Alcohol Fires

It is probable that the single biggest cause of serious accidents in school laboratories is fire caused by burning ethanol (alcohol, methylated spirits). Because ethanol is commonly found in the home, it may not be treated in school science with the respect that it deserves. Ethanol is highly flammable. At any temperature above 12°C, ethanol liquid produces sufficient vapour to ignite with air when a spark of flame is applied (its flash point is 12°C). At a temperature above 420°C. ethanol vapour will ignite spontaneously in air (auto-ignition point). Mixtures of ethanol with air will explode with anything from 3.3% to 19% ethanol.

There seems to be three distinct uses of ethanol in school science:

1. as a fuel
2. as a solvent
3. in a variety of experiments related to its physical properties.

As described in another note in this issue, there have been three very serious accidents, in which pupils were badly injured, when ethanol was in use as a fuel for steam engines. There is no need to continue using ethanol for this purpose: solid fuels are readily available. Ethanol is also used in spirit burners, which may be found in primary schools where there is no gas supply. Spirit burners vary greatly in design: some are much more stable than others, but in any case should always be stood in a shallow metal tray (e.g. a baking tray) to contain spillages.

Ethanol is commonly used as a solvent for extracting chlorophyll from leaves, or in re-crystallising a variety of organic substances. Ethanol, whether in a test tube or beaker, should never be heated by a naked flame. In a recently reported accident, ethanol trapped behind a plug of leaves in a test tube, suddenly exploded out onto a nearby pupil. The accident was made worse by the fact that the ethanol caught fire, as a result of a naked flame.

One way of avoiding this problem is to boil a beaker of water, extinguish the Bunsen flame, and then use the still hot water to warm the ethanol in a test tube. As the boiling point of ethanol is some 20°C below that of water, the latter remains more than hot enough for some time. However a better strategy is to avoid naked flames altogether: an ordinary domestic kettle is an excellent source of hot water for all sorts of laboratory purposes.

We have heard of several accidents where ethanol was being used as a non-aqueous alternative to water. For example, ethanol being directly heated in order to fill an ethanol-in-glass thermometer, caught fire, injuring a pupil. In another incident, ethanol was being boiled away in cut-off Cola Cola cans, in order to determine its latent heat of vapourisation: again a pupil received serious burns when the ethanol caught fire.

We repeat: ethanol should never be heated directly by a naked flame. Flames should be at least three metres away, and preferably all flames in the laboratory should be extinguished. Hot water from a domestic kettle is a convenient source of heat for many purposes.

This item was originally published in *EiS* in January 1986 and was checked by the ASE Health & Safety Group in July 2015 to ensure it still offers valid advice.