Write your name, centre number and candidate number in the boxes below.

Surname	Other names

Centre number | | | | | |

Candidate number | | | | |

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Chemistry of our environment

Time allowed: 1 hour 25 minutes

Subject code **0620**

Chemistry

Questions from Paper 3, Paper 4 and Paper 6

You must have: a ruler marked in centimetres and millimetres, a protractor, compasses, a pen, an HB pencil and an eraser.

Total marks

/ 85

Instructions

- Answer every question in the space provided on this paper.
- Write in black or dark blue ink. Pencil may be used for diagrams and graphs.
- Fill in your name, centre number and candidate number above.
- Show your working: a correct method can earn marks even if the answer is wrong.

Information

- This paper has 10 questions worth 85 marks in total.
- The marks for each question or part are shown in brackets, for example [3].

Advice

- Read every question through once before you write anything.
- Use the marks in brackets to judge how long to spend on each part.
- If you finish early, go back and check your working.

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Print at 100% (Actual size) so diagrams keep their real measurements.

1 This question is about air and water.

(a) Water needs to be treated to make it safe to drink.

Complete Fig. 7.1 to show the three stages needed in the treatment of domestic water. The second stage has been completed.

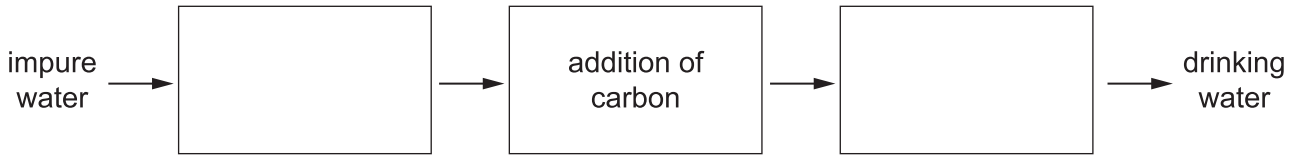


Fig. 7.1

[2]

(b) Describe a chemical test for the presence of water.

test .....

.....

observations .....

.....

[2]

(c) A sample of air contains carbon dioxide and oxides of nitrogen.

State **one** harmful effect of each of these air pollutants.

carbon dioxide .....

oxides of nitrogen .....

[2]

[Total: 6]

Water Click for more variations

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2 This question is about air and fertilisers.

(a) Air contains nitrogen, oxygen, noble gases and carbon dioxide.

State the percentage of nitrogen in clean, dry air.

..... [1]

(b) Polluted air contains oxides of nitrogen.

(i) Give **one** source of oxides of nitrogen in the air.

..... [1]

(ii) State **one** adverse effect of oxides of nitrogen on health.

..... [1]

(c) Many fertilisers contain nitrogen and potassium.

(i) Name one **other** element found in most fertilisers.

..... [1]

(ii) Explain why farmers use fertilisers on fields where crops are to be grown.

..... [1]

(iii) Describe a test for potassium ions.

test .....

observations .....

[2]

[Total: 7]

Air, pollution and climate change Click for more variations

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3 **(a)** A list of common air and water pollutants is shown.

methane
nitrates
oxides of nitrogen
particulates
plastics
sewage

Answer the following questions using **only** these pollutants.
Each pollutant may be used once, more than once or not at all.

State which pollutant:

(i) contains harmful microbes that can cause disease

..... [1]

(ii) can be produced by the incomplete combustion of carbon-containing fuels

..... [1]

(iii) is a gas formed from the decomposition of vegetation.

..... [1]

(b) A 250 cm^3 sample of polluted water contains 3.5 mg of particulates.

Calculate the mass of particulates present in 100 cm^3 of this polluted water.

mass of particulates = ... mg [1]

(c) Sulfur dioxide in the atmosphere causes acid rain.

State **one** method of reducing the emissions of sulfur dioxide to the atmosphere.

.....

..... [1]

(d) Sulfur dioxide is a simple molecular compound.

State **two** physical properties of simple molecular compounds.

1 .....

2 .....
[2]

[Total: 7]

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Covalent bonding and simple molecules Click for more variations

4 This question is about water and air.

(a) Water needs to be treated to make it safe to drink.

Draw a line from each stage in the treatment of domestic water to the reason why it is carried out.

stage	reason
addition of carbon	to kill microbes
sedimentation	to remove tastes and odours
chlorination	to remove solids

[2]

(b) Describe how to test whether a sample of water is pure using melting point.

.....

.....

..... [2]

(c) Air may contain sulfur dioxide and particulates.

(i) State **one** harmful effect of each of these air pollutants.

sulfur dioxide .....

particulates .....

[2]

(ii) Describe how flue gas desulfurisation reduces emissions of sulfur dioxide gas.

.....

.....

..... [2]

[Total: 8]

Water Click for more variations

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5 This question is about water.

(a) The water in rivers often contains pollutants such as acids.

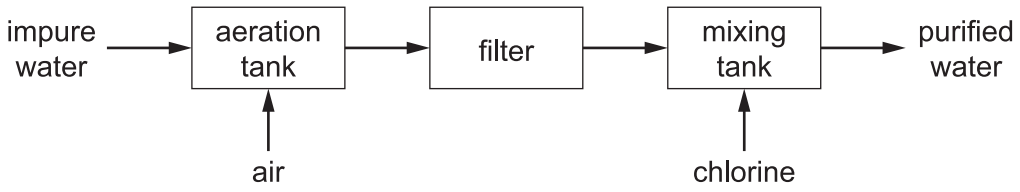
Describe how universal indicator paper can be used to determine the pH value of the water.

.....

.....

..... [2]

(b) The diagram shows some of the stages in water treatment.



(i) Air is blown through the aeration tank.

Name the **two** gases that make up most of the air.

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

(ii) After aeration, the water still contains large insoluble particles.

The filter is made up of fine sand and stones.

Explain how the filter helps purify the water.

.....

.....

..... [2]

(iii) Explain why chlorine is used in water treatment.

..... [1]

(c) Anhydrous cobalt(II) chloride is used to test for water.

State the colour change in this test.

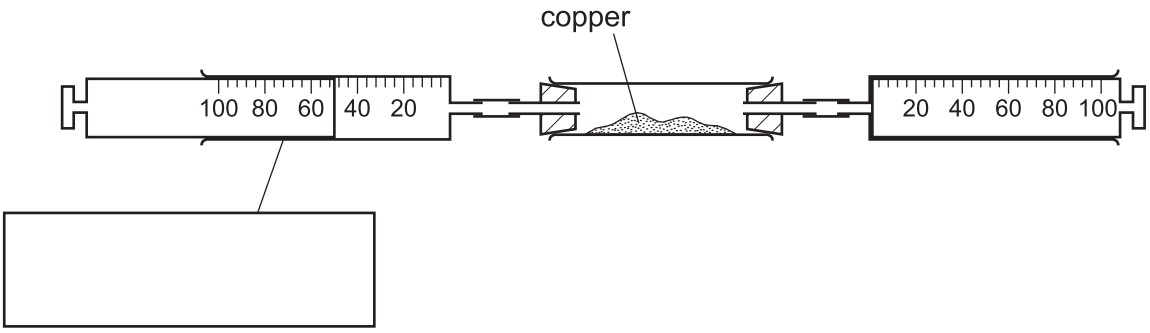
from ..... to ..... [2]

[Total: 9]

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Water Click for more variations

6 Air is a mixture of gases. The diagram shows the apparatus used to find the percentage of oxygen in air.
50 cm^3 of air were passed backwards and forwards over excess heated copper until there was no further change. The apparatus was left to cool and the volume of gas remaining was 40 cm^3.



(a) Complete the box to name the apparatus. [1]

(b) Use an arrow to indicate where heat is applied. [1]

(c) The colour of the copper changed from ..... to ..... . [2]

(d) From the results, work out the percentage of oxygen in the air.

..... % [2]

[Total: 6]

Air, pollution and climate change Click for more variations

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7 Clean dry air contains mainly nitrogen and oxygen.

(a) Name **two** other gases that are in clean dry air.

.....

..... [2]

(b) Air often contains pollutants.

Identify **three** common gaseous pollutants in air and state how each of these pollutants are produced.

pollutant gas 1 .....

how it is produced .....

.....

pollutant gas 2 .....

how it is produced .....

.....

pollutant gas 3 .....

how it is produced .....

.....

[6]

[Total: 8]

Air, pollution and climate change Click for more variations

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8 Two important greenhouse gases are methane and carbon dioxide.

(a) Methane is twenty times more effective as a greenhouse gas than carbon dioxide. The methane in the atmosphere comes from both natural and industrial sources.

(i) Describe **two** natural sources of methane.

.....

..... [2]

(ii) Although methane can persist in the atmosphere for up to 15 years, it is eventually removed by oxidation.
What are the products of this oxidation?

..... [2]

(b) How do the processes of respiration, combustion and photosynthesis determine the percentage of carbon dioxide in the atmosphere?

.....

.....

.....

..... [4]

[Total: 8]

Air, pollution and climate change Click for more variations

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9 **(a)** Coal is a solid fossil fuel.

Name **two** other fossil fuels.

..... [2]

(b) Two of the elements present in a sample of coal are carbon and sulfur.

A sample of coal was heated in the absence of air and the products included water, ammonia and hydrocarbons.

Name **three** other elements present in this sample of coal.

..... [2]

(c) Sulfur, present in coal, is one major cause of acid rain. Sulfur burns to form sulfur dioxide which reacts with rain water to form sulfuric acid.

(i) Describe how the high temperatures in vehicle engines are another cause of acid rain.

.....

.....

..... [3]

(ii) Give **two** harmful effects of acid rain.

.....

..... [2]

(d) In 2010, a large coal-burning power station in the UK was converted to burn both coal and wood.

Explain why the combustion of wood rather than coal can reduce the effect of the emissions from this power station on the level of carbon dioxide in the atmosphere.

.....

.....

.....

..... [3]

[Total: 12]

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Air, pollution and climate change Click for more variations

10 Water is present in the atmosphere, the seas and in ice and snow.

(a) Describe a chemical test for water.

test .....

result ..... [2]

(b) State **one** use of water in industry.

..... [1]

(c) Water is a good solvent.
What do you understand by the term *solvent*?

..... [1]

(d) Water vapour in the atmosphere reacts with sulfur dioxide, SO_2, to produce acid rain.

(i) State **one** source of sulfur dioxide.

..... [1]

(ii) State **two** adverse effects of acid rain.

1. .....

2. ..... [2]

(iii) Calculate the relative molecular mass of sulfur dioxide.

[1]

(e) Water from lakes and rivers can be treated to make the water safer to drink.

Describe **two** of the steps in water purification.
For each of these steps, give an explanation of its purpose.

step 1 .....

.....

step 2 .....

..... [4]

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(f) Water is formed when hydrogen burns in air.

(i) State the percentage of oxygen present in the air.

..... [1]

(ii) When 8 g of hydrogen is burned in excess air, 72 g of water is formed.
What mass of hydrogen needs to be burnt to produce 252 g of water?

[1]

[Total: 14]

Water Click for more variations

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