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

How about getting students to design a poster – competition here:
https://www.britishscienceweek.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:

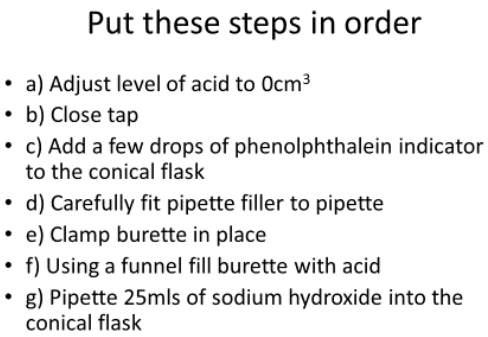
- cover different aspects of the required practicals, from hypothesis through to evaluation
- show the required practicals set in a different context for Assessment Objective 2 (AO2)
- cover the criteria for working scientifically (much of this was assessed as part of controlled assessment in the previous 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;<br>Partial method to complete |
| Neutralisation | Method & processing data | Justify choice of equipment;<br>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




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 the 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 $cm^3$ to $dm^3$ don't take much time. Remember to include the different terms – get them to convert mls to $dm^3$ 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)