N5 Chemistry: Unit 3 – Chemistry in Society

Part B – Fertilisers, Nuclear and Chemical Analysis

Lesson 2 – Chemical Analysis – Flame Tests, Gas Tests and Precipitation

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Learning Outcomes

By the end of this lesson you should know:

1. How to carry out a flame test and what it tells us
2. How to carry out different gas tests
3. How to identify a precipitation reaction

Success Criteria

You will have been successful in this lesson if you:

1. Read and learn the notes given here and in your printed notes booklet.
2. Watch the links provided

Flame Tests, Gas Tests and Precipitation	**Unit 3 – Chemical Analysis**	**https://youtu.be/g0imbd6vThE**

3. Complete revision questions provided
4. Complete and submit homework assigned (HW 16 and 17)

There is also a further reading section to help you gain more depth of understanding for this section.

If you have any questions about the content of this lesson, you should ask your class teacher either through your class MS team or via email. MS Teams will be monitored throughout the week by a chemistry teacher. If you need help or clarification with either the task or the content of the lesson, just ask.

Links to Prior Knowledge

You may wish to revise the following to help you understand this lesson:

Unit 1: Acids and Bases – Preparation of Salts

Words written in italics do not need to be copied and are there to provide instruction.

Watch this video first:

https://youtu.be/g0imbd6vThE

Flame Tests

Flame tests are used to identify a metal ion present in a sample. A sample is held in the flame of a Bunsen burner and the colour of the flame is observed. Different metal ions will produce different colours.

Not all metal ions produce a colour in the Bunsen flame, but the following examples are as listed on page 6 of the N5 Chemistry data booklet.

Element	**Ion**	**Flame Colour**
barium	Ba^{2+}	Green
calcium		Orange-red
copper		
	Li^{+}	Red
potassium		
	Na+	
		Red

Online Experiment:

https://www.newpathonline.com/free-curriculum-resources/virtual_lab/Flame_Test/9/12,13,14/1914

OR

https://www.evans2chemweb.co.uk/

Username: snhs password: giffnock

Select any teacher →Virtual lab → Flame Tests

Watch:

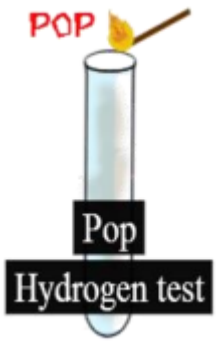
https://www.twigscotland.com/hi/7CCQOC46XUVT?next=https://www.twigscotland.com/experiment/flame-test-4135/

https://www.youtube.com/watch?v=z8bvFyIvg8E

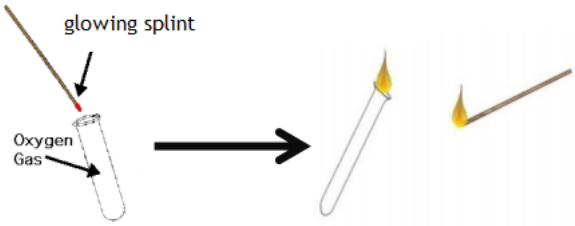
Gas Tests

We can use gas tests to identify the presence of certain gases.

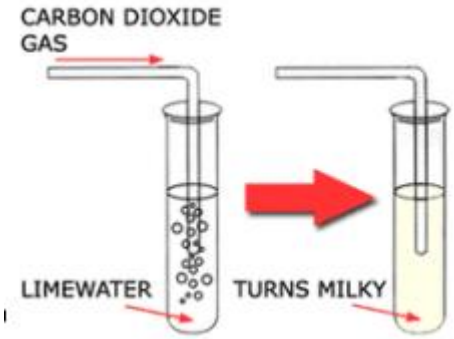
The test for hydrogen is it burns with a pop.



The test for oxygen is it relights a glowing splint.



The test for carbon dioxide is it turns limewater cloudy/milk.



Watch:

https://www.youtube.com/watch?v=tyhWF1EYtok

The following notes should be copied into your notes jotter.

Precipitation

Precipitation is the reaction of **two solutions to form a precipitate** (an insoluble salt).

All the ions in the reactant solutions are **aqueous** and we give them the state symbol: (aq). This means the are free from their lattice structure and can move around in the solution.

The ions 'swap ion partners' and form new products. One of these products will be a **solid**, the precipitate, and we give it the state symbol: (s).

e.g. $K^+I^-(aq)$ + $Pb^{2+}(NO_3^-)_2(aq)$ → $Pb^{2+}(I^-)_2(s)$ + $K^+NO_3(aq)$

Precipitate **Spectator Ions**

The spectator ions do not take part in the chemical reaction. Therefore, they do not change in any way (their state symbol is still aq).

Page 8 of the data booklet contains information on the solubility of some compounds.

We can use this to identify reactions where a precipitate will form. Chemists can add certain compounds to samples to identify the presence of a particular ion because of the precipitate that will form.

e.g.

- silver nitrate can be used to monitor pollution by halogens.

- barium chloride can be used to monitor sulfate pollution.

You do not need to know specific examples of testing for ions.

Online Experiment:

Using your data booklet, identify where you think a precipitation reaction will occur.
Then use the following link to carry out a virtual precipitation experiment and complete the table.

Click the ionic compound multiple times to add more ions to your solution.

https://javalab.org/en/precipitation_reaction_en/

Ionic solution 1	**Ionic solution 2**	**Precipitate formed (yes/no)**	**Name of precipitate (if formed)**
Barium chloride	Sodium sulfate		
Calcium chloride	Sodium carbonate		
Sodium sulfate	Potassium sulfate		
Silver nitrate	Sodium chloride		
Potassium nitrate	Barium chloride		

Watch:

https://www.youtube.com/watch?v=E1ODnGe9LnM

https://www.youtube.com/watch?v=KDR9HJhuvgQ

https://www.twigscotland.com/hi/7CCQOC46XUVT?next=https://www.twigscotland.com/experiment/precipitate-formation-4117/

Further Reading

To learn more about these analytical techniques, try the following online resources:

BBC Bitesize: https://www.bbc.co.uk/bitesize/guides/zx6csrd/revision/2

https://www.bbc.co.uk/bitesize/guides/zx6csrd/revision/3

Scholar: Log in through GLOW

National 5 Chemistry → Chemistry in Society → Chemical Analysis →

8.3.7. Preparation of insoluble salts by precipitation

8.4.2 Flame Testing

8.4.4 Testing for gases

Evans2 chem web: https://www.evans2chemweb.co.uk/

Username: snhs password: giffnock

Select any teacher → revision → National 5 → Unit 3: Chemistry in Society → Chemical Analysis

Complete self-check exercises in your class work jotter.

Self Check 11

1. The diagram below shows a sample being analysed in a flame test:

What colour would be produced from the following ions:
(You may wish to use the data booklet to help you.)
(a) Calcium
(b) Lithium
(c) Potassium

2. A technician found 4 bottles containing unknown solids. The results of flame tests are shown below:

Bottle	Flame Test Colour
A	Blue
B	Red
C	Yellow/Green
D	Lilac

(a) Match the bottles with the following compounds (1 of the bottles was contaminated with another compound!):
(You may wish to use the data booklet to help you.)

Sodium sulfate
Copper carbonate
Potassium chloride
Strontium nitrate

(b) Which substance was contaminated and what other metal ion was present?