

**Water**

1. This information has been taken from two bottles of Australian spring water.

<p><b>Ridgway Spring Water</b> comes from a natural source deep under the Central Highlands of Victoria.</p> <p style="text-align: center;">TYPICAL ANALYSIS (mg per litre)</p> <table style="width: 100%; border: none;"> <tr><td>hydrogencarbonate</td><td style="text-align: right;">158</td></tr> <tr><td>chloride</td><td style="text-align: right;">33</td></tr> <tr><td>sodium</td><td style="text-align: right;">33</td></tr> <tr><td>calcium</td><td style="text-align: right;">30</td></tr> <tr><td>magnesium</td><td style="text-align: right;">23</td></tr> <tr><td>potassium</td><td style="text-align: right;">9</td></tr> </table>	hydrogencarbonate	158	chloride	33	sodium	33	calcium	30	magnesium	23	potassium	9	<p><b>Homeland Spring Water</b> originates from a high mountainous source in the Central Highlands of Victoria..</p> <p style="text-align: center;">TYPICAL ANALYSIS (mg per litre)</p> <table style="width: 100%; border: none;"> <tr><td>hydrogencarbonate</td><td style="text-align: right;">158</td></tr> <tr><td>chloride</td><td style="text-align: right;">27</td></tr> <tr><td>sodium</td><td style="text-align: right;">24</td></tr> <tr><td>magnesium</td><td style="text-align: right;">15</td></tr> <tr><td>calcium</td><td style="text-align: right;">12</td></tr> <tr><td>potassium</td><td style="text-align: right;">5</td></tr> </table>	hydrogencarbonate	158	chloride	27	sodium	24	magnesium	15	calcium	12	potassium	5
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(a) The labels show the names of the ions present in Ridgway and Homeland spring waters. Describe how these ions got into the water.

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(2)

(b) Both Ridgway and Homeland spring waters are hard.

(i) There are two ions shown on the labels which make these spring waters hard. Name **one** of these ions.

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(1)

(ii) Ridgway spring water is about **twice** as hard as Homeland spring water. Use the information on the labels to explain why.

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(2)

- (iii) Describe how you could use soap solution to show that Ridgway spring water is about **twice** as hard as Homeland spring water. You should state how the experiment is made fair.

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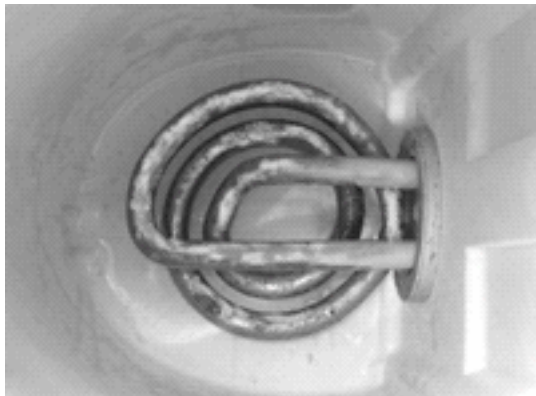
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(3)  
(Total 8 marks)

- 2. Two problems of hard water are *scale* and *scum*, as shown in the pictures of a heating element and a wash basin.



- (a) Explain the difference between *scale* and *scum*

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(2)

- (b) Explain how hard water can be made soft using an ion-exchange column.

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(2)  
(Total 4 marks)

- 3. 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.



DADA DANESHANANDA, Man with filtered water from the Mafi-Zongo water project. [www.amurt.net/africa/ghana/2005](http://www.amurt.net/africa/ghana/2005)

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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(Total 3 marks)

4. The chemical compositions of two samples of *hard water*, **A** and **B**, are shown in the table.

	Sample A	Sample B
<b>pH</b>	9	8
<b>Ions present:</b>	<b>Concentration in mg/litre</b>	
<b>Ca<sup>2+</sup></b>	101	135
<b>Mg<sup>2+</sup></b>	2	9
<b>Na<sup>+</sup></b>	9	6
<b>HCO<sub>3</sub><sup>-</sup></b>	299	6
<b>Cl<sup>-</sup></b>	14	8
<b>SO<sub>4</sub><sup>2-</sup></b>	5	136
<b>NO<sub>3</sub><sup>-</sup></b>	6	0

(a) What does the pH value tell you about these samples?

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(2)

(b) Use the information in the table to explain what is meant by *hard water*.

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(1)

(c) What would be the effect of using **temporarily** hard water in a kettle?

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(2)

(d) (i) Explain which sample of water is **permanently** hard.

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(3)

(ii) How could this hardness be removed?

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(1)

(e) State **one** advantage of drinking hard water.

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(1)

(Total 10 marks)