

O-level

### WATER OF CRYSTALLISATION:

This is the amount of water, which must be present in order a solid to form crystals. When this water of crystallization is removed, the crystals lose their shape.

- A crystalline compound containing water is said to be **Hydrated** and water crystallization is sometimes called water of hydration e.g. copper sulphate
- Salts without water of crystallization are said to be **anhydrous** e.g. sodium chloride,
- When hydrated crystalline compounds are heated strongly, they lose water of crystallization and turn into anhydrous powders.
- The process of loss where hydrated crystals lose water of crystallisation and become anhydrous when exposed to air is called efflorescence. A salt that spontaneously lose it water of crystallization when exposed to air is called efflorescent, examples are  $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$ ,  $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$
- Anhydrous compounds with different colour from hydrated compound can be used to test for water

For example,

Anhydrous copper sulphate of white turns blue on addition of water because hydrated copper II sulphate is blue. Similarly, anhydrous cobalt chloride is blue will turn pink on addition of water due to formation of hydrated cobalt II) chloride

Therefore, anhydrous copper II sulphate, anhydrous cobalt II chloride are used to test for the presence of water.

### EXPERIMENT: To prove that copper sulphate contains water of crystallisation.

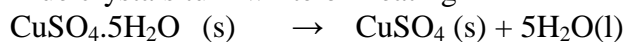
You are provided with copper sulphate crystals. Place the crystals in a dry test tube and heat first gently and then strongly.

Put two drops of water to the residue.

Record your observation and conclusions.

Result

Blue crystals turn white on heating



Blue

white

Addition of a drop of water to the product (anhydrous copper sulphate) the white crystal turn blue.

Conclusion hydrated copper sulphate contains water of crystallization



## EXERCISE

Circle the correct alternative

- 1 Anhydrous copper II sulphate is used for identification of
- Carbon dioxide
  - Sulphur dioxide
  - Water
  - oxygen

For question 2 one or more of the answers given may be correct. Read each questions carefully and then indicate the correct answer according to the following

- If 1, 2, 3, only are correct
  - If 1 and 3 only are correct
  - If 2 and 4 only are correct
  - If 4 only is correct
2. Which of the following substances can be used to test for water of crystallisation
- Copper II sulphate
  - Potassium dichromate
  - Cobalt II chloride
  - Potassium permanganate
3. (a) Define the following terms; give one example in each case.
- Hydrated compound
  - Anhydrous compound
- (b) Hydrated copper II sulphate solution was heated strongly
- State was observed
  - Write equation for the react that took place
  - How can you convert the product to hydrated copper sulphate



Answers

1. C      2. B

3. (a) (i) hydrated compound is one that contains water of crystallization  
(ii) anhydrous compound is one that does not contain water of crystallization

(b) (i) blue crystal turn white

(ii)



(iii) by adding a drop of water

