

TESTS FOR GASES, CATIONS AND ANIONS 1

Q1. Low sodium salt is used on food. This label is from a packet of low sodium salt.

Low Sodium Salt
Ingredients:
Sodium chloride
Potassium chloride
Drying agent: magnesium carbonate

(a) A chemist tests the low sodium salt for the substances on the label. The chemist tests for sodium ions and potassium ions using a flame test.

Draw a ring around the correct answer to complete each sentence.

(i) In a flame test, sodium ions produce a _____ colour.

lilac
red
yellow

(1 mark)

(ii) In a flame test, potassium ions produce a _____ colour.

lilac
red
yellow

(1 mark)

(b) The chemist added hydrochloric acid to low sodium salt. Carbon dioxide gas was produced.

Describe the test for carbon dioxide and give the result of the test.

(2 marks)

(c) The chemist made a solution of low sodium salt.

(i) Tick (✓) **one** box to show the chemical used to test for chloride ions

	Tick (✓)
Barium chloride solution	
Silver nitrate solution	
Sodium sulfate solution	

(1 mark)

(ii) Sodium hydroxide solution is used to test for magnesium ions.

Draw a ring around the colour of precipitate produced by this test.

brown green white

(1 mark)

(d) A student tests the low sodium salt for the substances on the label.

(i) The same test can be used to identify sodium ions and potassium ions.

Describe the test.

Give the result of the test for sodium ions and for potassium ions.

(3 marks)

(ii) It is difficult to identify potassium ions when sodium ions are present. Suggest why.

(1 mark)

(e) Describe how the student would test a solution of the low sodium salt for chloride ions.

Give the result of the test.

(3 marks)

(f) To test for magnesium ions, the student adds a few drops of sodium hydroxide solution to a solution of the low sodium salt.

A white precipitate is produced.

This test also gives a white precipitate with aluminum ions and calcium ions.

(i) Describe how the student could confirm that the low sodium salt contains magnesium ions and not aluminum ions.

(2 marks)

(ii) Describe a test the student could do to confirm that the low sodium salt does not contain calcium ions.

(2 marks)

Q2. Read the information in the box and then answer the questions.

Seidlitz Powder is a medicine.

Seidlitz Powder comes as two powders. One powder is wrapped in white paper and contains tartaric acid. The other powder is wrapped in blue paper and contains sodium hydrogen carbonate.

The contents of the blue paper are dissolved in water and the contents of the white paper are added. This causes a reaction that produces carbon dioxide gas. The mixture is safe to drink when the reaction stops.

(a) Suggest why Seidlitz Powder comes as two separate powders.

(1 mark)

(b) The reaction produces carbon dioxide gas.

(i) What would you see during the reaction?

(1 mark)

(ii) Which state symbol in a chemical equation shows that carbon dioxide is a gas?

Draw a ring around one answer.

(s)

(l)

(aq)

(g)

(1 mark)

(iii) Draw a ring around the correct answer to complete the sentence.

Carbon dioxide can be identified because it turns

limescale
limestone
limewater

milky.

(1 mark)

(c) Sodium hydrogen carbonate contains sodium ions. Sodium ions can be identified by flame tests.

Draw a ring around the correct answer to complete the sentence.

Sodium ions give a

blue
red
yellow

flame.

(1 mark)

(d) Some Seidlitz Powder was bought on the Internet for £5. However, when tested, it was found to be only magnesium sulfate, worth a few pence.

Draw a ring around the correct answer to complete each sentence.

(i)

The test for sulfate ions uses

barium chloride
silver nitrate
sodium hydroxide

solution.

(1 mark)

(ii)

A positive test for sulfate ions produces a

blue
red
white

precipitate.

(1 mark)

(iii) Suggest one disadvantage of buying medicines on the Internet.

(1 mark)

Q3. Read the further information about Seidlitz Powder in the box and then answer the questions.

Seidlitz Powder is the name of a medicine.

Seidlitz Powder comes as two powders. One powder is wrapped in white paper and contains tartaric acid ($C_4H_6O_6$). The other powder is wrapped in blue paper and contains potassium sodium tartrate ($KNaC_4H_4O_6$) and sodium hydrogen carbonate ($NaHCO_3$).

The contents of the blue paper are completely dissolved in water and then the contents of the white paper are added.

The equation which represents this reaction is:



(a) Describe and give the result of a test to identify the gas produced in this reaction.

(2 marks)

(b) One of the chemicals in Seidlitz Powder is potassium sodium tartrate ($\text{KNaC}_4\text{H}_4\text{O}_6$).

Suggest why it would be difficult to identify both potassium ions and sodium ions in potassium sodium tartrate using a flame test.

(1 mark)

(c) Some Seidlitz Powder was bought on the Internet. However, when tested, it was found to be only magnesium sulfate.

(i) Describe and give the result of a chemical test to show that magnesium sulfate contains sulfate ions.

Test

Result

(2 marks)

(ii) Magnesium sulfate contains magnesium ions.

Describe what you see when sodium hydroxide solution is added to a solution of magnesium sulfate.

(1 mark)

Q4. Chemical tests can be used to detect and identify elements and compounds.

A jar of a chemical from 1870 is shown.



Copperas was a name used for iron(II) sulfate, FeSO_4 . It does not contain any copper!

(a) A student tested solution of copperas to show which ions it contained.
Draw a ring around the correct answer to complete each sentence.

(i) The student tested for iron(II) ions, Fe^{2+} .

The student added a solution of

barium chloride.

silver nitrate.

sodium hydroxide.

The colour of the precipitate formed was

green.

red.

white.

The precipitate was a

liquid.

gas.

solid.

(3 marks)

(ii) The student tested for sulfate ions, SO_4^{2-} .

The student added dilute hydrochloric acid and _____ solution.

barium chloride
silver nitrate
sodium hydroxide

The colour of the precipitate formed was

green.
red.
white.

Sulfuric acid (H_2SO_4) should not be used instead of hydrochloric acid (HCl) when testing for sulfate ions. This is because sulfuric acid contains

chloride ions, Cl^-
nitrate ions, NO_3^-
sulfate ions, SO_4^{2-}

(3 marks)

(b) A flame test can be used to identify the metal ions in a compound. How do you carry out a flame test?

(1 mark)

(c) The elements in a compound can also be detected and identified using instrumental methods of analysis.

State one advantage of using instrumental methods compared with chemical tests.

(1 mark)

Total marks (39)