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NZQA

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

For Supervisor's use only

Level 2 Chemistry, 2007

90309 Describe the structural formulae and reactions of compounds containing selected organic functional groups

Credits: Four
2.00 pm Monday 19 November 2007

Check that the National Student Number (NSN) on your admission slip is the same as the number at the top of this page.

You should answer ALL the questions in this booklet.

If you need more space for any answer, use the page(s) provided at the back of this booklet and clearly number the question.

Check that this booklet has pages 2–8 in the correct order and that none of these pages is blank.

YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.

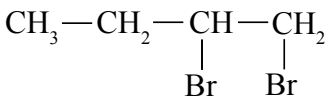
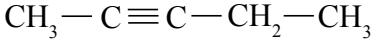
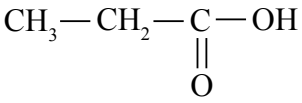
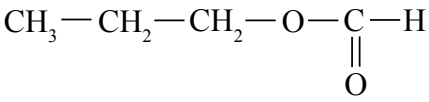
For Assessor's use only	**Achievement Criteria**		
Achievement	**Achievement with Merit**	**Achievement with Excellence**
Describe structures and reactions of organic compounds. ☐	Link structure and reactivity of organic compounds. ☐	Discuss reactivity and structure of organic compounds. ☐
Overall Level of Performance ☐		

You are advised to spend 45 minutes answering the questions in this booklet.

Assessor's use only

QUESTION ONE

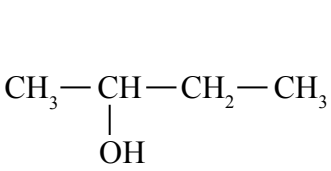
Complete the table below by writing the IUPAC (systematic) name for each compound.

Compound	Structural Formula	Name
A		
B		
C		
D		

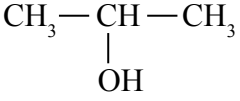
QUESTION TWO

Consider the following compounds.

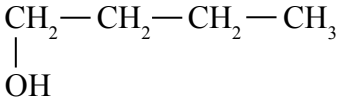
E



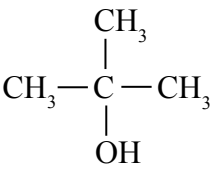
F



G



H



(a) Which compounds are **structural isomers**? Identify using the **bold** letters designating the molecules.

_____

(b) Explain why the compounds you have selected are structural isomers.

_____

_____

_____

_____

_____

_____

QUESTION THREE

Assessor's use only

Some reactions involving organic compounds can be classified as **addition** or **elimination**.

Use the examples (a) and (b) given below to clearly explain the type of reaction involved:

(i) complete the equation to show the **main** organic product formed
(ii) use the example to **explain why** it is classified as that type of reaction.

(a) When HCl reacts with but–1–ene an **addition reaction** occurs.

(i) $CH_2{=}CH-CH_2-CH_3 + HCl \longrightarrow$

(ii) This is an addition reaction because:

_____

_____

_____

(b) When ethanol is heated with concentrated sulfuric acid an **elimination reaction** occurs.

(i) $CH_3-CH_2-OH \xrightarrow{\text{conc. } H_2SO_4}$

(ii) This is an elimination reaction because:

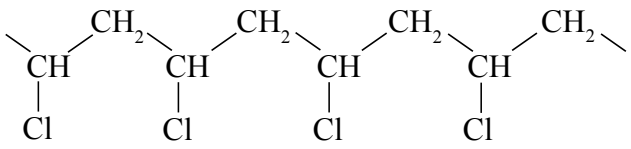
_____

_____

_____

QUESTION FOUR

The following diagram shows four repeating sections of the polymer commonly known as PVC.



Draw the **structural formula** for the monomer molecule used to make this polymer.

Structural formula of monomer molecule

QUESTION FIVE

Assessor's use only

Three colourless organic liquids have no labels on the bottles. They are known to be pentanoic acid, pentan–1–ol and pent–1–ene.

(a) Draw structural formulae for these three substances.

pentanoic acid	pentan–1–ol
pent–1–ene	

(b) Using only aqueous solutions of bromine and potassium permanganate, discuss how a student could identify the liquids.

Your answer should include:
- what is done
- related observations
- conclusions made
- organic products for any reactions occurring.

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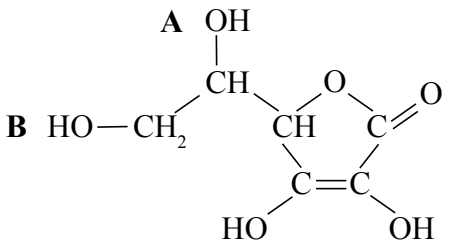
QUESTION SIX

Vitamin C has the following structure.



Classify the –OH groups labelled **A** and **B** as primary, secondary or tertiary.

A _____ **B** _____

QUESTION SEVEN

Draw structural formulae to show the organic product in the following reactions involving propan–1–ol.

(a)

$$CH_3—CH_2—CH_2—OH \xrightarrow{Cr_2O_7^{2-}(aq) / H^+(aq)}$$

(b)

$$CH_3—CH_2—CH_2—OH + CH_3—\overset{\overset{O}{\|}}{C}—OH \xrightarrow{H^+(aq)}$$

QUESTION EIGHT

Assessor's use only

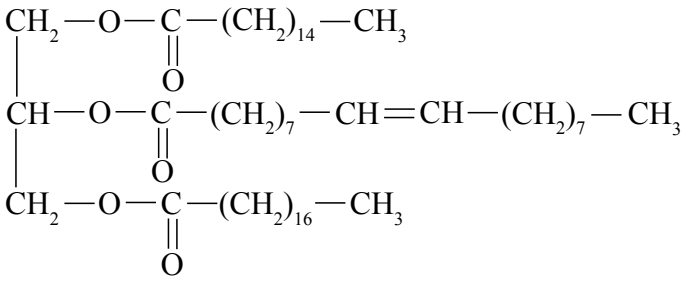
But–2–ene forms cis–trans (geometric) isomers while but–1–ene does not.

Discuss why this is the case.
Use diagrams to support your answer.

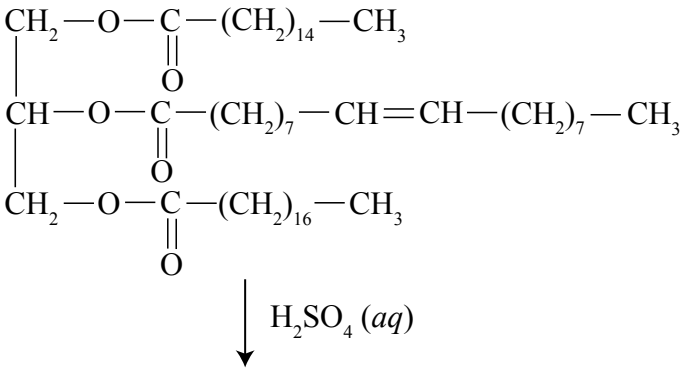
QUESTION NINE

Assessor's use only

A triglyceride found in cocoa butter has the following structure.



(a) Complete the equation below, which shows hydrolysis of this triglyceride in acidic conditions using H_2SO_4 solution.



(b) Compare the products that would form if the hydrolysis occurred in basic conditions using NaOH solution.

Extra paper for continuation of answers if required.
Clearly number the question.

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