H*ealth and Safety Briefing*



Institut für
Anorganische und Analytische Chemie

Albert-Ludwigs-Universität Freiburg

UNI FREIBURG

Dr. Martin Ade
Stand 04/2015



Regulatory Framework

EU-Directives

Laws: *Occupational health and Safety /Hazardous substances*

Gesetze: *Arbeitsschutz/Chemikalien:*

Regulations: Industrial Safety/Hazardous Substances

Verordnungen: *Betriebssicherheit/Gefahrstoffe:*

Technical Guidelines i. e. TRGS 526

Technische Regeln

Accident preventions regulations (accident insurance)

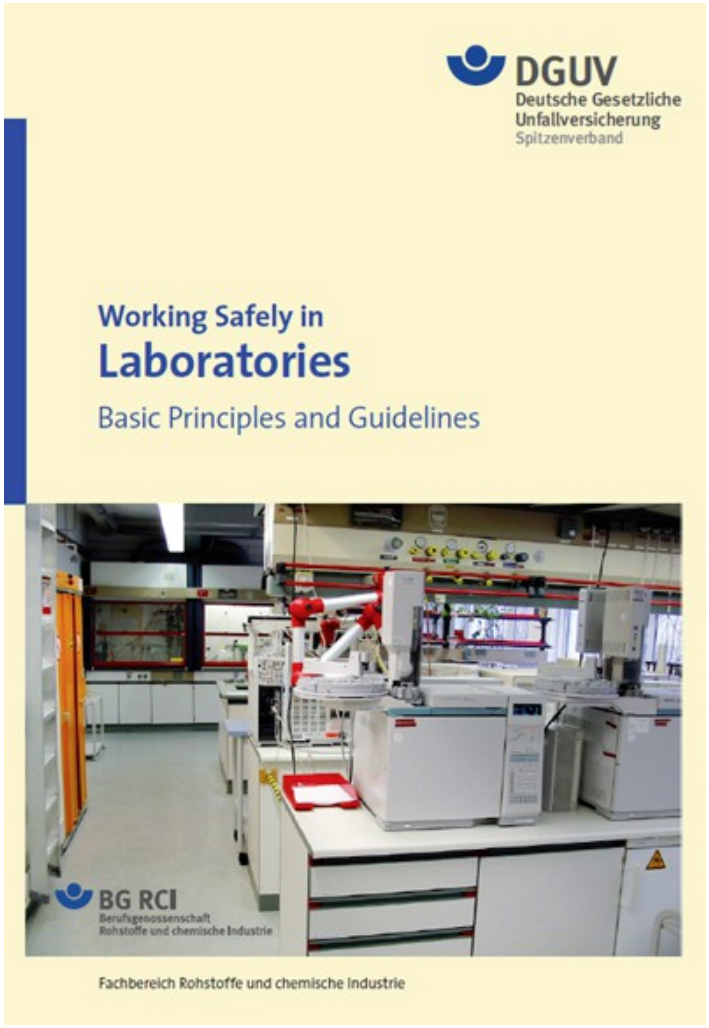
Unfallverhütungsvorschriften

Gesetzliche Unfallversicherungungen

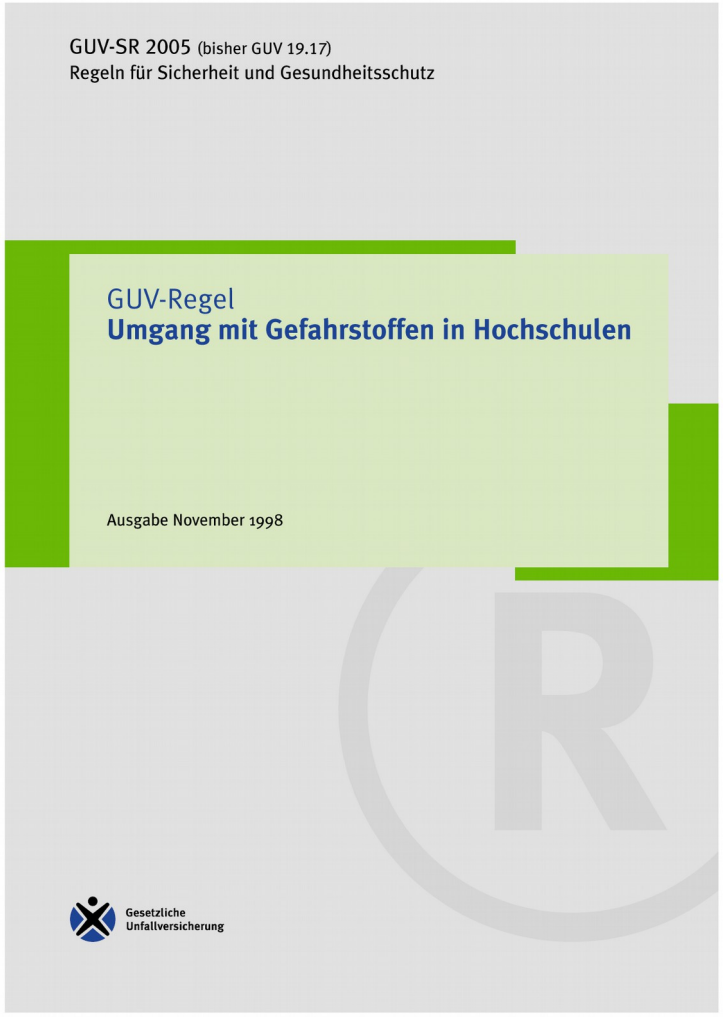
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Accident preventions regulations: Laboratories/ Hazardous Substances *(at Universities)*

BGI/GUV-I 850-0



GUV-SR-2005 (only in German)



Other important regulations

BGI/GUV-I 8553E

Deutsche Gesetzliche Unfallversicherung

Information

Safety in University Chemistry Courses

An Introduction for Students



BGI/GUV-I 8553 E October 2009

Fire safety regulation (ALU)

Brandschutzordnung

für die

Albert-Ludwigs-Universität

Freiburg

Ausgabe Juni 2006



Responsibilities

Responsible !

Rektor / Kanzler

Betriebsarzt
Occupational health physician
Supports and Advises

Fachkraft für Arbeitssicherheit
Occupational safety manager
Supports and Advises

Responsible!

Professor

Sicherheitsbeauftragte/r
Safety advisor
Supports and advises

Responsible !

Gruppenleiter (PI)

Responsible !

Werkstatt-Leiter

Technical Assistant

PostDoc

Students

Collaborator

Collaborator

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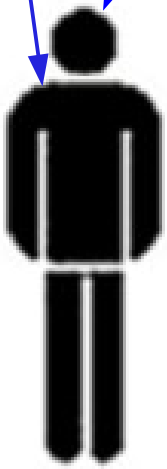
Gefährdungen im Labor/ *hazards in a lab*

Physische Gefahren/
physical factors (men)

Psychische Faktoren/
mental factors

Biologische Gefahren
biological hazards

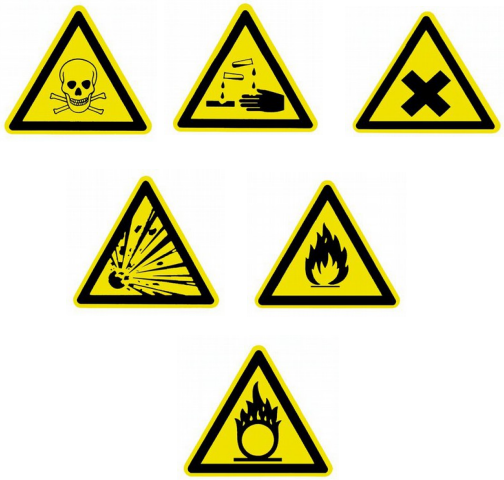




Mechanische Gefahren
mechanical hazards



Chemische Gefahren
chemical hazards



Elektrische Gefahren
electric hazards



Heiße oder kalte Korper/Medien/
hot or cold objects/ media

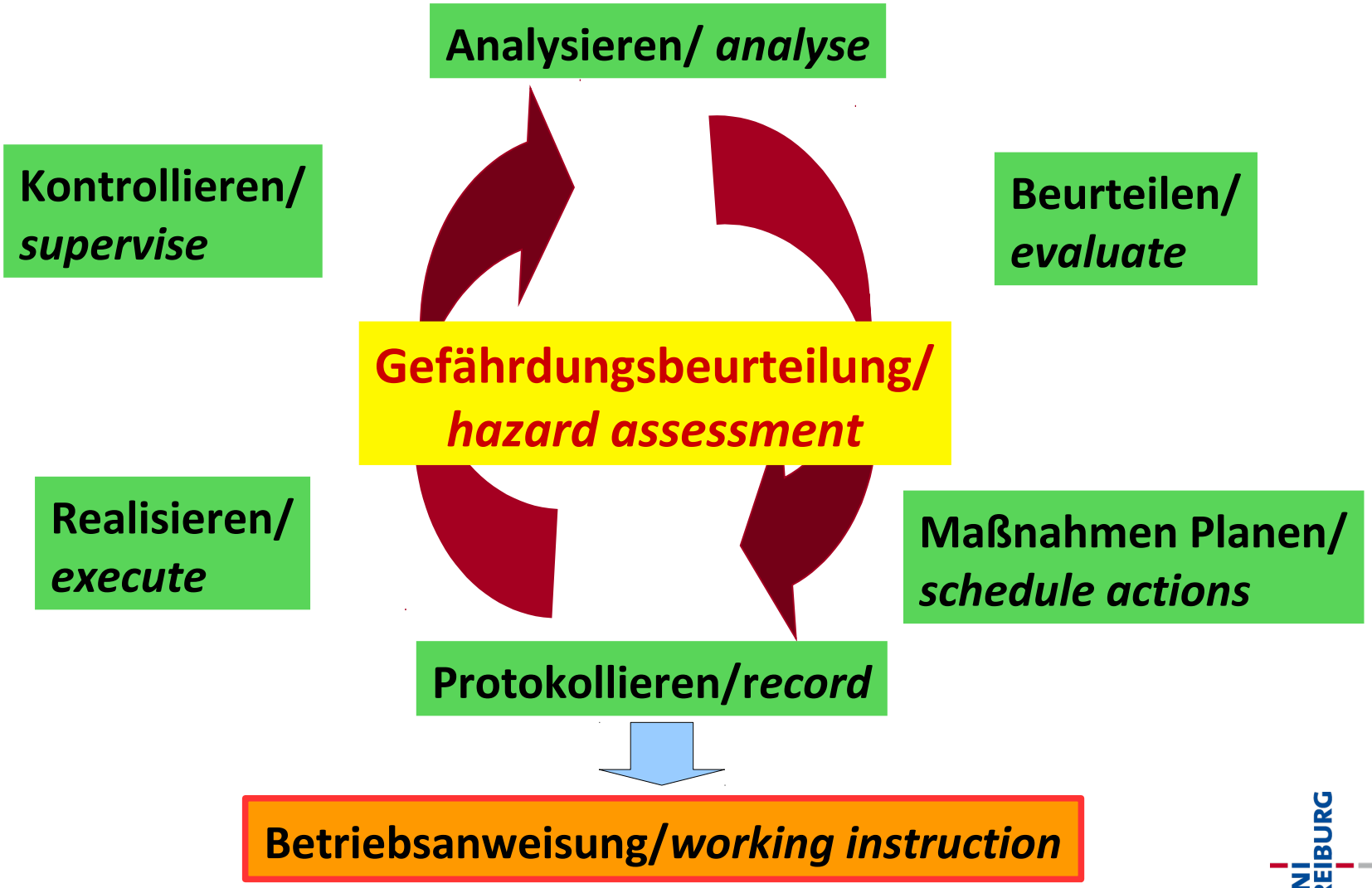


Physikalische Gefahren
physical factors (not men)



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Gefährdungsbeurteilung/*hazard assessment*



Working Instructions for Experiments

Versuchsbezogene Betriebsanweisung nach § 14 GefStoffV

für das Master-Grundpraktikum Anorganische Chemie

des Chemischen Laboratoriums der Universität Freiburg

Namen:	Mustermann Musterfrau	**Vornamen:**	Max Martina	**Gruppe:**	11
Assistent:	Mika Musterassi	**Versuch:**	AlBr3	**Datum:**	11.11.2014

Reaktionsgleichung: mit Angabe von Molmassen und Dichten (möglichst Strukturformeln)

	$2\ Al$	+	$3\ Br_2$	→	$2\ AlBr_3$
M [g/mol]	26,98		79,90		266,69
ρ [g/cm^3]	2,7		3,12		3,2

Eingesetzte Stoffe, Produkte	Fp/ ° C	Schmp. / Sdp °C	Gefahren-symbol	H- und P-Sätze	Signalwort Sonstiges	Benötigte Stoffmenge (ml, g, mmol)
Aluminiumfolie	–	660,3/-	–	Harmloser Stoff	–	5,66 g; 0,210 mol
Brom, Br_2	–	−7,3 / 59		H330, H314, H400, P210, P273, P304 + P340, P305 + P351 + P338 P403 + P233	Gefahr	5,12 ml; 0,20 mol
Hexan	−20	−94,3 / 69		H225, H304, H361, H373, H315, H336, H411, P210, P240, P273, P301 + P310, P331, P302 + P352, P403 + P235	Gefahr	ca. 50 mL
Aluminiumbromid $AlBr_3$		97 / 260		H290, H302, H314, P280, P301 + P330 + P331, P305 + P351 + P338,	Gefahr	53,34 g 0,200 mol

Gathering Informations for hazards/hazardous substances

↓

Estimate occupational exposure

↓

Evaluate experimental conditions and procedure

↓

Recognize the possible interaction of hazards

↓

Take appropriate measures

incl. measures in hazardous situations → first aid → safety waste disposal



Duties of Collaborators

- Hazard assessment prior to the experiment
- Follow working instructions for
  - *experiments*
  - *processes/methods*
  - *devices*
- Wear Personal Protective Equipment (PEE)
- Use safety devices (i. e. fume hoods)
- Damaged or errous safety devices/ machines
  - *Repair yourselve or*
  - *Submit to the machine shop of the chemistry department*



General Principles for Working in Laboratories

- “housekeeping”
- no smoking in the building
- no food or drinks in the lab
- wear appropriate clothing and footwear:
  - Personal protective equipment (safty googles/lab coat)
  - Long trousers
  - slip-proof footwear
- no contact lenses in the lab
- inform colleagues in your lab about hazards
- no work in isolation with hazard activities
  - monitoring by colleagues
  - entry in the time-book for working after 7 p.m. and at the weekend







Personal Protecive Equipment (PPE)

- Eye Protection
  - wear safety glasses with adequate side protection



- Lab Coat
  - made of hardly inflammale cotton
- Hand Protection
  - choose appropriate materials → consider resistance tables
  - avoid skin-disorder / allergic reactions → use hand lotions
  - take care not to spread contamination



- Respiratory Protection - Respirator
  - for toxic atmospheres/escape





new:
Smoke Hoods

- Special Protecive Clothing
  - Face shields i. e. For working with explosives/ overpressure)





Special Working Instructions I

Compressed-Gas Cylinders:

- Transport only with protected valve (protective cup screw on)
- Place toxic/corrosive gases in the fume hood (small cylinders!)
- Prevent cylinders from canting over by using appropriate chains
- Use only the correct pressure reducers/needle valves
- Clamp hoses to fed the gas
- Use buffering vessels to prevent liquids from flowing back
- Open the valves slowly
- Monitor feeding of the gas in the reaction vessel
- Store compressed-gas cylinders of flammable gases only in special safety cabinets



Special Working Instructions II

Evacuated Equipment:

- use only appropriate glassware (round-bottomed flasks or thick-walled vessels specially designed for vacuum work
- use only plastic-coated exsiccators
- rotary evaporators: use protective shields or place in the fume hood

Electric Equipment:

- must be in impeccable condition
- must be switched of in the case of damage
- must not be used in wet condition
- may be repaired only by electricity specialists

Further Special Operating Instructions:

→ *BGI/GUV-I 850-0e: „Working Safely in Laboratories“, 1st Ed. 12/2008*

Sicherheitseinrichtungen/ *Safety devices*
Abzüge/ *fume hoods*

- Frontschieber geschlossen halten/
  keep the windows closed
- Aufbauten dürfen die Absaug-funktionen nicht beeinträchtigen/ *experimental setups must not interfer with ventilation function*
- Absaugregelung nur extern/
  flow settings only externally
- Abzugsfunktion/Fehlfunktionen werden angezeigt/
  ventilation function/ misfunction is monitored
- jährliche Wartung/
  maintainanced annually



Sicherheitseinrichtungen/ *Safety devices*
Sicherheitsschränke/ *safety cabinets*

- Aufbewahrung/Lagerung von Gefahrstoffen /
  for storing hazardous substances overnight
- Belüftet und feuerresistent/
  ventilated and fire-resistant
- *Keine korrosiven Stoffe einlagern/*
  do not use for corrosives *(i. e. acids)*
- Zum Schließen Drücker benutzen/
  use only pusher to close
- Geschlossen halten/
  keep closed



Sicherheitseinrichtungen/ *Safety devices*
Notfalleinrichtungen/ emergency facilities

Notduschen/*emergency body showers*

Zugring/
drawing ring







Augenduschen/
emergency
eye-wash units



Notausschalter/
emergency switches



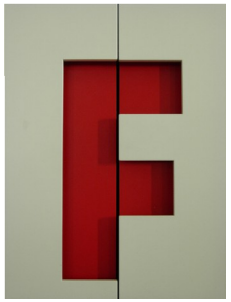
Feuerlöscher/
fire extinguisher



Erste Hilfe/ *First aid*



Erste Hilfe Kästen /First Aid Boxes



- are located in all big labs and in the „F-cabinet“ (staircase)
- use the accident log book
- *Emergency antidotes (i. e. in the F-cabinets/some laboratories)*
  - *accidents with hydrofluoric acid or other fluorine compounds*
  - *shortness of breath after inhalation of hazardous gases*
- *First aid cases (for easy transport)* → F cabinets

Ersthelfer / First aid assistants

- Aushänge /*notices*



Ersthelfer / First aid assistants

08.05.2014

Erste-Hilfe-Stationen

Chemie I, II

Notruf Hausapparat 2000 oder 112

Ansprechpartner

Name		Raum Nummer	Tel. Nr.
Ade	Martin	230 I	6102
Becherer	Anita	237a	6130
Benkmil	Boumahdi	137 II / -137 II	6138 / 6111
Bitgül	Fadime	235 II	6160
Daub	Michael	229 I	6146
Deck	Werner	240 II	6139
Frey	Marco	234 II	6106
Kaspar	Katrin	228 I	6137
Klose	Petra	334 II	6151
Ludwig	Thilo	241 II	6136
Petersen	Olaf	340 II	6116
Richert	Hasiba	229 I	6146
Rinderspacher	Johann	030 I	6003

Feuerlöscheinrichtungen/ *Fire extinguishing devices*

- **Feuerlöscher / Fire extinguishers**
  - Kohlendioxidlöscher (1-5 Kg) (Type B) - *carbon dioxide*
  - Pulverlöscher (Type ABC) - *powder extinguisher*
  - Metallbrandpulverlöscher (Type D) - metall extinguisher
- Löschsand → metalls/hydides - *sand containers*
- Löschdecken → persons - *fire blankets*
- every usage of an extinguisher has to be notified to the technical staff!

F-cabinets in the staircase:
- OG 1/2nd floor
- OG2 /3rd floor
- OG3 /4th floor





Special hazard areas



Night laboratories

- for reactions running overnight without monitoring
- automatic fire - extinguishing system (carbon dioxide)
- <u>all doors</u> must kept close
- system deactivation/activation by main light switch
- Pay attention to ultrasonic devices → ear protector



Fluorine laboratory

- for experiments with elemental fluorine and flourine compounds
- detector for hazards of toxic flourine atmosphere

→ responsible Dr. Werner Deck/ Ulf Breddemann



Spezielle Gefahrenbereiche/ *special hazard areas*

Röntgenschutzbereiche/

X-ray hazard protection areas:

Zutritt nur nach Unterweisung/

access only after appropriate safety instruction



Laserschutzbereiche/

Laser hazard protection areas:

Zutritt* nur nach Unterweisung/

access only after appropriate safety instruction*



* Lampe an/*lights on*

Neue Laser (Klasse größer 1) beim Laserschutzbeauftragten anmelden/

New laser devices (apart class 1) must be announced to the laser saftey manager



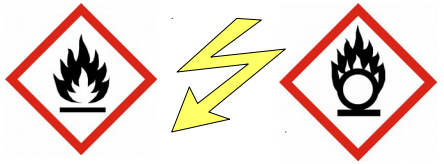
Gefahrstoffe/ *Hazardous Substances*

- work in fume hoods/with personal protective equipment to minimize exposure
- respect „*standard laboratory conditions*“ (boundary conditions)
  - toxic substances: max. 500 ml/ 500 g
  - highly toxic liquids: max. 100 ml/ 100 g
- complete marking of all containers in the lab
  - material/preperation, hazard symbols, associated designations
- prevent misuse of hazardous materials (access control)
- follow employment restrictions regarding hazardous materials
  - childbearing women and young people are restricted in working with category 1 and 2 carcinogenic, mutagenic and reprotoxic („cmr“-materials)
  - pregnant and breastfeeding women have **no access** to labs at the University of Freiburg

Gefahrstoffe/ *Hazardous Substances*

Storage

- Flammables and Toxic Substances → Safety Cabinets
- Corrosives → Fume Hoods, Exhausted Cupboards
- Prohibition of Clustering of Hazardous Substances
- Ensure Secure Placing and Redrawing
- Refrigerators: use appropriate Devices
  interior free from ignition sources (→ labelling)



Flammable Oxidizing

Transportation:

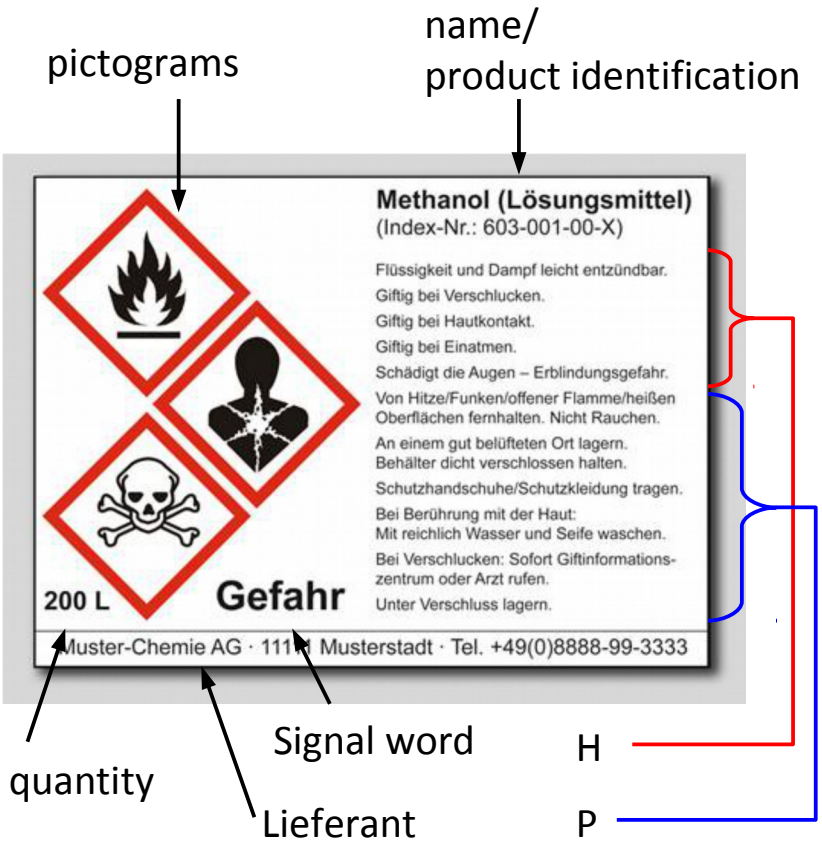
- only use appropriate Baskets for Glass Containers
- Hazardous substances envolving toxic or suffocative gases may not be transported together with persons in a lift



Gefahrstoffe/ *Hazardous Substances*

Labelling:

acc. GHS-System:



H: *hazardous statements*

P: *precautionary statements*

Simplified Labelling of Laboratory containers:

→ up to 3 Piktograms + Phrases





Register of Hazardous Substances

List of all Hazardous Substances in the area of Responsibility:

- Name/Identifier of the hazardous substance
- Classification of the hazardous substance/ specification of hazardous properties
- Quantity of hazardous substance
- Working Area (rooms/labs) where the substances are handled.

Lfd. Nr.	Bezeichnung des Stoffes / Produktes ggf. zusätzlich chemischer Name	GHS Kennzeichnung	Menge	Haut-gefährdend	Sicherheitsdatenblatt von: (Hersteller, Datum)
1	Aceton	 H225-H319 H336-EUH066	2,5 l	Ja (gering)	Merck, 21.03.2013
2	Acetonitril	 H225-H332 H312-H302 H319	1 l	Ja	Aldrich, 15.04.2007
3	Chloroform	 H302-H315 H351-H373	250 ml	Ja	Acros, 20.11.2010

→ regular Inventory in the central register of the chemistry department "Wertstoffbörse"



Sicherheitsdatenblätter (SDB)/ *Materials Safety Data Sheet /(MSDS)*

Online-Ressources:

- GESTIS substance database of BGIA
  - http://www.dguv.de/ifa/de/gestis/stoffdb/index.jsp
- GisChem chemical information system
  - http://www.gischem.de/index.htm
- ChemDB (University of Mainz) *in German*
  - http://www.chemdb.de/ (im Uni-Netz frei)

Validiert/ *validated*

- Wertstoffbörse des Chemischen Laboratoriums
  - http://orghelp.chemie.uni-freiburg.de (für Angestellte frei)
- Chemikalienlieferanten (Merck, Alfa-Aesar, Aldrich etc.)
- Links der Stabstelle für Sicherheit der ALU
  - http://www.sicherheit.uni-freiburg.de/ssilinks



Im Notfall / E*mergency Situation*



- Protect yourself – leave the hazard area
- Inform your colleagues
- Aid affected persons
- Secure the hazard area (close valves, shutdown devices for fuel gases, close safety cabinets)
- Follow the marked escape routes to leave the building
  → safety instruction plans on the floors/and signs on the walls





- Emergency exits: doors open in the case of fire alarm or may be opended manually
- Assembly point (parking place on the west side)
- Report incident (safety advisor, group leader, director of the institute, director of the „Chemisches Laboratorium“)

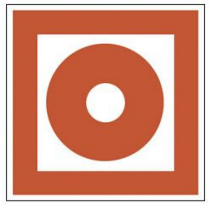


Im Brandfall / *in the case of fire*

- Fight small fires (respect self protection)
  - CO_2-extinguisher → burning liquids/electrical devices
  - ABC-powder extinguisher → burning gases and solids
  - Metall extinguisher/sand containers → alkaline metals, hydrides
  - Emergency showers/fire blankets → persons



- Set off a fire alarm
  - automatically (temperature detector/fume detectors)
  - pushbutton alarm indicator
  - By phone: **2000** or mobile: **112**



- Close windows and doors
- Leave the building immediatly → assembly point
- **Do not use the lift in the case of fire**



Accidents with Hazardous Substances

- Contamination of eyes/skin
  → wash immediately with a big amount of water
  (emergency shower/eye-wash units)





- If swallowed (Ingestion)→ Do not induce vomiting, drink a glass of water
- If inhalated → supply fresh air
- Pay attention to material safety data sheet/ operating instruction
- Take possible delayed effects on health and long-tail claims into account
  → consult safety advisors
  → medicin, hospital oder rescue service



- A written accident statement has to be set up for the insurance
- Mark the contaminated area
- Absorbe leaked hazardous materials (emergency cart)



Notfallrufnummern/ E*mergency Numbers*



- **2000** Rettungsleitzentrale der Feuerwehr/ *fire department*
  über **alle** Haustelefone/*by all phones at the institute*
- **112** Rettungsleitzentrale/rescue coordination center
  über Handy/*via mobile*
- **110** Polizei/*police* (via Handy/*mobile*)

- Technische Notfälle/ *technical emergencies*:
  Technisches Gebäudemanagement (TGM)/
  technical facility management

  3342 (bis 15 Uhr/Fr. bis 12 Uhr
  until 3 p.m./on Friday until 12 a.m.)
  2266 außerhalb dieser Zeiten [Fa. Ziemann]/
  outside working hours [Co. Ziemann]

Waste Management: Separation

Normal Waste





Boverage Bottles

Clean and without label!

Collection outside the Lab

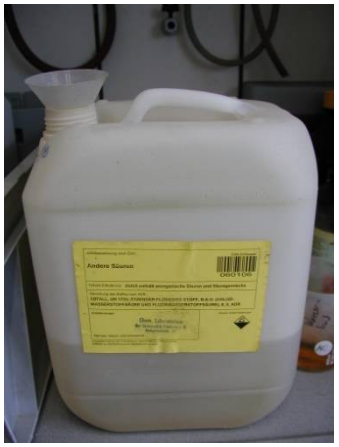
Collection in the Lab



Laboratory Bottles

Chemicals/Contaminated Appliances

Fluids/Solutions



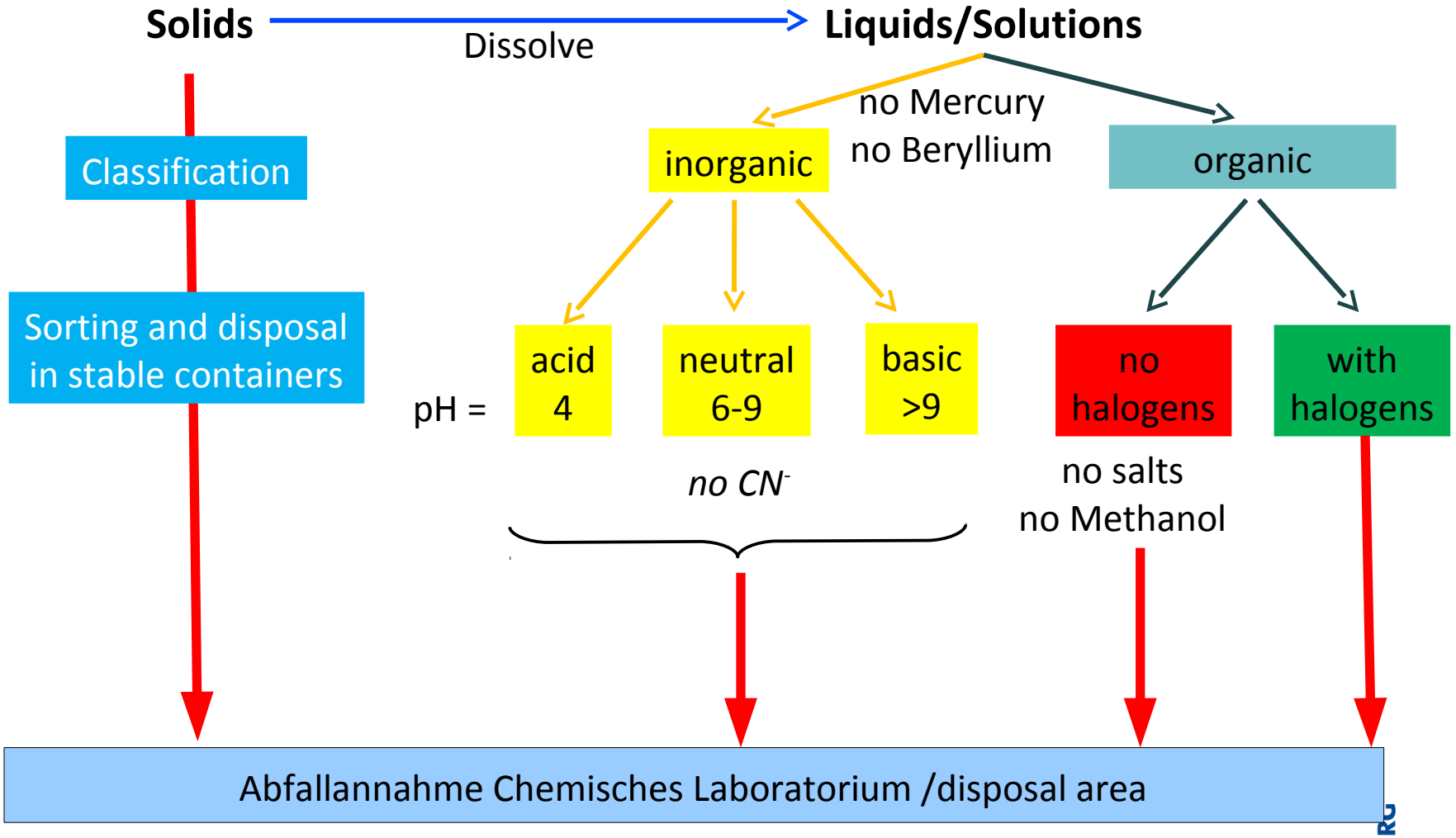
Appliances



Pointed, sharp or fragile objects



Waste Management: Hazardous Wastes

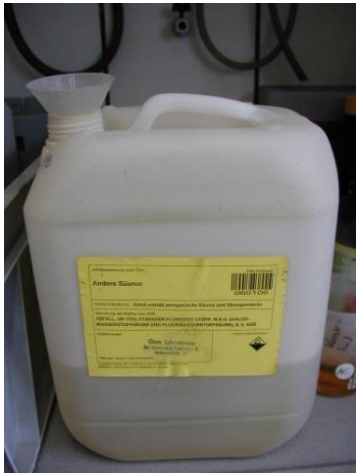


Abfallbeauftragter/*waste inspector:* Herr Lenhard Tel. 6007



Waste management: Basic Guidance

- Pay attention to material safety data sheet/working instruction
- Rule out hazardous reactions
- Storage of waste containers in a ventilated area
  - Inorganic → fume hoods/exhausted cupboards
  - Organic wastes → safety cabinets
- Containers have to be filled according to the label given
- Don't fill to the top, dispose regular
- Containers for disposal must be accompanied by a declaration about the content
- Take measures for a leakage of the containers
- **No chemical wastes in the washing bassin, not even a drop for WGK 1 (i. e. haloalkanes)!**





WGK: Wassergefährdungsklasse
(= *water hazard class*) → MSDS

Waste Mangement: Appliances

normal appliances (wipes, gloves)	laboratory glas bottles contaminated	pointed,sharp or fragile objects







plastic bag in red steel containers (fire-resistant)

in cardboard boxes/ buckets

yellow boxes

wipes
hoses

gloves
empty containers

Abfallannahme Chemisches Laboratorium / *disposal area*



Abfallbeauftragter/waste inspector Herr Lenhard Tel. 6007



Sicherheitsbeauftragte am Institut/ *safety advisors at the institute*

- **Arbeitsicherheit/*occupational safety***:
  - Dr. Martin Ade (*room* 230)
  - Dr. Werner Deck (*room* 240)

- **Röntgenschutz/ *X-ray protection***:
  - Dr. Martin Ade
  - Boumahdi Benkmil (*room* 137 / -137)
  - Prof. Dr. Caroline Röhr (*room* 139)
- **Laserschutz / *laser protection:***
  - Dr. Martin Ade
  - Dr. Werner Deck
- **Strahlenschutz / *radioactivity protection***:
  - Dr. Werner Deck



Literature and Links

- *BGI/GUV-I 8553E: „Safety in University Chemical Courses“ - An Introduction for Students*“, October 2009 →
  http://publikationen.dguv.de/dguv/pdf/10002/i-8553-e.pdf

- *BGI/GUV-I 850-0e: „Working Safely in Laboratories“, 1st Ed. 12/2008*
  http://bgi850-0.vur.jedermann.de/index.jsp

- *Globally Harmonized System for Classification and labelling of Chemicals:*
  http://en.wikipedia.org/wiki/Globally_Harmonized_System_of_Classification_and_Labelling_of_Chemicals

- *Hazard and Precautionary Statements:*
  http://en.wikipedia.org/wiki/GHS_hazard_statements
  http://en.wikipedia.org/wiki/GHS_precautionary_statements

- *Chemisches Laboratorium der Universität Freiburg*
  http://www.cpg.uni-freiburg.de/chemie/einrichtungen

- *Laboratory Waste Water at the University Freiburg (in German)*
  http://www.umweltschutz.uni-freiburg.de/downloads/vorschriften/abwasser1-120310.pdf

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