

1 In some parts of the UK, the water is hard.

Hard water contains dissolved compounds. Complete the following sentences to about hard water.

Choose from the given words.

[3 marks]

rocks	chlorine	neutralised	acid	boiled	calcium
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Hard water contains dissolved compounds, usually of **Calcium** [1 mark] or magnesium.

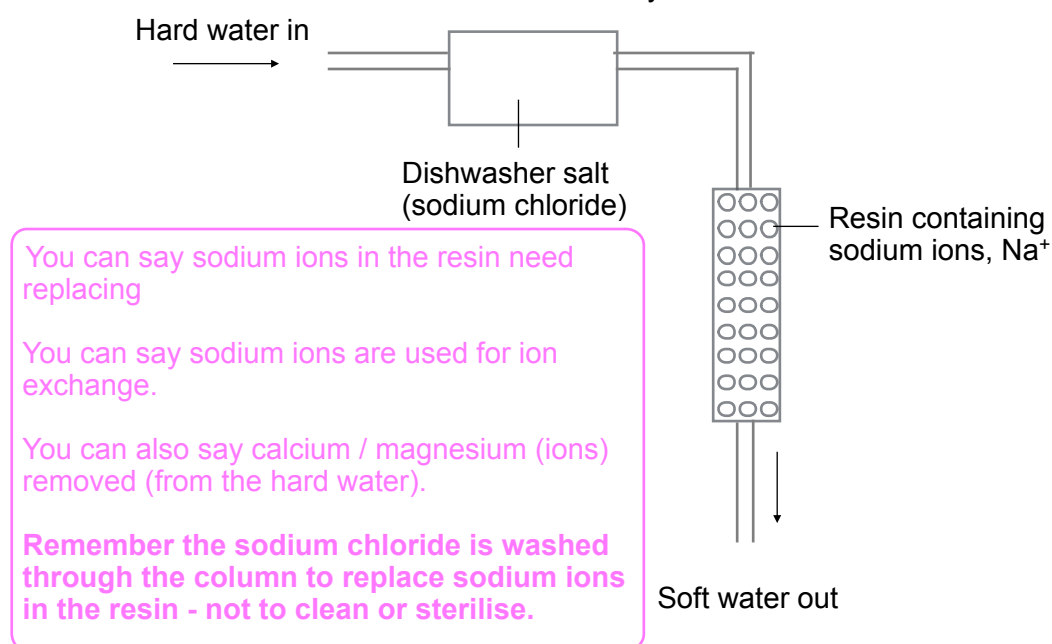
The compounds are dissolved when water comes into contact with **Rocks/calcium** [1 mark]

Permanent hard water remains hard when it is **Boiled** [1 mark]

1 (a) Hard water that is supplied to homes can cause damage to appliances that use water.

The damage happens over time and is caused by the build up of scale.

Dishwashers often have ways of making hard water soft. The diagram below shows a system found in a dishwasher.



1 (a) (i) Explain how sodium chloride helps to soften the water in this dishwasher.

[4 marks]

**Sodium chloride or dishwasher salt contains sodium ions** [1 mark]

**Sodium ions or  $\text{Na}^+$  in the resin are used to exchange / replace / displace** [1 mark]

**for calcium or magnesium (ions from the hard water)** [1 mark]

2 Temporary hard water can be made soft by heating.

Explain how heating makes temporary hard water soft.

**[4 marks]**

(Temporary hard water) contains hydrogencarbonate ions ( $\text{HCO}_3^-$ ) [1 mark]

that decompose on heating or hydrogencarbonate ions decompose on heating [1 mark]

to produce carbonate ions [1 mark]

(carbonate ions) they react with calcium and magnesium ions to form precipitates or to form magnesium carbonate/calcium carbonate. [1 mark]

**(Total marks 11)**