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tutors**

Student number

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Name _____

Date _____

Attempt/Time taken _____

GCSE CHEMISTRY

Topic Paper: 7.3 Synthetic and naturally occurring polymers
Part 2

Time allowed: 30 minutes

Materials

For this paper you must have:

- the Periodic Table/Data Sheet, provided as an insert (enclosed)
- a ruler with millimetre measurements
- a calculator, which you are expected to use where appropriate.

Instructions

- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- All working must be shown.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information

- The Periodic Table/Data Sheet is provided as in insert.
- You are reminded of the need for good English and clear presentation in your answers.
- When answering questions you need to make sure that your answer:
 - is clear, logical, sensibly structured
 - fully meets the requirements of the question
 - shows that each separate point or step supports the overall answer.



24 Marks



Q5. (a) The hydrocarbon $C_{16}H_{34}$ was heated strongly in the absence of air.

This is one of the reactions which took place:



This type of reaction is carried out because there is a greater demand for the products than for the original hydrocarbon.

Suggest **two** reasons for this.

1

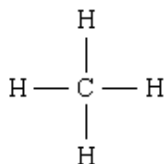
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2

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(2)

(b) A molecule of the compound methane, CH_4 , can be shown like this:

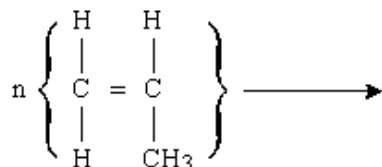


Draw a molecule of the compound ethene, C_2H_4 .

(2)

(c) Small molecules of substances called monomers can be joined together in polymerisation, eg. ethene poly \longrightarrow (ethene).

(i) Complete the equation below to show formation of the polymer from the monomer propene.



(1)



(ii) Suggest the name of the polymer formed.

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(1)

(Total 6 marks)

Q6. Supermarkets in the UK have been advised by the Government to stop giving plastic bags to customers. The Government states that this is because plastic bags use up resources that are not renewable and that the manufacture of plastic bags produces carbon dioxide. Most of these plastic bags are made from poly(ethene). The table shows methods to deal with large numbers of used plastic bags.

Method	Description of what happens to the plastic bag
Reused	used again by the customer
Recycled	collected, transported, washed and melted to make new plastic items
Burned	collected, transported and burnt to release heat energy
Dumped	mixed with other household waste, collected, transported and disposed of at a landfill site

Use the information and your knowledge and understanding to briefly give **one advantage and one disadvantage** for each of these methods.

Reused

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Recycled

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Burned

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Dumped

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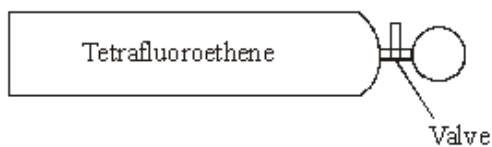
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(4)

(Total 4 marks)



Q7. In 1939 Roy Plunkett opened the valve on a new cylinder of tetrafluoroethene gas. No gas came out!



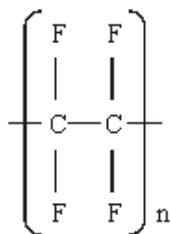
He cut the cylinder open and found that the gas had changed into a white solid. This solid was an addition polymer.

(a) Give the name of the addition polymer that formed inside the cylinder.

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(1)

(b) The structure of this polymer can be represented by the diagram below.



Draw the structure of the monomer, tetrafluoroethene, from which it is formed.

(2)

(c) Describe how this addition polymer forms from monomers.

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(3)

(Total 6 marks)

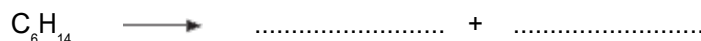


Q8. Ethanol (C₂H₅OH) is produced from ethene or from sugar cane.

The two different methods to produce ethanol are summarised in the table.

Ethanol from sugar cane is a batch process	Ethanol from crude oil is a continuous process
Sugar cane plants are crushed and soaked in water for one day.	Crude oil is distilled to separate the naphtha fraction.
The sugar solution is separated by filtration.	The naphtha fraction is cracked when the vaporised hydrocarbons are passed over a hot catalyst.
Yeast is added to the sugar solution and fermented for three days.	The ethene produced is separated by distillation.
The solution of water and ethanol produced is separated by filtration.	Ethene is reacted with steam in the presence of a catalyst.
Distillation of this solution produces a 50% solution of ethanol.	This hydration reaction produces 100% ethanol.

(a) Complete and balance an equation for the cracking of the hydrocarbon C₆H₁₄ to produce ethene.



(2)

(b) What is **seen** when the sugar solution and yeast are fermented?

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(1)



- (c) Evaluate the issues involved with the production of ethanol from sugar cane compared with the production of ethanol from crude oil.
You should explain why each issue you describe is important.

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(5)
(Total 8 marks)