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| Candidate forename | | Candidate surname | |
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| Centre number | | | | | | Candidate number | | | | |
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**OXFORD CAMBRIDGE AND RSA EXAMINATIONS
GCSE**

A321/01

**TWENTY FIRST CENTURY SCIENCE
CHEMISTRY A**

Unit 1: C1 C2 C3 (Foundation Tier)

THURSDAY 26 JANUARY 2012: Morning

DURATION: 40 minutes

SUITABLE FOR VISUALLY IMPAIRED CANDIDATES

**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)

READ INSTRUCTIONS OVERLEAF

INSTRUCTIONS TO CANDIDATES

- **Write your name, centre number and candidate number in the boxes on the first page. Please write clearly and in capital letters.**
- **Use black ink. HB pencil may be used for graphs and diagrams only.**
- **Answer ALL the questions.**
- **Read each question carefully. Make sure you know what you have to do before starting your answer.**
- **Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).**

INFORMATION FOR CANDIDATES

- **The number of marks is given in brackets [] at the end of each question or part question.**
- **The total number of marks for this paper is 42.**
- **The Periodic Table is provided.**

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Answer ALL the questions.

- 1 The centre of Town A is traffic-free. Shoppers can walk in these streets but cars are not allowed to drive along them.**

Cars are allowed to drive along the streets in the centre of Town B.

Scientists compare the concentration of carbon particulates in samples of air from the centres of these two towns.

Samples were collected at one place in each town. They were collected at the same time on the same day.

Their results are shown in the table.

| CONCENTRATION OF CARBON PARTICULATES IN $\mu\text{g}/\text{m}^3$ | | | | | | | |
|--|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|--------------------------|
| | sample 1 | sample 2 | sample 3 | sample 4 | sample 5 | sample 6 | best estimate |
| Town A | 13 | 11 | 14 | 10 | 12 | 24 | 12 |
| Town B | 64 | 66 | 66 | 65 | 67 | 68 | |

- (a) The scientists work out the mean (average) of the concentration of carbon particulates for Town A. They use this as the best estimate.**

They decide that sample 6 for Town A is an outlier. They do not use this measurement when working out the mean for this town.

- (i) Why do the scientists think that the measurement for sample 6 for Town A is an outlier?**

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

It is the highest measurement.

It is the last sample that they measured.

It is higher than the mean.

It is well outside the range of the other measurements.

[1]

(ii) Why do the scientists choose not to use the outlier when working out the mean for Town A?

Put ticks (✓) in the boxes next to the TWO best answers.

It would make the best estimate less accurate.

It is the highest value in the range.

They only need five measurements to calculate the mean.

It is likely to have resulted from an error in measurement.

The last measurement is never used to work out the mean.

It is easier to divide by 5 than divide by 6.

[2]

(b) (i) What is the range of the results for Town B?

The range is from _____ to _____ $\mu\text{g}/\text{m}^3$. [1]

(ii) Work out the best estimate for the concentration of carbon particulates for Town B.

Show your working.

best estimate = _____ $\mu\text{g}/\text{m}^3$ [2]

(c) The scientists think that carbon particulates come from cars.

How do their results support this idea?

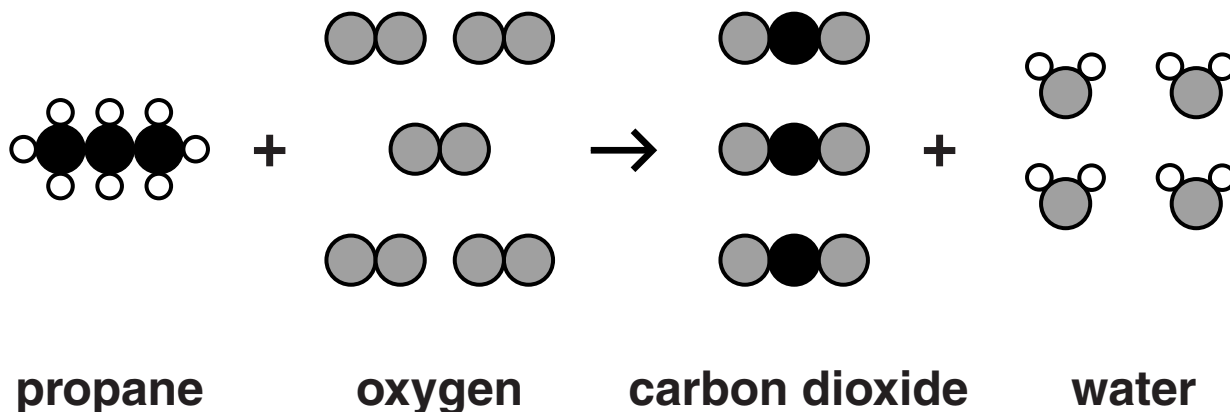
[3]

[Total: 9]

2 Propane is a fuel used for central heating.

When propane burns completely it produces carbon dioxide, CO₂, and water, H₂O.

The diagram shows this reaction.



(a) Finish this table to show the number of MOLECULES, of reactants and of products, when ONE molecule of propane burns completely.

| | REACTANTS | | PRODUCTS | |
|---------------------|-----------|--------|----------------|-------|
| | propane | oxygen | carbon dioxide | water |
| number of molecules | 1 | | 3 | |

[2]

(b) Finish this table to show the total number of ATOMS of each element, in the reactants and in the products, when ONE molecule of propane burns completely.

| | ELEMENTS | | |
|---|-----------------|-----------------|---------------|
| | carbon | hydrogen | oxygen |
| total number of atoms in reactants | 3 | 8 | 10 |
| total number of atoms in products | | | |

[1]

(c) When there is not enough air, propane does not burn completely.

Two other products are formed, as well as carbon dioxide and water.

These other products cause air pollution.

Name these two other products.

_____ and _____ **[2]**

[Total: 5]

3 This question is about the chemicals in crude oil and polymers made from them.

(a) The chemicals in crude oil are hydrocarbons.

Name the elements in hydrocarbons.

_____ [1]

(b) Some of the chemicals in crude oil are used to make polymers such as poly(ethene).

(i) What is the name of the process used to make polymers?

Put a **ring** around the correct answer.

COMBUSTION

CRYSTALLISATION

POLYMERISATION

PHOTOSYNTHESIS

[1]

(ii) Describe what happens to the molecules in the process used to make polymers.

_____ [2]

(c) Some of the polymers made from crude oil have replaced older materials.

(i) Give an example of something now made from a polymer that used to be made from another material.

example _____

old material _____

new material _____ **[3]**

(ii) Explain how the new material is better for making your example than the old material.

_____ **[2]**

[Total: 9]

- 4 (a) (i) Different types of additives may be added to food.

For each **ADDITIVE** in the first column draw a straight line to its best **DESCRIPTION** in the second column.

| ADDITIVE | DESCRIPTION |
|---------------------------|-----------------------------|
| preservative | has passed a safety test |
| artificial sweetener | mixes ingredients together |
| emulsifier | reduces the amount of sugar |
| additive with an E number | prevents growth of microbes |

[3]

(ii) Antioxidants are added to some foods.

Explain why.

Your answer should include

- **the type of food that antioxidants are added to**
- **why it is necessary to add antioxidants to this type of food**
- **what reaction they prevent.**

[3]

(b) Some processed foods contain high levels of sugar.

Use words from this list to complete the sentences about what happens to sugar after it is eaten.

Each word may be used once, more than once or not at all.

ABSORBED

AIR

BLOOD

CONDENSED

DECREASE

EVAPORATED

FALL

RISE

URINE

**Sugar is quickly _____ into the
_____ stream.**

**This causes a rapid _____ in
_____ sugar level. [3]**

[Total: 9]

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TURN OVER FOR QUESTION 5

5 Modern intensive farming methods use pesticides to increase crop yield.

(a) Explain how pesticides increase crop yield.

[2]

(b) Pesticides may remain on food or get into water supplies.

Some students are talking about the risk posed by the use of pesticides.

STAN

I wash fruit before I eat it and I use a water filter for all the water that I drink.

CHERYL

Pesticides are not the only danger. Harmful chemicals may be formed as food is cooked.

PETER

Before pesticides were invented pests were removed from crops by safer methods.

MARY

I am not concerned about pesticides. Everything is harmful to you in some way. You cannot avoid every risk.

TANIA

Before a new pesticide is used a scientific advisory committee carries out a risk assessment.

- (i) Which student is explaining why it is impossible for anything to be completely safe?**

[1]

- (ii) Which student is suggesting ways to reduce the risk from pesticides?**

[1]

- (iii) Which student is describing how the safe levels of chemicals in food are decided?**

[1]

[Total: 5]

6 Window frames can be made from wood or uPVC (unplasticized polyvinylchloride).

Data from a Life Cycle Assessment (LCA) for window frames of the same size, made from each of these two materials, are shown in the table.

| PART OF LCA | | WOOD | uPVC |
|--------------------|--|----------------|----------------|
| A | total energy used | 9150 MJ | 9700 MJ |
| B | fossil fuel used | 5.6 kg | 18.2 kg |
| C | carbon dioxide produced | 450 kg | 500 kg |
| D | air pollutants formed (arbitrary units) | 890 | 380 |
| E | acid rain formed (arbitrary units) | 29 | 38 |
| F | water pollution (arbitrary units) | 67 | 2 |

- (a) The results of the LCA as a whole can help to decide whether it is more sustainable to make window frames from uPVC rather than wood.**

Look at the data in the table.

Which two parts of the table show that it may be more sustainable to make a window frame from uPVC?

Put a ring around each of the TWO correct letters.

A B C D E F

[2]

(b) Which of the following statements support the idea that making window frames from wood is more sustainable than making them from uPVC?

Put ticks (✓) in the boxes next to the TWO best answers.

Wood can be painted or stained to the required colour.

Wood can be cut and joined to make window frames.

Trees can be grown to get more wood.

uPVC can be coloured as it is made.

uPVC is made from chemicals in crude oil, which is not renewable.

uPVC can be moulded to make any shape.

[2]

(c) PVC is much more flexible than uPVC because it contains a plasticizer.

PVC is used to make covering material for sofas and chairs.

Which statement explains why the plasticizer makes this PVC more flexible than uPVC?

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

The polymer chains are shorter.

There are fewer cross-links between polymer chains.

The forces of attraction between polymer chains are reduced.

Different molecules are joined together to make the polymer.

[1]

[Total: 5]

END OF QUESTION PAPER

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