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90309

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

National Certificate of Educational Achievement
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Level 2 Chemistry, 2006

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

Credits: Four
2.00 pm Monday 27 November 2006

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 2–10 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.

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QUESTION ONE

Draw the structural formulae for the following compounds.

	Name of compound	Structural formula
(a)	pent–2–ene	
(b)	3–chloropropan–1–ol	
(c)	propylmethanoate	
(d)	2–bromo–3–methylbutanoic acid	

QUESTION TWO

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Complete the following reactions by writing the structural formula of each organic product.

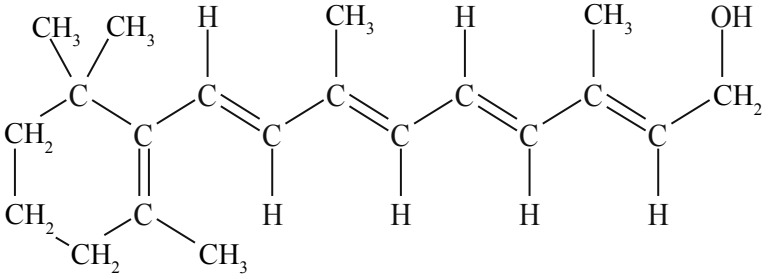
(a) $CH_3—CH_2—OH \xrightarrow{H^+ / Cr_2O_7^{2-}}$

(b) $CH_3—CH=CH_2 + Cl_2 \longrightarrow$

(c) $CH_3—CH=CH—CH_2—CH_3 \xrightarrow{H^+ / MnO_4^-}$

QUESTION THREE

Vitamin A has the structure shown below.



(a) Circle TWO **different** functional groups in the Vitamin A molecule above.

(b) Copy the two functional groups into the spaces below and name them.

Functional group:	Functional group:
Name: _____	Name: _____

QUESTION FOUR

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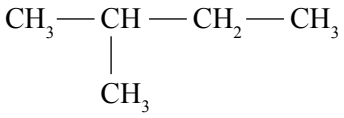
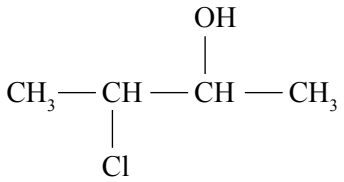
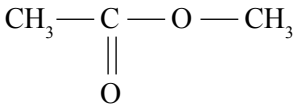
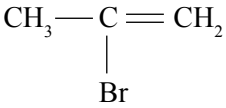
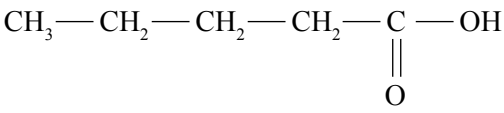
(a) Complete the following table by writing the IUPAC (systematic) name for each compound.

Compound	Structural formula	IUPAC name
A		
B		
C		
D		
E		

(b) Classify compound **B**, in the table above, as a primary, secondary or tertiary alcohol by circling your choice below.

primary secondary tertiary

(c) Using **ONLY** an aqueous solution of bromine, $Br_2(aq)$, explain how you can distinguish between compounds **D** and **E** listed in the table on the opposite page.

Include equations for any reactions that occur, showing the organic reactant and product.

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QUESTION FIVE

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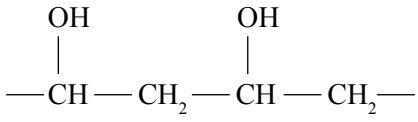
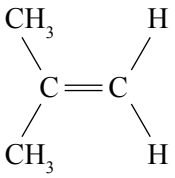
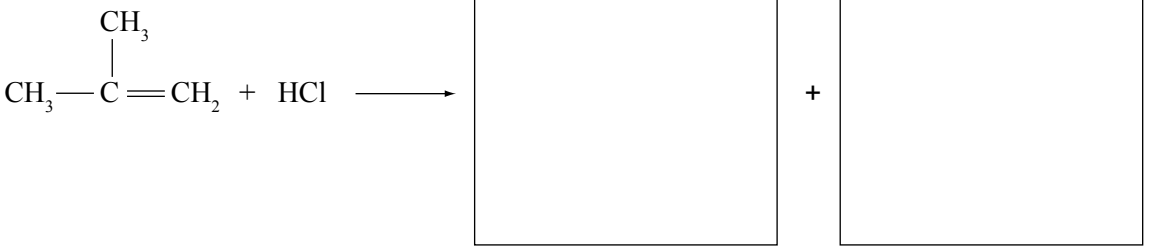
(a) Complete the table below by drawing the structural formula of the monomer or polymer (showing TWO repeating units).

	Monomer molecule	Section of the polymer
(i)		 polyvinylalcohol
(ii)	 methylpropene	

(b) Methylpropene will react with HCl to give two different haloalkane products.

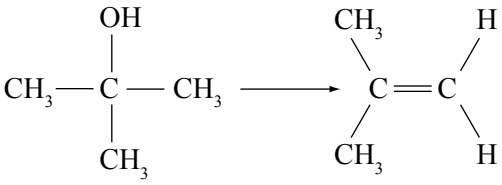
Draw BOTH haloalkane products.



Major product **Minor product**

(c) Methylpropene can be formed from methylpropan–2–ol.

Identify a reagent that can be used to do this.



Reagent: _____

QUESTION SIX

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Structural isomers of the molecular formula $C_2H_2Cl_2$ are 1,1–dichloroethene and 1,2–dichloroethene.

(a) Circle the compound that can exist as *cis-trans* isomers.

1,1–dichloroethene 1,2–dichloroethene

(b) Draw the *cis* and *trans* isomers of the compound you circled in (a).

***cis* isomer**	***trans* isomer**

(c) Discuss the requirements for *cis-trans* isomerism.

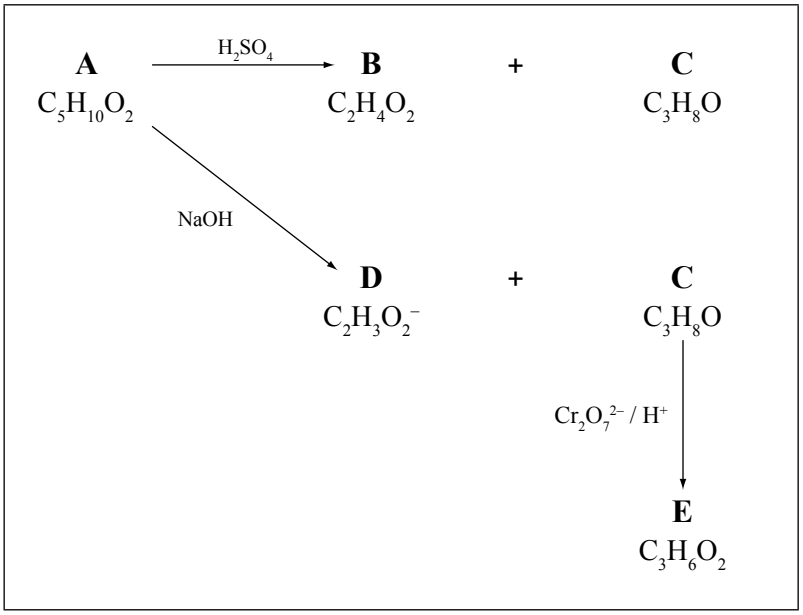
In your answer include reasons explaining why the structural isomer you selected above can exist as *cis-trans* isomers while the other structural isomer cannot.

QUESTION SEVEN

Assessor's use only

Complete the table on the opposite page by using the following information and the reaction scheme below to deduce the **names** and **structural formulae** of the compounds **A** to **E**.

- Compound **A**, $C_5H_{10}O_2$, has a characteristic smell and does not dissolve in water.
- Compound **A**, $C_5H_{10}O_2$, can be hydrolysed by heating in acidic conditions (using H_2SO_4 solution), and compounds **B** and **C** are formed.
- When wet blue litmus is added to compound **B**, $C_2H_4O_2$, the litmus turns red.
- Compound **A**, $C_5H_{10}O_2$, can also be hydrolysed in basic conditions (using NaOH solution), and compound **D**, $C_2H_3O_2^-$, is formed as well as compound **C**.
- Compound **C**, C_3H_8O, reacts with acidified potassium dichromate solution to form compound **E**, $C_3H_6O_2$.
- When wet blue litmus is added to compound **E**, $C_3H_6O_2$, the litmus turns red.



Write the IUPAC (systematic) name and draw the structural formula for each compound in the table below.

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Compound	Name	Structural formula
A		
B		
C		
D		
E		

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

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Question number	