

Exercise walk-through

7.3

Preparation of salts

IGCSE Chemistry

Oxides

acidic

non-metal oxides
(SO_2 , CO_2)

basic

metal oxides
(CuO , CaO)

amphoteric

react with both
(Al_2O_3 , ZnO)

Metal oxides tend to be basic; non-metal oxides tend to be acidic.

Making a soluble salt

React acid with **excess** solid (metal, base or carbonate):

- 1 add excess, then **filter**
- 2 **evaporate** some water
- 3 **crystallise**

An alkali needs **titration** instead.

add an **excess** of an insoluble base, metal or carbonate to the acid

filter to remove the leftover solid (the salt stays dissolved)

evaporate some of the water to make a saturated solution

leave to **crystallise**, then dry the pure salt crystals

Describing what you see, and water in salts

bubbles of gas

say **effervescence** – fizzing and bubbling are also accepted

the solid getting smaller

say the solid **dissolves** or **disappears**

a colour change

name **both** colours – from blue to colourless, not just “it changes”

heat given out

the mixture **warms** – an exothermic reaction

hydrated

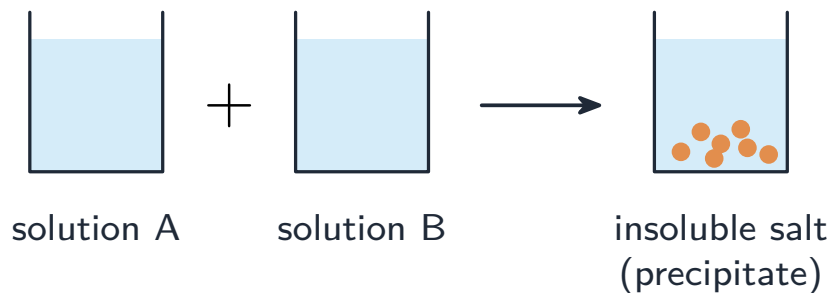
a substance **chemically joined with water** – blue copper(II) sulfate crystals

anhydrous

a substance containing **no** water – the same salt, white, after heating

Observations are marked separately from equations. Write what a person watching would actually be able to report.

Making an insoluble salt



By **precipitation** : mix two solutions that each carry one needed ion.

The insoluble salt appears as a solid – then filter, wash & dry it.

Bases and alkalis



pH strips: alkalis turn universal indicator purple or blue ($\text{pH} > 7$)

Exercises 2.1-2.3

2.1 State whether silver chloride is soluble or insoluble.

[1]

2.2 Name the method used to make an insoluble salt.

[1]

2.3 Identify which of these salts is insoluble: sodium chloride, barium sulfate, potassium nitrate.

[1]

Exercises 2.1-2.3

2.1 State whether silver chloride is soluble or insoluble. [1]

2.1

- silver chloride is **insoluble**

2.2 Name the method used to make an insoluble salt. [1]

2.2

- an insoluble salt is made by **precipitation**

2.3 Identify which of these salts is insoluble: sodium chloride, barium sulfate, potassium nitrate. [1]

2.3

- sodium chloride and potassium nitrate are soluble
- **barium sulfate** is insoluble

Exercises 2.4·2.5

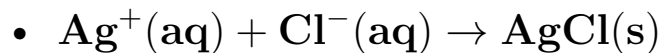
2.4 Write the ionic equation for the formation of silver chloride from silver nitrate and sodium chloride solutions. [2]

2.5 Explain why the solid is added in excess in the filtration route. [2]

Exercises 2.4·2.5

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2.4



2.5 Explain why the solid is added in excess in the filtration route. [2]

2.5

- excess solid uses up **all of the acid**
- the leftover solid is filtered off, leaving **only the salt** in solution

Exercises 3.1·3.2

3.1 A soluble salt is best made from an acid and an **excess** of an insoluble base by, in order: [1]

☐

A filter, react, crystallise

B react, filter, evaporate, crystallise

C evaporate, react, filter

D precipitate, wash, dry

3.2 Describe how to make pure, dry copper(II) sulfate crystals from copper(II) oxide and dilute sulfuric acid. [4]

Exercises 3.1-3.2

3.1 A soluble salt is best made from an acid and an **excess** of an insoluble base by, in order: [1]

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A filter, react, crystallise

B react, filter, evaporate, crystallise

C evaporate, react, filter

D precipitate, wash, dry

3.1 B

- **react** (excess base), **filter**, **evaporate**, **crystallise**
- A and C mix the order; D is precipitation

3.2 Describe how to make pure, dry copper(II) sulfate crystals from copper(II) oxide and dilute sulfuric acid. [4]

3.2

- add **excess** copper(II) oxide to warm dilute sulfuric acid until no more reacts
- **filter** off the excess solid
- **evaporate** some water from the filtrate
- leave to **crystallise**, then dry

Exercise 3.3

3.3 Barium sulfate is insoluble. Name two solutions that could be mixed to make it, and state what you would do after mixing. [3]

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3.3

- mix a soluble barium salt (e.g. barium chloride) with a soluble sulfate (e.g. sodium sulfate)
- then **filter, wash and dry** the precipitate

Exercise 3.4 (a)

3.4 A student prepares two salts: zinc sulfate crystals from zinc carbonate, and lead(II) iodide.

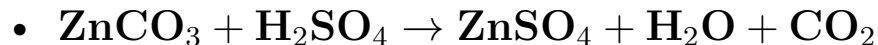
(a) Write the equation for the reaction of zinc carbonate with dilute sulfuric acid. [2]

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(a)



Exercise 3.4 (b)

3.4 A student prepares two salts: zinc sulfate crystals from zinc carbonate, and lead(II) iodide.

(b) Describe how the student obtains pure, dry crystals of zinc sulfate, giving the practical steps in order.

[5]

Exercise 3.4 (b)

3.4 A student prepares two salts: zinc sulfate crystals from zinc carbonate, and lead(II) iodide.

(b) Describe how the student obtains pure, dry crystals of zinc sulfate, giving the practical steps in order. [5]

(b)

- warm the dilute sulfuric acid
- add zinc carbonate a little at a time until it is in **excess**
- **filter** to remove the excess solid
- evaporate until crystals form at the edge
- cool, crystallise, and dry between filter papers

Exercise 3.4 (c)

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(c) Explain how the student knows when enough zinc carbonate has been added. [2]

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(c) Explain how the student knows when enough zinc carbonate has been added. [2]

(c)

- solid stays at the bottom and **no more bubbles**
- that shows **all the acid has reacted**

Exercise 3.4 (d)

3.4 A student prepares two salts: zinc sulfate crystals from zinc carbonate, and lead(II) iodide.

(d) Lead(II) iodide is insoluble. Identify two solutions that could be mixed to prepare it, and write the ionic equation. [3]

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(d) Lead(II) iodide is insoluble. Identify two solutions that could be mixed to prepare it, and write the ionic equation. [3]

(d)

- e.g. **lead(II) nitrate** and **potassium iodide**
- $\text{Pb}^{2+}(\text{aq}) + 2\text{I}^{-}(\text{aq}) \rightarrow \text{PbI}_2(\text{s})$

Exercise 3.4 (e)

3.4 A student prepares two salts: zinc sulfate crystals from zinc carbonate, and lead(II) iodide.

(e) State the three steps needed to obtain the dry lead(II) iodide from the mixture, and state why the residue is washed. [3]

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(e) State the three steps needed to obtain the dry lead(II) iodide from the mixture, and state why the residue is washed. [3]

(e)

- **filter**, **wash** with distilled water, **dry**
- washing removes soluble salt that would **contaminate** the product