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Level 2 Chemistry, 2017

91165 Demonstrate understanding of the properties of selected organic compounds

2.00 p.m. Thursday 16 November 2017
Credits: Four

Achievement	Achievement with Merit	Achievement with Excellence
Demonstrate understanding of the properties of selected organic compounds.	Demonstrate in-depth understanding of the properties of selected organic compounds.	Demonstrate comprehensive understanding of the properties of selected organic compounds.

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 attempt ALL the questions in this booklet.

A periodic table is provided on the Resource Sheet L2–CHEMR.

If you need more room for any answer, use the extra space provided at the back of this booklet and clearly number the question.

Check that this booklet has pages 2–12 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.

TOTAL

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QUESTION ONE

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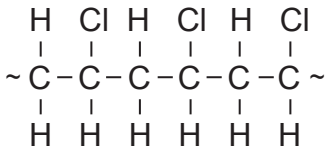
(a) Polyvinyl chloride (polychloroethene) is often used to make artificial leather. This can then be used to cover chairs, cover car seats, and make clothing.

A section of a polyvinyl chloride molecule is shown below.



(i) Draw the monomer from which the polymer polyvinyl chloride would be made.

(ii) Explain the difference in the structures and chemical reactivity of the monomer and polymer, and why the difference is important for the uses of the polymer.

(iii) Making polyvinyl chloride (polychloroethene) from its monomer is called ‘addition polymerisation’.

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Explain the term ‘addition polymerisation’ using polyvinyl chloride as an example.

Include an equation in your answer.

Equation:

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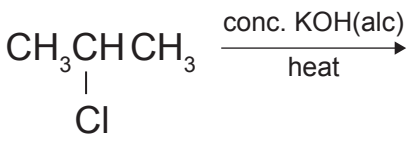
(b) A chemistry class was learning about the chemistry of haloalkanes. They were researching the effect of heat and concentrated potassium hydroxide in ethanol, conc. KOH(alc), on the haloalkane 2-chloropropane.

(i) Draw the organic product formed in the following reaction.



(ii) Explain how the functional group of the organic product drawn above could be identified.

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(iii) 2-bromo-3-methylbutane also reacts with conc. KOH(alc). However, in this reaction TWO organic products are formed, a major and a minor product.

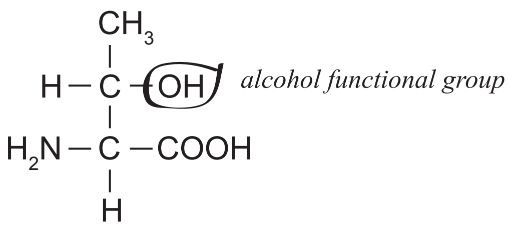
Give an account of the chemical processes that occur in this reaction.

In your answer you should:

- write an equation for this reaction showing the organic compounds
- name the type of reaction occurring
- explain how the products form
- explain which product you would expect to be the minor product.

QUESTION TWO

(a) The structure of a molecule of an organic compound, threonine, is shown below.



threonine

An alcohol functional group has been identified in the threonine molecule above.

(i) Circle and name **two other** functional groups on the threonine molecule above.

(ii) Classify the alcohol functional group as primary, secondary, or tertiary.

(iii) Explain how you classified the alcohol group.

(b) Name the organic compounds in the table below.

Compound	IUPAC (systematic) name
$CH_3-CH_2-CH_2-C\equiv CH$	
$CH_3-CH(Br)-CH(CH_3)-CH_2-CH_2-CH_3$	
$CH_3-CH_2-CH(OH)-C(CH_3)_2-CH_3$	

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(c) (i) Draw four alkene isomers for the organic compound C_4H_8 in the table below.

1.	**2.**
3.	**4.**

(ii) Identify the compounds that are *cis* and *trans* (geometric) isomers from the table above.

	cis	**trans**
Number		

Justify your choices, and explain why only these two compounds are *cis* and *trans* (geometric) isomers.

(d) Alkanes and alkenes can be identified by their reactions with a solution of bromine water, $Br_2(aq)$.

Contrast the types of reactions an alkane and an alkene will undergo with an orange solution of bromine water.

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QUESTION THREE

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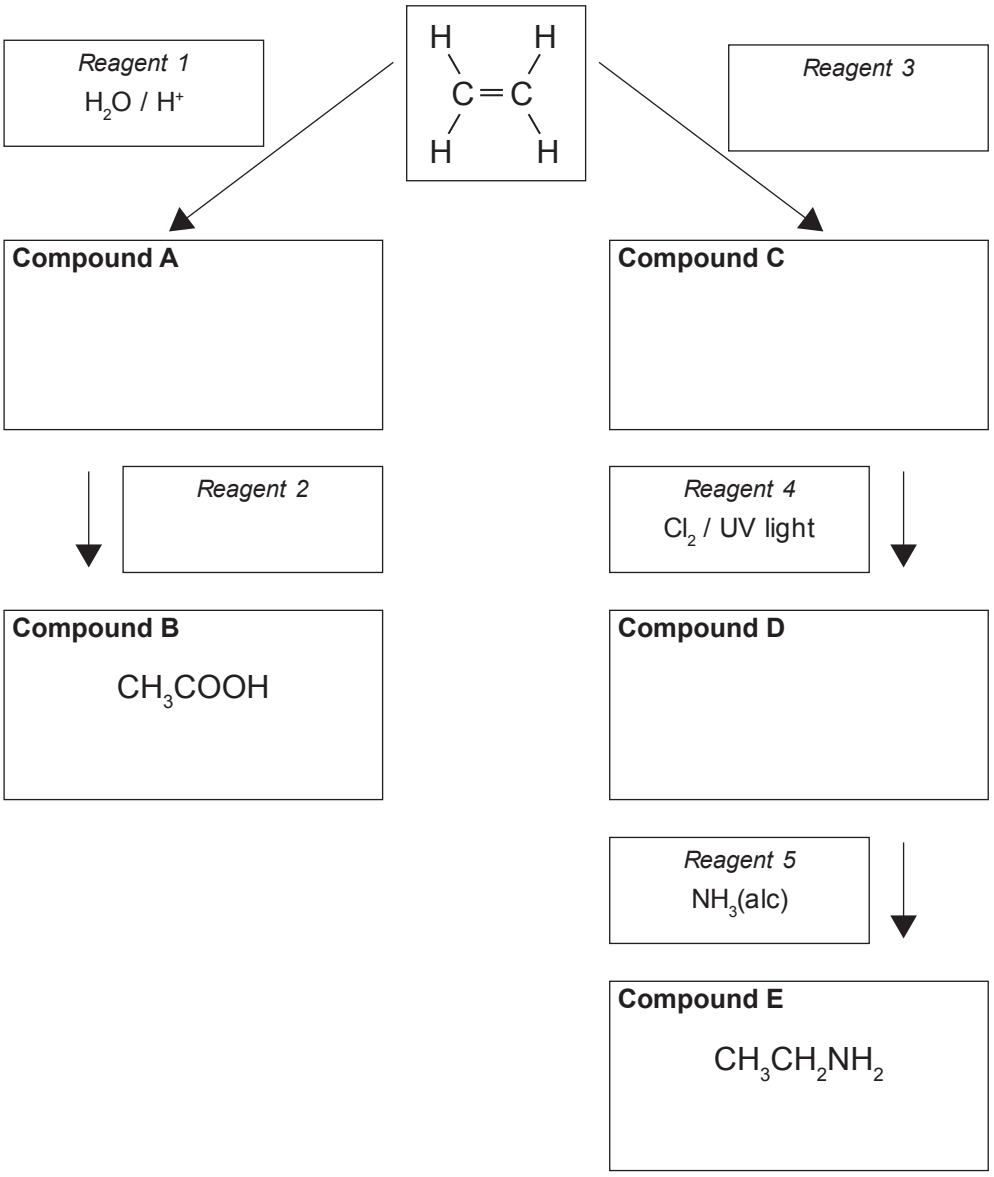
(a) (i) Complete the following reaction scheme by drawing the structural formulae for the organic compounds **A**, **C**, and **D**, and identifying *reagents 2 and 3*.



(ii) Identify the types of reactions that occur to produce compounds **A, B, C, D**, and **E**:

A. _____

B. _____

C. _____

D. _____

E. _____

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(b) Describe a simple test that will distinguish between solutions of the final organic compounds **B** and **E**.

(c) Compounds **B** and **E** react together.

(i) Write a balanced equation for the reaction that occurs between compounds **B** and **E**.

(ii) Identify the type of reaction that occurs between compounds **B** and **E**.
Justify your answer.

(d) Explain how compound **A** from the reaction scheme could be directly converted into compound **D**.

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Extra paper if required.
Write the question number(s) if applicable.

QUESTION NUMBER

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