Name:	Teacher:

Level 3 Chemistry

91391 Demonstrate understanding of the properties of organic compounds

Credits: Five

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

You should attempt ALL the questions in this booklet.

A periodic table is provided in the Resource Sheet.

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 1–11 in the correct order and that none of these pages is blank.

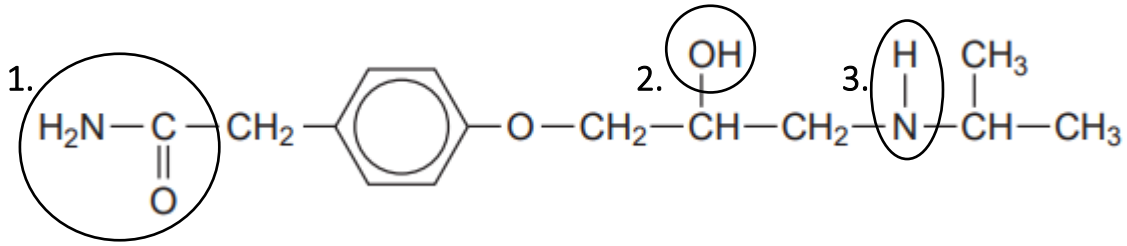
YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.

TOTAL

ASSESSOR'S USE ONLY

QUESTION ONE

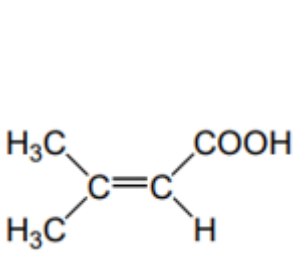
(a) (i) Atenolol is used mainly to lower high blood pressure. It can also be used to prevent chest pain (angina) or to treat an irregular heartbeat.
Identify the three circled functional groups.



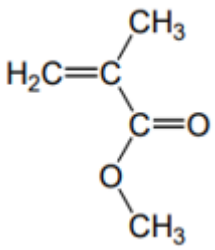
(ii) The following isomers all have the formula $C_5H_8O_2$.

Label each structure with the correct letter A, B, C and D.

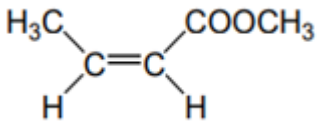
- A is an ester that shows geometrical isomerism.
- B is an optically active carboxylic acid.
- C is a carboxylic acid with a branched carbon chain and does not show stereoisomerism.
- D is methyl 2-methylpropenoate.



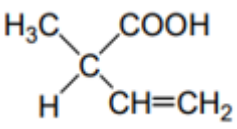
____



____

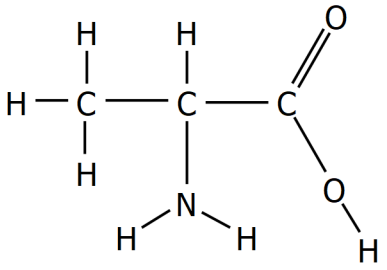


____

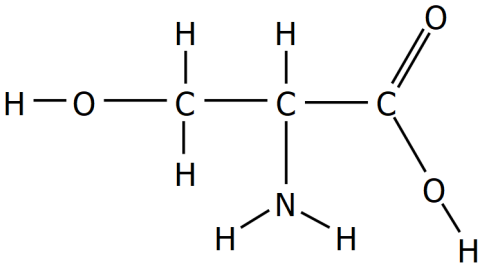


____

(b) Proteins contain sequences of amino acids joined by peptide links.



alanine



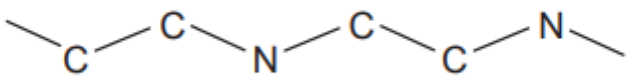
serine

(i) Give the IUPAC name for the amino acid alanine.

_____

(ii) Draw the structure of the species formed by serine at low pH.

(iii) A section of a protein is formed from one molecule of each of the amino acids alanine and serine.
Add bonds and atoms to the diagram to complete a structural formula for this section of the protein.



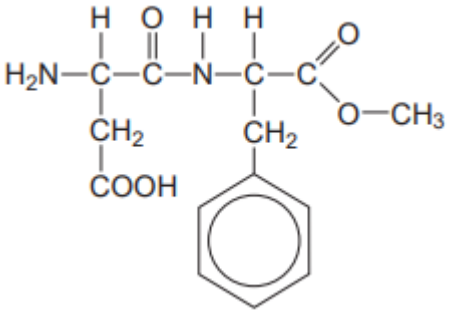
(c) Two reactions of organic compound E are shown below.
Compound **F** is a straight-chain hydrocarbon with the formula C_4H_8.

Discuss the reactions taking place. In your answer you should include

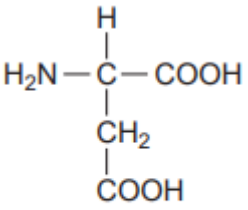
- The types of reaction taking place when E reacts to form F and G.
- Any colour changes that would be seen during the reaction(s).
- Structural formula of the possible isomers of E and how, if at all, this affects the products F and G.

QUESTION TWO

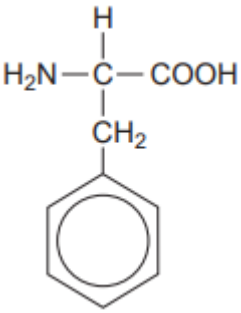
(a) Aspartame is a sweet tasting molecule that is the methyl ester of a compound formed by the condensation reaction between aspartic acid and phenylalanine. Neither aspartic acid nor phenylalanine taste sweet.



aspartame



aspartic acid

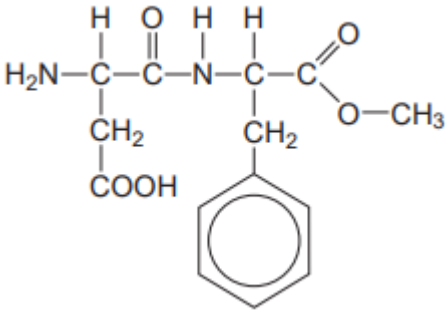


phenylalanine

(i) What is meant by a condensation reaction?

(ii) Hydrolysis of aspartame produces methanol initially. After a longer time, free amino acids are formed when the amide (peptide) link breaks.

What is meant by hydrolysis. Use aspartame to illustrate your answer .



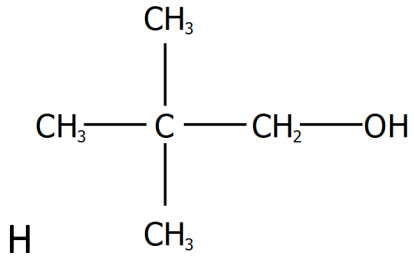
(iii) Discuss a reason why aspartame is unsuitable for use as a sweetener in foods that are being cooked.

(b) Describe how you could distinguish between the compounds in the following pairs using one simple test-tube reaction in each case.
For each pair,

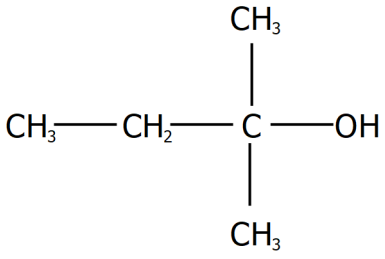
- identify a reagent and
- state what you would observe

when both compounds are tested separately with this reagent.

(i)

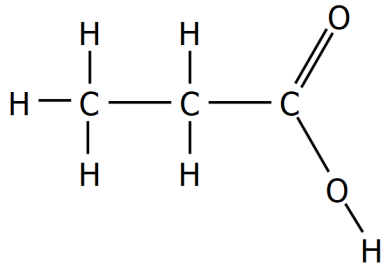


H

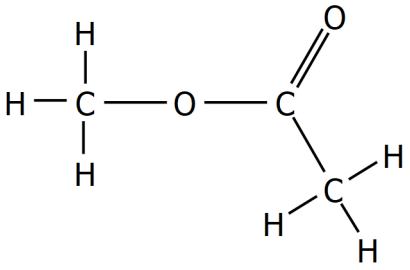


I

(ii)

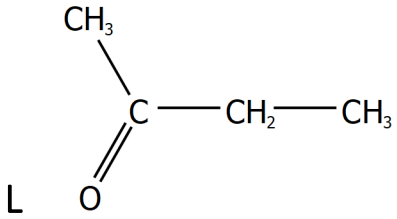


J

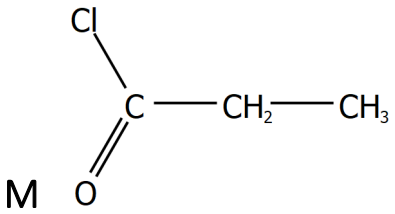


K

(iii)

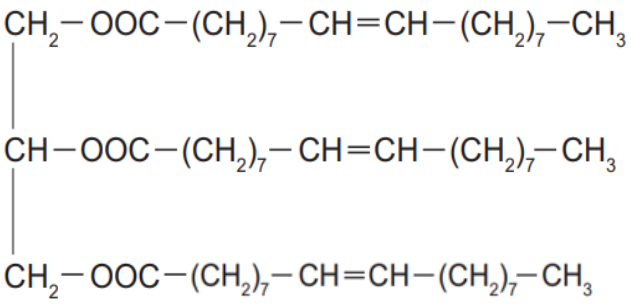


L



M

(c) The triglyceride shown below occurs in vegetable oils.

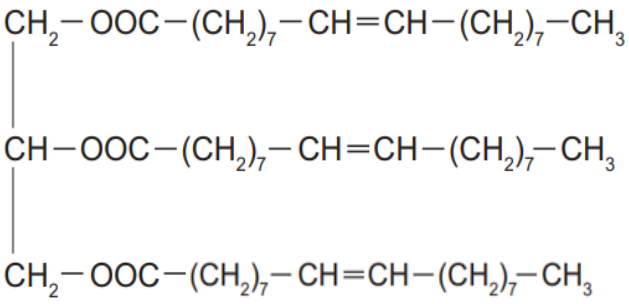


(i) Circle two different functional groups and name them on the diagram above.

(ii) Describe a chemical test that can be used to show that the molecule is unsaturated. Give any observations and state the type of reaction occurring.

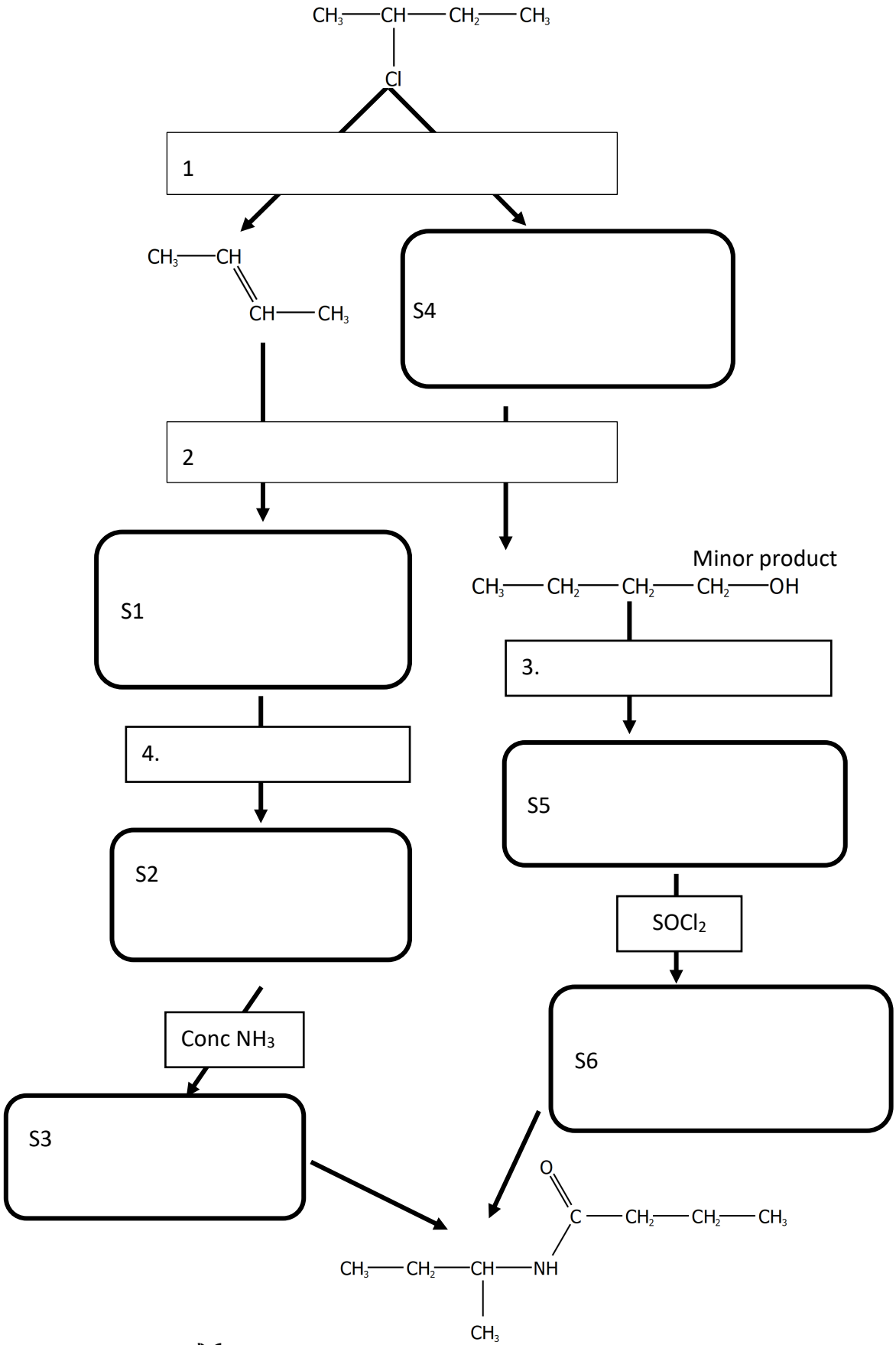
(ii) Compare and contrast the reaction of the above triglyceride when it undergoes both acidic and basic hydrolysis. In your answer you should include:

- drawings of condensed structures of the organic products
- any reagents and conditions required for the reaction to proceed.



QUESTION THREE

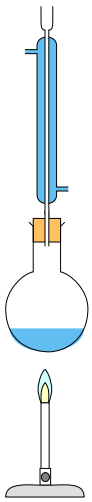
(a) Complete the following reaction scheme by drawing organic structures for S1 to S5 and identifying reagents 1 to 4.



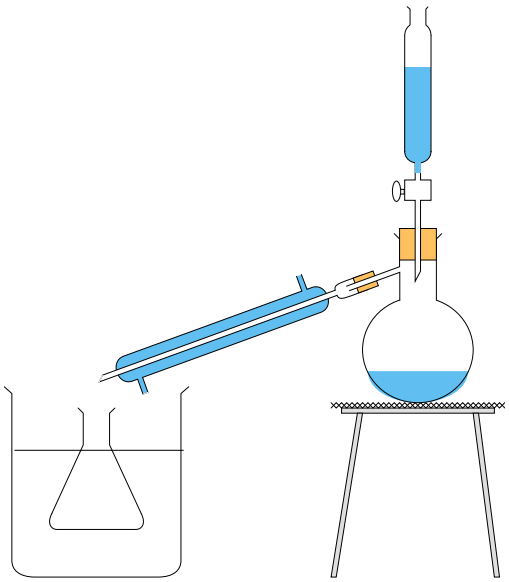
(b) The boiling points of ethanol, ethanal and ethanoic acid are given in the table below.

	CH_3CH_2OH	CH_3CHO	CH_3COOH
Boiling point(°C)	78	21	118

(i) Why is the organic product likely to be ethanoic acid if the apparatus below is used? The flask contains ethanol and acidified potassium dichromate solution.



(ii) Explain how the apparatus below can be used to produce a sample of ethanal.
The dropping funnel contains potassium dichromate solution and ethanol. The round bottomed flask contains dilute sulfuric acid that has been gently warmed to about 25°C. The conical flask is stood in a beaker of iced water.



Extra paper if required.

Write the question number(s) if applicable