

Collins

Foundation Support Workbook

AQA GCSE Combined Science
Chemistry topics

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Answers

Neutralisation of acids and making salts

- Acids are neutralised by alkalis and bases.
- A base is a metal oxide or metal hydroxide.
- An alkali is a metal oxide or metal hydroxide which dissolves in water (soluble).
- A salt is a compound formed by neutralisation of an acid by an alkali or a base.
- Acid + base or alkali → salt + water
 - The first part of the salt's name comes from the metal involved.
 - The second part of the salt's name comes from the acid, e.g. hydrochloric acid make chloride salts.
- In the formula of the salt the total positive charge must equal the negative charge.
- The formula of a salt can be worked out if the ions in it are known.

1. Which of the following is a base? Tick **one** box.

☐ Magnesium ☐ Magnesium oxide ☐ Magnesium chloride [1 mark]

2. What type of substance is zinc nitrate? Tick **one** box.

☐ Acid ☐ Alkali ☐ Base ☐ Salt

[1 mark]

3. Sodium hydroxide dissolves in water. Copper oxide is a black insoluble solid. Magnesium oxide is a white insoluble solid.

a Which of the three substances is an alkali?

[1 mark]

b When the three substances in part a) react with an acid, they all produce the same product.

What is this product? Tick **one** box.

☐ Carbon dioxide

☐ Hydrogen

☐ Water

[1 mark]

4. Name the salt made when hydrochloric acid reacts with the following bases.

Show Me

a Copper oxide Name of salt copper chloride

b Zinc hydroxide Name of salt _____

c Magnesium oxide Name of salt _____

[3 marks]

Support

Make sure you understand the word 'base' in chemistry, bases are the oxides or hydroxides of metals.

Support

Make sure you understand the word 'alkali' and how it is different from 'base'. All alkalis are bases, but not all bases are alkalis.

Support

copper oxide + hydrochloric acid → copper chloride + water

5. Name the acids used to make the following salts.

Show Me

a Magnesium sulfate Name of acid sulfuric acid

b Sodium chloride Name of acid _____

c Zinc nitrate Name of acid _____

[3 marks]

6. Which base and acid would you react together to make the compound iron nitrate?

Base: _____

Acid: _____

[2 marks]

7. What is the formula for zinc chloride (contains Zn^{2+} and Cl^- ions)?

Tick **one** box.

☐ ZnCl

☐ Zn_2Cl

☐ ZnCl_2

Support

When working out formulae, it may help to imagine balancing the charges on a see-saw. How will you balance the two positive charges in one Zn^{2+} ion?

[1 mark]

8. Complete the table to show the formula of the salt.

Show Me

Name of salt	Ions in the compound	Formula of the salt
magnesium chloride	Mg^{2+} and Cl^-	MgCl_2
magnesium sulfate	Mg^{2+} and SO_4^{2-}	
magnesium sulfate	Fe^{2+} and Cl^-	
zinc sulfate	Zn^{2+} and SO_4^{2-}	

[4 marks]

9. When calcium hydroxide reacts with hydrochloric acid, calcium chloride, CaCl_2 , is formed.

Balance the chemical equation for the reaction.

_____ $\text{Ca}(\text{OH})_2$ + _____ HCl → _____ CaCl_2 + _____ H_2O [1 mark]

Support

When balancing a chemical equation, never change the small numbers (subscripts) as this would change the actual formula of the substance.

Acids, metal carbonates and making salts

- Calcium carbonate is an example of a metal carbonate.
- Metal carbonates react with acids to make a salt, water and carbon dioxide:
- Acid + metal carbonate → salt + water + carbon dioxide

1. Which one of the following is a metal carbonate? Tick **one** box.

☐ Zinc oxide ☐ Zinc sulfate ☐ Zinc carbonate

[1 mark]

2. Acids can be neutralised by metal oxides, metal hydroxides or metal carbonates.

Complete the general word equations for these reactions.

acid + metal oxide → salt + _____ [1 mark]

acid + metal hydroxide → salt + _____ [1 mark]

acid + metal carbonate → _____ + _____ + _____ [3 marks]

Support

If you know the general equation for each type of reaction you will be able to write word equations for *any* reactions you are given, and predict the products.

3. Hydrochloric acid is reacted with zinc oxide and also with zinc carbonate.

Which of the following is false? Tick **one** box.

- ☐ Zinc chloride is made in both cases
- ☐ Bubbles of carbon dioxide appear only with the zinc carbonate
- ☐ Water is only made with zinc oxide

[1 mark]


4. Complete the following word equations.

 magnesium carbonate + nitric acid → _____ nitrate + water + carbon

zinc carbonate + sulfuric acid → _____ + _____ + _____

iron carbonate + hydrochloric acid → _____ + _____ + _____ [3 marks]

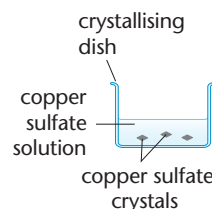
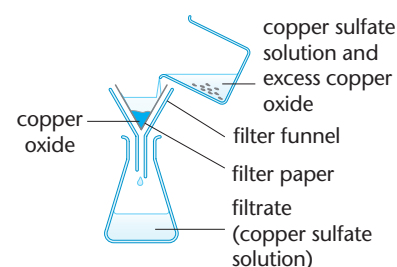
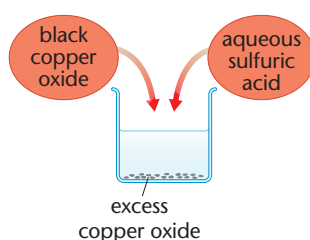
5. Complete the table to show the formula of the salt.

Name of salt	Ions in the compound	Formula of the salt
 magnesium carbonate	Mg ²⁺ and CO ₃ ²⁻	MgCO ₃
calcium carbonate	Ca ²⁺ and CO ₃ ²⁻	
zinc carbonate	Zn ²⁺ and CO ₃ ²⁻	
sodium carbonate	Na ⁺ and CO ₃ ²⁻	

[4 marks]

Making soluble salts

- The salts made in neutralisation reactions can be either soluble or insoluble.
- Soluble salts can be made from adding excess base, excess metal or excess metal carbonate to an acid.
- Dry crystals of a pure salt are made by:
 - Adding the excess metal to warm acid and waiting for the reaction to complete
 - Filtering the solution to remove the excess (unreacted) solid
 - Evaporating the solution to remove most of the water
 - Cooling the remaining solution to form crystals
 - Drying the crystals with filter paper



1. A soluble salt can be prepared by reacting an acid with an insoluble base.

Name the process that removes the excess or unreacted insoluble reactant from the mixture.

[1 mark]

2. The following sentences describe how to make crystals of a pure salt. The sentences are in the wrong order.

Place the letters in the boxes below to give the right order. Start with B.

- A** The solution is evaporated to remove most of the water
B Excess metal carbonate is added to an acid
C The remaining solution is cooled to form crystals
D Once the reaction has completed, the solution is filtered to remove excess base

B → → →

[3 marks]

3. Outline a safe plan for how to make pure, dry crystals of the soluble salt magnesium sulfate using an insoluble metal carbonate.

You may use the following equipment: beaker, stirring rod, spatula, Bunsen burner and mat, tripod and gauze, filter funnel and filter paper, evaporating dish, conical flask

Include the names of the insoluble reactant and the acid.

Show Me Method: 1. Add _____ acid to a beaker

2. Warm the acid on a tripod over the _____

3. Add magnesium carbonate a little at a time and stir _____

4. Add more magnesium carbonate until _____

Support

When the question says **outline** you only need to describe the main points. You could use bullet points or subheadings but your points must be in full sentences and in an order that makes sense.

The word 'safe' means you must include the safety precautions that should be taken by someone following the plan.

5. Use a filter funnel and filter paper to

[6 marks]

Safety:

- Wear eye protection because _____ is corrosive.
- Warm the mixture but do not over heat it
- Use tongs to hold the warm
