



R & S Phrases

Introduction

The so called R-Phrases give hints to special risks which may arise by the handling of hazardous substances or formulations. The letter “R” is the abbreviation for “Risk”. According to the “Ordinance on Hazardous Substances”, the R-Phrases have to be selected due to the classification of a substance and used for its labelling. Selection of R-Phrases follows the same criteria of the guidelines as for the assignment of hazard symbols and hazard descriptions. R-Phrases and the combination of R-Phrases are listed in the “Ordinance on Hazardous Substances”. (See also “Legal Conditions for the Handling of Hazardous Substances” and “Technical Guidelines on Safety in Chemical Laboratory Courses”). The R-Phrases consist of one or several code letters and the related descriptions (e.g., R41: Risk of serious damage to eyes). A particular attention is given to R10 (flammable), since this category does neither have a hazard symbol nor a code letter.

The so called S-Phrases give hints to safety informations of a hazardous substance. They should enable the user to avoid risks during the handling of hazardous substances and formulations, and to take measures against the release of these substances, to control the consequences of accidents, and recommend to give first aid. The letter “S” is the abbreviation for “Safety”. According to the “Ordinance on Hazardous Substances”, the S-Phrases have to be selected due the classification of a substance and used for its labelling. S-Phrases and the combination of S-Phrases are listed in the “Ordinance on Hazardous Substances”. Analogous to the R-Phrases, they consist of one or several code letters and the related descriptions (e.g., S22: Do not breathe dust).

While labelling a substance with several R&S Phrases these can be separated from each other by a hyphen (- : individual phrases) or a slash (/ : combination of phrases). Certain R-Phrases are always combined with certain S-Phrases, e.g., R45 with S53. The R&S Phrases are important parts of an operating instruction and they must be strictly followed.

In practice chemists will often be faced with the problem, that different R&S Phrases are assigned to the same substances depending on their origin (producer). The reason for this is following: The EU assigns obligatory classification and labelling for a series of substances



(i.e., R&S Phrases). But for all other substances not listed by the EU, the producer has the obligation to assign the hazard symbols and R&S Phrases by himself (Council Directive 67/548/EEC of 1967 on the approximation of laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substances). Classification is done by the EU guidelines on the basis of physical-chemical and toxicological data of the substances. In these cases, there are no standards and each producer classify his product after own test data leading to non-uniform labelling. The data base for these classifications are usually not available and the classification is, therefore, not comprehensible. It is, therefore, recommended that in case of different labelling of the manufacturers one should follow the most strongest R&S Phrases given.

R-Phrases – Hints to special risks

The separation of two R-Phrases by a hyphen (- , e.g., R12-20) means that the R-Phrases R12 **and** R20 have to be considered (and not R12 to R20). If R-Phrases are separated by a slash (/ , e.g., R26/27/28) then all three R-Phrases are indicated: R26 **and** R27 **and** R28 (combination of R-Phrases).

List of R-Phrases

- R1 Explosive when dry.
- R2 Risk of explosion by shock, friction, fire or other source of ignition.
- R3 Extreme risk of explosion by shock, friction, fire or other source of ignition.
- R4 Forms very sensitive explosive metallic compounds.
- R5 Heating may cause an explosion.
- R6 Explosive with or without contact with air.
- R7 May cause fire.
- R8 Contact with combustible material may cause fire.
- R9 Explosive when mixed with combustible material.
- R10 Flammable.
- R11 Highly flammable.
- R12 Extremely flammable.
- R13 Extremely flammable liquefied gas.
- R14 Reacts violently with water.



- R15 Contact with water liberates highly flammable gases.
- R16 Explosive when mixed with oxidizing substances.
- R17 Spontaneously flammable in air.
- R18 In use, may form flammable/explosive vapor-air mixture.
- R19 May form explosive peroxides.
- R20 Harmful by inhalation.
- R21 Harmful in contact with skin.
- R22 Harmful if swallowed.
- R23 Toxic by inhalation.
- R24 Toxic in contact with skin.
- R25 Toxic if swallowed.
- R26 Very toxic by inhalation.
- R27 Very toxic in contact with skin.
- R28 Very toxic if swallowed.
- R29 Contact with water liberates toxic gas.
- R30 Can become highly flammable in use.
- R31 Contact with acids liberates toxic gas.
- R32 Contact with acids liberates very toxic gas.
- R33 Danger of cumulative effects.
- R34 Causes burns.
- R35 Causes severe burns.
- R36 Irritating to eyes.
- R37 Irritating to respiratory system.
- R38 Irritating to skin.
- R39 Danger of very serious irreversible effects.
- R40 Limited evidence of a carcinogenic effect.
- R41 Risk of serious damage to eyes.
- R42 May cause sensitization by inhalation.
- R43 May cause sensitization by skin contact.
- R44 Risk of explosion if heated under confinement.
- R45 May cause cancer.
- R46 May cause heritable genetic damage.



- R48 Danger of serious damage to health by prolonged exposure.
- R49 May cause cancer by inhalation.
- R50 Very toxic to aquatic organisms.
- R51 Toxic to aquatic organisms.
- R52 Harmful to aquatic organisms.
- R53 May cause long-term adverse effects in the aquatic environment.
- R54 Toxic to flora.
- R55 Toxic to fauna.
- R56 Toxic to soil organisms.
- R57 Toxic to bees.
- R58 May cause long-term adverse effects in the environment.
- R59 Dangerous to the ozone layer.
- R60 May impair fertility.
- R61 May cause harm to the unborn child.
- R62 Possible risk of impaired fertility.
- R63 Possible risk of harm to the unborn child.
- R64 May cause harm to breast-fed babies.
- R65 Harmful: may cause lung damage if swallowed
- R66 Repeated exposure may cause skin dryness or cracking.
- R67 Vapors may cause drowsiness and dizziness.
- R68 May cause irreversible effects.

Combinations of R-Phrases

- R14/15 Reacts violently with water, liberating extremely flammable gases.
- R15/29 Contact with water liberates toxic, extremely flammable gas.
- R20/21 Harmful by inhalation and in contact with skin.
- R20/22 Harmful by inhalation and if swallowed.
- R21/22 Harmful in contact with skin and if swallowed.
- R20/21/22 Harmful by inhalation, in contact with skin and if swallowed.
- R23/24 Toxic by inhalation and in contact with skin.
- R23/25 Toxic by inhalation and if swallowed.
- R24/25 Toxic in contact with skin and if swallowed.



- R23/24/25 Toxic by inhalation, in contact with skin and if swallowed.
- R26/27 Very toxic by inhalation and in contact with skin.
- R26/28 Very toxic by inhalation and if swallowed.
- R27/28 Very toxic in contact with skin and if swallowed.
- R26/27/28 Very toxic by inhalation, in contact with skin and if swallowed.
- R36/37 Irritating to eyes and respiratory system.
- R36/38 Irritating to eyes and skin.
- R37/38 Irritating to respiratory system and skin.
- R36/37/38 Irritating to eyes, respiratory system and skin.
- R39/23 Toxic: danger of very serious irreversible effects through inhalation.
- R39/24 Toxic: danger of very serious irreversible effects in contact with skin.
- R39/25 Toxic: danger of very serious irreversible effects if swallowed.
- R39/23/24 Toxic: danger of very serious irreversible effects through inhalation and in contact with skin.
- R39/23/25 Toxic: danger of very serious irreversible effects through inhalation and if swallowed.
- R39/24/25 Toxic: danger of very serious irreversible effects in contact with skin and if swallowed.
- R39/23/24/25 Toxic: danger of very serious irreversible effects through inhalation, in contact with skin and if swallowed.
- R39/26 Very toxic: danger of very serious irreversible effects through inhalation.
- R39/27 Very toxic: danger of very serious irreversible effects in contact with skin.
- R39/28 Very toxic: danger of very serious irreversible effects if swallowed.
- R39/26/27 Very toxic: danger of very serious irreversible effects through inhalation and in contact with skin.
- R39/26/28 Very toxic: danger of very serious irreversible effects through inhalation and if swallowed.
- R39/27/28 Very toxic: danger of very serious irreversible effects in contact with skin and if swallowed.
- R39/26/27/28 Very toxic: danger of very serious irreversible effects through inhalation, in contact with skin and if swallowed.
- R42/43 May cause sensitization by inhalation and skin contact.



- R48/20 Harmful: danger of serious damage to health by prolonged exposure through inhalation.
- R48/21 Harmful: danger of serious damage to health by prolonged exposure in contact with skin.
- R48/22 Harmful: danger of serious damage to health by prolonged exposure if swallowed.
- R48/20/21 Harmful: danger of serious damage to health by prolonged exposure through inhalation and in contact with skin.
- R48/20/22 Harmful: danger of serious damage to health by prolonged exposure through inhalation and if swallowed.
- R48/21/22 Harmful: danger of serious damage to health by prolonged exposure in contact with skin and if swallowed.
- R48/20/21/22 Harmful: danger of serious damage to health by prolonged exposure through inhalation, in contact with skin and if swallowed.
- R48/23 Toxic: danger of serious damage to health by prolonged exposure through inhalation.
- R48/24 Toxic: danger of serious damage to health by prolonged exposure in contact with skin.
- R48/25 Toxic: danger of serious damage to health by prolonged exposure if swallowed.
- R48/23/24 Toxic: danger of serious damage to health by prolonged exposure through inhalation and in contact with skin.
- R48/23/25 Toxic: danger of serious damage to health by prolonged exposure through inhalation and if swallowed.
- R48/24/25 Toxic: danger of serious damage to health by prolonged exposure in contact with skin and if swallowed.
- R48/23/24/25 Toxic: danger of serious damage to health by prolonged exposure through inhalation, in contact with skin and if swallowed.
- R50/53 Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
- R51/53 Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.



- R52/53 Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
- R68/20 Harmful: possible risk of irreversible effects through inhalation.
- R68/21 Harmful: possible risk of irreversible effects in contact with skin.
- R68/22 Harmful: possible risk of irreversible effects if swallowed.
- R68/20/21 Harmful: possible risk of irreversible effects through inhalation and in contact with skin.
- R68/20/22 Harmful: possible risk of irreversible effects through inhalation and if swallowed.
- R68/21/22 Harmful: possible risk of irreversible effects in contact with skin and if swallowed.
- R68/20/21/22 Harmful: possible risk of irreversible effects through inhalation, in contact with skin and if swallowed.

S-Phrases – Safety Recommendations

The separation of two S-Phrases by a hyphen (-), e.g., S10-23 means that the S-Phrases S10 **and** S23 have to be considered (and not S10 to S23). If S-Phrases are separated by a slash (/), e.g., S36/37/38 then all three S-Phrases are indicated: S36 **and** S37 **and** S38 (combination of S-Phrases).

List of S-Phrases

- S1 Keep locked up.
- S2 Keep out of reach of children.
- S3 Keep in a cool place.
- S4 Keep away from living quarters.
- S5 Keep contents under.....(appropriate liquid to be specified by the manufacturer).
- S5.1 ... water.
- S5.2 ... kerosene.
- S5.3 ... paraffin oil.
- S6 Keep under.....(inert gas to be specified by the manufacturer).
- S6.1 ... nitrogen.
- S6.2 ... argon.



- S6.3 ... carbon dioxide.
- S7 Keep container tightly closed.
- S8 Keep container dry..
- S9 Keep container in a well-ventilated place.
- S12 Do not keep the container sealed.
- S13 Keep away from food, drink and animal feedingstuffs
- S14 Keep away from ... (incompatible materials to be indicated by the manufacturer).
 - S14.1 ... reducing agents, heavy metal compounds, acids, bases.
 - S14.2 ... oxidizing and acidic substances and heavy metal compounds.
 - S14.3 ... iron
 - S14.4 ... water and bases
 - S14.5 ... acids
 - S14.6 ... bases
 - S14.7 ... metals
 - S14.8 ... oxidizing and acidic substances
 - S14.9 ... flammable organic substances
 - S14.10 ... acids, reducing agents and flammable materials
 - S14.11 ... flammable substances
- S15 Keep away from heat.
- S16 Keep away from sources of ignition - No smoking.
- S17 Keep away from combustible material.
- S18 Handle and open container with care.
- S20 When using do not eat or drink.
- S21 When using do not smoke.
- S22 Do not breathe dust.
- S23 Do not breathe gas/fumes/vapour/spray (appropriate wording to be specified by the manufacturer).
 - S23.1 Do not breathe gas.
 - S23.2 Do not breathe vapour.
 - S23.3 Do not breathe spray.
 - S23.4 Do not breathe fumes.
 - S23.5 Do not breathe vapour/spray.



- S24 Avoid contact with skin.
- S25 Avoid contact with eyes.
- S26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
- S27 Take off immediately all contaminated clothing.
- S28 After contact with skin, wash immediately with plenty of ... (to be specified by the manufacturer).
 - S28.1 ... water
 - S28.2 ... water and soap
 - S28.3 ... water, soap, and polyethylene glycol 400, if available.
 - S28.4 ... polyethylene glycol 300 and ethanol (2:1), then water and soap.
 - S28.5 ... polyethylene glycol 400.
 - S28.6 ... polyethylene glycol 400, then cleaning with water.
 - S28.7 ... water and acidic soap.
- S29 Do not empty into drains.
- S30 Never add water to this product.
- S33 Take precautionary measures against static discharges.
- S35 This material and its container must be disposed of in a safe way.
 - S35.1 This material and its container must be disposed of by treating with 2% sodium hydroxide solution.
- S36 Wear suitable protective clothing.
- S37 Wear suitable gloves.
- S38 In case of insufficient ventilation, wear suitable respiratory equipment.
- S39 Wear eye/face protection.
- S40 To clean the floor and all objects contaminated by this material, use ... (to be specified by the manufacturer).
 - S40.1 To clean the floor and all objects contaminated by this material, use plenty of water.
- S41 In case of fire and/or explosion do not breathe fumes.
- S42 During fumigation/spraying wear suitable respiratory equipment (appropriate wording to be specified by the manufacturer).
- S43 In case of fire, use ... (indicate in the space the precise type of fire-fighting equipment. If water increases risk, add 'Never use water').



- S43.1 In case of fire, use water.
- S43.2 In case of fire, use water or fire powder.
- S43.3 In case of fire, use fire powder. Never use water.
- S43.4 In case of fire, use carbon dioxide. Never use water.
- S43.6 In case of fire, use sand. Never use water.
- S43.7 In case of fire, use metal fire powder. Never use water.
- S43.8 In case of fire, use sand, carbon dioxide or fire powder. Never use water.
- S45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
- S46 If swallowed, seek medical advice immediately and show this container or label.
- S47 Keep at temperature not exceeding ... °C (to be specified by the manufacturer).
- S48 Keep wet with ... (appropriate material to be specified by the manufacturer).
- S48.1 Keep wet with water.
- S49 Keep only in the original container.
- S50 Do not mix with ... (to be specified by the manufacturer).
- S50.1 Do not mix with acids.
- S50.2 Do not mix with bases.
- S50.3 Do not mix with strong acids, strong bases or transition metals and their salts.
- S51 Use only in well-ventilated areas.
- S52 Not recommended for interior use on large surface areas.
- S53 Avoid exposure - obtain special instructions before use.
- S56 Dispose of this material and its container to hazardous or special waste collection point.
- S57 Use appropriate container to avoid environmental contamination.
- S59 Refer to manufacturer/supplier for information on recovery/recycling.
- S60 This material and its container must be disposed of as hazardous waste.
- S61 Avoid release to the environment. Refer to special instructions/safety data sheets.
- S62 If swallowed, do not induce vomiting: seek medical advice immediately and show this container or label.
- S63 In case of accident by inhalation: remove casualty to fresh air and keep at rest.
- S64 If swallowed, rinse mouth with water (only if the person is conscious).



Combinations of S-Phrases

S1/2	Keep locked up and out of the reach of children.
S3/7	Keep container tightly closed in a cool place.
S3/14	Keep in a cool place away from ... (incompatible materials to be indicated by the manufacturer).
S3/14.1	... reducing agents, heavy metal compounds, acids, bases.
S3/14.2	... oxidizing and acidic substances and heavy metal compounds.
S3/14.3	... iron.
S3/14.4	... water and bases.
S3/14.5	... acids.
S3/14.6	... bases.
S3/14.7	... metals.
S3/14.8	... oxidizing and acidic substances
S3/9/14	Keep in a cool, well-ventilated place away from ... (incompatible materials to be indicated by the manufacturer).
S3/9/14.1	... reducing agents, heavy metal compounds, acids, bases.
S3/9/14.2	... oxidizing and acidic substances and heavy metal compounds
S3/9/14.3	... iron.
S3/9/14.4	... water and bases.
S3/9/14.5	... acids.
S3/9/14.6	... bases.
S3/9/14.7	... metals.
S3/9/14.8	... oxidizing and acidic substances
S3/9/49	Keep only in the original container in a cool, well-ventilated place.
S3/9/14/49	Keep only in the original container in a cool, well-ventilated place away from ... (incompatible materials to be indicated by the manufacturer).
S3/9/14.1/49	... reducing agents, heavy metal compounds, acids, bases.
S3/9/14.2/49	... oxidizing and acidic substances and heavy metal compounds.
S3/9/14.3/49	... iron.
S3/9/14.4/49	... water and bases.
S3/9/14.5/49	... acids.
S3/9/14.6/49	... bases.



- S3/9/14.7/49 ... metals.
- S3/9/14.8/49 ... oxidizing and acidic substances.
- S7/8 Keep container tightly closed and dry.
- S7/9 Keep container tightly closed and in a well-ventilated place.
- S7/47 Keep container tightly closed and at a temperature not exceeding ... °C (to be specified by the manufacturer).
- S20/21 When using do not eat, drink or smoke.
- S24/25 Avoid contact with skin and eyes.
- S27/28 After contact with skin, take off immediately all contaminated clothing, and wash immediately with plenty of ... (to be specified by the manufacturer).
- S29/35 Do not empty into drains; dispose of this material and its container in a safe way.
- S29/56 Do not empty into drains, dispose of this material and its container at hazardous or special waste collection point.
- S36/37 Wear suitable protective clothing and gloves.
- S36/39 Wear suitable protective clothing and eye/face protection.
- S37/39 Wear suitable gloves and eye/face protection.
- S36/37/39 Wear suitable protective clothing, gloves and eye/face protection.
- S47/49 Keep only in the original container at a temperature not exceeding ... °C (to be specified by the manufacturer).