

Question 26 (5 marks)

Water can be described as either 'hard' or 'soft'.

- (a) Describe a test you have used to determine whether a given sample of water is 'hard' or 'soft'. 2

Trying to lather soap in the water, if the soap lathers, then the water is considered "soft", if not, then the water is "hard".

- (b) A sample of hard water contains $6 \times 10^{-4} \text{ mol L}^{-1}$ of magnesium carbonate. 3

Calculate the mass, in mg, of magnesium carbonate in 150 mL of this sample.

$$\text{Atomic mass of } \text{MgCO}_3 = 24.31 + 12.01 + 3 \times 16 \\ = 84.32 \text{ g}$$

$$\text{Amount in } \overset{150}{\text{sample}} \text{ mL} = 6 \times 10^{-4} \times 0.15 \text{ L} \\ = 9 \times 10^{-5} \text{ mol}$$

$$\text{Total mass} = 9 \times 10^{-5} \times 84.32 \\ \text{MgCO}_3 \\ = 7.59 \text{ mg (2 dp)}$$