

GENERAL LABORATORY RULES

according to Art. 14 GefStoffV, as outlined in TRGS 526 und DGUV Information 213-850
for the Karlsruhe Institute of Technology

1. General

- It is forbidden to unauthorized persons to enter the laboratories. This shall be indicated by the corresponding information signs. Work of external staff shall only be permitted, if either existing hazards have been eliminated before or suitable protection measures and ways of conduct have been defined, and the external staff has been instructed accordingly. External staff shall be e.g. employees of other companies, but also KIT employees from other areas, who do not work at the laboratory, and visitors.
- Pregnant women and nursing mothers shall avoid contact with certain hazardous substances. Work at laboratories, where these hazardous substances are handled, shall also be excluded, if the respective female employee does not handle these hazardous substances herself. Even if they wish, female employees must not be employed when employment of pregnant women, nursing mothers, and women of childbearing age is restricted. Further details are outlined in the Maternity Protection Act.
- Adolescents aged between 15 and 18 (e.g. trainees) shall only be allowed to work at the laboratories under supervision by expert staff. Expert staff shall be staff having the corresponding professional qualification and several years of laboratory experience in handling hazardous substances, staff currently executing a corresponding professional activity, and staff having participated in the corresponding trainings.
- Adolescents under the age of 15 shall not be allowed to handle hazardous substances, unless these activities are required to reach the training objective and carried out under supervision.
- It is forbidden to eat, drink, smoke, and snuff at all laboratories.
- For every laboratory (laboratories of the same type may be combined), a risk assessment shall be made and kept available in writing or as a computerized version for consultation. The risk assessment shall be reviewed regularly and updated in case of changes of the hazard situation. The revision or control of the efficiency of defined measures shall be documented in writing (see also TRGS 400).
- Prior to the start of new work or in case of major changes of existing work processes, the hazards shall be determined and protection measures defined by the laboratory manager.
- Employees ordered to execute experiments may leave the workplace during the experiment only, if permanent supervision is not required or supervision is continued by another qualified person.
- Unattended experiments and installations shall be labelled. The name and phone number of the responsible person, the experimental setup or hazardous substances used, and the resulting hazards at least shall be indicated on the label. It shall be ensured that other necessary laboratory work can be carried out parallel to the unattended experiments.
- Laboratory doors shall be kept closed and shall not be blocked.

- Laboratory clothes and street clothes shall be kept separately. Street clothes must not be taken off in the laboratory.
- Writing work that does not require staying at the laboratory shall be carried out outside of the laboratory.
- All equipment and other devices shall be checked for a proper and safe state of operation prior to use. Obviously damaged devices shall not be used.
- Pressurized reaction vessels shall be licensed for the purpose of use. They shall be subject to the Operation Safety Ordinance and inspected regularly.
- Cooling devices, dewar vessels, and vacuum devices (e.g. desiccators) shall be enclosed by an adhesive foil, if they do not have any protective housing.
- Everyone is responsible for his safety at the laboratory. If a deficiency is noticed, it shall be eliminated or notified immediately and elimination shall be arranged.
- Prior to the first start of work, it must be checked whether a preventative examination by the company doctor is required or to be offered. If yes, such an examination shall be arranged.
- Drunken work or work under the influence of other drugs or substances impairing consciousness shall be forbidden.

2. Working times

Opening times of laboratories shall be specified by the organizational unit. Main opening times (e.g. Monday – Friday, 8:00 to 18:00, or core working time) and special opening times (e.g. Monday - Friday, 18:00 to 8:00 or outside of core working time, Saturday, Sunday) shall be distinguished. During main opening times, work of any type may be executed without any restrictions. Hence, it shall be ensured that sufficient staff is present for emergencies (first-aiders, fire protection assistants, radiation protection commissioners, etc.).

Execution of hazardous work (see section 6) at times other than the main opening times shall require a permit in writing by the responsible laboratory manager. The latter shall be obliged to ensure that hazardous work is not executed alone. By agreement with colleagues, it shall be ensured that at least two qualified persons are present to supervise each other at regular intervals. If necessary, registration in a control book at a central point shall be required.

3. Clothing, (personal) protective equipment

- When working with hazardous substances, appropriate work and/or protective clothes shall be worn. Staff shall be obliged to wear
 - safety glasses (goggles) with sufficient side protection and top coverage of the eye area, if possible,
 - a closed, long laboratory coat with long, tight-fitting arms, and the share of cotton of the fabric being at least 35%, and
 - sturdy, closed, and safe shoes all the time.

Any additionally required special protective clothing / equipment is listed in the operating instructions relating to substances, work materials, and special devices.

The head of the organizational unit shall be responsible for making available the required personal safety equipment and for its use by his staff.

- Wearers of correction glasses shall also wear safety glasses (either with cut-in lenses or over-glasses with side protection).
- The laboratory coat must not be worn at places, which may also be accessed by persons, who do not handle hazardous substances (office, kitchen, canteen, cafeteria, refectory, lecture hall, library, washing rooms, etc.).
- In case of activities associated with special hazards for the hands, e.g. when handling certain hazardous substances (caustic, corrosive, irritating, sensitizing, etc.), use of suitable gloves shall be required. The glove material shall be chosen depending on the purpose of use. As a rule, garden and household gloves are not suitable. Disposable gloves shall be suited for a few uses only (time until damage in case of contact with hazardous substances mostly is < 10 minutes).
- If there is a risk of cutting injuries, cut-proof protective gloves shall be made available and used when working with glass components.
- When working with very cold liquids (e.g. cryogenic nitrogen), suitable insulating gloves shall be made available and used.
- The gloves shall be checked for damage prior to each use.
- Gloves shall not be worn outside of the laboratory. They shall be taken off when using phones, opening room and corridor doors and windows as well as when using computers/office material, etc.

4. Orderliness and cleanliness of the workplace

The own workplace and all shared facilities shall be kept in an orderly state. The own laboratory place shall be tidied up regularly (at least once a week).

Escape and emergency routes and passages shall be kept free.

At least once a year, it shall be checked whether chemicals have to remain at the laboratory or to be removed or disposed of, if necessary. The cadaster of hazardous substances (to be administrated via the ChemA program) shall be updated accordingly. Minimum once a year a stocktaking shall be made and documented in ChemA.

5. Safety installations

Every person working at a laboratory shall inform himself / herself about locations and functions of safety installations as well as about escape routes, fire alarms, and alarm plans. Escape and rescue paths shall be kept free all the time. Fire-extinguishing substances, emergency showers, and first-aid installations must not be blocked.

- Two types of fire extinguishers are available at all laboratories:
 - Carbon dioxide extinguishers at every laboratory;
 - Water/foam or powder extinguishers on the corridors.

Immediately after use, fire extinguishers must be handed in either directly to the Fire Department or via the Control Centre for refilling or exchange, and then be returned to their places. While they are being refilled, alternative fire protection measures must be defined and implemented.

- First-aid boxes shall be provided at central locations and checked for completeness and service lives regularly. A first-aid log is to be kept (<http://www.kiss.kit.edu/102.php>, see Downloads: “Erste-Hilfe-Leistungen”). Persons responsible for first-aid boxes shall be appointed, e.g. the first-aiders. Even small injuries that do not require any examination by the company doctor or visit of a hospital shall be documented in the first-aid log for insurance reasons (in case of unexpected consequential damage).
- Emergency body showers shall be supplied with water of drinking water quality, if possible, and installed at the laboratory exits. Their water flow rate shall be at least 30 l/min..
- Emergency showers for the eyes shall be supplied with water of drinking water quality. They shall be installed, such that they can be immediately reached from any place in the laboratory. The water flow rate shall be at least 6 l/min at every outlet. .
- Emergency body showers and emergency eye showers must be inspected every month by the laboratory staff to check that they function correctly. This inspection must be documented. In areas without drinking water supply, a sufficient number of eyewash bottles must be provided. The content of these bottles (drinking water) must be replaced at least monthly.

Protective respirators shall be permitted for special work (e.g. with toxic gases) only. The breathing connections / masks shall be cleaned after each use, filters shall be screwed off and closed again on both sides. Time and duration of use shall be documented. When the service life of the filters expires, these shall be exchanged immediately.

Prior to the use of protective respirators as personal protection equipment, an examination (mandatory health care or optional health care) shall be offered by the company doctor and an instruction shall be required. DGUV rule 112-190 shall be observed.

6. Dangerous work

Dangerous work is any activity involving the use of substances that are explosive, highly ignitable, easily inflammable, inflammable, carcinogenic, mutagenic, toxic for reproduction, dangerous to life, (acutely) toxic or caustic, or work involving hazardous systems (under vacuum or pressure, Carius tubes and autoclaves, pressurized gases and gas cylinders, open flames or hot air fans on a high power, hydrogenations, ozonolysis, etc.).

- Dangerous work must not be performed alone.
- Dangerous work shall always be performed under special protection measures (under hoods, behind glass shields, in special rooms, etc.).
- In case of any dangerous work, it shall be ensured that the staff members executing it are informed about all potential hazards and have been instructed about the corresponding emergency measures.

7. Behaviour in case of hazardous situations

Whenever hazardous situations (e.g. release of gases and vapors, leaks of hazardous liquids, fires) occur, observe the following rules:

- STAY CALM
- TAKE CARE OF YOUR OWN SAFETY FIRST WHEN PROVIDING HELP
- Inform the emergency control center (phone 3333, externally via 0721 608-3333)

After this, take the following measures:

- Warn endangered persons.
- If possible, rescue helpless persons and get them to safety.
- Follow the indicated escape routes.
- Stop endangered or endangering experiments, if possible, and bring the systems into a safe state of operation (if possible).
- Switch off gas and power supply.
- Let the cooling water of systems continue to run.
- In the case of fire, close doors and windows, try to extinguish the fire with the existing fire-extinguishing agents (e.g. fire extinguisher).
- After eye or skin contact with chemicals, wash with much water (e.g. by using the body emergency and / or eye emergency shower).
- If necessary, take first-aid measures.
- Inform the responsible staff:
 - Laboratory manager Phone: See notice board or operating instructions
 - First-aiders See notice board, first aid
 - Safety commissioner Phone: See notice board or operating instructions
 - Emergency control center Phone: 3333 (via every landline telephone)
 - If necessary, fire department Phone: 3333 (via every landline telephone)
 - If necessary, police Phone: 3333 (via every landline telephone)
 - If necessary, company doctor/ Phone: 3333 (via every landline telephone)
 emergency doctor
- In case of major accidents, make the Emergency Control Center inform the responsible Safety Officer.
- In case of personal injuries, call the company doctor / emergency doctor. If a visit of a hospital is required, provide the emergency staff with the corresponding operating instruction, safety sheet according to REACH ordinance or other material information.
- Arrange for external rescue forces being shown the access paths.

8. Night work

Chemical experiments that have to be continued overnight for special reasons shall only be executed in accordingly secured night rooms envisaged for this purpose (with smoke or heat alarms, water monitors) using suitable devices (KPG stirrers with teflon tubes instead of glass tubes; gas and water hoses secured to prevent them from slipping off; heaters in safety collection basins, etc.). Continuation of such work at normal laboratories shall not be permitted. Exceptions may be permitted, if the reactants are not burnable and stirred without the supply of heat, coolant or reactants at room temperature with a magnetic stirrer. This exceptional permit shall be granted by the responsible laboratory manager.

9. Handling of hazardous substances

Substances, the harmlessness of which cannot be determined beyond all doubt, shall be handled analogously to hazardous substances.

Hazardous substances shall be substances and preparations / mixtures having one or several hazard characteristics according to the Chemikaliengesetz (Chemicals Act) and, hence, requiring labeling according to the Gefahrstoffverordnung (Hazardous Substances Ordinance) or the CLP Ordinance or substances, the production and use of which gives rise to the formation or release of hazardous substances or preparations / mixtures. In addition, substances and preparations / mixtures that are known to potentially transmit pathogens shall be considered hazardous substances.

Labeling of packages of hazardous substances used at laboratories shall be subject to TRGS 201 "Einstufung und Kennzeichnung bei Tätigkeiten mit Gefahrstoffen" (Classification and labeling when handling hazardous substances). Accordingly, simplified labeling shall be permitted, if this is the result of the risk assessment and if the corresponding operating instructions with instructions about hazards and protection measures are available. In case of simplified labeling,

- the name of the substance / mixture (with information on the constituents) and
- the hazard pictograms (hazard symbols and hazard designations according to the substance and preparation guidelines)





















of the main hazards caused by the physical / chemical, health-damaging, and environmentally hazardous effects of the substance or mixture shall be indicated at least.

In case of labeling according to the CLP Ordinance, there are no hazard designations. To compensate the reduced information content, a combination of hazard pictograms with phrases according to Annex 4 of DGUV information 213-850 is recommended for use as bottle label (see next page). Indication of the substance / mixture name (with information on the constituents) shall always be required.

At laboratories, hazards to health should always be described by up to two pictograms (acute and chronic effect), while physico-chemical hazards should be indicated by one pictogram (DGUV information 213-850, Annex 4).

When transporting or transferring hazardous substances to other persons or institutions, labeling according to the CLP Ordinance (Articles 17 – 22, CLP Ordinance) shall be required.

Overview of pictograms and phrases according to DGUV information 213-850:

			
Explosive	Danger to life	CMR substance cat. 1	Corrosive to skin/ metals
			
Extremely flammable	Toxic	CMR substance cat. 2	Irritant
			
Highly flammable	Harmful to health	Damages organs	Untested research substance
			<input type="checkbox"/> if inhaled <input type="checkbox"/> in contact with skin <input type="checkbox"/> if swallowed
Flammable	Narcotic	Can damage organs	
			Contact with water or acids liberates toxic gas
Pyrophoric	Allergenic if inhaled	Aspiration dangerous to life	Explosive when dry
		Can age dangerously	Reacts violently with water
Oxidising agent	Allergenic in contact with skin		

Use of the above pictogram / phrase combinations shall require observation of the following instructions for compaction of the information content of H-statements in phrases (excerpt from Annex 4 of DGUV information 213-850):

The information content of the H-statements was always compacted to phrases when further differentiation does not have any consequences for protection measures at the laboratory or a too detailed explanation would be required. In the latter case, it cannot be done without the additional information from the safety data sheet. Labeling only serves to initiate the process of obtaining information from the safety data sheet.

The following definitions were made:

- The characteristic “explosive” may be used as a collective characteristic, relevant additional information by the classification of H200ff, H240 is not obtained at the laboratory.
- For burnabilities and inflammation hazards, a distinction between “extremely flammable” and “(easily) flammable” is sufficient at the laboratory, burnability with water is considered to be an extreme flammability. Self-flammable substances are given a separate phrase.
- The H-statements concerning carcinogenic, mutagenic, and toxic for reproduction effects are reduced to the categories of “CMR substance cat. 1” and “CMR substance cat. 2”.
- The H-statements regarding specific target organ toxicity (STOT) are reduced to the two statements of “damages organs” for category 1 and “can damage organs” for category 2. At the laboratory, no distinction as to whether this may happen after a single or a repeated exposure is required. Category 3 STOT, respiratory tract irritation, is covered by the phrase “irritant”, the effect on the central nervous system is given the new phrase “narcotic”.
- “Caustic and irritating effects” on skin and eyes are not distinguished, as laboratory staff is permanently obliged to wear protective glasses.
- As the substances are disposed of properly in principle, a potential hazard to water does not have to be indicated at laboratories. If such information is needed, the pictogram “Umwelt” (GHS09, environment) can be used without any further phrase.

The pictogram “exclamation mark” with the phrase “ozone-damaging” also is not needed. This hazard category only refers to a small number of substances, the use of which is subject to strict legal regulations. Laboratories handling these substances have to instruct their employees accordingly and separately.







Information on Exposure Paths:








An additional sticker is offered, on which the relevant exposure paths, e.g. in case of “acute toxicity” may be indicated by checking boxes.












In addition to pictogram / phrase combinations, the following phrases are offered for special hazard potentials:







- “Entwickelt giftige Gase mit Wasser oder Säure“ (Contact with water and acids liberates toxic gas) [note: A distinction regarding toxicity is not helpful in laboratory practice], “Im trockenen Zustand explosiv“ (Explosive when dry) [note: Information on the decreasing desensitization for packages on stock],
- “Reagiert heftig mit Wasser“ (Reacts violently with water),
- “Kann gefährlich altern“ (Can age dangerously) [note: May form peroxides and undergo other dangerous modifications during storage].

When characterizing hazardous substances by pictogram / phrase combinations, the following summary of the Bundesanstalt für Arbeitsschutz und Arbeitsmedizin (BAuA) may be helpful (version 10/2014):

Kap.	Classification			Labelling				
	Hazard- Class	Category	Abbreviation of classification (without H set)	Pictogram, Code	Signal- word	Hazard Statement Code Text		
2.1	Explosives	Unstable, explosive	Unst. Expl.	 GHS01	Danger	H200	Unstable explosives	
		Division 1.1	Expl. 1.1			H201	Explosive; mass explosion hazard	
		Division 1.2	Expl. 1.2			H202	Explosive; severe projection hazard	
		Division 1.3	Expl. 1.3			H203	Explosive; fire, blast or projection hazard	
		Division 1.4	Expl. 1.4		Warning	H204	Fire or projection hazard	
		Division 1.5	Expl. 1.5	<i>no pictogram</i>	Danger	H205	May mass explode in fire	
		Division 1.6	Expl. 1.6	<i>no pictogram</i>	—	—	<i>no hazard statement</i>	
2.2	Flammable gases	1A	Flammable gas	 GHS02	Danger	H220	Extremely flammable gas	
			Pyrophoric gas			Pyr. Gas	H220 H232	Extremely flammable gas May ignite spontaneously if exposed to air
			Chemically unstable gas			Chem. Unst. Gas A	H220 H230	Extremely flammable gas May react explosively even in the absence of air
			Chemically unstable gas			Chem. Unst. Gas B	H220 H231	Extremely flammable gas May react explosively even in the absence of air at elevated pressure and/or temperature
		1B	Flammable gas	Flam. Gas 1B	<i>no pictogram</i>	Danger	H221	Flammable gas
		2	Flammable gas	Flam. Gas 2				
2.3	Aerosol	Category 1	Aerosol 1	 GHS02	Danger	H222 H229	Extremely flammable aerosol Pressurised container: May burst if heated.	
		Category 2	Aerosol 2			Warning	H223 H229	Flammable aerosol Pressurised container: May burst if heated.
		Category 3	Aerosol 3	<i>no pictogram</i>	Warning	H229	Pressurised container: May burst if heated.	
2.4	Oxidising gases	Category 1	Ox. Gas 1	 GHS03	Danger	H270	May cause or intensify fire; oxidizer	
2.5	Gases under pressure	Compressed gas	Comp.	 GHS04	Warning	H280	Contains gas under pressure; may explode if heated	
		Liquefied gas	Liq.					
		Dissolved gas	Diss.					
		Refrigerated liquefied gas	Ref. Liq.					Press. Gas (-)
2.6	Flammable liquids	Category 1	Flam. Liq. 1	 GHS02	Danger	H224	Extremely flammable liquid and vapour	
		Category 2	Flam. Liq. 2			H225	Highly flammable liquid and vapour	
		Category 3	Flam. Liq. 3			Warning	H226	
2.7	Flammable solids	Category 1	Flam. Sol. 1	GHS02	Danger	H228	Flammable solid	
		Category 2	Flam. Sol. 2					Warning

Kap.	Classification			Labelling		
	Hazard-Class	Hazard-Category	Abbreviation of classification (without H and E)	Pictogram, Code	Signal-word	Hazard Statement Code Text
2.8 2.15	Self-reactive substances and mixtures	Type A	Self-react. A	 GHS01	Danger	H240 Heating may cause an explosion
			Org. Perox. A			
		Type B	Self-react. B	 GHS02 + GHS01	Danger	H241 Heating may cause a fire or explosion
			Org. Perox. B			
	Organic peroxides	Type C Type D	Self-react. CD	 GHS02	Danger	H242 Heating may cause a fire
			Org. Perox. CD			
		Type E Type F	Self-react. EF Org. Perox. EF		Warning	
	Type G	Self-react. G Org. Perox. G	no pictogram	—	—	no hazard statement
2.9	Pyrophoric liquids	Category 1	Pyr. Liq. 1	 GHS02	Danger	H250 Catches fire spontaneously if exposed to air
2.10	Pyrophoric solids	Category 2	Pyr. Sol. 1			
2.11	Self-heating substances and mixtures	Category 1	Self-heat.1			Danger
		Category 2	Self-heat. 2	Warning	H252 Self-heating in large quantities; may catch fire	
2.12	Substances and mixtures which in contact with water emit flammable gases	Category 1	Water-react. 1	GHS02	Danger	H260 In contact with water releases flammable gases which may ignite spontaneously
		Category 2	Water-react. 2			H261 In contact with water releases flammable gases
		Category 3	Water-react. 3			Warning
2.13 2.14	Oxidising liquids	Category 1	Ox. Liq. 1	 GHS03	Danger	H271 May cause fire or explosion; strong oxidizer
			Ox. Sol. 1			
	Oxidising solids	Category 2	Ox. Liq. 2			H272 May intensify fire; oxidizer
			Ox. Sol. 2			
	Category 4	Ox. Liq. 3	Warning			
		Ox. Sol. 3				
2.16	Corrosive to metals	Category 1	Met. Corr. 1	 GHS05	Warning	H290 May be corrosive to metals
2.17	Desensitised explosives	Category 1	Desen. Expl. 1	 GHS02	Danger	H206 Fire, blast or projection hazard: increased risk of explosion if desensitising agent is reduced
		Category 2	Desen. Expl. 2			H207 Fire or projection hazard: increased risk of explosion if desensitising agent is reduced
		Category 3	Desen. Expl. 3		Warning	H208 Fire hazard: increased risk of explosion if desensitising agent is reduced
		Category 4	Desen. Expl. 4			

Kap.	Classification			Labelling			
	Hazard-Class	Category	Abbreviation of classification (without H set)	Pictogram, Code	Signal-word	Hazard Statement Code Text	
3.1	Acute toxicity	Category 1	Acute Tox. 1	 GHS06	Danger	H300 H310 H330	Fatal if swallowed Fatal in contact with skin Fatal if inhaled
		Category 2	Acute Tox. 2			H301 H311 H331	Toxic if swallowed Toxic in contact with skin Toxic if inhaled
		Category 3	Acute Tox. 3				
		Category 4	Acute Tox. 4	 GHS07	Warning	H302 H312 H332	Harmful if swallowed Harmful in contact with skin Harmful if inhaled
3.2	Skin corrosion/irritation	Category 1	Skin. Corr. 1	 GHS05	Danger	H314	Causes severe skin burns and eye damage.
		Category 1A	Skin. Corr. 1A				
		Category 1B	Skin. Corr. 1B				
		Category 1C	Skin. Corr. 1C	 GHS07	Warning	H315	Causes skin irritation
Category 2	Skin Irrit. 2						
3.3	Serious eye damage/eye irritation	Category 1	Eye Dam. 1	 GHS05	Danger	H318	Causes serious eye damage
		Category 2	Eye Irrit. 2	 GHS07	Warning	H319	Causes serious eye irritation
3.4	Respiratory sensitisation	Category 1	Resp. Sens. 1	 GHS08	Danger	H334	May cause allergy or asthma symptoms or breathing difficulties if inhaled
		Subcategory 1A	Resp. Sens. 1A				
		Subcategory 1B	Resp. Sens. 1B				
	Skin sensitisation	Category 1	Skin Sens. 1	 GHS07	Warning	H317	May cause an allergic skin reaction
		Subcategory 1A	Skin Sens. 1A				
		Subcategory 1B	Skin Sens. 1B				
3.5	Germ cell mutagenicity	Category 1A	Muta. 1A	 GHS08	Danger	H340	May cause genetic defects
		Category 1B	Muta. 1B				
		Category 2	Muta. 2		Warning	H341	Suspected of causing genetic defects
3.6	Carcinogenicity	Category 1A	Carc. 1A	 GHS08	Danger	H350 H360i	May cause cancer May cause cancer if inhaled
		Category 1B	Carc. 1B				
		Category 2	Carc. 2		Warning	H351	Suspected of causing cancer
3.7	Reproductive toxicity	Category 1A	Repr. 1A	 GHS08	Danger	H360 H360F H360D H360FD	May damage fertility or the unborn child May damage fertility May damage the unborn child May damage fertility. May damage the unborn child
		Category 1B	Repr. 1B				
		Category 2	Repr. 2				
		Additional category for effects on or via lactation	Lact.	no pictogram	—	H362	May cause harm to breast-fed children

Kap.	Classification			Labelling		
	Hazard-Class	Hazard-Category	Abbreviation of classification (without H and E)	Pictogram, Code	Signal-word	Hazard Statement Code Text
3.8	Specific target organ toxicity—single exposure	Category 1	STOT SE 1		Danger	H370 <i>Causes damage to organs (if swallowed, in contact with skin, if inhaled)</i>
		Category 2	STOT SE 2	GHS08	Warning	H371 <i>May cause damage to organs (if swallowed, in contact with skin, if inhaled)</i>
		Category 3	STOT SE 3		Warning	H335 <i>May cause respiratory irritation</i>
H336 <i>May cause drowsiness or dizziness</i>						
3.9	Specific target organ toxicity—repeated exposure	Category 1	STOT RE 1		Danger	H372 <i>Causes damage to organs through prolonged or repeated exposure (if swallowed, in contact with skin, if inhaled)</i>
		Category 2	STOT RE 2	GHS08	Warning	H373 <i>May cause damage to organs through prolonged or repeated exposure</i>
3.10	Aspiration hazard	Category 1	Asp. Tok. 1		Danger	H304 <i>May be fatal if swallowed and enters airways</i>
4.1	Acute aquatic hazard	Acute 1	Aquatic Acute 1		Warning	H400 <i>Very toxic to aquatic life</i>
	Chronic (long term) aquatic hazard	Chronic 1	Aquatic Chronic 1		Warning	H410 <i>Very toxic to aquatic life with long lasting effects</i>
		Chronic 2	Aquatic Chronic 2	GHS09	—	H411 <i>Toxic to aquatic life with long lasting effects</i>
		Chronic 3	Aquatic Chronic 3	no pictogram	—	H412 <i>Harmful to aquatic life with long lasting effects</i>
		Chronic 4	Aquatic Chronic 4		—	H413 <i>May cause long lasting harmful effects to aquatic life</i>
5.1	Hazardous to the ozone layer	Category 1	Ozone 1		Warning	H420 <i>Harms public health and the environment by destroying ozone in the upper atmosphere</i>

- Hazardous substances and chemicals may only be stored in containers that are shaped and labeled such that they cannot be confused with food / food containers.
- Labeling of the containers shall be made clearly and unambiguously using a proper label with at least one simplified characterization as described above. Over-sticking or over-writing of old labels shall not be permitted.
- Also wastes of hazardous substances shall be labeled.
- Packages containing no hazardous substances shall also be labeled clearly and permanently with the designation of the ingredient at least.
- For all hazardous substances and hazardous substance groups as well as for highly dangerous activities with certain setups, operating instructions shall be kept on site. Collective operating instructions have proved valuable and shall be permitted. However, single operating instructions shall be required for highly hazardous substances (e.g. substances dangerous to life, carcinogenic, mutagenic, toxic for reproduction, self-

inflammable, and explosive substances) or materials with a combination of hazardous characteristics that renders any meaningful assignment to a single group impossible.

- Setups and pipelines shall be labeled such that at least the hazardous substances contained and the hazards caused by them can be identified clearly.
- Hazardous substances shall be documented regularly in terms of type, quantity, and properties (hazardous substances register). Documentation can be made on data carriers. It shall be ensured that information on the substances existing may be provided any time on request. Use of the database “Chemieassistent (ChemA, Chemicals Assistant)” as a register of hazardous substances shall be mandatory.
- If substitutes of hazardous substances are known, these shall be used. Substitution shall be documented in the corresponding risk assessment.
- Hazardous substances shall be stored such that qualified persons only have access. Trained laboratory staff shall be considered to be qualified. Substances and preparations / mixtures classified as toxic, dangerous to life, carcinogenic category Carc. 1A, Carc. 1B or Carc. 2, mutagenic category Muta. 1A, Muta. 1B or Muta. 2 and reproductive toxicity category Repr. 1A, Repr. 1B or Repr. 2 shall be kept under lock or stored such that only qualified and reliable persons have access. Activities with these substances and preparations / mixtures as well as with substances and preparations / mixtures sensitizing the respiratory tract shall only be performed by qualified or specially instructed persons.
- Toxic substances shall be stored separately from highly flammable substances.
- Hazardous substances shall only be stored at the laboratory in standard laboratory quantities for use in the hand. These amounts are defined by TRGS 526, section 3.3.3 and TRGS 510. Any additional amounts shall be stored in appropriate storage rooms or licensed safety cabinets.
- When storing hazardous substances, potential restrictions of mixed storage (TRGS 510) shall be observed.
- Hazardous substances irritating the skin and eyes or releasing toxic vapors or highly inflammable and self-inflammable hazardous substances shall always be handled in hoods.
- Spent hazardous substances and hazardous substance solutions / mixtures shall be collected and stored properly at the laboratory and transferred to the waste collection center as “hazardous waste”.
- Transportation of hazardous substances in fragile pots may only be performed with safe transport over-containers (e.g. in plastic buckets or metal boxes).
- For handling hydrogen fluoride / hydrofluoric acid, a special instruction shall be required (“Flusssäurepass” = Hydrofluoric acid pass).

10. Handling of gases

- Pressurized gas bottles shall only be put up reliably outside of the laboratories. The gases shall be supplied to the workplaces via permanent, technically tight, and stationary pipelines.
- Pressurized gas cylinders shall not be left at the laboratories after the end of work or overnight, but shall be returned to the bottle storage facility or kept at another safe place (e.g. safety cabinet according to DIN EN 14 470-2, outdoor laboratory).

- Rooms, in which pressurized gas cylinders are put up, shall be marked with a corresponding warning sign W029 “Pressurized Cylinders“ according to ASR A1.3 “Safety and health signs“ (ASR = Technische Regel für Arbeitsstätten = Technical regulations for workplaces) on the doors.
- Gases may be only withdrawn from gas cylinders via additional valves fixed to the cylinder valve (specific of each type of gas).
- Valves shall only be exchanged by instructed employees.
- Pressurized gas hoses shall be secured to prevent them from sliding off.
- Pressurized gas cylinders shall not be opened forcibly. Pressurized gas cylinders that cannot be opened shall be labeled and returned to the supplier.
- Pressurized gas cylinders with toxic (H330, H331, R23, R26), oxidizing (H270, R8) or inflammable (H220, H221, R12) gases shall be put up permanently vacuumed (120 times air exchange in case of toxic, 10 times air exchange in case of other substances) (e.g. in a safety cabinet according to DIN EN 14470-2). When using smaller pressurized gas cylinders or “lecture bottles”, these shall be put up in the direct vicinity of the hood or better inside, if possible.
- Use of extremely toxic gases (e.g. hydrocyanic acid, phosgene, hydrogen sulfide) shall only be permitted in special, well-ventilated rooms (stinking rooms) and shall require a permit in writing by the responsible laboratory manager.
- At the laboratory, pressurized gas cylinders shall be secured against falling by a steel bracket and a chain / belt.
- Pressurized gas cylinders shall be moved only with special transport vehicles, an applied safety chain, and a valve cap. Carrying the bottles is strictly forbidden. Transportation should be made by two persons.
- When transporting pressurized gas cylinders and vacuum flasks with liquid nitrogen or helium in elevators, external control shall be used. Taking along of other persons shall be forbidden! If available, use the goods elevator!
- Liquid nitrogen in vacuum flasks shall always be covered in order to prevent condensation of oxygen from the air. Never use a tightly sealing lid, as this might cause a dangerous overpressure.
- The correct storage of pressurized gas cylinders is defined in TRGS 510. The provision, use and handling of pressurized gas cylinders is subject to TRGS 745.
- Pressurized gas cylinders that are no longer needed or empty should be returned to the supplier immediately.

11. Fume hoods

- The front slide of hoods shall be kept closed, required interventions shall be made via the intervention holes (panes movable to the sides).
- Exhaust air sliding diaphragms at the rear wall of older hoods shall always be kept open.
- Sitting in front of open hoods during reactions is dangerous and therefore forbidden.
- Functioning of the hoods shall be checked permanently (older models: Paper strips or wool threads; new models: Optical and acoustic displays).

- Hoods are subject to recurrent inspection and must therefore be inspected regularly at the intervals defined in the risk assessment (functional test at least every year, permanent monitoring systems check at least every three years). The inspections shall be made by qualified persons (e.g. operations engineers). In hoods marked as “defective”, no handling of hazardous substances shall be allowed. Any other use shall be agreed upon with the responsible occupational safety specialist.
- The superior and the fault desk (Phone 5555) shall be informed immediately about defects of hoods.

12. Refrigerators, freezers and cooling chambers

- Containers that are to be stored in refrigerators and cooling chambers shall be closed and marked in sufficient detail with the contents and name of the user. Once a year at least, it shall be checked whether these containers have to remain in the refrigerators / cooling chambers or may be disposed of.
- Burnable liquids that have to be stored in a cool place shall only be kept in refrigerators, if their interior is free of ignition sources (illumination removed, thermostat outside). Quantities shall be restricted to volumes used in the laboratory. The cooling chambers and freezers shall be marked with the label “Nur Innenraum frei von Zündquellen“ (Interior free of ignition sources only). Refrigerators, whose interior is not free of potential ignition sources, shall be marked with the sign “In diesem Kühlschrank ist das Aufbewahren brennbarer Stoffe verboten“ (Storage of burnable substances is forbidden in this refrigerator).
- Refrigerators, in which toxic substances are stored, shall be made lockable and kept locked.
- Refrigerators containing substances that are expected to decompose explosively in case of uncontrolled heating up to room temperature shall always be connected to emergency power supplies.
- Refrigerators and freezers shall be defrosted regularly, except for “no frost” models with an automatic defrost function.
- Mixed storage of food (food and beverages) with chemicals shall be strictly forbidden.

13. Abfälle

- The Waste Management Regulations of KIT shall apply.
- All waste collection containers shall be labeled such that it can be seen clearly and permanently which substances / fractions may be collected in which container. Waste collection containers containing hazardous substances shall be marked according to the Chemikaliengesetz (Chemicals Act).
- All types of waste shall be collected separately in the respective containers.
- Use of containers other than those distributed by the interim waste storage facilities (in particular, former cleaning agent containers) shall be forbidden.
- Wastes shall be collected separately according to sorts, if possible. Any mixing in particular of solid inorganic wastes shall be avoided.

- The containers shall be marked clearly and kept at a safe place (e.g. in collection tubs under the hood or in the safety cabinet according to DIN EN 14470-1).
- Storage of waste canisters in washbasins / laboratory basins shall not be allowed.
- Mechanically hazardous wastes, such as broken glass or cannulas, shall be packaged safely.
- Spilled mercury shall be taken up with suitable adsorption granules. Application of zinc or sulfur powder, which was usual practice in the past, shall be avoided, as it is hardly efficient and makes disposal unnecessarily complicated.
- Reactive and highly hazardous wastes (alkali metals, metal hydrides, cyanides, catalysts, acids, and brines, etc.) shall be deactivated before transfer to the interim waste storage facility. In cases of doubt, contact the Waste Management Center (phone 22222). There, you may also obtain instructions for the disposal of reactive wastes.
- Depending on their quality, chemicals in original packages may either be offered on the chemicals exchange platform (ChemA) or registered for disposal as laboratory chemicals.

14. Leaving the organizational unit

When staff members leave the laboratory, the following regulations shall be observed:

All chemicals shall be returned to other users (with handover certificate) or disposed of, if necessary.

The laboratory shall be left in a clean and tidy state.

All keys, original spectra, analyses and laboratory journals shall be handed in.

Karlsruhe, 21.10.2014