

GCSE Chemistry

Worksheet: Sulfates

TIME 25 min	TOTAL 25 marks	CALCULATOR Allowed	DIFFICULTY Easy, Medium
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Topics: Sulfates

NAME	CLASS	DATE
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- Use black ink or black ball-point pen. Pencil should only be used for drawing.
- Answer all questions in the spaces provided.
- In all calculations, show clearly how you work out your answer.
- The marks for questions are shown in brackets.

0 1

0 1 . 1 Which solution is used in the test for sulfate ions?

Tick (✓) **one** box.

Barium chloride solution

☐

Limewater

☐

Silver nitrate solution

☐

Sodium hydroxide solution

☐

[1 mark]

0 1 . 2 Name the acid that is added to the sample before this solution.

.....

.....

.....

[1 mark]

0 1 . 3 Give the result of a positive test for sulfate ions.

.....

.....

[1 mark]

0 2

0 2 . 1

Which colour precipitate forms in a positive test for sulfate ions?

Tick (✓) **one** box.

White

☐

Cream

☐

Yellow

☐

Blue

☐

[1 mark]

0 3

Barium chloride solution is toxic and irritant.

0 3 . 1

Give **one** safety precaution a student should take when using it.

.....

.....

[1 mark]

0 3 . 2

Suggest why barium chloride waste should not simply be poured down the sink after the experiment.

.....

.....

[1 mark]

0 4

White precipitates can form in several different tests used to identify ions.

0 4 . 1

Explain why obtaining a white precipitate is not, on its own, enough to identify which ions are present in a solution.

.....

.....

.....

.....

[2 marks]

0 5

0 5 . 1

Describe, step by step, how a student should test a solution to find out whether it contains sulfate ions, including the result of a positive test.

[3 marks]

0 6

A student tests a solution for sulfate ions by adding dilute hydrochloric acid and then barium chloride solution.

0 6 . 1

Why is dilute hydrochloric acid added first?

[1 mark]

0 6 . 2

Explain why dilute sulfuric acid must **not** be used instead of hydrochloric acid.

[2 marks]

0 6 . 3

The solution contained sodium sulfate.
Name the white precipitate formed.

.....

.....

.....

.....

[1 mark]

0 6 . 4

Complete the balanced equation for the reaction.

$\text{BaCl}_2(\text{aq}) + \text{Na}_2\text{SO}_4(\text{aq}) \rightarrow \dots\dots\dots + \dots\dots\dots$

.....

.....

.....

.....

[2 marks]

0 7

A student tested three solutions, X, Y and Z. Each solution contains one compound.
Table 1 shows the results.

Table 1

Solution	Other test and result	Result with dilute hydrochloric acid then barium chloride solution
X	sodium hydroxide solution: blue precipitate	white precipitate
Y	flame test: yellow flame	white precipitate
Z	sodium hydroxide solution: white precipitate that dissolves in excess	white precipitate

0 7 . 1

Name the compound in X.

.....

.....

.....

.....

[1 mark]

0 7 . 2

Name the compound in Y and give its formula.

.....

.....

.....

.....

[2 marks]

0 7 . 3

Name the compound in Z and give its formula.

.....

.....

.....

.....

[2 marks]

0 8

A student tests three water samples, X, Y and Z, for sulfate ions by adding dilute hydrochloric acid and then barium chloride solution.

Table 2 shows the results.

Table 2

Sample	Observation
X	no precipitate
Y	white precipitate
Z	white precipitate

0 8 . 1

Which sample(s) contain sulfate ions?

.....

.....

.....

.....

[1 mark]

0 8 . 2

The student did not add dilute hydrochloric acid before testing a fourth sample, W, which contains carbonate ions but no sulfate ions. A white precipitate still formed when barium chloride solution was added.
Explain this result.

.....

.....

.....

.....

[2 marks]

END OF QUESTIONS

Original practice questions written to match the specification. Not produced by, affiliated with or endorsed by AQA.

Mark scheme

GCSE Chemistry · Worksheet: Sulfates · 25 marks

Question 1 (3 marks)

01.1 [1 mark]

Correct: Barium chloride solution

01.2 [1 mark]

Answer: dilute hydrochloric acid

- (dilute) hydrochloric acid (1)
-

01.3 [1 mark]

Answer: white precipitate

- white precipitate (1)

Notes: Allow 'white solid forms'. Do not accept 'goes white' or 'cloudy' alone.

Question 2 (1 mark)

02.1 [1 mark]

Correct: White

Question 3 (2 marks)

03.1 [1 mark]

- wear eye protection / wear gloves / avoid skin contact / wash hands after use (1)
-

03.2 [1 mark]

- barium compounds are toxic, so the waste must be disposed of according to the school's / teacher's instructions rather than released into the environment (1)
-

Question 4 (2 marks)

04.1 [2 marks]

- several different tests give a white precipitate (e.g. barium chloride with sulfate ions, silver nitrate with chloride ions, sodium hydroxide with calcium, magnesium or aluminium ions) (1)
 - the reagent used and the exact conditions (e.g. whether the precipitate dissolves in excess) must also be considered to know which ions are actually present (1)
-

Question 5 (3 marks)

05.1 [3 marks]

- add dilute hydrochloric acid to a sample of the solution (to remove carbonate ions) (1)
 - add barium chloride solution (1)
 - a white precipitate forms if sulfate ions are present (1)
-

Question 6 (6 marks)

06.1 [1 mark]

- to remove / react with carbonate ions (which would also form a white precipitate with barium ions) (1)
-

06.2 [2 marks]

- sulfuric acid contains sulfate ions (1)
 - so a white precipitate would form whatever the sample contained (1)
-

06.3 [1 mark]

Answer: barium sulfate

- barium sulfate (1)
-

06.4 [2 marks]

Answer: $\text{BaCl}_2(\text{aq}) + \text{Na}_2\text{SO}_4(\text{aq}) \rightarrow \text{BaSO}_4(\text{s}) + 2\text{NaCl}(\text{aq})$

- BaSO_4 and NaCl (correct formulae of both products) (1)
- 2 in front of NaCl (1)

Notes: Ignore state symbols. The products can be written in either order.

Question 7 (5 marks)

07.1 [1 mark]

Answer: copper(II) sulfate

- copper(II) sulfate / copper sulfate (1)
-

07.2 [2 marks]

Answer: sodium sulfate, Na_2SO_4

- sodium sulfate (1)
 - Na_2SO_4 (1)
-

07.3 [2 marks]

Answer: aluminium sulfate, $\text{Al}_2(\text{SO}_4)_3$

- aluminium sulfate (1)
 - $\text{Al}_2(\text{SO}_4)_3$ (1)
-

Question 8 (3 marks)

08.1 [1 mark]

Answer: Y and Z

- Y and Z (1)
-

08.2 [2 marks]

- barium ions react with carbonate ions to form barium carbonate, which is also an insoluble white precipitate (1)
 - because the hydrochloric acid was not added first, the carbonate ions were not removed, giving a false positive result for sulfate ions (1)
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