

ORGANIC SUBSTITUENT GROUPS AND RING SYSTEMS

The first part of this table lists substituent groups and their line formulas. A substituent group is defined by IUPAC as a group that replaces one or more hydrogen atoms attached to a parent structure. Such groups are sometimes called radicals, but IUPAC now reserves the term radical for a free molecular species with unpaired electrons. IUPAC does not recommend some of these names, which are marked here with asterisks (e.g., *amyl**), but they are included in this list because they are often encountered in the older literature. Substituent group names which are formed

by systematic rules (e.g., methyl from methane, ethyl from ethane, etc.) are included here only for the first few members of a homologous series.

In the second part of the table a number of common organic ring compounds are shown, with the conventional numbering of the ring positions indicated.

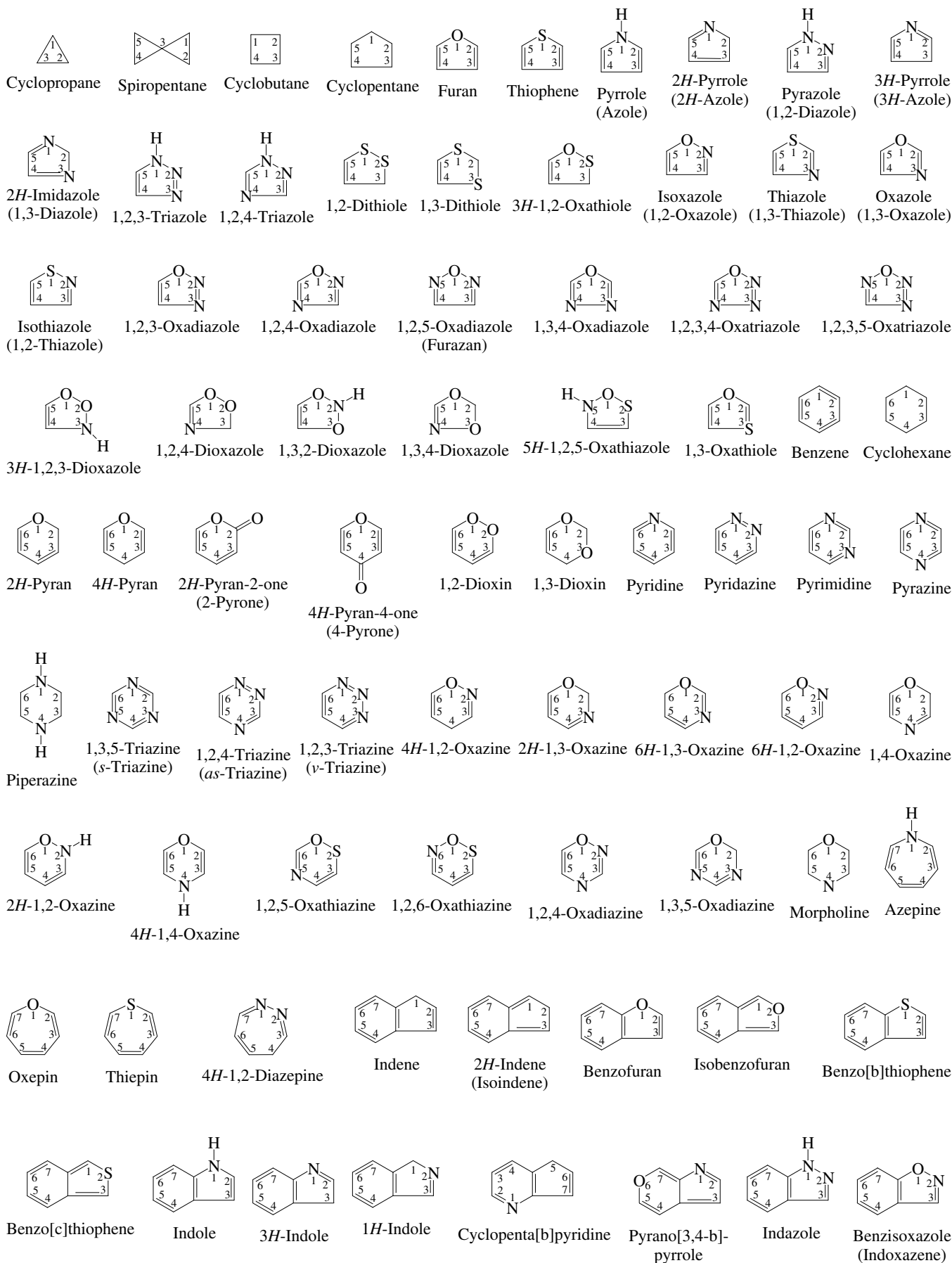
The help of Warren H. Powell in preparing this table is greatly appreciated. Pertinent references may be found in the table "Nomenclature of Chemical Compounds."

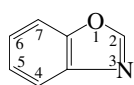
Substituent Groups

acetamido (acetylamino)	$\text{CH}_3\text{CONH-}$	cinnamoyl	$\text{C}_6\text{H}_5\text{CH=CHCO-}$
acetoacetyl	$\text{CH}_3\text{COCH}_2\text{CO-}$	cinnamyl (3-phenyl-2-propenyl)	$\text{C}_6\text{H}_5\text{CH=CHCH}_2\text{-}$
acetonyl	$\text{CH}_3\text{COCH}_2\text{-}$	cinnamylidene	$\text{C}_6\text{H}_5\text{CH=CHCH=}$
acetyl	$\text{CH}_3\text{CO-}$	cresyl* (hydroxymethylphenyl)	$\text{HO}(\text{CH}_2)\text{C}_6\text{H}_4\text{-}$
acryloyl* (1-oxo-2-propenyl)	$\text{CH}_2=\text{CHCO-}$	crotonoyl	$\text{CH}_3\text{CH=CHCO-}$
alanyl (from alanine)	$\text{CH}_3\text{CH}(\text{NH}_2)\text{CO-}$	crotyl (2-butenyl)	$\text{CH}_3\text{CH=CHCH}_2\text{-}$
β -alanyl	$\text{H}_2\text{N}(\text{CH}_2)_2\text{CO-}$	cyanamido (cyanoamino)	NCNH-
allyl (2-propenyl)	$\text{CH}_2=\text{CHCH}_2\text{-}$	cyanato	NCO-
allylidene (2-propenylidene)	$\text{CH}_2=\text{CHCH=}$	cyano	NC-
amidino (aminoiminomethyl)	$\text{H}_2\text{NC(=NH)-}$	decanedioyl	$-\text{OC}(\text{CH}_2)_8\text{CO-}$
amino	$\text{H}_2\text{N-}$	decanoyl	$\text{CH}_3(\text{CH}_2)_8\text{CO-}$
amyl* (pentyl)	$\text{CH}_3(\text{CH}_2)_4\text{-}$	diazo	$\text{N}_2=$
anilino (phenylamino)	$\text{C}_6\text{H}_5\text{NH-}$	diazoamino	$-\text{NHN=N-}$
anisidino	$\text{CH}_3\text{OC}_6\text{H}_4\text{NH-}$	disilanyl	$\text{H}_3\text{SiSiH}_2\text{-}$
anthranoyl (2-aminobenzoyl)	$2\text{-H}_2\text{NC}_6\text{H}_4\text{CO-}$	disiloxanyloxy	$\text{H}_3\text{SiOSiH}_2\text{O-}$
arsino	$\text{AsH}_2\text{-}$	disulfinyl	$-\text{S}(\text{O})\text{S}(\text{O})\text{-}$
azelaoyl (from azelaic acid)	$-\text{OC}(\text{CH}_2)_7\text{CO-}$	dithio	$-\text{SS-}$
azido	$\text{N}_3\text{-}$	enantioyl* (heptanoyl)	$\text{CH}_3(\text{CH}_2)_5\text{CO-}$
azino	$=\text{N=N=}$	epoxy	$-\text{O-}$
azo	$-\text{N=N-}$	ethenyl (vinyl)	$\text{CH}_2=\text{CH-}$
azoxy	$-\text{N}(\text{O})=\text{N-}$	ethynyl	$\text{HC}\equiv\text{C-}$
benzal* (benzylidene)	$\text{C}_6\text{H}_5\text{CH=}$	ethoxy	$\text{C}_2\text{H}_5\text{O-}$
benzamido (benzoylamino)	$\text{C}_6\text{H}_5\text{CONH-}$	ethyl	$\text{CH}_3\text{CH}_2\text{-}$
benzhydryl (diphenylmethyl)	$(\text{C}_6\text{H}_5)_2\text{CH-}$	ethylene	$-\text{CH}_2\text{CH}_2\text{-}$
benzoxyl* (benzoyloxy)	$\text{C}_6\text{H}_5\text{COO-}$	ethylidene	$\text{CH}_3\text{CH=}$
benzoyl	$\text{C}_6\text{H}_5\text{CO-}$	ethylthio	$\text{C}_2\text{H}_5\text{S-}$
benzyl	$\text{C}_6\text{H}_5\text{CH}_2\text{-}$	formamido (formylamino)	HCONH-
benzylidene	$\text{C}_6\text{H}_5\text{CH=}$	formyl	HCO-
benzylidyne	$\text{C}_6\text{H}_5\text{C=}$	furmaroyl (from fumaric acid)	$-\text{OCCH=CHCO-}$
biphenyl	$\text{C}_6\text{H}_5\text{C}_6\text{H}_5\text{-}$	furfuryl (2-furanylmethyl)	$\text{OC}_4\text{H}_3\text{CH}_2\text{-}$
biphenylene	$-\text{C}_6\text{H}_4\text{-C}_6\text{H}_4\text{-}$	furfurylidene (2-furanylmethylene)	$\text{OC}_4\text{H}_3\text{CH=}$
butoxy	$\text{C}_4\text{H}_9\text{O-}$	glutamoyl (from glutamic acid)	$-\text{OC}(\text{CH}_2)_2\text{CH}(\text{NH}_2)\text{CO-}$
<i>sec</i> -butoxy (1-methylpropoxy)	$\text{C}_2\text{H}_5\text{CH}(\text{CH}_3)\text{O-}$	glutaryl (from glutaric acid)	$-\text{OC}(\text{CH}_2)_3\text{CO-}$
<i>tert</i> -butoxy (1,1-dimethylethoxy)	$(\text{CH}_3)_3\text{CO-}$	glycylamino	$\text{H}_2\text{NCH}_2\text{CONH-}$
butyl	$\text{CH}_3(\text{CH}_2)_3\text{-}$	glycoloyl; glycolyl (hydroxyacetyl)	$\text{HOCH}_2\text{CO-}$
<i>sec</i> -butyl (1-methylpropyl)	$\text{CH}_3\text{CH}_2\text{CH}(\text{CH}_3)\text{-}$	glycyl (aminoacetyl)	$\text{H}_2\text{NCH}_2\text{CO-}$
<i>tert</i> -butyl (1,1-dimethylethyl)	$(\text{CH}_3)_3\text{C-}$	glyoxyloyl; glyoxylyl (oxoacetyl)	HCOCO-
butyryl (1-oxobutyl)	$\text{CH}_3(\text{CH}_2)_2\text{CO-}$	guanidino	$\text{H}_2\text{NC(=NH)NH-}$
caproyl* (hexanoyl)	$\text{CH}_3(\text{CH}_2)_4\text{CO-}$	guanyl (aminoiminomethyl)	$\text{H}_2\text{NC(=NH)-}$
capryl* (decanoyl)	$\text{CH}_3(\text{CH}_2)_8\text{CO-}$	heptadecanoyl	$\text{CH}_3(\text{CH}_2)_{15}\text{CO-}$
capryloyl* (octanoyl)	$\text{CH}_3(\text{CH}_2)_6\text{CO-}$	heptanamido	$\text{CH}_3(\text{CH}_2)_5\text{CONH-}$
carbamido (carbamoylamino)	$\text{H}_2\text{NCONH-}$	heptanedioyl	$-\text{OC}(\text{CH}_2)_5\text{CO-}$
carbamoyl (aminocarbonyl)	$\text{H}_2\text{NCO-}$	heptanoyl	$\text{CH}_3(\text{CH}_2)_5\text{CO-}$
carbamyl (aminocarbonyl)	$\text{H}_2\text{NCO-}$	hexadecanoyl	$\text{CH}_3(\text{CH}_2)_{14}\text{CO-}$
carbazoyl (hydrazinocarbonyl)	$\text{H}_2\text{NNHCO-}$	hexamethylene (1,6-hexanediyl)	$-(\text{CH}_2)_6\text{-}$
carbethoxy (ethoxycarbonyl)	$\text{C}_2\text{H}_5\text{OCO-}$	hexanedioyl	$-\text{OC}(\text{CH}_2)_4\text{CO-}$
carbonyl	$=\text{C=O}$	hippuryl (N-benzoylglycyl)	$\text{C}_6\text{H}_5\text{CONHCH}_2\text{CO-}$
carboxy	HOOC-	hydrazino	$\text{H}_2\text{NNH-}$
cetyl* (hexadecyl)	$\text{CH}_3(\text{CH}_2)_{15}\text{-}$	hydrazo	$-\text{HNNH-}$
chloroformyl (chlorocarbonyl)	ClCO-	hydrocinnamoyl	$\text{C}_6\text{H}_5(\text{CH}_2)_2\text{CO-}$

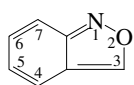
hydroperoxy	HOO-	phenylene (benzenediyl)	-C ₆ H ₄ -
hydroxyamino	HONH-	phosphino* (phosphanyl)	H ₂ P-
hydroxy	HO-	phosphinyl* (phosphinoyl)	H ₂ P(O)-
imino	HN=	phospho	O ₂ P-
iodoso* (iodosyl)	OI-	phosphono	(HO) ₂ P(O)-
iodyl	O ₂ I-	phthaloyl (from phthalic acid)	1,2-C ₆ H ₄ (CO) ₂
isoamyl* (isopentyl; 3-methylbutyl)	(CH ₃) ₂ CH(CH ₂) ₂ -	picryl (2,4,6-trinitrophenyl)	2,4,6-(NO ₂) ₃ C ₆ H ₂ -
isobutenyl (2-methyl-1-propenyl)	(CH ₃) ₂ C=CH-	pimeloyl (from pimelic acid)	-OC(CH ₂) ₅ CO-
isobutoxy (2-methylpropoxy)	(CH ₃) ₂ CHCH ₂ O-	piperidino (1-piperidinyl)	C ₅ H ₁₀ N-
isobutyl (2-methylpropyl)	(CH ₃) ₂ CHCH ₂ -	pivaloyl (from pivalic acid)	(CH ₃) ₃ CCO-
isobutylidene (3-methylpropylidene)	(CH ₃) ₂ CHCH=	prenyl (3-methyl-2-butenyl)	(CH ₃) ₂ C=CHCH ₂ -
isobutyryl (2-methyl-1-oxopropyl)	(CH ₃) ₂ CHCO-	propargyl (2-propynyl)	HC≡CCH ₂ -
isocyanato	OCN-	1-propenyl	-CH=CHCH ₂
isocyano	CN-	2-propenyl (allyl)	CH ₂ =CHCH ₂ -
isohexyl (4-methylpentyl)	(CH ₃) ₂ CH(CH ₂) ₃ -	propionyl* (propanyl)	CH ₃ CH ₂ CO-
isoleucyl (from isoleucine)	C ₂ H ₅ CH(CH ₃)CH(NH ₂)CO-	propoxy	CH ₃ CH ₂ CH ₂ O-
isonitroso* (hydroxyamino)	HON=	propyl	CH ₃ CH ₂ CH ₂ -
isopentyl (3-methylbutyl)	(CH ₃) ₂ CH(CH ₂) ₂ -	propylidene	CH ₃ CH ₂ CH=
isopentylidene (3-methylbutylidene)	(CH ₃) ₂ CHCH ₂ CH=	pyrryl (pyrrolyl)	C ₄ H ₄ N-
isopropenyl (1-methylethenyl)	CH ₂ =C(CH ₃)-	salicyloyl (2-hydroxybenzoyl)	2-HOC ₆ H ₄ CO-
isopropoxy (1-methylethoxy)	(CH ₃) ₂ CHO-	selenyl* (selanyl; hydroseleno)	HS ₂ e-
isopropyl (1-methylethyl)	(CH ₃) ₂ CH-	seryl (from serine)	HOCH ₂ CH(NH ₂)CO-
isopropylidene (1-methylethylidene)	(CH ₃) ₂ C=	siloxo	H ₃ SiO-
isothiocyanato (isothiocyano)	SCN-	silyl	H ₃ Si-
isovaleryl* (3-methyl-1-oxobutyl)	(CH ₃) ₂ CHCH ₂ CO-	silylene	H ₂ Si=
lactoyl (from lactic acid)	CH ₃ CH(OH)CO-	sorbonyl (from sorbic acid)	CH ₂ CH=CHCH=CHCO-
lauroyl (from lauric acid)	CH ₃ (CH ₂) ₁₀ CO-	stearoyl (from stearic acid)	CH ₃ (CH ₂) ₁₄ CO-
lauryl (dodecyl)	CH ₃ (CH ₂) ₁₁ -	stearyl (octadecyl)	CH ₃ (CH ₂) ₁₇ -
leucyl (from leucine)	(CH ₃) ₂ CHCH ₂ CH(NH ₂)CO-	styryl (2-phenylethenyl)	C ₆ H ₅ CH=CH-
levulinoyl (from levulinic acid)	CH ₃ CO(CH ₂) ₂ CO-	suberoyl (from suberic acid)	-OC(CH ₂) ₆ CO-
malonyl (from malonic acid)	-OCCH ₂ CO-	succinyl (from succinic acid)	-OCCH ₂ CH ₂ CO-
mandeloyl (from mandelic acid)	C ₆ H ₅ CH(OH)CO-	sulfamino (sulfoamino)	HOSO ₂ NH-
mercapto	HS-	sulfamoyl (sulfamyl)	H ₂ NSO ₂ -
mesityl	2,4,6-(CH ₃) ₃ C ₆ H ₂ -	sulfanilyl [(4-aminophenyl)sulfonyl]	4-H ₂ NC ₆ H ₄ SO ₂ -
methacryloyl (from methacrylic acid)	CH ₂ =C(CH ₃)CO-	sulfeno	HOS-
methallyl (2-methyl-2-propenyl)	CH ₂ =C(CH ₃)CH ₂ -	sulfhydryl (mercapto)	HS-
methionyl (from methionine)	CH ₃ SCH ₂ CH ₂ CH(NH ₂)CO-	sulfinyl	OS=
methoxy	CH ₃ O-	sulfo	HO ₃ S-
methyl	H ₃ C-	sulfonyl (sulfuryl)	-SO ₂ -
methylene	H ₂ C=	terephthaloyl	1,4-C ₆ H ₄ (CO) ₂
methylthio	CH ₃ S-	tetramethylene	-(CH ₂) ₄ -
myristoyl (from myristic acid)	CH ₃ (CH ₂) ₁₂ CO-	thienyl (from thiophene)	(C ₄ H ₃ S)-
myristyl (tetradecyl)	CH ₃ (CH ₂) ₁₃ -	thiocarbonyl (carbothionyl)	=CS
naphthyl	(C ₁₀ H ₇)-	thiocarboxy	HOSC-
naphthylene	-(C ₁₀ H ₆)-	thiocyanato (thiocyano)	NCS-
neopentyl (2,2-dimethylpropyl)	(CH ₃) ₃ CCH ₂ -	thionyl* (sulfinyl)	-SO-
nitramino (nitroamino)	O ₂ NNH-	threonyl (from threonine)	CH ₃ CH(OH)CH(NH ₂)CO-
nitro	O ₂ N-	toluidino [(methylphenyl)amino]	CH ₃ C ₆ H ₄ NH-
nitrosamino (nitrosoamino)	ONNH-	toluoyl (methylbenzoyl)	CH ₃ C ₆ H ₄ CO-
nitrosimino (nitrosoimino)	ONN=	tolyl (methylphenyl)	CH ₃ C ₆ H ₄ -
nitroso	ON-	α-tolyl (benzyl)	C ₆ H ₅ CH ₂ -
nonanoyl (from nonanoic acid)	CH ₃ (CH ₂) ₇ CO-	tolyene (methylphenylene)	-(CH ₂ C ₆ H ₃)-
oleoyl (from oleic acid)	CH ₃ (CH ₂) ₇ CH=CH(CH ₂) ₇ CO-	tosyl [(4-methylphenyl) sulfonyl]	4-CH ₃ C ₆ H ₄ SO ₂ -
oxalyl (from oxalic acid)	-OCCO-	triazano	H ₂ NNHNH-
oxo	O=	trimethylene (1,3-propanediyl)	-(CH ₂) ₃ -
palmitoyl (from palmitic acid)	CH ₃ (CH ₂) ₁₄ CO-	trityl (triphenylmethyl)	(C ₆ H ₅) ₃ C-
pentamethylene (1,5-pentanediy)	-(CH ₂) ₅ -	valeryl* (pentanoyl)	CH ₃ (CH ₂) ₃ CO-
pentyl	CH ₃ (CH ₂) ₄ -	valyl (from valine)	(CH ₃) ₂ CHCH(NH ₂)CO-
tert-pentyl	CH ₃ CH ₂ C(CH ₃) ₂ -	vinyl (ethenyl)	CH ₂ =CH-
phenacyl	C ₆ H ₅ COCH ₂ -	vinylidene (ethenylidene)	CH ₂ =C=
phenacylidene	C ₆ H ₅ COCH=	xylydino [(dimethylphenyl)amino]	(CH ₃) ₂ C ₆ H ₃ NH-
phenethyl (2-phenylethyl)	C ₆ H ₅ CH ₂ CH ₂ -	xylyl (dimethylphenyl)	(CH ₃) ₂ C ₆ H ₃ -
phenoxy	C ₆ H ₅ O-	xylylene [phenylenebis(methylene)]	-CH ₂ C ₆ H ₄ CH ₂ -
phenyl	C ₆ H ₅ -		

Organic Ring Compounds

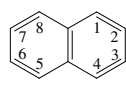




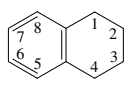
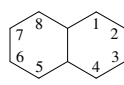
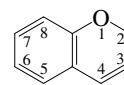
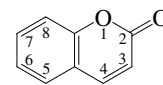
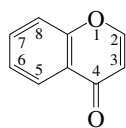
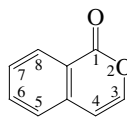
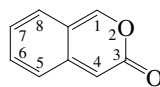
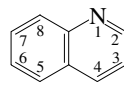
Benzoxazole



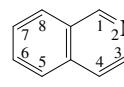
2,1-Benzisoxazole



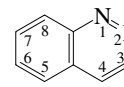
Naphthalene

1,2,3,4-Tetrahydronaphthalene
(Tetralin)Octahydronaphthalene
(Decalin)2H-1-Benzopyran
(2H-Chromene)2H-1-Benzopyran-2-one
(Coumarin)4H-1-Benzopyran-4-one
(Chromen-4-one)1H-2-Benzopyran-1-one
(Isocoumarin)3H-2-Benzopyran-1-one
(Isochromen-3-one)

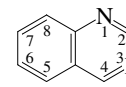
Quinoline



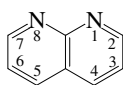
Isoquinoline



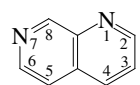
Cinnoline



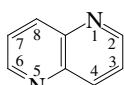
Quinazoline



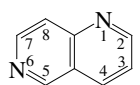
1,8-Naphthyridine



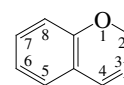
1,7-Naphthyridine



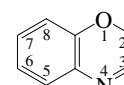
1,5-Naphthyridine



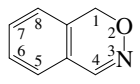
1,6-Naphthyridine



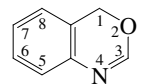
2H-1,3-Benzoxazine



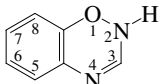
2H-1,4-Benzoxazine



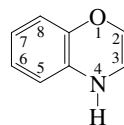
1H-2,3-Benzoxazine



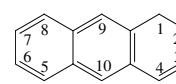
4H-3,1-Benzoxazine



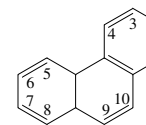
2H-1,2-Benzoxazine



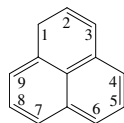
4H-1,4-Benzoxazine



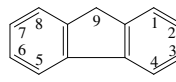
Anthracene



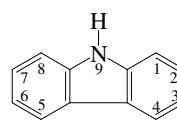
Phenanthrene



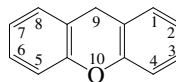
Phenalene



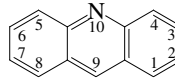
Fluorene



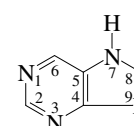
Carbazole



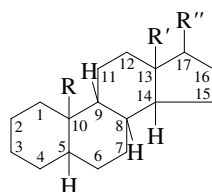
Xanthene



Acridine

Norpinane
(Bicyclo[3.1.1]heptane)

7H-Purine



Steroid ring system

R = Nearly always methyl
R' = Usually methyl
R'' = Various groups