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unclassified substances should be compared to related classified substances to identify potential hazard properties.

Workplace Exposure Limits (WELs) are statutory maximum exposure levels set by the Health and Safety Executive (HSE) for commonly used hazardous substances. WELs are expressed as concentrations (as mg/m^3 or ppm) of substances in air over a specified time period and are published by the [HSE in document EH40](#). **Time weighted average (TWA)** is the maximum exposure level that can be sustained continuously over an 8 hour period. **Short term exposure limit (STEL)** is the maximum exposure level that can be sustained continuously over a 15 minute period. If no STEL is cited in EH40, a three times concentration value for the 8 hour TWA should be applied for setting exposure limits over the STEL period.

Dusts of any kind at a concentration of more than $10\text{mg}/\text{m}^3$ for over 8 hours (TWA) for an inhalable dust, or $4\text{mg}/\text{m}^3$ for over 8 hours (TWA) for a respirable dust, are classified as a hazardous substance.

Inhalable dusts are any airborne particles capable of being inhaled through the nose or mouth (BS EN 481:1993).

Respirable dusts are any airborne particles capable of penetrate deep into into the unciliated (gas exchange) parts of the lungs (BS EN 481:1993).

Carcinogens are substances known or regarded as being capable of cause cancer in humans, or a substance of suspected carcinogenic effects. These are classified as carcinogenicity categories 1A, 1B or 2 under CLP (2015).

Mutagens are substances known or regarded as been capable of inducing genetic changes in the germ cells in humans and can be tra(he)12(eWñB0 G[(1B)6(-)3(or 2)6(u)-4(n)12(d)-4(er)9(CL)-4(P)10((2015)30))

Personal Protective Equipment (PPE) are items worn around the body of the worker to prevent the exposure to harm: substances, noise, vibration, damage to hearing or sight, or thermal discomfort and are covered by CoP-27.

Respiratory Protective Equipment (RPE) are items worn to cover the breathing zone (i.e. nose and mouth) to prevent the inhalation of harmful substances, and are PPE items. The RPE items should not interfere with the performance of other PPE worn (e.g. sight protection from chemical splashes).

Exposure Monitoring is the use of suitable techniques to check the adequacy of control measure performance in preventing a worker from being exposed to a hazardous substances. For example, using a dust lamp to observe possible exposure and the insufficient performance of the controls.

Health surveillance is the use of suitable techniques to check the health of a worker forwo

5 REQUIREMENTS

5.1 Routes of exposure and adverse effects on the body

The major routes of exposure to hazardous substances are through the lungs (inhalation), the gastrointestinal tract (ingestion) or through the skin (absorption). Exposure through penetration, cuts or abrasion of the skin (injection) may also occur. The adverse effects of exposure may be local or systemic, or both. Local effects occur at the site of exposure while systematic effects occur remotely from the point of exposure, at target organs or whole body following absorption and translocation. Acute effects are immediate, while chronic effects are slower and result from accumulative exposure and lower exposure levels and symptoms may not present for an extended time after exposure. Reversible effects are damage that the body can repair while irreversible effects can not be repaired (e.g. dead nerve cells cannot be replaced).

5.2 COSHH assessment

COSHH aims to prevent the adverse effects on the body from hazardous substances by preventing exposure, or to reduce the exposure level to as low as reasonably practical (ALARP). No work with hazardous substances or mixtures should commence until a COSHH assessment has been completed by a competent person, and the steps to control exposure have been implemented. Assessments should be recorded on either a COSHH assessment form or combined COSHH-risk assessment form, [available from H&S Services](#) and these should be made available to all relevant prior to commencing activities and training.

The University assessment process is developed from HSG 97 guidance "A step-by-step guide to COSHH assessment (2004).

5.2.1 Describe the activity and the hazardous substances used

Describe the activities and the hazardous substances involved at each stage of the work. Consider when the substances are being stored, moved/handled, used, or disposed. For each stage and substance think about the:

- a). the physical form of the substance : solid, liquid, gas, vapour, fumes, dust, biological agents.
- b). the quantities of substances or mixtures used.
- c). the concentration of a substance or mixtures used.
- d). how the substances reacts to external conditions (water, air, heat, pressure, other chemicals).
- e). the volume of the work space the amount of substance is used in (for estimating exposure levels).

5.2.2 Identify the hazards of each substances and routes of exposure

The assessor must gather information for each substance before completing the COSHH assessment. The assessor should identify all substances by name and there possible by CAS number to avoid synonymy confusion, and should identify the hazardous properties of each substance by reviewing the safety data sheets (SDS). While not a COSHH assessment the 16-part SDS document (appendix 1) records most of the information needed to complete the COSHH assessment. Within the 16-part document it records: the substance physical form, displays the diamond hazard pictograms (illustrated in Appendix 2), the hazard warning information recorded as hazard statement (H-statements, listed in Appendix 3) the precautionary advice recorded as precautionary statement (P-statements, listed in Appendix 4), information on WELs, PPE types

and standards. Other sources of information for identifying hazards can be found using the following sources:

- a). the product packaging.
- b). the European Chemical Agency (ECHA) website for chemical safety information including SDS, CAS number, synonyms, REACH regulation (2018) requirements.
- c). the [HSE EH40 document](#) for any Workplace Exposure Limits (WELs).

Also consider the route of entry into the body for each substance

Before selecting the individual controls refer to section 2 of substance(s) safety data sheet and the P-statements (Precautionary-statements) for safety advice. Controls should then be selected following a risk reduction priority order known as the "hierarchy of control". The hierarchy of control is as follows:

- **Eliminate** the hazardous substances used or generated (including by-products) by modifying the process or activity.
- **Replace** the substance with a less hazardous alternative
- **Substitute** the form of the substance with a safer one (e.g. pellets instead of powder)

Where it is not reasonably possible to eliminate exposure, you must adequately control exposure using

- **Display warning signage** of the hazardous substances being used in areas and on equipment
- **Apply good hygiene** when leaving the work area

The use **Personal Protective Equipment (PPE)** is in addition to other measures if exposure cannot be adequately controlled by any other measure alone, *PPE is a last resort only*. Each item of PPE must be carefully selected to protect against the substance being used, the duration of protection required to cover the planned tasks (e.g. glove breakthrough times), degree of protection needed for the activities (e.g. gloves with chemical splash protection vs full contact protection) and suitability of the PPE fit to the wearer (e.g. RPE and face fit testing). The specification of the PPE required for the activities must be recorded in the COSHH assessment and the arrangements for cleaning and storage as needed. An outline of the basic requirements for safe use of PPE is included in section 7 of this Code. For further details on PPE selection, access and storage, training needs and for the cleaning/repair/replacement, please see CoP-27 [Personal Protective Equipment](#).

Disposal procedures

All hazardous substances that are defined as waste must be segregated from non-hazardous substances and also by hazard category (e.g. oxidising/flammable), correctly labelled as hazardous waste (e.g. hazardous property codes, dates, amounts) and disposed via the correct disposal

Table 2. Probability

Category	Example <i>(for guidance only - some or all may apply for each category)</i>	
VERY UNLIKELY	Good control measures are in place. Controls do not rely on a person using them (i.e. personal compliance). Controls are very unlikely to break down. People are very rarely in this area or very rarely engage in this activity.	1
UNLIKELY	Reasonable control measures are in place but they do rely on a person using them (some room for human error). Controls are unlikely to breakdown. People are not often in this area / do not often engage in this activity / this situation is unlikely	2
POSSIBLE	Inadequate controls are in place, or likely to breakdown if not maintained. n,	

It is strongly recommended that you draw up a health and safety action plan to ensure that any further improvements needed to reduce the residual risk are prioritised according to the level of risk identified. Remember to include realistic time scales in your action plan and identify who will be responsible for checking that the objectives of the plan have been met. It is up to you to decide on appropriate time scales for action, but some typical timescales, according to risk are given as a guide in the table below.

SCORE	RISK LEVEL	TYPICAL TIME SCALES FOR ACTION REQUIRED
1	Insignificant	No further action needed
2 – 3	Low	Action within 12 months if improvements are reasonably practicable
4 – 6	Medium	Action within 6 months based on reasonable practicability
8 – 9	High	Action within 1 month to reduce risk (immediate action may be needed in some circumstances)
12 – 16	Very high	Immediate action required – work should stop / not commence until risk has been reduced to acceptable levels

5.2.7 Deciding if health surveillance is required

Health surveillance is unlikely to be needed in most circumstances but will be required where work involves substances and processes specified in [schedule 6 of the COSHH regulations](#). Surveillance will also be required if there is reasonable likelihood of exposure that could result in an identifiable occupational disease or adverse health effect and there is a valid technique for surveillance of the body. The need for health surveillance should be recorded on the COSHH assessment form and managers and supervisors should complete a [Occupational Health surveillance enrolment form](#) with the individual. Following surveillance an individual health record will be issued to the manager or supervisor advising of the outcome of the surveillance. Where a health condition is established by the Occupational Health (OH), managers and supervisors will be advised on any work restrictions that may be required. In these circumstances, following the consent of the individual, H&S Services will be informed of a possible work-related health effect has been identified. Substances to seek health surveillance advice from OH will include but are not limited to:

Asbestos (not included in COSHH)

Lead or lead salts as dusts or vapours (not included in COSHH)

Mercury or mercuric compounds where exposure to vapours of dusts possible

Organophosphorus compounds

Nitro or amino derivatives or phenol and benzene

Potassium or sodium chromate or dichromate

Epoxy resins

Styrene

Isocyanates

Carcinogens, mutagens, teratogens, (annotated as CARC in EH40)

6 EMERGENCY ARRANGEMENTS/EMERGENCY PREPAREDNESS

The COSHH assessment should must record the emergency arrangements required for reasonably foreseeable incidents of unintended exposure during work activity. The assessment should be made available to the emergency services in cases where they are asked to respond, so to communicate the substance names and hazard properties and potential quantities in order to prepare their response.

Local written procedures will be necessary if generic emergency procedures are not sufficient to cover all reasonable foreseeable eventualities. These should include instructions on the use of warning signage, controlling facility access and evacuations, and how to communication the situation, and later, how to communicate when remedial actions are completed, and facilities have been safety re-opened.

Specialised arrangements may be required for first aid treatment (e.g. contact with contaminated sharps), for dealing with a fire (e.g. specialised fire extinguishers for pyrophoric metals), the loss of containment (e.g. a spill during storage or when use/handling/disposing of a substance), a significant exposure as a result of a sudden failure of extraction system (e.g. release of airborne hazard) or acute process failure and a sudden release of chemicals (e.g. exothermic reaction), or any other incident threatening an exposure above a WEL. Specific local procedures must be in place for dealing with a uncontrolled release of carcinogens, mutagens, sensitisers, teratogens, or biological agents.

Safety drills for the emergency arrangements should be practiced regularly and safety equipment including suitable spill response equipment (e.g. kits, labels, pens, containers) and PPE and RPE must be stored in readiness for trained staff to use in the event of an incident. This includes the safe clean up and disposal of substances or contaminated materials generated by the release or the cleaning activities. The emergency procedures should be reviewed regularly and following any significant changes to activities (e.g. the quantities of substance used, the use of new substances, changes to the workplace) and the procedures updated and the changes trained out. Any deficiencies or alterations for emergency preparedness should be discussed at the local School or Function H&S Committee to ensure that any remedial actions to correct the emergency arrangements are completed in a reasonable period of time (see Safety Note 79 on Local Health and Safety Committees).

7 COMPETENCE/LEARNING REQUIREMENTS/TRAINING

Managers and supervisors should ensure that staff, students and visitors receive adequate information, instruction and training *prior* to the storing, moving, handling, use or disposal of hazardous substances. As a minimum, in addition to inductions and equipment training and standard operating procedures, managers and supervisors must ensure hazardous substance workers can read and understand the GHS hazard pictograms and labelling, and have received a safe system of work which described the significant findings of the COSHH assessment (see below paragraph). Individuals should sign a training record to confirm the receipt and understanding of the safe system of work. The COSHH assessments should be also be accessible, as a paper or electronic format, so to provide on-going access to information whilst working with the substance(s).

From the information and training received, users must be able to identify the substance(s) they are likely to be in contact with, have access to all relevant SDS, understand the hazardous properties and how the substances can cause health risks (routes of entry into the body and harm caused), to understand the control measures required to prevent the harm and to be able to reliably maintain the control measures during the activities. They should also understand what procedures are needed for dealing with the reasonably foreseeable emergencies identified by the COSHH assessment. Staff, students and visitors must receive training on the correct application and removal of PPE (including RPE), the means to clean and safely store any issued PPE, and who to report any defects for repair or replacement.

Following a COSHH assessment review, any changes arising must be communicated and trained out to all relevant staff, students and visitors using the substance(s) or anyone else regularly in the workarea (e.g. Technical Services staff).

8 REVIEW & AUDIT

Assessments should be reviewed regularly, at least every 12 months, or if there have been any significant changes to either the work activity, the understanding of the health risks arising from the substance, or following an incident. For example:

- Changes made to the workplace, work activities or equipment so that the assessment is no longer valid.
- Changes to the staff involved to alter the risk profile and the assessment is no longer valid. For example, changes to the level of experience, physical or mental capabilities or they become pregnant (health of unborn child and mother),
- Changes in the law or the categorisation of the risk to health may require additional controls and t G[45f0(OBT/F3 11.04 Tf1 0 0 1 244.61 453.31 Tm0 g0 G[(t)-3(o)-2(al)12(t)-3(er)9(t)-3()10(

Workplace Exposure Limits EH40/ (2005)

Personal Protective Equipment at Work Regulations (1998)

Appendix 1: Hazard Information

The Global Harmonisation System (GHS) sets out an international agreement by the UN in 2001 on the worldwide format for communicating standardised chemical hazard information. This agreement applies to the hazardous substances containers and packaging, to help COSHH assessors and users identify and understand the nature of the hazards when undertaking work with substances that can harm health.

In the UK the GHS is implemented by the Chemical Labelling and Package legislation (2015), which was re-adopted into UK law in December 2020 following the change in our EU membership, as GB mandatory classification and labelling (GB MCL 2020). All chemicals imported, manufactured, downstream used, or sold in the UK must now follow the [GB MCL list](#).

Hazard Pictograms and signal words

Hazard pictograms are standardised set of nine GHS diamond-shaped symbols that suppliers and manufacturers must displayed on container labels and packaging, and also in the safety data sheet, giving hazard classes of a substance. All pictograms are shown in Appendix 2.

Two signal words may be added to packaging to describe the level hazard severity

Danger means a signal word indicating the more severe hazard categories

Warning means a signal word indicating the less severe hazard categories

Hazard Statements

Hazard statements are standardised GHS phrases declared by the suppliers and manufacturers for describing the hazard descriptions of a substance. Each H-statement also has a standardised three-character code of classification for communicating the hazard. The H-statements are organised into three groups of related hazards: physical hazards H-2XX, health hazards H-3xx, environmental hazards H-4XX. A further 24 H-statements recognised by a previous classification regime (CHIP 2009) were retained by the UK through implementation of CLP (2015) and its successor GB MCL (2020). These H-statements are classified with EUH codes. All H-statements and alpha-numerical codes are listed in Appendix 3.

Precautionary statements

Precautionary statements are standardised GHS phrases declared by the suppliers and manufacturers for describing safety advice for handling a substance. Each P-statement also has a standardised three-character code of classification for communicating the advice. The P-statements are organised into five groups of related advice: generalise advice P-1XX, preventative measures advice P-2XX, emergency response advice P-3XX, storage advice P-4XX, Disposal advice P-5xx. All P-statements and alpha-numerical codes are listed in Appendix 4.

Safety Data Sheets

Safety data sheet (SDS) provide the principle means to communicate product safety information by suppliers and manufacturers. They are not a COSHH assessment but provide much of the key

information needed to undertake an assessment. SDS are arranged under an internationally agreed 16-part format. The format is as follows:

SDS standardised 16-part format with highlighted key details

1. Identification of the substance/mixture and of the company/undertaking; *[location of CAS number]*
2. Hazards identification; *[location of: hazard pictograms and signal words, H-statements, P-statements]*
3. Composition/information on ingredients;
4. First-aid measures;
5. Fire-fighting measures
6. Accidental release measures;
7. Handling and storage;
8. Exposure controls/personal protection; *[location of: WELs as TWA or STEL, also PPE Standards]*
9. Physical and chemical properties;
10. Stability and reactivity;
11. Toxicological information;
12. Ecological information;
13. Disposal considerations;
14. Transport information;
15. Regulatory information;
16. Other information. *[location of: full H-statements]*

Appendix 2: GHS Hazard Pictograms, signal words and hazard categories

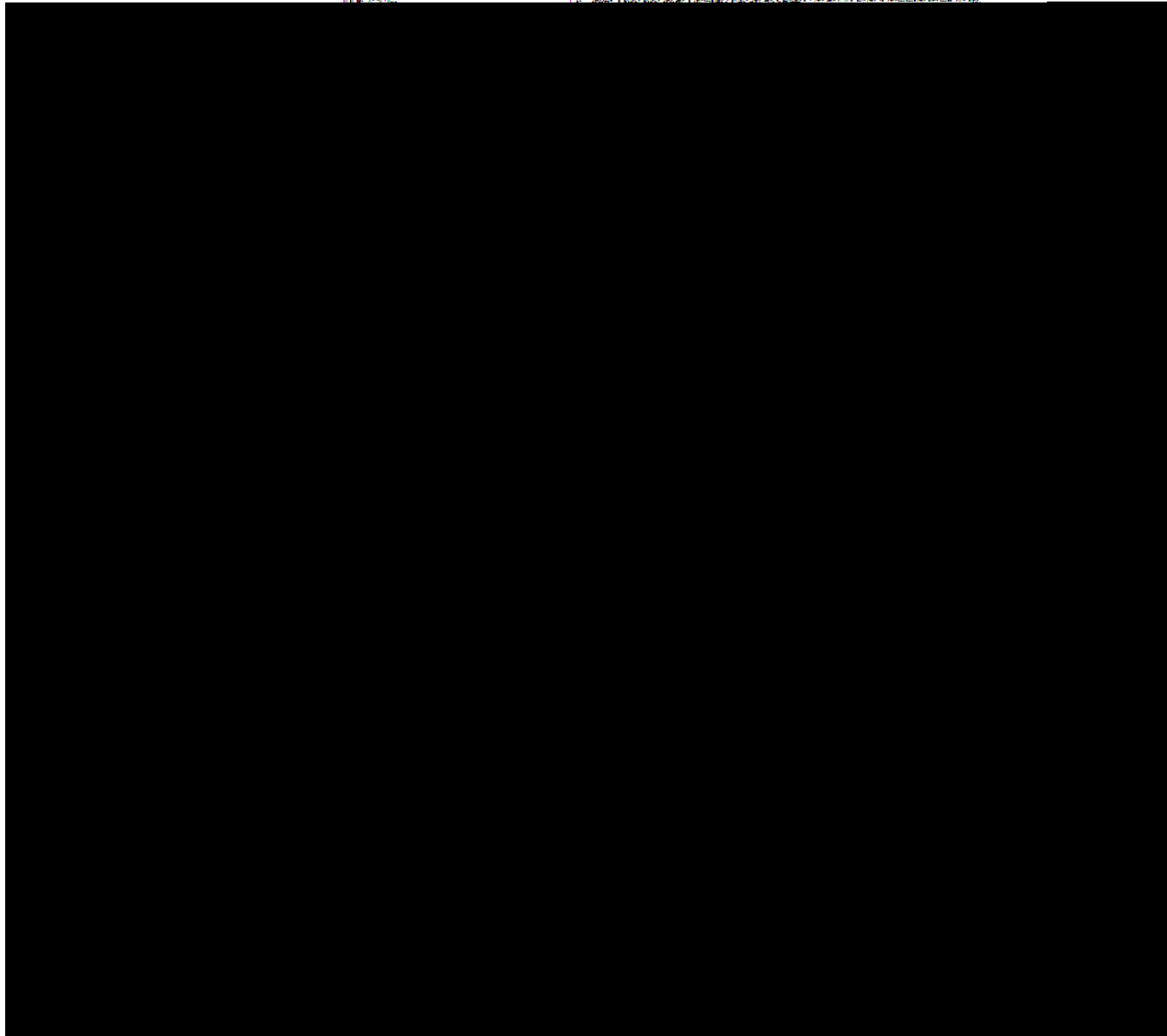
Hazard Pictogram	Hazard Class	Signal Words	Hazard Category	H-statements
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H-statement code		Hazard Statement	
H317	May cause an allergic skin reaction.		
	H330	Fatal if inhaled.	
	H331	Toxic if inhaled.	
	H332	Harmful if inhaled.	
	H334	May cause allergy or asthma symptoms or breathing difficulties if inhaled.	
	H335	May cause respiratory irritation.	
	H336	May cause drowsiness or dizziness.	
	H340	May cause genetic defects on exposure.	
	H341	Suspected of causing genetic defects on exposure.	
	H350	May cause cancer.	
	H351	Suspected of causing cancer.	
	H360	May damage fertility or the unborn child.	
	H361	Suspected of damaging fertility or the unborn child.	
	H370	Causes damage to organs.	
	H371	Causes damage to organs through prolonged or repeated exposure.	
	H372	Causes damage to organs through prolonged or repeated exposure cause the hazard.	
Environmental			
	H400	Very toxic to aquatic life	
	H410	Harmful to aquatic life with long lasting effects.	

H-statements for hazards not classified under GHS but adopted under CLP (2015) / GB MCL.

H-statement	Supplementary Hazard Statement
	EUH 001 Explosive when dry.
	EUH 006 Explosive with or without contact with air.
	EUH 011 Risk of explosion if heated under confinement.
explosive peroxides.	EUH 019 May form explosive peroxides.
Explosive when heated under confinement.	EUH 044 Risk of explosion if heated under confinement.
When in contact with water liberates toxic gas.	EUH 029 Contact with water liberates toxic gas.
When in contact with acids liberates toxic gas.	EUH 031 Contact with acids liberates toxic gas.
When in contact with acids liberates very toxic gas.	EUH 032 Contact with acids liberates very toxic gas.
May cause skin dryness or cracking.	EUH 066 Revealed exposure to the respiratory tract.
May be explosive to the respiratory tract.	EUH 071 Contact with water liberates very toxic gas.
EUH 201 Contains lead. Should not be used on surfaces liable to be chewed or sucked by children.	
EUH 201A Warning! Contains lead.	
EUH 202 Cyanoacrylates. Danger. Bonds skin and eyes in seconds. Keep out of the reach of children.	
EUH 203 Contains isocyanates. May produce an allergic reaction.	EUH 204 Contains isocyanates. May produce an allergic reaction.
Releases chlorine	EUH 206 Warning! Do not use together with other products. May release dangerous gas (chlorine).
	EUH 207 Contains benzene. May be harmful if inhaled.
	EUH 208 Contains benzene. May be harmful if absorbed through the skin.
	EUH 209 Contains benzene. May be harmful if swallowed.
	EUH 210 Safety data sheet available on request.
Apply with the instructions for use.	EUH 200 To avoid risks to human health and the environment, do not use.

P-statement code		Precautionary Statement	
Preventative measures			
			P301
	P302	IF ON SKIN:	
	P303	IF ON SKIN (or hair):	
	P304	IF INHALED:	
		IF ON CLOTHING:	P306
		IF exposed:	P307
		IF exposed or concerned:	P308
		IF exposed or if you feel unwell:	P310
		Immediately call a POISON CENTER or doctor/physician.	P311
		Call a POISON CENTER or doctor/physician.	P312
		Get medical advice/attention.	P313
		Get medical advice/attention if you feel unwell.	P314



Appendix 5: List of common chemical incompatibles

Chemical	Incompatibles
Acetic acid	Chromic acid, nitric acid, hydroxyl compounds, ethylene glycol, perchloric acid, peroxides, permanganates
Acetylene	Chlorine, bromine, copper, fluorine, silver, mercury
Acetone	Concentrated nitric and sulphuric acid mixtures
Alkali and alkaline earth metals (such as powdered aluminium or magnesium, calcium, lithium, sodium, potassium)	Water, carbon tetrachloride or other chlorinated hydrocarbons, carbon dioxide, halogens
Ammonia (anhydrous)	Mercury (in manometers, for example), chlorine, calcium hypochlorite, iodine, bromine, hydrofluoric acid (anhydrous)
Ammonium nitrate	Acids, powdered metals, flammable liquids, chlorates, nitrites, sulphur, finely divided organic combustible materials
Aniline	Nitric acid, hydrogen peroxide

