

# **SURVEY ON LABORATORY ACCIDENTS IN SECONDARY SCHOOLS (2008/09)**

EDB CM 55/2010

Science Education Section, EDB  
3 June 2010

## **Background and Objectives**

### **\* Background**

- Conducted annually from 1995/96 up to 1999/2000
- Conducted on triennial basis since 2002/03

### **\* Objectives**

- To monitor the standard of safety in secondary school science laboratories
- To make recommendations to schools based on survey results for schools to enhance laboratory safety

### Results: 2005/06 and 2008/09

	2005/2006	2008/09
Number of schools responded	464	459
Number (percentage) of schools with laboratory accidents	168 (36%)	156 (34%)
Number of accident cases	554	502
Number of accident cases per school	1.19	1.09
Number of students injured*	500	419
Total no. of injured staff*	8	8
Accident rate per 1,000 students studying science courses**	1.57	1.49
Accident rate per 10,000 practical periods	4.15	3.88

### Accident Rate - Comparison 1

	2005/2006	2008/09
Number of cases		
Cuts	218	201
Heat burns or scalds	178	172
Chemicals on skin	45	39
Eye accidents	40	35
Chemical spillage	21	22
Substances catching fire	14	17
Discomfort arising from inhalation of gases	6	5
Bites by animals	0	1

## Accident Rate – Comparison 2

- School Laboratory
  - 1.49 cases per 1,000 students
- Traffic accident (HK, 2008)
  - 2.1 cases per 1,000 population
- Industrial accident rate in all industries (HK, 2008)
  - 27.2 cases per 1,000 workers.

## Type of Accidents

Type of accident	Number of cases	Percentage
Cuts	201	40.0
Heat burns or scalds	172	34.3
Chemicals on skin	39	7.77
Eye accidents	35	6.97
Chemicals spillage	22	4.38
Substances catching fire	17	3.39
Discomfort arising from inhalation of gases	5	1.00
Bites by animals	1	0.20
Others with personal injury	10	1.99
Total	502	

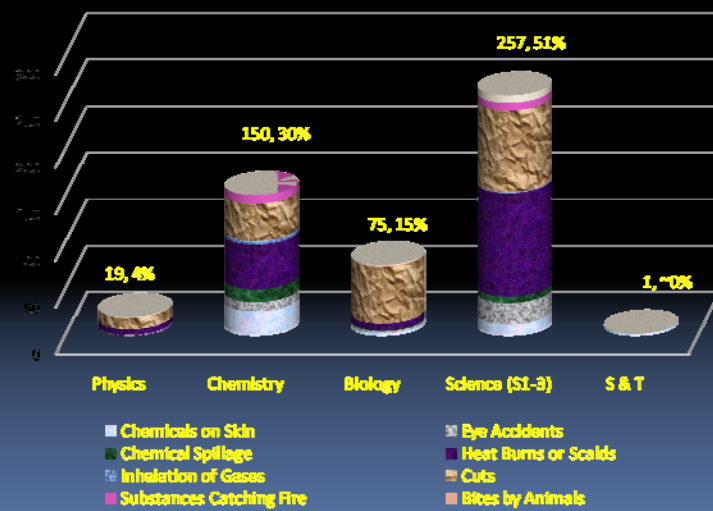
## Cuts / Heat Burns or Scalds



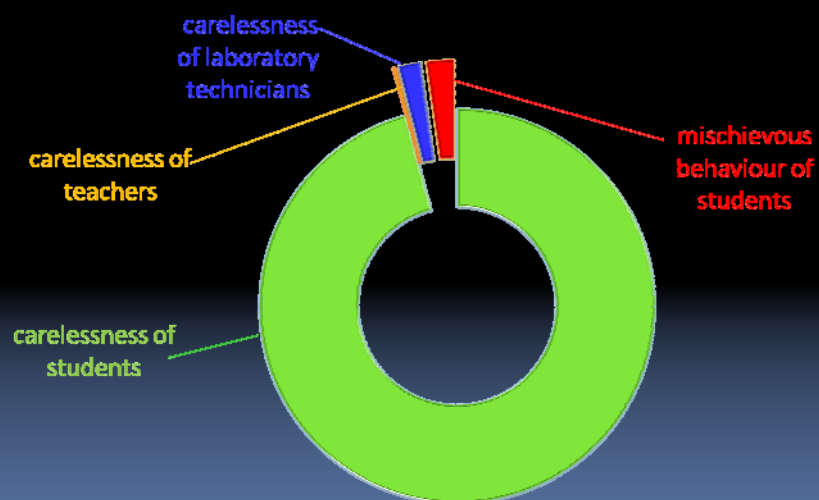
## Type of Accidents in Science Subjects

	Physics	Chemistry	Biology	Science (S1-3)	Science & Technology
Chemicals on skin	0	25	2	11	1
Eye accidents	0	10	2	23	0
Chemical Spillage	0	14	1	7	0
Heat burns / scalds	6	48	7	111	0
Inhalation of gases	0	4	0	1	0
Cuts	12	40	61	88	0
Substances catching fire	0	9	0	8	0
Bites by animals	0	0	1	0	0
Others with personal injury	1	0	1	8	0
Total	19 (4%)	150 (30%)	75 (15%)	257 (51%)	1 (~0%)

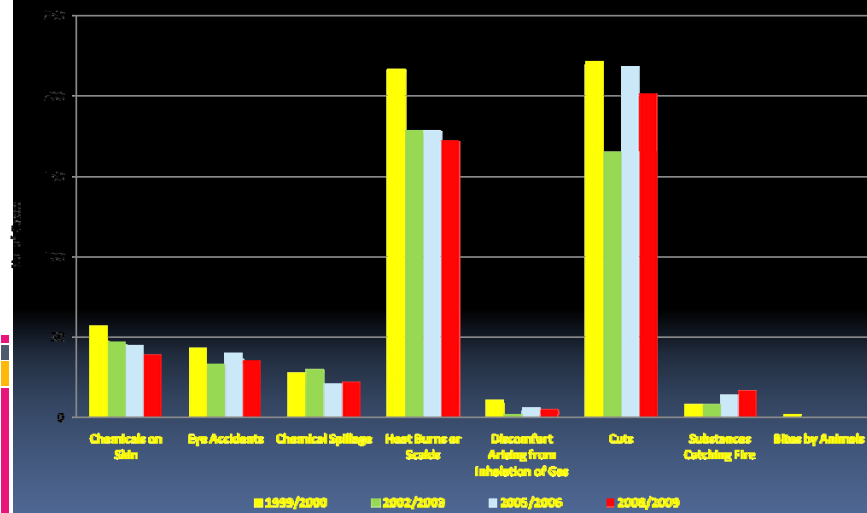
## Accidents in Science Subjects



## Causes of Accidents



## Trends



## Nature and Causes of Common Laboratory Accidents

### ● Cuts

- small cuts by broken glass apparatus (test tubes, glass tubing), tools (dissection instruments, cutters) or sharp edges
- e.g. fitting pipette into pipette filler/glass tube into rubber stopper
- 44% occurred in Science (S1-3)
- mostly found on fingers and palms

## Nature and Causes of Common Laboratory Accidents

- Heat burns or scalds
  - mainly caused by carelessness in handling hot objects (tripods, Bunsen burners, metal rods, glassware or combustion spoons), hot liquids, Bunsen flame or lighted matches
  - 65% occurred in Science (S1-3)
  - slight heat burns on hands
- Chemicals on Skin
  - mostly involved concentrated sulphuric acid, phenol, dilute acids
  - slight burns or irritations

## Nature and Causes of Common Laboratory Accidents

- Eye accidents
  - mostly involved copper(II) sulphate solution, dilute acids, alcohol
  - e.g. rubbing eyes with hands contaminated with chemicals, did not wear safety goggles properly, wore contact lenses and felt uncomfortable when irritating gas vapourised
  - e.g. eye of laboratory attendant injured by dilute acid when cleaning laboratory
  - slight irritation or discomfort

## Nature and Causes of Common Laboratory Accidents

- Chemical Spillage
  - small-scaled spillage of chemicals
  - e.g. quick fit apparatus not joined properly/heated evenly
  - e.g. laboratory technician poured concentrated acid into organic waste container
  - e.g. spilling of mercury

## Nature and Causes of Common Laboratory Accidents

- Substances catching fire
  - accidental ignition of flammable liquids
  - e.g. student used same pipette for transfer of two different catalysts in preparation of polystyrene
- Discomfort arising from inhalation of gases
  - e.g. when students washed test tubes, acidic gas came out from sink
  - discomfort in throat



## ■ Nature and Causes of Common Laboratory Accidents

- Bites by animals
  - e.g. a laboratory technicians bitten by mouse
- Others
  - e.g. stung by bee

■

**END OF SURVEY REPORT  
→ WAY FORWARD**

## Towards a safer laboratory

1. Safety Education for All Lab Users
2. Laboratory Management
3. Risk Assessment
4. Standing Committee on Laboratory Safety

### Online resources

<http://www.edb.gov.hk/cd/sc>

→ References & Resources

→ Laboratory Safety & Management

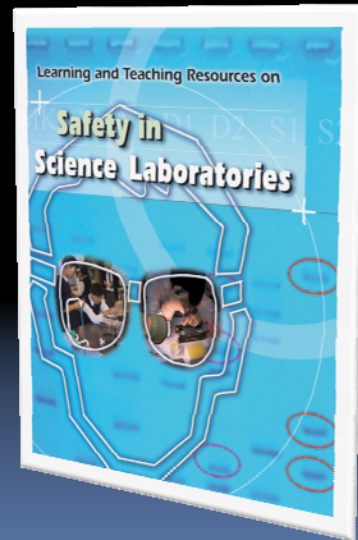
The screenshot shows the Education Bureau website. The header includes the Education Bureau logo and the text 'The Government of the Hong Kong Special Administrative Region'. Below the header, there is a navigation menu on the left with links like Home, What's New, About Us, Policy Highlights, Press Releases and Publications, Circulars, Kindergarten, Primary and Secondary Education, Special Education, Post-secondary Education, Other Education and Training, Our Services to Students and Parents, School Administration, and Teachers' Development. The main content area is titled 'Kindergarten, Primary and Secondary Education' and 'Science Education - Laboratory Safety and Management'. A pink arrow points to the 'Description' section, which lists the following items:

Description
1. Resources on laboratory safety and management
2. Activities on laboratory safety for students
3. Training activities
4. Disposal of chemical wastes
5. Survey on school laboratory accidents
6. Laboratory accidents and their safety precautions
7. Laboratory layout and facilities
8. Collection form for laboratory safety resources
9. Useful links

## Learning & Teaching Resources on Safety in Science Laboratories

### Learning activities

- Laboratory Safety Rules
- Eye Protection
- Safety Information on Chemicals
- Risk Assessment
- What if a Laboratory Accident Happens



## Safety in Exploring Science <http://resources.edb.gov.hk/~ses>

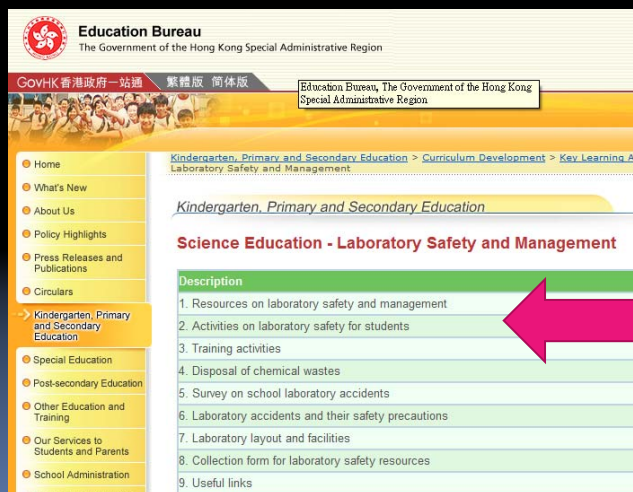


<http://www.edb.gov.hk/cd/sc>

→ References & Resources

→ Laboratory Safety & Management

→ Activities on laboratory safety for students



## 化學品安全網上遊戲設計比賽2009 冠軍作品



鳴謝：陳錦源老師

## Lists of Furniture and Equipment for NSS

<http://www.edb.gov.hk>

→ School Premises Related Information

→ Furniture and Equipment List for New Schools

→ Primary and Secondary Schools

(<http://www.edb.gov.hk/index.aspx?nodeID=5535&langno=1>)

New items related to safety:

Chemistry: Hand protector (silicon rubber), nitrile gloves, heating mantle, microscale organic quickfit apparatus

## Safety Spectacles



## Hand Protector

- Hand Protector 隔熱護手墊



## Gloves

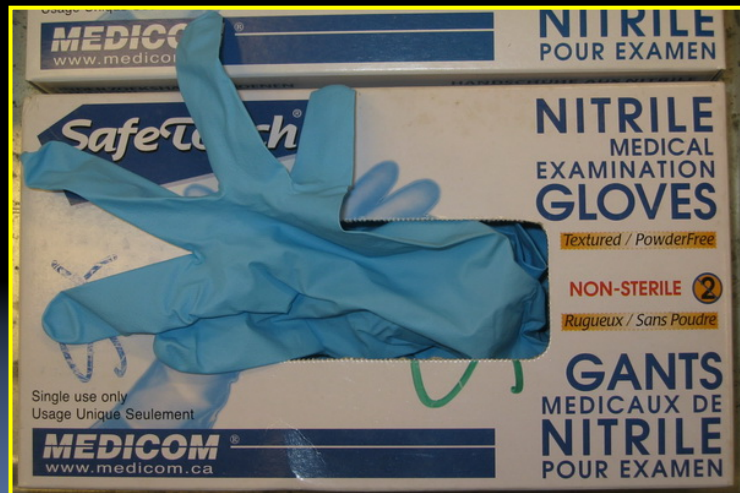
Cut Resistant Gloves



Nitrile Gloves



## Disposable Nitrile Gloves



## Spill Control Kit 1

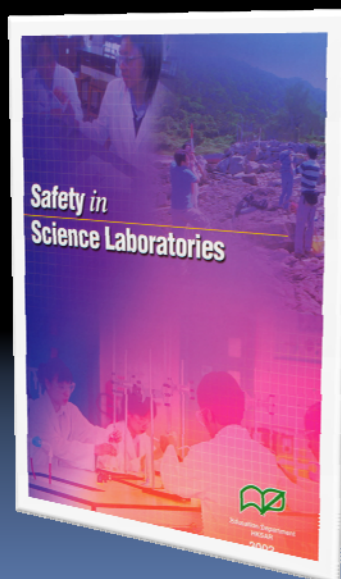




## Spill Control Kit 2



## Safety in Science Laboratories





## Label all CHEMICALS 2.0 化學品安全標籤



Courtesy: OSHC

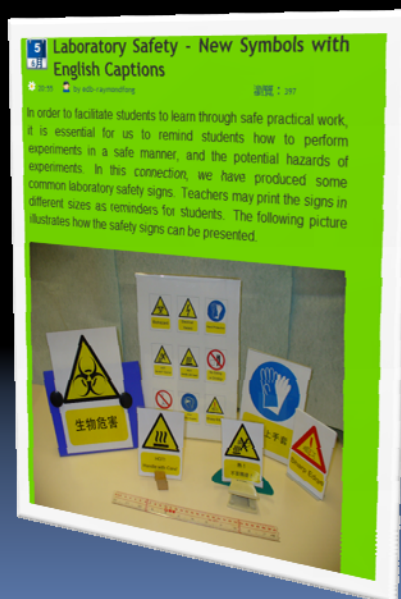
## Posters



Collection form:  
<http://resources.edb.gov.hk/cd/science/laboratory/safety/form.pdf>



## Laboratory Safety New Symbols with English Captions (實驗室安全-附中文解說的新標記)

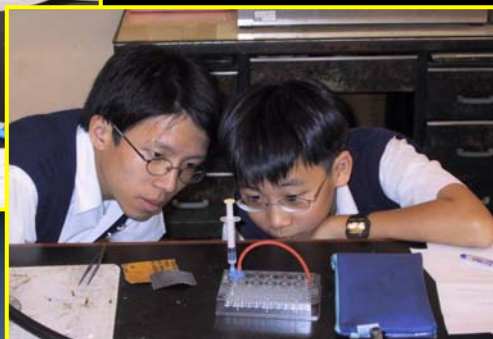


Latest Reference Materials for teachers and laboratory technicians

- Chemistry Teachers Professional Development and Resource Sharing Platform:

<http://edblog.hkedcity.net/nsscchem>

## Microscale Experiments



Fun!  
Concentrated!  
More hands-on!

## Microscale Experiments

- Reaction of gas with different reagents, e.g.  $\text{SO}_2 + \text{I}_2$ ,  $\text{KMnO}_4$ , methylene blue, pH paper
- Reduce the demand on the use of fume cupboard

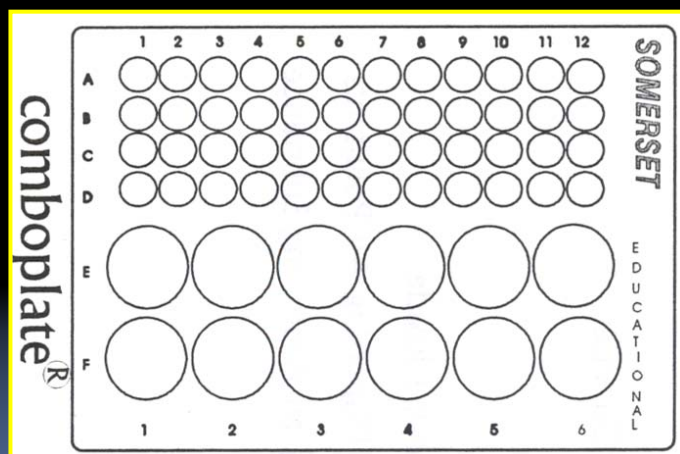


## Microscale Experiments

- Comparing reactivity of three different metals
- Equivalent to “6 beakers”
- Easy to compare experimental results



## Microscale Experiments



## Risk Assessment

Inquiry-based experiments, scientific investigations, investigative studies etc → Risk assessment is needed

Risk Assessment:

- Recognising potential hazards of chemicals
- Detecting possible risks associated with some procedures
- Take control measures and precautions

## Risk Assessment Exercise

- Ammonium Dichromate Volcano from Youtube  
(<http://www.youtube.com/watch?v=IHoKbLV-qeg>)



## Risk Assessment

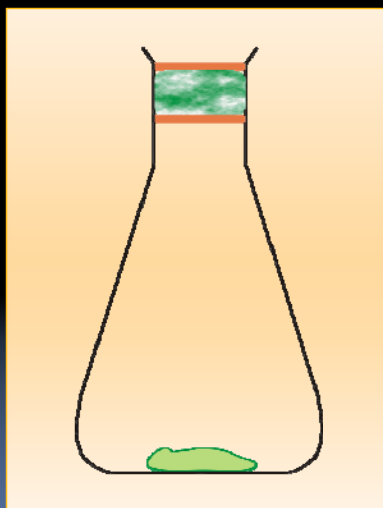
### Risk Assessment

Please list the potential hazards of the substances being used or produced, procedures and equipment; and the safety precautions that should be taken. Also think about what emergency procedures could be taken in case of accidents.

Hazardous substances being used or made, hazardous procedures or equipment	Nature of the hazards (e.g. toxic, flammable)	Control measures and precautions (e.g. use chemicals of lower hazard; reduce the scale; use fume cupboard or safety screen, wear protective gloves or safety spectacles, etc.)	Emergency action to be taken in case of accident	Sources of information (e.g. <i>Safety in Science Laboratories</i> , ICSCs, MSDSs or Hazcards, etc.)

**MSDS**

## Improved Set-up



## Materials Safety Data Sheet (MSDS)

**Education Bureau**  
The Government of the Hong Kong Special Administrative Region

GOVHK 香港政府一站通 繁體版 簡體版

Education Bureau, The Government of the Hong Kong Special Administrative Region

[Kindergarten, Primary and Secondary Education](#) > [Curriculum Development](#) > [Key Learning Area](#)  
[Laboratory Safety and Management](#)

**Kindergarten, Primary and Secondary Education**

**Science Education - Laboratory Safety and Management**

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A pink arrow points to the first item in the list: 1. Resources on laboratory safety and management.

## Standing Committee on Laboratory Safety (SLCS)

- A means to facilitate science teachers working closely for managing laboratory safety
- Better equips schools with capacity to deal with emergency situations
- Should meet regularly to put forward means for providing safe and rich laboratory based learning experience

**THANK YOU!**