



education

Department:
Education
REPUBLIC OF SOUTH AFRICA

SCHOOL PHYSICAL SCIENCE LABORATORY SAFETY GUIDELINES

Introduction

These guidelines have been developed to assist schools to improve safety measures in laboratories and improve safety of learners. The guidelines have been developed taking into account some of the basic requirements and best practice in laboratory work.

1. Design of a laboratory

Constructions, extensions, renovations and/or refurbishment of laboratory buildings, must comply with standards for such structures as set out by the South African Bureau of Standards. These include at a minimum the following:

- Proper plans for such buildings; and
- Materials used in such buildings especially for shelving and workstations.

2. Use of gas in laboratories

a) Installation

Make sure that the installation of gas from the cylinders to the laboratories is done by a person qualified to do so. Use of small gas canisters must be closely supervised by the teacher.

b) Storage

Gas cylinders/canisters to be stored under safe conditions where they are not vulnerable to hazards caused by impact, fire hazards or damage by the elements;

c) Handling and Use

All personnel using the gas cylinders/canisters need to be trained in the proper way of handling and using these cylinders;

d) Examination and Maintenance

Cylinders/gas canisters must be examined and tested by the appropriate inspection body, in accordance with relevant regulations and at intervals specified by the inspection body;

e) Filling of gas

The gas cylinders/canisters should only be filled by an approved agency. The cylinders must only be filled with the contents they were intended for.

3. Rules of the laboratory

- Every laboratory must have a code of conduct for learners on how to deal with prevention of injury as well as what to do in case of accidents.
- All learners entering a laboratory must be familiar with rules of the laboratory.
- The rules of the laboratory must be displayed in venues where experiments take place, or each learner handed a copy.
- All laboratories must have safety cards (see Annexure A) on all chemicals in the laboratory. These can be found on the Internet and other resources or chemical companies. These can be kept in a file or laminated and filed in the laboratory.

4. Responsibilities of Head of school, Head of Department and Educator

The Head of the school, the Head of Department for Physical Sciences and the educator must ensure that there are safety cards for every chemical in the laboratory. These can be kept in a file or laminated and kept as cards in a safe place in the laboratory. A CD containing safety cards on common chemicals used at schools has been given to provinces. These CDs should be made available to all schools.

- Learners must be made aware of the dangers associated with every chemical that they use. Safety audits advising students on precautions and on what to do in case of accidents must be discussed before the experiment is carried out.
- Necessary precautions must at all times be taken during experiments.
- Educators performing experiments must ensure that they make available to students information on the dangers of chemicals used, precautionary measures and safety measures in case of an accident.
- Cleaners and general workers in venues where experiments are taking place need to be made aware of the dangers associated with chemicals as well as equipment and taught how to deal with emergencies.

5. Learners' responsibilities

- Learners must undertake to observe the rules of the laboratory. Undertaking by learners who enter the laboratory must be done at the beginning of the phase when they choose to study Physical Sciences.
- Learners must know the dangers associated with the chemicals that they are using.

6. Parents' responsibility

- Parents must ensure that their children who are offering Physical Science are aware of the inherent dangers of chemicals, abide by the rules of the school and have proper protective clothing.

7. Storage of chemicals.

- Chemicals must first be stored by compatibility. Further separation is at the discretion of the teacher using suggested safety guidelines.
- Nitric acid must be stored separately from acids and all chemicals. Acids must be stored on the floor.
- Proper materials should be used for shelving.
- All chemicals must be labeled.
- All schools must have an inventory list. This must be updated at least once a year

8. Laboratory Apparatus

Learners must be made aware of the proper use of all laboratory equipment.

9. Disposal of chemical waste.

Proper methods in the disposal of chemicals must be followed. The local municipality or Department of Environmental Affairs as well as Health should be contacted in case of doubt.



10. First aid kits

All laboratories must have kits that are always stocked with the relevant supplies in order to handle emergencies in the laboratory. The emergency kit must be stored in a place that can be easily accessed during an emergency. The contents of the kit must be clearly marked. Expired materials must be replaced. The kit must be refilled on a regular basis.

11. Fire kits

Every laboratory must have a fire extinguisher and all the necessary equipment for the handling of fires. All users of the laboratory must be taught how to use the fire extinguisher.

Annexure A

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| MERCURY | | ICSC: 0056 |
| | | April 2004 |
| Quicksilver Liquid silver | |   |
| CAS No: 7439-97-6 | Hg | |
| RTECS No: OV4550000 | Atomic mass: 200.6 | |
| UN No: 2809 | | |
| EC No: 080-001-00-0 | | |

| TYPES OF HAZARD / EXPOSURE | ACUTE HAZARDS / SYMPTOMS | PREVENTION | FIRE FIGHTING |
|----------------------------|--|--|---|
| FIRE | Not combustible. Gives off irritating or toxic fumes (or gases) in a fire. | | In case of fire in the surroundings: use appropriate extinguishing media. |
| EXPLOSION | Risk of fire and explosion. | | In case of fire: keep drums, etc., cool by spraying with water. |
| EXPOSURE | | STRICT HYGIENE! AVOID EXPOSURE OF (PREGNANT) WOMEN! AVOID EXPOSURE OF ADOLESCENTS AND CHILDREN! | IN ALL CASES CONSULT A DOCTOR! |
| Inhalation | Abdominal pain. Cough. Diarrhoea. Shortness of breath. Vomiting. Fever or elevated body temperature. | Local exhaust or breathing protection. | Fresh air, rest. Artificial respiration if indicated. Refer for medical attention. |
| Skin | MAY BE ABSORBED! Redness. | Protective gloves. Protective clothing. | Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention. |
| Eyes | | Face shield, or eye protection in | First rinse with plenty of water for |

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| | | combination with breathing protection. | several minutes (remove contact lenses if easily possible), then take to a doctor. |
| Ingestion | | Do not eat, drink, or smoke during work. Wash hands before eating. | Refer for medical attention. |

| SPILLAGE DISPOSAL | PACKAGING & LABELLING | |
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| Evacuate danger area in case of a large spill! Consult an expert! Ventilation. Collect leaking and spilled liquid in sealable non-metallic containers as far as possible. Do NOT wash away into sewer. Do NOT let this chemical enter the environment. Chemical protection suit including self-contained breathing apparatus. | <p>T Symbol N Symbol R: 23-33-50/53 S: (1/2-)7-45-60-61 UN Hazard Class: 8 UN Pack Group: III</p> | Special material. Do not transport with food and feedstuffs. |

| EMERGENCY RESPONSE | STORAGE |
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| Transport Emergency Card: TEC (R)-80GC9-II+III | Provision to contain effluent from fire extinguishing. Separated from food and feedstuffs. Well closed. |

| IMPORTANT DATA | |
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| <p>Physical State; Appearance ODOURLESS, HEAVY AND MOBILE SILVERY LIQUID METAL.</p> <p>Chemical dangers Upon heating, toxic fumes are formed. Reacts violently with ammonia and halogens causing fire and explosion hazard. Attacks aluminum and many other metals forming amalgams.</p> <p>Occupational exposure limits TLV: 0.025 mg/m³ as TWA; (skin); A4; BEI issued; (ACGIH 2004). MAK: 0.1 mg/m³; Sh; Peak limitation category: II(8); Carcinogen category: 3B; (DFG 2003).</p> | <p>Routes of exposure The substance can be absorbed into the body by inhalation of its vapour and through the skin, also as a vapour!</p> <p>Inhalation risk A harmful contamination of the air can be reached very quickly on evaporation of this substance at 20°C.</p> <p>Effects of short-term exposure The substance is irritating to the skin. Inhalation of the vapours may cause pneumonitis. The substance may cause effects on the central nervous system and kidneys. The effects may be delayed. Medical observation is indicated.</p> <p>Effects of long-term or repeated exposure The substance may have effects on the central nervous system and kidneys, resulting in</p> |

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| | irritability, emotional instability, tremor, mental and memory disturbances, speech disorders. May cause inflammation and discoloration of the gums. Danger of cumulative effects. Animal tests show that this substance possibly causes toxic effects upon human reproduction. |
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| PHYSICAL PROPERTIES | ENVIRONMENTAL DATA |
|--|---|
| Boiling point: 357°C Melting point: -39°C Relative density (water = 1): 13.5 Solubility in water: none Vapour pressure, Pa at 20°C: 0.26 Relative vapour density (air = 1): 6.93 Relative density of the vapour/air-mixture at 20°C (air = 1): 1.009 | The substance is very toxic to aquatic organisms. In the food chain important to humans, bioaccumulation takes place, specifically in fish. |

| NOTES |
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| Depending on the degree of exposure, periodic medical examination is indicated. No odour warning if toxic concentrations are present. Do NOT take working clothes home. |

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| IPCS International Programme on Chemical Safety |  |  |  |  | Prepared in the context of cooperation between the International Programme on Chemical Safety and the European Commission © IPCS 2004 |
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For further information please contact the International Occupational Safety and Health Information Centre
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