

# Crystal structures of amino acids: from bond lengths in glycine to metal complexes and high pressure polymorphs

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Schematic illustrations of amino acids in the Cambridge Structural Database identified by their refcodes.

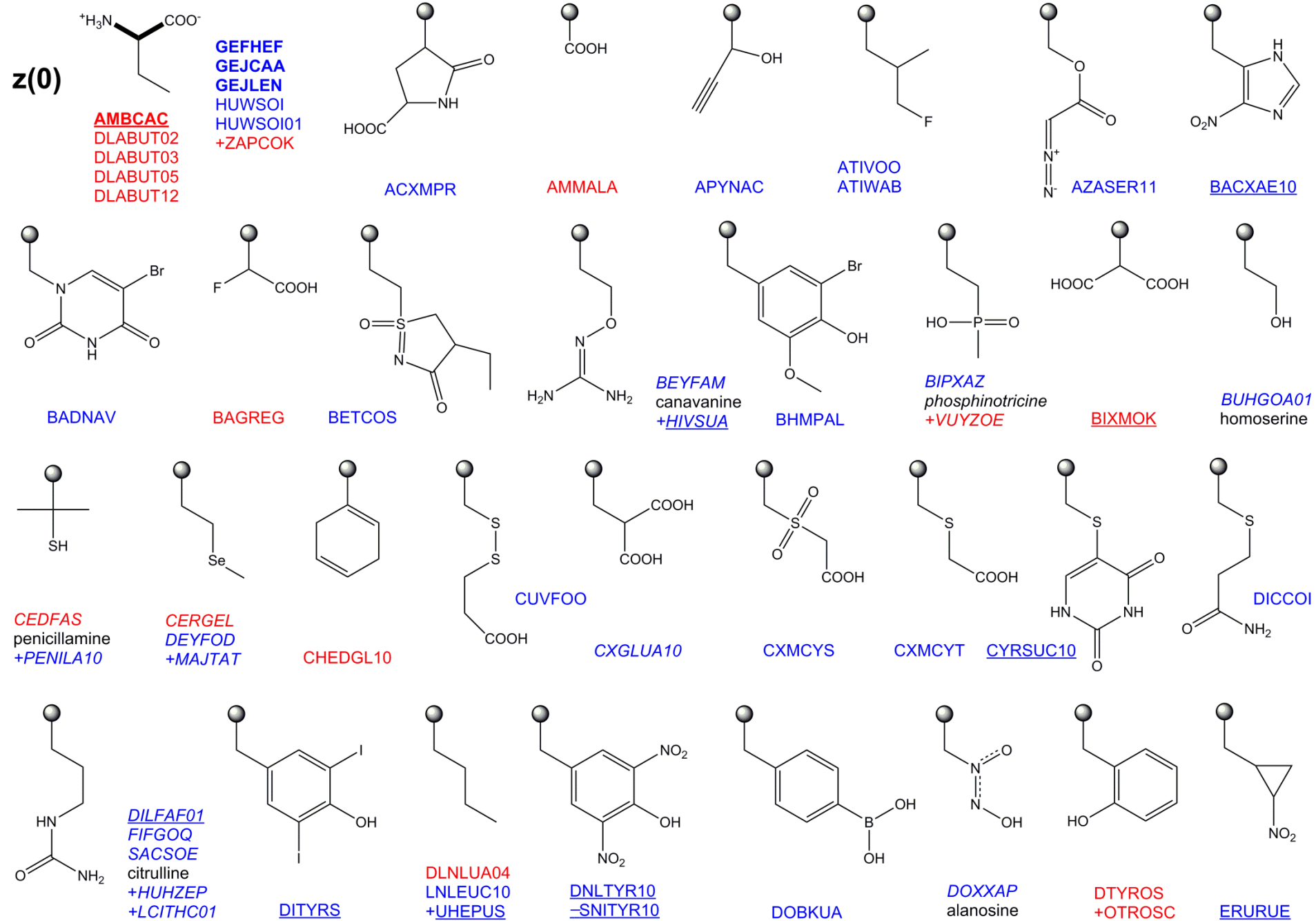
For organic structures the following applies to the listed refcodes:

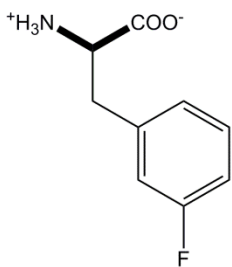
<b>REFCOD</b>	racemic structure
<b>REFCOD</b>	enantiopure structure
<b>REFCOD</b>	achiral compound
<b>REFCOD</b>	hydrate
<b>REFCOD</b>	complex
<b>REFCOD</b>	compound of biological relevance, common name given directly below if available
<b>+REFCOD</b>	polar head with positive charge [c(0), c(1) or c(2)]
<b>-REFCOD</b>	polar head with negative charge [a(0), a(-1) or a(-2)]

If a substance has been crystallized in different states, the illustration will appear under z(0) (if applicable).

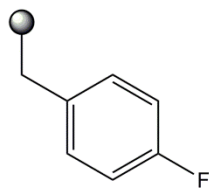
For metalloorganic structures other font codes apply, see page 18.

z(0)	acyclic	110 structures	page 2
z(-2), z(-1) and z(1)	acyclic	3 + 7 + 9 = 19 structures	page 6
c(0)	acyclic	22 structures	page 7
c(1)	acyclic	21 structures	page 8
c(2)	acyclic	6 structures	page 9
z(0), z(1)	acyclic, dimeric	8 + 3 = 11 structures	page 10
z(0)	cyclic	40 structures	page 11
c(1), n(0), a(-1), a(0)	cyclic	5 + 11 + 3 + 4 = 23 structures	page 13
z(0)	C <sup>α</sup> -alkylated cyclic	30 structures	page 14
z(0)	C <sup>α</sup> -alkylated other	12 + 2 + 1 = 15 structures	page 15
c(1)	C <sup>α</sup> -alkylated all	11 + 1 + 1 = 13 structures	page 16
n(0), c(1)	acyclic esters	14 structures (+ 8 from standard acids)	page 17
a(0)	acyclic metal ligands	42 structures	page 18

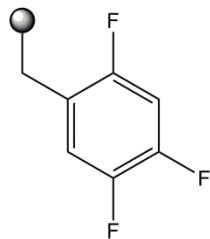




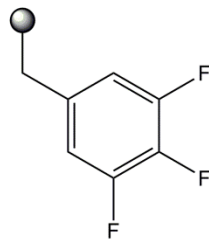
[EXAXAC](#)



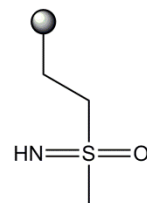
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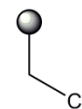
[EXAXIK](#)



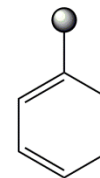
[EXAXOQ](#)



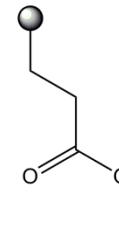
[FADVUB](#)  
[METTSO10](#)



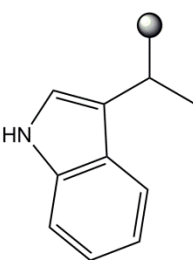
[FEGMAG](#)



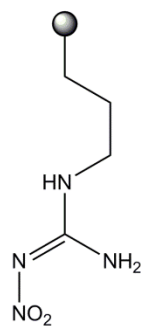
**FIVGEW**  
[+CABVUX](#)  
[+FAPMIT](#)  
[+FAPMOZ](#)  
**+GACVIP**  
**+HAZGIZ**  
[+IROVEQ](#)  
[+NILXUB](#)  
[+RENKUQ](#)  
[+TEHYUA](#)  
[+WIHJII](#)  
[+XALCOC01](#)  
[+XALCUI](#)  
[+XALDAP](#)



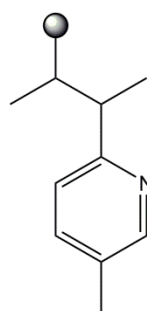
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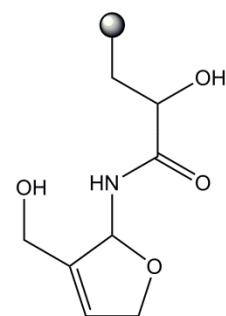
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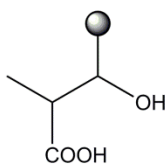
[HIVLAA01](#)  
[+SIXKIM](#)  
[+WIKNUZ](#)



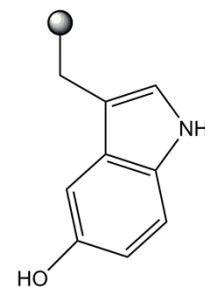
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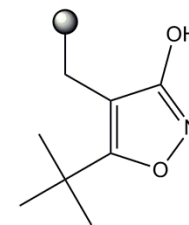
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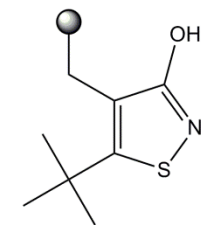
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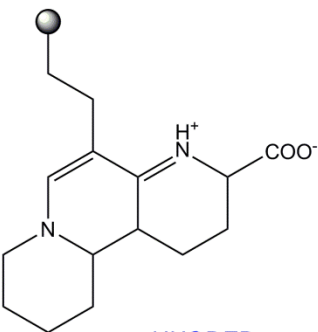
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**MUYTEG**  
**MUYTOQ**  
**MUYVAE**



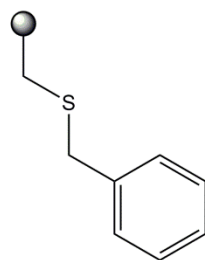
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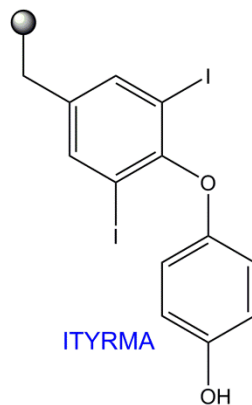
[HUKGAV\\*](#)



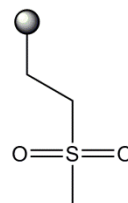
[HUQDED](#)  
 oryzamutaic acid E



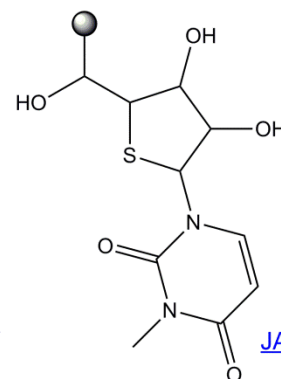
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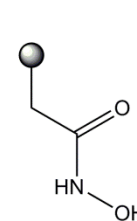
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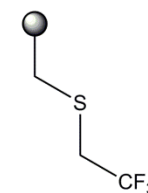
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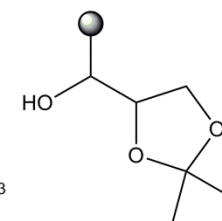
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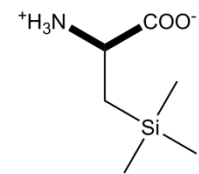
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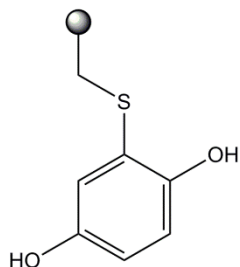
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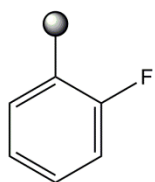
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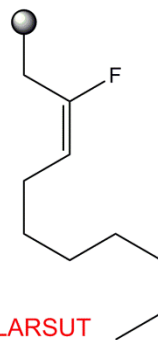
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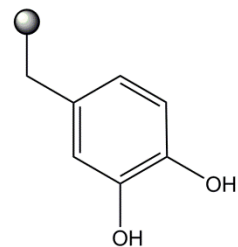
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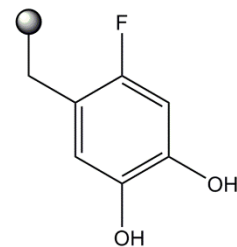
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LARSUT



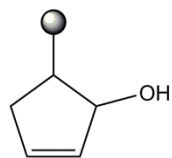
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L-dopa  
+LDOPAC01



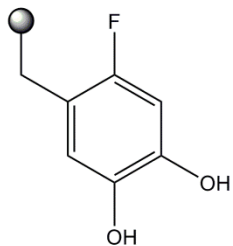
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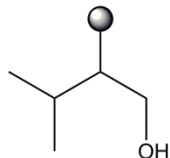
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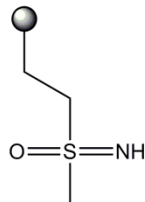
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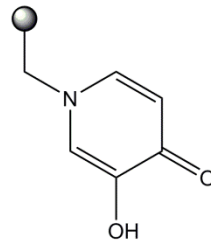
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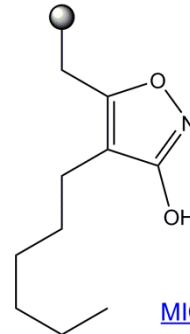
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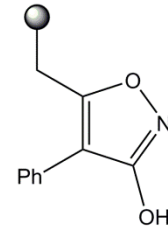
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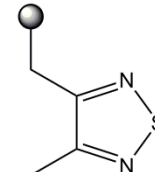
MIMOSN  
mimosine  
+LMIMOS



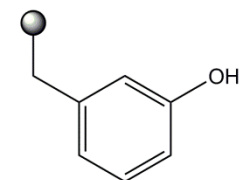
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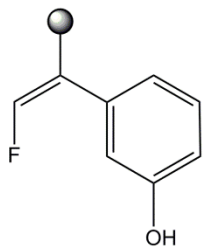
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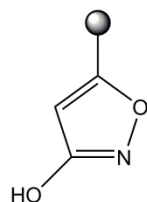
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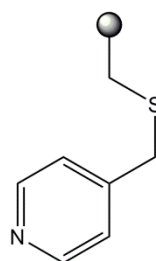
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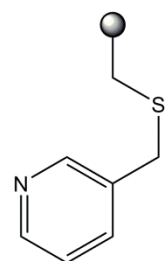
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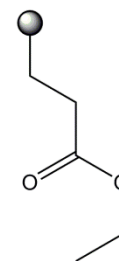
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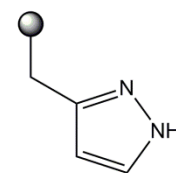
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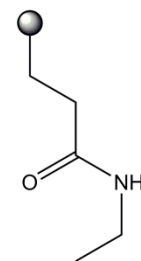
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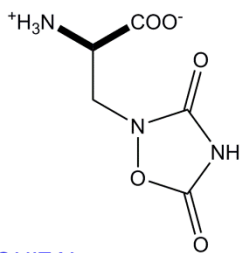
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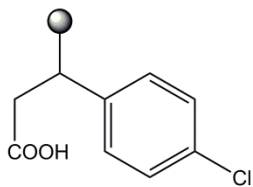
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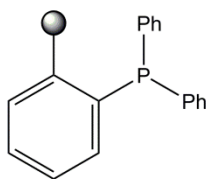
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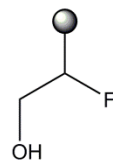
**QUIZAL**  
quisqualic acid



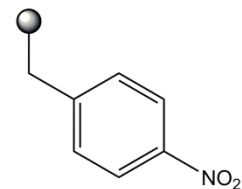
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**RAYWOD**



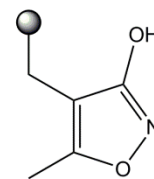
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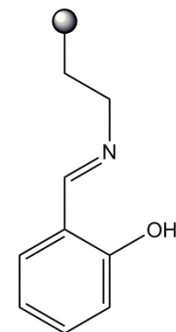
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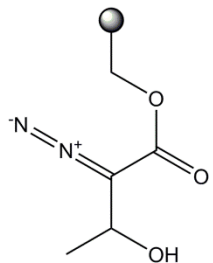
**RIYTUP**  
**+CUDSEK**  
**+NIPALA**



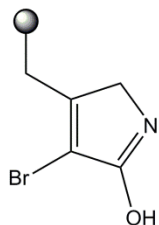
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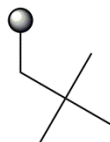
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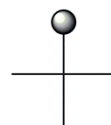
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thrazarine



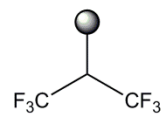
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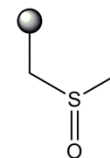
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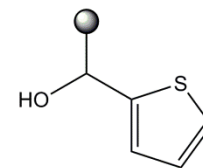
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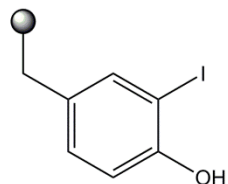
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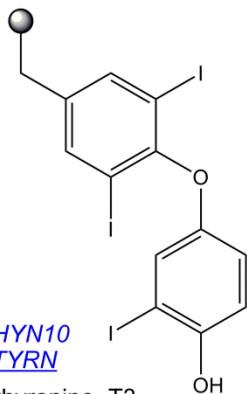
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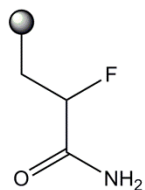
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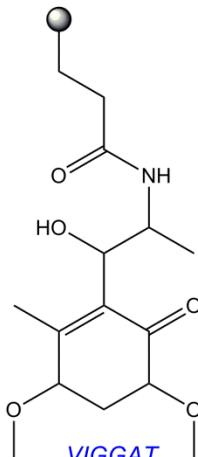
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**ZAMZES**



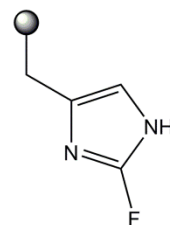
**TITHYN10**  
**+TITYRN**  
triiodothyronine, T3



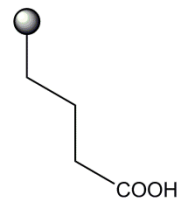
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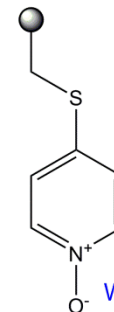
**VIGGAT**  
*lascivol*



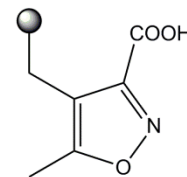
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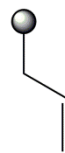
**VUYJEE**



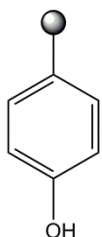
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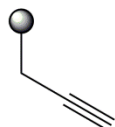
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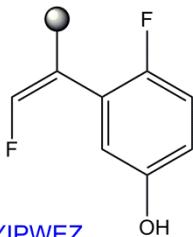
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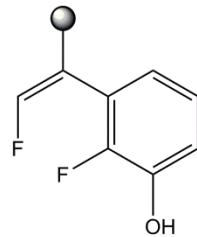
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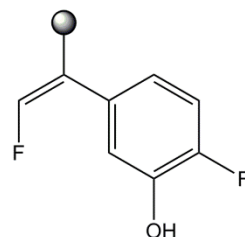
**YIJHOO**



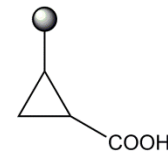
**YIPWEZ**  
**YIPWID**



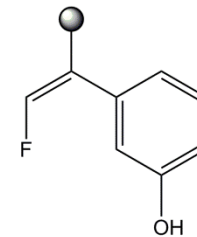
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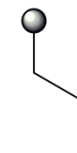
**YIPWUP**



**ZOGTIE**  
**ZOGTUK**

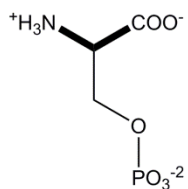


**ZULWEI**

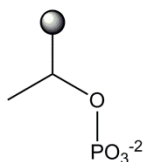


**ZZZODU01**  
**ZZZODU02**  
**+UHEPOM**

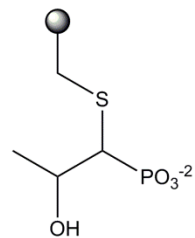
**z(-2)**



[ATEBAC](#)  
[ATEBIK](#)  
[ATEBIK01](#)

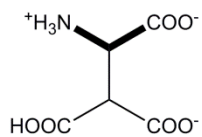


[GEJKUC](#)  
[IJICIN](#)

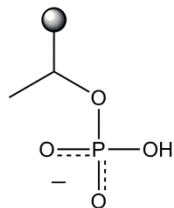


[HIKGIR](#)

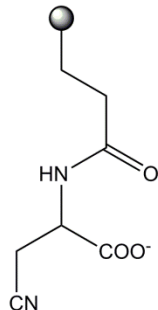
**z(-1)**



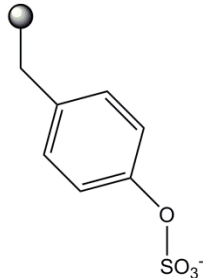
[ACXGLU](#)



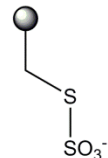
[GEDPIP](#)  
[IJICAF](#)  
[IJICEJ](#)  
[+POTHRE01](#)  
[+THREPO01](#)



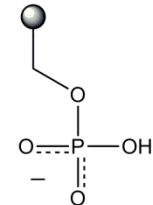
[HIBZUN](#)



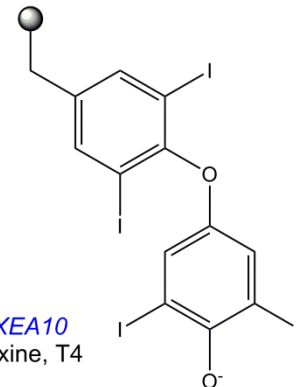
[KTYSUH10](#)



[LAKWEZ](#)

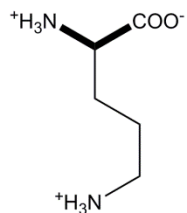


[LEPNAV\\*](#)  
[+SERIPH10](#)  
[+SERPOP01](#)



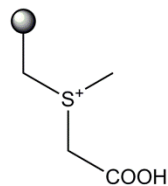
[TYRXEA10](#)  
thyroxine, T4

**z(1)**

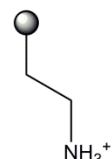


[CAPRAM](#)  
[DAHLOO](#)  
[ORNBDL10](#)  
[ORNHCL12](#)

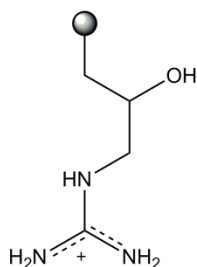
[PUYVUA](#)  
[VUYHII](#)  
ornithine



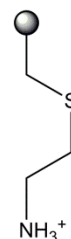
[CXMETN10](#)



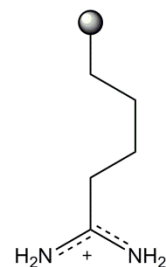
[DABUTA01](#)



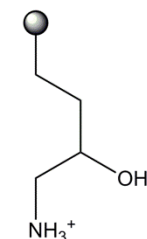
[HUCCUD](#)



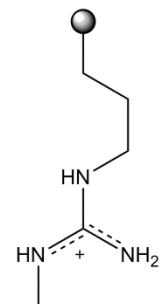
[JINGOC](#)



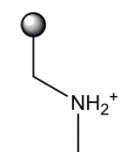
[KUFCIX](#)  
indospicine



[ROLCOL](#)

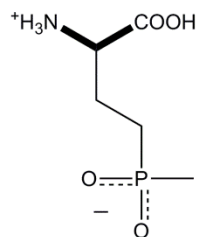


[SONSUK](#)  
[SONSUK01](#)

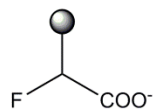


[YAKVOV](#)

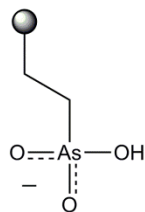
**c(0)**



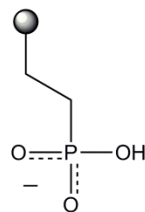
+BIPXED



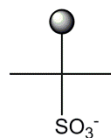
+BUTFUR



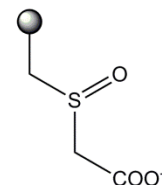
+CAXDEK



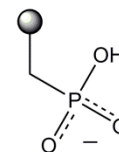
+CAXDIO01



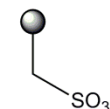
+CESKUG



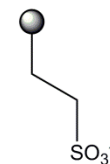
+CMXLCS



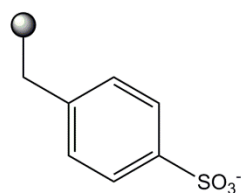
+CUFZAE



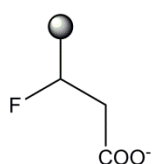
+CYSTAC02  
cysteic acid



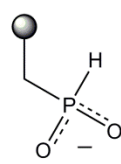
+HCYSAC



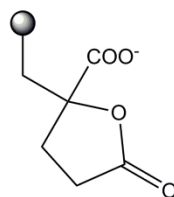
+IFIZIG02  
+IFIZIG04  
+VENLUW



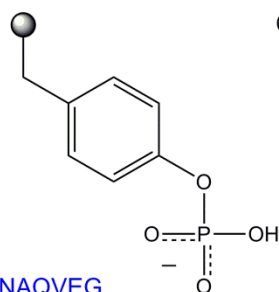
+KINWIN



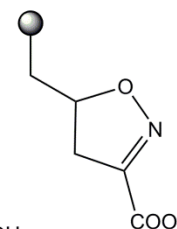
+LAVDER



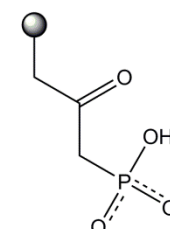
+LYCPER01



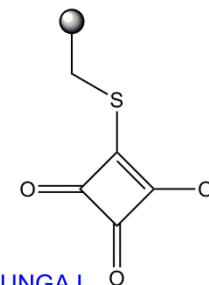
+NAQVEG



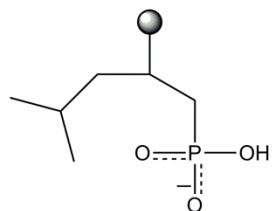
+NEWMOS



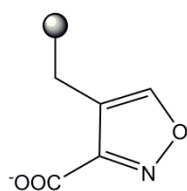
+POPJEJ



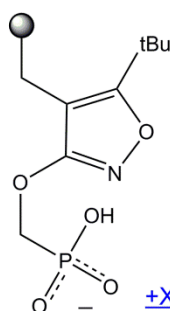
+RUNGAJ



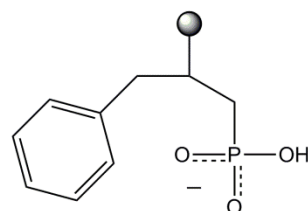
+ULIMOR



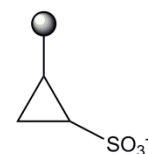
+WUHYIH



+XAPYET



+YEPTAP

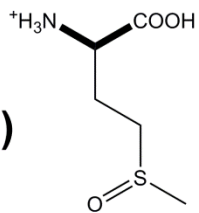


+YIZGAO  
+YODQIS  
+YODQOY

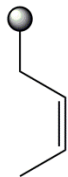
+POTHRE01  
+THREPO01  
see z(-1) GEDPIP

+SERIPH10  
+SERPOP01  
see z(-1) LEPNAW

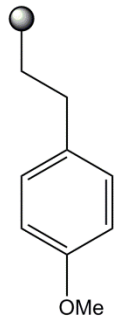
c(1)



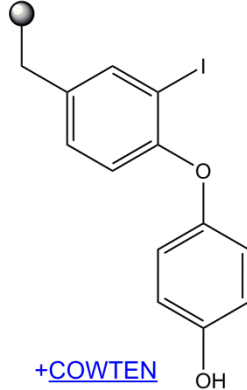
+AZIHUM



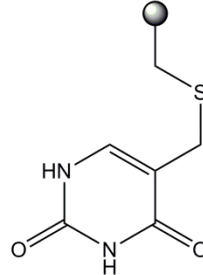
+BUTGLY



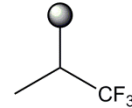
+CALKIL



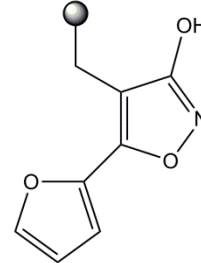
+COWTEN



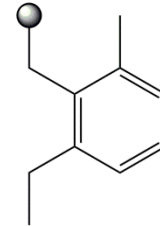
+CYSTYM



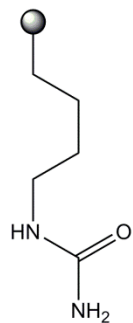
+DAFPOQ  
+DAFPUW



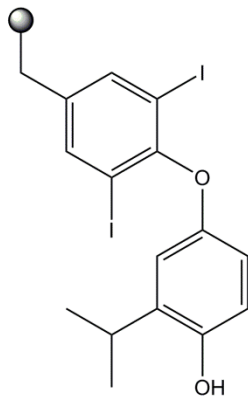
+GAFNAC



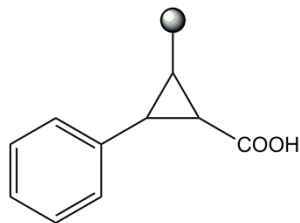
+GESQUR



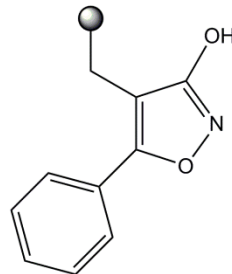
+HCITUL



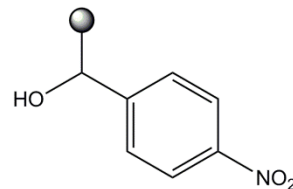
+IPLTYR10



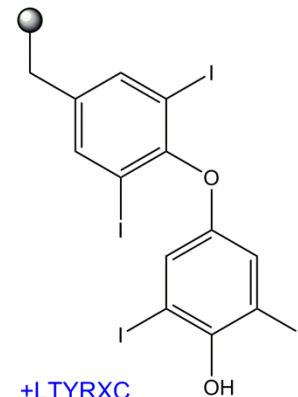
+KIZHAD  
+TAZQAM  
+TAZQIU



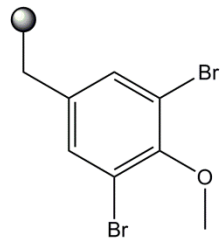
+LEPLUN



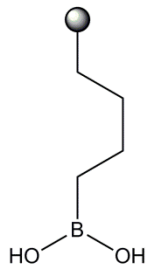
+LOBZOS



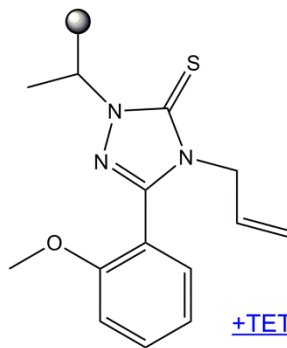
+LYRXC



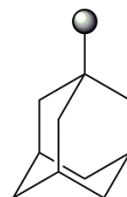
+MAFYOI



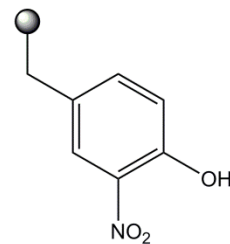
+NITFOL



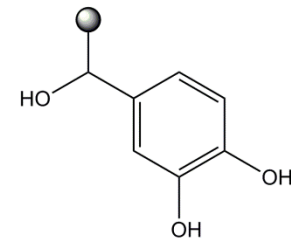
+TETYEX



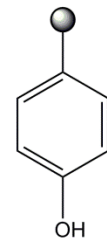
+UMURAW\*



+VIGBUI



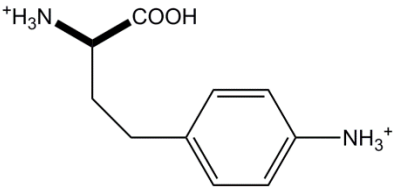
+XPSERC



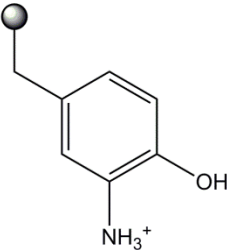
+ZIGJII  
+ZIGJOO



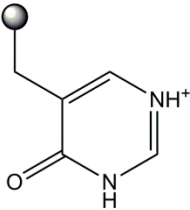
c(2)



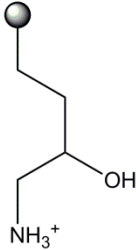
+AZOZIY



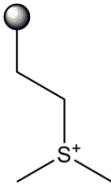
+FAPKEN



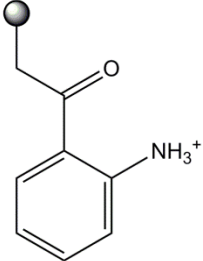
+QENMAX



+ROLCUR  
+ROLDAY

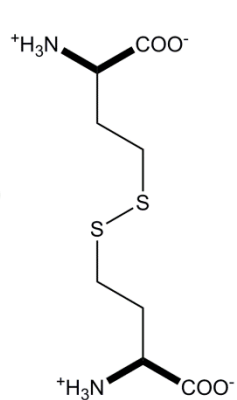


+SMMETC10



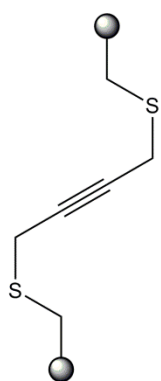
+WOCJON

**z(0)**



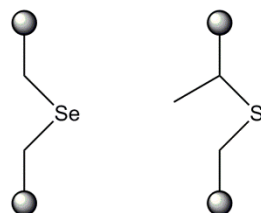
AMTBUA  
+AMTBUB

*DOLRUR*  
*JEDXAR*  
lanthionine  
*LANINE20*

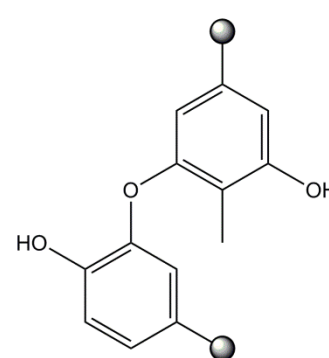


HUMSUD

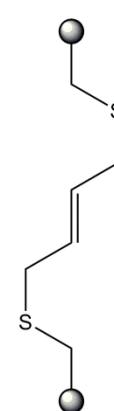
*JABPEH*  
selenolanthionine



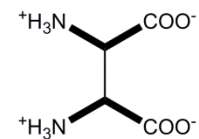
MLANTH10



SEGSAY

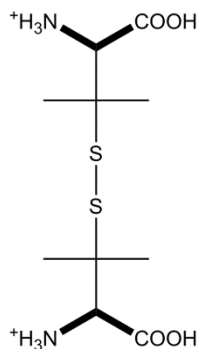


UGUGOS



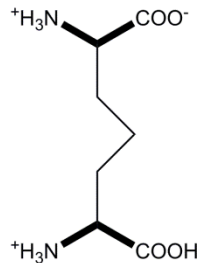
VUXJIH

**z(1)/mixed**

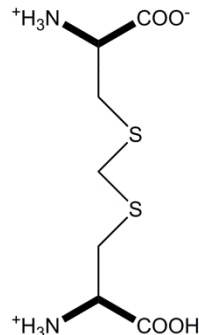


MDTBVL  
+PENICS10

MESO  
form

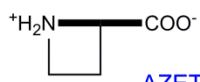


+LDAPCL  
+MDAPCL  
diaminopimelic acid

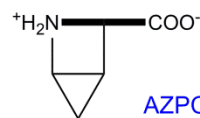


+BAZMOE

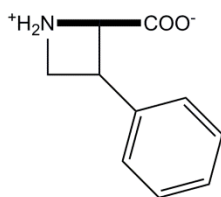
**z(0)**



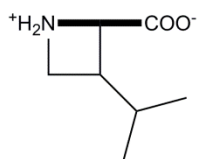
AZETAC



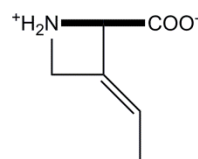
AZPCOH



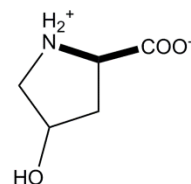
MATVAE



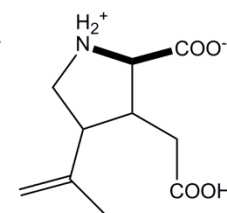
MATVEI



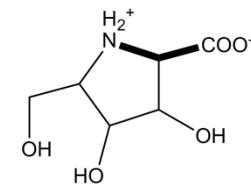
WAVKIN



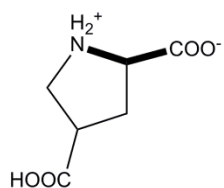
AHLPRO



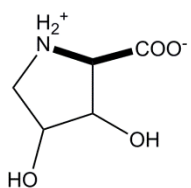
ALKINA01  
allo-kainic acid



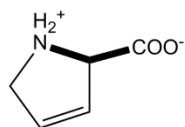
CUDCAG



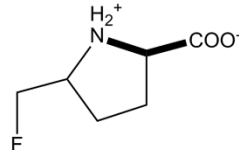
CXPROL



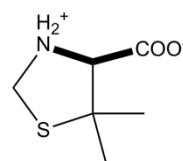
DHPROL10  
FIZDOH



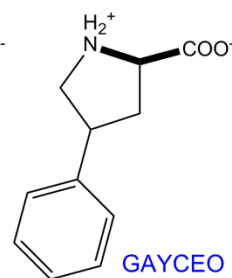
DHPROX



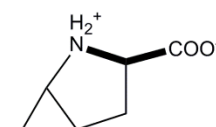
EQIHUI



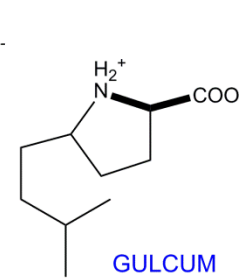
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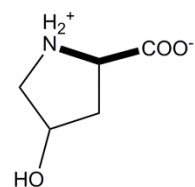
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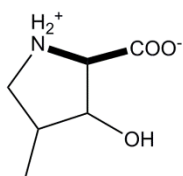
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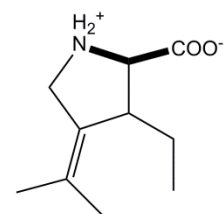
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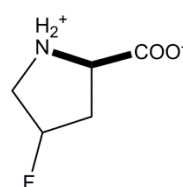
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-CAPROL10



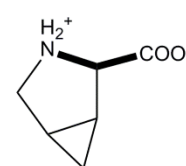
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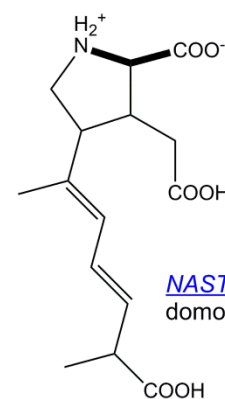
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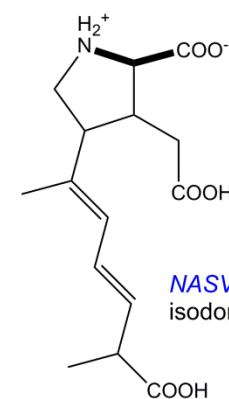
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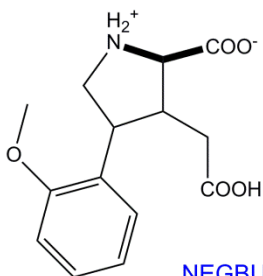
MPROLT  
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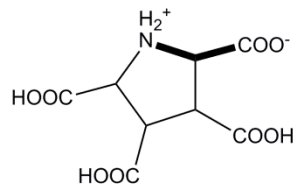
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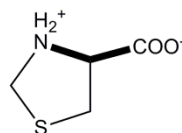
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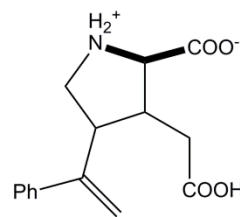
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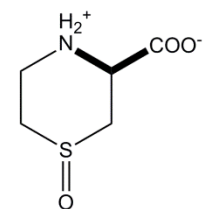
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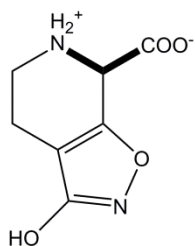
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TASOLC02  
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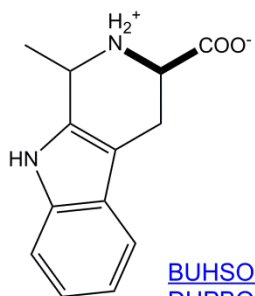
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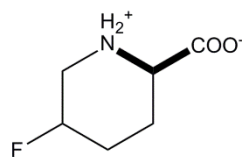
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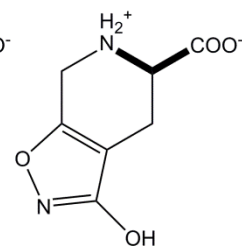
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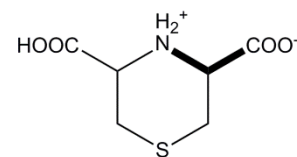
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DUPBOG



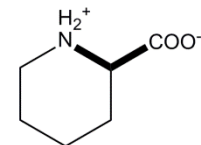
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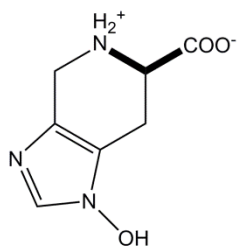
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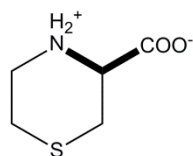
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LIVWOD



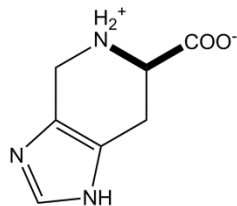
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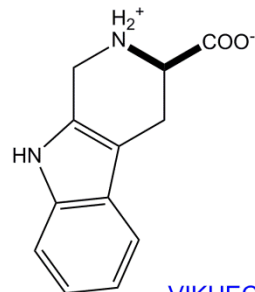
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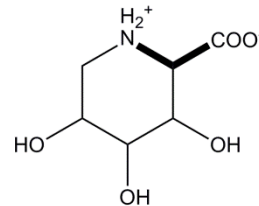
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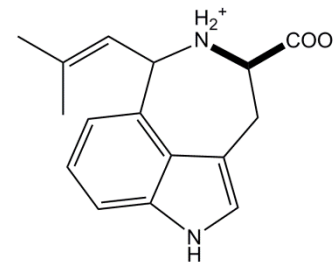
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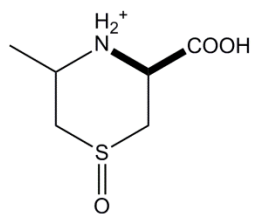
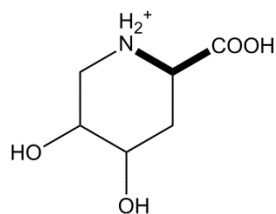
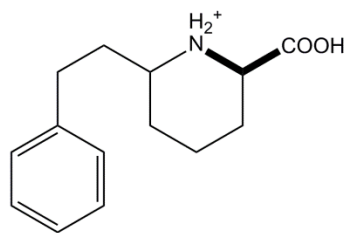
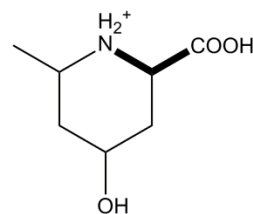
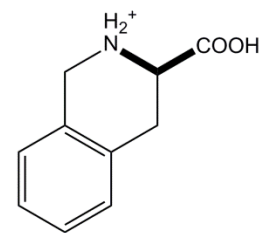
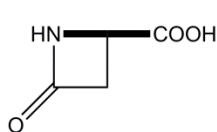
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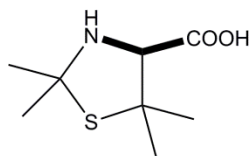
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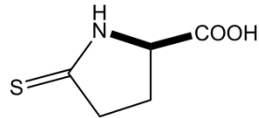
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UNAKOK

**c(1)**+CALHCL+CHPIPC  
+CPIPCL+PAWSUB+UTAFEBWAPYOC**n(0)**

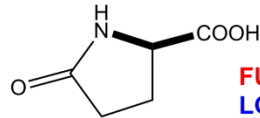
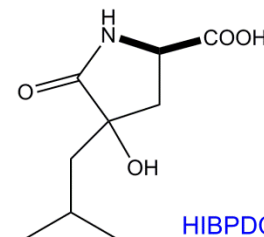
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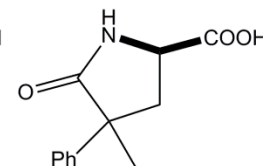
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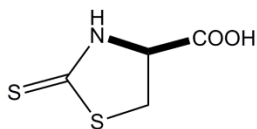
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FUHRAC  
LGPYRG  
LPYGLU  
PYRGLU01  
VAPMIX  
-VIWFOW

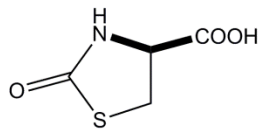
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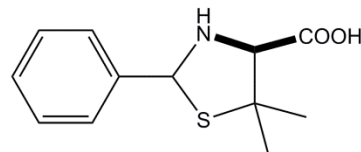
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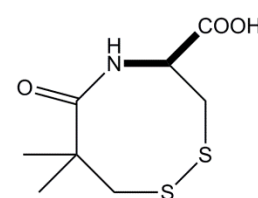
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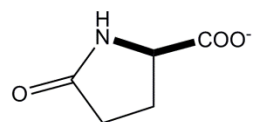
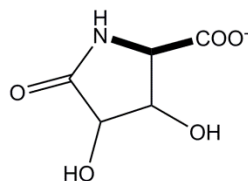
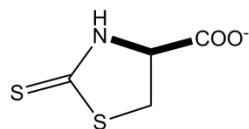
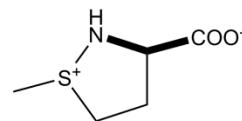
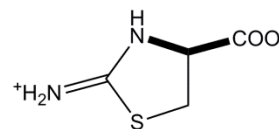
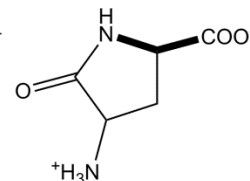
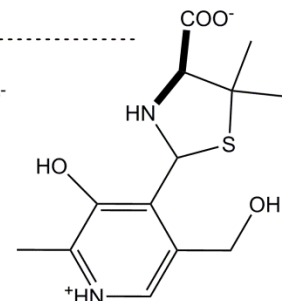
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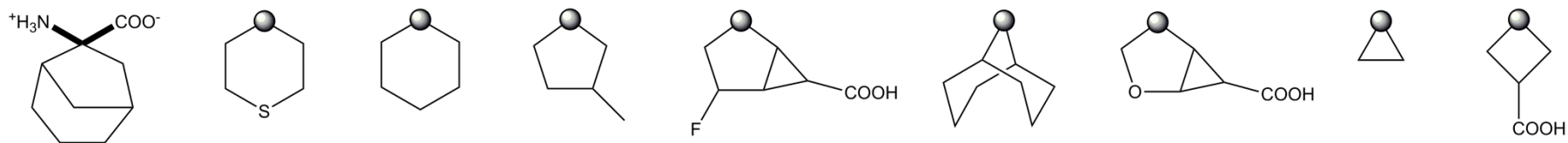
YESPER



KOWMEO

**a(-1)**-CPISIN-HOGZIN-LIWHAA  
-LIWHEE**a(0)**-DEHMET-IMIPID-KUTCOS

TAKGAN



[ABCOCK](#)

ACXTPY  
+ATPYCX

ACYHXA01  
+AMCHXC02

[AMPCPA10](#)

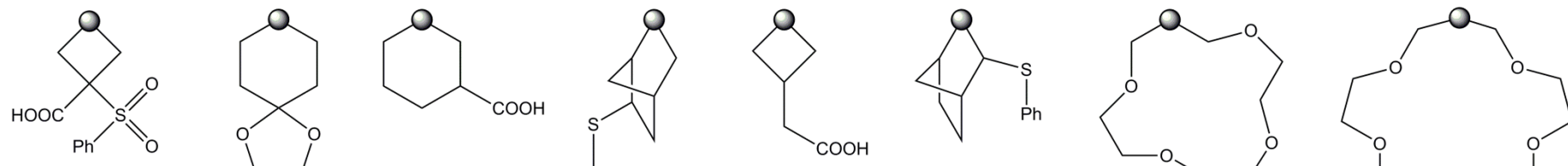
[BETCUS](#)

[CIHMUB](#)  
+ABCNCX

[COKJER](#)

[FOBJUB](#)

[GEHBIE01](#)  
[MEGLAC](#)



[GEHBOK](#)

JAPJUF

[JUXKES](#)

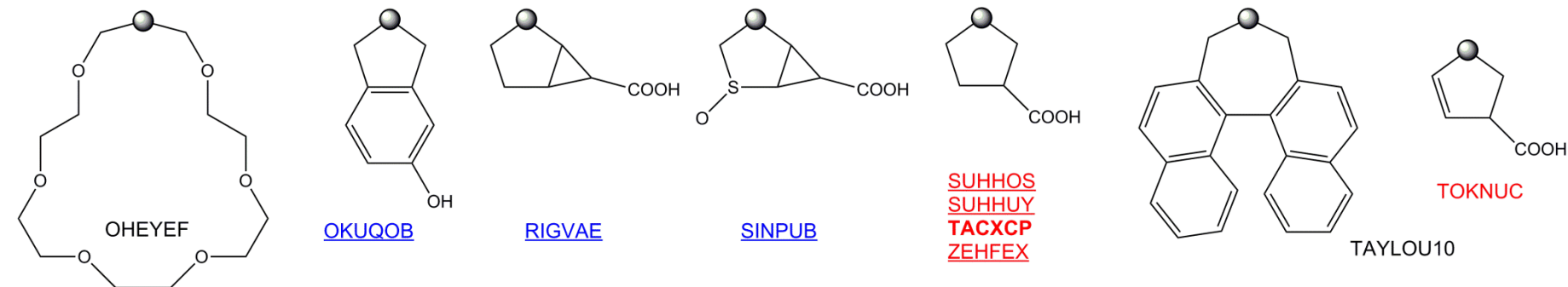
[KEPJOE](#)  
[PACWOF](#)

[KIDHOU](#)

[NAVKIG\\*](#)

OHEXUU

OHEYAB



OHEYEF

[OKUQOB](#)

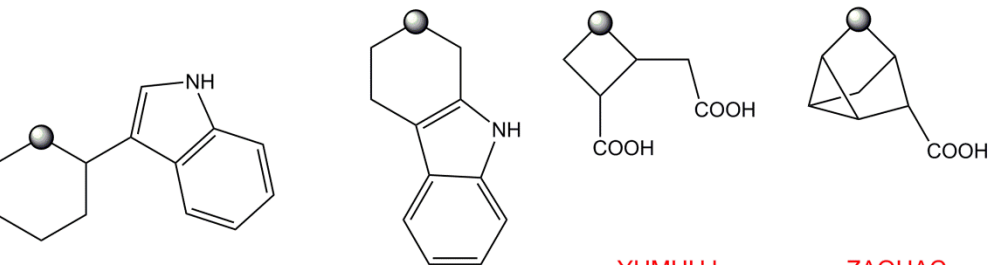
[RIGVAE](#)

[SINPUB](#)

[SUHHOS](#)  
[SUHHUY](#)  
[TACXCP](#)  
[ZEHFEX](#)

TAYLOU10

[TOKNUC](#)

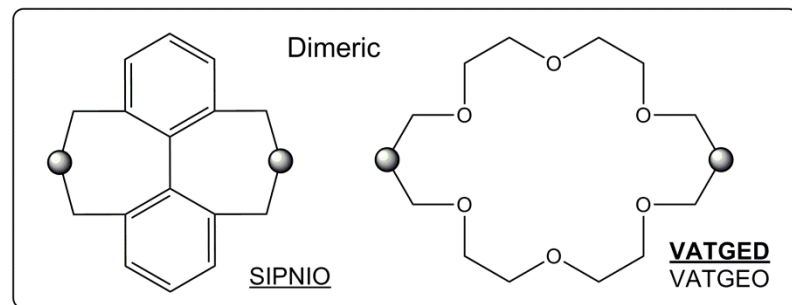


[UHAWUV](#)

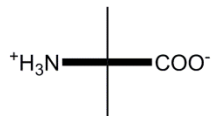
[YOFHEG](#)

[YUMHUJ](#)

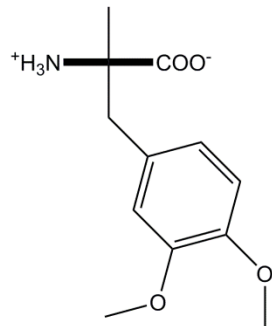
[ZAQHAC](#)



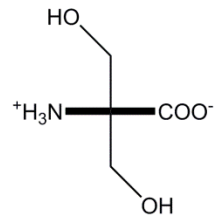
**z(0)**



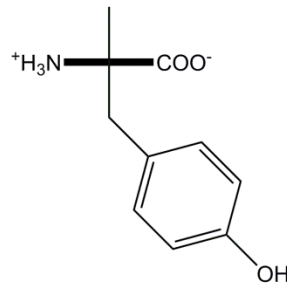
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+HOTHII  
+KENDOW



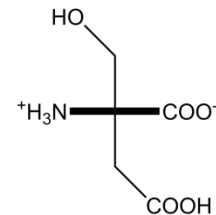
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COSGUM



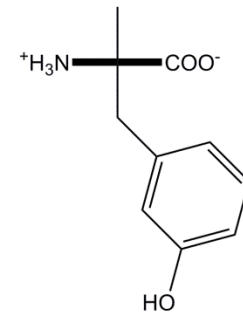
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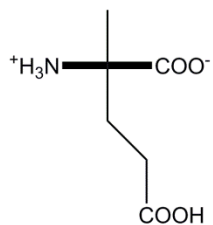
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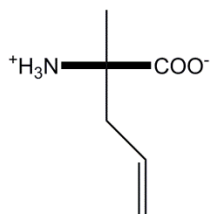
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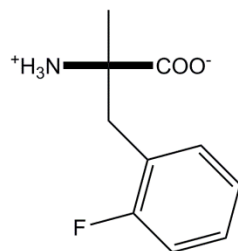
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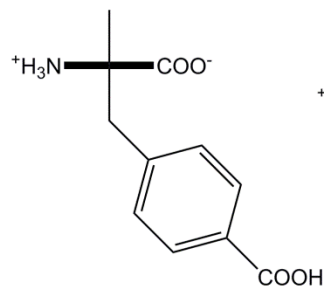
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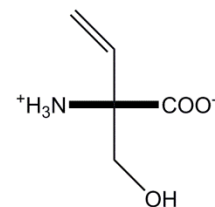
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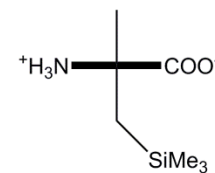
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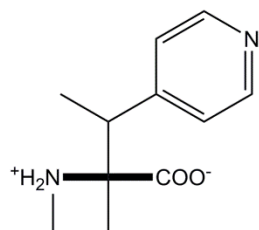
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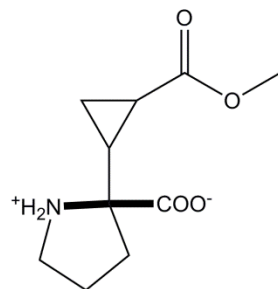
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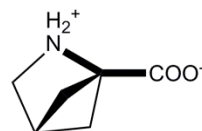
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TACLEO

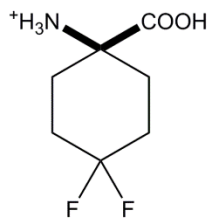


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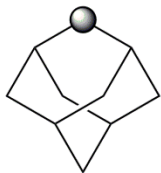


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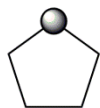
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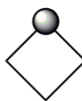
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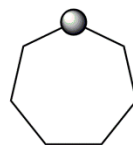
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+RECBAE



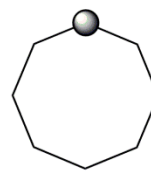
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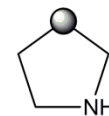
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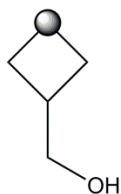
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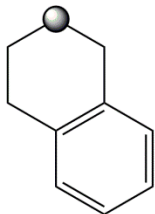
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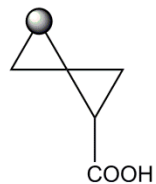
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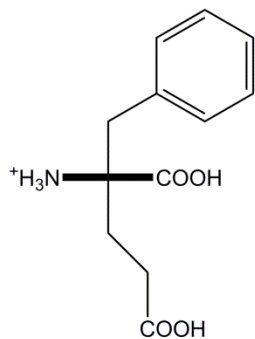
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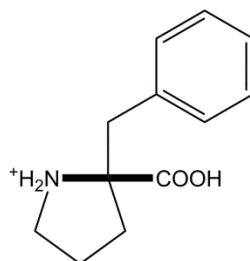
+RIPZOF



+UGIUW  
+UGIRAD  
+UGIREH

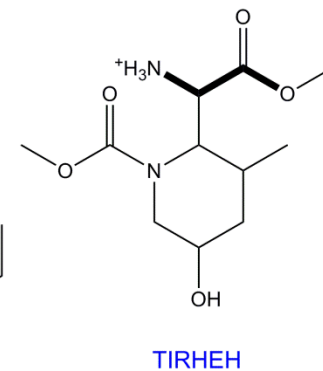
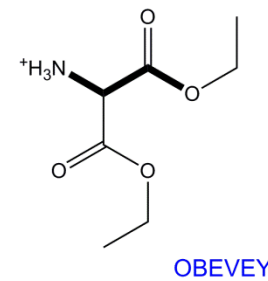
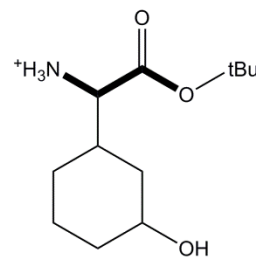
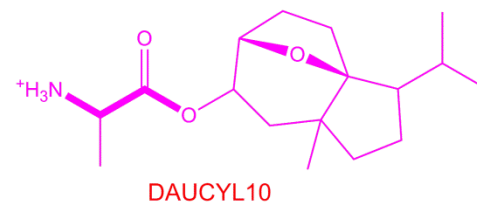
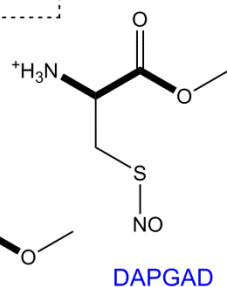
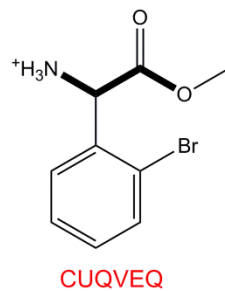
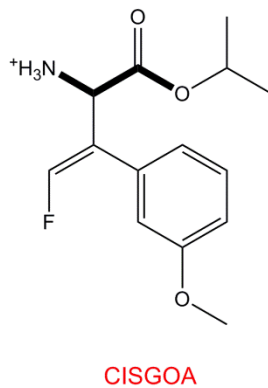
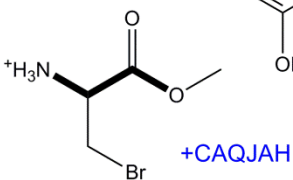
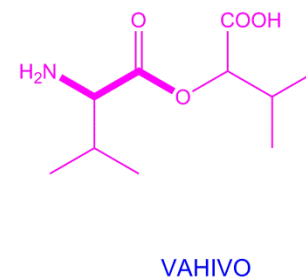
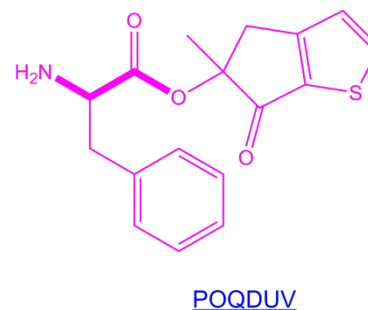
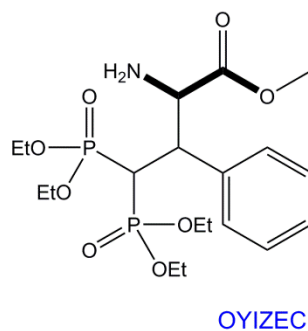
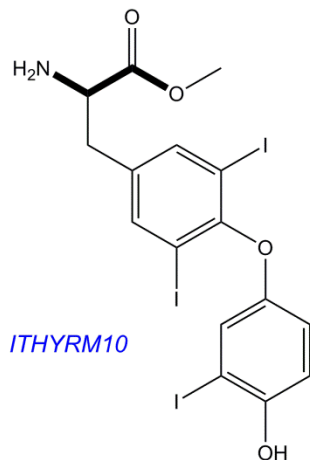
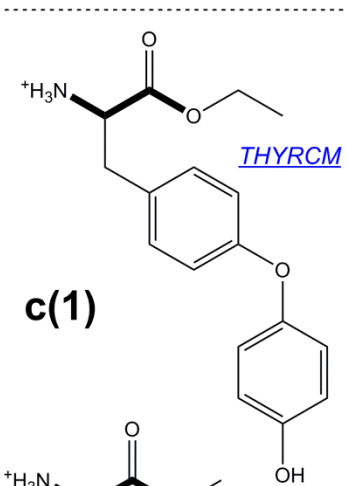
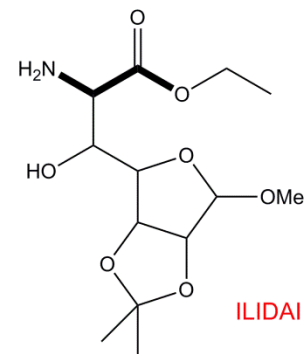
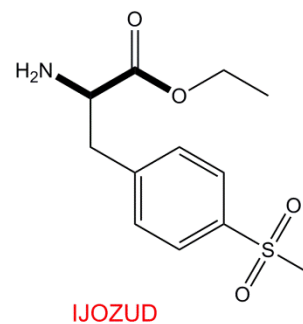
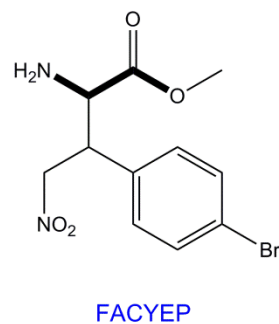
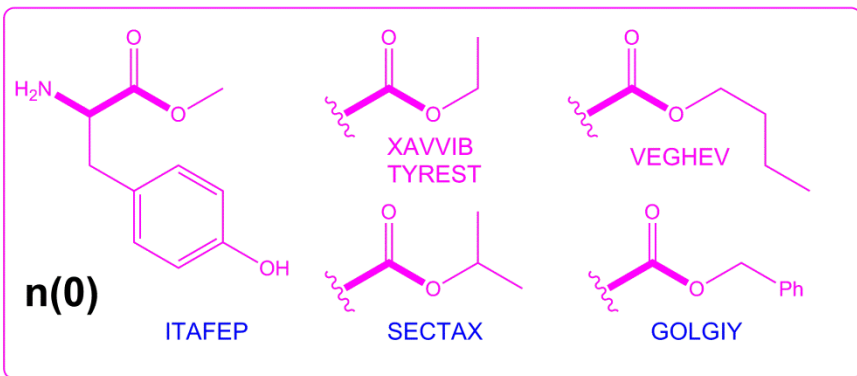


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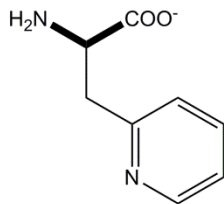




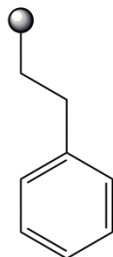
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amino acid

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**TRIDENTATE**  
 BIDENTATE ON  
*BIDENTATE NX'*  
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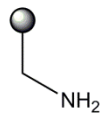
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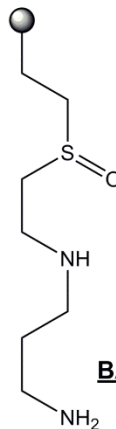
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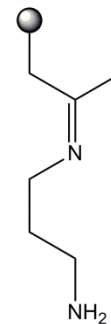
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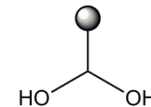
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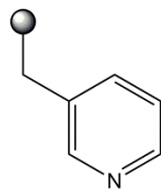
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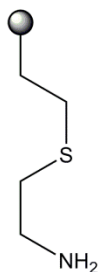
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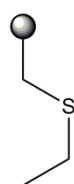
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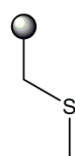
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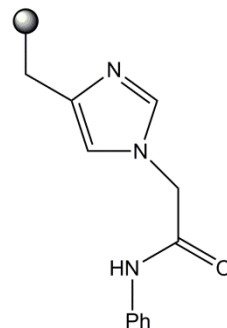
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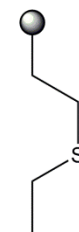
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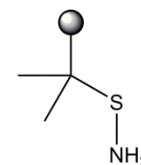
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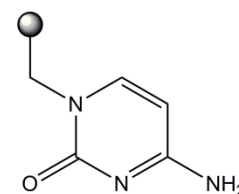
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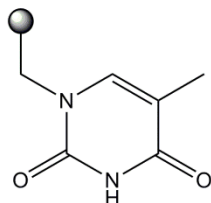
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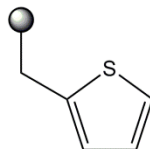
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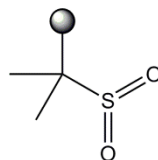
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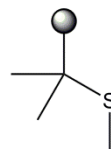
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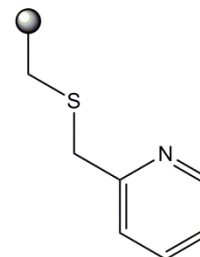
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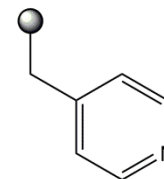
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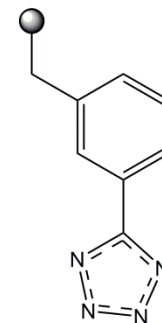
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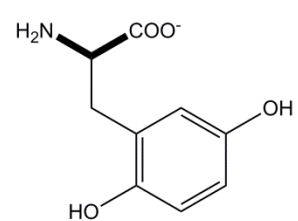
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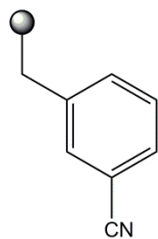
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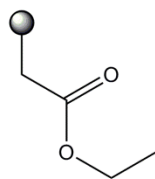
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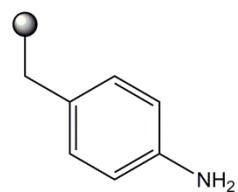
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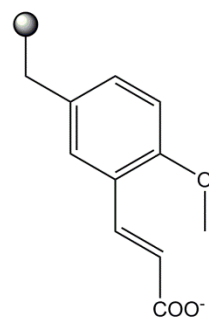
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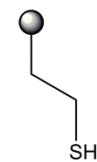
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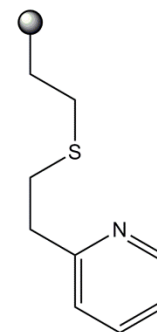
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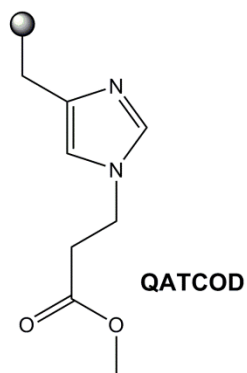
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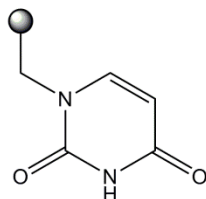
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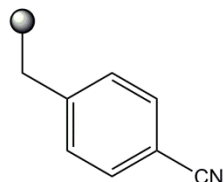
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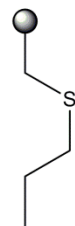
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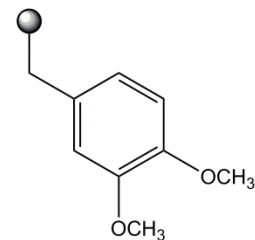
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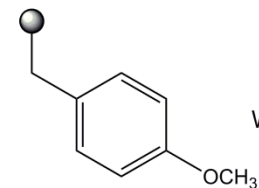
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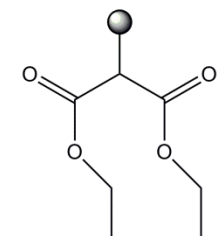
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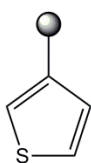
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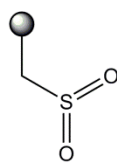
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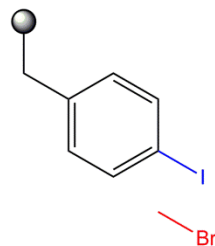
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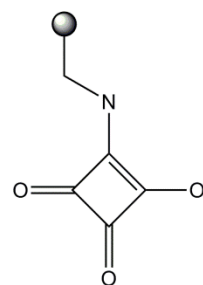
YESFEH



YIXPAW10



ZEDBOZ  
ZEDCAM01  
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ZILSES

