OCR
RECOGNISING ACHIEVEMENT

SPECIMEN F

GENERAL CERTIFICATE OF SECONDARY EDUCATION

TWENTY FIRST CENTURY SCIENCE **A171/01**

CHEMISTRY A

Unit A171: Modules C1, C2, C3 (Foundation Tier)

Candidates answer on the question paper
A calculator may be used for this paper

OCR Supplied Materials:
None

Other Materials Required:
- Pencil
- Ruler (cm/mm)

Duration: 1 hour

Candidate Forename		Candidate Surname	

Centre Number						Candidate Number				

INSTRUCTIONS TO CANDIDATES

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Write your answer to each question in the space provided, however additional paper may be used if necessary.

INFORMATION FOR CANDIDATES

- Your quality of written communication is assessed in questions marked with a pencil (✎).
- The number of marks for each question is given in brackets **[ ]** at the end of the question or part question.
- The total number of marks for this paper is **60**.
- This document consists of **20** pages. Any blank pages are indicated.

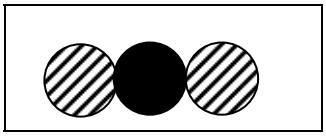
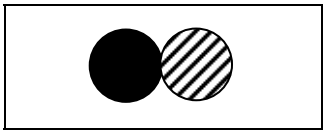
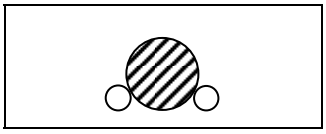
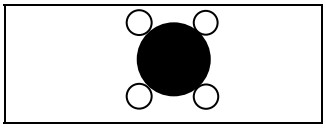
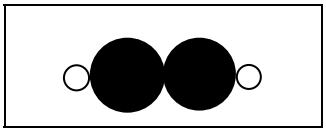
For Examiner's Use		
	Max	**Mark**
1	**5**	
2	**9**	
3	**6**	
4	**8**	
5	**7**	
6	**5**	
7	**10**	
8	**4**	
9	**6**	
TOTAL	**60**	

Answer **all** the questions.

1 Ethene is used as a fuel. It is obtained from crude oil.

(a) Carbon dioxide and water are produced when ethene burns completely.

Draw a straight line from each **product** to the **diagram** representing its molecule.

product	**diagram**
carbon dioxide	
water	
	
	
	

Key: ● carbon ◍ oxygen ○ hydrogen

[2]

(b) A scientist analyses the products of combustion of ethene.

He collects all the products of the reaction.

His results are shown in the table.

	mass in g
carbon dioxide	82.0
water vapour	70.2
carbon monoxide	52.0
carbon	2.0
total	**206.2**

(i) The scientist calculates that carbon dioxide made up 39.8% of the mass of the total products.

What is the percentage by mass of carbon monoxide?

percentage by mass = ... % **[1]**

(ii) What can be concluded from these results about the conditions in which combustion occurred?

Explain your answer.

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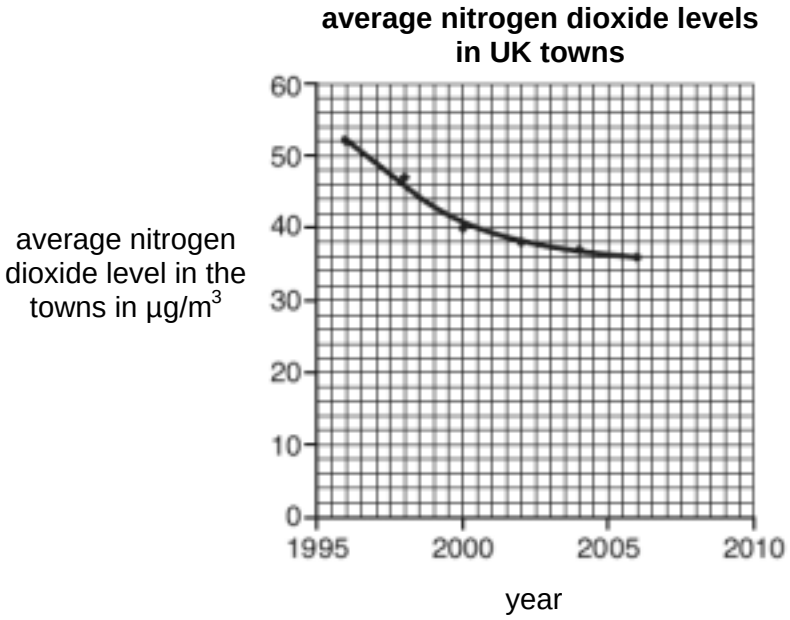
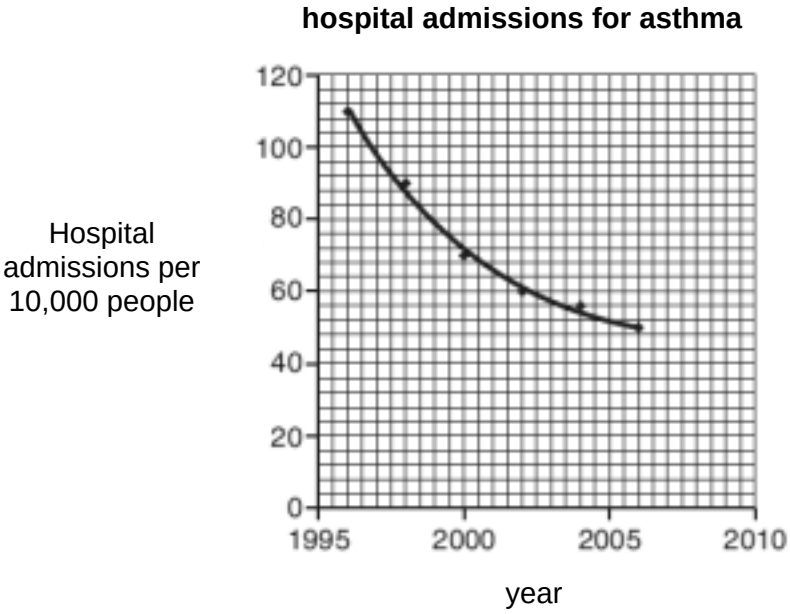
..... **[2]**

[Total: 5]

2 This question is about air pollution.

The graphs show nitrogen dioxide pollution in the air and the number of hospital admissions for asthma between 1996 and 2006.





(a) (i) What was the average nitrogen dioxide level in UK towns in 2000?

answer = ... µg / m^3 **[1]**

(ii) In what year did hospital admissions reach 60 per 10 000 people?

year = ... **[1]**

(b) (i) The graphs, **when taken together**, show a correlation between two factors.

Write a sentence to describe this correlation.

.....

..... **[1]**

(ii) Scientists looking at the graphs suggest that nitrogen dioxide in the air may cause asthma.

What extra information would support this suggestion?

Put ticks (✓) in the boxes next to the **two** correct answers.

how nitrogen dioxide is made in a car engine	☐
nitrogen dioxide levels in the countryside	☐
how nitrogen dioxide affects breathing	☐
similar data from other countries	☐
how many asthma inhalers are prescribed by doctors	☐

[2]

(c) The number of cars and lorries on the roads increased between 1996 and 2006.

During this time, the amount of pollution by nitrogen dioxide decreased.

Describe and explain how nitrogen dioxide pollution from cars and lorries has been reduced.

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..... **[4]**

[Total: 9]

3 The atmosphere of Venus was originally formed from gases released from inside the planet.

It is nearly completely made of carbon dioxide (96.5%).

The surface temperature is about 464°C.

How does the atmosphere of the Earth compare with the atmosphere of Venus?

Suggest similarities and differences in

- how the atmosphere formed
- the way this affected what the atmosphere is now made of.

The quality of written communication will be assessed in your answer to this question.

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[Total: 6]

4 The table shows how the Olympic record height for the pole vault event has increased over the last 60 years.

It also shows the material used to make the pole.

year that record was broken	Olympic record in metres	material used to make the pole
1948	4.45	bamboo
1952	4.55	bamboo
1960	4.70	bamboo
1964	5.10	polymer and glass fibre
1968	5.40	polymer and glass fibre
1972	5.50	polymer and glass fibre
1980	5.80	polymer and glass fibre
1988	5.90	polymer and glass fibre
2004	5.95	polymer and glass fibre
2008	5.96	polymer and glass fibre

(a) Here are four statements about the pole vault Olympic record height.

Use the evidence in the table to evaluate each statement.

Put a tick (✓) in the correct box next to each statement to show whether it is **true** or **false**.

	true	**false**
The world record doubled between 1948 and 2008.	☐	☐
The record increased by more than 1 m between 1948 and 2008.	☐	☐
The biggest increase over 4 years was between 1960 and 1964.	☐	☐
The record improved when polymer and glass fibre poles were introduced.	☐	☐

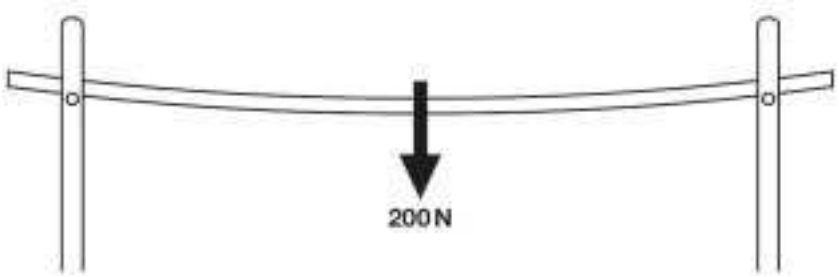
[2]

(b) Anna and Nick are investigating the properties of vaulting poles.

They know that flexibility (how far the pole bends) is an important property.

They support a pole at both ends as shown in the diagram.

They hang a 200 N weight from the centre of the pole and measure how far the pole bends.



(i) They repeat this measurement five times.

Suggest reasons why.

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..... **[2]**

Here are their results.

test number	**1**	**2**	**3**	**4**	**5**
how far the pole bends in cm	11.4	10.9	11.5	11.0	11.2

(ii) Suggest why the results of the five tests are different.

. .....

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..... **[2]**

(iii) What is the best estimate of the true value of how far the pole bends?

Put a (ring) around the correct answer.

10.9 **11.0** **11.2** **11.4** **11.5**

[1]

(iv) Within what range does the true value probably lie?

..... to ..... **[1]**

[Total: 8]

5 Read the newspaper article.

> **Skincare creams use nanotechnology**
>
> Nanoparticles can be put in face creams and sunscreens.
>
> These creams are easy to apply and invisible on the skin.
>
> At the moment it is impossible for consumers to tell if the creams contain nanoparticles.

(a) It has been suggested that labelling of these creams should show that they contain nanoparticles.

Why should this information be included?

Put a tick (✓) in the box next to the correct answer.

Nanotechnology increases the cost of the creams.	☐
Not all the effects of nanoparticles are fully understood.	☐
Creams containing nanoparticles are easy to apply.	☐
Nanoparticles can occur naturally.	☐
Nanoparticles are too small to see.	☐

[1]

(b) Nanoparticles are also added to other materials.

Adding nanoparticles changes the properties of these materials.

Describe **two** examples of products, other than skincare creams, that have nanoparticles added to them.

Explain how adding nanoparticles changes the properties of these products, and suggest why this is useful.

The quality of written communication will be assessed in your answer to this question.

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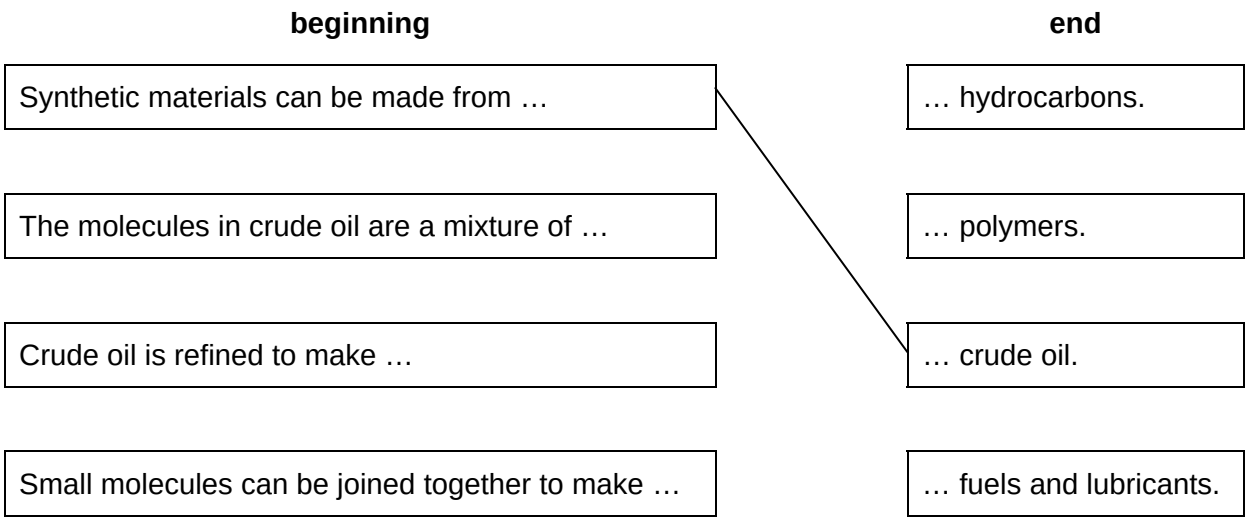
..... **[6]**

[Total: 7]

6 (a) The sentences below describe how polymers can be made.

Draw a straight line from the **beginning** of each sentence to its correct **end**.

The first one has been done for you.



[2]

(b) Hydrocarbons are one type of polymer.

Look at the table showing the number of carbon atoms in their chains and their boiling points.

hydrocarbon	number of carbon atoms in chain	boiling point in °C
ethane	2	-89
propane	3	-42
butane	4	-0.5
pentane	5	36

This shows that as the number of carbon atoms in the chain increases, the boiling point increases.

Use ideas about the forces between molecules to explain this trend.

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..... **[3]**

[Total: 5]

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Question 7 starts on page 14

7 A website gives information about salt in the diets of children.

The daily maximum amount of salt for children depends on their age.

1 to 3 years old	–	2 g salt per day
4 to 6 years old	–	3 g salt per day
7 to 10 years old	–	5 g salt per day
11 years old and over	–	6 g salt per day

The mean mass of children at different ages is also given in a table.

age in years	1	2	3	4	5	6	7	8	9	10	11
mean mass in kg	9.9	12.9	14.5	16.1	18.5	21.0	23.0	25.9	28.5	31.9	35.4

Use this information to answer the following questions.

(a) What is the relationship between the age of the children and the daily maximum amount of salt?

Complete the sentence by putting a tick (✓) in the box next to the correct answer.

As children get older, the daily maximum salt intake …

… keeps increasing. ☐

… increases gradually until age 11. ☐

… stays the same. ☐

… decreases gradually. ☐

[1]

(b) (i) Tom is surprised by these figures.

He suggests that the limit for a 1-year-old should be lower than the limit for a 3-year-old.

What evidence in the table supports his suggestion?

.....

..... **[1]**

(ii) A health advisor reassures Tom that the figures are safe, although they are not as precise as they could be.

What are possible reasons for this?

Put ticks (✓) in the boxes next to the **two** correct reasons.

Providing that the figure is safe for the youngest children in the range, it will also be safe for older children.	☐
Salt is a preservative so is needed in some foods.	☐
All of the figures are very low anyway.	☐
It is better to keep the figures as simple as possible so that they can be remembered more easily.	☐
Salt improves flavour so encourages children to eat a variety of healthy foods.	☐

[1]

(c) John is 5 years old.

For his dinner he eats

- one 200 g hamburger, which contains 1.89 g salt
- 225 g baked beans, which contain 2.98 g salt.

What advice would you give to John's mother about his salt intake from this meal?

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..... **[1]**

(d) Many food companies add salt to improve the taste of their food. Salt is also a food preservative.

Food companies are being told to reduce the amount of salt in their products.

Explain why

- food companies **may not want** to lower the amount of salt in their food
- food companies **should be made** to lower the amount of salt in their foods.

The quality of written communication will be assessed in your answer to this question.

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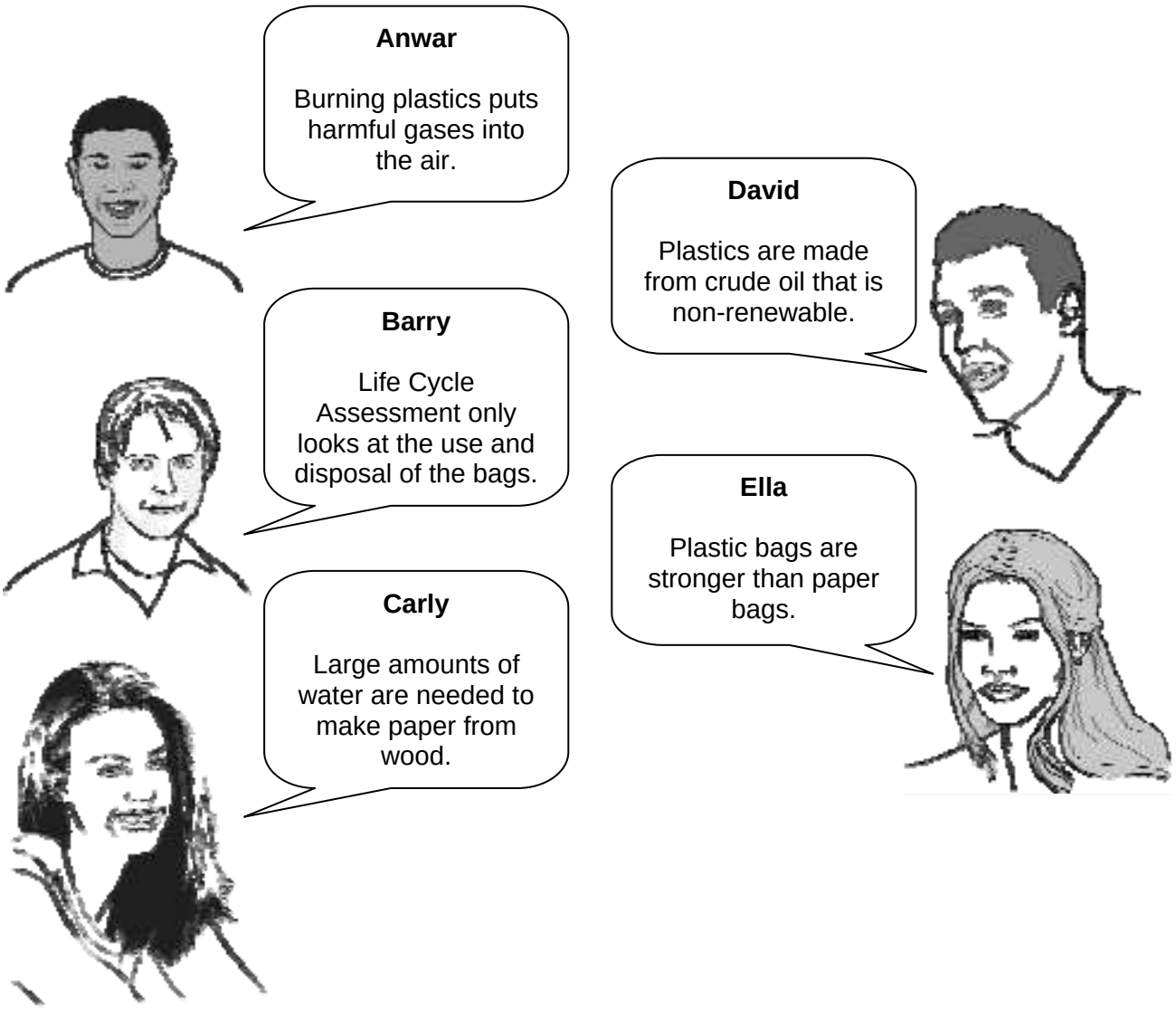
..... **[6]**

[Total: 10]

8 Some students are talking about the Life Cycle Assessment (LCA) of poly(ethene) bags and paper bags.

Here is what they say.



(a) Which two students are talking about resources?

..... and ..... **[2]**

(b) Which person is talking about the environmental problems of disposal?

..... **[1]**

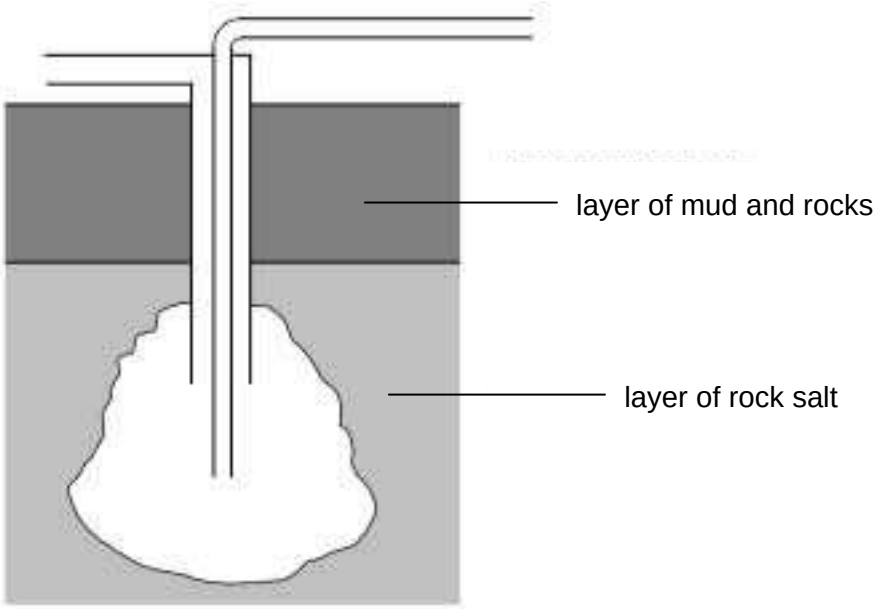
(c) Which one of these people is making an incorrect statement?

..... **[1]**

[Total: 4]

9 Salt is found underneath the ground in some parts of the UK.

The diagram shows one way in which salt can be obtained from underground.



(a) Use the diagram to describe how salt is obtained from underneath the ground.

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..... **[3]**

(b) What effect might solution mining have on the environment?

Include in your answer

- the effect on the land above the mine
- how this affects people who live there.

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[Total: 6]

[Paper Total: 60]

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