C8 Chemical Analysis

What's the science story?

Analysts have developed a range of qualitative tests to detect specific chemicals. The tests are based on reactions that produce a gas with distinctive properties, or a colour change or an insoluble solid that appears as a precipitate.
Instrumental methods provide fast, sensitive and accurate means of analysing chemicals, and are particularly useful when the amount of chemical being analysed is small. Forensic scientists and drug control scientists rely on such instrumental methods in their work.

Previous knowledge:

KS3 – Reactions 1

Next steps…

N/A

Keywords

Pure
Mixture
Formulation
Separation
Chromatography
Solvent
Soluble
Chromatogram
Stationary phase
Mobile phase

Working scientifically skills:

WS2 - Draw/Interpret diagrams

Assessments:

Exit tickets x 1 (formative)

- **ET - Chromatography**

AQA GCSE Combined Science Trilogy (8464)

Lesson No. and Title	Learning objectives	AQA Specification	Practical equipment
1. Purity and Chromatography	4 – Identify pure substances from data and state what a formulation is. 5 – Justify the method for chromatography. 7 – Evaluate the method and use of equipment.	**5.8.1.1 Pure substances** In chemistry, a pure substance is a single element or compound, not mixed with any other substance. Pure elements and compounds melt and boil at specific temperatures. Melting point and boiling point data can be used to distinguish pure substances from mixtures. In everyday language, a pure substance can mean a substance that has had nothing added to it, so it is unadulterated and in its natural state, eg pure milk. Students should be able to use melting point and boiling point data to distinguish pure from impure substances. **5.8.1.2 Formulations** A formulation is a mixture that has been designed as a useful product. Many products are complex mixtures in which each chemical has a particular purpose. Formulations are made by mixing the components in carefully measured quantities to ensure that the product has the required properties. Formulations include fuels, cleaning agents, paints, medicines, alloys, fertilisers and foods. Students should be able to identify formulations given appropriate information. Students do not need to know the names of components in proprietary products. **5.8.1.3 Chromatography** Chromatography can be used to separate mixtures and can give information to help identify substances. Chromatography involves a stationary phase and a mobile phase. Separation depends on the distribution of substances between the phases. The ratio of the distance moved by a compound (centre of spot from origin) to the distance moved by the solvent can be expressed as its Rf value: Rf = distance moved by substance distance moved by solvent Different compounds have different Rf values in different solvents, which can be used to help identify the compounds. The compounds in a mixture may separate into different spots depending on the solvent but a pure compound will produce a single spot in all solvents. Students should be able to: • explain how paper chromatography separates mixtures • suggest how chromatographic methods can be used for distinguishing pure substances from impure substances • interpret chromatograms and determine Rf values from chromatograms and provide answers to an appropriate number of significant figures.	RP 12: Investigate how paper chromatography can be used to separate and tell the difference between coloured substances. Students should calculate Rf values. Inks, filter paper, beakers, lolly sticks, paper clips, pencils, rulers

2. Testing for common gases	5 – To describe how to test for hydrogen, oxygen, carbon dioxide and chlorine. 6 – To construct word/symbol equations to represent reactions.	**5.8.2.1 Test for hydrogen** The test for hydrogen uses a burning splint held at the open end of a test tube of the gas. Hydrogen burns rapidly with a pop sound. **5.8.2.2 Test for oxygen** The test for oxygen uses a glowing splint inserted into a test tube of the gas. The splint relights in oxygen. **5.8.2.3 Test for carbon dioxide** The test for carbon dioxide uses an aqueous solution of calcium hydroxide (lime water). When carbon dioxide is shaken with or bubbled through limewater the limewater turns milky (cloudy). **5.8.2.4 Test for chlorine** The test for chlorine uses litmus paper. When damp litmus paper is put into chlorine gas the litmus paper is bleached and turns white.	PRAC - Gas tests Hydrogen – Mg, acid and splints Oxygen – Hydrogen peroxide, manganese oxide and splints Carbon dioxide – Limewater, acid and marble chips. Chlorine – Electrolysis equipment and copper chloride