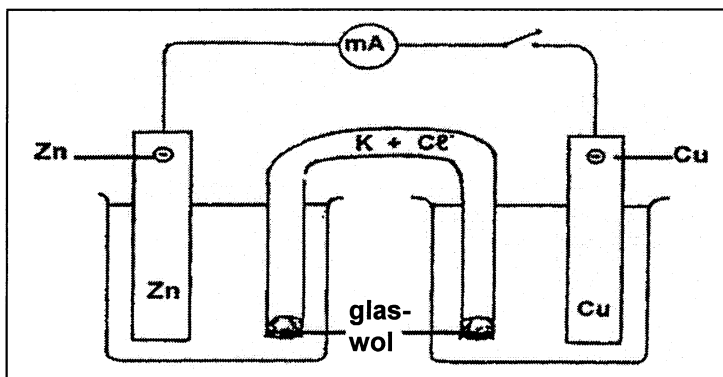
(10)  
[20]

- 2.2 State whether the following statements are TRUE or FALSE, e.g. 2.2.11 – True.
- 2.2.1 The pH of a very strong acid should be 1.
- 2.2.2 The formula for calcium carbonate is  $\text{CaCO}_3$ .
- 2.2.3 Universal indicator is an example of a broad spectrum acid-base indicator.
- 2.2.4 The colour of the indicator methyl orange in an acid is red.
- 2.2.5 If an element reacts with oxygen to form an oxide, the process is known as reduction.
- 2.2.6 The concentration of a standard solution in a copper-zinc cell must always be  $1 \text{ mol.dm}^{-3}$ .
- 2.2.7 The burning of hydrocarbons provides most of the energy used by man. When alkanes burn in oxygen, water is formed.
- 2.2.8 World demand for motor fuel far exceeds the quantities which can be supplied by means of fractional distillation of crude oil. Thus another process, called distillation, is also used.
- 2.2.9 A drop in temperature cannot influence the rate at which a chemical reaction takes place.
- 2.2.10  $\text{Ca(OH)}_2$  is an acid.

(10)  
[20]

VRAAG 3

Bestudeer die onderstaande skets wat 'n standaard sink-koper elektrochemiese sel voorstel sorgvuldig en beantwoord die daaropvolgende vrae.

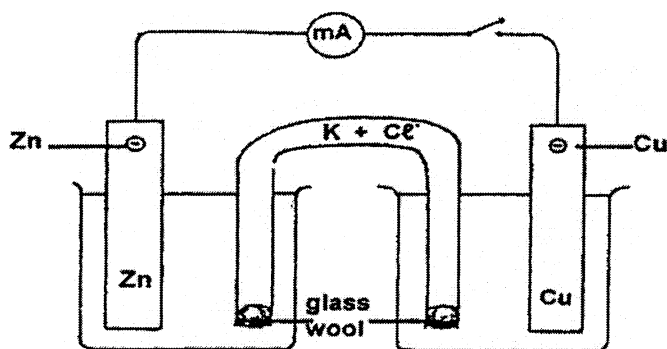


- 3.1 Skryf die vergelyking neer van die reaksie wat plaasvind in die koperhalfsel. (3)
- 3.2 Skryf die vergelyking neer van die reaksie wat plaasvind in die sinkhalfsel. (3)
- 3.3 Vloei elektrone deur die voltmeter na die sinkelektrode of na die koperelektrode? (2)
- 3.4 By watter elektrode vind reduksie plaas? (2)
- 3.5 Watter metaal is die anode? (2)
- 3.6 Is hierdie metaal in Vraag 3.5 die positiewe of negatiewe elektrode? (2)
- 3.7 Wat verbind hierdie twee halfselle en wat is sy doel? (3)
- 3.8 Gee 'n voorbeeld van 'n soort oplossing wat in die halfselle gebruik kan word. (2)
- 3.9 Waar sal ons in ons daaglikse lewe hierdie soort sel gebruik? (2)

[21]

### QUESTION 3

Carefully study the sketch below that shows a standard copper-zinc electrochemical cell, then answer the questions that follow.



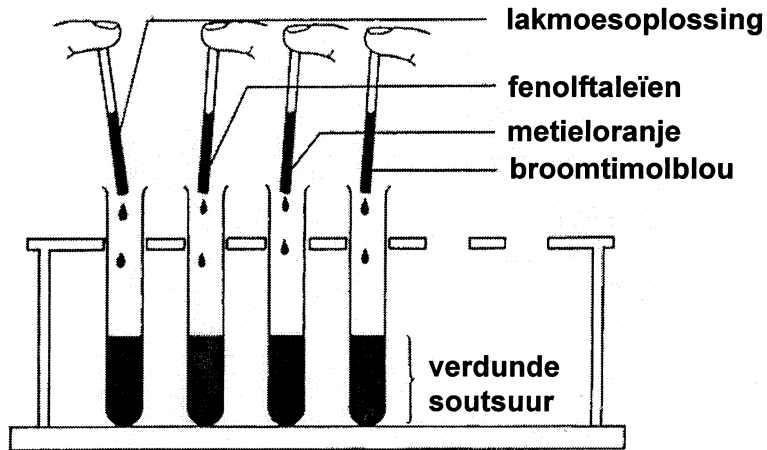
- 3.1 Write down the reaction that takes place at the copper half cell. (3)
- 3.2 Write down the reaction that takes place at the zinc half cell. (3)
- 3.3 Do the electrons flow through the external circuit to the copper or the zinc electrode? (2)
- 3.4 At which electrode will reduction take place? (2)
- 3.5 Which metal is the anode? (2)
- 3.6 Is the metal in Question 3.5 the positive or negative electrode? (2)
- 3.7 What joins these two half cells and what is its function? (3)
- 3.8 Name a possible solution that can be used in these half-cells. (2)
- 3.9 Where in our everyday lives would we use this type of cell? (2)

**[21]**

VRAAG 4

4.1 In elke van die vier proefbuisse is daar 5 cm<sup>3</sup> soutsuuroplossing. As 'n leerder 'n paar druppels indikator in elk van die vier proefbuisse gooi, soos in die skets aangetoon word:

4.1.1 Skryf die name van die vier indikatore neer en dan, langs die naam, die **kleur** wat elke suuroplossing sal wees nadat die indikator bygevoeg is.



(4)

4.2 Skryf die nommers 4.2.1 tot 4.2.6 en die ontbrekende antwoorde neer wat die tabel korrek sal voltooi.

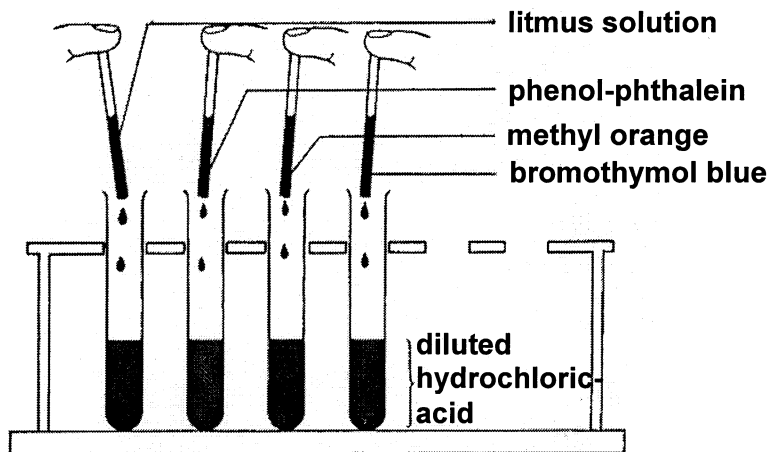
Sure		Alkalieë	
Naam	Formule	Naam	Formule
4.2.1 (_____)	HCl	4.2.4(_____)	NaOH
Swawelsuur	4.2.2(_____)	4.2.5(_____)	KOH
Koolsuur	4.2.3(_____)	Kalsiumhidroksied	4.2.6(_____)

(6)

**QUESTION 4**

4.1 In each of these four test tubes there is 5 cm<sup>3</sup> of a Hydrochloric acid solution. If a learner adds a few drops of indicator in each test tube as illustrated in the sketch below:

4.1.1 Write down the names of the four indicators and then the **colour** that each acid solution will be after each indicator is added.



(4)

4.2 Write down the numbers 4.2.1 to 4.2.6 and the missing answers that will complete the table correctly.

Acids		Alkalis	
Name	Formula	Name	Formula
4.2.1 (_____)	HCl	4.2.4(_____)	NaOH
Sulphuric Acid	4.2.2(_____)	4.2.5(_____)	KOH
Carbonic acid	4.2.3(_____)	Calcium Hydroxide	4.2.6(____)

(6)

4.3 Die tabel hieronder bevat 'n aantal stappe wat in die titrasieproses gebruik kan word.

A. Voeg universele indikator by die oplossing in die fles.	B. Roer die alkaliese oplossing gedurig.	C. Meet 100 cm <sup>3</sup> suur in 'n fles af.
D. Vul die buret met die suur.	E. Gebruik kleiner hoeveelhede aan die einde, om 'n meer akkurate lesing te kry.	F. Die kleur van die oplossing in die fles is groen.
G. Meet 20 cm <sup>3</sup> van 'n alkali af en gooi dit in die fles.	H. Gooi suur, 1 cm <sup>3</sup> op 'n slag, by en skud die fles na elke byvoeging.	I. Herhaal die eksperiment met dieselfde hoeveelhede suur en alkali, maar hierdie keer sonder 'n indikator.

Skryf in die **regte volgorde** die **agt** stappe neer wat in die titrasie-eksperiment gebruik moet word.

(8)  
[18]

### VRAAG 5

5.1 'n Molekule butaan het die formule C<sub>4</sub>H<sub>10</sub>.

5.1.1 Gee die name van die elemente teenwoordig in butaan.

(2)

5.1.2 Wat beteken die nommer 4 in die formule?

(2)

5.2 Gee die name, molekulêre formules en struktuurformules van enige TWEE lede van die alkaanreeks. Skryf jou antwoord in 'n tabelformaat soos volg.

Lid	Naam	Molekulêre formule	Struktuurformule
1			
2			

(12)



4.3 The grid below contains a number of steps which could be used in the titration process.

A. Add universal indicator to solution in flask.	B. Stir the alkali solution continuously.	C. Measure 100 cm <sup>3</sup> of acid into flask.
D. Fill the burette with the acid.	E. Use smaller additions near the end point, to get a more accurate result.	F. The colour of the solution in the flask is green.
G. Measure 20 cm <sup>3</sup> of alkali into flask.	H. Add acid, 1 cm <sup>3</sup> at a time, shaking flask after each addition.	I. Repeat, using same volumes of acid and alkali, but with no indicator.

Write down, in the **correct order** the letters for the **eight** steps which should be used during the titration process.

(8)  
[18]

### QUESTION 5

5.1 A molecule of butane has the formula C<sub>4</sub>H<sub>10</sub>.

5.1.1 Name the elements present in butane.

(2)

5.1.2 What does the number 4 in the formula mean?

(2)

5.2 Give the names, molecular formulae and structural formulae of any two members of the alkane series. Write your answer in table form as follows.

Member	Name	Molecular formula	Structural formula
1			
2			

(12)

5.3 Gee die algemene **name** van die volgende:

5.3.1 HCHO

5.3.2 CCl<sub>4</sub>

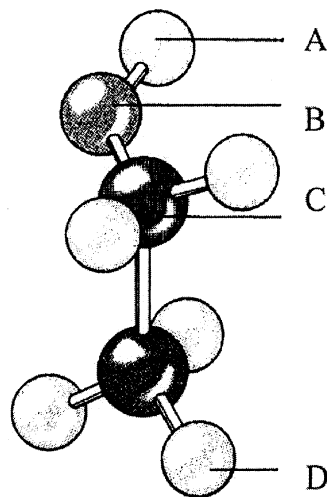
5.3.3 CH<sub>3</sub>COOH

(6)

5.4 Omdat die koolwaterstowwe oor die algemeen in suurstof brand en mengsels van alkane en lug heel dikwels plofbaar is, moet hulle baie versigtig hanteer word. Gee VYF veiligheidsmaatreëls wat in ag geneem moet word wanneer koolwaterstowwe in die laboratorium gebruik word.

(5)

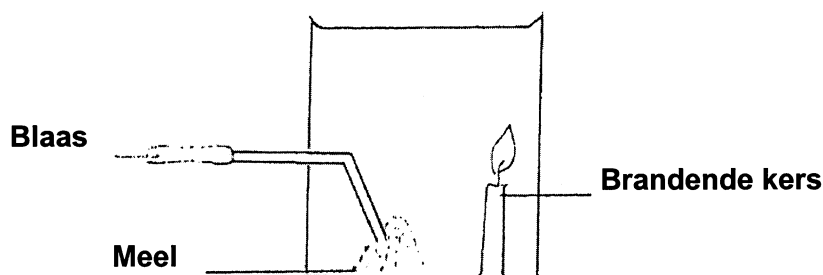
5.5 Die volgende is 'n model van 'n etielalkoholmolekuul (C<sub>2</sub>H<sub>5</sub>OH). Benoem nou die verskillende dele **A – D** op die model.



(5)  
[32]

### VRAAG 6

6.1 'n Opvoeder doen die volgende eksperiment om een van die faktore wat die tempo van 'n chemiese reaksie beïnvloed, te demonstreer.



Hy neem 'n groot koffieblik waaraan hy 'n buisie vasgeheg het, soos in die skets aangetoon. Hy plaas 'n klein hopen meel onder die buisie met 'n brandende kers langs die hopen meel. Hy sit dan die blik se deksel styf op en blaas deur die pypie sodat die meel 'n wolk in die blik maak. Die deksel van die blik skiet af en 'n lang vlam skiet in die lug op bokant die kers.

5.3 Give the common **names** of the following:

5.3.1 HCHO

5.3.2 CCl<sub>4</sub>

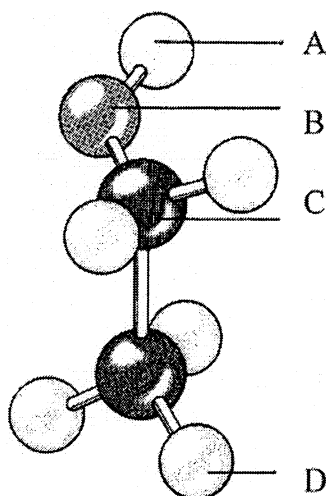
5.3.3 CH<sub>3</sub>COOH

(6)

5.4 Because the hydrocarbons generally burn in oxygen and because mixtures of the alkanes and air are often explosive, they must be handled very carefully. Name FIVE safety measures which must be taken into account when you work with these hydrocarbons in the laboratory.

(5)

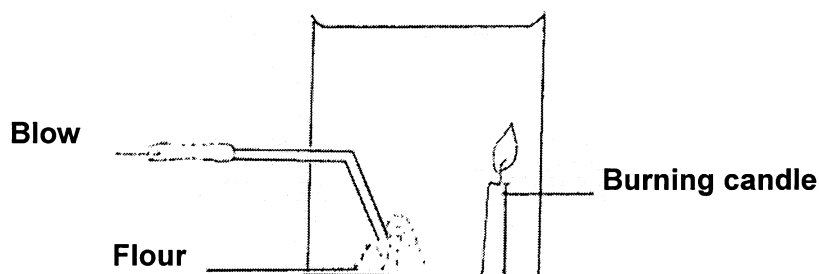
5.5 The following is a model of ethyl alcohol molecule (C<sub>2</sub>H<sub>5</sub>OH). Label the different parts **A – D** on this model.



(5)  
[32]

### QUESTION 6

6.1 An educator performs an experiment to explain one of the factors influencing the rate of a chemical reaction.



He takes a big coffee tin to which a small tube has been attached and places a small heap of flour in the tin below the end of the tube, with a burning candle next to it. He then places the lid firmly on the tin and blows through the tube so that the flour forms a “cloud” in the tin. The lid flies off and the learners observe a long flame above the candle.

<b>NATUUR- EN SKEIKUNDE LG</b> <b>(Tweede Vraestel)</b>	<b>304-3/2 (LS)</b>	<b>11</b>
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- 6.1.1 Watter faktor van die tempo van chemiese reaksies word hier gedemonstreer? (2)
- 6.1.2 Hoekom spuit hulle die steenkoolstof in die steenkoolmyne gedurig nat met water? (3)
- 6.1.3 Dink jy dit is wenslik om te rook in 'n steenkoolmyn? Gee 'n rede vir jou antwoord. (3)
- 6.2 Wat is 'n **katalisator**? (3)
- 6.3 Gee 'n voorbeeld van 'n katalisator en hoe dit 'n chemiese reaksie sal beïnvloed. (3)
- [14]**
- TOTAAL VIR AFDELING B: [105]**
- TOTAAL: 150**

**EINDE**

<b>PHYSICAL SCIENCE LG</b> <b>(Second Paper)</b>	<b>304-3/2 (LS)</b>	<b>11</b>
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- 6.1.1 Which factor influencing the rate of a chemical reaction has been demonstrated here? (2)
- 6.1.2 Why is coal dust in a coal mine constantly sprayed with water? (3)
- 6.1.3 Do you think it is wise to smoke in a coal mine? Give a reason for your answer. (3)
- 6.2 What is a **catalyst**? (3)
- 6.3 Give an example of a catalyst and how it will influence a reaction. (3)
- [14]**
- TOTAL FOR SECTION B: [105]**
- TOTAL: 150**

**END**