# Scheme of work

## Combined Science: Trilogy - Foundation

## Chemistry – Chemical analysis

This resource provides guidance for teaching the Chemical analysis topic from our new GCSE Combined Science: Trilogy specification (8464). It has been updated from the draft version to reflect the changes made in the accredited specification. These changes are also reflected in the learning outcomes and opportunities to develop skills.

The scheme of work is designed to be a flexible medium term plan for teaching content and development of the skills that will be assessed.

It is provided in Word format to help you create your own teaching plan – you can edit and customise it according to your needs. This scheme of work is not exhaustive; it only suggests activities and resources you could find useful in your teaching.

### 5.8 Chemical analysis

#### 5.8.1 Purity, formulations and chromatography

| **Spec ref.** | **Summary of the specification content** | **Learning outcomes**  *What most candidates should be able to do* | **Suggested timing (hours)** | **Opportunities to develop scientific communication skills** | **Opportunities to develop and apply practical and enquiry skills** | **Self/peer assessment**  **Opportunities and resources**  *Reference to past questions that indicate success* |
| --- | --- | --- | --- | --- | --- | --- |
| 5.8.1.1 | 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. | Be able to use melting point data to distinguish pure from impure substances.  WS 2.2, 4.1 | 1 | Define the terms  • pure substance  • compound.  Recall melting and boiling points.  Identify the contents of mineral waters sold as pure water.  Draw diagrams to illustrate pure distilled water with bottled water. | Students investigate the difference in boiling points of two unknown samples of water (brine and distilled) to determine which one is not pure water. | [Exampro user guide PowerPoint](http://filestore.aqa.org.uk/resources/science/AQA-GCSE-SCIENCE-EXAMPRO-UG.PPTX) |
| 5.8.1.2 | 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. | Identify formulations given appropriate information.  Students do **not** need to know the names of components in proprietary products.  WS 1.4, 2.2 | 1 | Define the terms:  • mixture  • formulation.  Carry out one or more of the applied chemistry experiments.  Produce a display that describes the composition of the one of the following formulations:  • fuel  • cleaning agents  • paints  • medicines  • alloys  • fertilisers  • foods.  Identify the purpose of the chemicals in the chosen formulation and share with class. | Making soap: [Nuffield Foundation - Making Soap](http://www.nuffieldfoundation.org/practical-chemistry/making-soaps-and-detergents)  Making glue: [Nuffield Foundation - Making a glue](http://www.nuffieldfoundation.org/practical-chemistry/developing-glue)    Making cut flower preservative: [RSC - Making a cut flower preservative](http://www.rsc.org/learn-chemistry/resource/res00001203/secret-in-the-sachet)  Comparing detergents: [RSC - comparing light and heavy duty detergents](http://www.rsc.org/learn-chemistry/resource/res00001715/comparing-light-and-heavy-duty-detergents)  Producing a foam: [RSC - producing a foam](http://www.rsc.org/learn-chemistry/resource/res00000477/producing-a-foam)    Making milk of Magnesia: [RSC - Making milk of magnesia](http://www.rsc.org/learn-chemistry/resource/res00000924/challenging-medicines-making-medicines-practicals-and-ppt#!cmpid=CMP00001267)  Investigating pigments:  [RSC - Investigating pigments](http://www.rsc.org/learn-chemistry/resource/res00001193/pigments)  Making fertiliser: [RSC - Making a fertiliser](http://www.rsc.org/learn-chemistry/resource/res00000475/making-a-fertiliser?cmpid=CMP00000545)    Making an alloy: [RSC- Making an alloy solder](http://www.rsc.org/learn-chemistry/resource/res00001742/making-an-alloy-solder) |  |
| 5.8.1.3 | 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:  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. | 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.  Provide answers to an appropriate number of significant figures.  WS 2.4, 2.6  MS 1a, 1c, 1d, 2a | 2 | Describe a method for paper chromatography.  Describe what happens to substances during the process of chromatography.  Describe what the Rf value is and write instructions on how to calculate the Rf value.  Use chromatograms to work out Rf values.  Describe how chromatographic methods could be used to find out whether a substance was pure or not. | **Required practical 12:**  Investigate how paper chromatography can be used to separate and tell the difference between coloured substances. Students should calculate Rf values.  AT skills covered by this practical activity: 1 and 4. | Video clips  YouTube:  [Basics of chromatography](https://www.youtube.com/watch?v=SnbXQTTHGs4&list=PLf9x1YPYxxybEystKXSdzqMnw-7wlJ8PY)  YouTube:  [Paper and thin layer chromatography](https://www.youtube.com/watch?v=ByJ6lzD2Vbg) |

#### 5.8.2 Identification of common gases

| **Spec ref.** | **Summary of the specification content** | **Learning outcomes**  *What most candidates should be able to do* | **Suggested timing (hours)** | **Opportunities to develop scientific communication skills** | **Opportunities to develop and apply practical and enquiry skills** | **Self/peer assessment**  **Opportunities and resources**  *Reference to past questions that indicate success* |
| --- | --- | --- | --- | --- | --- | --- |
| 5.8.2.1 | 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. |  | 0.5 | Describe the test for hydrogen. | Demonstrate the combustion of hydrogen: [Nuffield Foundation - Combustion of hydrogen in air](http://www.nuffieldfoundation.org/practical-chemistry/combustion-hydrogen-air)  Carry out a simple test for hydrogen: [RSC- Generating, collecting and testing gases](http://www.rsc.org/learn-chemistry/resource/res00000693/generating-collecting-and-testing-gases) | Video clip  YouTube: [Testing for hydrogen, oxygen, carbon dioxide, (ammonia) and chlorine](https://www.youtube.com/watch?v=_GqBl83Koig) |
| 5.8.2.2 | The test for oxygen uses a glowing splint inserted into a test tube of the gas. The splint relights in oxygen. |  | 0.5 | Describe the test for oxygen. | Demonstrate that water contains dissolved oxygen so fish can breathe: [Nuffield Foundation - Find out if tap and sea water contain dissolved solids](http://www.nuffieldfoundation.org/practical-chemistry/find-out-if-tap-water-and-sea-water-contain-dissolved-solids)  Carry out a simple test for oxygen: [RSC - Generating, collecting and testing gases](http://www.rsc.org/learn-chemistry/resource/res00000693/generating-collecting-and-testing-gases) |  |
| 5.8.2.3 | 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). |  | 0.5 | Describe the test for carbon dioxide. | Carry out a simple test for carbon dioxide: [RSC- Generating, collecting and testing gases](http://www.rsc.org/learn-chemistry/resource/res00000693/generating-collecting-and-testing-gases) |  |
| 5.8.2.4 | The test for chlorine uses litmus paper. When damp litmus paper is put into chlorine gas the litmus paper is bleached and turns white. |  | 0.5 | Describe the test for chlorine. | Small amounts of chlorine can be generated from the electrolysis of brine: [RSC - Generating, collecting and testing gases](http://www.rsc.org/learn-chemistry/resource/res00000693/generating-collecting-and-testing-gases) |  |