Education Services

Science

Safety File

Glasgow
CITY COUNCIL

Education Services

Science

Health and Safety
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MSF 4	Management Circular No. 20 application of the Health and Safety at Work Ect. Act 1974 to the Education Service (Revised December 2007)
MSF 5	Responsibility for Health, Safety and Welfare in the Education Service (Revised June 2002)
MSF 9a	Education Service Fire Safety Procedures (Revised June 2002)
MSF 10d	Insurance Inspection Records
MSF 10e	Electricity at Work Regulations 1989: HSE guidance Note GS23
MSF 10g	Inspection of Portable Pressure Systems
MSF 10k	Statutory Inspection Register – Pressure Systems and Transportable Gas Containers Regulations 1989 – Written Scheme of Examination
MSF 10l	Inspection and Testing of Electrical Appliances/Equipment
MSF 11	The Reporting of Incidents/Accidents, Dangerous Occurrences and Occupational Diseases Regulations 1995
MSF 12	Health and Safety (First Aid) Regulations 1981 – Education Services First Aid Procedures (Revised June 2002)
MSF 12a	First Aid Provision – Safety Flash
MSF 12b	New Accident Book Matter Sheet
MSF 12c	Accident Books
MSF 14a	Use and Storage of Highly flammable Liquids
MSF 14c	Use and Storage of Sodium Chlorate
MSF 14d	HSE Document – Storage and use of Highly Flammable Liquids in Educational Establishments
MSF 14h	Safety Flash – safe Use of Gas Cylinder Regulations (Issued 2001)
MSF 15	Collection, removal and disposal of hazardous or unwanted substances (Revised October 2000)
MSF 15b	The Process for the Legal Disposal of: Waste Electrical and Electronic Equipment from Educational Establishments
MSF 15c	Equipment containing Mercury (Issued January 2009)
MSF 20a	Basic Electrical Safety Booklet
MSF 26	Use of dischargeable devises in Educational Establishments – Guidelines
MSF 31	Control of Substances Hazardous to Health (COSHH) Education Procedures (Revised August 2002)
MSF 32	Statutory Inspection Record
MSF 34c	Manual Handling Operations Regulations 1992
MSF 34d	the Health and Safety (display Screen Equipment) Regulations 1992 – Guidance and Procedures for work with Display Screen Equipment (Revised March 2005)
MSF 34e	Health and Safety at Work – European Community (EC) Directive guidelines for the Implementations of the Personal Protective Equipment (PPE) at Work Regulations 1992
MSF 34g	Health and Safety Management in Schools

MSF 34h	Health and Safety at Work – European community EC Directives Manual Handling Operations Regulation 1992 Manual Handling Assessments – Pupils with Special Needs
MSF 34j	Education Services Risk Assessment Procedures (Revised August 2002)
MSF 34k	Manual Handling on education Premises (Revised November 2003, Issued February 2004)
MSF 34l	Employee Guide to Safe Manual Handling Operations (issued April 2004)
MSF 34m	Personal Protective Equipment (Issed May 2006)
MSF 34r	Education Services – New and Expectant Mothers (Part 1 and Part 2)
MSF 42	Safety Signs and Signal Procedures (Issued December 2004)
MSF 54	Electricity at Work on Education Premises (Issued April 2004)
MSF 55	Health and Safety Induction on Education services 9Revised – Issued February 2004)
MSF 57	Latex Gloves (Issued February 2004)
MSF 59	Stress in the Workplace (Issued April 2004)
MSF 60a	Employee Back Rehabilitation Programme (Issued February 2004)
MSF 60b	Managing Back Pain and associated Documents (Issued May 2006)
MSF 61	Work Equipment Procedures (Issued December 2004)

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1. Introduction

1.1 THE PRINCIPLES

The purpose of paying attention to safety precautions is to foster proper and lasting attitudes of mind to safety and to increase the confidence of all who work in science related activities. Staff and young persons must be alert to potential hazards so that they may be avoided. However, while recognised hazards can be guarded against there is always an element of unforeseen danger, which calls for thoughtful and deliberate attitudes to laboratory work, and the setting of good examples by teachers and technicians. Staff must be thorough in preparation and alert in supervision.

1.2 THE PRACTICES

All practices within Science departments are subject to the guidelines of Education Services policy in respect of the Health and Safety at Work Act 1974 as described in the document Management Circular No. 20 and MSF 4.

2. Responsibilities

2.1 Responsibilities of staff in Secondary schools for the implementation of the Code of Practice are as described in the document Responsibility for Health, Safety and Welfare in the Education Service MSF/5, para 9

- Head of Establishment
- Head of Department/Head of Faculty/Senior Support Service Technician
- Teacher/Support Service Technician

2.2 Although specific responsibilities have been allocated to particular categories of staff it is incumbent upon every employee to take all reasonable steps to ensure the health and safety at work of themselves and others.

2.3 The Control of Substances Hazardous to Health (COSHH) Regulations requires employers to undertake risk assessments before employees and others use or produce substances considered hazardous to health. Science teaching and support staff should consult specific local restrictions and use the following texts as sources of preventative and protective (control) measures, which are the result of model (general) risk assessments.

Safety Net Hazardous Chemical Manual	SSERC
Topics in Safety 3rd Edition	ASE
Be Safe Third Edition	ASE
Material of Living Origin	A Code of Practice for Schools SSERC
Safeguards in the School Laboratory 11th Edition	ASE

Novel or specific assessments

If a teacher cannot find a general risk assessment for a particular operation involving hazardous substances in these texts or an assessment for a very similar one, a special assessment is required. There is a reference to Risk assessment in Para 9(1) Chemical Substances.

2.4 All accidents/incidents must be reported in accordance with the procedures detailed in the Code Of Practice – "Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995 (RIDDOR)" MSF/11(a) and SSF/S24.

2.5 Senior Support Service Technicians shall be responsible for a series of recorded checks as listed in the appendix Record of Checks see Appendix 5 Record of Checks.

3. Laboratory Fixtures and Fittings

3.1 Fire precautions and procedures should comply with Management Circular No. 24, MSF 9 and SSF S23.

3.2 The following items must be readily available in each Science Laboratory:

- Suitable, operational fire fighting equipment;
- Waste bin (general/paper waste);
- Waste bin (broken or unwanted glass).

3.3 The following items must be available within Science departments:

- Safety screen(s).
- A range of eye protectors conforming to the appropriate British Standards Institute specification Topics in Safety 3rd edition pp25 - 27.
- A range of appropriate protective gloves.
- A brush and shovel.
- Spillage kit(s).
- A suitably equipped first aid kit MSF 12. Signage on the door of place of storage. Please see Appendix 4 signage;
- A suitably qualified and appointed first aid person within science department reference should be made to MSF 12 for information.

3.4 In Science laboratories young people must be supervised at all times.

3.5 Laboratory floors shelves and benches should be kept free of equipment and substances, which are not required for current use.

3.6 Equipment and substances should be stored safely. Provision should be made for the safe accessing of all stored materials. If required staff must make use of the appropriate access equipment when accessing stored materials.

3.7 Fixed and circulatory fume cupboards must not be used to store chemicals and are to be tested on a scheduled basis with regular maintenance only to be carried out by trained personnel. These local exhaust ventilation (LEV) facilities must be tested for compliance with the Control of Substances Hazardous to Health (COSHH) Regulations MSF 31. Technician Support Service will carry out this inspection and testing along with school based technicians.

For details and the schedule to be completed please see Appendix 5 Record of Checks.

3.8 Faults or defects in apparatus, equipment or service outlets should be dealt with in accordance with the instructions contained in MSF 5 para 10(g).

3.9 Each laboratory must have clearly displayed a concise set of general safety guidelines as compiled by the Education Services (see Appendix 1). Relevant safety signs appropriate to specific hazards and conforming to the Safety Signs and Signals Regulations should be clearly displayed.

3.10 Sharps disposal containers should be available and arrangements made for their safe disposal when necessary.

3.11 Sharps disposal containers can be sourced via PECOS.

4. Electricity and Electrical Appliances

4.1 All portable appliances using mains power shall be formally tested by Amey 3ED. Further, the equipment shall be visually inspected for defects before issue and after use by the user. SSF S26.

4.2 Adapters which enable more than one piece of equipment to be plugged into one socket must not be used. MSF 20(a).

4.3 The use of extension leads must where possible, be avoided. Only fused, neon indicator extension leads should be used. MSF 20(a).

4.4 Trailing data and power leads should be laid so as not to present a tripping hazard or sustain mechanical damage.

4.5 Temporary connections or open-knife switches must not be used with voltages in excess of 33 volts ac rms or 70 volts dc (ripple free) and are capable of delivering a current in excess of 0.5 mA ac rms, or 2 mA dc (ripple free).

4.6 On all electrical equipment operating at voltages in excess of 33 volts ac rms or 70 volts dc (ripple free) shrouded plugs and shrouded sockets must be used. Warning signage on the power supply and beside HT circuits must be used see Appendix 4: signage.

4.7 Prior to relocation, electrical equipment must be switched off and unplugged.

4.8 Privately obtained new or second hand electrical equipment must be electrically safety tested prior to its introduction to service within educational establishments. MSF 20(l).

4.9 Only authorised staff may undertake the investigation and repair of faults in electrical appliances. GSF 13(a) and GSF 13(b).

5. Optics and Optical Equipment

5.1 The sun or any other intense source of light must not be viewed directly or through an optical instrument capable of concentrating light on the retina of the eye.

5.2 Suitable filters or eye protectors should be used in the presence of strong ultra-violet radiation. Adequate ventilation is necessary in operations involving ultra-violet radiation Topics in Safety 3rd edition p120.

5.3 Care must be taken in the use of stroboscopes. Certain frequencies have been shown to be harmful to some young people, e.g. photo sensitive epilepsy, and care should be taken within the range 10-25 hertz. Gazing away from the flashing light source will not trigger an epileptic response in the brain. Young people should be instructed to look at the reflected light from the experiment.

5.4 In the use of lasers the safety rules contained in the Scottish Education Department (SED) Circular Number 766 and the guidance in the SSERC Bulletin 176 should be followed, SSF S16. Safety signage must be in place when laser is in use see Appendix 4: Signage

For guidance on the use of laser pens and pointers in educational establishment's reference should be made to MSF 18(d).

5.5 Eye protection should be worn during experiments involving carbon filament lamps. Topics in Safety, 3rd edition p120.

5.6 The use of UV LED's radiation wave band 315-400nm should be used with reference to SSERC bulletin - 206.

6. Ionising Radiations

6.2 Procedures for the use of ionising radiations in educational establishments are described within SED Circular No. 1166 dated 12 January 1988. A copy of this Circular must be available within all appropriate Safety Files. SSF S10.

6.2 Secondary schools within Glasgow City Council will be classified by SED Circular No. 1166 as *"Category C"* establishments and the maximum activity of all sealed radioactive sources held must not exceed 1.1 megabecquerels and no single sealed source may exceed 370 kilobecquerels.

6.3 The Council shall appoint a '*Radiation Protection Adviser*' (RPA) as required by the Ionising Radiation Regulation 1999. The RPA will provide advice and recommend good practice pertaining to all issues relating to radiological protection, working with radioactive sources, staff training and to be available for consultation on matters concerning radiological safety.

6.4 The Radiation Protection Advisor (RPA) will provide a set of Local Rules.

This is a single page document '*Working with Radioactive Substances - Safety Arrangements*', re-issued by the Scottish Schools Education Research Centre (SSERC) in April 2004. It shall be prominently displayed adjacent to the store(s) where radioactive sources are normally kept.

6.5 Education Services shall appoint a Radiation Protection Manager (RPM). The Radiation Protection Manager shall ensure that annual audits of establishments holding radioactive sources are undertaken. Records of audits, leak test results, purchases and disposals, etc. will be held and maintained within the Technician Support Service (TSS) on behalf of Education Services.

6.6 Each establishment holding radioactive sources shall appoint a '*Radiation Protection Supervisor*' (RPS), who shall manage the use of radioactive sources. The RPS would normally be the Principal Teacher of Physics or another physics teacher.

6.7 The Radiation Protection Supervisor (RPS) should ensure that a contingency plan based on the document, "Working with Radioactive Materials in Schools - Contingency Plans" re-issued by the Scottish Schools Education Research Centre (SSERC) in January 2004, is in place and regularly reviewed.

6.8 Schools wishing to purchase any sealed radioactive sources are required to submit a completed application form (IR/(C)) requesting purchase authorisation. IR/(C) forms are available by contacting the Radiation Protection Manager at the Technician Support Service (TSS).

6.9 Disposal of Radioactive sources can be arranged by contacting the Radiation Protection Manager at the Technician Support Service (TSS). Under no circumstances should schools attempt to dispose of sources via any other agencies.

6.10 The location of designated store(s) holding radioactive sources shall be made known to the Fire Service and the Radiation Protection Adviser (RPA) by the Radiation Protection Manager (RPM).

6.11 Young people in any class with children under age of 16 must not be allowed to undertake experiments with ionising radiations. In these circumstances experiments shall be by demonstration by the class teacher only.

6.12 Further information regarding the preparation of risk assessments, storage of sources, inventory, and usages record sheets etc are available within Management Circular No. 15: Ionising Radiations in Schools.

7. Materials of Living Origin in Schools

7.1 When considering the use of Animals in Educational Establishments reference should be made to - Material of Living Origin - A Code of Practice for Scottish Schools issued by SSERC and Be Safe Third Edition - Health and Safety in Science and Technology. Staff should regard the specific details below which are local restrictions.

7.2 The decision to adopt a particular species must be taken having a professional regard to the possible hazards involved, compared with the relevance and educational value of having the species. Arrangements should be made for any professional veterinary care that may be required.

7.3 Animals, which must not be used in schools, include birds, wild or non-domesticated mammals, poisonous reptiles and living parasitic organisms. Young people should not be allowed to bring in sick or *"lost"* wild animals. Animals must not be accepted as gifts to the school.

7.4 Animals, which may be used, include:

i. Those obtained from accredited breeders and reputable suppliers.

ii. Small mammals, e.g. Gerbils, Hamsters (Syrian or Golden type), Mice, and Rats.

NB: Rabbits and Guinea Pigs are specifically excluded from the recommended mammals because adequate space for exercising is not available. Exercising outdoors might bring the rabbit into contact with wild mammals or their faeces, which could cause infection.

iii. Fish and Amphibians: *Reference should be made to the Wildlife and Countryside Act 1981*

Those from the wild must be returned to their natural habitat after observation.

The keeping of aquaria should not be discouraged but due care should be exercised in the setting up of the electrical installation/s involved.

iv. Reptiles: Garter snake, Leopard Geckos.

v. Invertebrates: There are many useful examples but not Locusts, larvae of moths and butterflies which have hairy bodies and are prone to cause allergic reactions.

vi. Animals brought into schools by external agencies on educational visits should have the permission of the Education Services to provide the service

7.5 The number of animals in the schools should be the minimum required in order to fulfil the educational objective of having them.

7.6 Animals must be well maintained with appropriate housing, feeding and bedding.

7.7 All shelving, cages and water bottles must be thoroughly cleaned on a regular basis with a suitable disinfectant.

7.8 All food materials should be stored in closed containers.

7.9 Food should not be stored in bulk thus minimising the likelihood of infestation.

7.10 Hands should be thoroughly washed immediately before and after handling any living organism, after cleaning cages and before handling animal food.

7.11 Where there is the risk of a bite or scratch, suitable gloves must be worn.

7.12 If a bite or scratch is inflicted but there is no broken skin, the area should be thoroughly washed. If the skin is broken, medical attention must be sought.

7.13 Proper provision must be made for the care of all animals during weekends and longer holiday periods. Under no circumstances should children take animals home due to the possibility of contacting other disease carrying animals.

7.14 Sick animals must be quarantined. If serious disease is suspected, veterinary advice must be sought.

7.15 Faecal materials, soiled litter, dead animals and other remains of living organisms must be disposed of in such a way that they do not become a health hazard. This would entail double bagging and placing in an outside refuse bin.

7.16 When considering dissection or experimentation on animal material in Educational Establishments reference should be made to - Material of Living Origin - A Code of Practice for Scottish Schools issued by SSERC taking regards to the specific details below.

7.17 No pupils are required to take part in or observe any dissection procedure if they do not wish to do so.

7.18 Only material fit for human consumption obtained from abattoirs, butchers or fishmongers may be used for the purpose of dissection or experimentation. Advice on the use of nervous tissue (including eyes) from cattle and sheep see Material of Living Origin, A Code of Practice for Scottish Schools issued by SSERC. All such material mentioned above must be used while they are still fit for human consumption.

8. Microbiology in Schools

8.1 When carrying out Microbiology in educational establishments reference should be made to - Safety in Microbiology – A Code of Practice for Schools and Colleges 2002 and Topic in Safety 3rd Edition topic 15.

8.2 There are three levels of work. In general, these levels are related to the educational stage of the young people. Thus in primary school only level 1 work may be attempted; in secondary schools, young people in S1 to S4 will normally be restricted to work at level 1 or level 2, whilst for some post 16 national courses students may participate in level 3 work. Technicians and or teachers who may prepare materials for level 2 work may have to perform level 3 tasks.

8.3 Each establishment carrying out microbiological work must have at least one member of staff trained to Level 3 as detailed in the '*A Code of Practice for Schools and Colleges 2002*'. Refresher training is required to be carried out every five years.

9. Chemical Substances

9.1 Teachers and technicians must be aware of the special methods and hazards involved in the use, handling, storage and transportation of chemicals. Headteachers and Head(s) of Science subjects are responsible for ensuring that all relevant information issued is readily available to all staff. This should include details of COSHH assessments and resultant controls. Reference to SSERC Safety Net, Topics in Safety 3rd Edition, Be Safe Health and Safety in Primary School Science and Technology.

9.2 Before a young person is allowed to handle chemicals, the teacher must ensure that the young person is aware of the specific hazards associated with the chemical(s) and the experimental control procedure(s).

9.3 Personal protective equipment must be used as required.

9.4 Young people must not be given chemicals to take home.

9.5 Head(s) of Science subject(s) will have the responsibility of selecting chemicals for use within the Science department. The decision to adopt any chemical must be taken having regard to any hazards involved in use, storage, handling and transportation compared with the educational value of using the chemical concerned.

9.6 Chemicals must only be obtained from accredited suppliers.

9.7 Substances must be stored in such a way as to minimise possible hazards and in quantities, which ensure a fairly rapid turnover. Deliberate limiting of stock will assist in keeping storage problems to a minimum.

9.8 Each school must have an up to date stock list of all chemicals held. Stock lists should contain chemical name, amount, place of storage and annual usage. Stock lists should be updated as and when required or at least annually.

9.9 New stock must be date stamped on arrival this will indicate the start date of the substance's shelf life. Shelf lives should be adhered to. Ref SSERC Safety Net for guidance.

9.10 All containers must be clearly labelled and carry appropriate hazard warning label(s). Chemical stores should be clearly marked with the appropriate safety sign(s) see Appendix 4: Signage.

9.11 For guidance on relevant and up to date information on chemicals that should not be kept or have restricted use in schools reference should be made to the following documents:

'Safety Net Hazardous Chemical Manual' - Scottish Schools Equipment Research Centre Limited

'Topics in Safety' (3rd Edition) - Association for Science Education

'Safeguards in the School Laboratory' (11th Edition) - Association for Science Education

'Be Safe!', Health and Safety in Primary School Science and Technology (4th Edition) - Association for Science Education

9.12 Containers must be opened with care especially if they contain volatile or corrosive substances. Special care must be taken with ventilated stoppers.

9.13 Stoppers must be replaced immediately and the container returned to its proper storage area. Dispensed chemicals must not be returned to stock bottles.

9.14 Chemical spillage should be approached with caution. Chemical spillage kits and personal protective equipment must be available and used as appropriate.

9.15 Amounts of Bromine held within schools must be kept to a minimum. Stock should only be in the form of 1 ml capsules, bottle stocks of Bromine are prohibited.

9.16 Access to storage areas shall be restricted to authorised persons only. Storage area door(s) should be locked and labelled with the prohibition sign ***"NO UNAUTHORISED PERSONS ALLOWED BEYOND THIS POINT"*** see Appendix 4: Signage.

9.17 Special provision must be made for the storage of poisonous substances. Poisons may be stored within storage areas where entry can be restricted to one securely locked door. Where poison cabinets are in use the cabinet must be kept secure at all times. *"Poison"* signs must be displayed on the cabinet and storeroom door see Appendix 4: Signage.

9.18 Flammable chemicals must either be stored within specially designed flammable liquid stores or within lockable flammable liquid cabinets.

i. Where stored within flammable liquid cabinets, no more than 50 litres, aggregated, of flammable liquid can be stored within any one room.

ii. Flammable liquid cabinets must display a *"flammable liquids"* warning sign on the door panel see Appendix 4: Signage.

iii. The entry door(s) to the storage area should also be labelled *"Fire Risk"* see Appendix 4: Signage.

iv. Flammable liquid cabinets must be kept locked at all times and keys removed immediately after use. Keys should not be stored where they can be easily accessed by unauthorised persons.

v. Stocks should be kept to the minimum required. Reference to SSERC Safety Net for guidance.

vi. No container of flammable liquid greater than 500ml is allowed in any laboratory.

vii. Flammable liquids should be returned to secure storage immediately after use.

9.19 Safe storage and handling facilities for compressed gas cylinders must be used at all times.

i. Cylinders must be stored and transported in the trolleys provided for this purpose.

ii. Entry door(s) to storage area(s) must display *"Compressed Gas"* safety sign see Appendix 4: Signage.

iii. For ease of handling, only cylinders of the type in the table below or an equivalent size, capacity and design should be held within schools.

iv. Gas cylinders

Gas	Size	Volume/Weight	Height	Width
Oxygen	X	6.35Kg	940mm	140mm
Carbon Dioxide	VB	22.0Kg	940mm	140mm
Nitrogen	X	6.35Kg	940mm	140mm
Oxygen	-	10 Litres	655mm	176mm
Carbon Dioxide	-	10 Litres	1005mm	230mm
Nitrogen	-	10 Litres	655mm	176mm
Sulphur Dioxide	-	500 grams	260mm	70mm

v. Cylinders should not be stored within chemical stores or in classrooms.

vi. Access to cylinder keys should be restricted to authorised staff.

vii. Sulphur Dioxide cylinders must not be stored beside corrosive substances.

viii. Cylinder and regulator condition must be checked at least once per term and immediately before use. Formal recording of the above checks should be made using the record card provided.

For details and the schedule to be completed please see Appendix 5: Record of Checks. Refer to Senior Support Service Technician for information and record cards.

ix. On each occasion of use make a visual inspection for obvious signs of physical damage to the regulator, casing, coupling and threads.

x. Annually or if there is a reason to suspect a leak, carry out a simple leak test for details please refer to Technician Guidance Sheet 10 Safe Use: Gas Cylinders and Regulators see Appendix 6.

xi. Cylinder regulators should be examined at 5-year intervals by the external contractor to a maximum of 3 five year working lives. MSF 14(h) This will be arranged by Technician Support Service to be carried out by an outside agency.

9.20 Bottles containing Alkali metals or Phosphorous should be stored within separate sturdy non combustible compartmentalised containers to ensure that the bottle remains upright.

i. Both the bottle and **lidded** container should be clearly labelled with the name of the substance, name of the immersion liquid to be used and either a *"water reactive"* or *"air reactive"* warning sign, whichever is appropriate. *"Water reactive"* and *"air reactive"* metals must not be stored in the same container see Appendix 4: Signage.

ii. Immersion liquid levels should be checked at least once per term, immediately before issue and again before returning to secure storage.

iii. Formal recording of the above checks should be made using the record card provided for this purpose. Completed record cards should be retained for five years from the date of last entry. For details and the schedule to be completed please see Appendix 5: Record of Checks. Refer to Senior Support Service Technician for information and record cards.

iv. Only freshly cut pieces of Alkali metal, approximately the size of a grain of rice, should be used.

9.21 Care must be taken when transporting substances to and from storage areas. Winchester and bottle carriers must be used as appropriate.

9.22 Containers of corrosive substances should be stored at low levels, placed in containment trays and kept separate from flammable substances. Where substances are stored at floor level a "*kick board*" must be fitted to prevent accidental damage and resultant spillage.

9.23 Shelving units within the department should be checked annually for signs of damage or corrosion. Formal recording of the above checks should be made using the record card provided for this purpose. **For details and the schedule to be completed please see Appendix 6: Technician Guidance Sheet**.

9.24 Chemical stores should be sited to take account of security arrangements and transportation considerations.

9.25 Oxidising agents should be stored separately from combustible materials. Separate storage could consist of separate areas within the one store.

9.26 Chemicals should be disposed of following the practice outlined in the Glasgow City Council local policy – MSF 15.

Appendices

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APPENDIX

1.

FOR YOUR SAFETY

1. Remain outside a science laboratory until a teacher says it is safe to enter.
2. When you need to move, move carefully.
3. Keep your work space tidy; store bags and coats safely out of the way.
4. Wear any protection equipment until the apparatus is put away.
5. Avoid infection; never eat or drink anything in a science laboratory.
6. Always be ready to move away from danger at the workbench.
7. Follow your teacher's instructions; if in any doubt, ASK A TEACHER.
8. When working with Bunsen Burners, follow the Bunsen safety code:
    a) Tie long hair back and tuck shirts, ties and loose clothing.
    b) Make sure the tubing is attached firmly and away from the edge of the bench.
    c) Make sure there is nothing above the flame which can catch fire.
    d) Close the air hole to make a visible flame when not in use.
    e) When heating test tubes, always point them away from yourself and others.
    f) If you receive a hand burn, put it under cold running water immediately and get your partner to tell your teacher.
9. When working with chemicals, follow the chemical safety code:
    a) Always read the label and know what the hazards are.
    b) Always use clean, dry glassware.
    c) Know how to pour liquids safely from the container you are using.
    d) When moving solids, keep the jar and test tube close together and always use a spatula.
    e) If any chemical falls on your skin wash it off immediately with lots of water and tell your teacher.
    f) If anything spills or breaks, tell your teacher immediately.
    g) Once a chemical is removed from its container, never put it back even if you took too much.
    h) Always follow your teacher's instructions on how to deal with waste.
10. Always wash your hands after any experiment.

APPENDIX

2.

GUIDE TO ABBREVIATIONS

1.	The Department	Glasgow City Council Education Services
2.	MSF/-	Master Safety File
3.	GSF/-	General Safety File
4.	SSF/S-	Subject Safety File/Science
5.	COSHH	Control of Substances Hazardous to Health
6.	S.E.D.	Scottish Education Department
7.	SSERC	Scottish Schools Equipment Research Centre

APPENDIX

3.

BIBLIOGRAPHY

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3. 'Safeguards in the School Laboratory' (11th Edition)
   2006. Association for Science Education – ISBN 13: 9780863574085

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   2010. Association for Science Education – ISBN 13: 9780863574269

5. 'Material of Living Origin - A Code of Practice for Scottish Schools'
   2005. Scottish Schools Equipment Research Centre Limited

6. 'Safety in Microbiology - A Code of Practice for Scottish Schools and Colleges'
   2002. Scottish Schools Equipment Research Centre Limited

7. 'COSHH: Guidance for Schools'
   1989. Health and Safety Executive (HSE) – ISBN 13: 9780118855112.

8. 'Preparing COSHH Risk Assessments for Project Work in Schools'
   1991. Scottish Schools Equipment Research Centre Limited (SSERC Bulletins)

SIGNAGE

Signs required within Science departments.

Section 3(c)(vi): First aid sign

Section 4(f): High Voltage

Section 5(d): Laser in use

Section 6: Radioactive sources

Section 9(i): Chemical storage areas

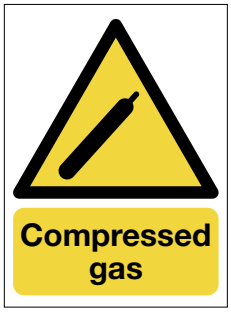
No unauthorised entry

Section 9(p): Poison

Section 9(q)(ii): Flammable Liquid

Section 9(q): Fire Risk

Section 9(r)(ii): Compressed Gases



Section 9(s)(ii): Air reactive

Section 9(s)(ii): Water reactive

Technician Support Service

Science Code of Practice: Record Card

Alkali Metals

	Inspection Date	Immersion Level [3]	Date of Purchase	Signature	Comments
Potassium					
Sodium					
Lithium					

Date of Disposal (Potassium) _____

Date of Disposal (Sodium) _____

Date of Disposal (Lithium) _____

Science Code of Practice 9.20

*Bottles containing Alkali metals or phosphorous should be stored within separate sturdy non-combustible compartmentalised containers to ensure that the bottle remains upright. Both the bottle and lidded container should be clearly labelled with the name of the substance, name of the immersion liquid to be used and either a "**water reactive**" or "**air reactive**" warning sign, whichever is appropriate. "Water reactive" and "Air reactive" metals should not be stored in the same container. Immersion liquid levels should be checked at least **once per term** and **immediately before use***

APPENDIX 5 - RECORD OF CHECKS: PHOSPHOROUS

Science Code of Practice: Record Card

Phosphorous

	Inspection Date	Immersion Level [✓]	Date of Purchase	Signature	Comments
Red Phosphorous					
White/Yellow Phosphorous					

Science Code of Practice 9.20

*Bottles containing Alkali metals or phosphorous should be stored within separate sturdy non-combusti compartmentalised containers to ensure that the bottle remains upright. Both the bottle and lidded container should be clearly labelled with the name of the substance, name of the immersion liquid to be used and eithe "**water reactive**" or **"air reactive"** warning sign, whichever is appropriate. "Water reactive " and "Air reacti metals should not be stored in the same container. Immersion liquid levels should be checked at least **once per term** and **immediately before use**.*

This record **MUST** be kept by the Senior Technician and be made available for inspection and audit as required.

Model:

Cupboard Identity Serial Number:

Face velocity tests: (monthly)
(L - left, C - centre, R - right, Av - average)

Month	Airflow sensor operational **Yes/No**	Face velocity readings (minimum 0.3 m/sec)				Date	Signed
		L	**C**	**R**	**Av**		
TSS					0.00		
January							
February							
March							
April							
May							
June							
July							
August							
September							
October							
November							
December							

Comments:

Main Filter Challenge Tests (4 monthly) Sulphur Dioxide

Main filter test: Test Chemical:- **Sulphur Dioxide**	Date of Test	Pass condition (<1 ppm)	Signed
First Test TSS (Left exhaust)			
First Test TSS (Right Exhaust)			
Second Test School (Left exhaust)			
Third Test School (Right exhaust)			

Main Filter Challenge Tests (4 monthly) Xylene

Main filter test: Test Chemical:- **Xylene**	Date of Test	Pass condition (<15 ppm)	Signed
First Test TSS (Left exhaust)			
First Test TSS (Right Exhaust)			
Second Test School (Left exhaust)			
Third Test School (Right exhaust)			

Test regime is based on the operator facing the front of the cupboard

APPENDIX 5 - RECORD OF CHECKS: FUME CUPBOARD MONITORING 2 OF 2

Visual Inspection:-	**Month**											
Yes/No	**January**	**February**	**March**	**April**	**May**	**June**	**July**	**August**	**Sept**	**Oct**	**Nov**	**Dec**
The spillage tray is in good condition, clean and undamaged, clear of chemicals and equipment that is not in use												
The glazing material should, be undamaged no cracks and clean. No spaces between glazing and frame												
Service portholes blanking caps in place												
The visor hinges should be undamaged and free from corrosion												
Where applicable, examine gas services, flexible hose should be inspected for any signs of damage												
Where applicable, examine electrical sockets are undamaged and functional												
Mains cable no damage and securely fixed both at casing and plug end												
Where applicable, examine mains RCD circuit breakers are operational												
Lighting is secure and operational												
Wheels/castors should be free moving and no damage.												
When brakes applied trolley resists movement												
Comments:												

This record **must** be kept by the Senior Technician and be made available for inspection and audit as required.

Glasgow City Council
Education Services
Education Services

Technician Support Service

Bunsen Burner Formal Inspection Record

Bunsen ID Number	Visual Inspection	Tubing Inspection	Burner unit Inspection	Date	Comments

Room No.

This record **must** be kept by the Senior Technician and be made available for inspection and audit as required.

Glasgow City Council
Education Services

Technician Support Service

Working Platform Formal Inspection Record

	Structural Inspection			Feet and Castors				
Date	**Visual Inspection**	**Welds & Joints**	**Rubber Treads**	**Cupped Feet**	**Castors**	**Integrity**	**Comments**	**Signed**
1st Test								
2nd Test								
3rd Test								

Platform ID No.

This record **must** be kept by the Senior Technician and be made available for inspection and audit as required.

Glasgow City Council
Education Services

Technician Support Service

Gas Cylinder Regulator Inspection

Gas Regulator: **Date of Purchase:**

Inspection Date	Visual Inspection Physical damage Yes/No	Regulator Leak test ✓	Comments	Signed

Gas Regulator: **Date of Purchase:**

Inspection Date	Visual Inspection Physical damage Yes/No	Regulator Leak test ✓	Comments	Signed

Gas Regulator: **Date of Purchase:**

Inspection Date	Visual Inspection Physical damage Yes/No	Regulator Leak test ✓	Comments	Signed

APPENDIX

6.

TECHNICIAN GUIDANCE SHEETS

1. TGS / 01c Care and use of LCD projectors
2. TGS / 02 Bunsen Burner Annual Inspection
3. TGS / 03 Generating Gases: Hydrogen, Chlorine and Nitrogen Dioxide
4. TGS / 04 Working Platform: Inspection and Maintenance
5. TGS / 10 Safe Use: Gas Cylinders and Regulators
6. TGS / 11 Safe Use of Pressure Steriliser
7. TGS / 16 Transportation and Safe Storage of Hazardous Substances
8. TGS / 19 Procurement of Heart and Lungs for Dissection or Experimentation Purposes and Safe Disposal Procedures for Animal Products
9. TGS / 20a Managing Mercury

Checks to be carried out on shelving units still to be written.

Glasgow City Council

EDUCATION SERVICES

Technician Support Service

Technician Guidance Sheets TGS / 01c

Care and use of LCD Projectors within Secondary Schools

Issued by **Technician Support Service**

Date **September 2008**

Objectives - The objectives of this bulletin are to ensure the safe use and with simple preventative measures ensure the correct working of LCD projectors.

Persons responsible - Senior Support Service Technicians and Support Service Technicians

TECHNICIAN SUPPORT SERVICE

Technician Guidance Sheet

LCD Projectors (Revised September 2008)

A vertical line highlights new content.

If properly cared for LCD projectors will prove useful across a range of departments within your school. However, the cost of replacement lamps should be considered when purchasing units. TSS will obtain and advertise the cost of replacement lamps and filters for the most popular makes and models of LCD projectors. Any bulk discounts will be fully passed on to schools.

Presently the replacement cost of the same manufacturer lamp can vary from £290.00 to £350.00. The average lamp life, assuming correct usage during this period, is between 600-2000 hrs.

Points to note in the safe use of projectors:

General

1. If the unit is supplied with a laser pointer in the remote control the guidelines issued in MSF 18d must be followed.

2. Unlike many other types of presentational equipment LCD projector cannot be switched off, unplugged and moved immediately after use.

3. All LCD's have a 'powering/cooling down' procedure which must be strictly adhered to.

4. Under no circumstances should the projector be moved or unplugged until the 'powering/cooling down' procedure has been completed e.g. in most cases a warning light will indicate or the cooling fan will have stopped.

5. In most cases the 'powering/cooling down' procedure will take between 3-8 minutes dependant on manufacturer, length of usage and ambient temperature.

6. Failure to follow the 'powering/cooling down' procedure has been identified as the main cause of damage to projectors and significantly reduces the life span of the lamp.

7. Running the projector in economy mode (if available) increases the life span of the bulb.

Cleaning the air filter

1. All projectors are fitted with an air filter(s) which are designed to remove dust and dirt from the supply of 'cooling air' which is required to prevent the heat generated by the lamp from overheating the unit.

2. By using filtered cooling air the internal optics and other components of the projector are kept free from excessive exposure to harmful dirt and dust.

3. Filters should be removed and cleaned on average every 100 hours of use.

4. If projectors are operated in a dusty environment the frequency of cleaning should be increased accordingly.

5. Failure to clean the filter(s) regularly as part of a planned preventative maintenance program may cause the projector to overheat and will significantly reduce the life of the unit's lamp.

6. Filters should be handled with care and cleaned using a 'dry' method such as a brush, photographic blower lens brush or by using a vacuum cleaner.

7. Unless it is specifically recommended by manufacturers filters should **not** be cleaned using 'wet' methods such as soap and water, as this will adversely affect the delicate membrane of the filter.

8. Filters should be replaced when they show any signs of damage that may adversely affect their efficiency, after approx 1500 hrs use or as recommended by the manufacturer and as a general rule when replacing the bulb.

Lamp replacement

1. Due to the danger from very hot surfaces any attempts to fit a replacement lamp should only be carried out once the existing lamp has returned to ambient temperature. **Under no circumstances should an attempt be made to remove the bulb until ambient temperature is reached.** This will normally take between 45 minutes and an hour.

2. Ensure that you switch off and unplug the unit from the main supply before proceeding to the replace the lamp.

3. Do not touch the lamp with your hands or this will reduce the effective working life of the bulb.

4. Lamps must be replaced immediately when the warning lamp life warning message appears on the screen. Various messages such as "the lamp has reached the end of its usable life" or ”warning lamp life has almost expired" or "lamp is nearing the end of working life" may be used and will vary from manufacturer to manufacturer.

5. Do not continue to use the lamp after this warning appears as continued usage may result in the lamp shattering and causing damage to the internal working of the projector and/or injury to the operator.

6. Always follow the manufacturer guidelines concerning lamp replacement and remember to reset the lamp usage hour meter.

7. If the projector is ceiling mounted then the above maintenance operations should only be carried out by making proper use of the safe working platform which was provided to schools for fume cupboard monitoring.

Testing suspect/broken lamps

1. As before, with lamp replacement, allow approximately 45-60 minutes cooling time before accessing the projector.

2. If there is no output from the lamp, ensure that all internal, external and trip fuses are intact and filter covers are correctly fitted.

3. If another projector of the same make and model is available, change over the lamp assembly to confirm that the lamp is at fault.

4. If the projector is now working, a replacement lamp should be ordered from a recommended supplier.

5. If the projector still fails to work, check that the manufacturer's warranty has expired and, if so, contact TSS and report the fault as normal.

6. When replacing a lamp and it is found that the glass lamp housing has shattered, be aware that lamps can contain a small amount of mercury vapour. The room should be evacuated for a minimum of 30 minutes prior to any further remedial work being carried out.

7. On returning to the room, **do not** attempt to clean out the shards of broken glass. The projector should be carefully placed in a robust plastic bag and sealed. Contact TSS and report the fault as normal.

Lens cleaning

1. When the lens is dirty or dusty first remove dust with a photographic blower/puffer brush then; gently wipe with a soft lens brush or lens cleaning tissue.

2. Never touch the lens or other optics with your fingers, as this will damage the surface coatings.

3. Selvet cloths, used for cleaning science dept laser kits, are a useful cleaning aid for lens.

4. Avoid using an excessive amount of cleaning fluid during the cleaning process. And only use recommended cleaning products (check manufacturers instructions re. the use of such products). **NB**. All cleaning fluids must be approved as per education services MSF 31a.

5. Do not under any circumstances use abrasive cleaners, solvents or other harsh chemicals on the lens or other optics.

6. Always remove lens cap prior to powering up the projector, as this will prevent serious overheating.

7. Always replace the lens cap in order to protect the lens when the projector is not in use.

Disposal of Old Lamps

To ensure adherence to the new WEEE initiative (Waste from Electrical and Electronic Equipment - Directive 2002/96/E) any electrical or electronic item, including projector lamps, marked with a label depicting a wheelie bin with a cross over it will require special disposal methods and should not be mixed with other rubbish.

There are 2 recommended methods for disposing of old projector lamps from educational establishments.

1. Return to the original supplier

   If the lamp was purchased from a recognised manufacturer, a returns label will have been included with your new lamp. The redundant lamp can be placed in the discarded packaging from the new lamp, ensuring that it is securely enclosed.

   Attach the return label whilst checking that any sign of the previous address label has been removed.

   Return the package with your regular mail collection or, if you don't have a collection service, drop it off at any Post Office.

2. WEEE (Waste from Electrical and Electronic Equipment) uplift and disposal

   The disposal and recycling company presently used by TSS, have a standard charge of £2.00 for each lamp uplifted from an establishment plus a cost for certification of £25.00.

   To dilute this certification charge being made to individual establishments, they should initially contact TSS, who will arrange to collect the redundant lamp(s) and dispose of them as part of a bulk WEEE uplift. This will result in only one certificate being issue per disposal, hence significantly reducing the costs to individual schools.

Health and Safety guidelines issued by the British Educational Communications and Technology Agency (BECTA)

It's important to be aware of the Health and Safety implications of using LCD projectors with equipment such as interactive whiteboards in the classroom, particularly if children will be standing in front of the beam to give a presentation to the rest of the class.

All projectors, if misused, have the potential to cause eye damage; so some simple guidelines should be followed:

1. Make clear to all users that they should not stare directly into the beam of the projector.
2. When entering the beam, users should not look towards the audience for more than a few seconds.
3. Encourage users to keep their backs to the projector beam when standing in it.
4. Pupils should be supervised at all times when a projector is being used.

A maximum of 1,500 ANSI lumens is normally adequate for projection equipment in most classroom environments. The only exception might be extreme ambient lighting conditions. In this case the advice is to use window blinds rather than increasing the brightness of the projector.

When purchasing or using an LCD projector for purposes where it is likely that someone will be standing in front of the beam, consider using a method of brightness reduction such as a neutral density filter or brightness adjustment facility.

These modifications can be removed or adjusted for other purposes such as video projection, when no one would be standing in front of the beam, thus allowing the projector to be used to its full potential.

Labelling

A suggested format for an advice label which can be attached to LCD projectors is given below.

IMPORTANT NOTICE ON THE USE OF LCD PROJECTORS

UNDER NO CIRCUMSTANCES SHOULD YOU MOVE, KNOCK OR UNPLUG THIS UNIT WHILST IT IS IN OPERATION

THIS UNIT MUST BE POWERED DOWN AS FOLLOWS

Press the standby button - wait until the cooling fan has stopped - this will be approximately 3-8 minutes (depending on make of projector)

FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN DAMAGE TO THE LAMP RESULTING IN THE COST OF AN EXPENSIVE REPLACEMENT!

BULBS SHOULD ONLY BE REPLACED BY COMPETENT PERSONS

Glasgow City Council

EDUCATION SERVICES

Technician Support Service

Technician Guidance Sheets TGS / 02

Bunsen Burner Annual Inspection

Issued by **Technician Support Service**

Date **June 2003**

Objectives - The objectives of this bulletin are to ensure the safe use of Bunsen burners and guidelines for the annual inspection checks

Persons responsible - Senior Support Service Technicians and Support Service Technicians

TECHNICIAN SUPPORT SERVICE

Technician Guidance Sheet

Bunsen Burners - Formal Annual Inspection

The following are notes concerning guidance re the annual inspection scheme for Bunsen burners. It is essential to check each lab and prep room is equipped with a fire blanket and a means of extinguishing a small fire. Such items of equipment, fire blanket and appropriate fire extinguishers should normally be situated adjacent to the teacher area within the laboratory.

All fire extinguishers and fire blankets should be inspected regularly and maintained in accordance with the requirements of the Education Services, and after use serviced in accordance with the manufacturers recommendations. This service will be arranged via facility management system within schools.

Maintenance of the Bunsen burners is essential for the safe running of any laboratory and the following should be checked on an **annual** basis:

General

1. *Examine the burner for general mechanical condition and soundness*

2. *With the Bunsen connected to the gas but with the supply switched off apply a dilute 1% soap solution to areas around the mechanical joints and the tubing connection with a small paint brush. Turn the gas supply back on to test the bunsen thoroughly for gas leaks. Any leakage will be self evident such as bubbles around mechanical joints.*

3. *Test the burner by varying the flame across its full range.*

4. *In addition to the above annual inspection, Bunsen's and Bunsen tubing should be visually inspected for obvious defects before they are issued for use.*

Jets and Mixing Tubes

5. *Jets and flame retention collars can become clogged because of a build up of various waste materials such as dirt, chemicals, wax and foodstuffs etc. Ensure that the jet and flame retention collars are free of all waste materials and clear using a suitable implement as required.*

6. *Pushing a suitably selected length and diameter of stiff wire through via the rear of the jet can easily clear blocked or partially blocked jets. Ensure that jet is clear of all waste materials.*

7. *Some types of Bunsen are fitted with a mixing tube, which can occasionally work loose where the mixing tube joins on to the base of the jet. Fitting a suitably sized steel washer between the tube and the base can help eliminate this problem. Ensure that the mixing tube is securely fixed to the main body of the Bunsen.*

8. *Mixing tubes can become clogged because of a build up of various waste materials such as dirt, chemicals, wax and foodstuffs etc. The mixing tube will usually unscrew from the base by hand and can then be cleaned using test tube brushes, scourers or any other suitable implement as required. Mixing tubes, which are badly fouled, may jam and using an appropriately sized open-ended spanner, small adjustable wrench or similar tool can assist removal. Ensure that the mixing tube is free of all waste materials*

Rubber Bunsen Tubing

9. *Bunsen burner tubing should be regularly inspected for perishing, brittleness, cracking, cuts etc, and replaced if there is any evidence of damage or poor fit. Small suspected leakage's of Bunsen burner tubing can be confirmed by applying a dilute 1% soap solution to the suspected area with a small paint brush. Any leakage will be self evident ie the production of small soap bubbles at the point of suspected leakage.*

10. *The flexible connection to the burner should be thick-walled bunsen tubing of minimum length. The recommended overall length of tubing should range from 500mm minimum to no more than 900mm maximum. Avoid using thick-walled neoprene tubing as it is too rigid and may cause instability in the use of the Bunsen burners and may cause the unit to fall over or be knocked over during use.*

11. *Thin walled rubber tubing is intended mainly for use with water, it should not be used to carry gas. Due to the thinner walls this type of tubing is much more susceptible to cutting, cracking and perishing resulting in gas leaks which can become ignited. It can also kink easily, extinguishing the flame and allowing gas escapes. Wherever possible Bunsen burner tubing should be keep to the recommended minimum working length (optimum safe working length is 500mm), sound and undamaged. It is recommended that the rubber tubing should be checked on a more frequent base than annually.*

Inspection Record

12. *A record of annual inspections is required to be maintained by the Support Service Technicians using the record sheets provided.*

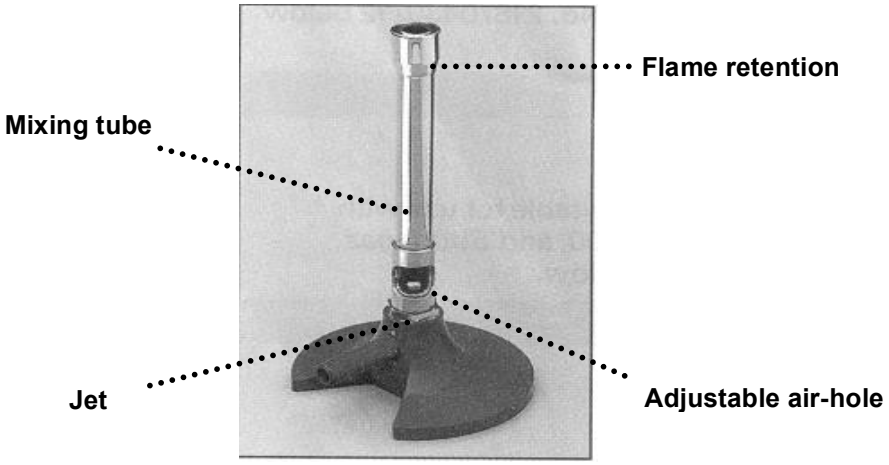
Gas Pipework

13. In addition to the Bunsen itself, the piping transporting the gas needs to be inspected on a regular basis. This would normally be arranged by the facility management system.

Reporting Gas Leakage

14. in the event a suspected leakage, isolate the gas supply to the room and implement the gas safety procedures. Refer to MSF 9(d).

Thanks to CLEAPSS, Topics in Safety and The University of Liverpool for their assistance



Glasgow City Council

EDUCATION SERVICES

Technician Support Service

Technician Guidance Sheets TGS / 03

Generating Gases: Hydrogen, Chlorine and Nitrogen Dioxide

Issued by **Technician Support Service**

Date **June 2005**

Objectives - The objectives of this bulletin are to ensure the safe preparation and disposal of Hydrogen, Chlorine and Nitrogen Dioxide Gas.

Persons responsible - Senior Support Service Technicians and Support Service Technicians

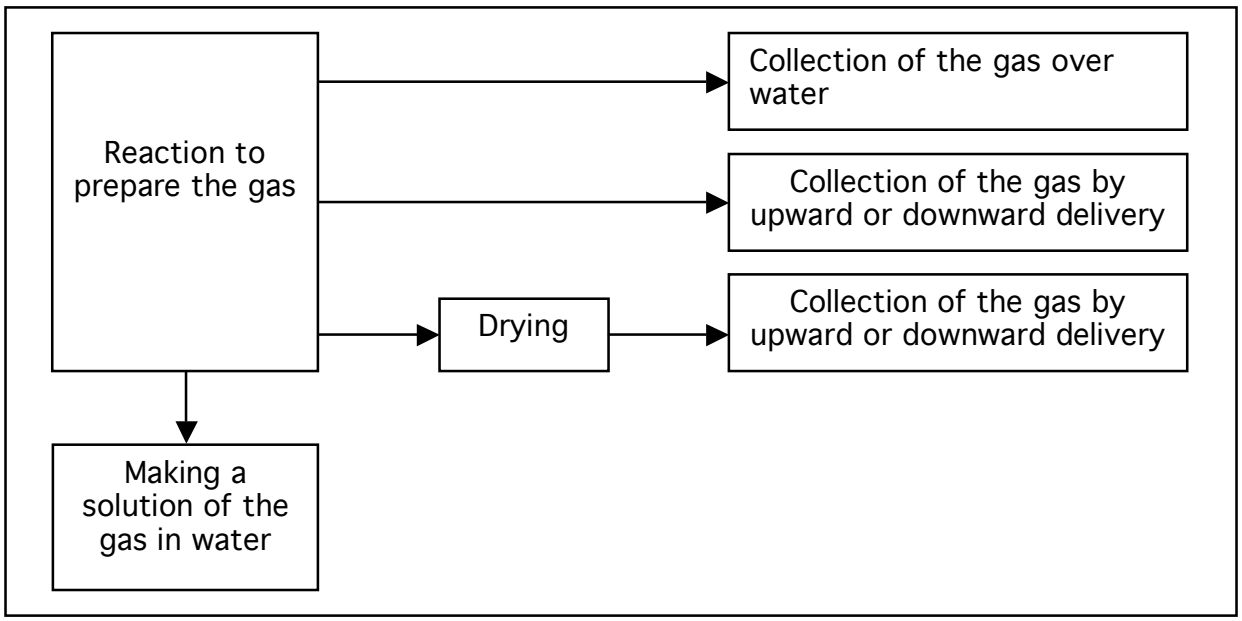
Preparation of Gases: Hydrogen, Chlorine and Nitrogen Dioxide

The purpose of this Guidance Sheet is to provide a standard procedure for the safe production of hydrogen, chlorine and nitrogen dioxide. The methods described in this document include:

- Preparation of a measured amount of gas.
- Quenching the gas generator and glassware after use to remove all traces of the gas.
- Disposal of all excess products from the reaction.
- Disposal of the gases.

"Gas Preparation: Gases can give rise to particular hazards ranging from unpleasant smells to explosions; breathing difficulties and faintness can be caused by their inhalation. Consequently whenever gases are prepared in school laboratories, steps must be taken to control them".

This diagram shows the stages which may be required to prepare a sample of a gas for a chemical investigation.



CLEAPPS Laboratory Handbook 1992

Both chlorine gas and nitrogen dioxide gas being heavier than air are collected by downward delivery, directly into the collection glassware: test tubes or gas jars.

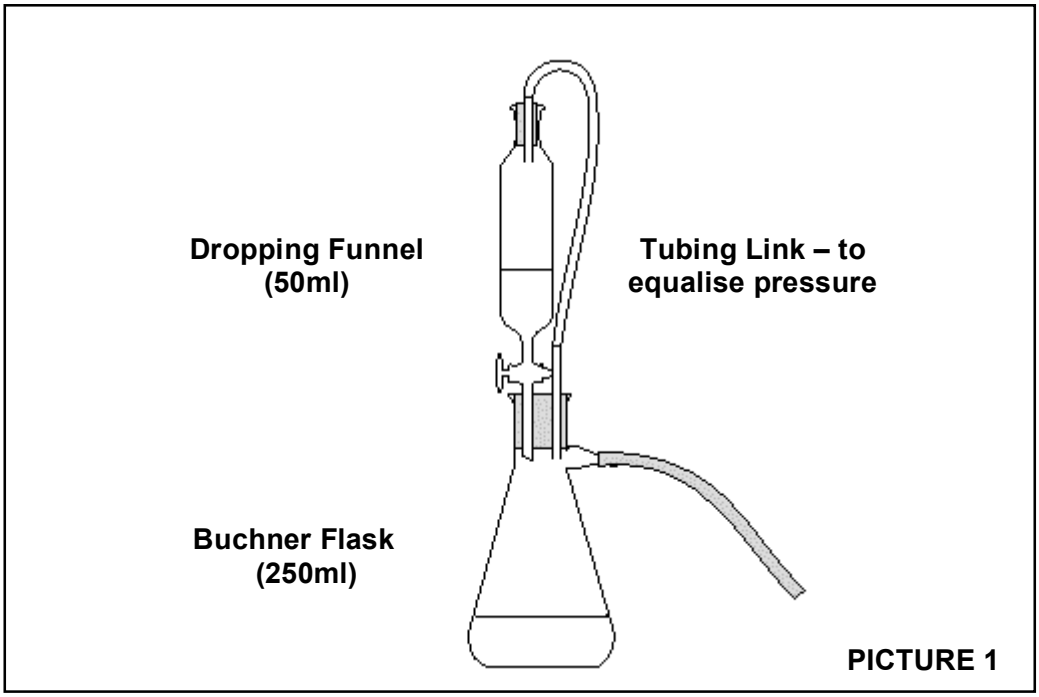
Chlorine gas may be required to be dried if so, a U-Tube containing granular calcium chloride should be placed between the delivery tube and the collection glassware (see Picture 4).

Hydrogen gas is a colourless gas that is collected over water using a trough and a bee-hive shelf.

Thanks to CLEAPPS, Topics in Safety, SSERC and J.G. McCarthy (TSS) for their assistance in compiling this information.

All gases are generated using an Andrew's Gas Generator (see picture 1). When generating hydrogen gas, due to the explosive nature of this gas, a plastic buchner flask replaces the glass buchner flask (see Picture 5).

Andrew's Gas Generator



PICTURE 1

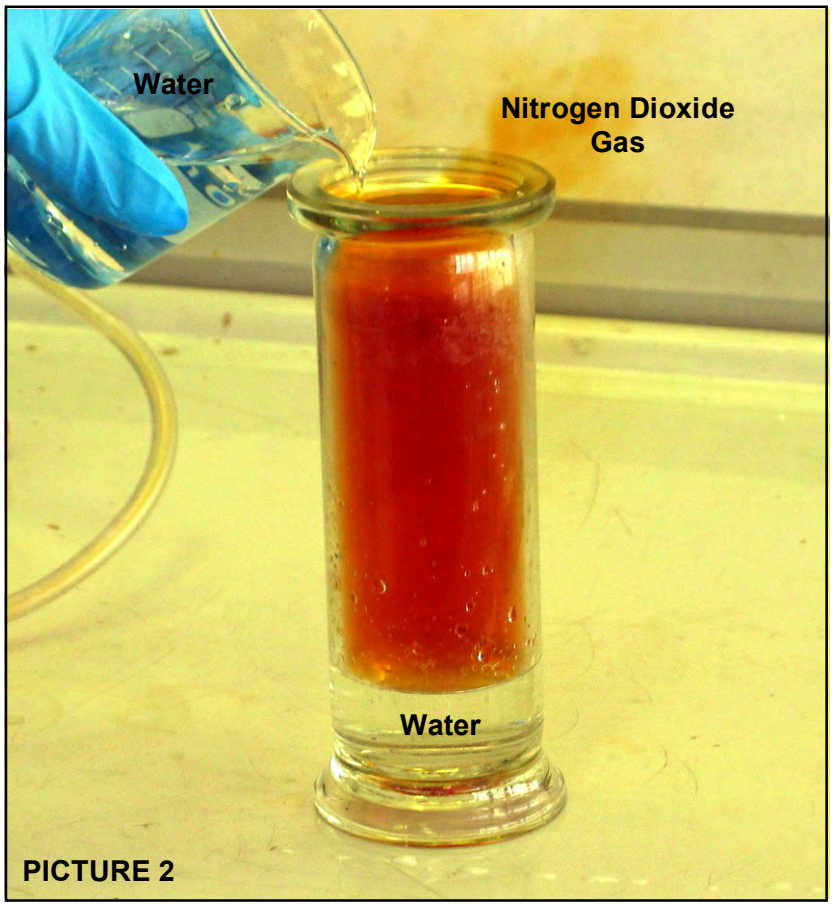
It is important to generate measured amounts of gas. Although the methods described in this Guidance Sheet suggest measured quantities, consideration must be given to the "dead space" within the generator apparatus. Therefore, the amounts suggested are approximate.

When generating gases, it must be understood that all parts of the gas generator apparatus will become filled with the gas being produced, this includes: buchner flask, dropping funnel and the delivery tube. (If drying the gas is required, this will also include the drying agent and the associated glassware). It is therefore essential that all parts of the gas generator are thoroughly quenched with water before being removed from the fume cupboard for cleaning.

The drying agent should be emptied into a beaker and left in the fume cupboard for at least 30 minutes to allow the gas to disperse (see: chlorine preparation method pages 4-6).

As well as producing the desired gas, there are other products produced which must be disposed of at the end of the reaction. All other products must be thoroughly diluted and washed to waste with plenty of water. In the case of hydrogen and nitrogen dioxide the metals involved, copper and zinc, can be washed and reused as described.

After use there will still be traces of the gas in the gas jar or test-tube, this must be disposed of before the glassware is washed for reuse. All gas jars or test tubes should be thoroughly quenched with water inside a fume cupboard (switched on) before being washed for reuse.



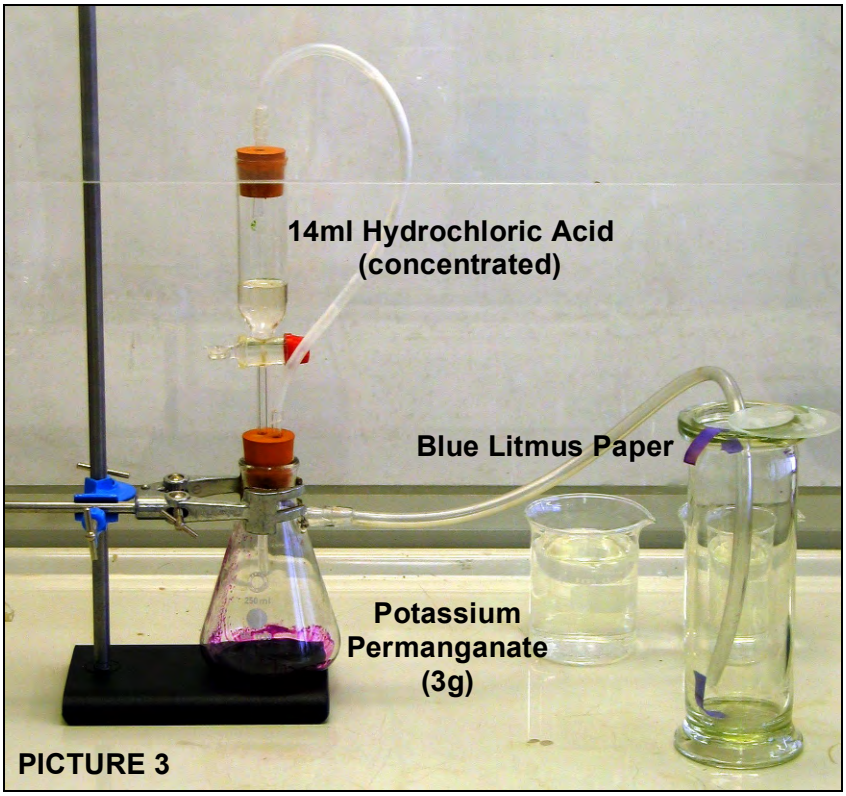
PICTURE 2

"Quenching with water: the vessel or tube should be completely filled with water or completely immersed in water to remove all traces of gas".

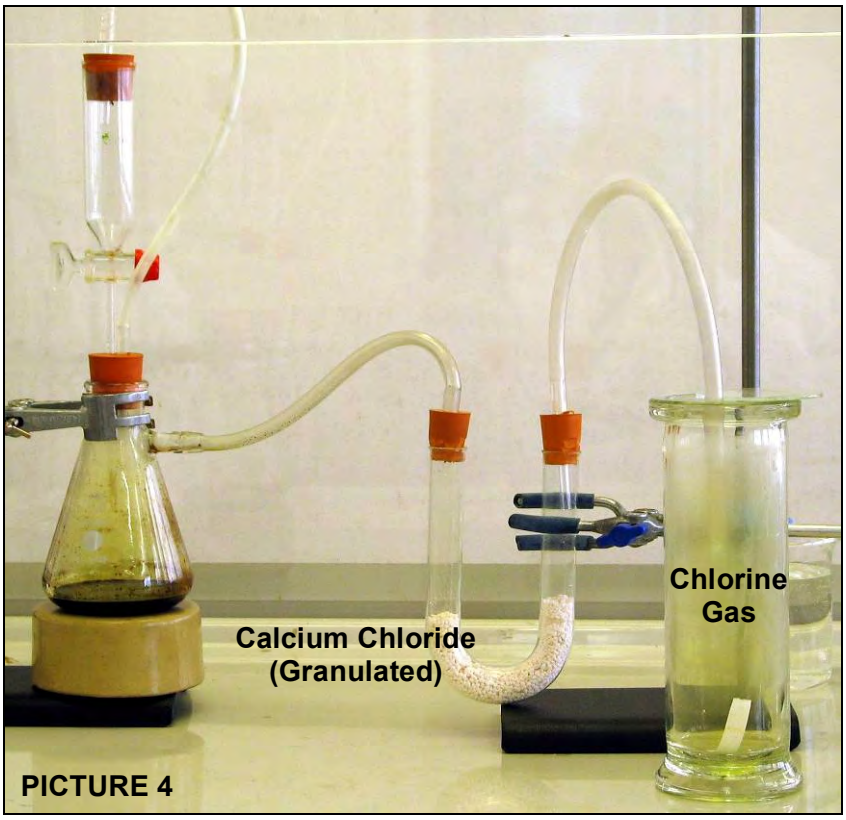
For toxic gases such as chlorine or nitrogen dioxide, quenching must be carried out in a fume cupboard.

Due to the highly flammable nature of hydrogen gas, quenching of hydrogen from glassware must be carried out in a well ventilated area ***not in a fume cupboard****.*

CHLORINE GAS GENERATOR



DRYING CHLORINE GAS



Generating 0.5 Litre of Chlorine Gas
Using 14 ml concentrated Hydrochloric Acid and 3g Potassium Permanganate

Chemicals (reactants and products)	Hazards
Concentrated Hydrochloric Acid (reactant)	Corrosive
Potassium Permanganate (reactant)	Oxidising Agent
Chlorine Gas (product)	Toxic
Potassium Chloride (product)	
Manganese Dioxide (product)	Harmful
Water (product)	

Apparatus: Andrew's Gas Generator (see pictures 3 and 4).

1 Control Measures

1.1 Carry out chlorine gas preparation and use in a fume cupboard
1.2 Wear rubber or plastic gloves
1.3 Wear eye protection
1.4 Have water available to stop reaction
1.5 Have a strong solution of sodium thiosulphate available to absorb excess chlorine gas
1.6 Always add hydrochloric acid to potassium permanganate
1.7 Always generate measured amounts of chlorine gas do not over produce unnecessary quantities of gas
1.8 Never use commercial bleach in the production of chlorine gas
1.9 Never attempt this reaction using sulphuric acid – sulphuric acid forms explosive higher oxides of manganese.

Note:

Chlorine gas is a greenish/yellow colour and has a choking smell, which is detected at a concentration of 0.2 ppm – 0.4 ppm. Even in very small quantities chlorine is detected by smell.

Chlorine gas is heavier than air and will be collected by "downward delivery". The reaction between concentrated hydrochloric acid and potassium permanganate is a vigorous reaction, a lot of gas will be produced in the initial seconds and then production will slow to stop. Excess chlorine gas can be absorbed in a strong solution of sodium thiosulphate (see SSERC Hazardous Chemicals Disc).

2 Process

2.1 Assemble gas generator (as shown in pictures 3 or 4)
2.2 Clamp the buchner flask (and U tube if drying gas)
2.3 Have all test tubes and gas jars prepared (e.g. stoppers available, gas jars/lids greased)
2.4 Have a 250ml beaker of water available, to stop the reaction
2.5 Switch on fume cupboard
2.6 Add 3g of potassium permanganate to the buchner flask
2.7 With the stop valve closed add 14ml concentrated hydrochloric acid to the dropping funnel
2.8 Open the dropping funnel stop valve and slowly (drop by drop) add the hydrochloric acid to the potassium permanganate
2.9 At the end of the delivery tube, test the gas produced with wet blue litmus paper, when the paper turns pink, chlorine gas is present
2.10 Immediately fill gas jars / test tubes, placing the delivery tube at the bottom of the gas jar / test tube and use blue litmus paper at the mouth of the gas jar / test tube to indicate when full
2.11 When all gas jars / test tubes are filled, add water to the buchner flask to stop the reaction
2.12 If any acid remains in the dropping funnel, empty into a beaker of water, dilute and wash to waste with plenty of running water
2.13 Dilute the reactants in the buchner flask, with water, and leave in the fume cupboard for a further 30 minutes to allow the chlorine gas to disperse
2.14 Wash the reactants to waste with plenty of running water
2.15 With equipment still in the fume cupboard, thoroughly quench all parts of the gas generator with water to remove any traces of chlorine gas
2.16 Dilute any sodium thiosulphate used to absorb excess chlorine, and leave in the fume cupboard for a further 30 minutes to allow all chlorine gas to disperse before washing to waste with plenty of running water.

3 Storage

Chlorine cylinders are not recommended for use in schools.

Gas jars and test tubes of chlorine gas should be prepared immediately before use and should be stored in a fume cupboard (switched on) until used. Chlorine gas can be detected at very low concentrations therefore should not be generated and stored for any length of time.

4 Disposal

After use, all test tubes and gas jars of chlorine gas should be quenched with water and emptied in a fume cupboard, before being washed for reuse.

5 Spillage

As applied to the chemicals which react to form chlorine:

Chlorine: In the event of a large escape of chlorine into the laboratory (500cm^3 or more) evacuate the laboratory. Outside windows should be opened and internal windows and doors closed.

6 Immediate Remedial Measures (exposure to Chlorine Gas)

Eyes: Irrigate with water for at least 10 minutes. Obtain medical attention.

Lungs: Remove patient from exposure to fresh air, rest and keep warm. If more than just a whiff, obtain medical attention.

7 Additional Information

7.1 Drying Chlorine Gas:

If it is necessary to dry the chlorine gas use GRANULAR Calcium Chloride in a U-Tube (see picture 4). NEVER use calcium oxide powder as blockages can occur in the drying vessel and an explosion can happen.

After use the Calcium Chloride should be emptied into a 250ml beaker and left inside the fume cupboard (switched on) for at least 30 minutes to allow the chlorine to disperse. Whilst in the fume cupboard, the U-Tube should be thoroughly quenched with water to remove all traces of Chlorine Gas. The Calcium Chloride can then be stored in a reagent jar and labelled "Calcium Chloride (used for drying chlorine)" and reused as necessary.

7.2 Safely Smelling Gas:

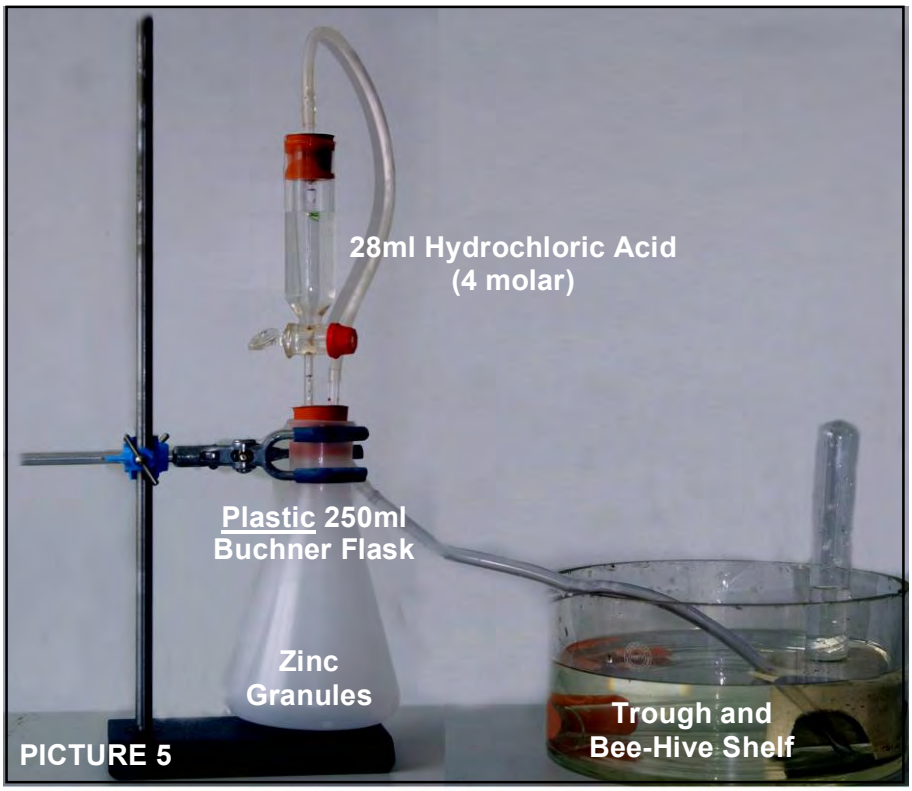
Breathe in to fill the lungs with air. Pointing the test tube of gas away from the face at a distance of 15cm, use the hand to waft the fumes towards the nose. Sniff gently (more will not be possible if the lungs are full of air). If no smell can be detected, slowly move the test tube closer to the face. DO NOT TAKE DEEP BREATHS.
Safeguards in the School Laboratory 10th edition ASE

7.3 Electrolysis of copper (II) chloride solution:

Carry out on a small scale using a low voltage (recommend demonstration). Use a piece of wet blue litmus paper inside the electrolysis cell and stop the electrolysis as soon as several bubbles of chlorine break the surface and bleach the blue litmus paper. Smell cautiously by using the "wafting technique" as outlined above.

Generating 0.5 Litre of Hydrogen Gas:
Using 28ml 4 Molar Hydrochloric Acid and Zinc Granules

HYDROGEN GAS GENERATOR



Chemicals (reactants and products)	Hazards
4 Molar Hydrochloric Acid (reactant)	Corrosive
Zinc Granules (reactant)	Highly Flammable
Hydrogen (product)	Extremely Flammable
Zinc Chloride (product)	Corrosive

Apparatus: Andrew's Gas Generator (see picture 5)

1 Control Measures

1.1 Carry out hydrogen gas preparation in a well ventilated area, **not in a fume cupboard**
1.2 Wear protective gloves
1.3 Wear eye protection
1.4 Have water available to stop the reaction
1.5 Always add hydrochloric acid to zinc granules
1.6 Always generate measured amounts of hydrogen do not over produce unnecessary quantities of gas.

Note:

Mixtures of hydrogen and air of between 4% and 74% are explosive; therefore hydrogen should be prepared in a well ventilated area **not in a fume cupboard**. Due to the volatility of hydrogen it is recommended that the gas be generated in a plastic buchner flask (see picture 5). Hydrogen is a colourless, odourless and tasteless gas it is lighter than air and will be collected by "upward delivery" over water. The chemical reaction is initially quite slow and the rate gradually settles to a steady rate of production.

2 Process

2.1 Assemble the Andrew's Gas Generator (as shown in picture 5)
2.2 Clamp the plastic buchner flask
2.3 Position the water trough and the bee-hive shelf
2.4 Have all test tubes prepared (e.g. stoppers available)
2.5 Have 250ml beaker of water available to stop reaction
2.6 Add zinc granules to the buchner flask (cover base of flask)
2.7 With the stop valve closed carefully add 28ml of 4 molar hydrochloric acid to the dropping funnel
2.8 Position the delivery tube in the glass trough, beneath the bee-hive shelf
2.9 Place the test tubes and stoppers in the trough underneath the water level
2.10 Open the dropping funnel stop valve and slowly add the 28ml of hydrochloric acid to the zinc granules
2.11 Bubbles of gas will be produced, allow 5 seconds before filling to allow all excess air to be expelled from the generator
2.12 Fill 2 test tubes by water displacement
2.13 Retain these first 2 test tubes for testing
2.14 Now continue to fill the remaining test tubes
2.15 When all test tubes are filled, add water to the buchner flask to stop the reaction
2.16 If any acid remains in the dropping funnel, empty into a beaker of water, dilute and wash to waste with plenty of running water
2.17 Dilute the reactants in the buchner flask with water and wash to waste the zinc chloride solution with plenty of running water, the zinc granules can be washed / dried and reused
2.18 Thoroughly quench all parts of the gas generator with water to remove any traces of hydrogen gas
2.19 Finally test the first two test tubes filled (for hydrogen "pop" with a lighted splint) to ensure that subsequent tubes were in fact filled with hydrogen.

3 Storage

Test tubes of hydrogen gas should be prepared no more than 1 hour before use and should be stored in a well ventilated area until use.

4 Disposal

After use, all test tubes of hydrogen gas should be quenched with water and emptied, in a well ventilated area **not a fume cupboard**, before being washed for reuse.

5 Spillage

As applied to the chemicals used in the reaction:

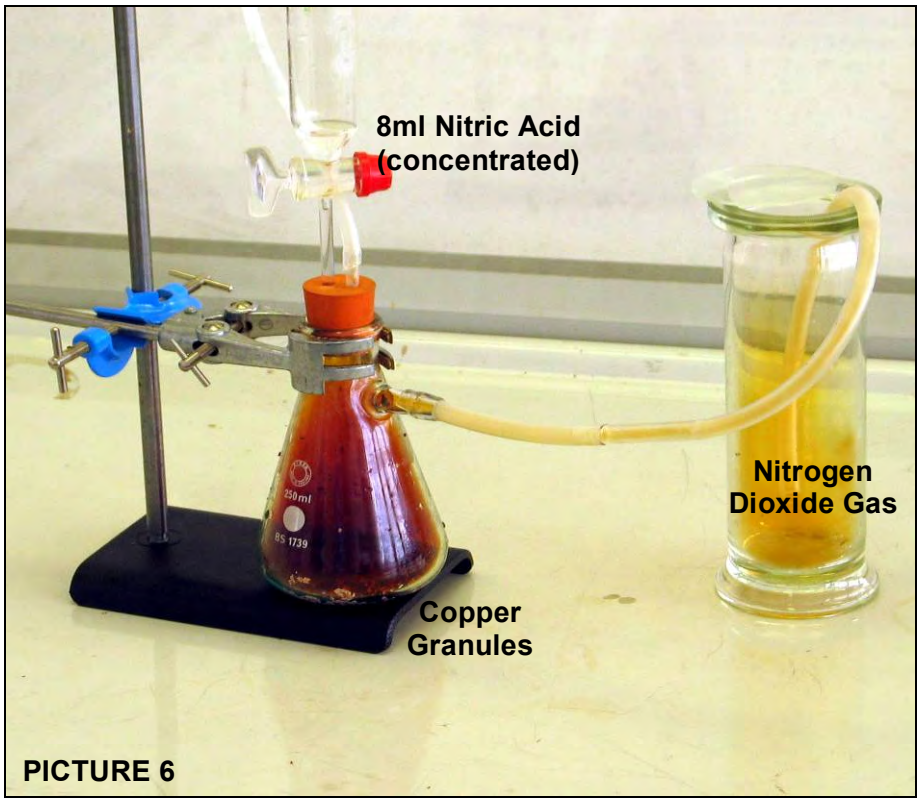
Hydrogen – will disperse very quickly, ventilate area, and open external windows. Due to highly flammable nature avoid any sources of ignition (do not switch on / off lights)

6 Immediate Remedial Measure (exposure to hydrogen gas)

Lungs: Remove patient from exposure to fresh air, rest and keep warm. If breathing is affected take casualty to hospital as soon as possible.

Generating 1 Litre of Nitrogen Dioxide:
Using 8ml Concentrated Nitric Acid and Copper Turnings

NITROGEN DIOXIDE GAS GENERATOR



PICTURE 6

Chemicals (reactants and products)	Hazards
Concentrated (70%) Nitric Acid (reactant)	Corrosive
Copper Turnings (reactant)	
Nitrogen Dioxide (product)	Very Toxic, Irritant
Copper Nitrate (product)	Oxidising

Apparatus: Gas Generator – Andrew's Generator (see picture 6).

1 Control Measures

1.1 Carry out nitrogen dioxide gas preparation in a fume cupboard
1.2 Wear high grade protective gloves
1.3 Wear eye protection
1.4 Have water available to stop the reaction
1.5 Always add nitric acid to copper
1.6 Always generate measured amounts of nitrogen dioxide do not over produce unnecessary quantities of gas.

Note:

Nitrogen dioxide is a red – brown colour with a pungent smell, it is heavier than air and is collected by "downward delivery".

The reaction between concentrated nitric acid and copper turnings is a very vigorous reaction, a lot of gas will be produced in the initial seconds and then production will slow to stop.

2 Process

2.1 Assemble the Andrew's Gas Generator (as shown in picture 6)
2.2 Clamp the buchner flask
2.3 Have all test tubes and gas jars prepared (e.g. stoppers available, gas jars/lids greased)
2.4 Have 250ml beaker of water available to stop the reaction
2.5 Switch on the fume cupboard
2.6 Add copper turnings to the buchner flask (cover base of flask)
2.7 With the stop valve closed carefully add 8ml of concentrated nitric acid to the dropping funnel
2.8 Place the delivery tube at the bottom of the first gas jar / test tube to be filled
2.9 Open the dropping funnel stop valve and slowly (drop by drop) add the nitric acid to the copper turnings
2.10 Immediately fill the gas jars / test tubes, placing the delivery tube at the bottom of the gas jar / test tube
2.11 When all gas jars / test tubes are filled, add water to the buchner flask to stop the reaction
2.12 If any acid remains in the dropping funnel, empty into a beaker of water, dilute and wash to waste with plenty of running water
2.13 Dilute the reactants in the buchner flask with water and wash the copper nitrate solution to waste with plenty of running water, the copper turnings can be washed / dried and reused
2.14 While still in the fume cupboard, thoroughly quench all parts of the gas generator with water to remove any traces of nitrogen dioxide.

3 Storage

Gas jars and test tubes of nitrogen dioxide gas should be prepared no more than 1 hour before use and should be stored in a fume cupboard (switched on) until used.

4 Disposal

After use, all test tubes and gas jars of nitrogen dioxide gas should be quenched with water and emptied, in a fume cupboard, before being washed for reuse.

5 Spillage

As applied to the chemicals which react to form nitrogen dioxide:

In the event of a large escape of nitrogen dioxide into the laboratory ($500cm^3$ or more) evacuate the laboratory. Outside windows should be opened and internal windows and doors closed.

6 Immediate Remedial Measures (exposure to nitrogen dioxide gas)

Eyes: Irrigate with water for at least 10 minutes.

Lungs: Remove patient from exposure to fresh air. Rest and keep warm. Even if symptoms are not obvious, medical observation for up to 72 hours may be required because of the insidious effects of nitrogen monoxide and nitrogen dioxide. Dinitrogen monoxide has an anaesthetic effect upon inhalation.

Skin: Wash well with soap and water. Remove and wash contaminated clothing.

If more than just a trace of nitrogen monoxide or nitrogen dioxide is inhaled or eyes are irritated then take casualty to hospital as soon as possible.

Glasgow City Council

EDUCATION SERVICES

Technician Support Service

Technician Guidance Sheets TGS / 04

Working Platform: Inspection and Maintenance

Issued by **Technician Support Service**

Date **September 2005**

Objectives - The objectives of this bulletin are to ensure the safe use of a Working Platform and guidelines for the monthly inspection and maintenance

Persons responsible - Senior Support Service Technicians and Support Service Technicians

TECHNICIAN SUPPORT SERVICE

Technician Guidance Sheet

Working Platform - Formal Inspection and Maintenance

The following notes are guidance concerning the planned inspection and maintenance program required to ensure that working platforms are safe for use at all times.

The working platform should be visually inspected for any obvious signs of damage prior to making use of the unit concerned. This pre-use inspection should include checking the frame and steps for physical damage and that castor return springs and cupped feet are fully operational.

A formal visual inspection of the working platform should be carried out 3 times a year and the results of this inspection recorded on the record sheet provided. Such inspections should be carried out as follows:

1 Structural Inspections

1.1 Visual Inspection

Examine the metal framework for any signs of distortion or structural damage and inspect the paintwork for corrosion. Support Service Technicians should not attempt to repair a working platform with a distorted frame; such repairs should be referred to Technician Support Service for further assessment.

1.2 Welds and Joints

Carefully examine all of the welds and joints of the frame for the following defects: hairline cracks, excessive corrosion and flaking paint. Minor corrosion and flaking paint can be cleaned using a wire brush and emery cloth and repainted to prevent further corrosion. If hairline cracks in the welds or extensive corrosion are found, the platform should be removed from service and referred to the Technician Support Service for further assessment.

Paint Recommended: Hammerite Enamel Paint (R.S. Components 297-3736 £9.29)

1.3 Rubber Treads

The rubber treads should be carefully examined for the following: tears, holes, missing screws, foreign objects stuck in the ruts and any separation from the frame. Any damaged treads or missing screws should be replaced immediately and the ruts must be cleaned and kept free of debris at all times.

2 Feet and Castors

2.1 Cupped Feet

The rubber "O" rings around the cupped feet should be inspected to ensure that they are; in place, secure to the metal feet and free from corrosion. Excessively corroded or missing "O" rings should be replaced immediately by referring the working platform to Technician Support Services for repair.

2.2 Castors

Before inspecting the castors, all dirt, grime and rust should be removed using a stiff brush. The castors on the feet should be physically checked to ensure that the securing bolt is tight. The securing bolt can be tightened using a suitable spanner or socket set.

Next, check that the rubber on the wheel treads is complete, not excessively worn, that the wheels turn freely and are not clogged with dirt or grime. Ensure that the castors depress freely, rotate in all directions and that the return spring mechanism is working correctly. If the castors do not depress freely and return, they should be removed, cleaned and lubricated using WD40.

If the working platform has excessively worn or damaged castors they should be replaced immediately.

If a repair cannot be undertaken by the Support Service Technicians, the working platform should be withdrawn from service and labelled **"Unsafe – Do Not Use"**. The working platform should then be referred to the Technician Support Service, in the usual manner, for repair.

2.3 Integrity of Platform

Finally the steps should be tested by putting your full weight on each step individually. Care should be taken by keeping both hands on the handrails while testing the integrity of each step.

Inspection Record

The working platform should be inspected 3 times a year in line with the fume cupboard monitoring program. A record of inspections should be maintained by the Principal Support Service Technician using the record sheet provided. Any faults detected should be repaired immediately and recorded on the inspection record sheet.

Inspection records should be made available to Health and Safety Officers, TSS Staff and any Officer of the Council if so requested. Records of completed inspections must be retained, in a safe place, for a minimum period of five years after the last entry.

Glasgow City Council

EDUCATION SERVICES

Technician Support Service

Technician Guidance Sheets TGS / 10

Gas Cylinder Regulator Inspection

Issued by **Technician Support Service**

Date **February 2007**

Objectives - The objectives of this bulletin are to ensure the safe use of and guidelines for the annual inspection of gas cylinders and associated regulators

Gas Regulators - Formal Inspection

The purpose of this Guidance Sheet is to provide information on the safe use and inspection of gas cylinders and associated regulators

Gases that are normally stored and used for educational purposes are as follows:

Oxygen
Nitrogen
Carbon dioxide
Sulphur dioxide
Argon mix

The following notes are guidance concerning the handling, storage, and use of gas cylinders and inspection of gas regulators to ensure that they are safe for use. The two main sets of regulations covering gas cylinders/regulators are:

The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2004

The Pressure Equipment Regulations 1999

The law requires that all gas cylinders, which in the case of Glasgow schools are hired via a reputable supplier, are examined and tested by the company that supplies the cylinder.

Gas regulators must **not** be used unless either of the following conditions are met:

1. It is less than 5 years old

2. It is greater than 5 years old and has been inspected and certified for use by a company specialising in gas equipment.

An HSE approved body, carries out the initial and reassessment examination and verification. Within Glasgow Education Services all regulators are owned by the school, which carries the responsibility for having them tested by a competent person and retain the test records for a period of at least five years.

Regulator inspection, testing and certification will be arranged by Technician Support Service and will be carried out by a registered outside agency. Regulators purchased after 1998 carry the marking BS EN ISO2503.

General Inspections

Regulators
Users should carry out an external visual examination on each occasion of use of gas regulator to determine whether there are obvious signs of physical damage to the valves, casing, coupling and threads

- Also check that the regulator is suitable for use with the gas in the cylinder under no circumstances should a regulator be used on a gas cylinder that contains a different gas from that which the regulator is designed to dispense
- Annually, or if there is reason to suspect a leak, technicians should conduct a simple Leak test the results of which should be recorded on the record sheet provided. Please see appendix 1
- Record sheet must be retained by the school for a minimum period of five years and to be made available to council safety officers and officers of the HSE as requested.

Cylinders
Gas cylinders, which in the case of Glasgow schools are hired via a reputable supplier, are examined and tested by the company that supplies the cylinder.

Users should carry out an external visual examination on each occasion of use of gas cylinder to determine whether there is obvious damage.

Do not use and immediately return the cylinder to the supplier:

- If mounting threads are damaged
- If the regulator doesn't seat properly or
- If the spindle valve requires great force than normal to turn off the supply.

Training
Anyone one who examines, refurbishes, fills or uses a gas cylinder should be suitably trained and have the necessary skills to carry out their job safely. They should understand the risks associated with gas cylinder and its contents. (HSE Safe Use of Gas Cylinders 2004)

Precautions

- Regulator valves should always be opened slowly. Hammers, mallets or excessive leverage must **never** be used on a stiff or frozen valve.
- Empty cylinders must be closed before detaching the regulator, clearly marked as empty and returned to the supplier.
- Fire extinguishers must **never** be used as a source of carbon dioxide for laboratory use.
- When using a carbon dioxide cylinder (with jet freezer adaptor) to make dry ice, suitable protective equipment must be worn to prevent burns e.g. gloves and goggles/face visor.
- **Hydrocarbon Contamination**
  Do not use oil, grease or other hydrocarbon substances on the cylinder valves for lubrication. Where there is contamination of this kind contact with oxygen can, in certain conditions result in an explosion. The dangers of this practise both to the users of the cylinders and to the employees of the supplier are obvious. If any cylinders do accidentally become contaminated, they should not be used but set aside and clearly labelled. The supplier should then be informed immediately.

Storage

- Entry door(s) to storage area(s) must display "Compressed Gases" safety sign.
- Cylinders should not be stored within chemical stores or in classrooms.
- Access to cylinder keys should be restricted to authorised staff e.g. keys should not be kept with cylinder
- Sulphur dioxide cylinders must not be stored beside corrosive substances; separate area of chemical store will suffice.
- Protect gas cylinders from external heat sources that may adversely affect their mechanical integrity. Do not store next to radiators or other heat sources.
- Ensure the valve is kept shut on empty cylinders to prevent contaminants entering the cylinder.
- Store gas cylinders securely when they are not in use, they should be properly restrained against the wall or in trolleys designed for the purpose. This will prevent them from falling over.
- Gas cylinders must be clearly marked to show their contents and the associated hazards.
- Store cylinders where they are not vulnerable to hazards caused by impact, e.g. under shelves.

Handling

- Cylinders must be transported and securely stored in the trolleys provided for this purpose.
- Use gas cylinders in a vertical position, unless specifically designed to be used otherwise.
- Cylinders of capacity greater than 18Kg for Oxygen (F), 6.35Kg for Carbon dioxide (VB), 6.35Kg for Nitrogen (F) and 19Kg Argon mix (X) should not be used within schools. Please see Appendix 1 for cylinder sizes.
- Do not drop, roll or drag gas cylinders.
- When required wear suitable safety shoes and other personal protective equipment when handling gas cylinders/regulators.
- Do not use valves, shrouds and caps for lifting cylinders unless they have been designed and manufactured for this purpose.

Use

- Always double-check that the cylinder/gas is suitable for the intended use.
- Before connecting a gas cylinder to equipment or pipework make sure that the regulator and pipework are suitable for the type of gas and pressure being used.
- Do not use gas cylinders for any other purpose than the transport and storage of gas.
- User's should always carry out an external visual examination of gas cylinder and regulator to determine whether there is any physical damage.

References have been made to:

SSERC Bulletin 205
SSERC HazChem Manual for Science
Safe Use of Gas Cylinders HSE 2004
Safe Guards in the school laboratory 11th Edition

Inspection Record

The Principal Support Service Technician using the record sheet provided should maintain a record of inspections. Any faults detected in the regulator or the gas cylinder should be reported to the supplier immediately.

Inspection records should be made available to Health and Safety Officers, TSS Staff and any Officer of the Council if so requested. Records of completed inspections must be retained, in a safe place, for minimum period of five years after the last entry.

APPENDIX 1

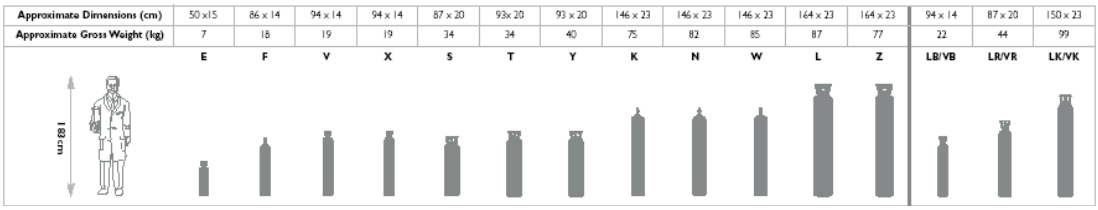
General Inspections

On an annual basis, or if there is reason to suspect a leak, carry out a simple **Leak test** the results of which should be recorded.

Leak Test

- Wear goggles or face visor for this test. With the regulator fitted to the cylinder attach a short length of rubber tubing to the outlet and close the open end with a lab screw clip.
- With a paintbrush apply a dilute 1% soap solution over the joints and the outside of the regulator.
- Adjust the output pressure to a very low value, of about 0.5 bar.
- If any leaks are indicated by the appearance of small bubbles, then the regulator should be returned to the supplier or other firm for further testing.
- Once leak test is complete please ensure that you remove any remaining detergent solution with a damp cloth and dry the regulator.

Cylinder size



Glasgow City Council

EDUCATION SERVICES

Technician Support Service

Technician Guidance Sheets TGS / 11

Safe Use of Pressure Steriliser

Issued by Technician Support Service

Date February 2007

Objectives - The objectives of this bulletin are to ensure the safe use and with simple preventative measures ensure the correct working of a pressure steriliser

Safe Use of Autoclaves

The purpose of this Guidance Sheet is to provide information on the safe use of sterilising vessels to include autoclaves and pressure cookers.

General

An autoclave or pressure cooker is an essential item for microbiology. They are used for steam sterilisation but neither piece of equipment can be relied upon if not used correctly. Liquids and articles which would be damaged by dry heat at 160^0C are sterilised by steam at 121^0C ($103kNm^{-2}$ or $15lbs\ in^{-2}$ steam pressure) which if held for 15 minutes will kill all micro-organisms including bacterial endospores (126°C for 10 minutes produced in the Prestige Medical Autoclave is equally effective).

Regular inspection of autoclaves and pressure vessels are required under the Pressure Systems and Transportable Gas Containers Safety Regulations. It is the responsibility of the employer to make arrangements for these inspections. The services of an outside agency are used by GCC for such inspections. Examination involves checking for signs of physical damage such as cracks or pitting, the normal operation of the pressure release valve and whether any rubber seal or gasket requires replacing.

Hazards

It can be very dangerous to open an autoclave before the pressure has dropped to atmospheric (when the temperature inside will be about 80^0C). The sudden change in temperature caused by opening the vessel before the internal pressure has been allowed to fall has been known to cause violent cracking of glass containers or liquids boiling over and being wasted. Serious scalds and burns have occurred because this hazard has not been appreciated. The cooling period increases the time of exposure to steam and may be necessary for the effective sterilisation of some materials.

Heating autoclaves or pressure cookers with Bunsen burners is not recommended.

Keep all electrical leads, especially mains leads, tidy and site electrical equipment so as to minimise the risk of water ingress.

Ensure that all electrical equipment is inspected on a regular basis by the external inspectors, as arranged by GCC, Education Services.

Ensure autoclaves, gas and electric, are inspected on a regular basis by the external inspectors as arranged by GCC, Education Services.

Care must be taken to avoid overloading the autoclave as heat and steam will not be able to circulate and complete sterilisation will not occur.

Set up the autoclave where there is the least likelihood of injury to oneself or others from the issuing steam or from the trailing cable. The external surface of the autoclave reaches a temperature of 121^0C during its operation.

Autoclaves with fixed sterilisation cycle can not manually be extended. With larger volumes of cultures or media, it has been found that not enough time elapses for the temperature of the entire medium to be raised sufficiently so that complete sterilisation occurs. In these circumstances, volumes of media must be divided into several smaller batches, preferably in medical flats.

Disposal

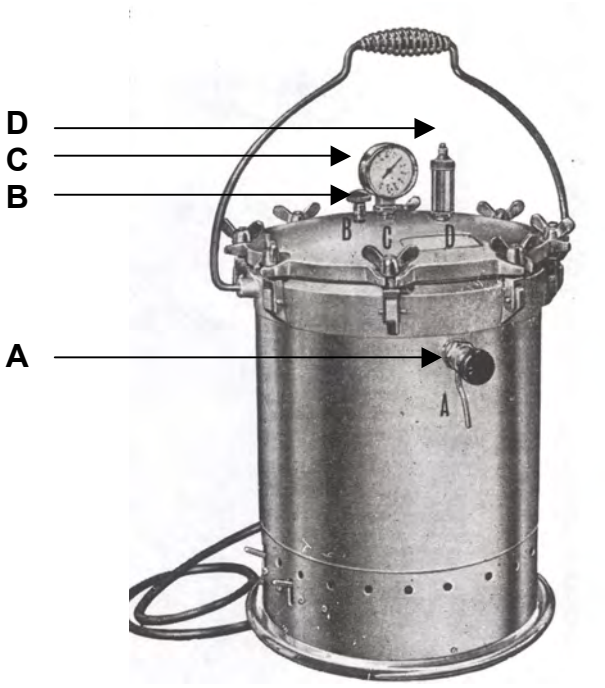
After sterilisation, solid cultures can be disposed of, in tied autoclave bags or similar, via the normal refuse system. Liquid cultures can be flushed away down the lavatory or the sink with lots of water. Additional care must be taken to prevent culture material to accumulate in open or closed waste traps.

Clean autoclave chamber internally after use as recommended by manufacturer.

Clean lid seal with damp cloth and examine to ensure it is in good condition.

The Autoclave

Portable Electric Model



A Draw-off Cock
B Aircock
C Gauge
D Safety valve

Checks before use

1. Examine for physical damage
2. The routine Electrical Safety inspection has been made
3. The routine Pressure Systems inspection has been made
4. The lid gasket inside the rim of the lid is free from splits and is flexible
5. The rim of the body on which the gasket seats has no dents
6. That there is a set of instructions for reference at hand
7. Safety valve D should be set to 15lbs in^{-2}. Adjustment should not be required for normal educational purpose but if required it can be adjusted from 15lbs in^{-2}. to 10lbs in^{-2}. To set to 10lbs in^{-2} twist until it unlocks and rises. To reset to 15lbs in^{-2} depress and turn until it locks.

Note:
The pressure vessel should not be allowed to boil dry; if it does so a thermal cut-out switch will be activated. To Re-Set switch off main supply remove contents, empty the container and allow to cool. The cut-out switch is located in the base of the autoclave between the two switches; the technician that is qualified to carryout repairs in school can remove the base plate and re-set the switch. Replace the base plate and check operation.

Steam Sterilisation Cycle	
Heating up	Water comes to the boil
Free steaming	All air must be driven out. Steam should be observed to escape vigorously through the open airlock or steam vent for not less than 2 minutes before the pressure control is operated
Holding	At least 15 minutes at 121^{0}C. The timing to start when steam starts to escape with hissing. Turn down the heat shortly after this time but ensure that some steam is escaping throughout the holding period.
Cooling	Allow to cool naturally; rapid cooling may lead to glassware cracking or liquids boiling over and being wasted.

Note that the instructions supplied by manufacturers for the operation of their autoclaves may suggest longer holding times or cooling periods than are necessary for effective sterilisation. It would seem that such instructions are erring on the side of safety rather excessively.

The following points must be observed using a pressure cooker or autoclave

1. Wear a lab coat and use eye protection. Wear protective gloves when handling hot equipment.
2. Add water to the recommended depth (3cm to the base of the pressure cooker).
3. Place the trivet/stand in the base if required.
4. Loosen caps slightly (tighten then loosen a half turn) on bottles and place the materials to be sterilised in cooker/autoclave. Note that bottles should contain a maximum of 500cm^3 of medium and there should be space for expansion above the medium in the bottle.
5. Place Browne's tube/test strip as close as possible to centre of materials to be sterilised. The colour change should be checked at the end of the procedure.
6. Secure the lid of the pressure cooker/autoclave according to the manufacturer's instructions.
7. Heat on an electric or gas ring till steam issues evenly or switch on if the heater is integral.
8. Place on the valve (pressure cooker and some autoclaves).
9. When cooker begins to 'hiss' evenly, turn down heat.
10. Continue heating gently for 15 minutes. Note that steam should continue to issue gently from the valve - if it does not, pressure and temperature are likely to have fallen. The pressure and temperature must be maintained continuously for the recommended time. Steam escaping other than through the safety valve may indicate that the lid is not properly fitted or a worn gasket
11. Turn off heat and allow to cool naturally. Do not attempt to speed up cooling - this can distort the pressure cooker; can cause media to boil over and glass containers may crack. The pressure valve must <u>not</u> be opened until the cooker has reached atmospheric pressure
12. Take care when opening the lid that steam does not escape towards the operator.
13. Allow sterilised materials to cool naturally before removing from the vessel.
14. Lids of screw-capped bottles must be loose to allow equalisation of pressure and for steam to envelope the medium. Failure to loosen lids may result in the bottles exploding due to the increase in pressure. Lids must be tightened once the medium has cooled to appropriate temperature.
15. Cotton wool plugs must be covered with aluminium foil to prevent them becoming wet. Wet bungs will allow organisms to enter the medium and will not filter them out of air passing into containers.
16. All liquids and media except those that are heat sensitive can be sterilised in the pressure cooker or autoclave.
17. Glassware such as Pasteur pipettes and spreaders and autoclavable resistant plastics such as tips for automatic pipettes can be wrapped in foil and autoclaved.

If a fault occurs and the unit is not under manufacturers warranty please report it to Technician Support Service for repair.

Please circulate this Guidance Sheet to all relevant technicians and teaching staff for information.

Glasgow City Council

EDUCATION SERVICES

Technician Support Service

Technician Guidance Sheet TGS/16

Transportation and Safe Storage of Hazardous Substances or Equipment

Issued by: **Technician Support Service**

Date: **September 2009**

Objectives - The objective of this Guidance Sheet is to instruct Support Service Technicians in the method of safe storage of chemicals and solutions.

Persons responsible: Senior and Support Service Technicians

Role of the Senior Support Service Technician

The Senior Support Service Technician is responsible for coordinating and planning all the requests and demands for technician support, equipment and resources. This includes ensuring that equipment is used to its full potential and is properly and efficiently managed throughout the whole school.

The Senior Support Service Technician is responsible for organising and monitoring the duties of the Support Service Technician team, allowing time for unforeseen demands and factoring in time for medium and long term projects.

Science Code of Practice

The above code of practice indicates the following pertaining to all the staff concerned.

2 RESPONSIBILITIES

2.1 Responsibilities of staff in Secondary schools for the implementation of the Code of Practice are as described in the document Responsibility for Health, Safety and Welfare in the Education Service MSF/5, para 9.

(i) Head of school or Head Teacher
(ii) Head of Department/Head of Faculty/Senior Support Service Technician
(iii) Teacher/Support Service Technician

2.2 Although specific responsibilities have been allocated to particular categories of staff it is incumbent upon every employee to take all reasonable steps to ensure the health and safety at work of themselves and others.

Scottish Schools Equipment Research Centre (SSERC)

SSERC'S general advice as to the security of laboratories or storage areas is shown below.

3.1.10 Security

Access to laboratories, preparation areas and stores is at all times to be controlled so as to comply with the provisions of the Management of Health and Safety at Work Regulations 1999.

Measures to remove or minimise any risks must be made known to all staff. All staff are required to exercise control and supervision to ensure that, as far as is practicable, such preventive and protective measures are always taken. Holders of promoted posts have the added responsibility to monitor, and if necessary review the preventive or protective measures

Resource Managers

The Support Service Technician team should ensure that all the resources, within their control, are safely stored, regularly maintained and available for use as required throughout the school.

It is the responsibility of the Senior Support Service Technician to ensure that a robust resource management system is agreed, communicated and implemented throughout the school. This is particularly necessary within the science department where the range of resources can include; hazardous chemicals, dangerous apparatus, expensive equipment and vulnerable materials (e.g. items which are can be subject to pilfering).

As well as constructing, presenting and assembling the materials safely as required, it is the role of the technician (core skills science) to ensure the safe delivery and retrieval of equipment and resources.

Whilst it is not always possible to deliver all equipment just prior to the lesson or to visit every practical room at the end of a period to remove equipment, technicians should plan and prioritise the daily delivery and removal of hazardous chemicals, dangerous apparatus, expensive equipment and vulnerable materials (e.g. items which are can be subject to theft) in order to limit the amount of time these materials are left unattended and or unsupervised.

Methods of Transportation

Delivery and retrieval from the laboratory

- Practical rooms requiring hazardous chemicals, dangerous apparatus, expensive equipment and vulnerable materials (e.g. items which are can be subject to pilfering), should have equipment delivered directly to the teacher or just prior to the lesson and removal before the end of the lesson while the teacher is still present. Schools should ensure that all staff are aware of which materials are subject to this type of delivery system.
- Certain items tend to be attractive to pupils e.g. syringes, scalpels, magnets, lenses, needles etc. it is prudent to ensure that any missing items are reported to the class teacher prior to the class being dismissed, as this will allow a careful and thorough search to be undertaken. Schools should ensure that all staff are aware of which materials are subject to this type of delivery system.
- If the hazardous substance or equipment has to be left in an unoccupied laboratory the door(s) must be locked at all times.
- It is essential that an agreed system is in place for reporting any shortages and that all staff (teachers and technicians) are aware of the local system and adhere to the various process as agreed at the establishment level.

General Laboratory Equipment and Stock Chemicals

General laboratory stock equipment may be issued to the laboratory on a semi-permanent basis. Such items of equipment do not require to be removed from the laboratory on a daily basis; however a system of checking numbers and the operational status of the equipment concerned should be undertaken at suitable intervals.

Large stock containers of chemicals, and stock bottles, should never be issued to the laboratory. Contents of large stock containers should be decanted into smaller bottles and jars. Each container should be labelled with the modern chemical name of its contents and any hazards which are applicable.

General Storage of Chemicals

"Substances must be stored in such a way as to minimise possible hazards and in quantities which ensure a fairly rapid turnover. Deliberate limiting of stock will assist in keeping storage problems to a minimum". Science – A code of practice

Access to storage areas shall be restricted to authorised persons only. Storage area door(s) should be locked and labelled with the prohibition sign "NO UNAUTHORISED PERSONS ALLOWED BEYOND THIS POINT".

These notes are for general guidance only, and particular attention should be paid to the information regarding storage on the manufacturer's data sheets provided with each chemical.

Chemical Store	• Restricted Access (Technicians and Teachers) • Locked at all times • Hazard warning sign "**No Unauthorised Persons Allowed Beyond This Point"**
Chemical Stock List/Inventory	Should contain the following information: • Type • Amount • Place of storage • Annual usage • Shelf life (SSERC Safetynet for guidance) • New stock added as it arrives • Updated annually
Date Stamping/Labelling	All chemicals must be date stamped on arrival.
Clear Labelling	• Chemicals should be clearly labelled • Old/worn labels should be replaced • All containers should be clearly labelled with appropriate hazard warning label.
Chemicals which must not be used within schools	• Phenols, Isocyanates, Benzene, Crude oil, Carbon Disulphide, Carbon Tetrachloride, Picric Acid, Formaldehyde, Alkyl sulphates, Ethylene Dichloride, Ethylene Dibromide and Asbestos products. Reference should be made to the following documents: *SafetyNet Hazardous Chemical - SSERC* *Topics in safety 3rd Edition - ASE* *Safeguards in the school laboratory 11th Edition - ASE* *Be Safe 3rd Edition, Health and Safety in Primary School Science and Technology – ASE*
Shelving	• Avoid overcrowding • Shelving units within the department should be checked annually for signs of damage or corrosion. Formal recording of the above checks should be made using the record card provided for this purpose.

Transporting Chemicals	Winchester and bottle carriers must be used as and when appropriate.
Spillage kits	• Spillage kits should be available • Data sheets on usage should be available
Compressed Gases	• **Do not store in Chemical Store or Classroom** • Cylinders must be stored and transported in trolleys provided for this purpose • Entry Door(s) to storage area(s) must be labelled with **"Compressed Gases"** safety sign • For ease of handling only cylinders H655-940mm, W140 -176mm or cylinders of an equivalent size should be held within schools • Access to cylinder keys should be restricted to authorised staff • Cylinder and valve condition must be checked at least once per term and immediately before use formal recording of the above checks should be made using the record card provided for this purpose. (Technician Guidance Sheet 10) • A leak test must be carried out annually and at any time where a leak is suspected (Technician Guidance Sheet 10) • Sulphur dioxide cylinders must not be stored beside corrosive substances.
Bromine	• Stocks kept to a minimum • Bromine liquid should only be purchased and stored in the form of 1ml or 2ml vials of concentrate **no open bottles of bromine are permitted.**
Poisonous substances	• Poisons may be stored in a chemical store with restricted access • If stored in "poison cabinet" cabinet must be locked at all times • The storeroom door or cabinet must be labelled with **"Poison"** safety sign.
Flammable Liquids	• Must be stored within specially designed "Flammable Liquid Cabinets" (FLC's) • FLC's can store no more than **50 Litres** aggregated of flammable liquid within any one room • FLC's must be kept locked at all times and keys removed immediately after use • FLC's keys should not be stored where they can be accessed by unauthorised persons • Stocks of flammable liquids should be kept to the minimum required • No container of flammable liquid greater than **500ml** should be allowed in any laboratory • Flammable liquids should be returned to secure storage immediately after use • Flammable liquid cabinets must display a **"Flammable Liquids"** warning sign • The entry door(s) to the storage area(s) should also be labelled **"Fire Risk"**.

Alkali Metal or Phosphorus	• Phosphorus should be stored in a separate area from Alkali Metals and Flammable Liquids • Bottles containing alkali metals (sodium, lithium or potassium) or phosphorus should be stored within sturdy non combustible compartmentalised containers to ensure that the bottle remains upright • Both the bottle and the container should be clearly labelled with the name of the substance, name of immersion liquid to be used and either a **"water reactive"** or **"air reactive"** warning sign, whichever is appropriate • Immersion liquid levels should be checked and recorded at least once per term and immediately before and after issue • Sodium should be **"freshly cut"** before use (Only freshly cut pieces of Alkali metal, approximately the size of a grain of rice, should be used) • Where a teacher requests alkali metal to demonstrate the oxidisation of a freshly cut surface only the minimal amount should be issued • There should only be enough for class use issued • No stock bottles should be issued • It is prudent revisit the classroom concerned just before the end of the lesson. This will allow any necessary checks to be undertaken prior to the class being dismissed. • Alkali metals/phosphorus should not be left uncollected in classrooms • The department may wish to introduce a written signing out signing in system for the issue and return of alkali metals and phosphorus
Corrosive Substances (liquids – acid/alkali)	• Acids and alkalis should be stored as far apart from each other as practicable • Containers should be stored at low level, placed in containment trays and kept separate from flammable substances • Where substances are stored at floor level a "kick board" must be fitted to prevent accidental damage and resultant spillage.
Oxidising Agents	• Oxidising agents should be stored separately from combustible materials; separate storage could consist of separate areas within the one store • The entry door to the storage area should be labelled **"Oxidising Agent"**.
Chemicals stored in FRIDGES e.g. Biological Material	• Fridges should be sited in an area where access is restricted (not a classroom) • Fridge door should be labelled **"Biological Hazard"** • The entry door to the storage area should be labelled **"Biological Hazard"**.

Radioactive Material	• Radioactive Sources should not be stored in a Chemical Storeroom • The sources are to be in a metal container which should be recognisable after a fire • The sources should be kept under lock and key which could either be the container cupboard or store • Access should be restricted to authorised staff • The store containing the sources must not be in the same room as a container used for flammable liquids • The sources must not be stored “close” to a place where any one person works habitually. This is usually interpreted as “not within 2-3m of a desk, bench or sink.

Bibliography

Science Technicians Handbook - Herbison Scientific
Topics in Safety - ASE
SSERC - SafetyNet

Glasgow City Council

EDUCATION SERVICES

Technician Support Service

Technician Guidance Sheets TGS / 19

Procurement of Heart and Lungs for Dissection or Experimentation Purposes and Safe Disposal Procedures for Animal Products

Issued by Technician Support Service

Date December 2009

Objectives - The objectives of this bulletin are to outline the procurement, storage and disposal of animal heart and lungs.

Persons responsible - Senior and Support Service Technicians

Background

The use of animal material in school can be of considerable educational value and has been authorised by the Scottish Executive for diagnostic, educational or research purposes.[1]

However, simple precautions are required in order to reduce the risk of contamination from the material and also to minimise the risk of personal injury from the use of sharp instruments.

Procurement of Heart & Lungs

"Only materials fit for human consumption obtained from abattoirs, butchers or fishmongers may be used for the purpose of dissection or experimentation".[2]

In order to ensure that this advice is followed, TSS has negotiated an agreement with Paisley Abattoir on behalf of all Glasgow Secondary Schools.

If a school requires a set of sheep heart and lungs - also known as a pluck, the Support Service Technician's first point of contact is Bill Johnstone, manager at the abattoir (contact details are listed below).

Meat hygiene inspectors within the abattoir ensure that only meat fit for human consumption is passed for food. Official regulations require specific inspections of all animals, carcasses and offal. This includes the incision of the various organs including lung-sac and heart, which makes it extremely difficult to then inflate the lungs. However, when placing an order please ensure that it is made clear to the abattoir that a pluck with the lung-sac intact is required. TSS has been assured by the meat inspectors and vets at the abattoir that this poses no threat to human health. However, please note that the heart will have an inspection incision which should not interfere with any dissection that is then subsequently carried out. Schools should note that the abattoir will require a minimum of 24 hours notice prior to collection of materials.

Schools should then make the appropriate arrangements to uplift the material requested and pay for the material (£2.00 per pluck). The abattoir will accept cash or cheque. Please remember to ask for a receipt.

It is recommended that a cool box lined with an opaque polythene bag will also be required in order to transport the material safely. The abattoir may issue an identification number which is required for traceability of its meat products.

Contact Details:
Bill Johnstone (Manager)
Sandyford Abattoir (Paisley) Ltd
Sandyford Road
PAISLEY
PA3 4HP

Phone 0141 887 6266

Fax 0141 848 5671

[1] **Regulation (EC) No 1774/2002, The Animal By-Products (Scotland) Regulations 2003, SERAD**
[2] Living Materials CoP, SSERC 2nd Edition 2005

Preparation and Storage

The material **must** be used while it is still deemed to be in a state fit for human consumption. Offal has a maximum refrigerated storage time of 24 hours and must be kept at a temperature no higher than 3°C, but if buying in bulk can be stored in a freezer for 3-4 months.

As with any work involving the risk of contamination, cover any exposed cuts or grazes with waterproof dressings. Ensure hands are thoroughly washed with hot water and an appropriate anti-bacterial soap before and after contact with the material.

It may not be necessary to use disposable gloves for this type of low risk work as they can increase clumsiness, which in turn can lead to a greater risk from cuts etc. However, they should be available to those who wish to use them.

It may be helpful to use scissors rather than scalpels to minimise the risk of accidental cuts.

Before starting the dissection, cover the table with a bin bag. The remains can then be wrapped up with this before disposing of appropriately (see 'Disposal Arrangements' below). Afterwards, wash the table with hot soapy water.

Lungs should only be inflated using a bicycle or foot pump. Do not under any circumstances inflate the lungs orally.

Scissors or scalpels used for dissection purposes must be cleaned using hot water and detergent before and after use. Disinfectants such as those based on chlorine, or Virkon may corrode metal instruments and therefore should be avoided.

It is recommended that instruments are autoclaved before being used again.

Disposal Arrangements

Disposal of animal remains are regulated by the Animal By-Products Order 1999 and the related SERAD guidance note.[3]

However, due to the small quantity of material that would be handled within a school environment, it is possible to dispose of the remains via the school's refuse disposal system as long as the following advice is adhered to:

- Once the dissection or experiment has taken place all remains must be double bagged in opaque polythene (e.g. autoclave bags) and disposed of via the establishment's waste disposal system
- Making sure that the bag is placed within a lidded bin to avoid attracting cats, dogs and vermin.
- Where feasible, refrigerate or freeze the remains and delay placement in the refuse system until as near to the uplift date as possible.

[3] Guidance Note on the Disposal of Animal By-Products and Catering Waste, Scottish Executive Rural Affairs Department, February 2001.

Dissecting Eyes

Eyes from cattle and sheep come under the *Specified Risk Materials* (SRM) *Regulations* as they are nervous tissue and as such may be a source of infection from BSE and nvCJD. This applies to Cattle slaughtered over the age of six months and to sheep slaughtered over the age of twelve months which are classified as Category 1 (high risk).

TSS has been informed by Paisley Abattoir that there are lambs of under a year old slaughtered at the abattoir. The ocular material of these animals is classified as Category 3 (low risk) and theoretically could be used for dissection purposes within schools.

The only concern that will prohibit their use within schools is the disposal of this material as "Category 3 material should be disposed of as waste by incineration, processed in a processing plant or transformed in a biogas plant or a composting plant".

Scottish Water own and maintain "Deerdykes Composting and Organics Recycling Facility" at Cumbernauld. Although this is 11 miles from the centre of Glasgow, it is the only waste site capable of taking this type of Category 3 material. Scottish Water has assured TSS there would be no charge to schools for this service. The only consideration would of course be the logistics of getting the material to the facility.

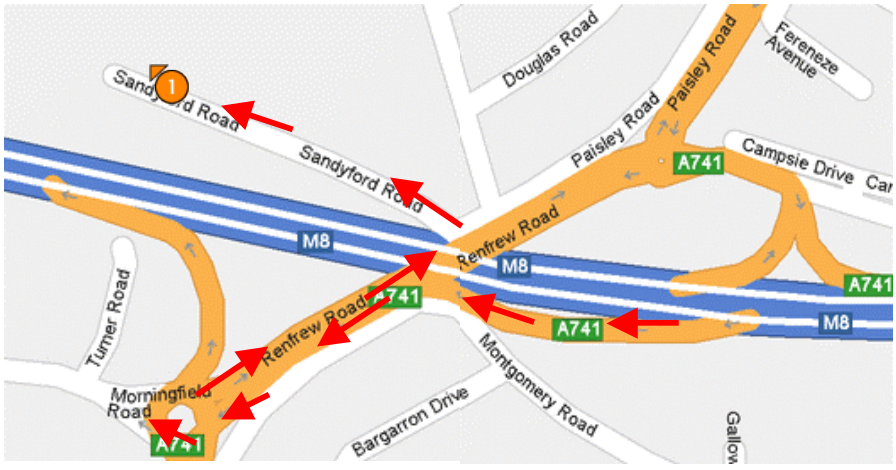
Contact Details:
Jennifer Agnew
Scottish Water (Deerdykes)
Deerdykes Composting and Organics Recycling Facility
Mollins Road
CUMBERNAULD
North Lanarkshire
G68 9NB

Phone 01236 875415

Directions to Abattoir:

Driving west on the M8 motorway

Leave the M8 at junction 27 left turn only at top of ramp. Enter roundabout at Abbotsinch retail park take fourth exit signposted Renfrew. The left turn onto Sandyford Road is immediately after you cross back over the motorway. The abattoir is situated at the very end of this road.



Glasgow City Council

EDUCATION SERVICES

Technician Support Service

Technician Guidance Sheets TGS / 20a

Managing Mercury

Issued by **Technician Support Service**

Date **August 2010**

Objectives - The objective of this Guidance Sheet is to instruct Support Service Technicians in the procedures in dealing with a Mercury spillage and the recording of equipment containing Mercury

Persons responsible - Senior Support Service Technicians and Support Service

SAFETY FLASH
MSF 15(c) - Date 5th December 2008
'Equipment Containing Mercury'

Recommended Action

1. **Mercury containing equipment:** All Heads of Establishment should ensure that all members of staff are made aware of the need to identify any mercury containing equipment located within the school and an appropriate record should be established.
2. **Mercury containing equipment:** should be stored in a safe area where it is not likely to be knocked over or damaged.
3. **Disposal:** Any items of mercury containing equipment that are not of recognised requirement of the curriculum should be removed from use and disposed of appropriately. Contact should be made with Technician Support Services for uplift

Further Guidance / Advice

Education Services Master Safety File 15 – Collection, Removal and Disposal of unwanted or hazardous substances.
Education Services Master Safety File 11 – Accident and Incident Reporting Procedures

In addition to the above Glasgow City Council Safety Flash MSF 15(c)
TSS would like to further advise all establishments/technicians that the following procedures should be put into action when dealing with a mercury spillage.

Mercury and its uses

Mercury is used mainly in thermometers, barometers and sphygmomanometers. Within the curriculum it can also be used as a solvent for other metals and in the making of amalgams. It is toxic by inhalation and can also be easily absorbed through the skin and into the body with a danger of cumulative and systematic effects including: headaches, tinnitus, dermatitis, anorexia, fever, toxic pneumonitis and gastrointestinal haemorrhage. For further information see SSERC Safetynet Hazardous Chemicals (www.sserc.org.uk).

Mercury quickly evaporates at room temperature. As mercury divides into tiny globules, spillages can present a vast surface area from which evaporation takes place. Mercury spillages in an unventilated room can rapidly give rise to concentrations of mercury in the air of many times the accepted levels. Therefore, due to the high toxicity of its vapour it is important to clean up mercury as thoroughly as possible.

Alternatives to mercury containing items as advised by SSERC:

Where possible substitute mercury filled thermometers with alcohol or 'rotatherm' types. The use of mercury thermometers is justified for older pupils who may require higher accuracy or speed of response. These thermometers should be handled carefully to avoid breakage. The device of the anti-roll flag of PVC or cellotape attached to the top end is useful.

With regards to ovens, the alcohol based thermometers will only be suitable in ovens when they are being used as incubators or on low range. Simmerstat controls (on the front of the oven) can be calibrated and the knob setting then used to indicate the approximate temperature.

For higher temperatures use a thermocouple probe (see Appendix 1).

General Points

- Keep a pre-prepared mercury spillage kit available for immediate in the event of a spillage (see Appendix 2).
- Every spillage should be dealt with, no matter how small.
- Vacuum cleaners should **never** be used to remove mercury spillages.[1] [4]
- Mercury must **never** be disposed of via sinks or ordinary waste bins.[1]
- Where a trap below a sink has been contaminated, it should not be flushed with water but should be logged as a repair with the facilities management to have the trap disconnected and it can then be decanted and collected in a sealable container and disposed of as hazardous waste.[1]
- Clothing that has come into contact with the mercury directly must not be washed in the washing machine, but must be **discarded**, **double bagged**, in the normal house hold refuse.[1]
- If the spill is on upholstery or carpet and the mercury can not be retrieved, the area of contaminated upholstery or carpet may need to be removed and disposed of as hazardous waste.[1]
- Ensure all cuts and grazes on hands are covered by plasters.
- Wear rubber or nitrile gloves.[4]
- Place all items used to remove the spillage e.g. gloves, paper towels, syringes etc into a plastic bag and store for disposal by council approved waste disposal company.
- Mercury attacks gold and silver jewellery, therefore remove such items prior to dealing with the spill.
- Thoroughly wash hands in a stream of cold water with liquid soap and dry hands with disposable paper towels.
- Do not take any action which will further disperse the mercury e.g. brushing.
- Do not walk over or stand on the mercury spillage during the treatment process. [1]

Primary Schools

All **Primary schools** should be advised to remove all mercury sources from schools as special chemical waste disposal. Contact TSS for further advice.

Technician Support Service
Phone 0141 276 8550
Email admin@tss.ea.glasgow.sch.uk

Secondary Schools

Dealing with a Small Scale Spill (e.g. broken thermometer)

Anything up to approximately 5 cm^3 (10 standard thermometers) is considered as a small scale spill. Anything over 5 cm^3 a stock bottle or open source with a mercury reservoir should be regarded as a large scale spill.

Evacuate and ventilate the area by opening windows for a minimum of 30 minutes. Do not use internal doors as a means of venting the room as this will allow vapours to travel along the corridor. Delay further working in this area until the minimum ventilation time has elapsed. If the area of the spill has poor ventilation the time allowed must be increased accordingly.[1] [2]

1. Remove rings, bracelets, watches etc.
2. Wear rubber or nitrile gloves.
3. Carefully pick up any broken glass and place in a plastic jar with a lid to prevent any vapour escaping (you may need a container tall enough to hold broken thermometers). Label the jar **Mercury – Contaminated Waste. Toxic/Irritant**.
4. Use strips of wood, e.g. wooden spatulas or thin card to gather the bulk of mercury together.[1] [4]
5. Use an appropriately sized plastic syringe to draw up the mercury and place in another plastic jar with lid. [2] [3] [4]
6. Secure the lid with adhesive tape and label the jar, **Recovered Spilt Mercury. Toxic.**
7. The above containers can be reused for further small spillages.
8. All containers should be stored with the toxic chemicals until sufficient has been collected for disposal by council approved waste disposal company, contact TSS to arrange.[1] [3] [4]

Technician Support Service
147 Berkeley Street
GLASGOW
G3 7HP
Phone 0141 276 8550
Email admin@tss.ea.glasgow.sch.uk

Residual Clean Up

A dust mask (FFP2) should be worn along with lab coat, goggles and disposable gloves during the clean up. [3]

To remove any remaining mercury from **smooth surfaces**, mix precipitated copper powder with sufficient 2M hydrochloric acid in a plastic beaker to make a thick paste and spread the paste over the contaminated area with a plastic spatula, the paste will pick up the fine mercury droplets.[4] Place a dust pan inside a plastic bag and sweep up the paste with a paint brush (approx 3cm) on to the dust pan.[3] When the waste has been gathered the plastic bag can be inverted with the waste safely contained, the used brush should be placed in the plastic bag and labelled. **Mercury – Contaminated Waste. Toxic/Irritant.**[1][4]

or

To remove remaining drops of mercury from **rough surfaces** and cracks, heat some calcium hydroxide/flowers of sulphur (1:1w/w) with a little water to make a slurry, spread over the contaminated area and leave to dry.[3][4] When dry place a dust pan inside a plastic bag and sweep up the paste with a paint brush (approx 3cm) on to the dust pan. When the waste has been gathered the plastic bag can be inverted with the waste safely contained, the used brush should be placed in the plastic bag and the bag labelled. **Mercury-Contaminated Waste. Toxic/Irritant.**

Wipe the area with damp paper towels and place in the plastic bag labelled **Mercury – Contaminated Waste. Toxic/Irritant**[1][4] which should be stored as toxic material until disposal by council approved waste disposal company.

Dealing with a Large Scale Spill in all Educational Establishments
(Spills greater than approximately 5 cm^3)

Any stock bottle of mercury or open source with a mercury reservoir maybe regarded as a large scale spill e.g. sphygmomanometer (blood pressure monitor) which typically holds 30-40ml.

1. Evacuate the area and ventilate by opening windows, not the internal doors as this allows vapours to travel along the corridor. Control access possibly by locking the door
2. Inform the School Management Team (SMT) who in turn should contact the following agencies:

Within working hours: **Health and Safety (Education Services) 0141 287 3734**

Out of hours: ***Local Fire Brigade***

3. An accidents and incident report form should be completed and forwarded to the following:

Yellow copy of Incident Report form to:

House 6
94 Elmbank Street
GLASGOW
G2 4DL

Pink copy of the Incident Report form to:

Health and Safety
Education Services
Wheatley House
25 Cochrane Street
GLASGOW
G1 1HL

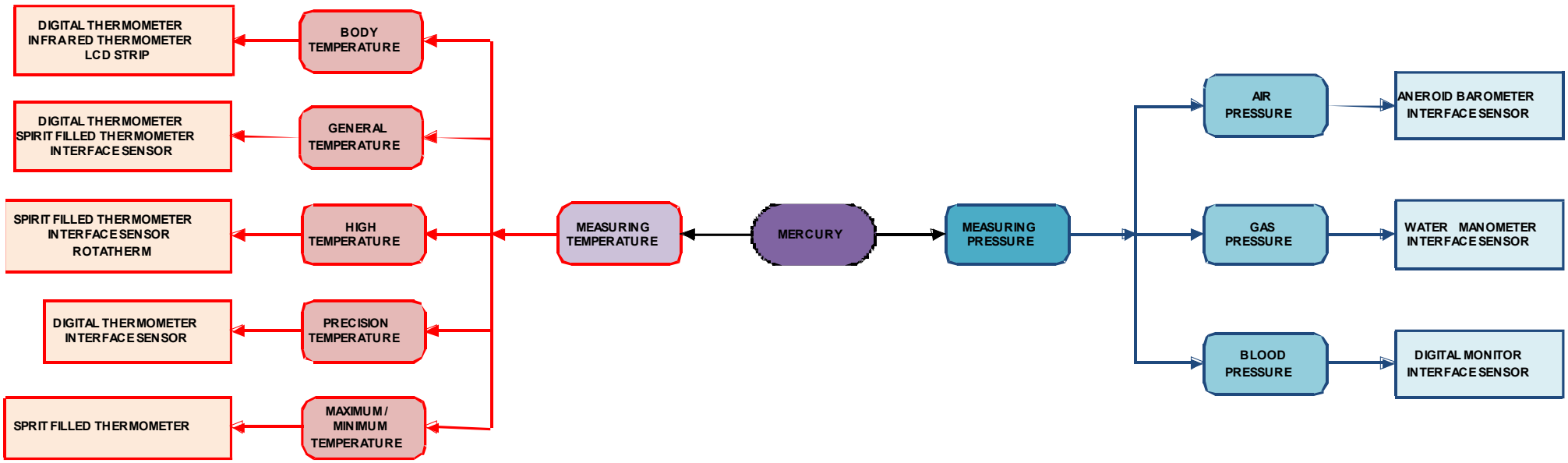
Recommended Action

It is recommended that a list be made of all items in the school that contains mercury and a record kept for future reference. In secondary schools the stock of mercury containing vessels and devices must be recorded on an annual basis (see Appendix 3).

Appendix 1

Mercury Alternatives

Suggested alternatives to devices which contain mercury



Appendix 2

Mercury Spillage Kit

1. polythene bottle for recovered mercury
2. polythene bottle for mercury contaminated waste
3. 250g precipitated copper powder
4. 100ml 2M hydrochloric acid
5. 250ml polypropylene beaker
6. a mixture of 500g flowers of sulphur and 500g calcium hydroxide
7. paintbrush, 3cm wide
8. 10 wooden spatulas
9. disposable gloves, face mask (FFP2)
10. plastic bag
11. dustpan

References

1. Health Protection Agency – Mercury in residential settings: step-by-step guide to cleaning up spills
2. Technician Support Service - www.tssglasgow.org
3. SSERC – www.sserc.org.uk
4. CLEAPSS – Laboratory Handbook (paragraph 7.7, 12, 13)
5. Wikipedia

Mercury Record **Appendix 3**

Establishment:

Item	Number Held	Location	Date	Removed	Signature	Date

APPENDIX

7.

CONTACT NAMES AND DETAILS FOR FURTHER INFORMATION

Quality Improvement Officer: Science
Education Services
Glasgow City Council
Wheatley House
25 Cochrane Street
GLASGOW
G1 1HL
Phone 0141 287 4126

Service Manager
Technician Support Service
Education Services
Glasgow Gaelic School
147 Berkeley Street
GLASGOW
G3 7HP
Phone 0141 276 8550

Health and Safety section
Education Services
Glasgow City Council
Wheatley House
25 Cochrane Street
GLASGOW
G1 1HL
Phone 0141 287 4622

Scottish Schools Equipment Research Centre Limited
Unit 2, Pitreavie Court
South Pitreavie Buisness Park
Queensferry Road
DUNFERMLINE
Fife
KY11 8UB
Phone 01383 626070

Association for Science Education
College Lane
HATFIELD
Hertfordshire
AL10 9AA
Phone 01707 283000

Education Services

Risk Assessment

Glasgow
CITY COUNCIL

From "*Guide to Occupational Health and Safety Management Systems BS 8800*"

A simple risk level estimator

	Slightly harmful	Harmful	Extremely harmful
Highly Unlikely	Trivial risk	Tolerable risk	Moderate risk
Unlikely	Tolerable risk	Moderate risk	Substantial risk
Likely	Moderate risk	Substantial risk	Intolerable risk

A simple risk-based control plan

Risk Level	Action and Timescale
Trivial	No action is required and no documentary records need to be kept.
Tolerable	No additional controls are required. Consideration may be given to a more cost-effective solution or improvement that imposes no additional cost burden. Monitoring is required to ensure that controls are maintained.
Moderate	Efforts should be made to reduce the risk, but the costs of prevention should be carefully measured and limited. Risk reduction measures should be implemented within a defined time period. Where the moderate risk is associated with extremely harmful consequences, further assessment may be necessary to establish precisely the likelihood of harm as a basis for determining the need for improved control measures.
Substantial	Work should not be started until the risk has been reduced. Considerable resources may have to be allocated to reduce the risk. Where the risk involves work in progress, urgent action should be taken.
Intolerable	Work should not be started or continued until the risk has been reduced. If it is not possible to reduce risk even with unlimited resources, work has to remain prohibited.

NOTE

Tolerable here means that the risk has been reduced to the lowest level that is reasonably practicable.

Risk Assessment Documentation

Glasgow CITY COUNCIL

PLEASE USE BLACK INK

SUBJECT AREA OF ASSESSMENT (JOB TITLE/PROCESS/LOCATION OR OTHER SUBJECT AREA)	Reference No. RA/ED/

DEPARTMENT	EDUCATION SERVICES	SECTION	

COMPLETION SHEET

Reference Number	Risk Rating (BS 8800)	Actions to be Taken	Target Date

Service Senior Officer with overall Responsibility for Health and Safety	Name Title Date	Corporate Health and Safety Manager for Verification	Name Title Date
			Date of Next Assessment

PART 1. LIST OF SUBJECTS	
Subject Reference Number	**List of Subjects (activity, process, location etc.)**

PART 2. RECORD OF RISK ASSESSMENT							
Subject Reference Number	**Hazard Reference Number**	**Hazard Description (e.g. potential causes of injury/damage)**	**Potential injury/damage**	**Persons at risk**	**Current preventative and protective measures (more detail on training in Part 3, more detail on P.P.E. in Part 4)**	**Risk Rating (BS 8800)**	**Further action required**

Subject Reference Number	Hazard Reference Number	Hazard Description (e.g. potential causes of injury/damage)	Potential injury/damage	Persons at risk	Current preventative and protective measures (more detail on training in Part 3, more detail on P.P.E. in Part 4)	Risk Rating (BS 8800)	Further action required

Subject Reference Number	Hazard Reference Number	Hazard Description (e.g. potential causes of injury/damage)	Potential injury/damage	Persons at risk	Current preventative and protective measures (more detail on training in Part 3, more detail on P.P.E. in Part 4)	Risk Rating (BS 8800)	Further action required

Subject Reference Number	Hazard Reference Number	Hazard Description (e.g. potential causes of injury/damage)	Potential injury/damage	Persons at risk	Current preventative and protective measures (more detail on training in Part 3, more detail on P.P.E. in Part 4)	Risk Rating (BS 8800)	Further action required

Risk Assessor	Authorising Manager	Service Health and Safety Group
Name	**Name**	**Name**
Title	**Title**	**Title**
Date	**Date**	**Date**

PART 3. CONTROL MEASURES - TRAINING						
Reference Number	**Training Subject**	**Conducted by**	**Brief Details of Training (state where further information can be found, e.g. training programmes, where appropriate)**	**Training Records (state where records of training are located)**	**Is Training Evaluated? YES/NO (provide details)**	**Further action required**

PART 4. CONTROL MEASURES - PERSONAL PROTECTIVE EQUIPMENT					
Reference Number	**P.P.E. Name of equipment**	**Description (include reference to Standard)**	**Are details of issue recorded? YES/NO**	**Specific Risk Assessment carried out? YES/NO**	**Further action required**

FURTHER ACTION REQUIRED ON P.P.E.	
Reference Number	**Action required**

Other Information

Glasgow
CITY COUNCIL