# GRADE 12

# PHYSICAL SCIENCES: CONTROL TEST (P2)

## MARCH 2018

**MARKS: 50**

**TIME: 1 hour**

**This question paper consists of 7 pages and 2 data sheets**

## INSTRUCTIONS AND INFORMATION

1. This question paper consists of FOUR questions. Answer ALL the questions in the ANSWER SHEET.

2. Start EACH question on a NEW page in the ANSWER SHEET

3. Number the answers correctly according to the numbering system used in this question paper.

4. Leave ONE line between two subquestions, 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.

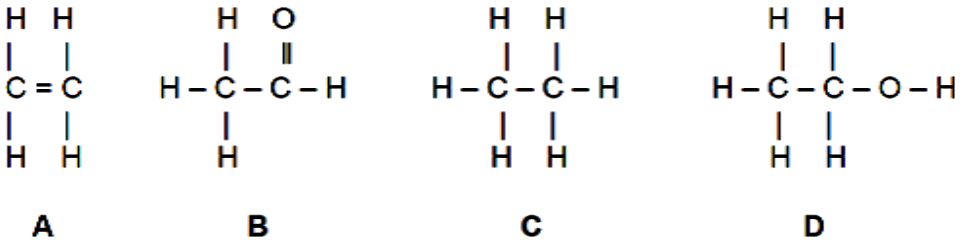
10. Give brief motivations, discussions, et cetera where required.

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 (1.1–1.3) in the ANSWER SHEET, for example 1.4 E.

1.1 Which ONE of the following compounds will decolourise bromine water the fastest under normal conditions?



**A** **B** **C** **D**

(2)

1.2 The melting points of four straight chain hydrocarbons (**A**, **B**, **C** and **D**) are shown in the table below.

| Hydrocarbon | Melting point (°C) |
|---|---|
| **A** | -182,5 |
| **B** | -95 |
| **C** | 28 |
| **D** | -56,5 |

Which ONE of the above hydrocarbons has the strongest intermolecular forces?

A A

B B

C C

D D (2)

1.3 The addition of hydrogen to an alkene is known as ...

A hydration.

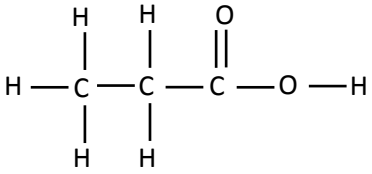
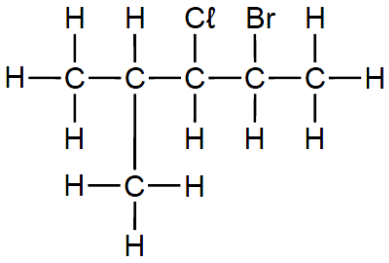
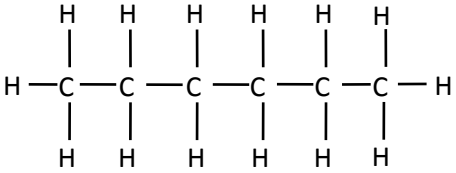
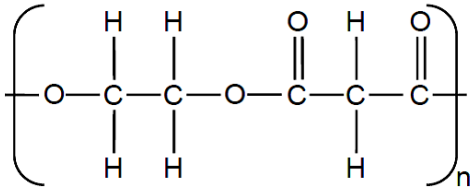
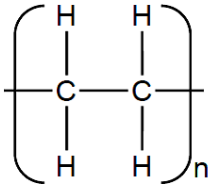
B cracking.

C hydrogenation.

D hydrohalogenation. (2)

**QUESTION 2 (Start on a new page.)**

The letters **A** to **H** in the table below represent eight organic compounds.

| | | | |
|---|---|---|---|
| **A** |  | **B** |  |
| **C** | $C_4H_8$ | **D** | $CH_3CH_2COCH_3$ |
| **E** | $CH_3CH(CH_3)CH_2OH$ | **F** |  |
| **G** |  | **H** |  |

Use the information in the table (where applicable) to answer the questions that follow.

2.1 Write down the LETTER that represents a compound that:
(A compound may be used more than once.)

2.1.1 Is a haloalkane (1)

2.1.2 Has a hydroxyl group as functional group (1)

2.1.3 Belongs to the same homologous series as ethanoic acid (1)

2.1.4 Is a condensation polymer (1)

2.2 Write down the:

2.2.1 IUPAC name of compound **B** (3)

2.2.2 IUPAC name of compound **E** (2)

2.2.3 Structural formula of the *functional group* of compound **D** (1)

2.3 Compound **C** has CHAIN and POSITIONAL isomers.

2.3.1 Define the term *positional isomer*. (2)

2.3.2 Write down the structural formula of a chain isomer of compound **C**. (2)

2.4 Compound **A** reacts with pentan-1-ol in the presence of an acid catalyst

2.4.1 Write down the TYPE of reaction taking place (1)

2.4.2 Write down the IUPAC name of the organic product formed (2)

**[17]**

**QUESTION 3 (Start on a new page.)**

The boiling points of compounds **A**, **B** and **C** were determined during a practical investigation and recorded in the table below

| COMPOUND | CONDENSED STRUCTURAL FORMULA | BOILING POINT (°C) |
|---|---|---|
| **A** | $CH_3OH$ | 78 |
| **B** | $CH_3CH_2CH_2OH$ | 97 |
| **C** | $CH_3C\ell$ | 39,6 |

3.1 Define the term *boiling point* (2)

3.2 Write down the type of intermolecular force that is responsible for the difference in the boiling points of compound **A** and **B** (1)

3.3 Explain the difference in the boiling points of compound **A** and **C** by referring to the TYPE and STRENGTH of the intermolecular forces (3)

3.4 Compound **C** is prepared under standard conditions (STP) by the reaction between methane and chlorine as shown by the equation:

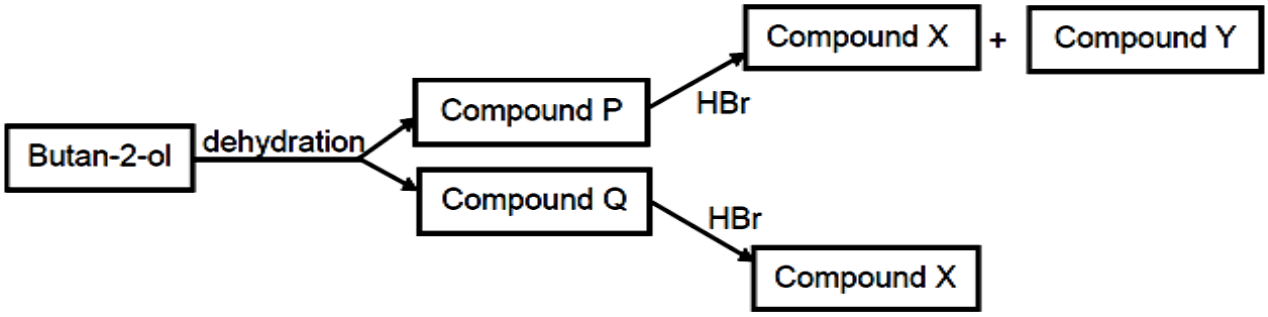
$$CH_4(g) + C\ell_2(g) \rightarrow CH_3C\ell(g) + HC\ell$$

In the reaction, 12,8 g of $CH_4$ produces 0,035 kg $CH_3C\ell$. Calculate the percentage yield in the reaction (5)

**[11]**

**QUESTION 4 (Start on a new page.)**

The flow diagram below shows the conversion of an alcohol into haloalkanes. **Compound Q is the major product**




4.1 Name the type of organic reaction of which dehydration is an example (1)

4.2 To which homologous series do compounds **P** and **Q** belong? (1)

4.3 What type of reaction takes place when compound P is converted to compounds **X** and **Y** as illustrated above? (1)

4.4 Use structural formulae to write a balanced equation for the preparation of compound **Q** as illustrated above. (4)

4.5 Write down the structural formula and the IUPAC name for compound **X**. (3)

4.6 A learner indicates that he can convert butan-2-ol directly into compound **X**. Name the type of reaction that will take place during a direct conversion. (1)

Petroleum companies use an elimination reaction to break longer hydrocarbons into shorter, more useable hydrocarbons.

An example of such a reaction is given:

$$C_{10}H_{22} \xrightarrow{\text{Heat/catalyst}} C_8H_{18} + \text{compound R}$$

4.7 Name the TYPE of elimination reaction referred to above. (1)

Molecules of compound R can bond to each other to form a polymer

4.8 What is this TYPE of POLYMERISATION called? (1)

4.9 Using STRUCTURAL FORMULAE, write down a balanced equation for this polymerisation reaction. (3)

**[16]**

**GRAND TOTAL= 50 marks**

**"You are not a failure if you don't make it. You're a success because you tried" (Susan Jeffers)**

**GOOD LUCK!!! GOOD LUCK!!! GOOD LUCK!!!**

# DATA FOR PHYSICAL SCIENCES GRADE 12
# PAPER 2 (CHEMISTRY)

## *GEGEWENS VIR FISIESE WETENSKAPPE GRAAD 12*
## *VRAESTEL 2 (CHEMIE)*

### TABLE 1: PHYSICAL CONSTANTS/*TABEL 1: FISIESE KONSTANTES*

| NAME/*NAAM* | SYMBOL/*SIMBOOL* | VALUE/*WAARDE* |
|---|---|---|
| Standard pressure<br>*Standaarddruk* | $p^\theta$ | $1{,}013 \times 10^5$ Pa |
| Molar gas volume at STP<br>*Molêre gasvolume by STD* | $V_m$ | 22,4 $dm^3 \cdot mol^{-1}$ |
| Standard temperature<br>*Standaardtemperatuur* | $T^\theta$ | 273 K |
| Charge on electron<br>*Lading op elektron* | e | $-1{,}6 \times 10^{-19}$ C |
| Avogadro's constant<br>*Avogadro-konstante* | $N_A$ | $6{,}02 \times 10^{23}$ $mol^{-1}$ |

### TABLE 2: FORMULAE/*TABEL 2: FORMULES*

| | |
|---|---|
| $n = \frac{m}{M}$ | $n = \frac{N}{N_A}$ |
| $c = \frac{n}{V}$ or/*of* $c = \frac{m}{MV}$ | $n = \frac{V}{V_m}$ |
| $\frac{c_a v_a}{c_b v_b} = \frac{n_a}{n_b}$ | pH = $-\log[H_3O^+]$ |
| $K_w = [H_3O^+][OH^-] = 1 \times 10^{-14}$ at/*by* 298 K | |
| $E^\theta_{cell} = E^\theta_{cathode} - E^\theta_{anode}$ / $E^\theta_{sel} = E^\theta_{katode} - E^\theta_{anode}$<br>or/*of*<br>$E^\theta_{cell} = E^\theta_{reduction} - E^\theta_{oxidation}$ / $E^\theta_{sel} = E^\theta_{reduksie} - E^\theta_{oksidasie}$<br>or/*of*<br>$E^\theta_{cell} = E^\theta_{oxidisingagent} - E^\theta_{reducingagent}$ / $E^\theta_{sel} = E^\theta_{oksideermiddel} - E^\theta_{reduseermiddel}$ | |

## TABLE 3: THE PERIODIC TABLE OF ELEMENTS