



Cheshire and Stockport Science Learning Partnership

## Cheshire & Stockport SLP Newsletter – February 2018 (1)

This week we are celebrating STEM clubs; in fact 5-10 February is STEM clubs week and there are lots of ways to get involved:

<https://www.stem.org.uk/news-and-views/news/celebrating-stem-clubs>

There are lots of benefits too: From increasing interest in science, to raising a student's science capital (in summary, their experiences of science); to having the chance to do something beyond the curriculum; to enhancing relationships and many more positives.

BP also has a range of interesting resources: <http://bpes.bp.com/stem-clubs/>

And there's more here from Cisco: <https://www.stem.org.uk/enrichment/competitions-challenges/cisco-little-big-futures>

In fact any activity where students can use their skills and experience to tackle a science related challenge would be a good basis.

Another great way of inspiring students is with STEM ambassadors – these are volunteers who work in STEM related careers and are willing to come to schools to share their experiences with students.

Find out more here:

<https://www.stem.org.uk/stem-ambassadors>

Or use these videos to help students understand what engineers do: [ow.ly/5Uth30i8g27](http://ow.ly/5Uth30i8g27)

How about getting students to design a poster – competition here:



<https://www.britishtscienceweek.org/plan-your-activities/poster-competition/>

This week, I am going to focus on practicals in the new GCSEs; inspired by this piece from AQA, but generalising across the different awarding bodies.

## In January 2018, you asked us...

### What does practical assessment in the exam look like?

tudents should expect to see questions that:

- cover different aspects of the required practicals, from hypothesis through to evaluation
- show the required practicals set in a different context for Assessment Objective 2 (AO2)
- cover the criteria for working scientifically (much of this was assessed as part of controlled assessment in the previous specification)
- use the  [subject specific vocabulary \(143.9 KB\)](#)  which gives definitions of the key words used in practical science.

So how do we cover different aspects of the 'required' practicals? One way would be to list the different practicals and then decide which aspect to focus on with each practical: would the activity be better suited to developing a hypothesis; or writing a method; determining which results to collect; processing the data generated or evaluating the procedure. Make sure that all aspects are covered across all the practicals. For example – titration is good for writing a method and for processing results – particularly identifying which titres to use.

You might produce a table like this:

Essential practical	Aspect to focus on	Suggested activities for students
Making salts	Method; choice of equipment	Card sort of stages; Partial method to complete
Neutralisation	Method & processing data	Justify choice of equipment; Perform calculations on given data
Electrolysis	Hypothesis; recording observations	Predict products made for different electrolytes; Design results table
Temperature changes	Processing data; evaluation	Calculate temperature changes; draw graphs; suggest how to improve method
Rate of reaction	Processing data; evaluate method	Draw graphs; calculate rate/gradient; spot errors in diagrams of equipment
Chromatography	Writing a method; application	What happens if questions? E.g. I draw the origin in pen/I use permanent marker etc.
Identifying ions	Collecting data	Card sort of tests and results
Water purification	Writing a method; application	Ques such as what would the temperature on the thermometer read? Give different mixtures to separate

Taking one particular aspect – writing a method – there are lots of ways to approach this – from giving students a set of steps to sequence

### Put these steps in order

- a) Adjust level of acid to  $0\text{cm}^3$
- b) Close tap
- c) Add a few drops of phenolphthalein indicator to the conical flask
- d) Carefully fit pipette filler to pipette
- e) Clamp burette in place
- f) Using a funnel fill burette with acid
- g) Pipette 25mls of sodium hydroxide into the conical flask

To adding in un-necessary steps for students to remove; starting a method for them to complete; providing different versions of a written method to rank or correct; providing incorrect methods to rectify; providing diagrams drawn wrongly for them to correct; providing basic methods to improve; what else can you add?

Cover the criteria for working scientifically – remember the exam covers all the contents of the specification; have a look back at what working scientifically means. It will include – the development of scientific thinking; experimental skills and strategies; analysis and evaluation; and vocabulary, units, symbols and nomenclature. Where do students learn about the nature of scientific discovery? When do they get the chance to design experiments and select equipment? Can they analyse and evaluate their experiments? And are they fluent in the language of science? Are you using the subject specific vocabulary for your exam board and subject? Have you thought about some simple starter quizzes to ensure familiarity with the key terminology? Can students recognise and write units? Can they inter-convert? Again starters where they convert litres to millilitres and  $\text{cm}^3$  to  $\text{dm}^3$  don't take much time. Remember to include the different terms – get them to convert mls to  $\text{dm}^3$  and so on; until it becomes automatic – familiarity breeds success!

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AO2 – the application objective is the basis for a lot of discussion. Can you think of an application for the different techniques employed? Can you think of a variant of the practical? Here are some suggestions as a starter.

Essential practical	Application	Variation of practical
Making salts	Indigestion remedies; neutralisation of acidic lakes/soils	Use different combinations of acid and base; contrast with titration – another form of neutralisation
Neutralisation	Determining the amount of acid in vinegar	Use different indicators; use different acids/alkalis; use of a pH probe to measure change in pH
Electrolysis	Extraction of metals; chlor-alkali industry; electroplating	Use different electrolytes; colourful electrolysis (RSC); microscale electrolysis of Copper chloride (CLEAPPS);
Temperature changes	Cool packs; heating packs;	Different combinations of chemicals; metal displacement reactions
Rate of reaction	Industrial processes; digestion of food; sizes of lumps of coal on the fire; storing food in the fridge	Microscale rate of reaction – great for evaluation – are drop sizes uniform?; decomposition of hydrogen peroxide of different concentrations
Chromatography	Analysis of food additives; quality assurance of drug samples;	Try different solutes – chlorophyll from different plants; food dyes; pen inks and different solvents. Try plates as well as paper.
Identifying ions	Analysis of water samples; colours of fireworks	Link the amount of precipitate produced to the concentration of the ion present.
Water purification	Purification of any liquid; fractional distillation	Separation of any two liquids with differing boiling points; or a liquid from a solute

Some useful resources:

<https://eic.rsc.org/feature/know-your-poison-the-festival-chemical-safety-net/3007847.article>

(Identification of ions)

<https://eic.rsc.org/feature/precious-water/3008282.article> (Water purification)

<https://eic.rsc.org/cpd/practical-electrolysis/3007573.article> (Electrolysis)

<https://eic.rsc.org/cpd/moles-and-titrations/2000006.article> (Titration)

<https://eic.rsc.org/cpd/rate-experiments/3008551.article> (Rate)