scottish schools education research centre

Bulletin 269 Health & Safety

©SSERC 2019 - ISSN 2631-794X WINTER 2019

Safety in Microbiology
Level 3 training

Safety in Microbiology – A Code of Practice for Scottish Schools and Colleges (SSERC 2018) [1], the most recent edition of which was issued to schools in December 2018, contains guidance on the safe handling of micro-organisms for local authority and SSERC member schools and colleges. In most cases, local authority, or independent school/college, employers have adopted the Code of Practice to meet the requirements of the COSHH Regulations and of other related health and safety legislation.

Where the Code of Practice has been adopted by an employer, various training requirements are necessary for microbiological work to be undertaken according to the Code of Practice guidance.

The following extracts from the Code of Practice refer to training requirements:

1.8 The level of work with micro-organisms that a teacher or technician may undertake will be limited by the training that the teacher or technician has undergone.

Training required for work at level 1
2.2 [At level 1] No specialist training is required.

Training required for work at level 2
3.1 For class laboratory work with learners at level 2 a science teacher does not require specialist (level 3) training. However, teachers may prefer and feel more confident in managing level 2 laboratory class work if they are trained to level 3.

3.2 Support for science teachers with limited experience of microbiology could be provided in a short in-school training session from a more experienced technician or teacher colleague. Such support could be based on the SSERC Microbiological Techniques [2] resource materials.

3.3 Teachers of level 2 classes must be trained in dealing with spillages.

3.4 In order for level 2 class laboratory work to be safely carried out, personnel trained at level 3 must be available to carry out the preparation, maintenance and disposal level 3 tasks necessary to support level 2 work.

Training required for work at level 3
4.1 For level 3 work technicians and teachers are required to be trained to level 3. They must have undertaken and achieved the competence standards of the SSERC Safety in Microbiology for Schools course. Senior phase students may be trained to carry out a range of level 3 tasks for

>>

Other topics

specific experiments or project work. Such students must be supervised by a teacher or technician trained to level 3.

4.2 The following level 3 tasks are normally required to be carried out in an establishment in support of level 2 work:
a) order, receipt, labelling and storage of cultures;
b) preparation of sterile media and sterile equipment;
c) preparation of cultures for class use;
d) maintenance of stock sub-cultures;
e) sampling from bioreactors;
f) sterilisation and disposal of cultures;
g) sterilisation of used equipment;
h) management of incidents of spillage;
i) staining of incubated plates (e.g. starch agar).

Determination of competence to carry out level 3 tasks

To operate within the Code of Practice school technicians who are preparing and disposing of materials for level 2 work must be trained to level 3. There is no absolute requirement for teachers to be trained to level 3 (unless they are carrying out, or supervising level 3 tasks).

A teacher or technician is considered competent to carry out level 3 tasks if they have undertaken and achieved the competence standards of the SSERC course, Safety in Microbiology for Schools, which has been SCQF Credit and Levelled by SQA. However, employers may consider an individual competent if they have undertaken a degree, course or work-based training that allows them to meet the same competence standard within the last five years. SSERC sometimes receives enquiries from teachers or technicians outlining their qualifications and asking us to determine their competence to undertake level 3 work. SSERC can only explain the guidance, it is for the employer to make the decision.

Level 3 refresher training

From time to time SSERC also receives enquiries, from individual technician/teachers who have already passed the Safety in Microbiology for Schools course, regarding refresher training. If an employer has a policy on refresher training, individuals must adhere to their employer's requirements. Otherwise, there is no hard and fast rule about refresher training. If an individual regularly uses and has maintained the skill level they achieved in microbiological techniques via the Safety in Microbiology for Schools course (or equivalent), there may be no need for a refresher course. If, however, an individual has not had the opportunity to maintain these skills through regular practice, refresher or re-training is appropriate. <<

References
[1] Safety in Microbiology – A Code of Practice for Scottish Schools and Colleges (SSERC 2018) is available at https://www.sserc.org.uk/health-safety/biology-health-safety/codes-of-practice/.
[2] SSERC advice on microbiological techniques is available at https://www.sserc.org.uk/health-safety/biology-health-safety/microbiological-techniques/.

Protactinium generator update

In our last bulletin, we told you that protactinium generators eight years old or more would require to be disposed of. We ourselves own one and whilst we knew that disposal would not be cheap, we were taken aback at just how expensive it could be. Co-ordinating disposals from a number of schools could bring the cost down significantly. If you have not already informed us that you have a protactinium generator awaiting disposal, please do so immediately. <<

Capacitor safety

'What is the maximum capacitance allowable for a capacitor that will be used by students?' A query like this one was emailed to our helpline and, as is often the way of these questions, there turned out to be more to it than initially seemed to be the case.

Voltage

We can approach this from the 'hazardous live' perspective that we discussed in Bulletin 266 [1]. If the capacitor is fully charged by being connected to a potential difference of more than 30 V, this will exceed the safety limits set down by SSERC. However, the power supply doing the charging would also exceed these limits, so this is not something that is likely to happen in schools. Having said that, there are electronic circuits and methods of connecting charged capacitors together that can give voltages greater than that used for charging. These should not be used if they result in potential differences greater than 30 V.

Energy

A Van de Graaff generator, like a capacitor, has the ability to hold charge. We assess the risk of harm from these devices by considering the energy of the discharge rather than the voltage. Voltage, though initially well above 30 V, reduces to zero. There are some Advanced Higher experiments that involve charging a parallel plate capacitor using an EHT supply, but in these cases the capacitors have very low capacitances in the picofarad range. Using the capacitor energy formula E = ½ CV2, where C is the capacitance of the capacitor and V is the potential difference across it, the energy works out to be well below the 350 mJ limit for high voltage discharges. Note that only an EHT supply can be used for these experiments as it is current-limited. Although an HT supply has a lower output voltage, it is not current limited and must not be used for these activities.

Figure 1 - Electrolytic capacitors.

Supercapacitors

Is that the end of the story? Enter the supercapacitor. When there were only two channels on TV and Wagon Wheel biscuits were nearly as big as actual wagon wheels, the idea of a small 20 F capacitor would have been laughable. Now such supercapacitors are easy to obtain. Typically, they have an operating voltage of 2 or 3 V, though we have seen some that can be charged until the potential difference across them is 12 V. Such a capacitor has the potential to store a few hundred Joules. Were you to accidentally short-circuit such a charged capacitor with a piece of jewellery such as a ring, there could be a sudden, large amount of localised heating. Care is needed.

Other considerations

Some capacitors such as electrolytic capacitors are polarity sensitive. Connecting these the wrong way round can cause them to explode. The negative side of the capacitor is usually marked with a minus sign, and the leg on that side is shorter. Do not use such capacitors with ac. Very old paper-based capacitors may still be in use in schools. The ageing paper can break down at voltages below that for which the capacitors would have been rated as being safe when new. By this we mean that current can flow through the material that is supposed to act as an insulator between the plates. This can create a fire hazard.

You can find the summary in Table 1 below.

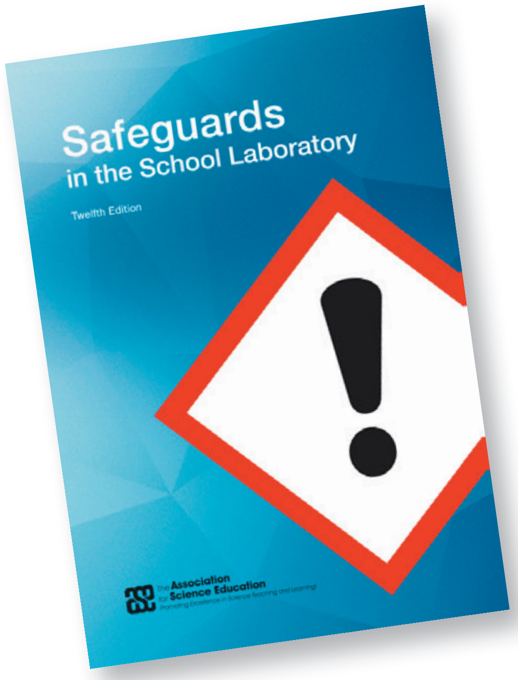
Control measure	Rationale
The potential difference across a capacitor or an assembly of capacitors must not exceed 30 V.	This is to avoid anyone coming into contact with a 'hazardous live'. See below for the special case of parallel plate assemblies.
Parallel plate capacitors must not be charged using HT supplies.	Unlike EHT supplies, HT supplies are not current-limited.
Take care not to short-circuit a charged supercapacitor with jewellery.	The energy in a supercapacitor, if transferred to a piece of jewellery during a short, could cause damaging localised heating.
Do not charge any capacitor to a value above its voltage rating. For an older paper-based capacitor, keep well below the maximum rated voltage.	Too large a voltage can cause a capacitor to break down, presenting a fire hazard.
Ensure that electrolytic capacitors are used only with dc and are always connected the correct way round.	Wrongly-polarised electrolytic capacitors can explode.

Table 1 - Summary.

Reference

[1] https://www.sserc.org.uk/wp-content/uploads/Publications/Bulletins/266/SSERC-bulletin-266p11_18.pdf.

A new edition of Safeguards in the School Laboratory



At its Annual Conference in Reading, ASE launched the 12th edition of *Safeguards in the School Laboratory*. This familiar title was written by members of the ASE's Health & Safety Group and is intended for all those involved in 11-19 science education. It will be particularly useful for newly-qualified and trainee teachers, new technicians and for those seeking promotion to, or newly-appointed as, heads of department, senior technicians, etc. Having said that, one experienced former head of department, who joined the Group shortly before the revision started, was astonished at how much he hadn't known!

Safeguards in the School Laboratory seeks to provide an overview of health & safety issues in science education; it flags up areas where there are significant misconceptions, where problems commonly arise and draws attention to situations which, although rare, may have serious consequences.

Although the underlying advice in the 11th edition (2006) is still sound, it has been updated where legislation has altered, e.g. on chemical hazards and radioactivity, or where school practice has changed. Most sections have been reworded to improve clarity; the chapters and sections dealing with chemicals have been completely reorganised and rewritten.

Strictly speaking, this is really the 13th edition. *Safeguards in the Laboratory* was first published by the Association of Women Science Teachers in 1933 '*… to help inexperienced teachers to avoid some of the commoner laboratory mishaps and to guide non-scientific headmistresses in laboratory administration from the point of view of safety*.' In 1947, the Science Masters' Association and the Association of Women Science Teachers published what was described as the 1st edition of Safeguards in the Laboratory, followed by the 2nd edition in 1950 and the 3rd in 1957. The 4th edition (by now, *Safeguards in the School Laboratory*) came in 1961. By the 5th edition in 1965, the ASE was the publisher and rest is history - 6th edition in 1972, 7th 1976, 8th 1981, 9th 1988, 10th 1996 and 11th 2006.

It does not replace detailed health & safety advice or risk assessments provided by SSERC on behalf of employers (or CLEAPSS in the rest of the UK); it does, however, alert readers to those occasions when they need to be careful and check those details. Ideally it should be read from cover to cover, even if some parts are skipped over at a first reading. Physicists do use some chemicals, biologists do use electrical equipment and technicians need to understand the issues facing teachers - and vice versa. This approach is perhaps most valuable for heads of faculty to make them aware of potential problems outwith their own subject specialism.

This, coupled with Topics in Safety, the latest chapters of which are available on the ASE website, provides an invaluable resource for managing health and safety in school science departments. <<

The SSERC Bulletin is published by SSERC 2 Pitreavie Court South Pitreavie Business Park Dunfermline KY11 8UU
Managing Editor: Alastair MacGregor Telephone 01383 626070 enquiries@sserc.scot www.sserc.scot