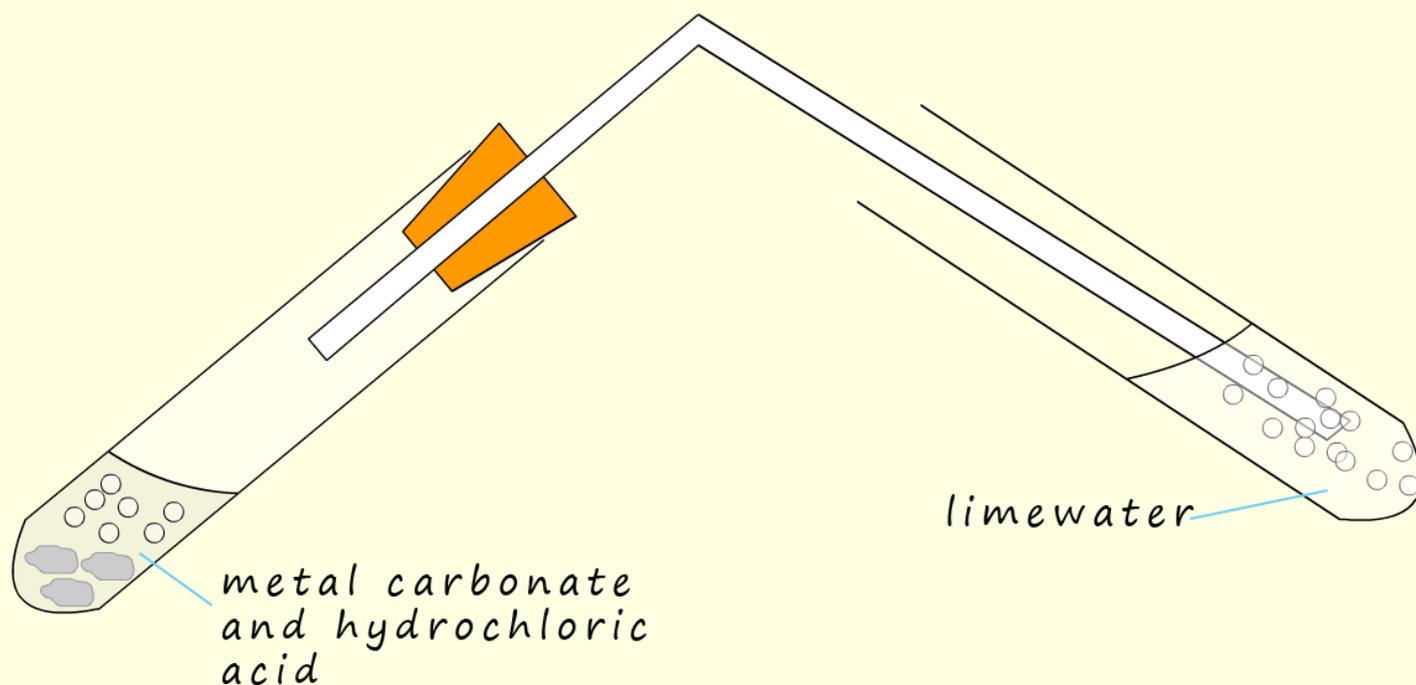


Tests for anions

Answer all the questions below then check your answers.

1. Describe how to test an unknown sample to detect the presence of carbonate ions. Include all reagents and the expected result. The diagram below should help you.



a. What gas is released when the carbonate ion reacts with hydrochloric acid?

2. To detect the presence of sulfate ions you would dissolve the sample in water then:

❖ Add dilute hydrochloric acid

❖ Add a few drops of barium chloride solution to your sample.

a. Why can you not acidify the solution using sulfuric acid?

b. Why do you have to add the hydrochloric acid?

c. What is the result of this test if the sample contains sulfate ions?

d. Write a word and balanced symbolic equation for the reaction of magnesium sulfate solution with barium chloride solution.

e. What is the precipitate formed in this reaction?

3. Name the first 4 halide ions.

a. To test for halide ions you would:

i. Dissolve the sample to be tested in water.

ii Add a few drops of dilute nitric acid to the solution.

iii Add a few drops of silver nitrate solution.

iv. observe any colour changes.

Complete the table below to give the observed colour changes:

Halide ion	symbol	Colour observed
chloride		
bromide		
iodide		

b. Why can hydrochloric acid not be used to acidify the solution instead of nitric acid?

i Suggest a reason why the solution to be test has to be acidified with nitric acid at all?

c. Why can you not test for fluoride ions using this method?

4. Complete the word and symbolic equations below:

i sodium chloride_(aq) + silver nitrate_(aq) →



ii potassium bromide_(aq) + silver nitrate_(aq) →



iii potassium iodide_(aq) + silver nitrate_(aq)



Tests for anions

Answers

1. Describe how to test an unknown sample to detect the presence of carbonate ions. Include all reagents and the expected result.

Add dilute hydrochloric acid to the sample, if carbonate ions are present then carbon dioxide gas will be released. Allow this gas to bubble through a limewater (calcium hydroxide) solution. The limewater will turn a milky/chalky colour indicating the gas released is CO_2

a. What gas is released when the carbonate ion reacts with hydrochloric acid?

Carbon dioxide

2. To detect the presence of sulfate ions you would dissolve the sample in water then:

❖ Add dilute hydrochloric acid

❖ Add a few drops of barium chloride solution to your sample.

a. Why can you not acidify the solution using sulfuric acid? Sulfuric acid contains sulfate ions which would react with the barium chloride solution and give a positive test!

b. Why do you have to add the hydrochloric acid?

Carbonate ions also react with barium chloride to give a white precipitate. This would obviously make the test for sulfate useless. So by adding the acid if carbonate ions are present they will react with the acid and be removed from the sample to be tested.

c. What is the result of this test if the sample contains sulfate ions?

A white precipitate of barium sulfate forms.

d. Write a word and balanced symbolic equation for the reaction of magnesium sulfate solution with barium chloride solution.

Magnesium sulfate_(aq) + barium chloride_(aq) → magnesium chloride_(aq) + barium sulfate_(s)



e. What is the precipitate formed in this reaction?

Barium sulfate

3. Name the first 4 halide ions.

Fluoride, chloride, bromide, iodide ions

a. To test for halide ions you would:

i. Dissolve the sample to be tested in water.

ii Add a few drops of dilute nitric acid to the solution.

iii Add a few drops of silver nitrate solution.

iv. observe any colour changes.

Complete the table below to give the observed colour changes:

Halide ion	symbol	Colour observed
chloride	Cl ⁻	white
bromide	Br ⁻	cream
iodide	I ⁻	yellow

b. Why can hydrochloric acid not be used to acidify the solution instead of nitric acid?

It contains chloride ions and would react with the silver nitrate solution to form insoluble silver chloride

1 Suggest a reason why the solution to be test has to be acidified with nitric acid at all?

The acid will remove any carbonate ions in the test sample. Silver will react with carbonate ions to form insoluble silver carbonate which would spoil the test result.

c. Why can you not test for fluoride ions using this method?

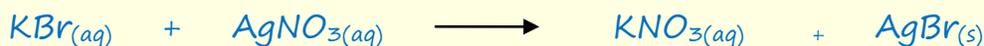
Silver fluoride is soluble, no precipitate is formed!

4. Complete the word and symbolic equations below:

i sodium chloride_(aq) + silver nitrate_(aq) → sodium nitrate_(aq) + silver chloride_(aq)



ii potassium bromide_(aq) + silver nitrate_(aq) → potassium nitrate_(aq) + silver bromide_(aq)



iii potassium iodide_(aq) + silver nitrate_(aq) → potassium nitrate_(aq) + silver iodide_(aq)

