AQA GCSE Chemistry | 8462

SPECIFICATION POINT 4.10.1.2

Potable water

Past-paper questions

Tier	**Higher**
Question groups	**11**
Available paper years	**2008–2024**

Using this booklet

1. Answer the questions in order and show your working.
2. Original question numbers and marks are retained.
3. Print at actual size (100%) for measuring questions.
4. Use the companion answer booklet to check your work.

Name: _____ **Date:** _____

Whole questions are retained for context, so some parts assess other specification points. Current and legacy sources are labelled. Continue on extra paper if needed.

4.10.1.2 Potable water

Question 01

June 2008 | CHY3H | Original Q8 | Legacy

8 Good quality water is needed for a healthy life.

In the United Kingdom, obtaining safe water for drinking is as simple as turning on a tap. The water is made safe to drink by water companies.

However, in many parts of Africa and Asia, water used for drinking is contaminated and untreated. It is estimated that 2.2 million people die each year as a result of drinking contaminated water.



Efforts are being made to solve this problem and more water is being treated.

Describe how water in the United Kingdom is treated.
Explain how this makes it safe to drink.

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(3 marks)

3

4.10.1.2 Potable water

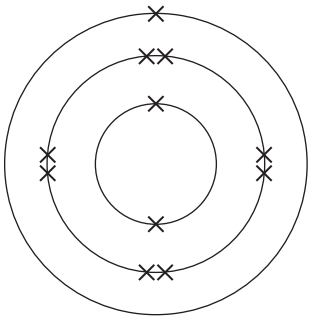
Question 02

1 Sodium chloride is a raw material.

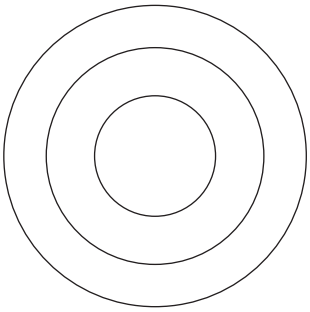
1 (a) The electronic structure of a sodium atom is shown below.

Complete the diagram for the electronic structure of a chlorine atom. A chlorine atom has 17 electrons.

Sodium atom



Chlorine atom



(1 mark)

1 (b) When sodium and chlorine react to form sodium chloride they form sodium ions (Na^+) and chloride ions (Cl^-).

How does a sodium atom change into a sodium ion?

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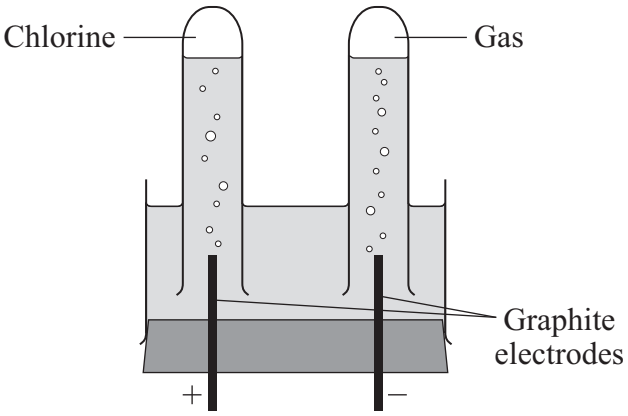
(2 marks)

4.10.1.2 Potable water

Question 02 · continued

for mark

1 (c) The diagram shows apparatus used in a school laboratory for the electrolysis of sodium chloride solution.



The solution contains sodium ions (Na^+), chloride ions (Cl^-), hydrogen ions (H^+) and hydroxide ions (OH^-).

1 (c) (i) Why do chloride ions move to the positive electrode?

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(1 mark)

1 (c) (ii) Name the gas formed at the negative electrode.

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(1 mark)

Question 1 continues on the next page

4.10.1.2 Potable water

Question 02 · continued

for mark

1 (d) Chlorine and chlorine compounds are used to bleach wood pulp that is used to make paper.

The article below is from a newspaper.

> Local people have been protesting outside a paper factory. They say:
> 'We want the company to stop using chlorine compounds. Chlorine compounds release poisons into the environment. The company should use safer compounds.'
>
> The company replied:
> 'Chlorine has been used safely for many years to treat drinking water. Only tiny amounts of chlorine are released, which cause no harm. Using other compounds will be more expensive and may put us out of business.'

1 (d) (i) Why are some local people worried about the use of chlorine compounds?

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(1 mark)

1 (d) (ii) Why might other local people want the company to continue to use chlorine compounds?

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(1 mark)

1 (d) (iii) It is decided to have an enquiry.
Why should this be done by independent scientists?

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(1 mark)

8

4.10.1.2 Potable water

Question 03

January 2010 | CHY3H | Original Q8 | Legacy

8 In the United Kingdom, water companies supply drinking water to our homes. However, some people are concerned about the taste and quality of the water that is supplied.

Describe one method that people can use at home to improve the taste and quality of the tap water supplied. Explain how this method works.

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(4 marks)

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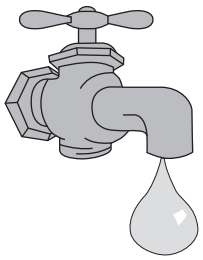
4.10.1.2 Potable water

Question 04

January 2011 | CHY3H | Original Q2 | Legacy

2 Good quality water is essential for life.

2 (a) In the United Kingdom, water is filtered **and** treated with chlorine to make it safe to drink.



Explain why the water is:

filtered .....

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treated with chlorine. .....

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(2 marks)

2 (b) Millions of people in Bangladesh drink water from wells that contain high levels of arsenic. Arsenic is poisonous.

The World Health Organisation recommends that there should be no more than 0.01 mg of arsenic per litre in drinking water.

The table gives some information about two instrumental methods of testing for arsenic.

Factor to consider	Laboratory Instrumental Method	Portable Instrumental Method
Cost of equipment	£10 000	£50
Skill level of technician	Highly skilled	Little training needed
Where test is done	Laboratory only	Anywhere
Time to prepare the instrument for the test	5 minutes	10 seconds
Sensitivity of the instrument	0.000001 mg of arsenic per litre of water	0.1 mg of arsenic per litre of water

4.10.1.2 Potable water

Question 04 · continued

2 (b) (i) Use the information in the table to give **two** advantages and **one** disadvantage of using the Portable Instrumental Method compared with the Laboratory Instrumental Method.

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(3 marks)

2 (b) (ii) The information about these two instrumental methods was provided by the Professional Institute of Water Engineers (PIWE). The Institute has no connection with the companies that make these instruments.

Suggest why many people would accept the views of PIWE rather than the views of the companies that make the instruments.

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(1 mark)

6

4.10.1.2 Potable water

Question 05

June 2012 | CH2HP | Original Q2 | Legacy

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

The salt called potassium chloride is made when potassium hydroxide solution reacts with hydrochloric acid.

potassium hydroxide solution + hydrochloric acid → potassium chloride solution + water

Describe a method for making **crystals** of potassium chloride from potassium hydroxide solution and hydrochloric acid.

In this method you should:

- describe how you will add the correct amount of the hydrochloric acid to neutralise the potassium hydroxide solution
- describe how you will get crystals of potassium chloride.

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(6 marks)

Question 2 continues on the next page

4.10.1.2 Potable water

Question 05 · continued

2 (b) Ammonium nitrate is another salt.
Ammonium nitrate is made when ammonia solution is neutralised with an acid.

Name the acid to complete the word equation.

ammonia + ... acid → ammonium nitrate

(1 mark)

2 (c) Read the information.

Ammonium nitrate – good or bad?

Some farmers put a lot of ammonium nitrate on their farmland.

Many people are worried about this use of ammonium nitrate.

Rain water can wash the ammonium nitrate off the farmland and into rivers and lakes. The ammonium nitrate may get into drinking water supplies and could be harmful to health.

2 (c) (i) Why do some farmers put ammonium nitrate on their farmland?

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(1 mark)

4.10.1.2 Potable water

Question 05 · continued

2 (c) (ii) Which **one** of the questions in the table cannot be answered by science alone?

Tick (✓) **one** question.

Question	Tick (✓)
How much ammonium nitrate is in drinking water?	
Should farmers stop using ammonium nitrate on their farmland?	
Is ammonium nitrate soluble in rain water?	

Give **two** reasons why this question **cannot** be answered by science alone.

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(3 marks)

11

4.10.1.2 Potable water

Question 06

June 2014 | CH3HP | Original Q1 | Legacy

1 Water in Britain is taken from reservoirs to use as drinking water.

Figure 1



1 (a) What are the **two** main steps used to treat water from reservoirs?

Give **one** reason for each step.

[4 marks]

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4.10.1.2 Potable water

Question 06 · continued

1 (b) Some people use water filters to treat water before drinking it.

1 (b) (i) Water filters remove hardness from hard water.

What is in water filters that removes hardness from water?

[1 mark]

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1 (b) (ii) Suggest why water filters used in the home contain particles of silver.

[1 mark]

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1 (c) Pure water can be produced by distillation.

Why is distillation **not** usually an economic method of treating water for drinking?

[1 mark]

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1 (d) Drinking hard water has health benefits.

State **one** health benefit of drinking hard water.

[1 mark]

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8

4.10.1.2 Potable water

Question 07

June 2016 | CH3HP | Original Q4 | Legacy

4 This question is about water.

4 (a) Hard water contains dissolved compounds.
Explain **one** benefit of drinking hard water.

[2 marks]

4 (b) What is the name of the solid formed when hard water reacts with soap?

[1 mark]

4 (c) Using temporary hard water in an electric kettle reduces the efficiency of the kettle.
Describe how this happens.

[4 marks]

4.10.1.2 Potable water

Question 07 · continued

4 (d) Water filters used in homes contain ion exchange resins.
Explain how an ion exchange resin changes the dissolved compounds in tap water to improve the water.

[3 marks]

10

Turn over for the next question

4.10.1.2 Potable water

Question 08

June 2019 | 8462/2H | Original Q7

0 7 A large amount of aluminium sulfate was accidentally added to the drinking water supply at a water treatment works.

0 7 . 1 Describe a test to show that the drinking water contained aluminium ions.

Give the result of the test.

[3 marks]

Test _____

_____

Result _____

_____

_____

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0 7 . 2 Describe a test to show that the drinking water contained sulfate ions.

Give the result of the test.

[2 marks]

Test _____

_____

Result _____

_____

4.10.1.2 Potable water

Question 08 · continued

0 7 . 3 Plan an investigation to find the total mass of dissolved solids in a 100 cm^3 sample of the drinking water.

Your investigation should produce valid results.

[4 marks]

9

4.10.1.2 Potable water

Question 09

November 2020 | 8462/2H | Original Q2

0 2 This question is about water.

0 2 . 1 In the UK, potable (drinking) water is produced from different sources of fresh water.

Explain how potable water is produced from fresh water.

[4 marks]

0 2 . 2 A different country has:

- very little rainfall
- a long coastline
- plentiful energy supplies.

Suggest **one** process this country could use to obtain most of its potable water.

[1 mark]

4.10.1.2 Potable water

Question 09 · continued

0 2 . 3 Waste water is not fit to drink.

Treatment of waste water produces two substances:

- liquid effluent
- solid sewage sludge.

Draw **one** line from each substance to the way the substance is processed.

[2 marks]

Substance	Process
Liquid effluent	Aerobic biological treatment
	Anaerobic digestion
	Grit removal
Solid sewage sludge	Screening
	Sedimentation

Question 2 continues on the next page

Table 1 shows information about the disposal of processed solid sewage sludge in the UK in 1992 and in 2010.

Table 1

Year	Mass of processed solid sewage sludge in millions of kilograms				
	Used as fertiliser	Sent to landfill	Burned	Other methods	Total
1992	440	130	90	338	998
2010	1118	9	260	26	1413

0 2 . 4 Calculate the percentage of processed solid sewage sludge that was burned in 2010.

Give your answer to 3 significant figures.

Use **Table 1**.

[3 marks]

Percentage (3 significant figures) = _____ %

4.10.1.2 Potable water

Question 09 · continued

0 2 . 5 Suggest **one** reason why the total mass of processed solid sewage sludge increased between 1992 and 2010.

[1 mark]

0 2 . 6 Between 1992 and 2010 the proportion of processed solid sewage sludge used as fertiliser increased.

Suggest **two** reasons why.

[2 marks]

1

2

13

4.10.1.2 Potable water

Question 10

June 2022 | 8462/2H | Original Q5

0 5 This question is about water.

0 5 . 1 Sewage is waste water.

Sewage contains organic matter.

Describe how sewage is treated to remove organic matter.

[4 marks]

Question 5 continues on the next page

Question 10 · continued

Sea water and ground water are treated to make them potable.

Table 5 shows information about the composition and treatment of sea water and of ground water.

Table 5

	Sea water	**Ground water**
Concentration of sodium ions and chloride ions before **Process 1**	Na^+ : 0.5 mol/dm^3 Cl^- : 0.5 mol/dm^3	Na^+ : 0.001 mol/dm^3 Cl^- : 0.001 mol/dm^3
Process 1	Reverse osmosis	Filtration
Concentration of sodium ions and chloride ions after **Process 1**	**X**	Na^+ : 0.001 mol/dm^3 Cl^- : 0.001 mol/dm^3
Process 2	Add ozone	Expose to ultraviolet light

0 5 . 2 Sea water is desalinated during **Process 1**.

Which pair of concentrations could represent **X** in **Table 5**?

[1 mark]

Tick (✓) **one** box.

Na^+ : 0.003 mol/dm^3 Cl^- : 0.003 mol/dm^3 ☐

Na^+ : 0.003 mol/dm^3 Cl^- : 0.5 mol/dm^3 ☐

Na^+ : 0.5 mol/dm^3 Cl^- : 0.003 mol/dm^3 ☐

Na^+ : 0.5 mol/dm^3 Cl^- : 0.5 mol/dm^3 ☐

0 5 . 3 Explain why the concentrations of sodium ions and of chloride ions in the ground water in **Table 5** are unchanged by **Process 1**.

[2 marks]

4.10.1.2 Potable water

Question 10 · continued

0 5 . 4 Explain why the ground water in **Table 5** requires **Process 2** before the water is safe to drink.

[2 marks]

0 5 . 5 After treatment the ground water in **Table 5** is sold by a company as pure water.

The ground water in **Table 5** is not chemically pure because the water contains sodium ions and chloride ions.

Suggest what the company means by 'pure'.

[1 mark]

0 5 . 6 Chlorine is also used to treat some ground water.

Describe the test for chlorine gas.

Give the result of the test.

[2 marks]

Test

Result

12

4.10.1.2 Potable water

Question 11

June 2024 | 8462/2H | Original Q3

0 3 This question is about water.

0 3 . 1 Hydrogen gas reacts with oxygen gas to produce water.

Water is decomposed into hydrogen gas and oxygen gas using electricity.

Which **two** words describe the reaction between hydrogen gas and oxygen gas?

[2 marks]

Tick (✓) **two** boxes.

- Alloying ☐
- Combustion ☐
- Corrosion ☐
- Endothermic ☐
- Reversible ☐

0 3 . 2 Water molecules break down into hydrogen ions and hydroxide ions.

The equation for the reaction is:

$$H_2O \rightleftharpoons H^+ + OH^-$$

Which sentence describes this reaction at equilibrium?

[1 mark]

Tick (✓) **one** box.

- Water molecules break down at a higher rate than they reform. ☐
- Water molecules break down and reform at the same rate. ☐
- Water molecules break down at a lower rate than they reform. ☐

Question 3 continues on the next page

4.10.1.2 Potable water

Question 11 · continued

0 3 . 3 Water collected from rivers is used in the home for drinking and flushing toilets.

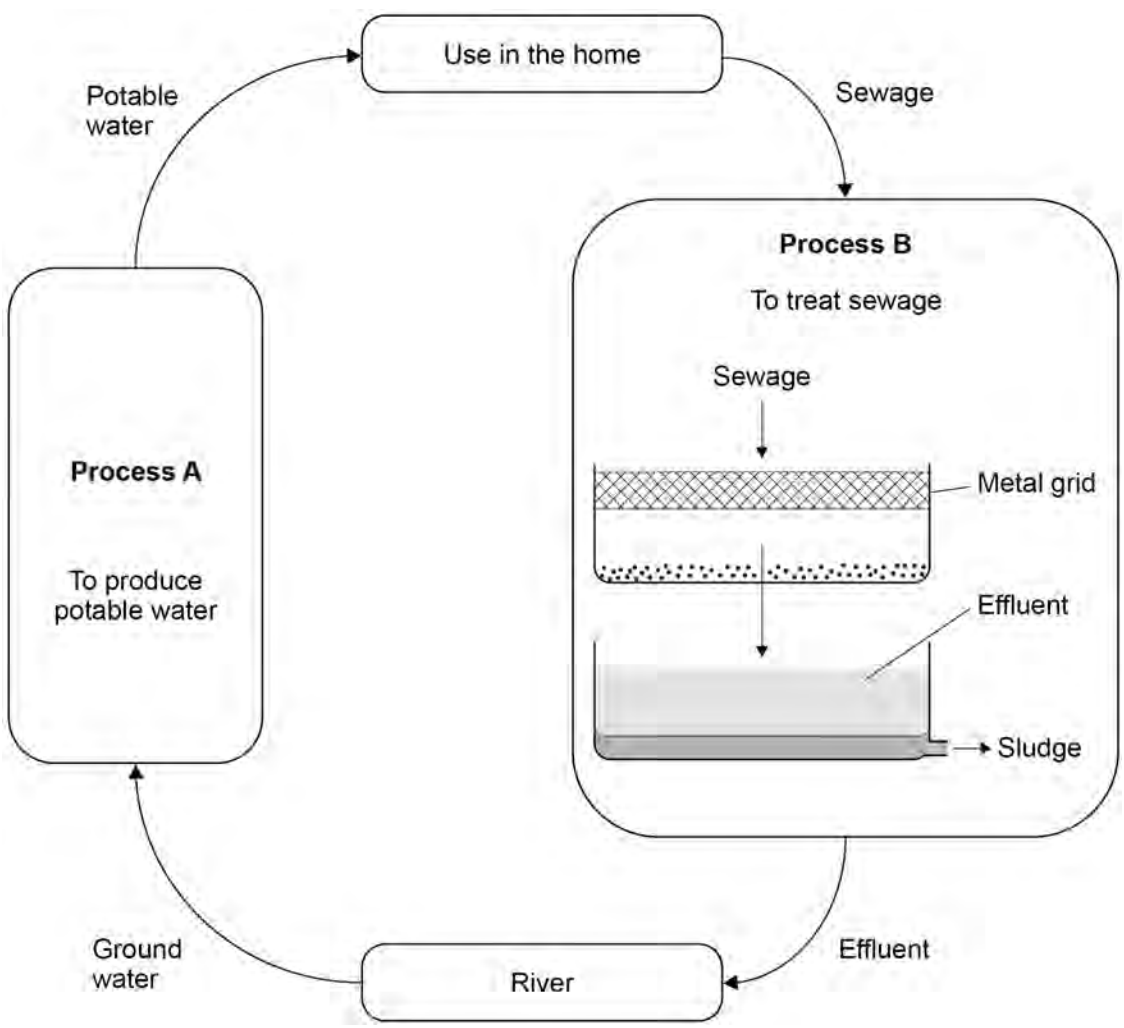
Water used in the home must be potable.

Potable water is safe to drink.

Waste water produced after use in the home is called sewage.

Figure 3 shows how water is collected from rivers and returned to rivers after use.

Figure 3



4.10.1.2 Potable water

Question 11 · continued

Explain what happens to water in **Process A** and in **Process B** in **Figure 3**.

Do **not** refer to use of water in the home.

[6 marks]

9