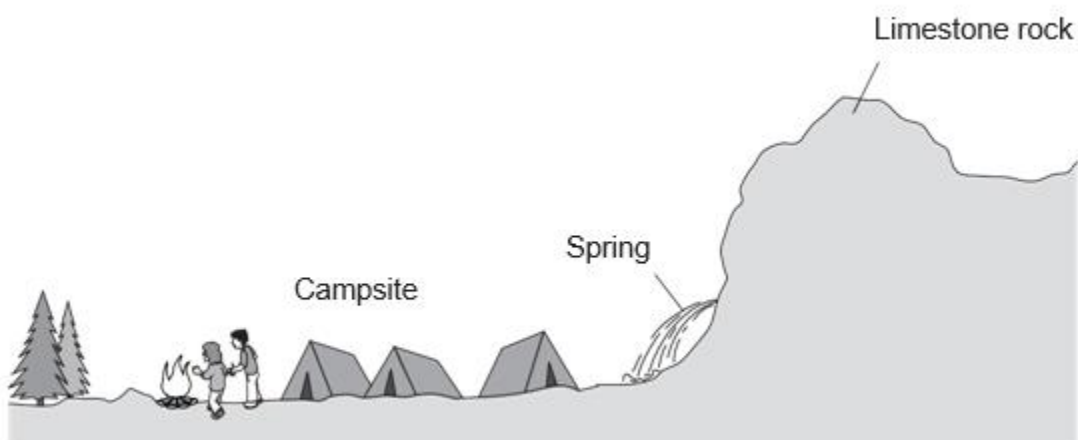


# WATER 1

**Q1.** This question is about hard water.

**(a)** A campsite has a spring, where water flows out of limestone rock.



**(i)** The water from the spring is hard because it contains calcium ions.

How do the calcium ions get into the spring water?

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(1 mark)

**(ii)** A student at the campsite boils some of the spring water in a pan. The inside of the pan becomes coated with a white solid.

What is the white solid?

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(1 mark)

- (iii) When the student uses soap to wash in the spring water, scum forms.  
Scum is not formed if the spring water has been boiled and allowed to cool.

Draw a ring around the correct answer to complete the sentence.

The hardness in the spring water is

acidic.
permanent.
temporary.

(1 mark)

- (b) In a laboratory, a student compared the hardness of three different samples of water.

The student measured 20 cm<sup>3</sup> of water into a boiling tube. The student then:

- added a drop of soap solution
- shook the boiling tube for 10 seconds
- looked to see if a permanent lather had formed.

The student repeated the process until a permanent lather formed. The results are shown in the table.

Water sample	Number of drops of soap solution needed to form a permanent lather			
	Test 1	Test 2	Test 3	Mean
Spring water	13	11	6	
Tap water	7	5	6	6
Distilled water	1	1	1	1

- (i) Calculate the correct mean for spring water.

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.. (2 mark)

(ii) Which of the three sources of water was hardest?

Draw a ring round the correct answer.

**distilled water**

**spring water**

**tap water**

Use the results in the table to give a reason for your answer.

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(2 marks)

**Q2.** Tap water in the UK is safe to drink because water companies add chlorine to sterilise the water.

Suggest one argument for and one argument against water companies adding chlorine to sterilise water.

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(2 marks)

**Q3.** Good quality water is essential for life.

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



Explain why the water is:

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Filtered

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Treated with chlorine

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(2 marks)

**(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.

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

**(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)

**(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)

**Q4.** The table gives some information about the composition of three samples of water from wells in the Canary Islands, Crete and Cyprus.

Ions	Mineral content of water in mg per litre		
	Canary Islands	Crete	Cyprus
Calcium, $\text{Ca}^{2+}$	28	82	18
Magnesium, $\text{Mg}^{2+}$	14	41	13
Sodium, $\text{Na}^+$	53	7	22
Chloride, $\text{Cl}^-$	7	143	39
Hydrogen carbonate, $\text{HCO}_3^-$	281	5	93
Sulfate, $\text{SO}_4^{2-}$	2	14	16

**(a)** Describe and explain how ions get into these samples of water.

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(2 marks)

**(b)** The sample of water from Crete is harder than the other two.

Use the information in the table to explain why.

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(1 mark)

**(c)** People who use hard water can expect higher costs than people who use soft water.

Explain why.

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(2 marks)

**(d)** Hard water can be made soft by removing the ions that cause hardness.

State one way these ions can be removed.

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(1 mark)

**Q5.** Some people use water filters because they are concerned about the quality of drinking water.

**(a)** Draw a ring around the correct answer to complete each sentence.

**(i)** One of the active chemicals in many water filters is

carbon.
magnesium.
sulfur.

(1 mark)

**(ii)** In many areas of the United Kingdom the water is hard.

The hardness in water is caused by \_\_\_\_\_ ions.

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bromide  
calcium  
hydrogen

(1 mark)

(b) Describe and give the result of a test to show that some drinking water is hard.

Test .....

.....

Result of test .....

.....

(2 marks)

(c) State and explain one benefit of drinking hard water.

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.....  
.....

(2 marks)

Q6. Read the following information and then answer the questions.

**Chlorine – for better, for worse?**





Chlorine is used to make bleaches, plastics and medicines. Swimming pool water is often treated with chlorine. Chlorine is used to make water safe to drink. It is relatively cheap and easy to use. People who drink untreated water risk dying from typhoid and cholera. However, chlorine is a poisonous chemical. It causes breathing difficulties and can kill people. Some people are also allergic to chlorine.

**(a)** How does chlorine make water safe to drink?

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(1 mark)

**(b)** The amount of chlorine in swimming pool water should be carefully monitored and controlled. Explain why.

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(2 marks)

**(c)** Developing countries are likely to choose chlorination as their method of making water safe to drink. Suggest why.

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(1 mark)

- (d)** A government is setting up an enquiry into the safety of using chlorine.  
**(i)** Suggest why people from all political parties should be represented.

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(1 mark)

- (ii)** Suggest why the opinion of a well-respected scientist might change the outcome of any discussion.

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(1 mark)

- (iii)** The decision taken about the safety of using chlorine should be based on evidence and data rather than on hearsay and opinion. Suggest why.

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(1 mark)

**Q7.** 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)

Total marks (38)