



1.

Methylated spirit is a useful product made from a mixture of substances.

The table below shows the mass of the substances in a sample of methylated spirit.

Substance	Mass in grams
Ethanol	265.5
Methanol	23.3
Pyridine	3.0
Methyl violet	1.5

(a) What name is given to a useful product such as methylated spirit?

\_\_\_\_\_

(1)

(b) Calculate the percentage by mass of methanol in methylated spirit.

Use the table above.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Percentage = \_\_\_\_\_ %

(2)

Methylated spirit contains ethanol and is available cheaply.

Methylated spirit also contains:

- pyridine which has a very unpleasant smell
- methyl violet which makes the mixture purple.

(c) Suggest why pyridine and methyl violet are added to ethanol to make methylated spirit.

\_\_\_\_\_  
\_\_\_\_\_

(1)

(d) Suggest **one** use of methylated spirit.

\_\_\_\_\_

(1)



(e) Describe how ethanol is produced from sugar solution.

Give the name of this process.

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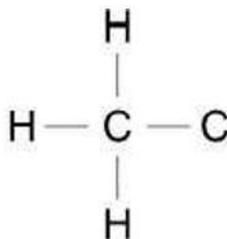
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(3)

(f) The diagram below shows part of the displayed formula for ethanol.

Complete the diagram.



(1)

(g) Name the gas produced when sodium is added to ethanol.

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(1)

(h) Methanol is used to produce methanoic acid.

What type of substance reacts with methanol to produce methanoic acid?

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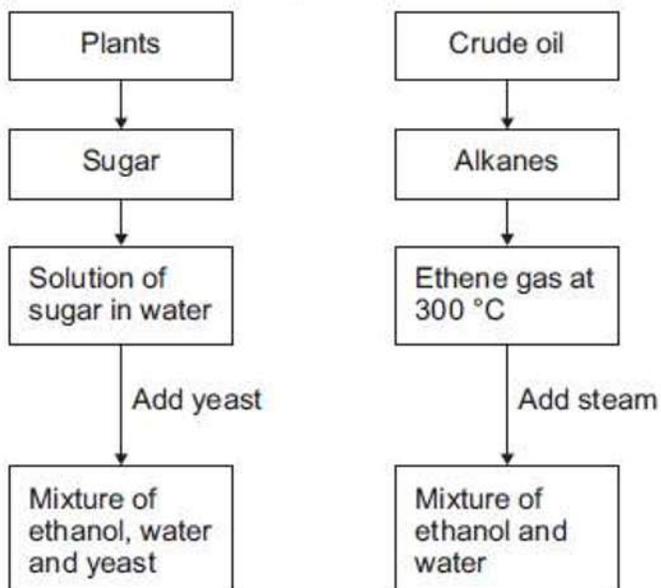
(1)

(Total 11 marks)



2. **Figure 1** shows how ethanol is made from plants and from crude oil.

**Figure 1**



(a) What is the name of the reaction to produce ethanol from sugar?

Tick (✓) **one** box.

fermentation

polymerisation

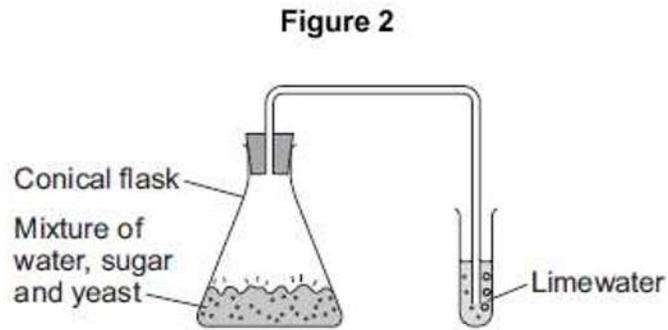
reduction

(1)



(b) A student made ethanol from sugar.

**Figure 2** shows the apparatus used.



(i) What change is seen in the limewater?

Give a reason for your answer.

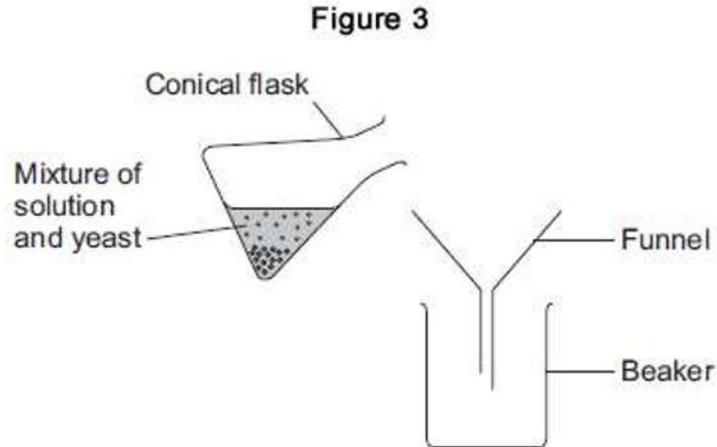
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(2)

(ii) The student wanted to separate the solid yeast from the solution.

**Figure 3** shows the apparatus used.



What is missing from the apparatus in **Figure 3**?

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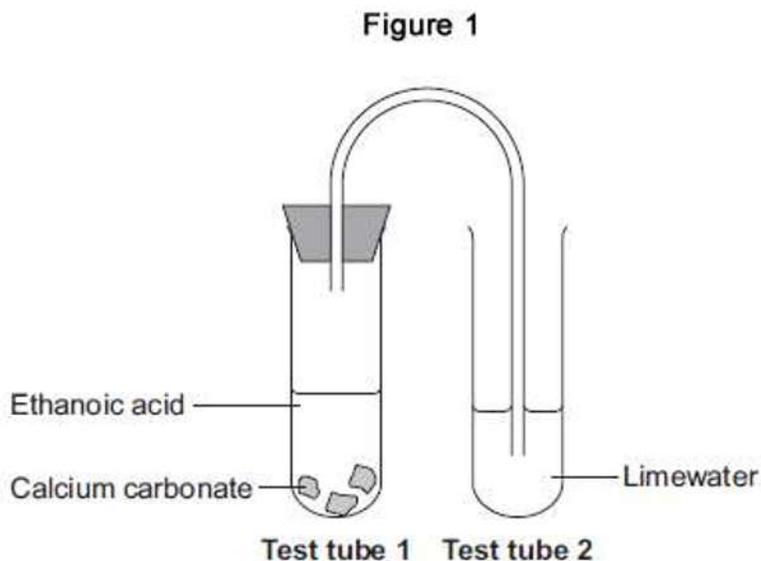
(1)

(Total 4 marks)



3. This question is about reactions of ethanoic acid and the analysis of salts.

(a) **Figure 1** shows the apparatus used to investigate the reaction of ethanoic acid with calcium carbonate.



(i) Describe a change that would be seen in each test tube.

Give a reason for each change.

**Test tube 1** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**Test tube 2** \_\_\_\_\_

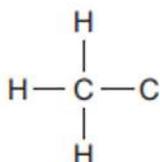
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\_\_\_\_\_

\_\_\_\_\_

(4)

(ii) Complete the displayed structure of ethanoic acid.





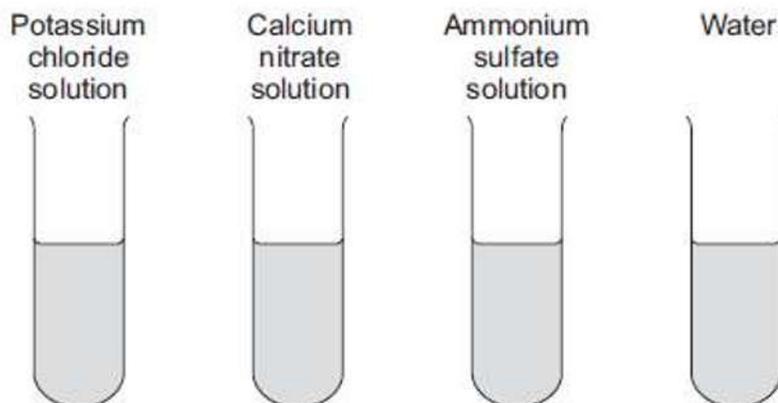
- (iii) Ethanoic acid is a carboxylic acid.  
Complete the sentence.

Carboxylic acids react with alcohols in the presence of an \_\_\_\_\_ catalyst to produce pleasant-smelling compounds called \_\_\_\_\_.

(2)

- (b) **Figure 2** shows four test tubes containing three different salt solutions and water.

**Figure 2**



Each solution and the water was tested with:

- silver nitrate in the presence of dilute nitric acid
- barium chloride in the presence of dilute hydrochloric acid.

Complete the table of results.

	Potassium chloride solution	Calcium nitrate solution	Ammonium sulfate solution	Water
Test with silver nitrate in the presence of dilute nitric acid			no change	no change
Test with barium chloride in the presence of dilute hydrochloric acid		no change	white precipitate	

(2)



(c) Flame tests can be used to identify metal ions.

(i) Complete the following sentences.

The flame colour for potassium ions is \_\_\_\_\_ .

The flame colour for calcium ions is \_\_\_\_\_ .

(2)

(ii) Give **one** reason why a flame test would **not** show the presence of both potassium ions and calcium ions in a mixture.

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(1)

(Total 12 marks)

4.

This question is about ethanol.

(a) Ethanol can be made by fermentation of sugars from plants.

(i) What is a suitable temperature for fermentation?

Draw a ring around the correct answer.

0 °C

25 °C

450 °C

(1)

(ii) Fermentation produces a dilute solution of ethanol in water.

Name the process used to obtain ethanol from this dilute solution.

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(1)



(b) Ethanol made by fermentation can be used as a biofuel.

(i) Explain why increasing the use of biofuels may cause food shortages.

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(2)

(ii) Explain why burning biofuels contributes less to climate change than burning fossil fuels.

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(2)



(c) In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.

Ethanol can also be made by reacting ethene with steam in the presence of a catalyst.

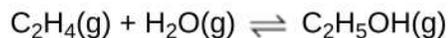


Figure 1 shows how the percentage yield of ethanol changes as the pressure is changed at three different temperatures.

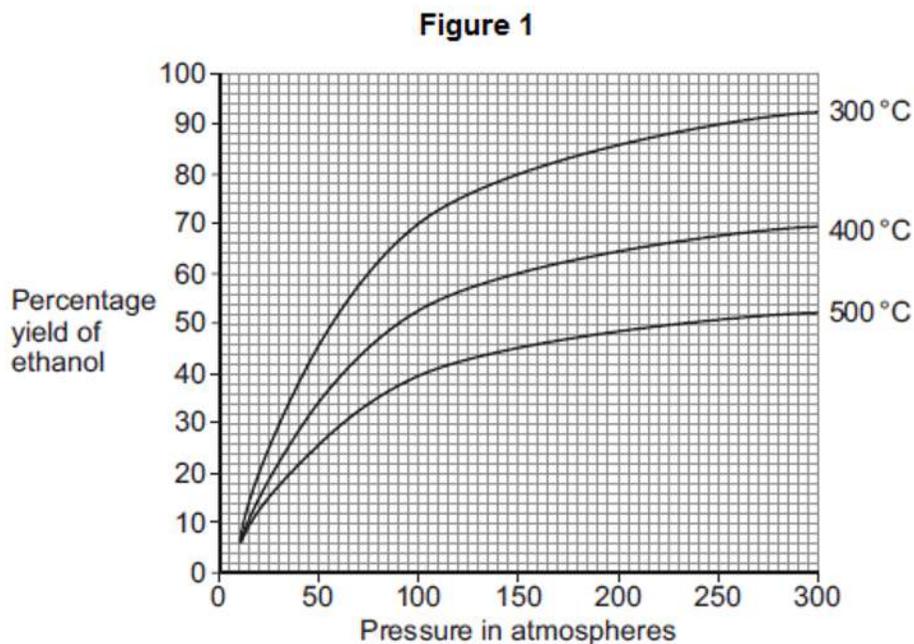
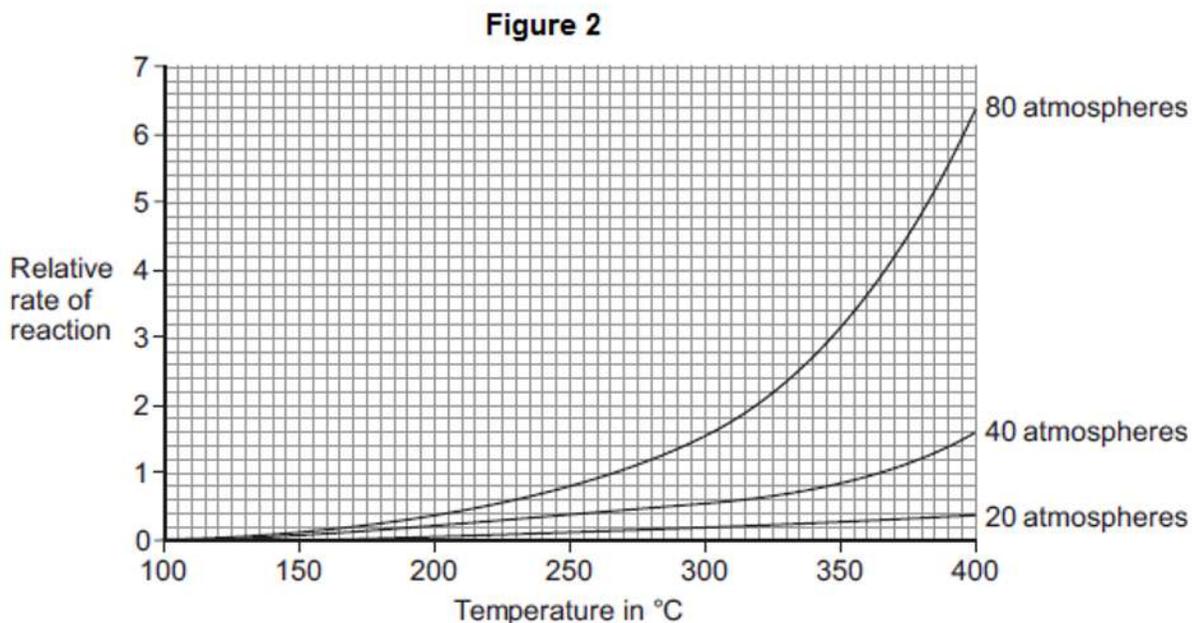


Figure 2 shows how the rate of reaction changes as the temperature changes at three different pressures.



In one process for the reaction of ethene with steam the conditions are:





(b) Which gas is produced when sodium reacts with ethanol?

Tick (✓) **one** box.

Carbon dioxide

Carbon monoxide

Hydrogen

Oxygen

(1)

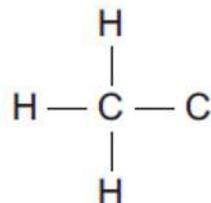
(c) Ethanoic acid ( $\text{CH}_3\text{COOH}$ ) can be produced from ethanol ( $\text{CH}_3\text{CH}_2\text{OH}$ ).

(i) What type of reaction produces ethanoic acid from ethanol?

\_\_\_\_\_

(1)

(ii) Complete the displayed structure of ethanoic acid.



(1)

(iii) Solutions of ethanoic acid and hydrochloric acid with the same concentration have different pH values.

Explain why the solution of ethanoic acid has a higher pH than the solution of hydrochloric acid.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

(2)



(d) Ethanol and ethanoic acid react in the presence of a catalyst to form an ester.

(i) Name the ester made from ethanol and ethanoic acid.

\_\_\_\_\_

(1)

(ii) What type of chemical is used as a catalyst in this reaction?

\_\_\_\_\_

(1)

(iii) Esters are used in perfumes because they smell pleasant and are volatile.

What does volatile mean?

\_\_\_\_\_

(1)

(Total 10 marks)

6.

Most petrol used in cars contains about 5% ethanol ( $C_2H_5OH$ ).

(a) The complete combustion of ethanol produces carbon dioxide and water.

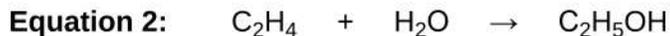
Complete and balance the symbol equation for the complete combustion of ethanol.



(2)

(b) Ethanol can be produced from octane ( $C_8H_{18}$ ).

The two chemical equations represent the production of ethanol from octane.



(i) In **Equation 1** the products are a mixture of two gases.

Describe a chemical test that would indicate the presence of ethene ( $C_2H_4$ ) in the mixture.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

(2)

