

Chemistry at Work – a guide for presenters (Scotland, primary)

Thank you (and your organisation) for agreeing to give a presentation at the forthcoming Chemistry at Work event at XXXXX on DDDDDD, which is for students aged FFFF.

The Chemistry at Work programme is sponsored by the Royal Society of Chemistry and has been running since 1991. There will be about 40 events this year across the UK.

More general information about Chemistry at Work can be found at <http://www.rsc.org/lap/educatio/chemwork.htm>. For information about this particular event, please contact the Local Organiser, XXXX, on YYYYYY.

These notes are aimed to help you give the best possible presentation to your audience of young people.

Aims

The aims of Chemistry at Work are:

- To present a positive image of chemistry and the chemical sciences to young people at school or in college
- To show the variety of what chemists do and how chemistry is part of some jobs where it may not have been expected
- To show that chemistry is an important part of the economy of the country
- To show that chemistry is an interesting and exciting way to earn a living
- To show that chemists are real people (and not nerds).

The events are *not* primarily careers events (although if students leave the event favourably disposed towards a career in chemistry this would be a bonus). Neither are they primarily aimed at teaching students chemistry (although if they leave the event with some extra knowledge, this, too, is a bonus).

What is a Chemistry at Work event like?

Every Chemistry at Work event is different in detail and has its own character. The following points describe a typical event.

- It is aimed at young people at school (different events cater for different age groups from primary to post-16)
- It takes place at a venue such as a school, college, university, conference centre, industrial workplace, *etc*
- It lasts from 1 to 3 days
- It takes the form of a 'circus' of several (typically six to eight) short (approximately 25 minute) presentations in which presenters explain how they use chemistry in their everyday work. This may then lead to a related practical activity that is linked (in some way) to their work
- Ideally presentations are interactive and 'hands on' as much as possible
- Small groups of students (15 to 20) move around the presentations accompanied by a teacher
- Each student will spend half a day at the event and experience about six presentations
- Some events finish with a talk / demonstration to all, often with a 'wow' factor
- It is visited by up to 300 students per day.

Preparing your presentation

Outline

Your presentation will be about 25 minutes long. A presentation for young people needs to be different in many respects from one aimed at adults:

- You will need to grab their attention – the students may not be at your presentation by choice
- You will need to break up your presentation – children have shorter attention spans than adults
- You will need to be aware of the chemistry that your audience does and does not know
- Your presentation will need to be interactive and ‘hands on’ wherever possible
- You will need to take care with technical terms, jargon and long words.

It will not be possible to cover a lot of detail in the time available, so choose three or four points that you would like to get across. Break up your talk by giving the audience things to look at, pass round or do. Vary your tone of voice. If possible have two (or more) presenters (ideally of different genders and/or ethnicities) to give the audience a different person to look at and a different voice to hear.

Content

Remember that you are not primarily trying to teach chemistry or sell chemistry as a career (at least directly). Your brief is to tell the students about how you use chemistry in your work, how your work fits in with everyday life and why you find your work interesting and stimulating. If at all possible, try to include something active for the students to do. Some simple practical work may be possible even if the event is not held in a laboratory.

Health and safety

The Local Organiser is responsible for general H&S issues such as what to do in the event of an emergency, but do make sure that you are aware of these too. The Local Organiser may not be a chemist and cannot be responsible for any issues to do with any demonstration you might do. You may be asked to fill in a simple risk assessment form. If you have any queries about this, contact the Organiser who can get advice from the National Coordinators.

Know your audience

It is important that you bear in mind the chemistry that your audience will know (and not know) when preparing your presentation. The best way to do this is to check on the various chemistry-containing courses that students follow in Scotland. More details about these courses are given in **Appendix 1** but the table below summarises the stage students have typically reached at certain ages.

Course	Level reached (5-14 only)	Age
5-14 Environmental Studies	A/B	5-7
5-14 Environmental Studies	C/D	7-11
5-14 Environmental Studies	D/E/F	11-14
Standard Grade or Intermediate 2	NA	14-16
Intermediate 2 or Higher or Advanced Higher	NA	16+

One can be confident that students on a particular course will have covered the material in earlier courses. Higher is above the level of Intermediate 2 and Standard Grade; and Advanced Higher is obviously above Higher. Students at the stage of 5-14 Environmental Studies will have very little knowledge of formal chemistry.

Presentation software

Powerpoint™ and similar presentation software is excellent but beware of basing your whole presentation around it. If all the presenters use it, it can lead to a rather dull experience for the students. *You* are the resource they have come to see and hear!

If using Powerpoint™ structure your presentation so that it asks questions.

Also make sure that equipment is available at the venue if you are not bringing your own.

Tips for talking to primary children

1. Children are not small adults

- Children may not be at your talk by choice – most adult audiences are (at some level!)
- Children will not share your vocabulary – both general language and technical, but they do enjoy ‘big words’. Take time to explain what they mean, then model their use by giving examples.
- Many primary children will not understand that words such as ‘solution’ have more than one meaning – use concrete examples to make the meaning clear, and link technical words to everyday-life situations wherever possible
- Children have shorter attention spans than adults – in minutes this is approximately equal to their chronological age in years plus two. This means that the average Reception child (‘year 0’) will be able to concentrate for about six minutes, and the average Year 6 child for about 12 minutes. Break up the workshop / talk with opportunities for the children to move about, for example to look at something, and ‘chunk’ the sessions into small sections.
- Some children may lack the confidence to interact with the speaker – ask questions, interrupt *etc*, especially in large groups. Most children will respond well in small groups. It may help to break up the session by asking the children to discuss something in small groups, and then feed back to the large group. This could be linked to the previous bullet point. For example saying to the children ‘I want you to talk about ‘x’ and decide if you agree or disagree’, involves them moving to discuss in small groups and moving back again.
- Young children will be keen to share their personal experiences, for example ‘My Daddy has some of that in his car’, and may ‘go off at a tangent’. They need to be guided gently back on task. Children are generally happy to have a brief acknowledgement of their contribution, and to accept that the

discussion will jump back to where it was. Don't feel rude for not responding to 'red herrings' in detail.

2. Say where you are going

Pick a small number of points (one or two) that you want to get across

- Say what your point is going to be.
- Start with the 'big picture'. How does your point fit into the children's understanding of the world?
- Link it to children's experiences.
- Develop it. If possible, provide practical opportunities to illustrate it.
- Share findings and recap what the main message is.

3. Be varied

- Children are used to regular changes of activity rather than concentration on one long argument – look at a children's magazine or TV programme if you don't believe this.
- Give the audience things to do, hear, see, (even feel or smell, if appropriate).
- Have more than one presenter to vary tone of voice and delivery (better still if one is male, one female).
- Involve the audience – get them to help with demonstrations
- Ask questions - but be prepared to wait for answers and don't be thrown if you get no answer at all or an unexpected answer. Children do not have preconceived ideas about what is expected in certain situations. It may be necessary to unpick misconceptions.

4. Things to avoid

- Jargon – this could be:
 - *technical terms (eg solution, dissolving – although the oldest primary pupils should have encountered these words)
 - *passive language ('it can be shown that')
- Being derogatory (by implication) about their attainments eg 'I knew all about melting and freezing at primary school'
 - *You probably didn't
 - *There will be plenty of things they can do that you couldn't at their age (such as surfing the internet)
- Aping 'yoof' culture – don't talk about the latest pop group, trends, fashions *etc* unless you are sure of your ground 'daddy-oh'.
- Talking down to children. They like to feel grown up!
- Sexism and racism – these are almost always implicit rather than deliberate, but what message does it give if the presenter is always selecting boys to answer questions or help with a demonstration?
- Being threatening – don't imply they are stupid if they can't or won't answer questions. Children respond well to praise and encouragement.

5. Do

- Introduce yourself, your organisation and your place in it. 'I'm Freda Smith and I work for ----- which makes -----'. I make sure that all the ----- are -----'.
- Involve as much practical work as possible – this is the best way to develop understanding.
- Take 'goodies' to give away – company pens, posters *etc etc*.

- Visit the venue beforehand. Is there an OHP, projection screen, data projector *etc*?
- Praise answers to questions even if they are not the ones you expected / hoped for
- Use analogies to explain difficult ideas – for example 1 part per million is the same as a £5 note hidden in a pile of paper 50 m high (about the height of a 15 storey building).
- If possible, talk to the teacher or organiser beforehand to find out about the group and their background.
- Time your talk / activity to fit the slot.

6. Watch out for

- Units – most children will not be familiar with non-metric units – inches, pounds *etc*.
- Chemical names – children will know chemicals by everyday names such as ‘white spirit’, vinegar, nail varnish remover.
- Chemical notation – only the most able Year 6 students will have encountered this at all.
- Make sure that you and your AVAs are visible and audible – sit at the back beforehand – can you see your OHTs? It is most frustrating (and only too common) to hear speakers say ‘I know you can’t read this at the back but...’

Appendix 1

5-14 Environmental Studies

The following is taken from the *Materials from Earth* and *Changing materials* (ie Chemistry) sections of the 5-14 Environmental Studies guidelines.

You may find it useful to skim the appropriate sections for the age group at which your presentation is aimed to get a feel for the level at which these young people are working.

The entire 5-14 Environmental Studies guidelines can be found at <http://www.ltscotland.org.uk/5to14/guidelines/environmentalstudies/index.asp>.

Materials from Earth

Pupils are able to

Level A

- recognise and name some common materials from living and non-living sources
- give examples of uses of some materials based on simple properties
- give the main uses of water.

Level B

- make observations of differences in the properties of common materials
- relate uses of everyday materials to properties
- explain why water conservation is important.

Level C

- describe the differences between solids, liquids and gases
- give some everyday uses of solids, liquids and gases.

Level D

- describe the internal structure of the Earth
- describe the processes that led to the formation of the three main types of rock
- give examples of useful materials that we obtain from the Earth's crust
- describe how soils are formed
- name the gases of the atmosphere and describe some of their uses.

Level E

- describe the particulate nature of solids, liquids and gases and use this to explain their known properties
- describe what is meant by an element
- describe how physical properties of elements are used to classify them as metals or non-metals.

Level F

- describe some features of the structure of the atom
- describe some of the characteristic features of the periodic table
- explain the water cycle using the particulate model.

Changing materials

Pupils are able to

Level A

- make observations of the ways in which some materials can be changed by processes such as squashing, bending, twisting and stretching.

Level B

- describe how everyday materials can be changed by heating or cooling
- give examples of everyday materials that dissolve in water
- give examples of common causes of water pollution.

Level C

- describe changes when materials are mixed
- describe how solids of different sizes can be separated
- distinguish between soluble and insoluble materials
- describe in simple terms the changes that occur when water is heated or cooled.

Level D

- describe what happens when materials are burned
- explain how evaporation and filtration can be used in the separation of solids from liquids
- describe the effect of burning fossil fuels.

Level E

- give examples of simple chemical reactions, explaining them in terms of elements and compounds
- describe the effect of temperature on solubility
- describe the use of pH to measure acidity
- describe the process of neutralisation and give some everyday applications
- describe what happens when metals react with oxygen, water and acids
- describe how metal elements can be extracted from compounds in the Earth's crust.

Level F

- give examples of the ways in which the rates of chemical reactions can be changed
- distinguish between chemical and physical changes
- give examples of chemical reactions using word equations.

The quickest way to get an idea of the content of chemistry courses for 14+ is probably to locate their description on the internet. The URLs of the various courses are as follows:

Standard Grade

http://www.sqa.org.uk/files/nq/SG_Chemistry.pdf

Intermediate 2

http://www.sqa.org.uk/files_ccc/Chemistry_Int2.pdf

Higher

<http://www.sqa.org.uk/files/nq/ChemistryH.pdf>

RS•C

Advanced Higher

<http://www.sqa.org.uk/files/nq/ChemistryAH.pdf>

To download these documents you will need to visit the main Scottish Qualifications Authority website at

<http://www.sqa.org.uk/>

The site is tricky to navigate but you should identify yourself as a teacher and then select chemistry as the subject. The documents are known as "arrangements documents".