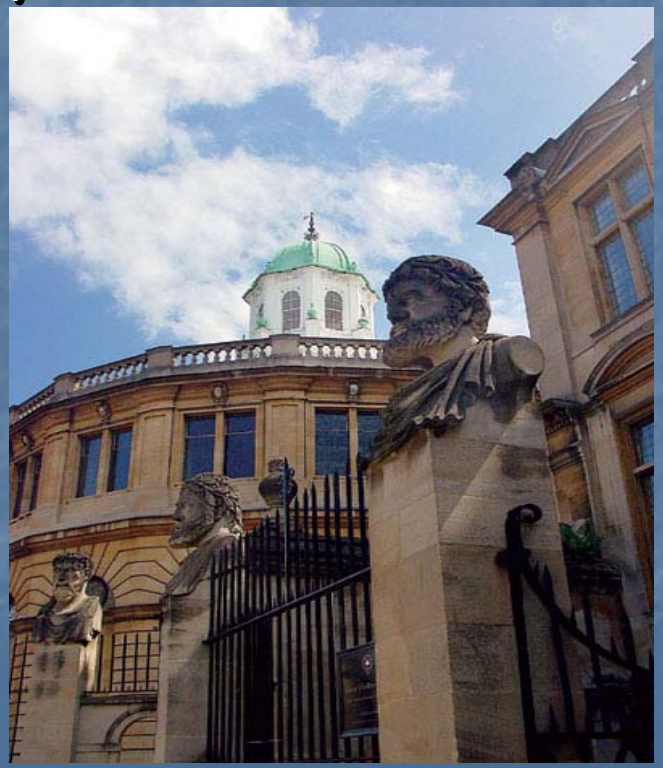
Chemical safety in the classroom – helping your students understand what it's all about

Hugh Cartwright

Chemistry Department
Oxford University, England.



Outline

- Why is safety important?
- How should we teach safety?

Safety is important because… (1)

Laboratories are dangerous places

The methanol flame test

Safety is important because… (2)

- Through safety we can teach science
- Why is methanol dangerous?
- … it burns
- … it has a non-luminous flame
- … it is very volatile, so dangerous levels of vapour can build up

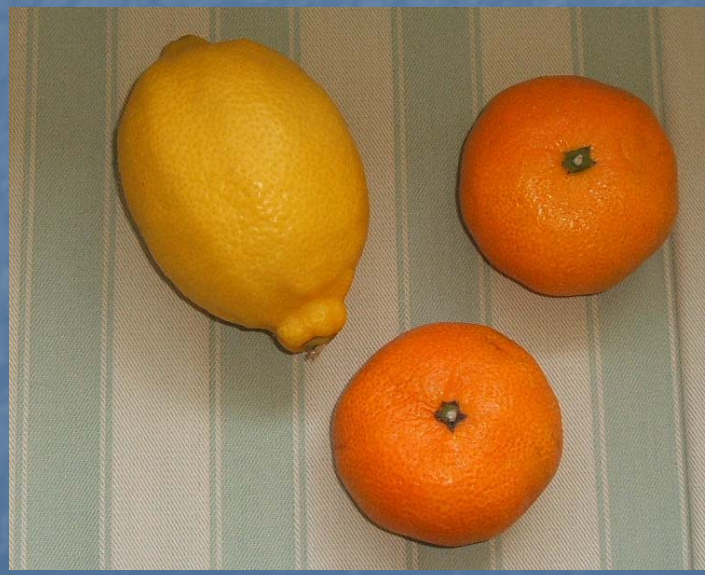
Safety is important because… (3)

A proper understanding of chemical properties is crucial (particularly for adults!)

Phenylimidazopyridine

Acetaldehyde

Sudan I

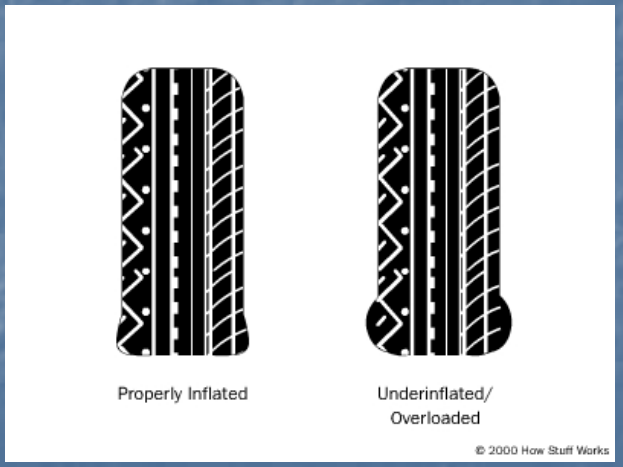


Principles of teaching safety

- 1. Impose a requirement of safe working
- 2. Do not put students off
- 3. Be cautious about treating safety as a standalone topic

More principles

4. Safety is crucial from the moment that an experiment begins



Preparation

- 5. Offer students information, but encourage them to research safety data for themselves. This must be recorded before the experiment begins.

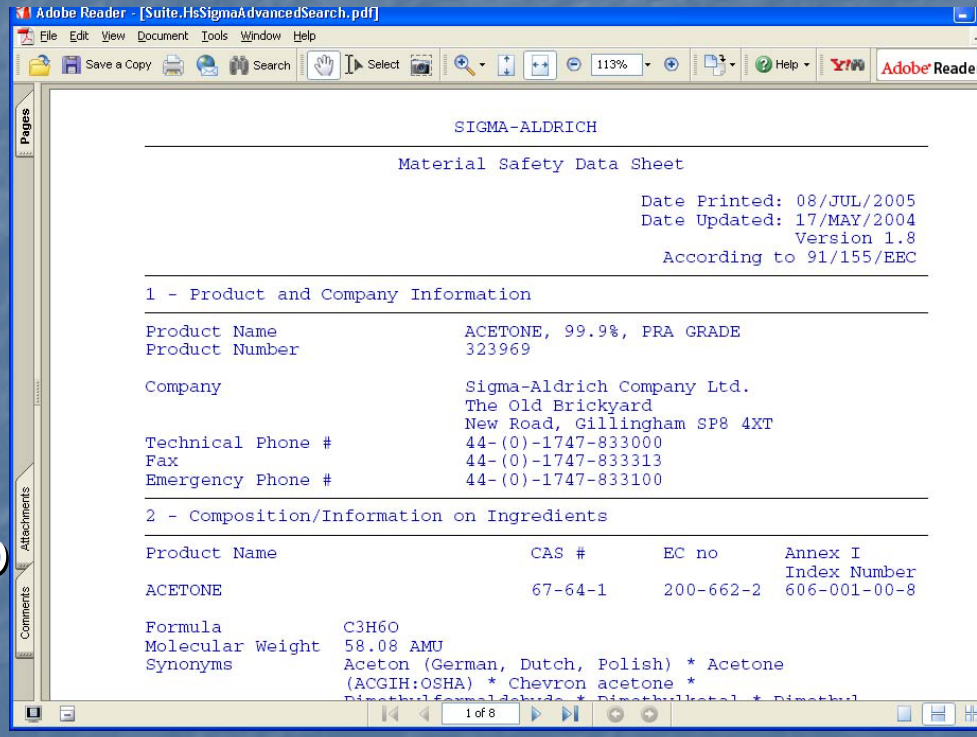
- Is a new chemical 

or just 

?

More preparation

- 6. Spread the burden of preparing safety notes among students
- 7. Tailor your approach to each group



Background

- 8. Explain at an early stage that everything is chemical.

Safety and demonstrations

- 9. Give every demonstration a scientific justification – science can (should…) be entertaining, but is not about entertainment

Scientific debate

- 10. Environmental debates can be helpful. Encourage students to take sides, but conduct the debates in an unbiased and science-based fashion.

Safety and the environment

- 11. Encourage students to recognize the links between environmental and ethical issues alongside the science…

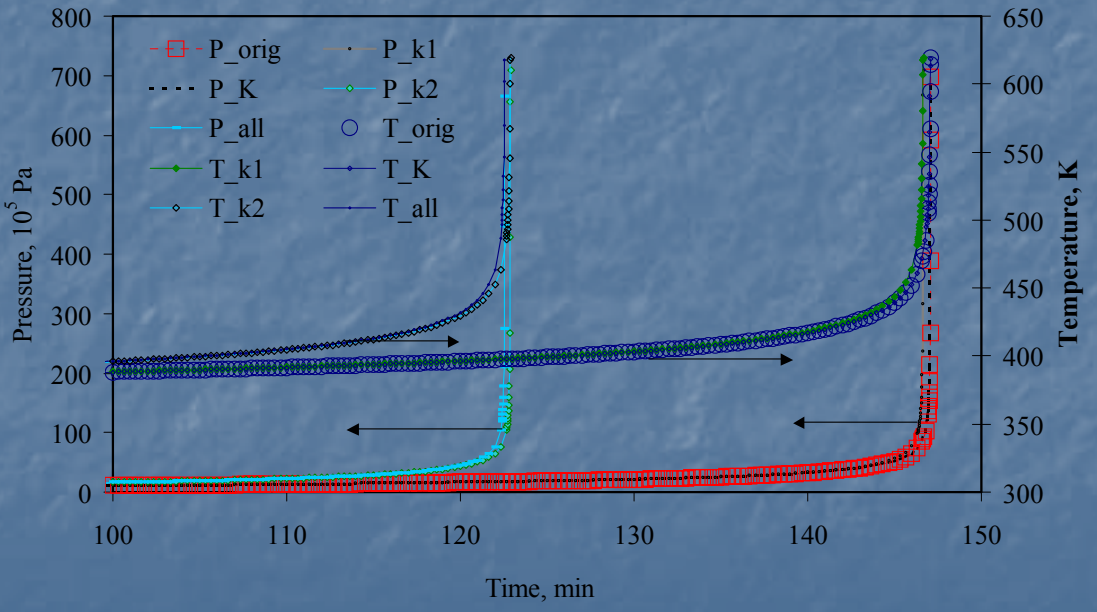
- 12. …and to appreciate that environmental issues are often complex (effectiveness may be a trade-off against toxicity)

Safety and chemistry

- 13. Relate the hazards posed by a chemical to its position on the periodic table and to the behaviour of similar chemicals

Safety in processes

- 14. Demonstrate that both the properties of chemicals and those of processes may present hazards (why has the runaway occurred?)



Sources of safety information

- Chemical suppliers (e.g. Sigma Aldrich)
  - http://www.sigmaaldrich.com/
- HSci chemical safety database
  - http://ptcl.chem.ox.ac.uk/~hmc/hsci
- Physical & Theoretical Chemistry Lab, Oxford University, Safety database
  - http://ptcl.chem.ox.ac.uk/MSDS