

**1. Nov/2023/Paper\_9701/41/No.4(b)**

**(b)** Calcium nitrate,  $\text{Ca}(\text{NO}_3)_2$ , is a white crystalline solid. When heated, it starts to decompose at approximately  $500^\circ\text{C}$ .

**(i)** Write an equation for the decomposition of  $\text{Ca}(\text{NO}_3)_2$ .

..... [1]

**(ii)** Suggest temperatures at which  $\text{Mg}(\text{NO}_3)_2$  and  $\text{Ba}(\text{NO}_3)_2$  start to decompose.

Explain your answer.

temperature at which  $\text{Mg}(\text{NO}_3)_2$  starts to decompose .....  $^\circ\text{C}$

temperature at which  $\text{Ba}(\text{NO}_3)_2$  starts to decompose .....  $^\circ\text{C}$

explanation .....

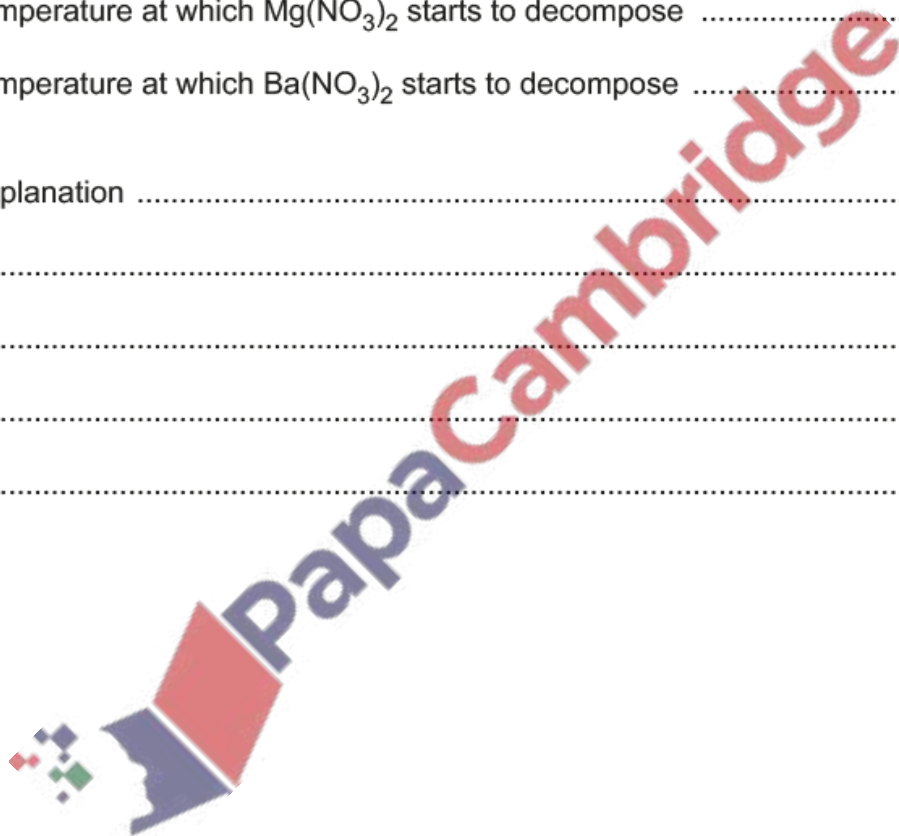
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[3]



Some of the ionic compounds of Group 2 elements undergo thermal decomposition.

Thermal decomposition of solid anhydrous magnesium ethanedioate,  $\text{MgC}_2\text{O}_4$ , occurs above  $650^\circ\text{C}$ . The products are magnesium oxide and a mixture of two different gases, one of which gives a white precipitate with saturated calcium hydroxide solution.

- (a) Complete the equation for the thermal decomposition of  $\text{MgC}_2\text{O}_4$ .



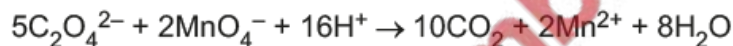
- (b) Suggest which of  $\text{MgC}_2\text{O}_4$  or  $\text{CaC}_2\text{O}_4$  undergoes thermal decomposition at a **lower** temperature. Explain your answer.

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..... [2]

- (c) The ethanedioate ion is oxidised by acidified  $\text{KMnO}_4$ .



An experiment is performed to find the solubility of  $\text{MgC}_2\text{O}_4$  in water.

A  $40.0\text{cm}^3$  sample of saturated aqueous  $\text{MgC}_2\text{O}_4$  requires  $27.05\text{cm}^3$  of  $0.00200\text{mol dm}^{-3}$  acidified  $\text{KMnO}_4$  to oxidise all the  $\text{C}_2\text{O}_4^{2-}$  ions.

Calculate the solubility, in  $\text{mol dm}^{-3}$ , of  $\text{MgC}_2\text{O}_4$  in water. Show your working.

solubility = .....  $\text{mol dm}^{-3}$  [3]

[Total: 6]

3. June/2023/Paper\_9701/41/No.1(a, b)

(a) Group 2 nitrates decompose when heated.

Describe how the thermal stability of Group 2 nitrates changes with increasing proton number.

Explain your answer.

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..... [3]

(b) Copper(II) nitrate decomposes in a similar manner to Group 2 nitrates.

Write an equation for the decomposition of  $\text{Cu}(\text{NO}_3)_2$ .

..... [1]

