

15 Hydrated magnesium nitrate, $\text{Mg}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$, is heated in a boiling tube and the following observations are made.

- Stage 1 The white solid forms a clear, colourless solution.
Stage 2 Condensation forms around the mouth of the boiling tube and a white solid starts to form at the bottom of the tube.
Stage 3 As the heating continues, the colourless solution disappears leaving a white solid.
Stage 4 The white solid melts.
Stage 5 A brown gas forms.
Stage 6 A glowing splint reignites when it is placed in the boiling tube.
Stage 7 A white solid is left in the boiling tube.

(a) Explain what is happening in stages 1 and 2.

(3)

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(b) (i) Identify the products formed in stages 5, 6 and 7.

(3)

Stage 5

Stage 6

Stage 7

(ii) Write the equation for the complete thermal decomposition of hydrated magnesium nitrate, $\text{Mg}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$.

State symbols are not required.

(2)



(c) The chlorides of magnesium and calcium can be distinguished from each other by carrying out a flame test.

(i) Describe what you would see in each test. (2)

Magnesium chloride.....

Calcium chloride.....

*(ii) Explain how flame colours arise in a flame test. (3)

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(iii) Suggest why the observations of the flame tests for magnesium chloride and calcium chloride are different. (2)

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(Total for Question 15 = 15 marks)

TOTAL FOR SECTION B = 41 MARKS

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