

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”. After 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”. After 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: Possible risk of irreversible effects
- 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
- R47: May cause birth defects
- 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 highly flammable gases
- R15/29: Contact with water liberates toxic, highly flammable gas
- R20/21: Harmful by inhalation and in contact with the skin
- R20/21/22: Harmful by inhalation, in contact with the skin and if swallowed
- R20/22: Harmful by inhalation and if swallowed
- R21/22: Harmful in contact with the skin and if swallowed
- R23/24: Toxic by inhalation and in contact with the skin
- R23/24/25: Toxic by inhalation, in contact with the skin and if swallowed

- R23/25: Toxic by inhalation and if swallowed
- R24/25: Toxic in contact with the skin and if swallowed
- R26/27: Very toxic by inhalation and in contact with the skin
- R26/27/28: Very toxic by inhalation, in contact with the skin and if swallowed
- R26/28: Very toxic by inhalation and if swallowed
- R27/28: Very toxic in contact with the skin and if swallowed
- R36/37: Irritating to eyes and respiratory system
- R36/37/38: Irritating to eyes, respiratory system and skin
- R36/38: Irritating to eyes and skin
- R37/38: Irritating to respiratory system and skin
- R42/43: May cause sensitization by inhalation and skin contact
- R48/20: Harmful: danger of serious damage to health by prolonged exposure through inhalation
- R48/20/21: Harmful: danger of serious damage to health by prolonged exposure through inhalation and in contact with the skin
- R48/20/21/22: Harmful: danger of serious damage to health by prolonged exposure through inhalation, in contact with the skin and if swallowed
- R48/20/22: Harmful: danger of serious damage to health by prolonged exposure through inhalation and if swallowed
- R48/21: Harmful: danger of serious damage to health by prolonged exposure in contact with skin
- R48/21/22: Harmful: danger of serious damage to health by prolonged exposure in contact with skin and if swallowed
- R48/22: Harmful: danger of serious damage to health by prolonged exposure if swallowed
- R48/23: Toxic: danger of serious damage to health by prolonged exposure through inhalation
- R48/23/24: Toxic: danger of serious damage to health by prolonged exposure through inhalation and in contact with the skin
- R48/23/24/25: Toxic: danger of serious damage to health by prolonged exposure through inhalation, in contact with the skin and if swallowed
- R48/23/25: Toxic: danger of serious damage to health by prolonged exposure through inhalation and if swallowed

- R48/24: Toxic: danger of serious damage to health by prolonged exposure in contact with skin
- R48/24/25: Toxic: danger of serious damage to health by prolonged exposure in contact with skin and if swallowed
- R48/25: Toxic: danger of serious damage to health by prolonged exposure 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: May cause irreversible effects by inhalation
- R68/21: May cause irreversible effects in contact with skin
- R68/22: May cause irreversible effects if swallowed
- R68/20/21: May cause irreversible effects by inhalation and in contact with skin
- R68/20/22: May cause irreversible effects by inhalation and if swallowed
- R68/21/22: May cause irreversible effects in contact with skin and if swallowed
- R68/20/21/22: May cause irreversible effects by 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** S20 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: S26 **and** S27 **and** S28 (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)

- 1 ... water
 - 2 ... kerosene
 - 3 ... paraffin oil
- S6 : Keep under.....(inert gas to be specified by the manufacturer)
- 1 ... nitrogen
 - 2 ... argon
 - 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 feedstuffs
- S14: Keep away from..... (incompatible material to be indicated by the manufacturer)
- 1 ... reducing agents, heavy metal compounds, acids, alkaline
 - 2 ... oxidizing and acidic substances and heavy metal compounds
 - 3 ... iron
 - 4 ... water and alkaline
 - 5 ... acids
 - 6 ... alkaline
 - 7 ... metals
 - 8 ... oxidizing and acidic substances
 - 9 ... flammable organic substances
 - 10 .. acids, reducing agents and flammable materials
 - 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/vapor/spray (appropriate wording to be specified by the manufacturer)
- 1 ... gas
 - 2 ... vapor
 - 3 ... spray
 - 4 ... fumes
 - 5 ... vapor/spray

- S24: Avoid contact with the 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)
- 1 ... water
 - 2 ... water and soap
 - 3 ... water, soap, and polyethylene glycol 400, if available
 - 4 ... polyethylene glycol 300 and ethanol (2:1), then water and soap
 - 5 ... polyethylene glycol 400
 - 6 ... polyethylene glycol 400, then cleaning with water
 - 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
- S34: Avoid shock and friction
- S35: This material and its container must be disposed of in a safe way
- 1 ... through treatment with 2% sodium hydroxide
- 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)
- S41: In case of fire and/or explosion do not breath 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 this space the precise type of fire fighting equipment. If water increases the risk, add "never use water")
- 1 ... water
 - 2 ... water and powder extinguishing agent
 - 3 ... powder extinguishing agent, do not use water
 - 4 ... carbon dioxide, do not use water
 - 6 ... sand, do not use water
 - 7 ... metal extinguishing agent, do not use water

- 8 ... sand, carbon dioxide, or powder extinguishing agent, do not use water
- S44: If you feel unwell, seek medical advice (show the label where possible)
- 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 the container or label
- S47: Keep at temperature not exceeding °C (to be specified by the manufacturer)
- S48: Keep wetted with (appropriate material to be specified by the manufacturer)
- S49: Keep only in the original container
- S50: Do not mix with... (to be specified by the manufacturer)
- 1 ... acids
 - 2 ... alkaline
 - 3 ... strong acids, strong alkaline, heavy 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
- S54: Obtain the consent of pollution control authorities before discharging to waste-water treatment plants
- S55: Treat using the best available techniques before discharge into drains or the aquatic environment
- S56: Do not discharge into drains or the environment, dispose to an authorised waste collection point
- S57: Use appropriate containment to avoid environmental contamination
- S58: To be disposed of as hazardous waste
- S59: Refer to manufacturer/supplier for information on recovery/recycling
- S60: This material and/or its container must be disposed of as hazardous waste
- S61: Avoid release to the environment. Refer to special instructions/ material safety data sheet
- S62: If swallowed, do not induce vomiting: seek medical advice immediately and show the 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 reach of children
- S3/9: Keep in a cool, well ventilated place
- S3/7/9: Keep container tightly closed in a cool, well ventilated place
- S3/14: Keep in a cool place away from..... (incompatible materials to be indicated by the manufacturer)
- 1 ... reducing agents, heavy metal compounds, acids, alkaline
 - 2 ... oxidizing and acidic substances and heavy metal compounds
 - 3 ... iron
 - 4 ... water and alkaline
 - 5 ... acids
 - 6 ... alkaline
 - 7 ... metals
 - 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)
- 1 ... reducing agents, heavy metal compounds, acids, alkaline
 - 2 ... oxidizing and acidic substances and heavy metal compounds
 - 3 ... iron
 - 4 ... water and alkaline
 - 5 ... acids
 - 6 ... alkaline
 - 7 ... metals
 - 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)
- 1 ... reducing agents, heavy metal compounds, acids, alkaline
 - 2 ... oxidizing and acidic substances and heavy metal compounds
 - 3 ... iron
 - 4 ... water and alkaline
 - 5 ... acids
 - 6 ... alkaline
 - 7 ... metals
 - 8 ... oxidizing and acidic substances
- S3/14: Keep in a cool place away from.....(incompatible materials to be indicated by the manufacturer)
- 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 Take off immediately all contaminated clothing. After contact with skin, wash immediately with plenty of(to be specified by the manufacturer)
- S29/35 Do not empty into drains. This material and its container must be disposed of in a safe way.
- S29/56: Do not empty into drains: dispose of this material and its container to hazardous or special waste collection point
- S36/37: Wear suitable protective clothing and gloves
- S36/37/39: Wear suitable protective clothing, gloves and eye/face protection
- S36/39: Wear suitable protective clothing and eye/face protection
- S37/39: Wear suitable 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)