

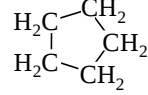
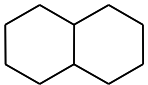
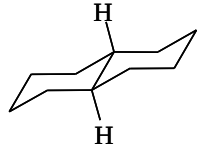
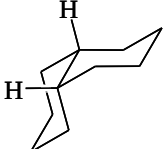
This list of structures was assembled to help learn formulas or chemical structures of the most important organic and inorganic compounds. **It is essential to know these structures in the exam**, however, it cannot be excluded that some other compounds are also mentioned and/or information about them is asked in the midterm or semifinal/final exams. Salts shown in italics are examples. You are supposed to set up any inorganic salts consisting of the ions on the list. Branched or positional isomers of hydrocarbons not shown here might also be asked in the exam.

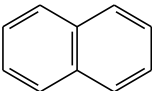
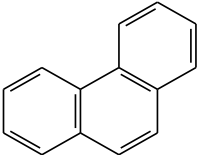
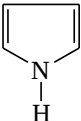
ammonia	NH ₃
boric acid	H ₃ BO ₃
hypobromous acid	HBrO
bromous acid	HBrO ₂
bromic acid	HBrO ₃
perbromic acid	HBrO ₄
carbon dioxide	CO ₂
carbon monoxide	CO
carbonic acid	H ₂ CO ₃
hydrazine	H ₂ N–NH ₂
hydrobromic acid	HBr
hydrochloric acid	HCl
hydrogen cyanide	HCN
hydrogen peroxide	H ₂ O ₂
hydrogen sulfide	H ₂ S
hydroxylamine	HO–NH ₂
hypochlorous acid	HClO
chlorous acid	HClO ₂
chloric acid	HClO ₃
perchloric acid	HClO ₄
metaphosphoric acid	(HPO ₃) _n
nitric acid	HNO ₃
nitric oxide	NO
nitrous acid	HNO ₂
nitrous oxide	N ₂ O
orthophosphoric acid	H ₃ PO ₄
sulfur dioxide	SO ₂
sulfur trioxide	SO ₃
sulfuric acid	H ₂ SO ₄
sulfurous acid	H ₂ SO ₃
sodium hydroxide	NaOH
water	H ₂ O
superoxide anion	O ₂ [–]
pyrophosphate anion	P ₂ O ₇ ^{4–}
ammonium ion	NH ₄ ⁺
sodium ion	Na ⁺
potassium ion	K ⁺
magnesium ion	Mg ²⁺
calcium ion	Ca ²⁺
ferrous ion	Fe ²⁺
ferric ion	Fe ³⁺
cuprous ion	Cu ⁺
cupric ion	Cu ²⁺
zinc ion	Zn ²⁺
silver ion	Ag ⁺
aluminium ion	Al ³⁺
mercurous ion	Hg ₂ ²⁺
mercuric ion	Hg ²⁺

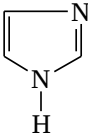
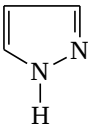
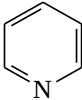
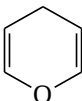
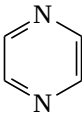
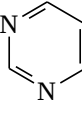
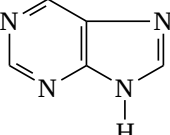
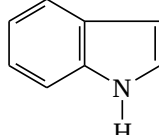
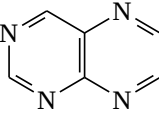
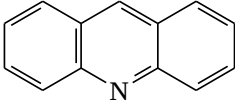
manganese ion	Mn^{2+}
hydroxide ion	OH^-
oxide ion	O^{2-}
fluoride ion	F^-
chloride ion	Cl^-
bromide ion	Br^-
sulfide ion	S^{2-}
sulfate ion	SO_4^{2-}
sulfite ion	SO_3^{2-}
Hydrogen sulfate ion	HSO_4^-
thiosulfate ion	$\text{S}_2\text{O}_3^{2-}$
nitrate ion	NO_3^-
nitrite ion	NO_2^-
hypochlorite ion	ClO^-
chlorite ion	ClO_2^-
chlorate ion	ClO_3^-
perchlorate ion	ClO_4^-
hypobromite ion	BrO^-
bromite ion	BrO_2^-
bromate ion	BrO_3^-
perbromate ion	BrO_4^-
cyanide ion	CN^-
phosphate ion	PO_4^{3-}
monohydrogen phosphate ion	HPO_4^{2-}
dihydrogen phosphate ion	H_2PO_4^-
carbonate ion	CO_3^{2-}
hydrogen carbonate (bicarbonate) ion	HCO_3^-
permanganate ion	MnO_4^-
chromate ion	CrO_4^{2-}
ferricyanide ion	$[\text{Fe}(\text{CN})_6]^{3-}$
aluminium chloride	AlCl_3
ammonium sulfate	$(\text{NH}_4)_2\text{SO}_4$
calcium chloride	CaCl_2
calcium sulfate	CaSO_4
copper sulfate	CuSO_4
dipotassium hydrogen phosphate	K_2HPO_4
ferrous ammonium sulfate	$\text{Fe}(\text{NH}_4)_2(\text{SO}_4)_2$
fluoroapatite	$\text{Ca}_5(\text{PO}_4)_3\text{F}$
hydroxyapatite	$\text{Ca}_5(\text{PO}_4)_3\text{OH}$
magnesium sulfate	MgSO_4
manganese chloride	MnCl_2
mercurous chloride (calomel)	Hg_2Cl_2
mercuric chloride	HgCl_2
potassium biiodate	$\text{KH}(\text{IO}_3)_2$
potassium cyanide	KCN
potassium ferricyanide	$\text{K}_3[\text{Fe}(\text{CN})_6]$
potassium hydrogencarbonate	KHCO_3
potassium hydroxide	KOH
potassium iodide	KI
potassium nitrate	KNO_3
potassium permanganate	KMnO_4
potassium sulfite	K_2SO_3
silver chloride	AgCl
silver chromate	Ag_2CrO_4

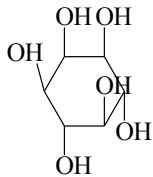
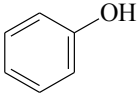
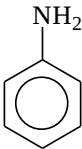
silver nitrate	AgNO_3
sodium carbonate	Na_2CO_3
sodium chlorate	NaClO_3
sodium chloride	NaCl
sodium chlorite	NaClO_2
sodium dihydrogen phosphate	NaH_2PO_4
sodium hypochlorite	NaClO
sodium nitrite	NaNO_2
sodium periodate	NaIO_4
sodium pyrophosphate	$\text{Na}_4\text{P}_2\text{O}_7$
sodium thiosulfate	$\text{Na}_2\text{S}_2\text{O}_3$
zinc chloride	ZnCl_2

Organic compounds

methane ethane propane butane (<i>n</i> -butane) pentane hexane heptane octane alkane (homologous series)	CH_4 $\text{CH}_3\text{--CH}_3$ $\text{CH}_3\text{--CH}_2\text{--CH}_3$ $\text{CH}_3\text{--CH}_2\text{--CH}_2\text{--CH}_3$ $\text{CH}_3\text{--CH}_2\text{--CH}_2\text{--CH}_2\text{--CH}_3$ $\text{CH}_3\text{--CH}_2\text{--CH}_2\text{--CH}_2\text{--CH}_2\text{--CH}_3$ $\text{CH}_3\text{--}(\text{CH}_2)_5\text{--CH}_3$ $\text{CH}_3\text{--}(\text{CH}_2)_6\text{--CH}_3$ $\text{CH}_3\text{--}(\text{CH}_2)_n\text{--CH}_3$
isobutane = 2-methyl-propane	$\begin{array}{c} \text{CH}_3 \\ \\ \text{CH}_3\text{--CH--CH}_3 \end{array}$
isopentane = 2-methyl-butane	$\begin{array}{c} \text{CH}_3 \\ \\ \text{CH}_3\text{--CH--CH}_2\text{--CH}_3 \end{array}$
neopentane = 2,2-dimethyl-propane	$\begin{array}{c} \text{CH}_3 \\ \\ \text{CH}_3\text{--C--CH}_3 \\ \\ \text{CH}_3 \end{array}$
ethene (ethylene) propene 1-butene 1-pentene 1-hexene 1-heptene 1-octene 1-alkene (homologous series)	$\text{CH}_2=\text{CH}_2$ $\text{CH}_2=\text{CH--CH}_3$ $\text{CH}_2=\text{CH--CH}_2\text{--CH}_3$ $\text{CH}_2=\text{CH--CH}_2\text{--CH}_2\text{--CH}_3$ $\text{CH}_2=\text{CH--CH}_2\text{--CH}_2\text{--CH}_2\text{--CH}_3$ $\text{CH}_2=\text{CH--}(\text{CH}_2)_4\text{--CH}_3$ $\text{CH}_2=\text{CH--}(\text{CH}_2)_5\text{--CH}_3$ $\text{CH}_2=\text{CH--}(\text{CH}_2)_n\text{--CH}_3$
cyclopentane	 
cyclohexane (chair and boat forms)	 
decalin (trans and cis forms)	  

1,3-butadiene	$\text{CH}_2=\text{CH}-\text{CH}=\text{CH}_2$
2-methyl-1,3-butadiene = isoprene	$\begin{array}{c} \text{CH}_3 \\ \\ \text{CH}_2=\text{C}-\text{CH}_2=\text{CH}_2 \end{array} \quad \text{or} \quad \begin{array}{c} \diagup \quad \diagdown \\ \quad \\ \diagdown \quad \diagup \end{array}$
ethyne (acetylene) propyne 1-butyne 1-pentyne 1-hexyne 1-heptyne 1-octyne 1-alkyne (homologous series)	$\text{CH}\equiv\text{CH}$ $\text{CH}\equiv\text{C}-\text{CH}_3$ $\text{CH}\equiv\text{C}-\text{CH}_2-\text{CH}_3$ $\text{CH}\equiv\text{C}-\text{CH}_2-\text{CH}_2-\text{CH}_3$ $\text{CH}\equiv\text{C}-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{CH}_3$ $\text{CH}\equiv\text{C}-(\text{CH}_2)_4-\text{CH}_3$ $\text{CH}\equiv\text{C}-(\text{CH}_2)_5-\text{CH}_3$ $\text{CH}\equiv\text{C}-(\text{CH}_2)_n-\text{CH}_3$
benzene	
naphthalene	
phenanthrene	
pyrrole	
thiophene	
furane	
thiazole	
oxazole	

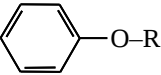
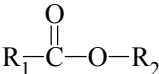
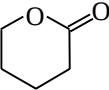
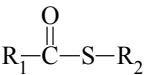
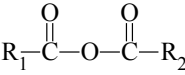
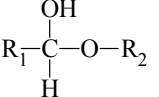
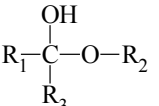
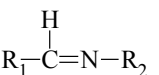
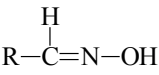
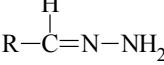
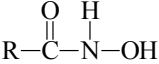
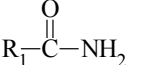
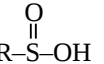
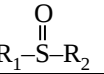
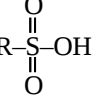
imidazole	
pyrazole	
pyridine	
pyrane	
pyrazine	
pyrimidine	
purine	
indole	
pteridine	
acridine	
methanol	$\text{CH}_3\text{-OH}$
ethanol	$\text{CH}_3\text{-CH}_2\text{-OH}$

propanol	$\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-OH}$
isopropanol	$\begin{array}{c} \text{OH} \\ \\ \text{CH}_3\text{-CH-CH}_3 \end{array}$
n-butanol	$\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-CH}_2\text{-OH}$
ethylene-glycol	$\text{HO-CH}_2\text{-CH}_2\text{-OH}$
glycerol	$\begin{array}{c} \text{H}_2\text{C-OH} \\ \\ \text{HC-OH} \\ \\ \text{H}_2\text{C-OH} \end{array}$
inositol	
phenol	
diethylether	$\text{H}_3\text{C-CH}_2\text{-O-CH}_2\text{-CH}_3$
formaldehyde	$\begin{array}{c} \text{O} \\ \\ \text{H-C} \\ \\ \text{H} \end{array}$
acetaldehyde	$\begin{array}{c} \text{O} \\ \\ \text{H}_3\text{C-C} \\ \\ \text{H} \end{array}$
D-glyceraldehyde (Fischer-projection)	$\begin{array}{cc} \begin{array}{c} \text{H-C=O} \\ \\ \text{H-C-OH} \\ \\ \text{CH}_2\text{OH} \end{array} & \begin{array}{c} \text{H-C=O} \\ \\ \text{H} \cdots \text{C} \cdots \text{HO} \\ \\ \text{CH}_2\text{OH} \end{array} \end{array}$
L-glyceraldehyde (Fischer-projection)	$\begin{array}{cc} \begin{array}{c} \text{H-C=O} \\ \\ \text{HO-C-H} \\ \\ \text{CH}_2\text{OH} \end{array} & \begin{array}{c} \text{H-C=O} \\ \\ \text{HO} \cdots \text{C} \cdots \text{H} \\ \\ \text{CH}_2\text{OH} \end{array} \end{array}$
acetone	$\begin{array}{c} \text{CH}_3 \\ \\ \text{C=O} \\ \\ \text{CH}_3 \end{array}$
mercaptoethanol	$\text{HO-CH}_2\text{-CH}_2\text{-SH}$
aniline	

urea	$\begin{array}{c} \text{NH}_2 \\ \\ \text{C}=\text{O} \\ \\ \text{NH}_2 \end{array}$
guanidine	$\begin{array}{c} \text{NH}_2 \\ \\ \text{C}=\text{NH} \\ \\ \text{NH}_2 \end{array}$
formic acid	$\begin{array}{c} \text{O} \\ // \\ \text{H}-\text{C} \\ \\ \text{OH} \end{array}$
acetic acid	$\begin{array}{c} \text{O} \\ // \\ \text{H}_3\text{C}-\text{C} \\ \\ \text{OH} \end{array}$
propionic acid	$\text{CH}_3\text{-CH}_2\text{-COOH}$
butyric acid	$\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-COOH}$
valeric acid	$\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-CH}_2\text{-COOH}$
caproic acid	$\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-CH}_2\text{-CH}_2\text{-COOH}$
oxalic acid	HOOC-COOH
malonic acid	$\begin{array}{c} \text{COOH} \\ \\ \text{H}_2\text{C} \\ \\ \text{COOH} \end{array}$
succinic acid	$\begin{array}{c} \text{CH}_2\text{-COOH} \\ \\ \text{CH}_2\text{-COOH} \end{array}$
glutaric acid	$\begin{array}{c} \text{CH}_2\text{-COOH} \\ \\ \text{H}_2\text{C} \\ \\ \text{CH}_2\text{-COOH} \end{array}$
maleic acid	$\begin{array}{c} \text{H}-\text{C}-\text{COOH} \\ \\ \text{H}-\text{C}-\text{COOH} \end{array}$
fumaric acid	$\begin{array}{c} \text{H}-\text{C}-\text{COOH} \\ \\ \text{HOOC}-\text{C}-\text{H} \end{array}$
lactic acid	$\begin{array}{c} \text{COOH} \\ \\ \text{H}-\text{C}-\text{OH} \\ \\ \text{CH}_3 \end{array}$
β -hydroxybutyric acid	$\begin{array}{c} \text{COOH} \\ \\ \text{CH}_2 \\ \\ \text{H}-\text{C}-\text{OH} \\ \\ \text{CH}_3 \end{array}$

pyruvic acid	$ \begin{array}{c} \text{COOH} \\ \\ \text{C}=\text{O} \\ \\ \text{CH}_3 \end{array} $
acetoacetic acid	$ \begin{array}{c} \text{COOH} \\ \\ \text{CH}_2 \\ \\ \text{C}=\text{O} \\ \\ \text{CH}_3 \end{array} $
citric acid	$ \begin{array}{c} \text{H}_2\text{C}-\text{COOH} \\ \\ \text{HO}-\text{C}-\text{COOH} \\ \\ \text{H}_2\text{C}-\text{COOH} \end{array} $
cis-aconitic acid	$ \begin{array}{c} \text{H}-\text{C}-\text{COOH} \\ \\ \text{C}-\text{COOH} \\ \\ \text{H}_2\text{C}-\text{COOH} \end{array} $
isocitric acid	$ \begin{array}{c} \text{H} \\ \\ \text{HO}-\text{C}-\text{COOH} \\ \\ \text{HC}-\text{COOH} \\ \\ \text{H}_2\text{C}-\text{COOH} \end{array} $
α -ketoglutaric acid	$ \begin{array}{c} \text{O}=\text{C}-\text{COOH} \\ \\ \text{CH}_2 \\ \\ \text{H}_2\text{C}-\text{COOH} \end{array} $
malic acid	$ \begin{array}{c} \text{COOH} \\ \\ \text{HO}-\text{C}-\text{H} \\ \\ \text{CH}_2 \\ \\ \text{COOH} \end{array} $
oxaloacetic acid	$ \begin{array}{c} \text{COOH} \\ \\ \text{C}=\text{O} \\ \\ \text{CH}_2 \\ \\ \text{COOH} \end{array} $

Important bond types

ether	R_1-O-R_2	(alcohol + alcohol – H_2O)
phenolether		(phenol + alcohol – H_2O)
thioether	R_1-S-R_2	(thiol + alcohol – H_2O)
ester		(acid + alcohol – H_2O)
lactone		intramolecular ester – for example: δ -hydroxy valeric acid lactone
thioester		(acid + thiol – H_2O)
anhydride		(acid + acid – H_2O)
hemiacetale		(aldehyde + alcohol)
hemiketale (cyclic forms included)		(ketone + alcohol)
Schiff-base		(aldehyde + amine – H_2O)
oxime		(aldehyde + hydroxylamine – H_2O)
hydrazone		(aldehyde + hydrazine – H_2O)
hydroxamic acid		(acid + hydroxylamine – H_2O)
amide		(acid + NH_3 – H_2O)
thiol	$R-SH$	
sulfinic acid		
sulfoxide		
sulfonic acid		
acyl chloride	