

27. GROUP 2

Calcium nitrate, $\text{Ca}(\text{NO}_3)_2$, is a white crystalline solid. When heated, it starts to decompose at approximately 500°C . Suggest temperatures at which $\text{Mg}(\text{NO}_3)_2$ and $\text{Ba}(\text{NO}_3)_2$ start to decompose. Explain your answer.

- $\text{Mg}(\text{NO}_3)_2$ below 480°C , $\text{Ba}(\text{NO}_3)_2$ above 520°C
- ionic radii of M^{2+} increases down the group OR charge density of M^{2+} decreases down the group
- larger cations polarise / distort anion / NO_3 less OR larger ions weaken N-O / N=O (bond) less

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

- increases (down the group)
- radius / size of (cat)ion / M^{2+} increases
- less polarisation / distortion of anion / nitrate ion / NO_3

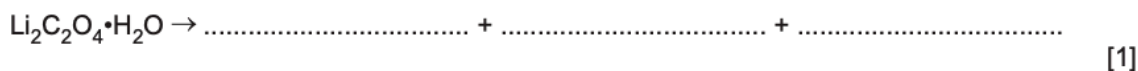
Write an equation for the decomposition of $\text{Cu}(\text{NO}_3)_2$.



- (a) When a sample of hydrated lithium ethanedioate, $\text{Li}_2\text{C}_2\text{O}_4 \cdot \text{H}_2\text{O}$, is gently heated, two gaseous products are formed and a white solid residue remains.

The residue is added to $\text{HNO}_3(\text{aq})$. A gas is produced that turns limewater milky.

Complete the equation for the decomposition of $\text{Li}_2\text{C}_2\text{O}_4 \cdot \text{H}_2\text{O}$.



- In thermal decomposition of a hydrated compound, H_2O is always one of the products!! (H_2O gas/ steam)

Identify the products formed when MgO reacts with dilute sulfuric acid.

- MgSO_4 and H_2O

Describe the trend in the solubility of the sulfates of magnesium, calcium and strontium. Explain your answer.

- Magnesium (most soluble) > calcium > strontium (least soluble).
- ΔH_{latt} and ΔH_{hyd} both become less exothermic / less negative down group 2.
- ΔH_{hyd} changes more / is the dominant factor.

- ΔH_{sol} becomes less exothermic / less negative / more positive / more endothermic

Describe the trend in the solubility of the hydroxides of magnesium, calcium and strontium. Explain your answer.

- Strontium (most soluble) > calcium > magnesium (least soluble).
- ΔH_{latt} and ΔH_{hyd} both become less exothermic / less negative down group 2.
- ΔH_{latt} changes more / is the dominant factor.
- ΔH_{sol} becomes more exothermic / more negative / less positive / less endothermic.

Explain why magnesium sulfate is more soluble than strontium sulfate.

- MgSO_4 has more exothermic ΔH_{latt} and ΔH_{hyd} .
- Difference in ΔH_{hyd} is greater.
- MgSO_4 has a more exothermic ΔH_{sol} .

$\text{Co}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$ behaves like $\text{Mg}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$ when heated. Describe in detail what you would expect to observe when crystals of $\text{Co}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$ are heated in a boiling tube, gently at first and then more strongly.

- condensation on tube / steam evolved
- brown fumes / brown gas evolved
- O_2 formed that relights a glowing splint
- solid dissolves / turns to liquid