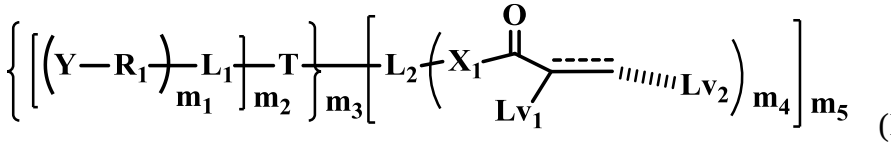
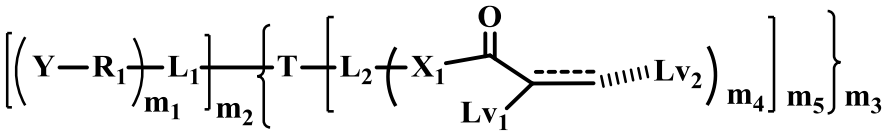
CLAIMS

1. A linker compound of the Formula (I) and (II):



(I)



(II)

wherein

"—" and "ıllıllı" represent a single bond, and "ıllıllı" can be an enantiomer or stereoisomer bond when linked to a single or a double bond;

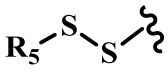
⚌ represents either a single bond, or a double bond, or a triple bond.

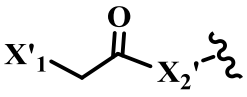
Lv_1 and Lv_2, represent the same or different leaving group that can be substituted by a thiol, and are selected from a halide (selected from, fluoride, chloride, bromide, and iodide), methanesulfonyl (mesyl), toluenesulfonyl (tosyl), trifluoromethyl-sulfonyl (triflate), trifluoromethylsulfonate, nitrophenoxyl, N-succinimidyloxyl (NHS), phenoxyl; dinitrophenoxyl; pentafluorophenoxyl, tetrafluorophenoxyl, trifluorophenoxyl, difluorophenoxyl, monofluorophenoxyl, pentachlorophenoxyl, 1H-imidazole-1-yl, chlorophenoxyl, dichlorophenoxyl, trichlorophenoxyl, tetrachlorophenoxyl, N-(benzotriazol-yl)oxyl, 2-ethyl-5-phenylisoxazolium-3′-sulfonyl, phenyloxadiazole-sulfonyl (-sulfone-ODA), 2-ethyl-5-phenylisoxazolium-yl, phenyloxadiazol-yl (ODA), oxadiazol-yl, or an intermediate molecule generated with a condensation reagent of EDC (N-(3-Dimethylaminopropyl)-N′-ethylcarbodiimide), DCC (Dicyclohexylcarbodiimide), N,N′-Diisopropylcarbodiimide (DIC), N-Cyclohexyl-N′-(2-morpholinoethyl)carbodiimide metho-p-toluenesulfonate (CMC,or CME-CDI), 1,1′-Carbonyldiimi-dazole (CDI), TBTU (O-(Benzotriazol-1-yl)-N,N,N′,N′-tetramethyluronium tetrafluoroborate), N,N,N′,N′-Tetramethyl-O-(1H-benzotriazol-1-yl)uronium hexafluorophosphate (HBTU), (Benzotriazol-1-yloxy)tris(dimethylamino)phosphonium hexafluorophosphate (BOP), (Benzotriazol-1-yloxy)tripyrrolidinophosphonium hexafluorophosphate (PyBOP), Diethyl cyanophosphonate (DEPC), Chloro-N,N,N′,N′-tetramethylformamidiniumhexafluorophosphate, 1-[Bis(dimethylamino)methylene]-1H-1,2,3-triazolo[4,5-b]pyridinium 3-oxid hexafluorophosphate (HATU), 1-[(Dimethylami-no)(morpholino)methylene]-1H-[1,2,3]triazolo[4,5-b]pyridine-1-ium 3-oxide hexafluorophosphate (HDMA), 2-Chloro-1,3-dimethylimidazolidinium hexafluorophosphate (CIP), Chlorotripyrrolidinophosphonium hexafluoro-

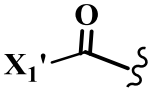
phosphate (PyCloP), Fluoro-N,N,N′,N′-bis(tetramethylene)formamidinium hexafluorophosphate (BTFFH), N,N,N′,N′-Tetramethyl-S-(1-oxido-2-pyridyl)thiuronium hexafluorophosphate, O-(2-Oxo-1(2H)pyridyl)-N,N,N′,N′-tetramethyluronium tetrafluoroborate (TPTU), S-(1-Oxido-2-pyridyl)-N,N,N′,N′-tetramethylthiuronium tetrafluoroborate, O-[(Ethoxycarbonyl)-cyanomethylenamino]-N,N,N′,N′-tetramethyluronium hexafluorophosphate (HOTU), (1-Cyano-2-ethoxy-2-oxoethylidenaminooxy) dimethylamino-morpholino-carbenium hexafluorophosphate (COMU), O-(Benzotriazol-1-yl)-N,N,N′,N′-bis(tetramethylene)uronium hexafluorophosphate (HBPyU), N-Benzyl-N′-cyclohexyl-carbodiimide (with, or without polymer-bound), Di-pyrrolidino(N-succinimidyl-oxy)carbenium hexafluoro-phosphate (HSPyU), Chlorodipyrrolidinocarbenium hexafluorophosphate (PyClU), 2-Chloro-1,3-dimethylimidazolidinium tetrafluoroborate(CIB), (Benzotriazol-1-yloxy)dipiperidino-carbenium hexafluorophosphate (HBPipU), O-(6-Chlorobenzotriazol-1-yl)-N,N,N′,N′-tetramethyluronium tetrafluoroborate (TCTU), Bromotris(dimethylamino)-phosphonium hexafluorophosphate (BroP), Propylphosphonic anhydride (PPACA, T3P®), 2-Morpholinoethyl isocyanide (MEI), N,N,N′,N′-Tetramethyl-O-(N-succinimidyl)uronium hexafluorophosphate (HSTU), 2-Bromo-1-ethyl-pyridinium tetrafluoroborate (BEP), O-[(Ethoxycarbonyl)cyano-methylenamino]-N,N,N′,N′-tetra-methyluronium tetrafluoroborate (TOTU), 4-(4,6-Dimethoxy-1,3,5-triazin-2-yl)-4-methylmorpholiniumchloride (MMTM, DMTMM), N,N,N′,N′-Tetramethyl-O-(N-succinimidyl)uronium tetrafluoroborate (TSTU), O-(3,4-Dihydro-4-oxo-1,2,3-benzotriazin-3-yl)-N,N,N′,N′-tetramethyluronium tetrafluoro-borate (TDBTU),1,1′-(Azodicarbonyl)-dipiperidine (ADD), Di-(4-chlorobenzyl)azodicarboxylate (DCAD), Di-tert-butyl azodicarboxylate (DBAD),Diisopropyl azodicarboxylate (DIAD), or Diethyl azodicarboxylate (DEAD);

when ==== represents a double bond, either Lv_1 or Lv_2 can be H, but they are not H at the same time; when ===== represents a triple bond, Lv_1 is absent and Lv_2 can optionally be H;

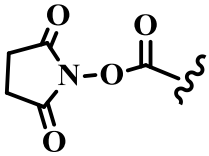
Y is a function group that enables to react with a drug or a cytotoxic agent, to form a disulfide, ether, ester, thioether, thioester, peptide, hydrazone, carbamate, carbonate, amine (secondary, tertiary, or quarter), imine, cycloheteroalkyane, heteroaromatic, alkyloxime or amide bond; Y is selected from the following structures:

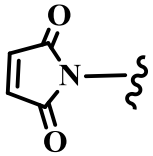


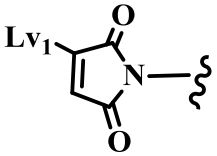
disulfide;


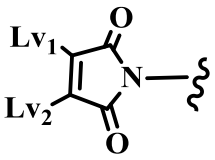
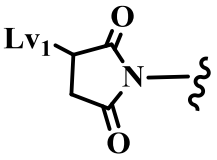
haloacetyl;


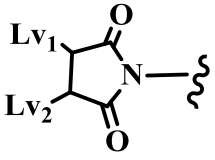
acyl halide (acid halide);

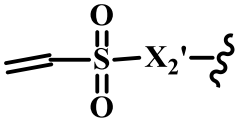
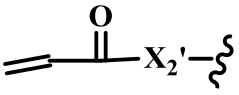


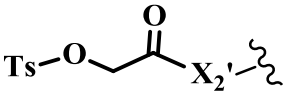
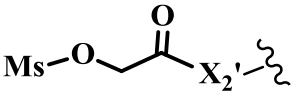
N-hydroxysuccinimide ester;


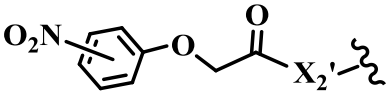
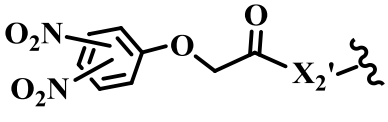
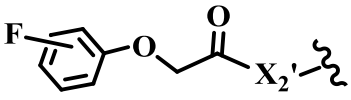
maleimide;


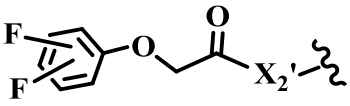
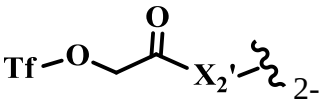
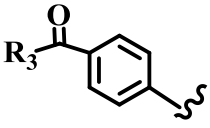
monosubstituted maleimide;  disubstituted maleimide; 

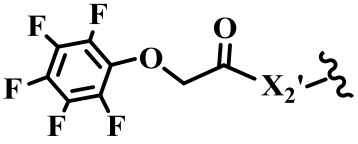
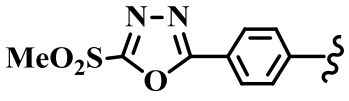
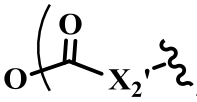
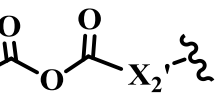
monosubstituted succinimide;  disubstituted succinimide; -CHO aldehyde;

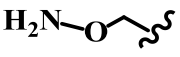
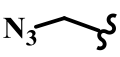
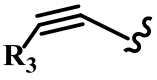
 ethenesulfonyl;  acryl (acryloyl);

 2-(tosyloxy)acetyl;  2-(mesyloxy)acetyl;

 2-(nitrophenoxy)acetyl;  2-(dinitrophenoxy)acetyl;  2-(fluorophenoxy)-acetyl;

 2-(difluorophenoxy)-acetyl;  2-(((trifluoromethyl)-sulfonyl)oxy)acetyl;  ketone, or aldehyde,

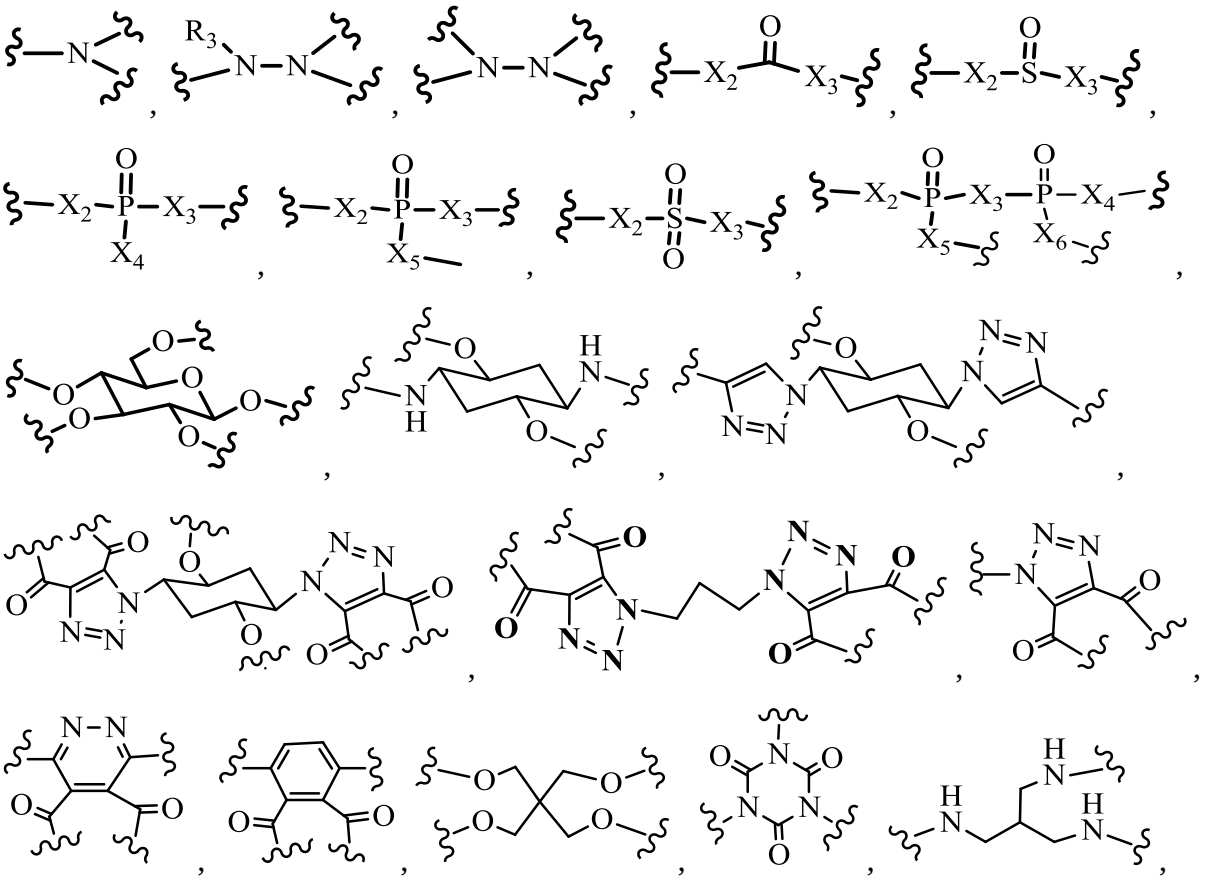
 2-(pentafluorophenoxy)acetyl;  , methyl-sulfonephenyloxadiazole (ODA);  ,  acid anhydride,

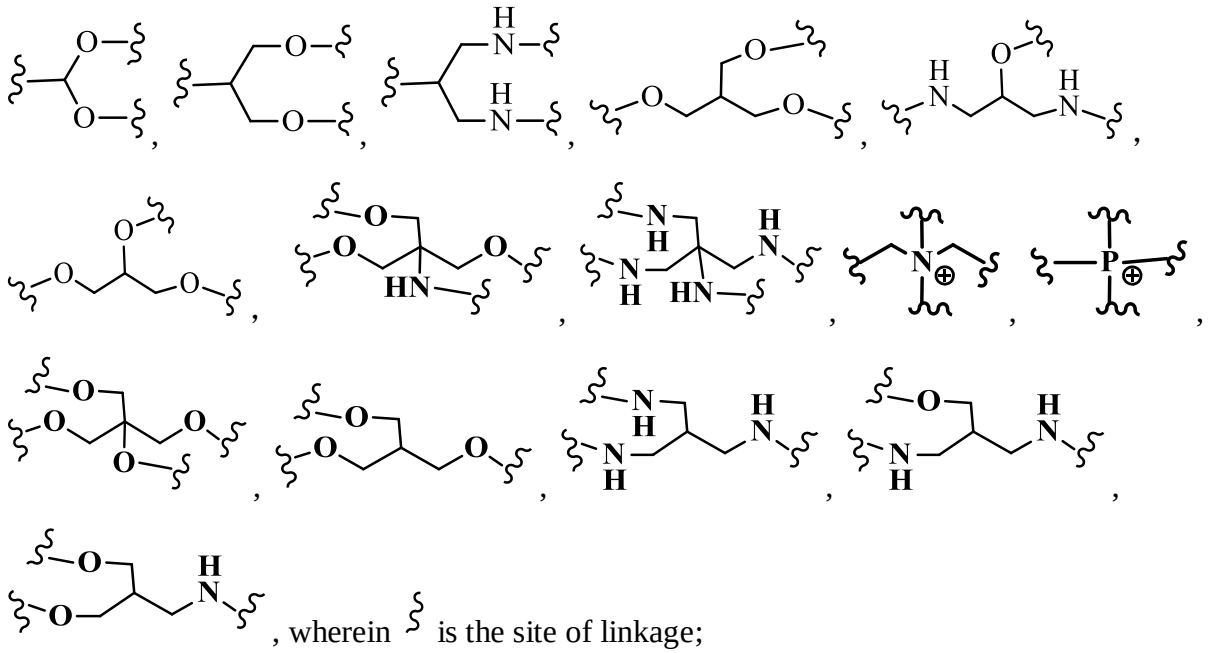
 alkyloxyamino;  azido,  alkynyl, or  hydrazide. wherein X_1' is F, Cl, Br, I or Lv_3; X_2' is O, NH, N(R_1), or CH_2; R_5 is H, C_1-C_8 of alkyl; C_2-C_8 of heteroalkyl, alkylcycloalkyl, heterocycloalkyl; C_3-C_8 of aryl, Ar-alkyl, aromatic, heteroaromatic, or aromatic group wherein one or several H atoms are replaced independently by -C_1-C_8 of alkyl; C_2-C_8 of heteroalkyl, alkylcycloalkyl, heterocycloalkyl; C_3-C_8 of aryl, Ar-alkyl,, -halogen, -OR_1, -SR_1, -NR_1R_2, - NO_2, -$S(O)R_1$,-$S(O)_2R_1$, or -$COOR_1$; Lv_3 is a leaving group se-

lected from nitrophenol; N-hydroxysuccinimide (NHS); phenol; dinitrophenol; pentafluorophenol; tetrafluorophenol; difluorophenol; monofluorophenol; pentachlorophenol; triflate; imidazole; dichlorophenol; tetrachlorophenol; 1-hydroxybenzotriazole; tosylate; mesylate; 2-ethyl-5-phenylisoxazolium-3′-sulfonate, anhydrides formed its self, or formed with the other anhydride, selected from acetyl anhydride, formyl anhydride; or an intermediate molecule generated with a condensation reagent for peptide coupling reactions or for Mitsunobu reactions;

R_1 can be absent, or is selected from C_1-C_8 of alkylene; C_2-C_8 of heteroalkylene, alkylcycloalkylene, heterocycloalkylene; C_3-C_8 of arylene, Ar-alkylene, heterocyclic, carbocyclic, cycloalkylene, heteroalkylcycloalkylene, alkylcarbonyl, heteroarylene; or C_2-C_8 (2- 8 carbon atoms) of ester, ether, amide, amines, imines, polyamines, hydrazines, hydrazones, ureas, semicarbazides, carbazides, alkoxyamines, alkoxylamines, urethanes, amino acids, acyloxylamines, glycosides, or hydroxamic acids; or peptides containing 1-8 amino acids, or polyethyleneoxy unit of formula $(OCH_2CH_2)_p$ or $(OCH_2CH(CH_3))_p$, wherein p is an integer from 1 to about 1000, or combination of above groups thereof;

T is CH_2, NH, NHNH, $N(R_3)$, $N(R_3)N(R_{3'})$, O, S, C_2-C_8 of heteroalkylene, alkylcycloalkylene, heterocycloalkylene; C_3-C_8 of arylene, Ar-alkylene, heterocyclic, carbocyclic, cycloalkylene, heteroalkylcycloalkylene, alkylcarbonyl, heteroarylene; a peptide containing1~4 units of amino acids; or one of the following structures:





, wherein ~ is the site of linkage;

X_1, X_2, X_3, X_4, X_5, X_6, X_1', X_2' and X_3' are independently selected from NH; NHNH; $N(R_3)$; $N(R_3)N(R_{3'})$; O; S; C_1-C_6 of alkylene; C_2-C_6 of heteroalkylene, alkylcycloalkylene, heterocycloalkylene; C_3-C_8 of arylene, Ar-alkylene, heterocyclic, carbocyclic, cycloalkylene, heteroalkylcycloalkylene, alkylcarbonylene, heteroarylene; or 1~8 amino acids;

m_1, m_2, m_4 and are independently an integer from 1 to 10, preferably from 1 to 4;

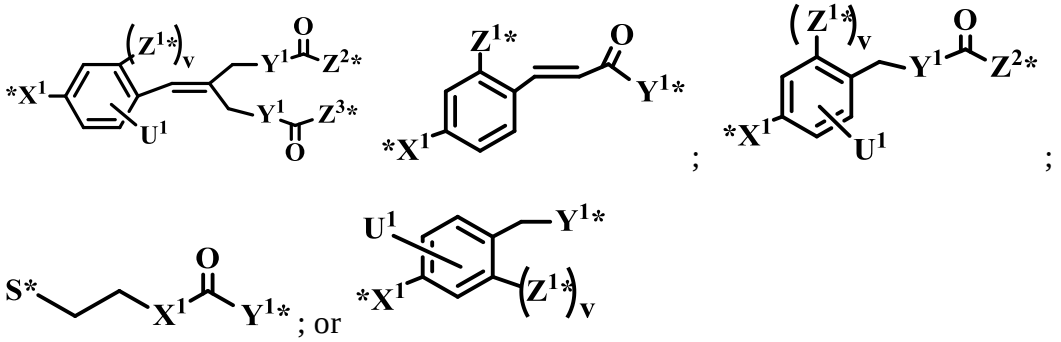
m_3 and m_5 are independently 1 or 2;

L_1 and L_2 are, the same or different, independently selected from O, NH, S, NHNH, $N(R_3)$, $N(R_3)N(R_3')$, polyethyleneoxy unit of formula $(OCH_2CH_2)_pOR_3$, or $(OCH_2CH(CH_3))_pOR_3$, or $NH(CH_2CH_2O)_pR_3$, or $NH(CH_2CH(CH_3)O)_pR_3$, or $N[(CH_2CH_2O)_pR_3][(CH_2CH_2O)_{p'}R_3']$, or $(OCH_2CH_2)_pC(=O)X_1R_3$, or $CH_2CH_2(OCH_2CH_2)_pC(=O)X_1R_3$, wherein p and p' are independently an integer selected from 1 to about 1000, or combination thereof; C_1-C_8 of alkylene; C_2-C_8 of heteroalkylene, alkylcycloalkylene, heterocycloalkylene; C_3-C_8 of arylene, Ar-alkylene, heterocyclic, carbocyclic, cycloalkylene, heteroalkylcycloalkylene, alkylcarbonyl, heteroarylene;

wherein R_3 and R_3' are independently H; C_1-C_8 of alkylene; C_2-C_8 of hetero-alkylene, alkylcycloalkylene, heterocycloalkylene; C_3-C_8 of arylene, Ar-alkylene, heterocyclic, carbocyclic, cycloalkylene, heteroalkylcycloalkylene, alkylcarbonylene, heteroarylene; or 1-8 carbon atoms of esters, ether, or amide; or 1~8 amino acids; or polyethyleneoxy unit of formula $(OCH_2CH_2)_p$ or $(OCH_2CH(CH_3))_p$, wherein p is an integer from 0 to about 1000, or combination above thereof.

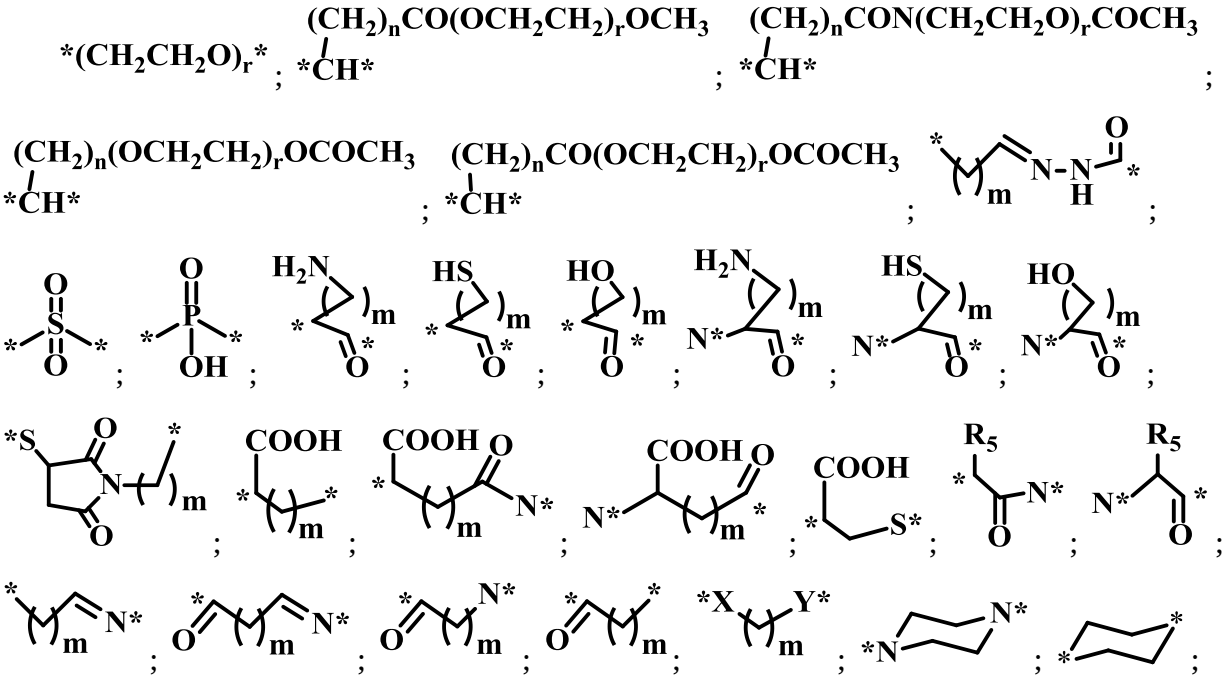
L_1 or L_2 may contain a group of self-immolative or a non-self-immolative component, peptidic units (1~8 of natural or unnatural amino acids), a hydrazone bond, a disulfide, an

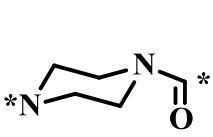
ester, an oxime, an amide, or a thioether bond. The self-immolative unit is selected from group of a para-aminobenzylcarbamoyl (PAB) group, 2-aminoimidazol-5-methanol derivatives, heterocyclic PAB analogs, beta-glucuronide, and ortho or para-aminobenzylacetals, or one of the following structures:



wherein the (*) atom is the point of attachment of additional spacer or releasable linker units, or a cytotoxic agent, and/or a cell-binding molecule (CBA); X^1, Y^1, Z^2 and Z^3 are independently NH, O, or S; Z^1 is independently H, NHR_1, OR_1, SR_1, COX_1R_1, wherein X_1 and R_1 are defined above; v is 1; U^1 is independently H, OH, C_1~C_6 alkyl, $(OCH_2CH_2)_n$, F, Cl, Br, I, OR_5, SR_5, NR_5R_5', N=NR_5, N=R_5, NR_5R_5', NO_2, SOR_5R_5', SO_2R_5, SO_3R_5, OSO_3R_5, PR_5R_5', POR_5R_5', $PO_2R_5R_5$', $OPO(OR_5)(OR_5')$, or $OCH_2PO(OR_5(OR_5')$ wherein R_5 and R_5' are independently selected from H, C_1~C_8 of alkyl; C_2~C_8 of alkenyl, alkynyl, heteroalkyl, or aminocaine; C_3~C_8 of aryl, heterocyclic, carbocyclic, cycloalkyl, heterocycloalkyl, heteroaralkyl, alkylcarbonyl, or glycoside; or pharmaceutical cation salts.

the non-self-immolative linker component is selected from one of following structures:

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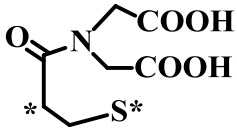
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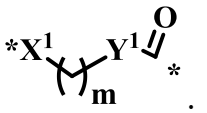
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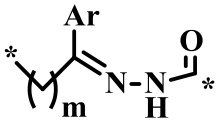
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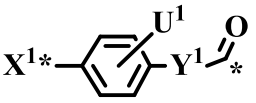
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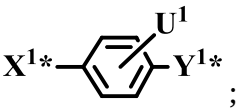
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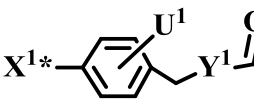
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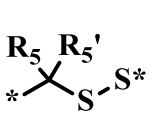
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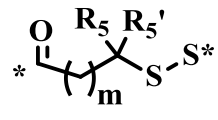
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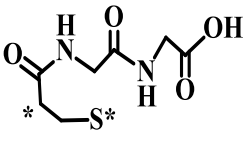
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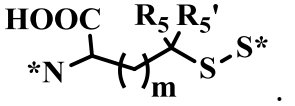
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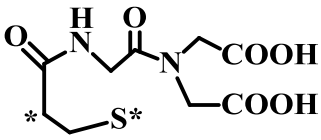
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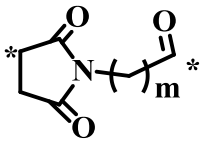
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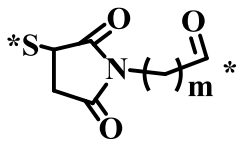
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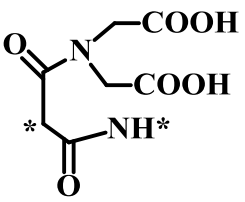
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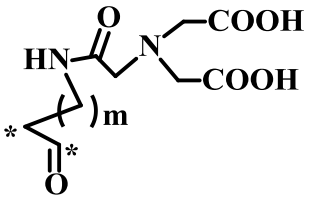
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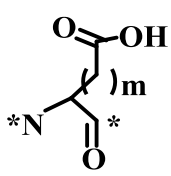
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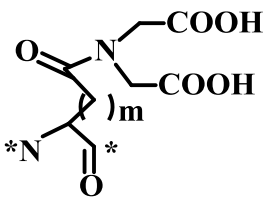
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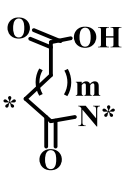
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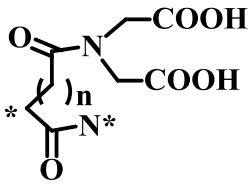
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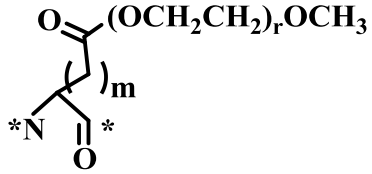
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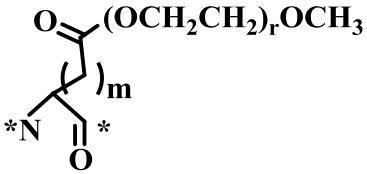
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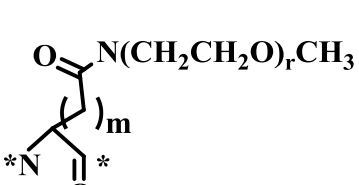
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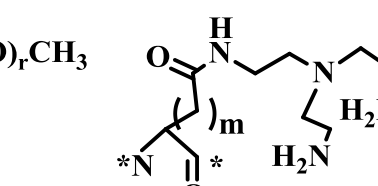
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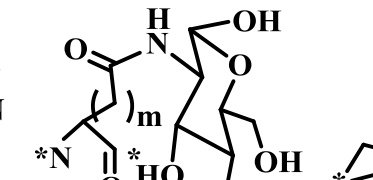
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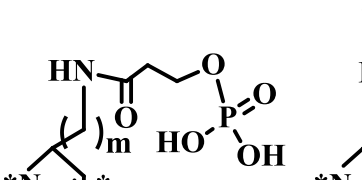
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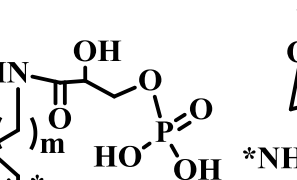
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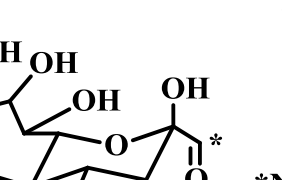
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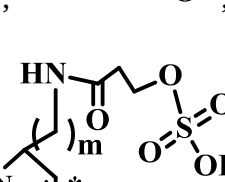
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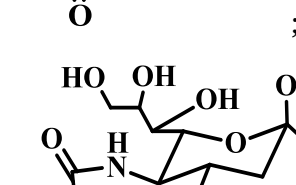
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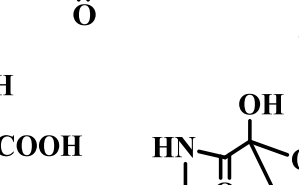
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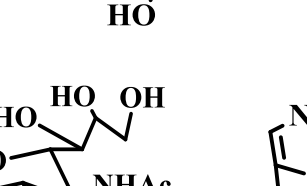
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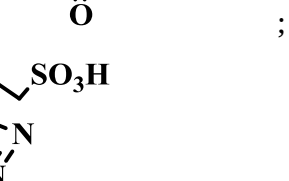
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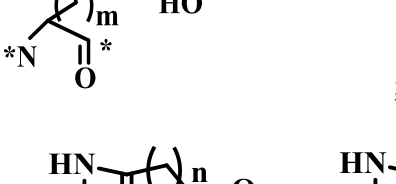
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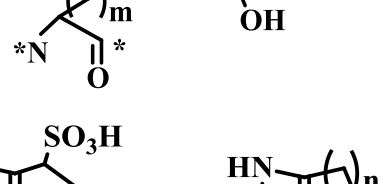
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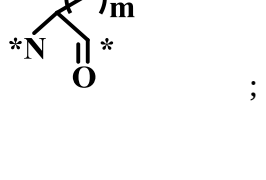
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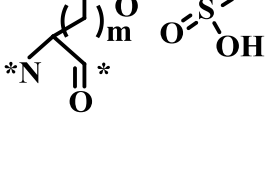
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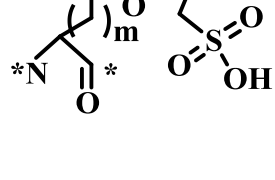
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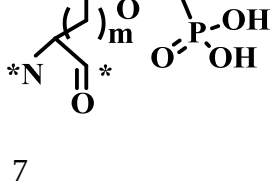
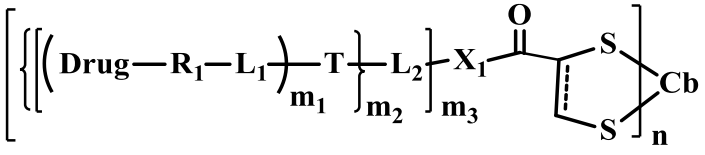

;

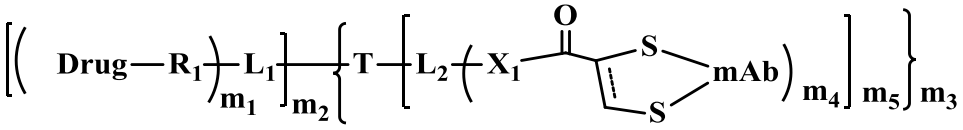
wherein the (*) atom is a point of attachment of additional spacer or releasable linker, a cytotoxic agent, and/or a binding molecule; r is 0~100; m and n are 0~6 independently;

In addition, L_1, L_2, X_1, X_2, X_3, X_1', X_2' and X_3' can be independently absent.

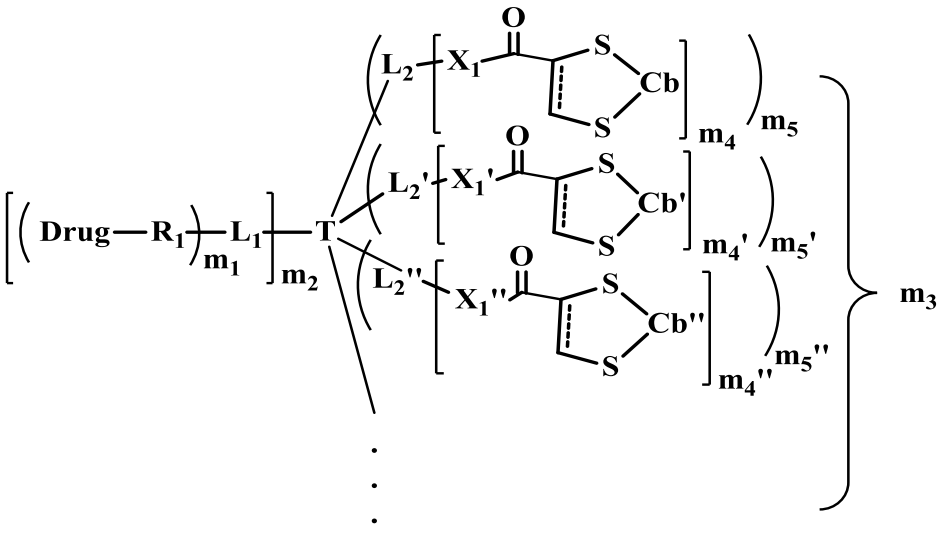
2. A cell-binding agent-drug conjugate compound of Formula (III), (IV), (V), (VI), (VII), (VIII), or (IX) :



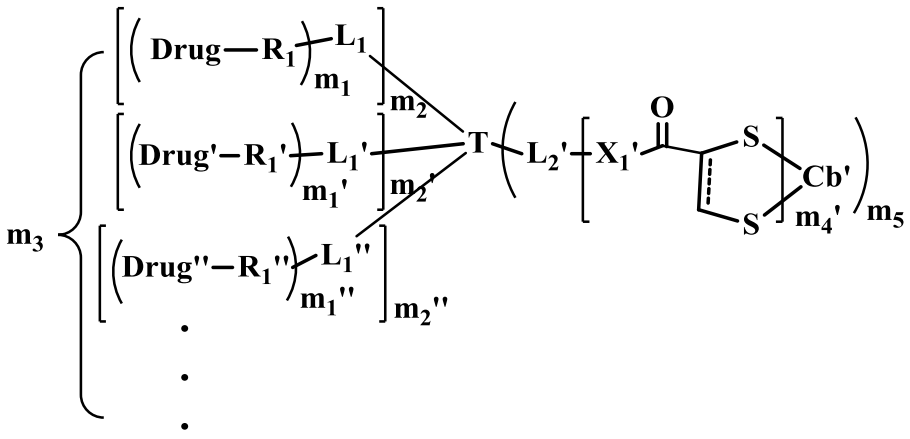
(III),



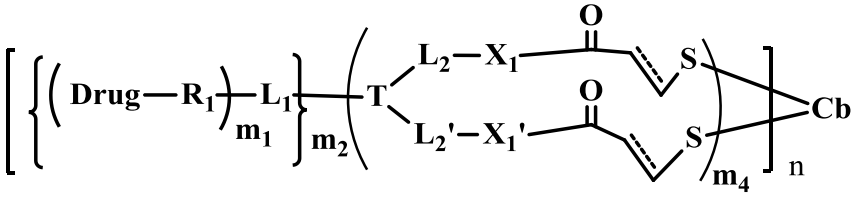
(IV),



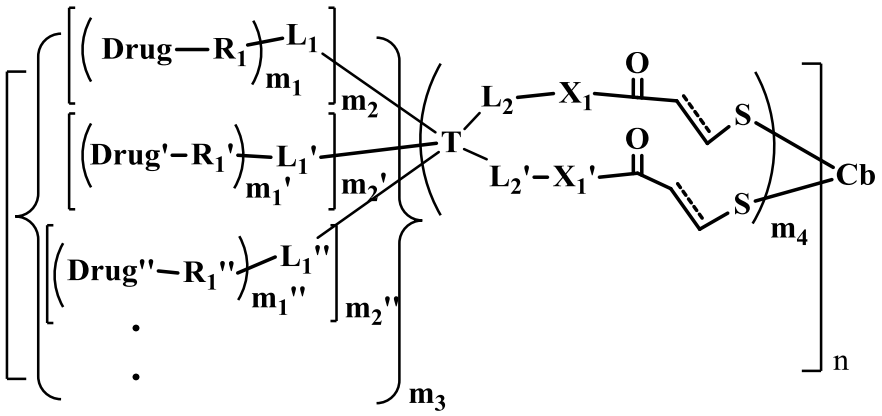
(V),



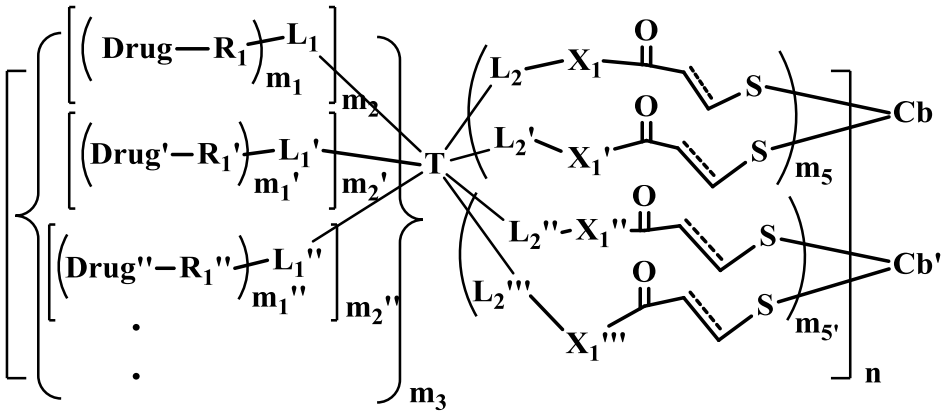
(VI),



(VII),



(VIII),



(IX),

Wherein:

n is 1 ~ 20; and T is described the same previously in Formula (I).

Cb, Cb', Cb'', represent the same or different, a cell-binding agent/molecule, or an immunotherapeutical protein, preferably an antibody or an antibody fragment.

Drug, Drug', and Drug" represent the same or different of, a cytotoxic agent, or a therapeutic drug, or an immunotherapeutical protein, an antibody or an antibody fragment, or siRNA, miRNA, mRNA, piRNA, or DNA, or a function molecule for enhancement of binding or stabilization of the cell-binding agent, or a cell-surface receptor binding ligand, which is linked to the cell-binding agent via the linker of the patent through R_1, R_1', and R_1'' respectively containing an C_1-C_8 of alkylene; C_2-C_8 of alkenylene, alkynylene, aromatic, ether, polyoxyalkylene, ester, amine, imine, polyamine, hydrazine, hydrazone, amide, urea, semicarbazide, carbazide, alkoxyamine, urethanes, amino acid, peptide, acyloxylamine, hydroxamic acid, disulfide, thioether, thioester, carbamate, carbonate, heterocyclic ring, heteroalkyl, heteroaromatic, or alkoxime; or combination above thereof;

"-----" represents either single bond or double bond;

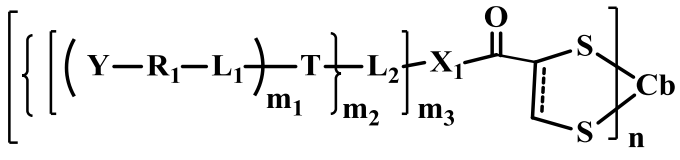
m_1, m_1', m_1'', m_2, m_2', m_2'', m_3, m_4, m_5, m_4', m_5', m_4'', m_5'', m_4''', m_5''', are independently an integer from 1 to 10.

X_1, X_1', X_1'', X_1''' are independently selected from NH; NHNH; $N(R_3)$; $N(R_3)N(R_3')$; O; S; C_1-C_6 of alkylene; C_2-C_6 of heteroalkylene, alkylcycloalkylene, heterocycloalkylene; C_3-C_8 of arylene, Ar-alkylene, heterocyclic, carbocyclic, cycloalkylene, heteroalkylcycloalkylene, alkylcarbonyl, heteroarylene; or 1~8 amino acids; wherein R_3 and R_3' are independently H;C_1-C_8 of alkylene; C_2-C_8 of hetero-alkylene, alkylcycloalkylene, heterocycloalkylene; C_3-C_8 of arylene, Ar-alkylene, heterocyclic, carbocyclic, cycloalkylene, heteroalkylcycloalkylene, alkylcarbonyl, heteroarylene; or 1-8 carbon atoms of esters, ether, or amide; or polyethyleneoxy unit of formula $(OCH_2CH_2)_p$ or $(OCH_2CH(CH_3))_p$, wherein p is an integer from 0 to about 1000, or combination above thereof. In addition, X_1, X_1', X_1'', X_1''' can be independently absent.

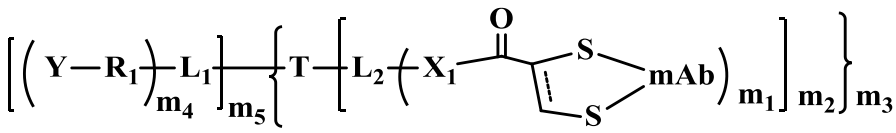
R_1, R_1', and R_1'', are the same or different, selected from C_1-C_8 of alkylene; C_2-C_8 of heteroalkylene, alkylcycloalkylene, heterocycloalkylene; C_3-C_8 of arylene, Ar-alkylene, heterocyclic, carbocyclic, cycloalkylene, heteroalkylcycloalkylene, alkylcarbonyl, heteroarylene; or C_2-C_8 of esters, ether, or amide; or polyethyleneoxy unit of formula $(OCH_2CH_2)_p$ or $(OCH_2CH(CH_3))_p$, wherein p is an integer from 0 to about 1000, or combination of above groups thereof.

L_1, L_1', L_1'', L_1''', L_2, L_2', L_2'' and L_2''' are the same or different and defined the same as L_1 and L_2 in Claim 1. L_1, L_1', L_1'', L_1''', L_2, L_2', L_2'' and L_2''' may be composed of one or more linker components, selected from 6-maleimidocaproyl ("MC"), maleimidopropanoyl ("MP"), valine-citrulline ("val-cit" or "vc"), alanine-phenylalanine ("ala-phe" or "af"), p-aminobenzyloxycarbonyl ("PAB"), 4-thiopentanoate ("SPP"), 4-(N-maleimidomethyl)-cyclohexane-1 carboxylate ("MCC"), (4-acetyl)aminobenzoate ("SIAB"), 4-thio-butyrate (SPDB), 4-thio-2-hydroxysulfonyl-butyrate (2-Sulfo-SPDB), ethyleneoxy $-CH_2CH_2O-$- as one or more repeating units ("EO" or "PEO").

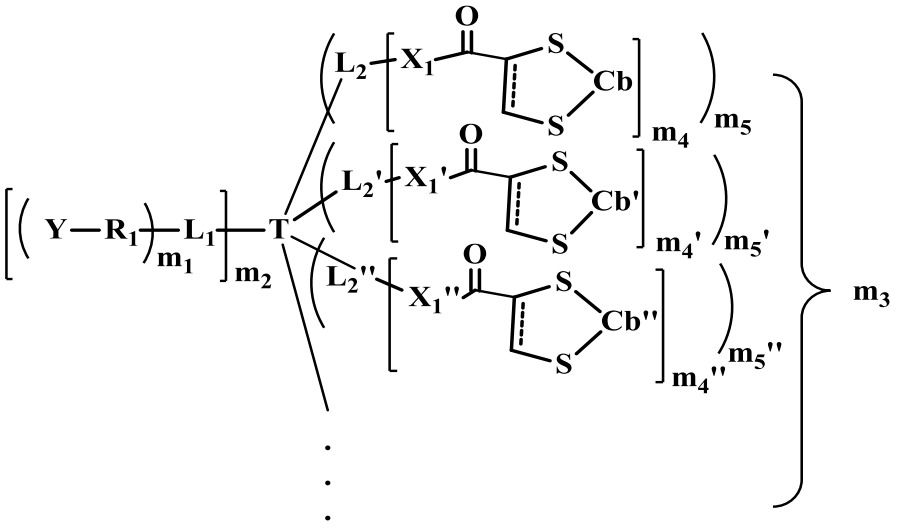
3. A compound of Formula (X), (XI), (XII), (XIII), (XIV), (XV), or (XVI):



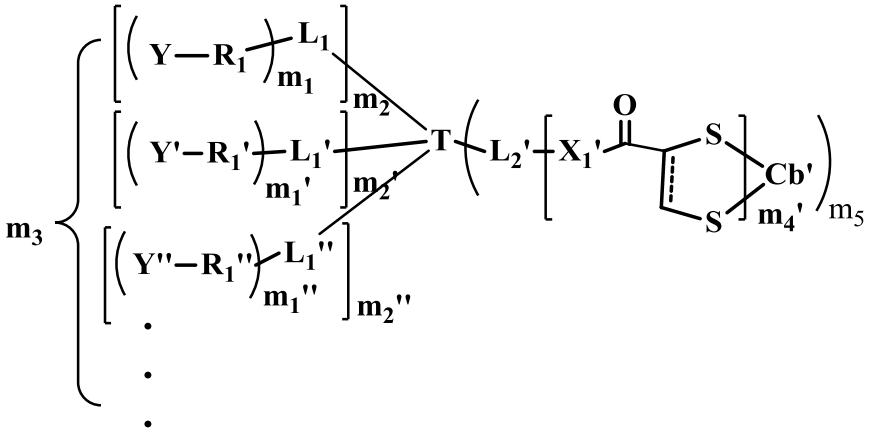
(X)



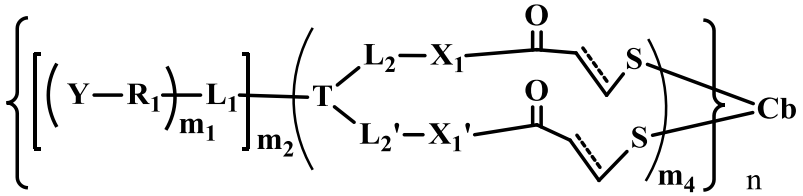
(XI)



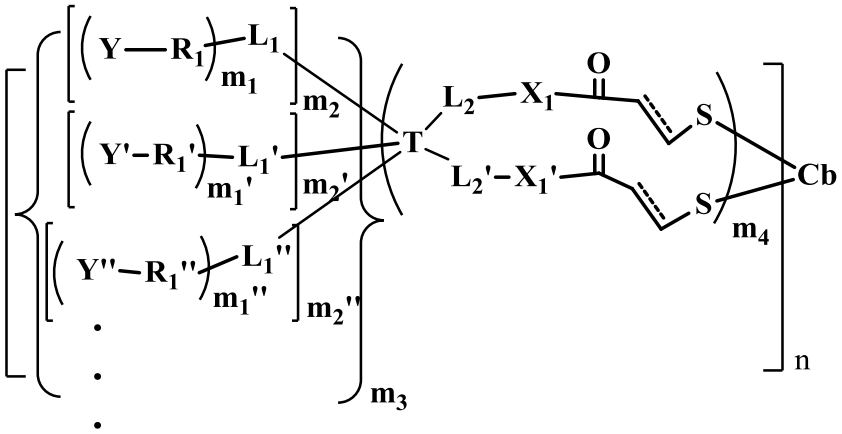
(XII).



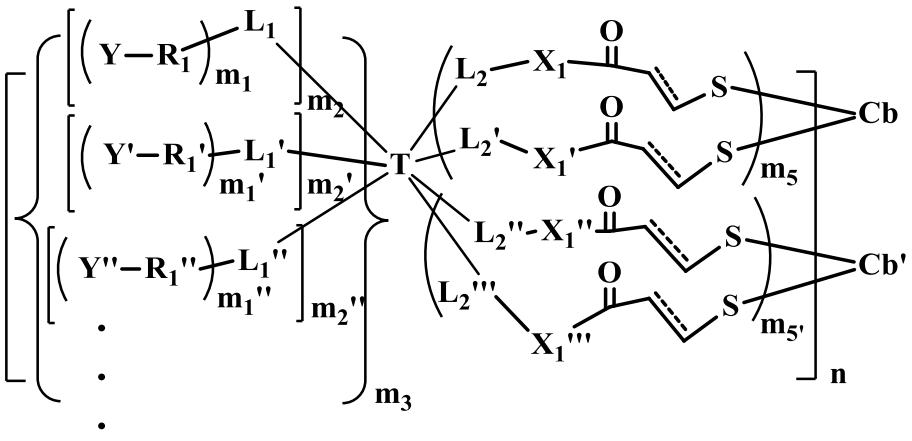
(XIII)



(XIV)



(XV)

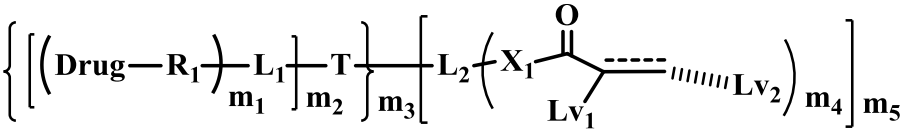


(XVI)

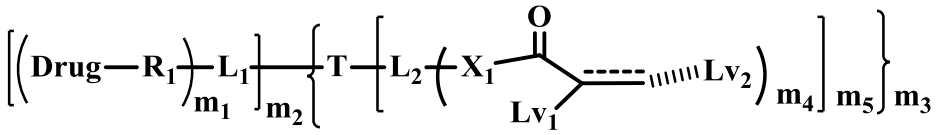
wherein R_1, R_1', R_1'', X_1, X_1', X_1'', L_1, L_1', L_1'', L_2, L_2', L_2'', "═══", Cb, m_1, m_1', m_1'', m_2, m_2', m_2'', m_3, m_4, m_5, m_4', m_5', m_4'', and m_5'' are defined the same as in Claim 2; X_1''' and L_2''' are defined the same as X_1 and L_1 respectively in Claim 2;

wherein Y, Y', and Y'' are defined the same as Y in Claim 1, and Y, Y', and Y'' can be independently a disulfide substituent, maleimido, haloacetyl, alkoxyamine, azido, ketone, aldehyde, hydrazine, alkyne, an *N*-hydroxysuccinimide ester, or a carboxyl ester formed with phenol; dinitrophenol; pentafluorophenol; tetrafluoro-phenol; difluorophenol; monofluorophenol; pentachlorophenol; triflate; imidazole; dichlorophenol;tetrachlorophenol;1-hydroxybenzotriazole; tosylate; mesylate; 2-ethyl-5-phenylisoxa-zolium-3′-sulfonate; and Y, Y', and Y'' can independently react with a cytotoxic agent through disulfide, thioether, hydrazone, amide, alkoxime, carbamate, ester, ether bond or hetero-aromatic ring.

4. A compound of Formula (XVII) or (XVIII):



(XVII)



(XVIII)

wherein "ıllıll", "═══", L_1, L_2, R_1, T, m_1, m_2, m_3, m_4, m_5, X_1, Lv_1 and Lv_2 are defined the same as in Claim 1; and Drug is defined the same as in Claim 2.

5. The conjugate compound of Formula (III), (IV), (V), or (VI) of Claim 2 is prepared from condensation of a compound of Formula (XVII) or (XVIII) of Claim 4 with a pair of thiols in the cell-binding molecule under an assistance of UV light at wavelength of range 190-390 nm.

6. The conjugate compound of Formula (X), (XI), (XII), or (XIII) of Claim 3 is prepared from condensation of a compound of Formula (I) or (II) of Claim 1 with a pair of thiols in the cell-binding molecule under an assistance of UV light at wavelength of range 190-390 nm.

7. The compounds according to Claim 2 or Claim 3, wherein a pair of thiols of the cell-binding agent/molecule which are linked to the linker are the inter chain disulfide atoms of the cell-binding agent that are reduced by a reduction agent selected from dithiothreitol (DTT), dithioerythritol (DTE), dithiolbutylamine (DTBA), L-glutathione (GSH), tris (2-carboxyethyl) phosphine (TCEP), 2-mercaptoethylamine (β-MEA), or/and beta mercaptoethanol **(**β-ME, 2-ME**)**.

8. The conjugate compound according to Claim **2** or Claim **4,** wherein the Drug, Drug', and Drug" is independently selected from:

(1). A chemotherapeutic agent selected from the group consisting of:

a). an alkylating agent: selected from the group consisting of nitrogen mustards: chlorambucil, chlornaphazine, cyclophosphamide, dacarbazine, estramustine, ifosfamide, mechlorethamine, mechlorethamine oxide hydrochloride, mannomustine, mitobronitol, melphalan, mitolactol, pipobroman, novembichin, phenesterine, prednimustine, thiotepa, trofosfamide, uracil mustard; CC-1065 (including its adozelesin, carzelesin and bizelesin synthetic analogues); duocarmycin (including the synthetic analogues, KW-2189 and CBI-TMI); benzodiazepine dimers (selected from, dimmers of pyrrolobenzodiazepine (PBD) or tomaymycin, indolinobenzodiazepines, imidazobenzothiadiazepines, or oxazolidinobenzodiazepines); Nitrosoureas: (carmustine, lomustine, chlorozotocin, fotemustine, nimustine, ranimustine); Alkylsulphonates: (busulfan, treosulfan, improsulfan and piposulfan); Triazenes: (dacarbazine); Platinum containing compounds: (carboplatin, cisplatin, oxaliplatin); aziridines, benzodopa, carboquone, meturedopa, or uredopa; ethylenimines and methylamelamines including altretamine, triethylenemelamine, trietylenephosphoramide, triethylenethiophosphoramide and trimethylolomelamine];

b). A plant alkaloid: selected from the group consisting of Vinca alkaloids: (vincristine, vinblastine, vindesine, vinorelbine, navelbin); Taxoids: (paclitaxel, docetaxol) and their analogs, Maytansinoids (DM1, DM2, DM3, DM4, DM5, DM6, DM7, maytansine and ansamitocins) and their analogs, cryptophycins (selected from the group consisting of cryptophycin 1 and cryptophycin 8); epothilones, eleutherobin, discodermolide, bryostatins, dolostatins, auristatins, tubulysins, cephalostatins; pancratistatin; a sarcodictyin; spongistatin;

c). A DNA Topoisomerase Inhibitor: selected from the group consisting of [Epipodophyllins: (9-aminocamptothecin, camptothecin, crisnatol, daunomycin, etoposide, etoposide phos-

phate, irinotecan, mitoxantrone, novantrone, retinoic acids (retinols), teniposide, topotecan, 9-nitrocamptothecin (RFS 2000)); mitomycins: (mitomycin C)];

d). An antimetabolite: selected from the group consisting of {[Anti-folate: DHFR inhibitors: (methotrexate, trimetrexate, denopterin, pteropterin, aminopterin (4-aminopteroic acid) or folic acid analogues); IMP dehydrogenase Inhibitors: (mycophenolic acid, tiazofurin, ribavirin, EIC-AR); Ribonucleotide reductase Inhibitors: (hydroxyurea, deferoxamine)]; [Pyrimidine analogs: Uracil analogs: (ancitabine, azacitidine, 6-azauridine, capecitabine (Xeloda), carmofur, cytarabine, dideoxyuridine, doxifluridine, enocitabine, 5-Fluorouracil, floxuridine, ratitrexed (Tomudex)); Cytosine analogs: (cytarabine, cytosine arabinoside, fludarabine); Purine analogs: (azathioprine, fludarabine, mercaptopurine, thiamiprine, thioguanine)]; folic acid replenisher, frolinic acid};

e). A hormonal therapy: selected from the group consisting of {Receptor antagonists: [Anti-estrogen: (megestrol, raloxifene, tamoxifen); LHRH agonists: (goscrclin, leuprolide acetate); Anti-androgens: (bicalutamide, flutamide, calusterone, dromostanolone propionate, epitiostanol, goserelin, leuprolide, mepitiostane, nilutamide, testolactone, trilostane and other androgens inhibitors)]; Retinoids/Deltoids: [Vitamin D3 analogs: (CB 1093, EB 1089 KH 1060, cholecalciferol, ergocalciferol); Photodynamic therapies: (verteporfin, phthalocyanine, photosensitizer Pc4, demethoxyhypocrellin A); Cytokines: (Interferon-alpha, Interferon-gamma, tumor necrosis factor (TNFs), human proteins containing a TNF domain)]};

f). A kinase inhibitor, selected from the group consisting of BIBW 2992 (anti-EGFR/Erb2), imatinib, gefitinib, pegaptanib, sorafenib, dasatinib, sunitinib, erlotinib, nilotinib, lapatinib, axitinib, pazopanib. vandetanib, E7080 (anti-VEGFR2), mubritinib, ponatinib (AP24534), bafetinib (INNO-406), bosutinib (SKI-606), cabozantinib, vismodegib, iniparib, ruxolitinib, CYT387, axitinib, tivozanib, sorafenib, bevacizumab, cetuximab, Trastuzumab, Ranibizumab, Panitumumab, ispinesib;

g). A poly (ADP-ribose) polymerase (PARP) inhibitors selected from the group consisting of olaparib, niraparib, iniparib, talazoparib, veliparib, CEP 9722 (Cephalon's), E7016 (Eisai's), BGB-290 (BeiGene's), or 3-aminobenzamide.

h). An antibiotic, selected from the group consisting of an enediyne antibiotic (selected from the group consisting of calicheamicin, calicheamicin γ1, δ1, α1 or β1; dynemicin, including dynemicin A and deoxydynemicin; esperamicin, kedarcidin, C-1027, maduropeptin, or neocarzinostatin chromophore and related chromoprotein enediyne antibiotic chromomophores), aclacinomycins, actinomycin, authramycin, azaserine, bleomycins, cactinomycin, carabicin, carminomycin, carzinophilin; chromomycins, dactinomycin, daunorubicin, detorubicin, 6-

diazo-5-oxo-L-norleucine, doxorubicin, morpholino-doxorubicin, cyanomorpholino-doxorubicin, 2-pyrrolino-doxorubicin and deoxydoxorubicin, epirubicin, esorubicin, idarubicin, marcellomycin, nitomycins, mycophenolic acid, nogalamycin, olivomycins, peplomycin, potfiromycin, puromycin, quelamycin, rodorubicin, streptonigrin, streptozocin, tubercidin, ubenimex, zinostatin, zorubicin;

i). A polyketide (acetogenin), bullatacin and bullatacinone; gemcitabine, epoxomicins (including carfilzomib), bortezomib, thalidomide, lenalidomide, pomalidomide, tosedostat, zybrestat, PLX4032, STA-9090, Stimuvax, allovectin-7, Xegeva, Provenge, Yervoy, Isoprenylation inhibitors (selected from Lovastatin), Dopaminergic neurotoxins (selected from 1-methyl-4-phenylpyridinium ion), Cell cycle inhibitors (selected from staurosporine), Actinomycins (selected from the group consisting of Actinomycin D, dactinomycin), amanitins, Bleomycins (selected from the group consisting of bleomycin A2, bleomycin B2, peplomycin), Anthracyclines (selected from the group consisting of daunorubicin, doxorubicin (adriamycin), idarubicin, epirubicin, pirarubicin, zorubicin, mtoxantrone, MDR inhibitors or verapamil, Ca^{2+}ATPase inhibitors or thapsigargin, Histone deacetylase inhibitors ((selected from the group consisting of Vorinostat, Romidepsin, Panobinostat, Valproic acid, Mocetinostat (MGCD0103), Belinostat, PCI-24781, Entinostat, SB939, Resminostat, Givinostat, AR-42, CUDC-101, sulforaphane, Trichostatin A) ; Thapsigargin, Celecoxib, glitazones, epigallocatechin gallate, Disulfiram, Salinosporamide A.; Anti-adrenals, selected from the group consisting of aminoglutethimide, mitotane, trilostane; aceglatone; aldophosphamide glycoside; aminolevulinic acid; amsacrine; arabinoside, bestrabucil; bisantrene; edatraxate; defofamine; demecolcine; diaziquone; eflornithine (DFMO), elfomithine; elliptinium acetate, etoglucid; gallium nitrate; gacytosine, hydroxyurea; ibandronate, lentinan; lonidamine; mitoguazone; mitoxantrone; mopidamol; nitracrine; pentostatin; phenamet; pirarubicin; podophyllinic acid; 2-ethylhydrazide; procarbazine; PSK®; razoxane; rhizoxin; sizofiran; spirogermanium; tenuazonic acid; triaziquone; 2, 2',2''-trichlorotriethylamine; trichothecenes (selected from the group consisting ofT-2 toxin, verrucarin A, roridin A and anguidine); urethane, siRNA, antisense drugs;

(2). An anti-autoimmune disease agent: cyclosporine, cyclosporine A, aminocaproic acid, azathioprine, bromocriptine, chlorambucil, chloroquine, cyclophosphamide, corticosteroids (selected from the group consisting of amcinonide**,** betamethasone, budesonide**,** hydrocortisone, flunisolide, fluticasone propionate, fluocortolone danazol, dexamethasone, Triamcinolone acetonide, beclometasone dipropionate), DHEA, enanercept, hydroxychloroquine, infliximab, meloxicam, methotrexate, mofetil, mycophenylate, prednisone, sirolimus, tacrolimus.

(3). An anti-infectious disease agents:

a). Aminoglycosides: amikacin, astromicin, gentamicin (netilmicin, sisomicin, isepamicin), hygromycin B, kanamycin (amikacin, arbekacin, bekanamycin, dibekacin, tobramycin), neomycin (framycetin, paromomycin, ribostamycin), netilmicin, spectinomycin, streptomycin, tobramycin, verdamicin;

b). Amphenicols: azidamfenicol, chloramphenicol, florfenicol, thiamphenicol;

c). Ansamycins: geldanamycin, herbimycin;

d). Carbapenems: biapenem, doripenem, ertapenem, imipenem/cilastatin, meropenem**,** panipenem;

e). Cephems: carbacephem (loracarbef), cefacetrile, cefaclor, cefradine, cefadroxil, cefalonium, cefaloridine, cefalotin or cefalothin, cefalexin, cefaloglycin, cefamandole, cefapirin, cefatrizine, cefazaflur, cefazedone, cefazolin, cefbuperazone, cefcapene, cefdaloxime, cefepime, cefminox, cefoxitin, cefprozil, cefroxadine, ceftezole, cefuroxime, cefixime, cefdinir, cefditoren, cefepime, cefetamet, cefmenoxime, cefodizime, cefonicid, cefoperazone, ceforanide, cefotaxime, cefotiam, cefozopran, cephalexin, cefpimizole, cefpiramide, cefpirome, cefpodoxime, cefprozil, cefquinome, cefsulodin, ceftazidime, cefteram, ceftibuten, ceftiolene, ceftizoxime, ceftobiprole, ceftriaxone, cefuroxime, cefuzonam, cephamycin (cefoxitin, cefotetan, cefmetazole), oxacephem (flomoxef, latamoxef);

f). Glycopeptides: bleomycin, vancomycin (oritavancin, telavancin), teicoplanin (dalbavancin), ramoplanin;

g). Glycylcyclines: tigecycline;

h). β-Lactamase inhibitors: penam (sulbactam, tazobactam), clavam (clavulanic acid);

i). Lincosamides: clindamycin, lincomycin;

j). Lipopeptides: daptomycin, A54145, calcium-dependent antibiotics (CDA);

k). Macrolides: azithromycin, cethromycin, clarithromycin, dirithromycin, erythromycin, flurithromycin, josamycin, ketolide (telithromycin, cethromycin), midecamycin, miocamycin, oleandomycin, rifamycins (rifampicin, rifampin, rifabutin, rifapentine), rokitamycin, roxithromycin, spectinomycin, spiramycin, tacrolimus (FK506), troleandomycin, telithromycin;

l). Monobactams: aztreonam, tigemonam;

m). Oxazolidinones: linezolid;

n). Penicillins: amoxicillin, ampicillin (pivampicillin, hetacillin, bacampicillin, metampicillin, talampicillin), azidocillin, azlocillin, benzylpenicillin, benzathine benzylpenicillin, benzathine phenoxymethylpenicillin, clometocillin, procaine benzylpenicillin, carbenicillin (carindacillin), cloxacillin, dicloxacillin, epicillin, flucloxacillin, mecillinam (pivmecillinam)**,**

mezlocillin, meticillin, nafcillin, oxacillin, penamecillin, penicillin, pheneticillin, phenoxymethylpenicillin, piperacillin, propicillin, sulbenicillin, temocillin, ticarcillin;

o). Polypeptides: bacitracin, colistin, polymyxin B;

p). Quinolones: alatrofloxacin, balofloxacin, ciprofloxacin, clinafloxacin, danofloxacin, difloxacin, enoxacin, enrofloxacin, floxin, garenoxacin, gatifloxacin, gemifloxacin, grepafloxacin, kano trovafloxacin, levofloxacin, lomefloxacin, marbofloxacin, moxifloxacin, nadifloxacin, norfloxacin, orbifloxacin, ofloxacin, pefloxacin, trovafloxacin, grepafloxacin, sitafloxacin, sparfloxacin, temafloxacin, tosufloxacin, trovafloxacin;

q). Streptogramins: pristinamycin, quinupristin/dalfopristin);

r). Sulfonamides: mafenide, prontosil, sulfacetamide, sulfamethizole, sulfanilimide, sulfasalazine, sulfisoxazole, trimethoprim, trimethoprim-sulfamethoxazole (co-trimoxazole);

s). Steroid antibacterials: selected from fusidic acid;

t). Tetracyclines: doxycycline, chlortetracycline, clomocycline, demeclocycline, lymecycline, meclocycline, metacycline, minocycline, oxytetracycline, penimepicycline, rolitetracycline, tetracycline, glycylcyclines (selected from tigecycline);

u). Other antibiotics: selected from the group consisting of annonacin, arsphenamine, bactoprenol inhibitors (Bacitracin), DADAL/AR inhibitors (cycloserine), dictyostatin, discodermolide, eleutherobin, epothilone, ethambutol, etoposide, faropenem, fusidic acid, furazolidone, isoniazid, laulimalide, metronidazole, mupirocin, mycolactone, NAM synthesis inhibitors (fosfomycin), nitrofurantoin, paclitaxel, platensimycin, pyrazinamide, quinupristin/dalfopristin, rifampicin (rifampin), tazobactam tinidazole, uvaricin;

(4). Anti-viral drugs:

a). Entry/fusion inhibitors: aplaviroc, maraviroc, vicriviroc, *gp41* (enfuvirtide**),** PRO 140**,** CD4 (ibalizumab);

b). Integrase inhibitors: raltegravir, elvitegravir, globoidnan A;

c). Maturation inhibitors: bevirimat, vivecon;

d). Neuraminidase inhibitors**:** oseltamivir, zanamivir, peramivir;

e). Nucleosides & nucleotides: abacavir, aciclovir, adefovir, amdoxovir, apricitabine, brivudine, cidofovir, clevudine, dexelvucitabine, didanosine (ddI), elvucitabine, emtricitabine (FTC), entecavir, famciclovir, fluorouracil (5-FU), 3'-fluoro-substituted 2', 3'-dideoxynucleoside analogues (selected from the group consisting of3'-fluoro-2',3'-dideoxythymidine (FLT) and 3'-fluoro-2',3'-dideoxyguanosine (FLG), fomivirsen, ganciclovir**,** idoxuridine, lamivudine (3TC), l-nucleosides (selected from the group consisting ofβ-l-thymidine and β-l-2'-deoxycytidine),

penciclovir, racivir, ribavirin, stampidine, stavudine (d4T), taribavirin (viramidine), telbivudine, tenofovir, trifluridine valaciclovir, valganciclovir, zalcitabine (ddC), zidovudine (AZT);

f). Non-nucleosides: amantadine, ateviridine, capravirine, diarylpyrimidines (etravirine, rilpivirine), delavirdine, docosanol, emivirine, efavirenz, foscarnet (phosphonoformic acid), imiquimod, interferon alfa, loviride, lodenosine, methisazone, nevirapine, NOV-205, peginterferon alfa, podophyllotoxin, rifampicin, rimantadine, resiquimod (R-848), tromantadine;

g). Protease inhibitors: amprenavir, atazanavir, boceprevir, darunavir, fosamprenavir, indinavir, lopinavir, nelfinavir, pleconaril, ritonavir, saquinavir, telaprevir (VX-950), tipranavir;

h). Other types of anti-virus drugs: abzyme, arbidol, calanolide a, ceragenin, cyanovirin-n, diarylpyrimidines, epigallocatechin gallate (EGCG), foscarnet, griffithsin, taribavirin (viramidine), hydroxyurea, KP-1461, miltefosine, pleconaril, portmanteau inhibitors, ribavirin, seliciclib.

(5). A radioisotope that can be selected from the group consisting of (radionuclides) ^{3}H, ^{11}C, ^{14}C, ^{18}F, ^{32}P, ^{35}S, ^{64}Cu, ^{68}Ga, ^{86}Y, ^{99}Tc, ^{111}In, ^{123}I, ^{124}I, ^{125}I, ^{131}I, ^{133}Xe, ^{177}Lu, ^{211}At, or ^{213}Bi.

(6). A chromophore molecule, which has the ability to absorb a kind of light, selected from the group consisting of UV light, florescent light, IR light, near IR light, visual light, is a class or subclass of xanthophores, erythrophores, iridophores, leucophores, melanophores, cyanophores, fluorophore molecules which are fluorescent chemical compounds reemitting light upon light, visual phototransduction molecules, photophore molecules, luminescence molecules, luciferin compounds; Non-protein organic fluorophores, selected from: Xanthene derivatives (fluorescein, rhodamine, Oregon green, eosin, and Texas red); Cyanine derivatives: (cyanine, indocarbocyanine, oxacarbocyanine, thiacarbocyanine, and merocyanine); Squaraine derivatives and ring-substituted squaraines, including Seta, SeTau, and Square dyes; Naphthalene derivatives (dansyl and prodan derivatives); Coumarin derivatives; Oxadiazole derivatives (pyridyloxazole, nitrobenzoxadiazole and benzoxadiazole); Anthracene derivatives (anthraquinones, including DRAQ5, DRAQ7 and CyTRAK Orange); Pyrene derivatives (cascade blue); Oxazine derivatives (Nile red, Nile blue, cresyl violet, oxazine 170). Acridine derivatives (proflavin, acridine orange, acridine yellow). Arylmethine derivatives (auramine, crystal violet, malachite green). Tetrapyrrole derivatives (porphin, phthalocyanine, bilirubin); Any analogs and derivatives of the following fluorophore compounds: CF dye (Biotium), DRAQ and CyTRAK probes (BioStatus), BODIPY (Invitrogen), Alexa Fluor (Invitrogen), DyLight Fluor (Thermo Scientific, Pierce), Atto and Tracy (Sigma Aldrich), FluoProbes (Interchim), Abberior Dyes (Abberior), DY and MegaStokes Dyes (Dyomics), Sulfo Cy dyes (Cyandye), HiLyte Fluor (AnaSpec), Seta, SeTau and Square Dyes (SETA BioMedicals), Quasar and Cal Fluor dyes (Biosearch Technol-

ogies), SureLight Dyes (APC, RPEPerCP, Phycobilisomes)(Columbia Biosciences), APC, APCXL, RPE, BPE (Phyco-Biotech), Allophycocyanin (APC), Aminocoumarin, APC-Cy7 conjugates, BODIPY-FL, Cascade Blue, Cy2, Cy3, Cy3.5, Cy3B, Cy5, Cy5.5, Cy7, Fluorescein, FluorX, Hydroxycoumarin, Lissamine Rhodamine B, Lucifer yellow, Methoxycoumarin, NBD, Pacific Blue, Pacific Orange, PE-Cy5 conjugates, PE-Cy7 conjugates, PerCP, R-Phycoerythrin(PE), Red 613, Seta-555-Azide, Seta-555-DBCO, Seta-555-NHS, Seta-580-NHS, Seta-680-NHS, Seta-780-NHS, Seta-APC-780, Seta-PerCP-680, Seta-R-PE-670, SeTau-380-NHS, SeTau-405-Maleimide, SeTau-405-NHS, SeTau-425-NHS, SeTau-647-NHS, Texas Red, TRITC, TruRed, X-Rhodamine, 7-AAD (7-aminoactinomycin D, CG-selective), Acridine Orange, Chromomycin A3, CyTRAK Orange (Biostatus, red excitation dark), DAPI, DRAQ5, DRAQ7, Ethidium Bromide, Hoechst33258, Hoechst33342, LDS 751, Mithramycin, PropidiumIodide (PI), SYTOX Blue, SYTOX Green, SYTOX Orange, Thiazole Orange, TO-PRO: Cyanine Monomer, TOTO-1, TO-PRO-1, TOTO-3, TO-PRO-3, YOSeta-1, YOYO-1. The fluorophore compounds that can be linked to the linkers of the invention for study cells are selected from the group consisting of the following compounds or their derivatives: DCFH (2'7'Dichorodihydro-fluorescein, oxidized form), DHR (Dihydrorhodamine 123, oxidized form, light catalyzes oxidation), Fluo-3 (AM ester. pH > 6), Fluo-4 (AM ester. pH 7.2), Indo-1 (AM ester, low/high calcium (Ca2+)), SNARF(pH 6/9), Allophycocyanin(APC), AmCyan1 (tetramer, Clontech), AsRed2 (tetramer, Clontech), Azami Green (monomer, MBL), Azurite, B-phycoerythrin(BPE), Cerulean, CyPet, DsRed monomer (Clontech), DsRed2 ("RFP", Clontech), EBFP, EBFP2, ECFP, EGFP (weak dimer, Clontech), Emerald (weak dimer, Invitrogen), EYFP (weak dimer, Clontech), GFP (S65A mutation), GFP (S65C mutation), GFP (S65L mutation), GFP (S65T mutation), GFP (Y66F mutation), GFP (Y66H mutation), GFP (Y66W mutation), GFPuv, HcRed1, J-Red, Katusha, Kusabira Orange (monomer, MBL), mCFP, mCherry, mCitrine, Midoriishi Cyan (dimer, MBL), mKate (TagFP635, monomer, Evrogen), mKeima-Red (monomer, MBL), mKO, mOrange, mPlum, mRaspberry, mRFP1 (monomer, Tsien lab), mStrawberry, mTFP1, mTurquoise2, P3 (phycobilisome complex), Peridinin Chlorophyll (PerCP), R-phycoerythrin(RPE), T-Sapphire, TagCFP (dimer, Evrogen), TagGFP (dimer, Evrogen), TagRFP (dimer, Evrogen), TagYFP (dimer, Evrogen), tdTomato (tandem dimer), Topaz, TurboFP602 (dimer, Evrogen), TurboFP635 (dimer, Evrogen), TurboGFP (dimer, Evrogen), TurboRFP (dimer, Evrogen), TurboYFP (dimer, Evrogen), Venus, Wild Type GFP, YPet, ZsGreen1 (tetramer, Clontech), ZsYellow1 (tetramer, Clontech).

(7). The cell-binding ligands or receptor agonists, which can be selected from: Folate derivatives; Glutamic acid urea derivatives; Somatostatin and its analogs (selected from the group

consisting of octreotide (Sandostatin) and lanreotide (Somatuline)); Aromatic sulfonamides; Pituitary adenylate cyclase activating peptides (PACAP) (PAC1); Vasoactive intestinal peptides (VIP/PACAP) (VPAC1, VPAC2); Melanocyte-stimulating hormones (α-MSH); Cholecystokinins (CCK) /gastrin receptor agonists; Bombesins (selected from the group consisting ofPyr-Gln-Arg-Leu-Gly-Asn-Gln-Trp-Ala-Val-Gly-His-Leu-Met-NH_2)/gastrin-releasing peptide (GRP); Neurotensin receptor ligands (NTR1, NTR2, NTR3); Substance P (NK1 receptor) ligands; Neuropeptide Y (Y1–Y6); Homing Peptides include RGD (Arg-Gly-Asp), NGR (Asn-Gly-Arg), the dimeric and multimeric cyclic RGD peptides (selected from cRGDfV), TAASGVRSMH and LTLRWVGLMS (Chondroitin sulfate proteoglycan NG2 receptor ligands) and F3 peptides; Cell Penetrating Peptides (CPPs); Peptide Hormones, selected from the group consisting of luteinizing hormone-releasing hormone (LHRH) agonists and antagonists, and gonadotropin-releasing hormone (GnRH) agonist, acts by targeting follicle stimulating hormone (FSH) and luteinising hormone (LH), as well as testosterone production, selected from the group consisting of buserelin (Pyr-His-Trp-Ser-Tyr-D-Ser(OtBu)-Leu-Arg-Pro-NHEt), Gonadorelin (Pyr-His-Trp-Ser-Tyr-Gly-Leu-Arg-Pro-Gly-NH_2), Goserelin (Pyr-His-Trp-Ser-Tyr-D-Ser(OtBu)-Leu-Arg-Pro-AzGly-NH_2), Histrelin (Pyr-His-Trp-Ser-Tyr-D-His(N-benzyl)-Leu-Arg-Pro-NHEt), leuprolide (Pyr-His-Trp-Ser-Tyr-D-Leu-Leu-Arg-Pro-NHEt), Nafarelin (Pyr-His-Trp-Ser-Tyr-2Nal-Leu-Arg-Pro-Gly-NH_2), Triptorelin (Pyr-His-Trp-Ser-Tyr-D-Trp-Leu-Arg-Pro-Gly-NH_2), Nafarelin, Deslorelin, Abarelix (Ac-D-2Nal-D-4-chloroPhe-D-3-(3-pyridyl)Ala-Ser-(N-Me)Tyr-D-Asn-Leu-isopropylLys-Pro-DAla-NH_2), Cetrorelix (Ac-D-2Nal-D-4-chloroPhe-D-3-(3-pyridyl)Ala-Ser-Tyr-D-Cit-Leu-Arg-Pro-D-Ala-NH_2), Degarelix (Ac-D-2Nal-D-4-chloroPhe-D-3-(3-pyridyl)Ala-Ser-4-aminoPhe(L-hydroorotyl)-D-4-aminoPhe(carbamoyl)-Leu-isopropylLys-Pro-D-Ala-NH_2), and Ganirelix (Ac-D-2Nal-D-4-chloroPhe-D-3-(3-pyridyl)Ala-Ser-Tyr-D-(N9, N10-diethyl)-homoArg-Leu-(N9, N10-diethyl)-homoArg-Pro-D-Ala-NH_2); Pattern Recognition Receptor (PRRs), selected from the group consisting of Toll-like receptors' (TLRs) ligands, C-type lectins and Nodlike Receptors' (NLRs) ligands; Calcitonin receptor agonists; integrin receptors' and their receptor subtypes' (selected from the group consisting of$\alpha_V\beta_1$, $\alpha_V\beta_3$, $\alpha_V\beta_5$, $\alpha_V\beta_6$, $\alpha_6\beta_4$, $\alpha_7\beta_1$, $\alpha_L\beta_2$, $\alpha_{IIb}\beta_3$) agonists (selected from the group consisting of GRGDSPK, cyclo(RGDfV) (L1) and its derives [cyclo(-N(Me)R-GDfV), cyclo(R-Sar-DfV), cyclo(RG-N(Me)D-fV), cyclo(RGD-N(Me)f-V), cyclo(RGDf-N(Me)V-)(Cilengitide)]; Nanobody (a derivative of VHH (camelid Ig)); Domain antibodies (dAb, a derivative of VH or VL domain); Bispecific T cell Engager (BiTE, a bispecific diabody); Dual Affinity ReTargeting (DART, a bispecific diabody); Tetravalent tandem antibodies (TandAb, a dimerized bispecific

diabody); Anticalin (a derivative of Lipocalins); Adnectins (10th FN3 (Fibronectin)); Designed Ankyrin Repeat Proteins (DARPins); Avimers; EGF receptors and VEGF receptors' agonists.

(8). The pharmaceutically acceptable salts, acids or derivatives of any of the above drugs.

9. The conjugate compound according to claim **2**, wherein Drug, Drug', or Drug" is a chromophore molecule, and the conjugate compound of claim **2** is used for detecting, monitoring, or studying the interactions and/or functions of the cell binding molecule, and/or the interactions of the conjugate with a targeted cell.

10. The conjugate compound according to claim **2**, wherein one, two or all of the Drug, Drug', or Drug" are independently a poly(ethylene glycol) (PEGs), poly(propylene glycol), a copolymer of ethylene oxide or propylene oxide, or their analogs that has a molecular weight of from about 44 Daltons to about 300 kDa., and these polymers are used for extending the half-life of the cell-binding molecule when administered to a mammal.

11. The conjugate compound according to claim **2**, wherein one, two or all of the Drug, Drug', or Drug" are independently a cell-binding ligand or a cell receptor agonist, or a cell receptor binding molecule, and the conjugate works as a targeting conductor/director to deliver the conjugate to malignant cells, or modulate or co-stimulate a desired immune response, or alter signaling pathways.

12. The conjugate compound according to claim **2** or Claim **4**, wherein Drug, Drug', or Drug" is selected from the group consisting of tubulysins, calicheamicins, auristatins, maytansinoids, CC-1065 analogs, daunorubicin and doxorubicin compounds, taxanoids (taxanes), cryptophycins, epothilones, benzodiazepine dimers (selected from the group consisting of dimmers of pyrrolobenzodiazepine (PBD), tomaymycins, anthramycins, indolinobenzodiazepines, imidazobenzothiadiazepines, or oxazolidinobenzodiazepines), calicheamicins and the enediyne antibiotics, actinomycins, amanitins, azaserines, bleomycins, epirubicins, tamoxifen, idarubicin, dolastatins/auristatins (selected from the group consisting of monomethyl auristatin E, MMAE , MMAF, auristatin PYE, auristatin TP, Auristatins 2-AQ, 6-AQ, EB (AEB), and EFP (AEFP)), duocarmycins, geldanamycins, methotrexates, thiotepa, vindesines, vincristines, hemiasterlins, nazumamides, microginins, radiosumins, alterobactins, microsclerodermins, theonellamides, esperamicins, siRNA, miRNA, piRNA, nucleolytic enzymes, and/or pharmaceutically acceptable salts, acids, or/and their analogues derivatives of any of the above molecules.

13. The conjugate compound according to claim **2** or **3,** wherein the cell binding agent/molecule, Cb, Cb', or Cb'' is selected from the group consisting of an antibody, a protein, a vitamin (selected from folate), peptides, a polymeric micelle, a liposome, a lipoprotein-

based drug carrier, a nano-particle drug carrier, a dendrimer, and a molecule said above coating with cell-binding ligands, or a combination of said above thereof.

14. The conjugate compounds according to claim **2,** or **3,** or **13,** wherein the cell binding agent/molecule, Cb, Cb', or Cb'' is independently selected from the group consisting of an antibody, an antibody-like protein, a full-length antibody (polyclonal antibody, monoclonal antibody, antibody dimer, antibody multimer, or multispecific antibody (selected from, bispecific or trispecific antibody)); a single chain antibody, an antibody fragment that binds to the target cell, a monoclonal antibody, a single chain monoclonal antibody, or a monoclonal antibody fragment that binds the target cell, a chimeric antibody, a chimeric antibody fragment that binds to the target cell, a domain antibody, a domain antibody fragment that binds to the target cell, a resurfaced antibody, a resurfaced single chain antibody, or a resurfaced antibody fragment that binds to the target cell, probody, a humanized antibody or a resurfaced antibody, a humanized single chain antibody, or a humanized antibody fragment that binds to the target cell, anti-idiotypic (anti-Id) antibodies, CDR's, diabody, triabody, tetrabody, miniantibody, probody, small immune proteins (SIP), a lymphokine, a hormone, a vitamin, a growth factor, a colony stimulating factor, a nutrient-transport molecule, large molecular weight proteins, nanoparticles or polymers modified with antibodies or large molecular weight proteins.

15. The conjugate compounds according to claim **2,** or **3,** or **13,** wherein the cell binding agent/molecule, Cb, Cb', or Cb'' is a molecule or agent that is able to target against a tumor cell, a virus infected cell, a microorganism infected cell, a parasite infected cell, an autoimmune disease cell, an activated tumor cells, a myeloid cell, an activated T-cell, an affecting B cell, or a melanocyte, or cells expressing one or more of the following antigens or receptors: CD3, CD4, CD5, CD6, CD7, CD8, CD9, CD10, CD11a, CD11b, CD11c, CD12w, CD14, CD15, CD16, CDw17, CD18, CD19, CD20, CD21, CD22, CD23, CD24, CD25, CD26, CD27, CD28, CD29, CD30, CD31, CD32, CD33, CD34, CD35, CD36, CD37, CD38, CD39, CD40, CD41, CD42, CD43, CD44, CD45, CD46, CD47, CD48, CD49b, CD49c, CD51, CD52, CD53, CD54, CD55, CD56, CD58, CD59, CD61, CD62E, CD62L, CD62P, CD63, CD66, CD68, CD69, CD70, CD72, CD74, CD79, CD79a, CD79b, CD80, CD81, CD82, CD83, CD86, CD87, CD88, CD89, CD90, CD91, CD95, CD96, CD98, CD100, CD103, CD105, CD106, CD109, CD123, CD117, CD120, CD125, CD126, CD127, CD133, CD134, CD135, CD137, CD138, CD141, CD142, CD143, CD144, CD147, CD151, CD147, CD152, CD154, CD156, CD158, CD163, CD166, .CD168, CD174, CD180, CD184, CDw186, CD194, CD195, CD200, CD200a, CD200b, CD209, CD221, CD227, CD235a, CD240, CD262, CD271, CD274, CD276 (B7-H3), CD303, CD304, CD309, CD326, 4-1BB, 5AC, 5T4 (Trophoblast glycoprotein, TPBG, 5T4, Wnt-

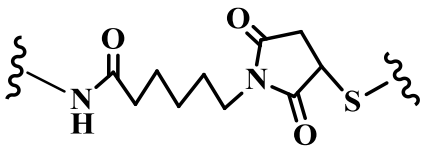
Activated Inhibitory Factor 1 or WAIF1), Adenocarcinoma antigen, AGS-5, AGS-22M6, Activin receptor-like kinase 1, AFP, AKAP-4, ALK, Alpha intergrin, Alpha v beta6, Aminopeptidase N, Amyloid beta, Androgen receptor, Angiopoietin 2, Angiopoietin 3, Annexin A1, Anthrax toxin protective antigen, Anti-transferrin receptor, AOC3 (VAP-1), B7-H3, Bacillus anthracis anthrax, BAFF (B-cell activating factor), BCMA, B-lymphoma cell, bcr-abl, Bombesin, BORIS, C5, C242 antigen, CA125 (carbohydrate antigen 125, MUC16), CA-IX (or CAIX, carbonic anhydrase 9), CALLA, CanAg, Canis lupus familiaris IL31, Carbonic anhydrase IX, Cardiac myosin, CCL11(C-C motif chemokine 11), CCR4 (C-C chemokine receptor type 4, CD194), CCR5, CD3E (epsilon), CEA (Carcinoembryonic antigen), CEACAM3, CEACAM5 (carcino-embryonic antigen), CFD (Factor D), Ch4D5, Cholecystokinin 2 (CCK2R), CLDN18 (Claudin-18), Clumping factor A, cMet, CRIPTO, FCSF1R (Colony stimulating factor 1 receptor, CD115), CSF2 (colony stimulating factor 2, Granulocyte-macrophage colony-stimulating factor (GM-CSF)), CSP4, CTLA4 (cytotoxic T-lymphocyte-associated protein 4), CTAA16.88 tumor antigen, CXCR4 (CD184), C-X-C chemokine receptor type 4, cyclic ADP ribose hydrolase, Cyclin B1, CYP1B1, Cytomegalovirus, Cytomegalovirus glycoprotein B, Dabigatran, DLL3 (delta-like-ligand 3), DLL4 (delta-like-ligand 4), DPP4 (Dipeptidyl-peptidase 4), DR5 (Death receptor 5), E. coli shiga toxin type-1, E. coli shiga toxin type-2, ED-B, EGFL7 (EGF-like domain-containing protein 7), EGFR, EGFRII, EGFRvIII, Endoglin (CD105), Endothelin B receptor, Endotoxin, EpCAM (epithelial cell adhesion molecule), EphA2, Episialin, ERBB2 (Epidermal Growth Factor Receptor 2), ERBB3, ERG (TMPRSS2 ETS fusion gene), Escherichia coli, ETV6-AML, FAP (Fibroblast activation protein alpha), FCGR1, alpha-Fetoprotein, Fibrin II, beta chain, Fibronectin extra domain-B, FOLR (folate receptor), Folate receptor alpha, Folate hydrolase, Fos-related antigen 1F protein of respiratory syncytial virus, Frizzled receptor, Fucosyl GM1, GD2 ganglioside, G-28 (a cell surface antigen glyvolipid), GD3 idiotype, GloboH, Glypican 3, N-glycolylneuraminic acid, GM3, GMCSF receptor α-chain, Growth differentiation factor 8, GP100, GPNMB (Trans-membrane glycoprotein NMB), GUCY2C (Guanylate cyclase 2C, guanylyl cyclase C(GC-C), intestinal Guanylate cyclase, Guanylate cyclase-C receptor, Heat-stable enterotoxin receptor (hSTAR)), Heat shock proteins, Hemagglutinin, Hepatitis B surface antigen, Hepatitis B virus, HER1 (human epidermal growth factor receptor 1), HER2, HER2/neu, HER3 (ERBB-3), IgG4, HGF/SF (Hepatocyte growth factor/scatter factor), HHGFR, HIV-1, Histone complex, HLA-DR (human leukocyte antigen), HLA-DR10, HLA-DRB , HMWMAA, Human chorionic gonadotropin, HNGF, Human scatter factor receptor kinase, HPV E6/E7, Hsp90, hTERT, ICAM-1 (Intercellular Adhesion Molecule 1), Idiotype, IGF1R (IGF-1, insulin-like growth factor 1 receptor), IGHE, IFN-

γ, Influenza hemagglutinin, IgE, IgE Fc region, IGHE, IL-1, IL-2 receptor (interleukin 2 receptor), IL-4, IL-5, IL-6, IL-6R (interleukin 6 receptor), IL-9, IL-10, IL-12, IL-13, IL-17, IL-17A, IL-20, IL-22, IL-23, IL31RA, ILGF2 (Insulin-like growth factor 2), Integrins (α4, $\alpha_{IIb}\beta_3$, αvβ3, $\alpha_4\beta_7$, α5β1, α6β4, α7β7, αllβ3, α5β5, αvβ5), Interferon gamma-induced protein, ITGA2, ITGB2, KIR2D, Kappa Ig, LCK, Le, Legumain, Lewis-Y antigen, LFA-1 (Lymphocyte function-associated antigen 1, CD11a), LHRH, LINGO-1, Lipoteichoic acid, LIV1A, LMP2, LTA, MAD-CT-1, MAD-CT-2, MAGE-1, MAGE-2, MAGE-3, MAGE A1, MAGE A3, MAGE 4, MART1, MCP-1, MIF (Macrophage migration inhibitory factor, or glycosylation-inhibiting factor (GIF)), MS4A1 (membrane-spanning 4-domains subfamily A member 1), MSLN (mesothelin), MUC1(Mucin 1, cell surface associated (MUC1) or polymorphic epithelial mucin (PEM)), MUC1-KLH, MUC16 (CA125), MCP1(monocyte chemotactic protein 1), MelanA/MART1, ML-IAP, MPG, MS4A1 (membrane-spanning 4-domains subfamily A), MYCN, Myelin-associated glycoprotein, Myostatin, NA17, NARP-1, NCA-90 (granulocyte antigen), Nectin-4 (ASG-22ME), NGF, Neural apoptosis-regulated proteinase 1, NOGO-A, Notch receptor, Nucleolin, Neu oncogene product, NY-BR-1, NY-ESO-1, OX-40, OxLDL (Oxidized low-density lipoprotein), OY-TES1, P21, p53 nonmutant, P97, Page4, PAP, Paratope of anti-(N-glycolylneuraminic acid), PAX3, PAX5, PCSK9, PDCD1 (PD-1, Programmed cell death protein 1,CD279), PDGF-Rα (Alpha-type platelet-derived growth factor receptor), PDGFR-β, PDL-1, PLAC1, PLAP-like testicular alkaline phosphatase, Platelet-derived growth factor receptor beta, Phosphate-sodium co-transporter, PMEL 17, Polysialic acid, Proteinase3 (PR1), Prostatic carcinoma, PS (Phosphatidylserine), Prostatic carcinoma cells, Pseudomonas aeruginosa, PSMA, PSA, PSCA, Rabies virus glycoprotein, RHD (Rh polypeptide 1 (RhPI), CD240), Rhesus factor, RANKL, RhoC, Ras mutant, RGS5, ROBO4, Respiratory syncytial virus, RON, ROR1, Sarcoma translocation breakpoints, SART3, Sclerostin, SLAMF7 (SLAM family member 7), Selectin P, SDC1 (Syndecan 1), sLe(a), Somatomedin C, SIP (Sphingosine-1-phosphate), Somatostatin, Sperm protein 17, SSX2, STEAP1 (six-transmembrane epithelial antigen of the prostate 1), STEAP2, STn, TAG-72 (tumor associated glycoprotein 72), Survivin, T-cell receptor, T cell transmembrane protein, TEM1 (Tumor endothelial marker 1), TENB2, Tenascin C (TN-C), TGF-α, TGF-β (Transforming growth factor beta), TGF-β1, TGF-β2 (Transforming growth factor-beta 2), Tie (CD202b), Tie2, TIM-1 (CDX-014), Tn, TNF, TNF-α, TNFRSF8, TNFRSF10B (tumor necrosis factor receptor superfamily member 10B), TNFRSF-13B (tumor necrosis factor receptor superfamily member 13B), TPBG (trophoblast glycoprotein), TRAIL-R1 (Tumor necrosis apoprosis Inducing ligand Receptor 1), TRAILR2 (Death receptor 5 (DR5)), tumor-associated calcium signal transducer 2, tumor specific glycosylation of

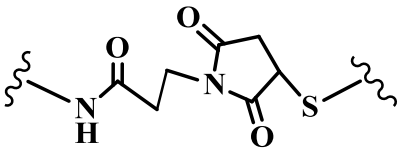
MUC1, TWEAK receptor, TYRP1(glycoprotein 75), TRP-2, Tyrosinase, VCAM-1 (CD106), VEGF, VEGF-A, VEGF-2 (CD309), VEGFR-1, VEGFR2, or vimentin, WT1, XAGE 1, or cells expressing any insulin growth factor receptors, or any epidermal growth factor receptors.

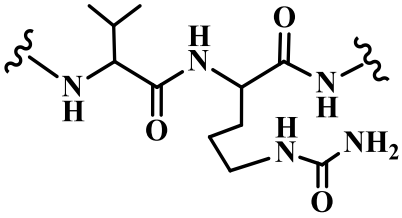
16. The tumor cell according to claim **13** is further defined as lymphoma cells, myeloma cells, renal cancer cells, breast cancer cells, prostate cancer cells, ovarian cancer cells, colorectal cancer cells, gastric cancer cells, squamous cancer cells, small-cell lung cancer cells, none small-cell lung cancer cells, testicular cancer cells, malignant cells, or any cells that grow and divide at an unregulated, quickened pace to cause cancers.

17. The compound linker according to claim **1, 2, 3,** or **4,** wherein the linker component, L_1, L_1', L_1'', L_1''', L_2, L_2', L_2'' and L_2''' is independently selected from the group consisting of one or more, or repeating, or combining thereof, components of the following structure:

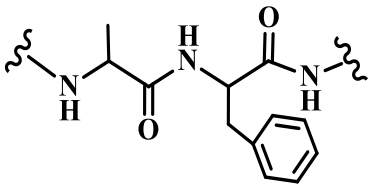


6-maleimidocaproyl (MC),

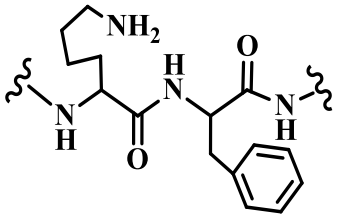




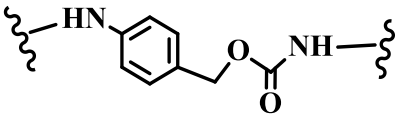
maleimido propanoyl (MP), valine-citrulline (val-cit),



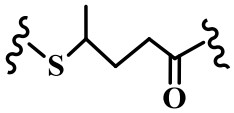
alanine-phenylalanine (ala-phe),



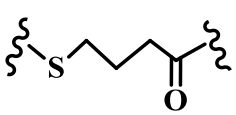
ly-



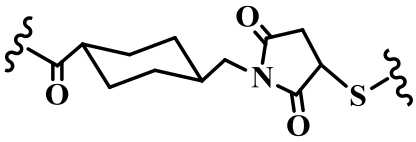
sine-phenylalanine (lys-phe), p-aminobenzyloxycarbonyl



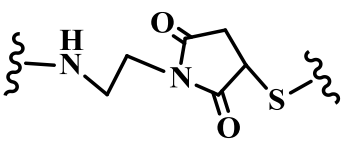
(PAB), 4-thio-pentanoate (SPP),



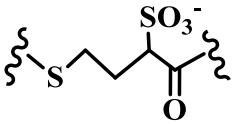
4-thio-butyrate



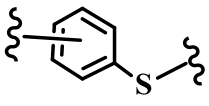
(SPDB), 4-(N-maleimidomethyl)cyclo-hexane-1-carboxylate

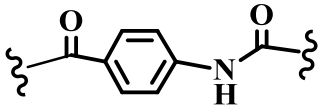
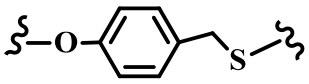


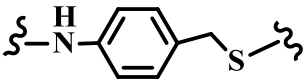
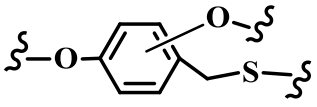
(MCC), maleimidoethyl (ME),

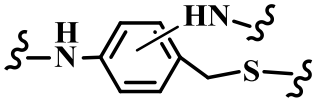
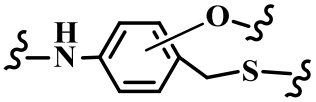


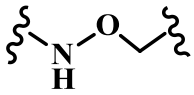
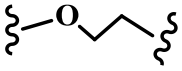
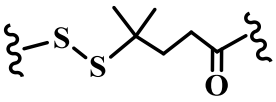
4-thio-2-

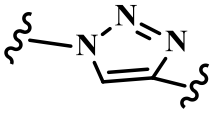
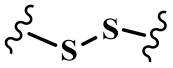
hydroxysulfonyl-butyrate (2-Sulfo-SPDB),  aryl-thiol (PySS),

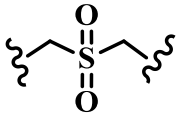
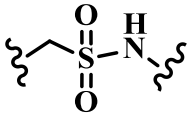
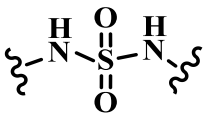
 (4-acetyl)aminobenzoate (SIAB),  , oxylben-

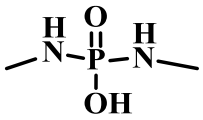
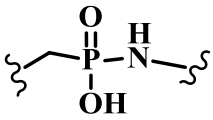
zylthio,  aminobenzylthio,  dioxylbenzylthio,

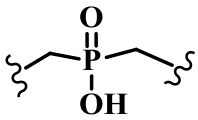
 diaminobenzylthio,  amino-oxylbenzylthio,

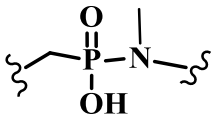
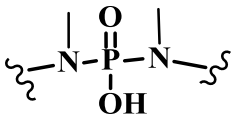
 alkoxy amino (AOA),  ethyleneoxy (EO), 

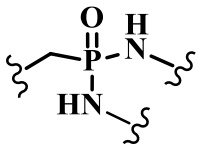
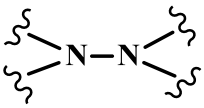
4-methyl-4-dithio-pentanoic (MPDP),  triazole,  dithio,

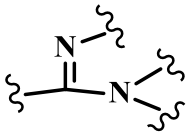
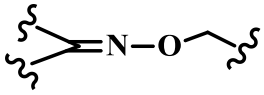
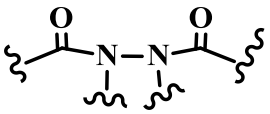
 alkylsulfonyl,  alkylsulfonamide,  sulfon-

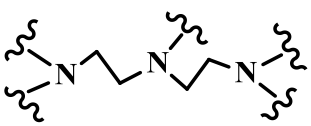
bisamide,  Phosphondiamide,  alkylphosphonamide,

 phosphinic acid,

 N-methylphosphonamidic acid,  N,N’-dimethylphosphon-

amidic acid,  N,N’-dimethylphosphondiamide,  hydrazine,

 acetimidamide;  oxime,  acetylaceto-

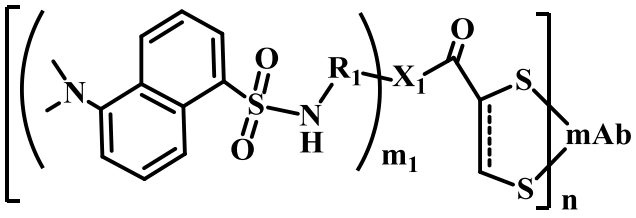
hydrazide,  aminoethyl-amine,  aminoethyl-

aminoethyl-amine, and L- or D-, natural or unnatural peptides containing 1-20 amino acids, wherein "$\sim\!\!\sim$"is the site of linkage (or connection).

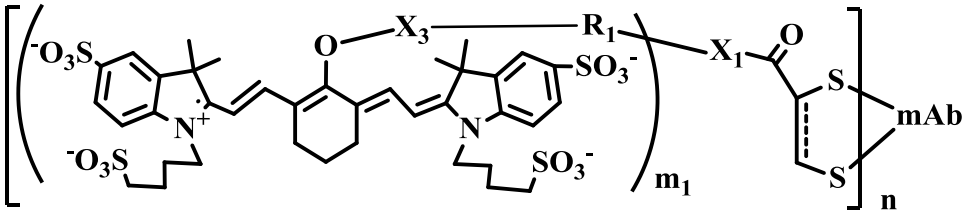
18. The compound linker according to claim **1, 2, 3,** or **4,** wherein the linker component, L_1, L_1', L_1'', L_2, L_2', L_2'' and L_2''' is independently selected from the group consisting of one or more, or repeating, or combining thereof, components of the following structure: -$(CR_5R_6)_m$(Aa)r$(CR_7R_8)_n(OCH_2CH_2)_t$-, -$(CR_5R_6)_m(CR_7R_8)_n$(Aa)$_r(OCH_2CH_2)_t$-, -(Aa)$_r$-$(CR_5R_6)_m(CR_7R_8)_n(OCH_2CH_2)_t$-, -$(CR_5R_6)_m(CR_7R_8)_n(OCH_2CH_2)_r(Aa)_t$-, -$(CR_5R_6)_m$-$(CR_7{=}CR_8)(CR_9R_{10})_n$(Aa) $_t(OCH_2CH_2)_r$-, -$(CR_5R_6)_m(NR_{11}CO)$(Aa)$_t(CR_9R_{10})_n$-$(OCH_2CH_2)_r$-, -$(CR_5R_6)_m$(Aa)$_t(NR_{11}CO)(CR_9R_{10})_n(OCH_2CH_2)_r$-,-$(CR_5R_6)_m$(OCO)(Aa)$_t(CR_9R_{10})_n$-$(OCH_2CH_2)_r$-, -$(CR_5R_6)_m(OCNR_7)(Aa)_t(CR_9R_{10})_n(OCH_2CH_2)_r$-, -$(CR_5R_6)_m$(CO)(Aa)$_t$-$(CR_9R_{10})_n(OCH_2CH_2)_r$-, -$(CR_5R_6)_m(NR_{11}CO)(Aa)_t(CR_9R_{10})_n(OCH_2CH_2)_r$-, -$(CR_5R_6)_m$-(OCO)(Aa)$_t(CR_9R_{10})_n$-$(OCH_2CH_2)_r$-, -$(CR_5R_6)_m(OCNR_7)(Aa)_t(CR_9R_{10})_n(OCH_2CH_2)_r$-, -$(CR_5R_6)_m$(CO)(Aa)$_t(CR_9R_{10})_n$-$(OCH_2CH_2)_r$-, -$(CR_5R_6)_m$-phenyl-CO(Aa)$_t(CR_7R_8)_n$-, -$(CR_5R_6)_m$-furyl-CO(Aa)$_t(CR_7R_8)_n$-, -$(CR_5R_6)_m$-oxazolyl-CO(Aa)$_t(CR_7R_8)_n$-, -$(CR_5R_6)_m$-thiazolyl-CO(Aa)$_t$(CC$R_7R_8)_n$-, -$(CR_5R_6)_t$-thienyl-CO$(CR_7R_8)_n$-, -$(CR_5R_6)_t$-imidazolyl-CO-$(CR_7R_8)_n$-, -$(CR_5R_6)_t$-morpholino-CO(Aa)$_t$-$(CR_7R_8)_n$-, -$(CR_5R_6)_t$piperazino-CO(Aa)$_t$-$(CR_7R_8)_n$-, -$(CR_5R_6)_t$-N-methylpiperazin-CO(Aa)$_t$-$(CR_7R_8)_n$-, -$(CR_5R)_m$-(Aa)$_t$phenyl-, -$(CR_5R_6)_m$-(Aa)$_t$furyl-, -$(CR_5R_6)_m$-oxazolyl(Aa)$_t$-, -$(CR_5R_6)_m$-thiazolyl(Aa)$_t$-, -$(CR_5R_6)_m$-thienyl-(Aa)$_t$-, -$(CR_5R_6)_m$-imidazolyl(Aa)$_t$-, -(C $R_5R_6)_m$-morpholino-(Aa)$_t$-, -$(CR_5R_6)_m$-piperazino-(Aa)$_t$-, -$(CR_5R_6)_m$-N-methylpiperazino-(Aa)$_t$-, -K$(CR_5R_6)_m$(Aa)r$(CR_7R_8)_n(OCH_2CH_2)_t$-, -K$(CR_5R_6)_m(CR_7R_8)_n$(Aa)$_r(OCH_2CH_2)_t$-, -K(Aa)$_r$-$(CR_5R_6)_m(CR_7R_8)_n(OCH_2CH_2)_t$-, -K$(CR_5R_6)_m(CR_7R_8)_n(OCH_2CH_2)_r(Aa)_t$-, -K$(CR_5R_6)_m$-$(CR_7{=}CR_8)(CR_9R_{10})_n(Aa)_t(OCH_2CH_2)_r$-, -K$(CR_5R_6)_m(NR_{11}CO)(Aa)_t(CR_9R_{10})_n(OCH_2CH_2)_r$-, -K$(CR_5R_6)_m(Aa)_t(NR_{11}CO)(CR_9R_{10})_n(OCH_2CH_2)_r$-, -K$(CR_5R_6)_m$(OCO)(Aa)$_t(CR_9R_{10})_n$-$(OCH_2CH_2)_r$-, -K$(CR_5R_6)_m(OCNR_7)(Aa)_t(CR_9R_{10})_n(OCH_2CH_2)_r$-, -K$(CR_5R_6)_m$(CO)(Aa)$_t$-$(CR_9R_{10})_n(OCH_2CH_2)_r$-, -K$(CR_5R_6)_m(NR_{11}CO)(Aa)_t(CR_9R_{10})_n(OCH_2CH_2)_r$-, -K$(CR_5R_6)_m$-(OCO)(Aa)$_t(CR_9R_{10})_n(OCH_2CH_2)_r$-, -K$(CR_5R_6)_m(OCNR_7)(Aa)_t(CR_9R_{10})_n(OCH_2CH_2)_r$-, -K-$(CR_5R_6)_m$(CO)(Aa)$_t(CR_9R_{10})_n(OCH_2CH_2)_r$-, -K$(CR_5R_6)_m$-phenyl-CO(Aa)$_t(CR_7R_8)_n$-, -K-$(CR_5R_6)_m$-furyl-CO(Aa)$_t$-$(CR_7R_8)_n$-, -K$(CR_5R_6)_m$-oxazolyl-CO(Aa)$_t(CR_7R_8)_n$-, -K$(CR_5R_6)_m$-thiazolyl-CO(Aa)$_t$-$(CR_7R_8)_n$-, -K$(CR_5R_6)_t$-thienyl-CO$(CR_7R_8)_n$-, -K$(CR_5R_6)_t$imidazolyl-CO-$(CR_7R_8)_n$-, -K$(CR_5R_6)_t$morpholino-CO(Aa)$_t(CR_7R_8)_n$-, -K$(CR_5R_6)_t$piperazino-CO(Aa)$_t$-$(CR_7R_8)_n$-, -K$(CR_5R_6)_t$-N-methylpiperazinCO(Aa)$_t(CR_7R_8)_n$-, -K$(CR_5R)_m(Aa)_t$phenyl, -K-$(CR_5R_6)_m$-(Aa)$_t$furyl-, -K$(CR_5R_6)_m$-oxazolyl(Aa)$_t$-, -K$(CR_5R_6)_m$-thiazolyl(Aa)$_t$-, -K$(CR_5R_6)_m$-thienyl-(Aa)$_t$-, -K$(CR_5R_6)_m$-imidazolyl(Aa)$_t$-, -K$(CR_5R_6)_m$-morpholino(Aa)$_t$-, -K$(CR_5R_6)_m$-piperazino-(Aa)$_t$G, -K$(CR_5R_6)_m$N-methylpiperazino(Aa)$_t$-;

wherein R_3, and R_5 are described in Claim 1; t and r are 0 – 100 independently; R_6, R_7, R_8, R_9, R_{10}, and R_{11} are independently chosen from H; halide; C_1~C_8 of alkyl, aryl, alkenyl, alkynyl, ether, ester, amine or amide, which optionally substituted by one or more halide, CN, NR_1R_2, CF_3, OR_1, Aryl, heterocycle, $S(O)R_1$, SO_2R_1, $-CO_2H$, $-SO_3H$, $-OR_1$, $-CO_2R_1$, $-CONR_1$, $-PO_2R_1R_2$, $-PO_3H$ or $P(O)R_1R_2R_3$; K is NR_1, -SS-, -C(=O)-, -C(=O)NH-, -C(=O)O-, -C=NH-O-, -C=N-NH-, -C(=O)NH-NH-, O, S, Se, B, heterocyclic or heteroaromatic ring having C_3-C_8, or peptides containing 1- 20 amino acids; Aa is a natural amino acid; m and n herein are 1 ~6.

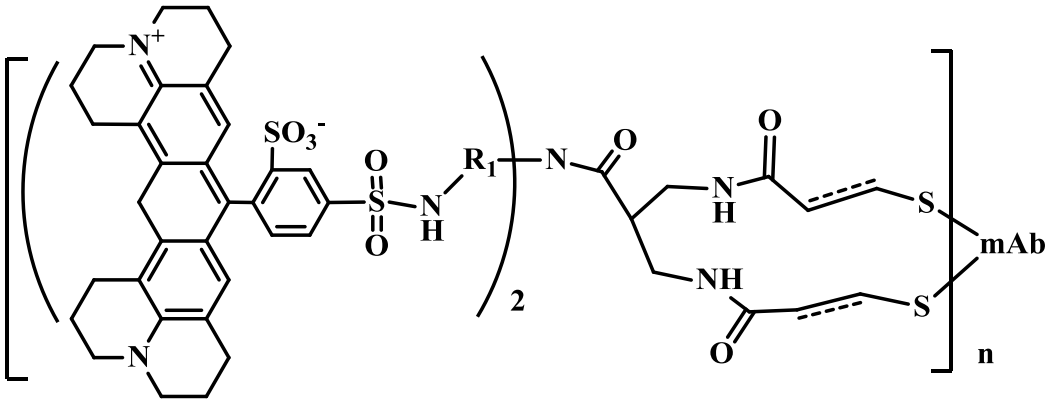
19. The conjugate compound of claim **2**, wherein Drug, Drug', or Drug" is a chromophore molecule, the conjugate compound of Formula (II) is selected from the group consisting of structures of Ac01, Ac03, Ac04, Ac05, Ac06, Ac07, Ac08 and Ac09 as following:



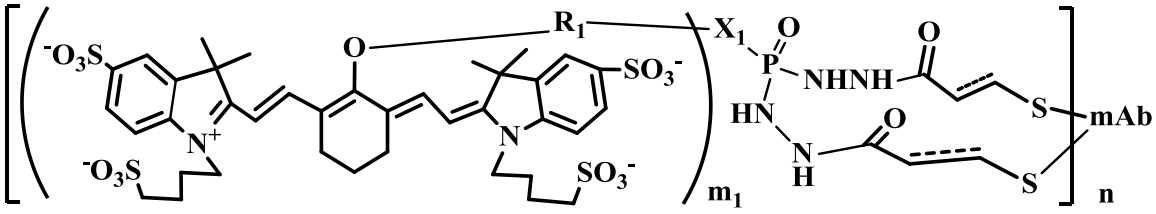
Ac01,



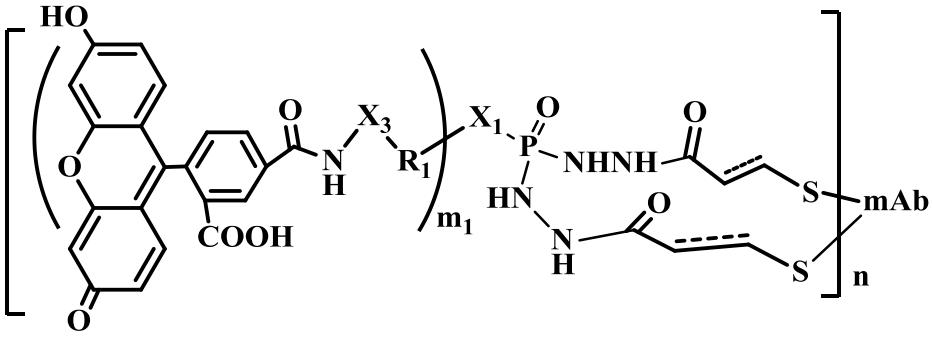
Ac03,



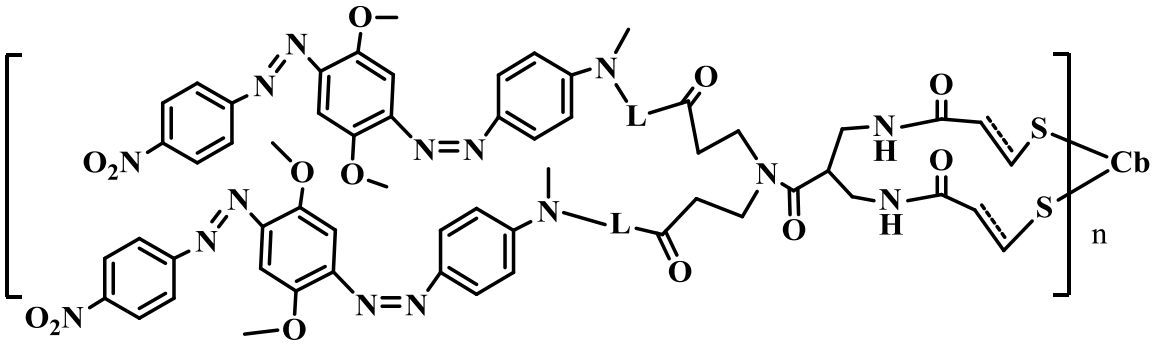
Ac04,



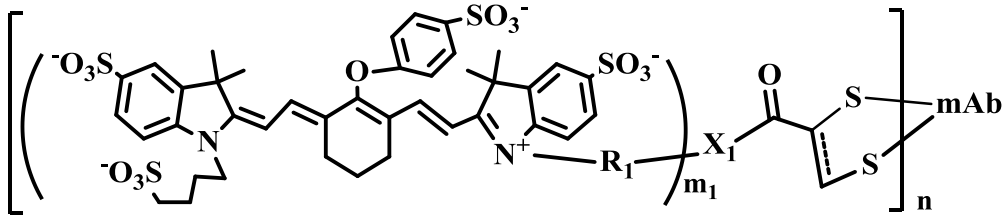
Ac5 (FNIR-774 conjugate),



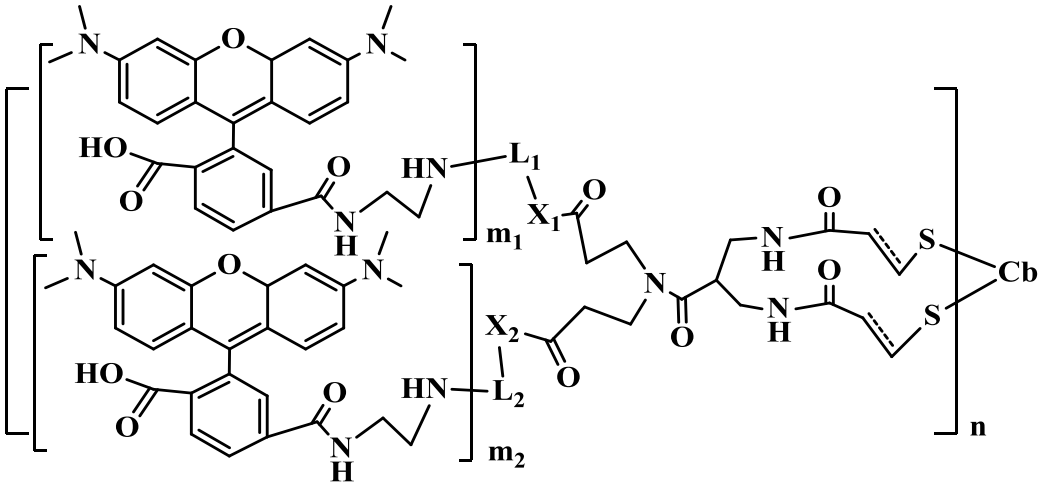
Ac06,



Ac07,



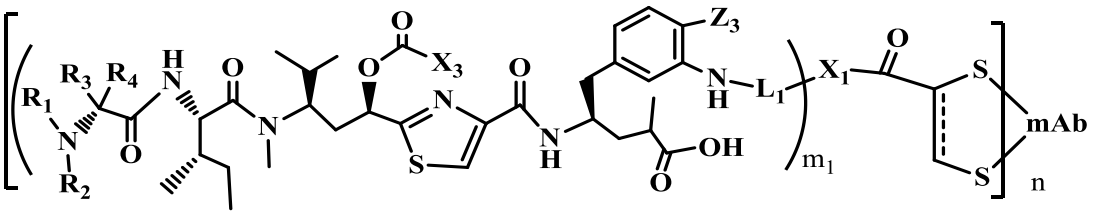
Ac08 (IR800CW conjugate),



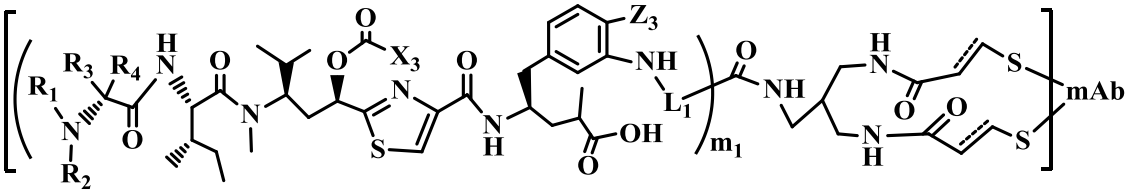
Ac09

wherein mAb is antibody, monoclonal antibody or a cell-binding molecule; "═══", n, m_1, m_2, X_1, X_2, X_3, L, L_1, L_2, R_1, and R_3 are the same defined in Claims **1**.

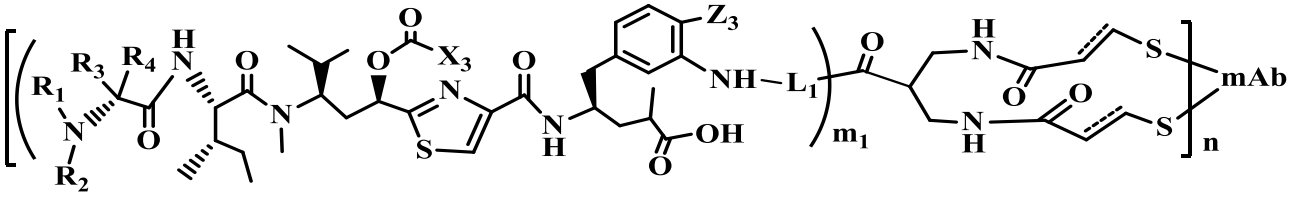
20. The conjugate compound of claim **2**, wherein Drug, Drug', or Drug" is a Tubulysin analog, the conjugate compound of Formula (II) is selected from structures of T01, T02, T03, T04, T05, T06, T07, T08, T09, T10, T11, T12, T13, T14, T15, T16, T17 and T18 as following:



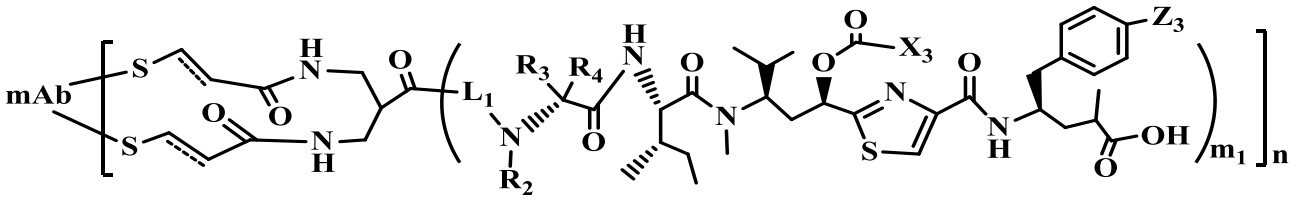
T01



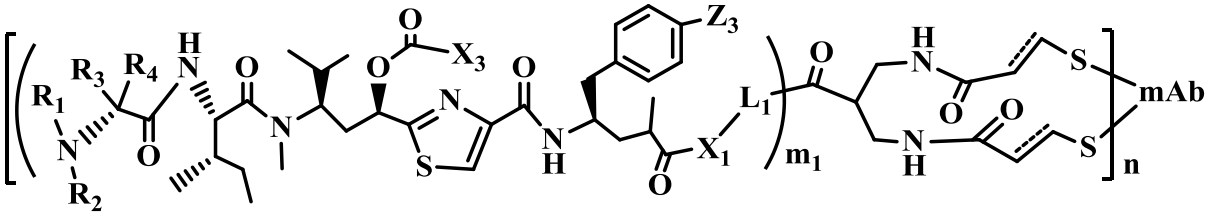
T02



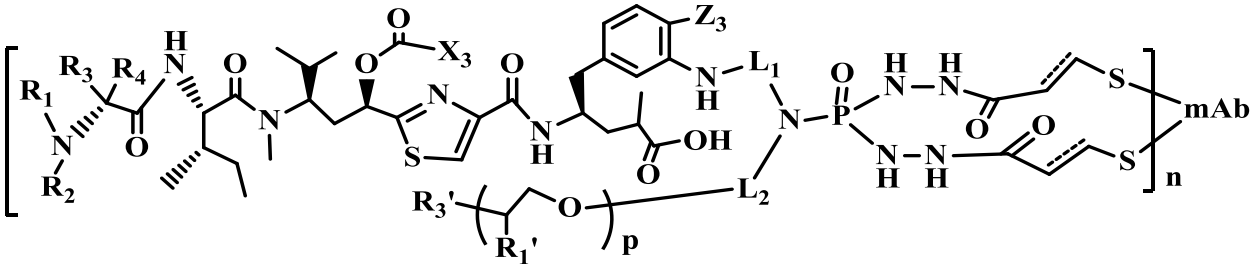
T03



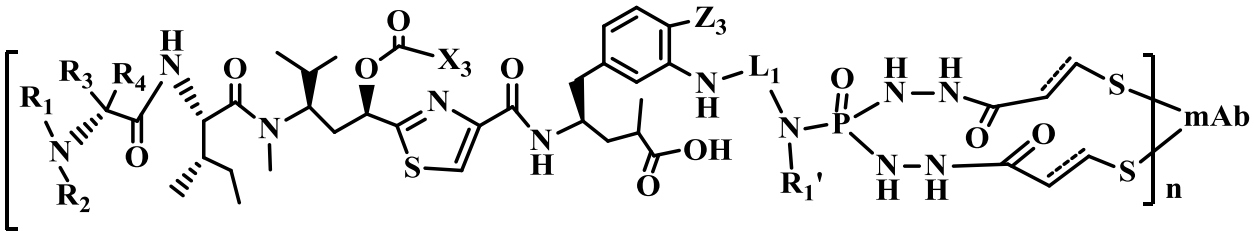
T04



T05



T06



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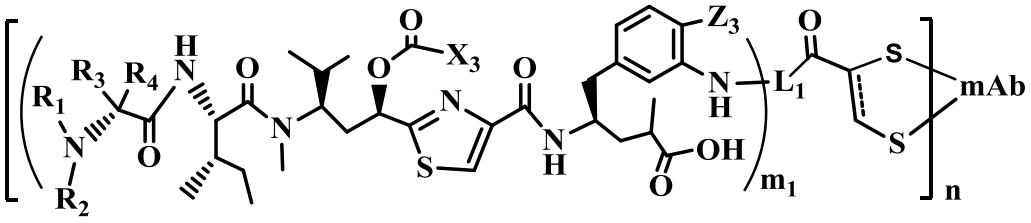

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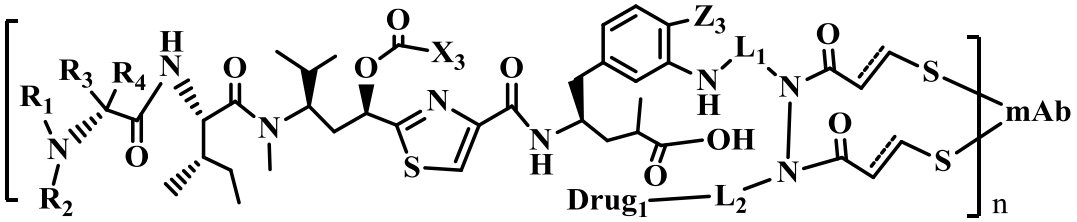

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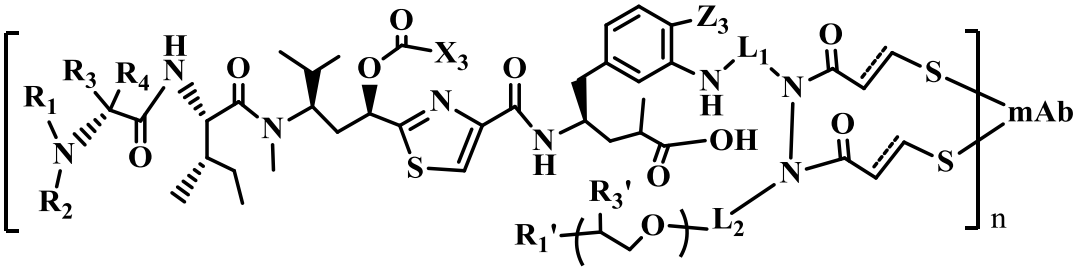

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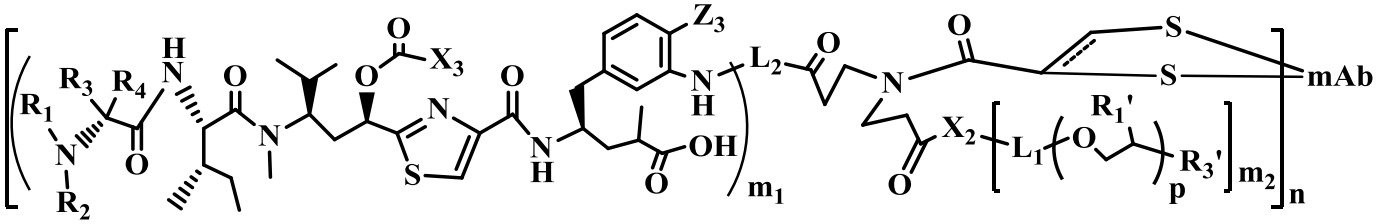

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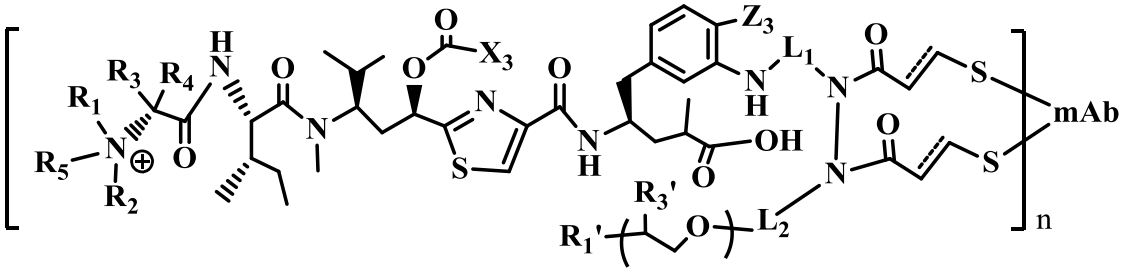

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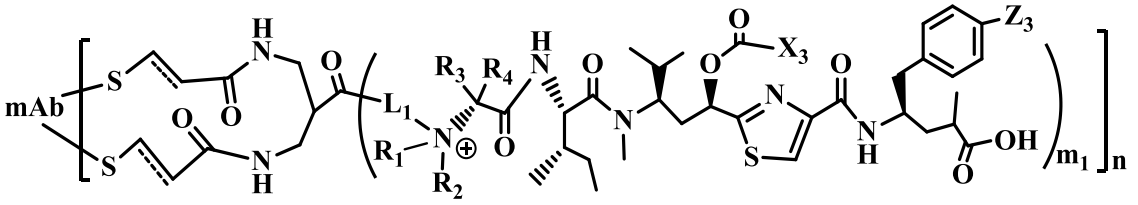

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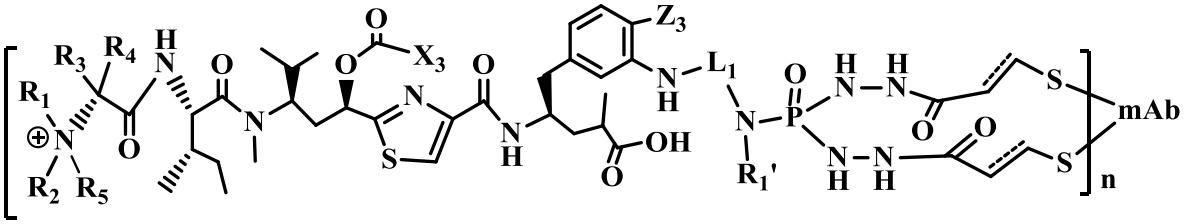

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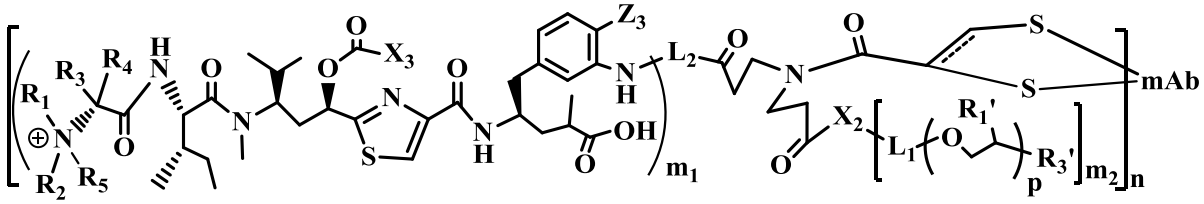

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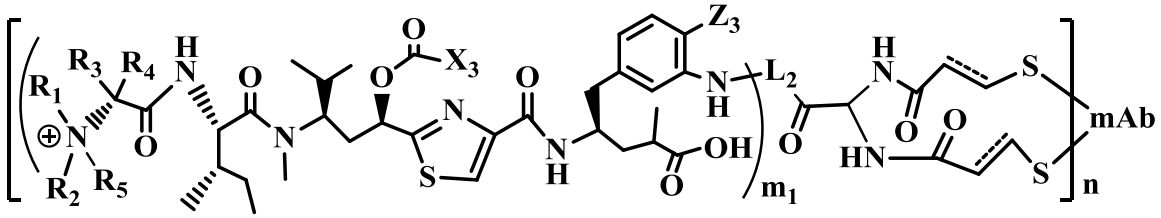

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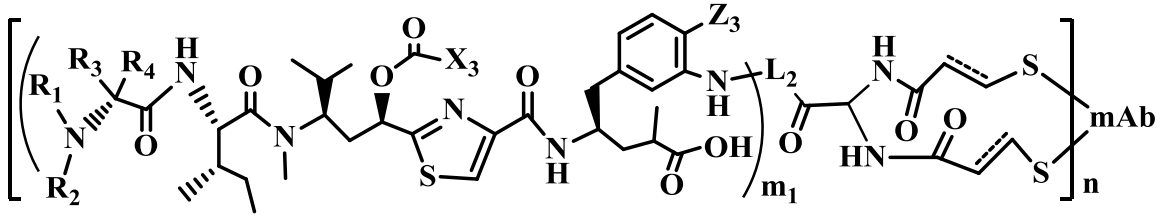

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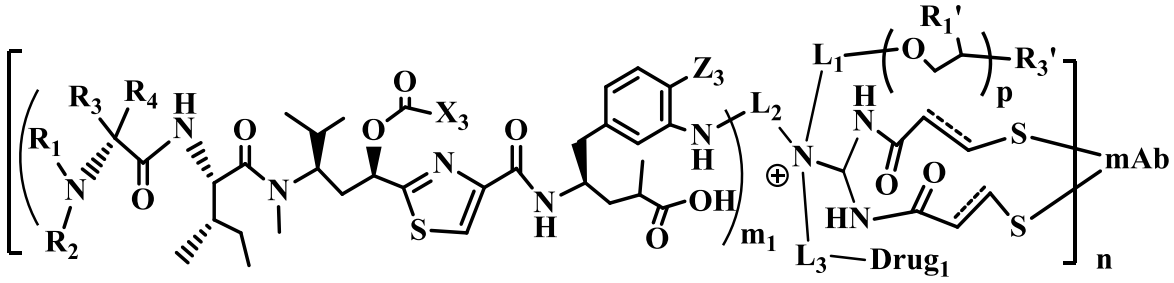
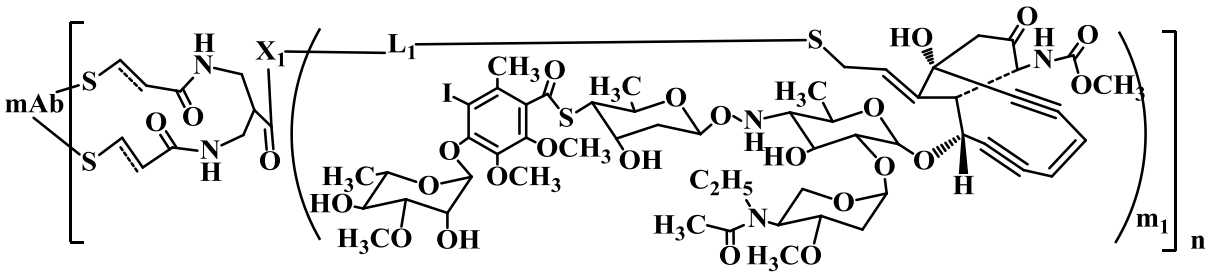


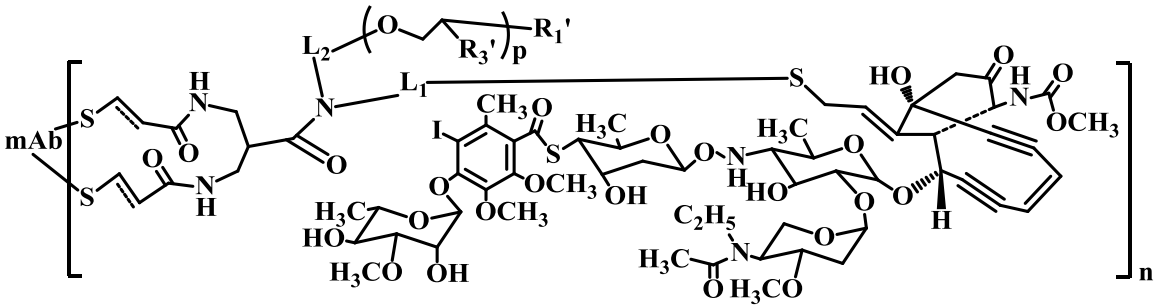
T18,

wherein "----", n, m_1, m_2, X_1, X_2, L_1, L_2, L_3, R_1, R_2, R_3, R_4, and R_5 are the same defined in Claim 1 or Claim 2; mAb is an antibody, or a cell-binding molecule; Z_3 is H, $OP(O)(OM_1)(OM_2)$, $OOCCH_3$, $OCH_2OP(O)(OM_1)(OM_2)$, OSO_3M_1, R_1, or O-glycoside (including glucoside, galactoside, mannoside, glucuronoside/ glucuronide, alloside, fructoside), NH-glycoside, S-glycoside or CH_2-glycoside; The two Rs: R_1R_2, R_2R_3, R_1R_3 or R_3R_4 can form 3~8 member cyclic ring of alkyl, aryl, heteroaryl, heteroalkyl, or alkylcycloalkyl group; X_3 is H, CH_3, or $X_1'R_1'$, wherein X_1' is NH, $N(CH_3)$, NHNH, O, or S, and R_1' is H or C_1-C_8 of lineal or branched alkyl, aryl, heteroaryl, heteroalkyl, alkylcycloalkyl, acyloxylamines; R_1' and R_3' are independently H or C_1-C_6 of lineal or branched alkyl; p is 0 -2000; M_1 and M_2 are independently H, Na, K, Ca, Mg, NH_4, $NR_1R_2R_3$; $Drug_1$ is another tubulysin analog or a cytotoxic agent selected from Claim 8; In addition, R_1' can be a cytotoxic agent, selected from in Claim 8.

21. The conjugate compound of claim **2**, wherein Drug, Drug', or Drug" is a Calicheamicin analog, the conjugate compound of Formula (II) is selected from structures of C01 and C02 as following:



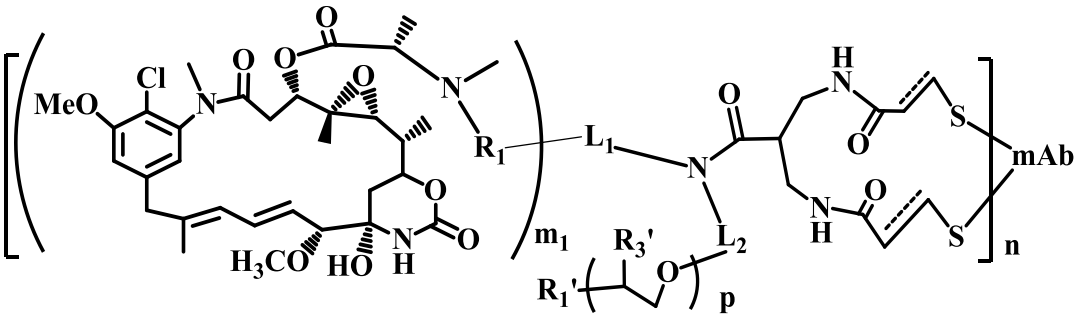
C01.



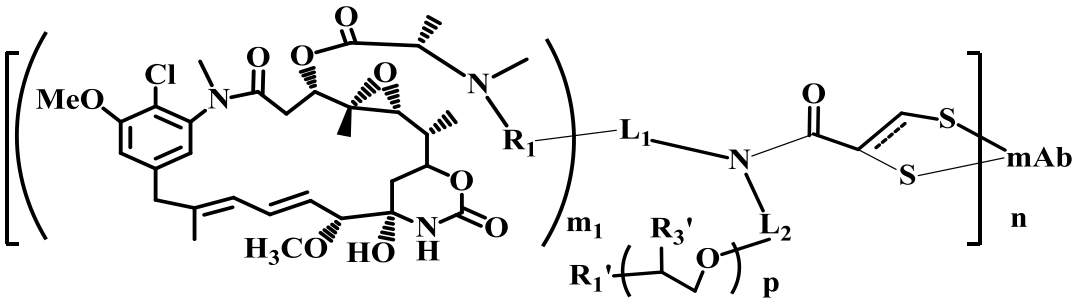
C02

wherein mAb is an antibody or a cell-binding molecule; "═══", n, m_1, X_1, L_1, L_2, and R_1 are defined the same in Claim 1; R_1' and R_3' are independently H or C_1-C_6 of lineal or branched alkyl; p is 0 -2000; In addition, R_1' can be a cytotoxic agent, selected from in Claim 8.

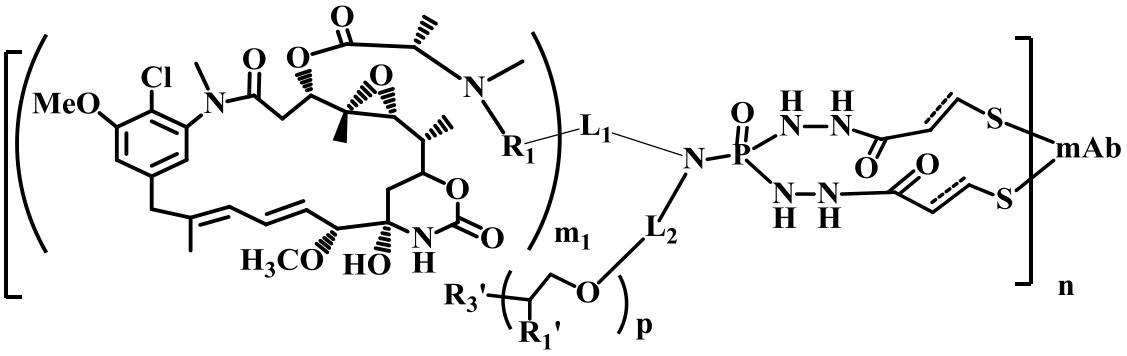
22. The conjugate compound of claim **2**, wherein Drug, Drug', or Drug" is a Maytansinoid analog, the conjugate compound is selected from structures of My01 as following:



My01,



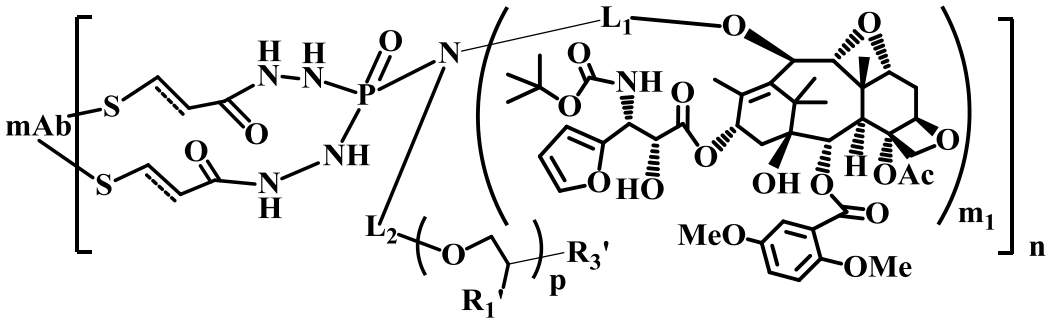
My02



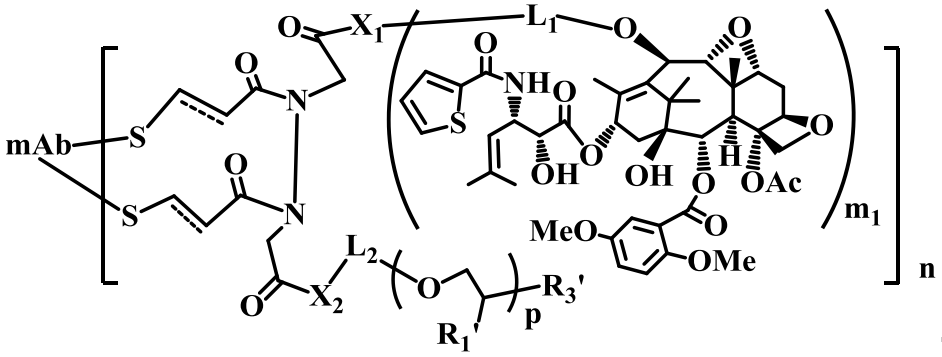
My03

wherein mAb is an antibody or a cell-binding molecule; "----", n, m_1, L_1, L_2, and R_1 are defined the same in Claim 1; R_1' and R_3' are independently H or C_1-C_6 of lineal or branched alkyl; p is 0 -2000; In addition, R_1' can be a cytotoxic agent, selected from in Claim 8.

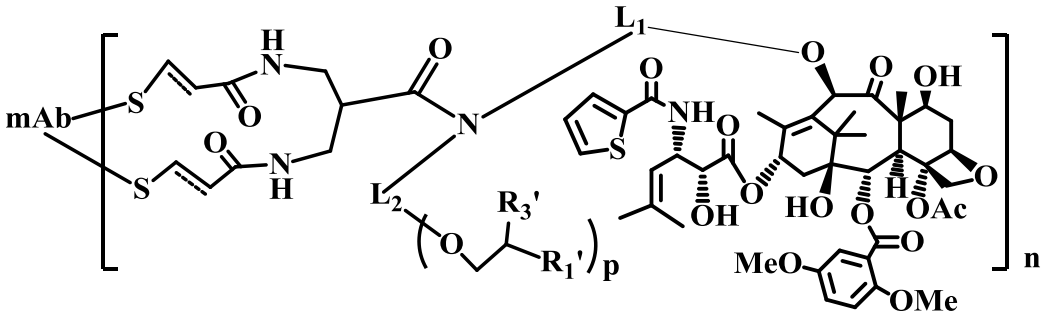
23. The conjugate compound of claim **2**, wherein Drug, Drug', or Drug" is a Taxane analog, the conjugate compound is selected from structures of Tx01, Tx02 and Tx03 as following:



Tx01



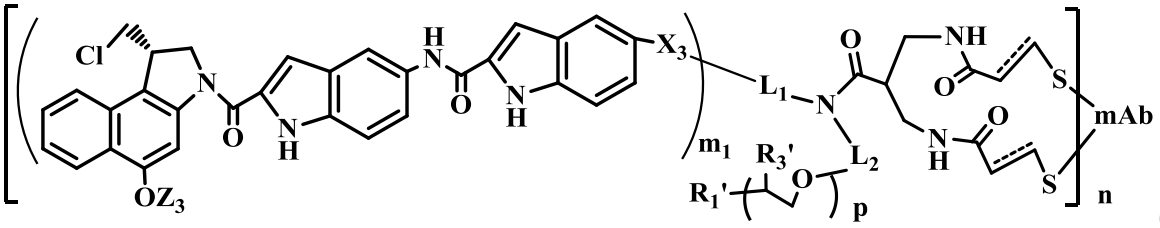
Tx02



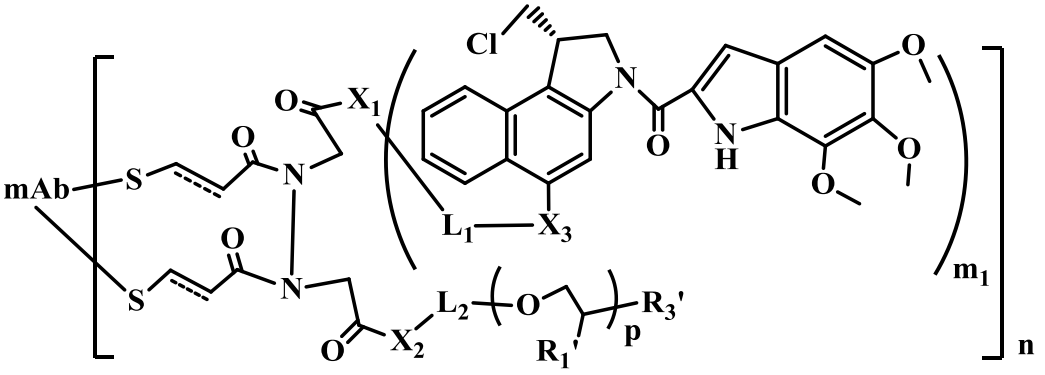
Tx03

wherein mAb is an antibody or a cell-binding molecule; "----", n, m_1, X_1, L_1, L_2, are defined the same in Claim 1; R_1' and R_3' are independently H or C_1-C_6 of lineal or branched alkyl; p is 0 - 2000; In addition, R_1' can be a cytotoxic agent, selected from in Claim 8.

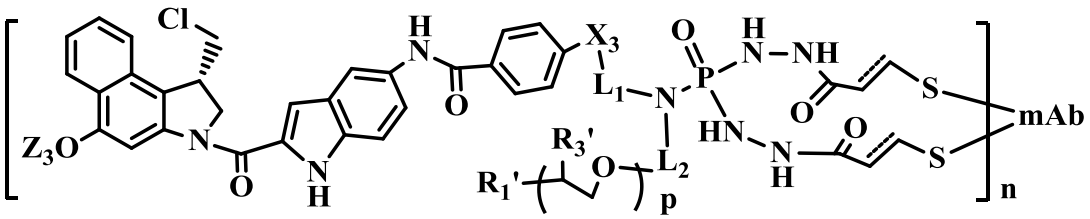
24. The conjugate compound of claim **2**, wherein Drug, Drug', or Drug" is a CC-1065 analogue and/or duocarmycin analog, the conjugate compound is selected from structures of CC01, CC02, and CC03 as following:



CC01

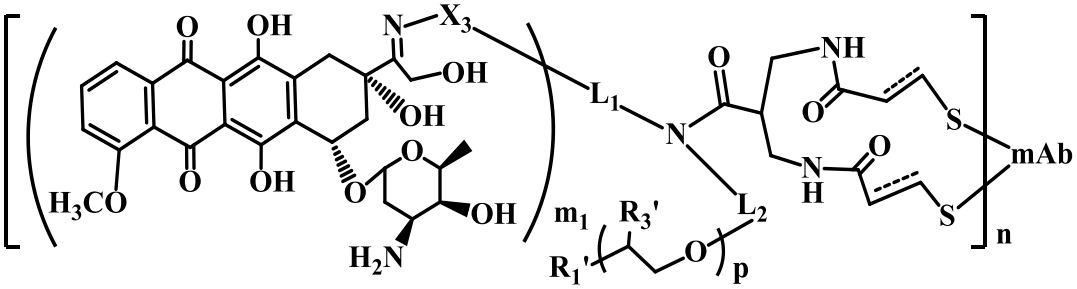


CC02

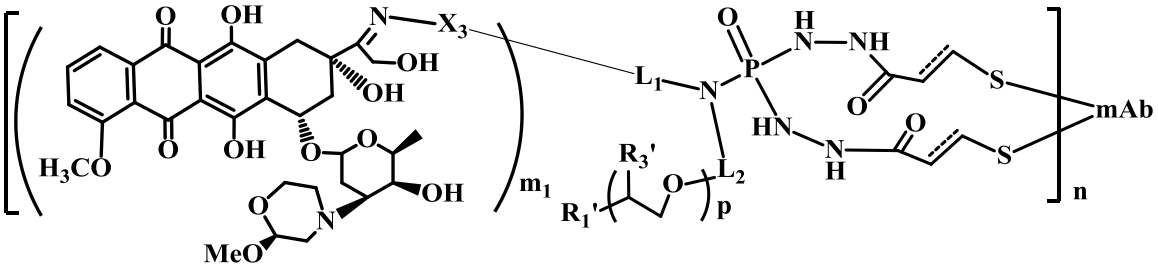


CC03

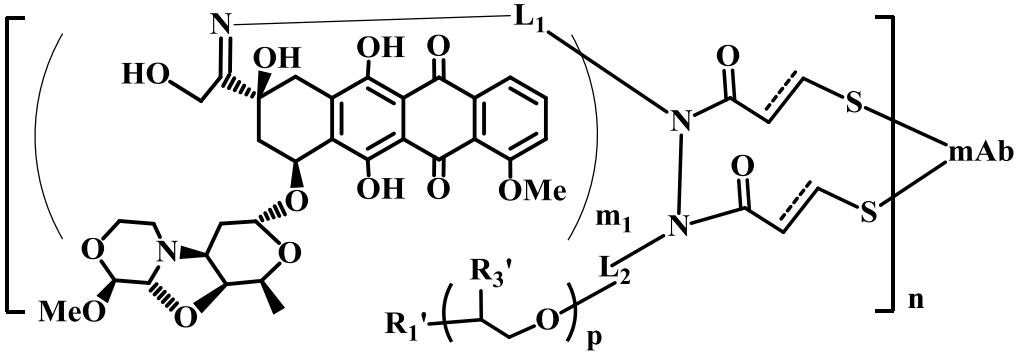
wherein mAb is an antibody or a cell-binding molecule; "═══", n, m_1, X_1, L_1, L_2, and R_1 are defined the same in Claim 1; R_1' and R_3' are independently H or C_1-C_6 of lineal or branched alkyl; p is 0 -2000; In addition, R_1' can be a cytotoxic agent, selected from in Claim 8.**25.** The conjugate compound of claim **2**, wherein Drug, Drug', or Drug" is a Daunorubicin or Doxorubicin analogue, the conjugate compound is selected from structures of Da01, Da02, Da03 and Da04 as following:



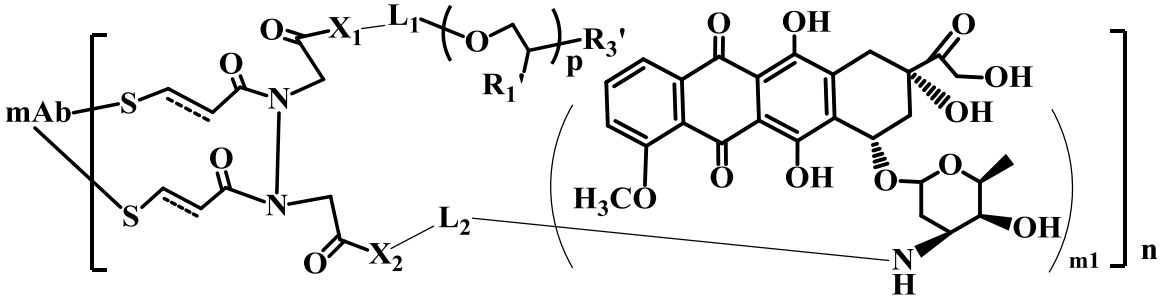
Da01



Da02



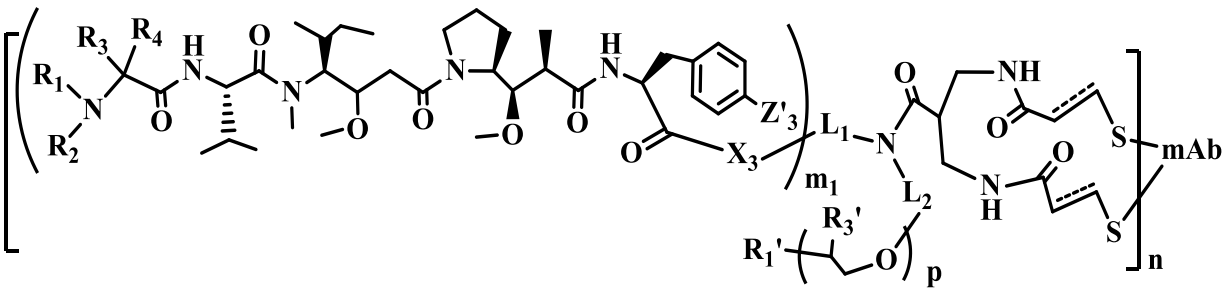
Da03



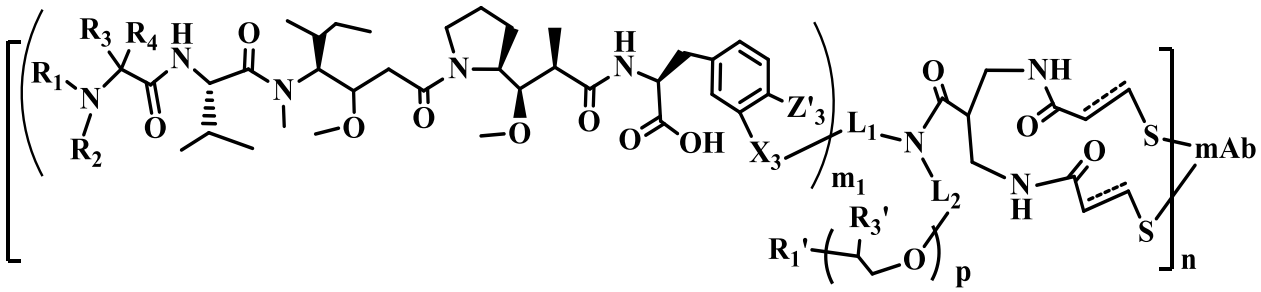
Da04

wherein mAb is an antibody or a cell-binding molecule; X_3 is O, NH, NHC(O), NHC(O)NH, C(O), R_1, OC(O), or absent; "----", n, m_1, X_1, L_1, L_2, and R_1 are defined the same in Claim 1; R_1' and R_3' are independently H or C_1-C_6 of lineal or branched alkyl; p is 0 -2000; In addition, R_1' can be a cytotoxic agent, selected from in Claim 8.

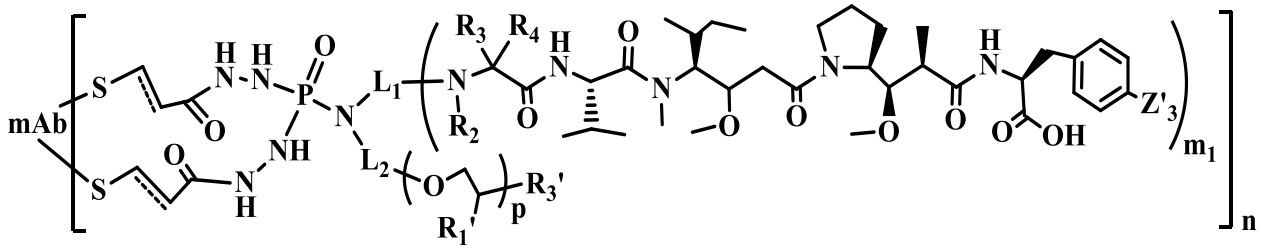
26. The conjugate compound of claim **2**, wherein Drug, Drug', or Drug" is an Auristatin or dolastatin analogue, the conjugate compound is selected from structures of Au01, Au02, Au03, Au04, Au05, Au06, Au07, Au08, Au09, Au10, Au11, A12 and Au13 as following:



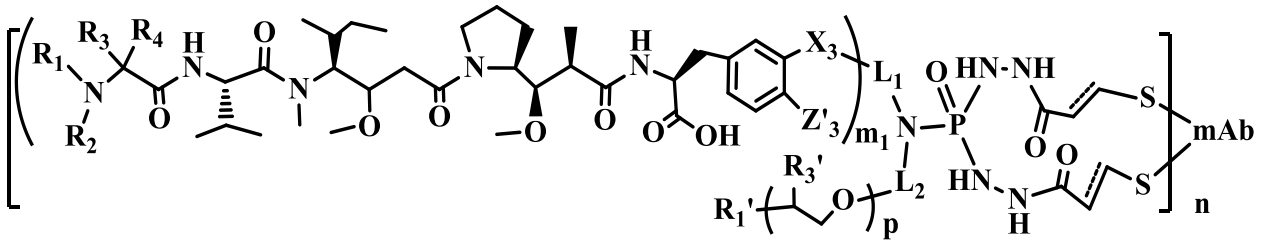
Au01



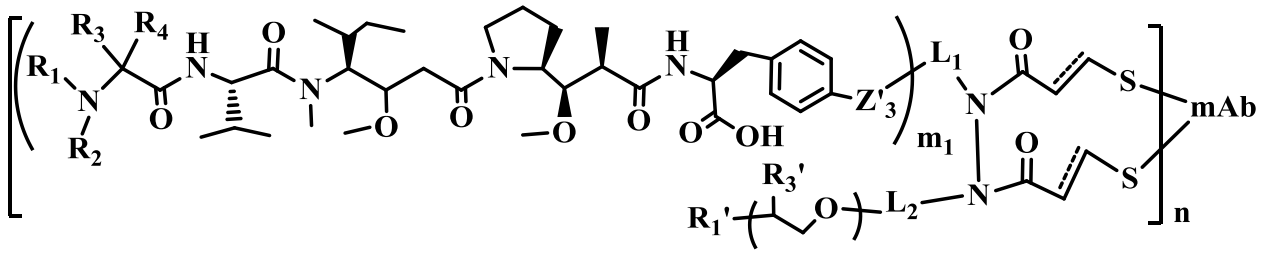
Au02



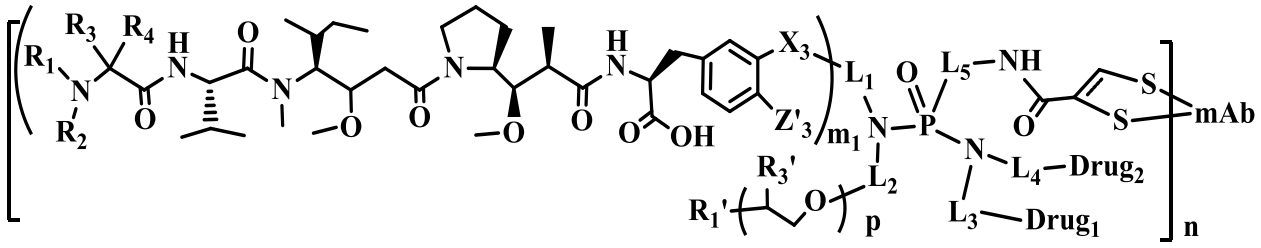
Au03



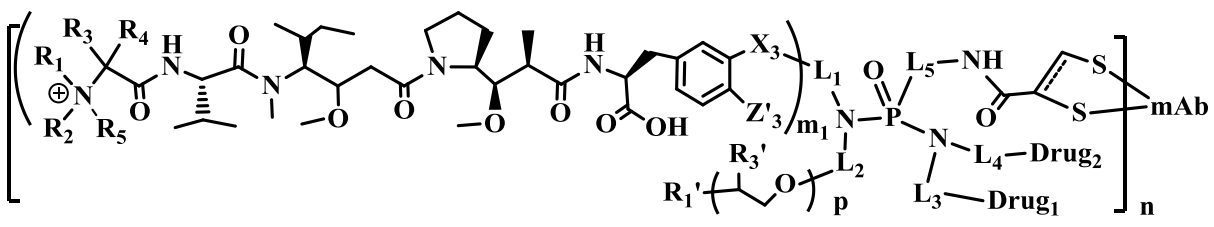
Au04



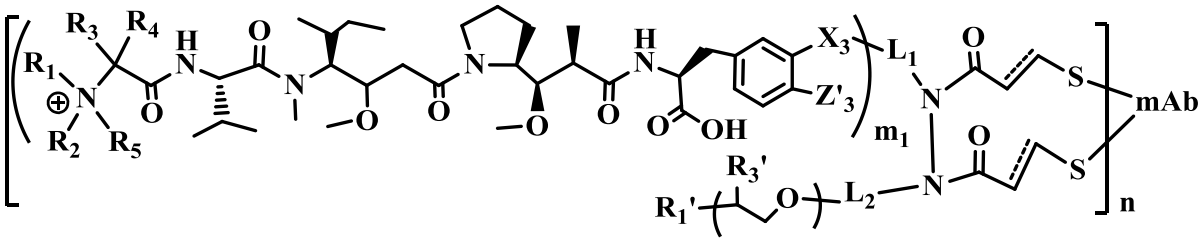
Au05



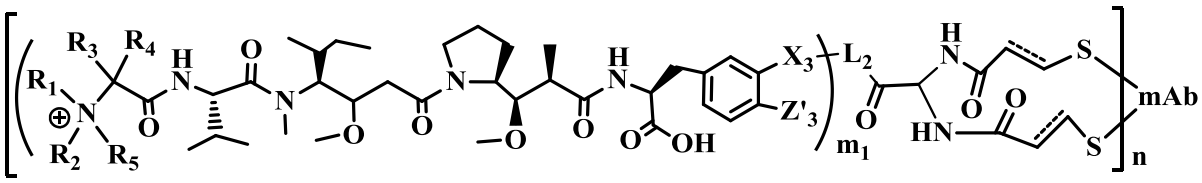
Au06



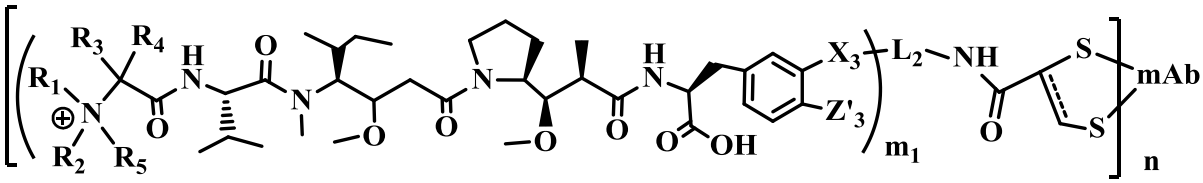
Au07



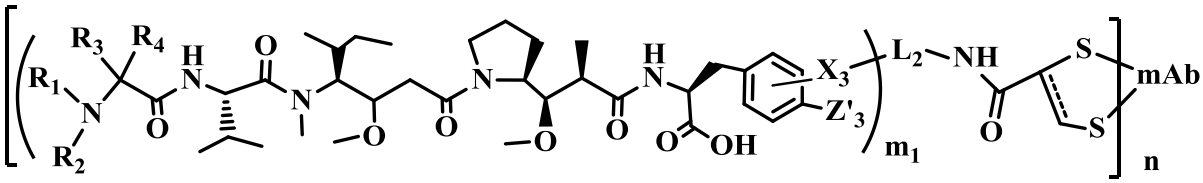
Au08



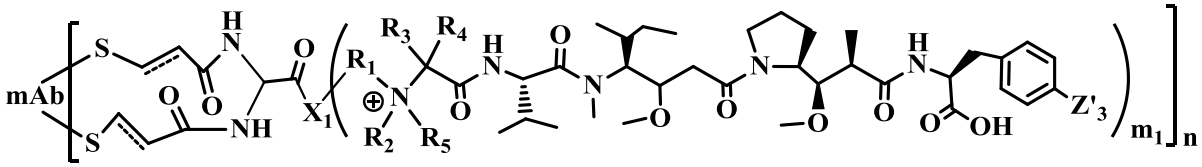
Au09



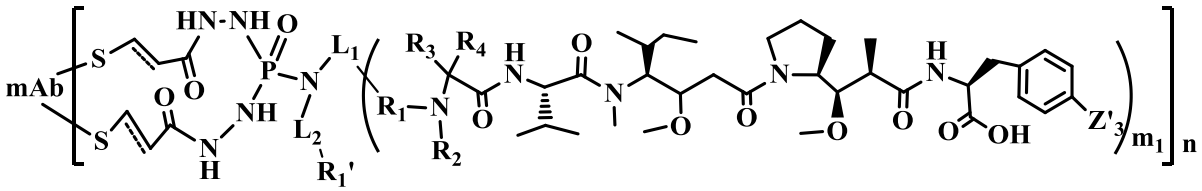
Au10



Au 11



Au12

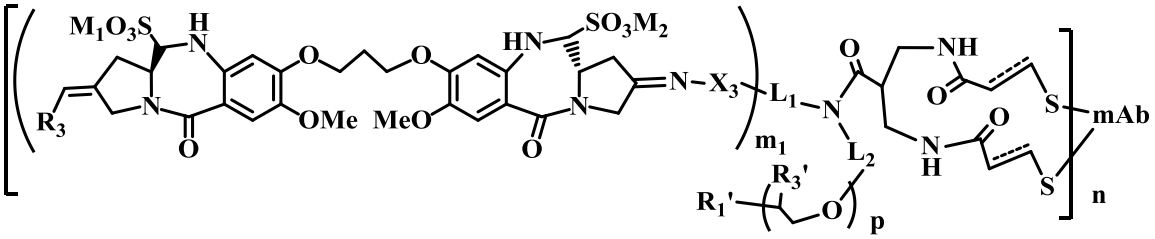


Au13

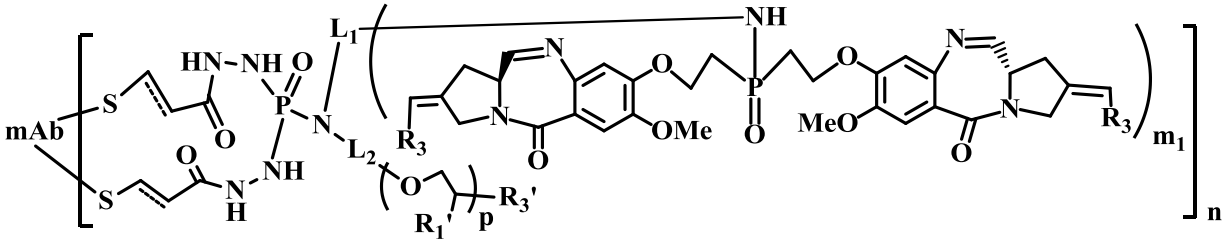
wherein "═══", n, m_1, m_2, X_1, X_2, R_1, R_2, R_3, R_4 and R_5 are the same defined in Claim 1 or Claim 2; mAb is an antibody, or a cell-binding molecule; L_1, L_2, L_3, L_4, and L_5 are independently defined as L_1 in Claim 1; Z_3' is H, $OP(O)(OM_1)(OM_2)$, $OOCCH_3$, $OCH_2OP(O)(OM_1)(OM_2)$, OSO_3M_1, R_1, or O-glycoside (including glucoside, galactoside, mannoside, glucuronoside/ glucuronide, alloside, fructoside), NH-glycoside, S-glycoside or CH_2-glycoside; In addition, the two Rs: R_1R_2, R_2R_3, R_1R_3 or R_3R_4 can form 3~8 member cyclic ring of alkyl, aryl, heteroaryl, het-

eroalkyl, or alkylcycloalkyl group; X_3 is H, CH_3, or X_1'R_1', wherein X_1' is NH, N(CH_3), NHNH, O, or S, and R_1' is H or C_1-C_8 of lineal or branched alkyl, aryl, heteroaryl, heteroalkyl, alkylcycloalkyl, acyloxylamines; R_3' is H or C_1-C_6 of lineal or branched alkyl; p is 0 -2000; M_1 and M_2 are independently H, Na, K, Ca, Mg, NH_4, $NR_1R_2R_3$; In addition, R_1' can be a cytotoxic agent, selected from in Claim 8.

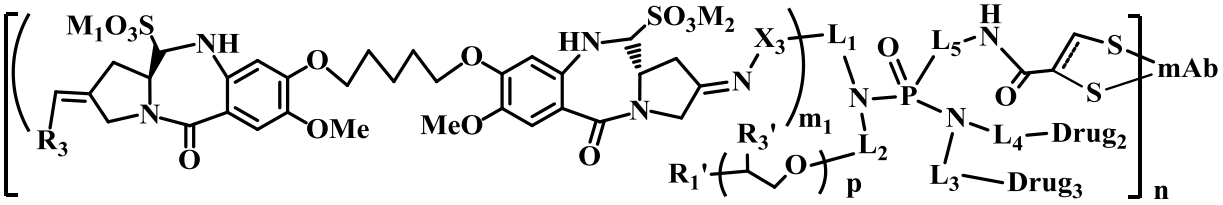
27. The conjugate compound of claim **2**, wherein Drug, Drug', or Drug" is a dimer of benzodiazepine analogues, the conjugate compound is selected from structures of PB01, PB02, PB03, PB04, PB05, PB06, PB07, PB08, PB09, PB10 and PB11.



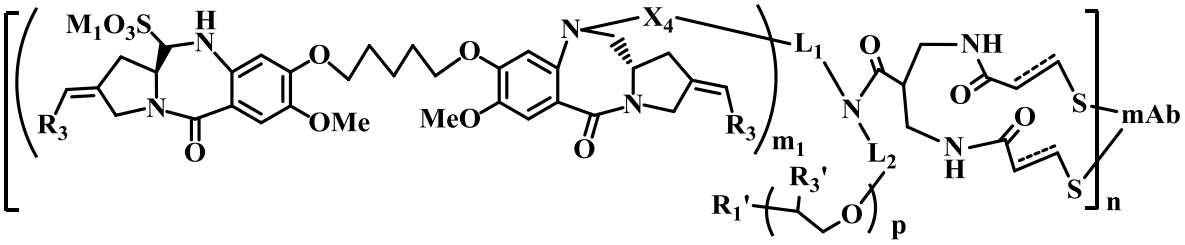
PB01



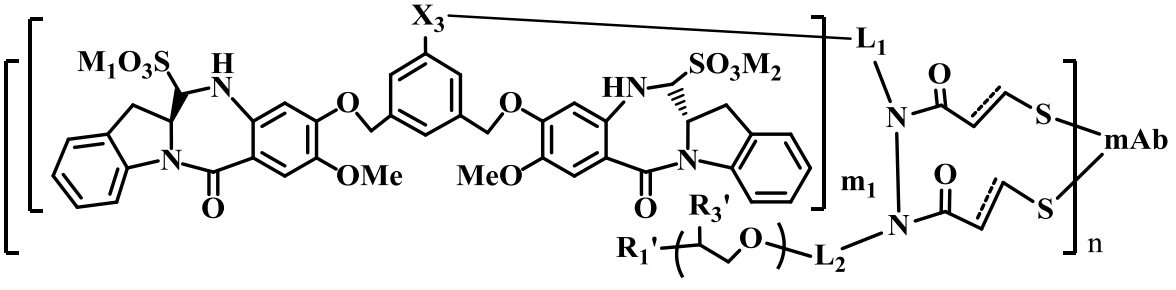
PB02



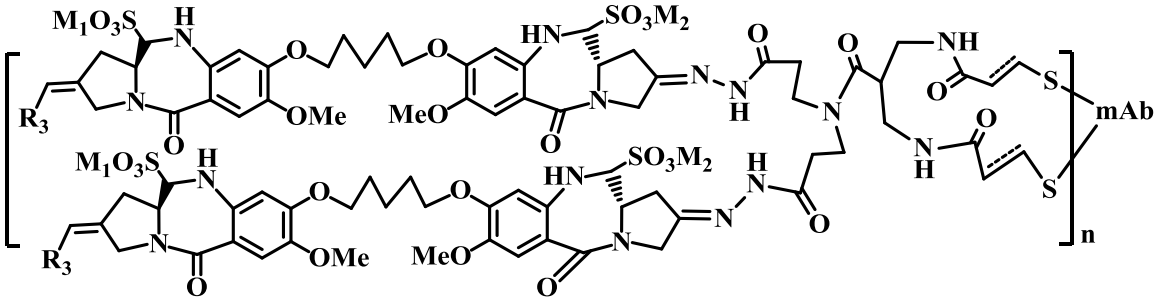
PB03



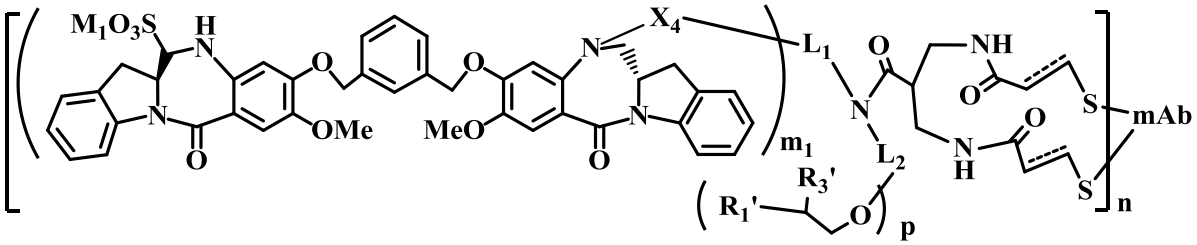
PB04



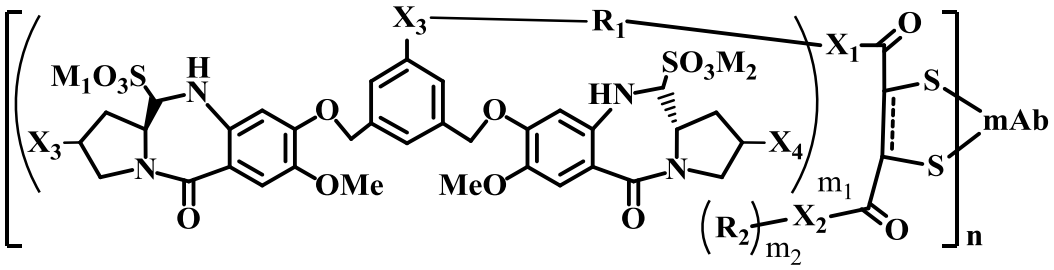
PB05



PB06



PB07



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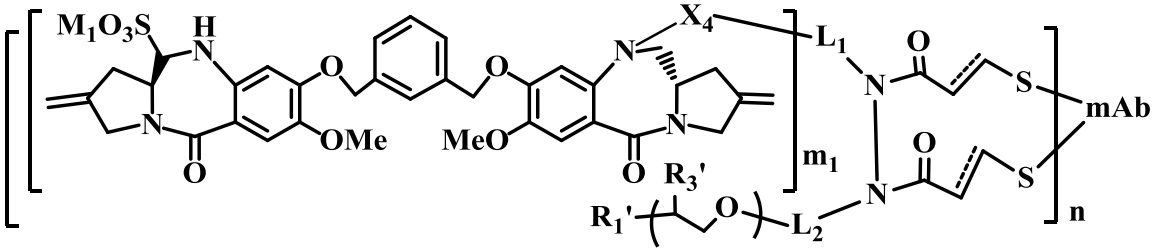
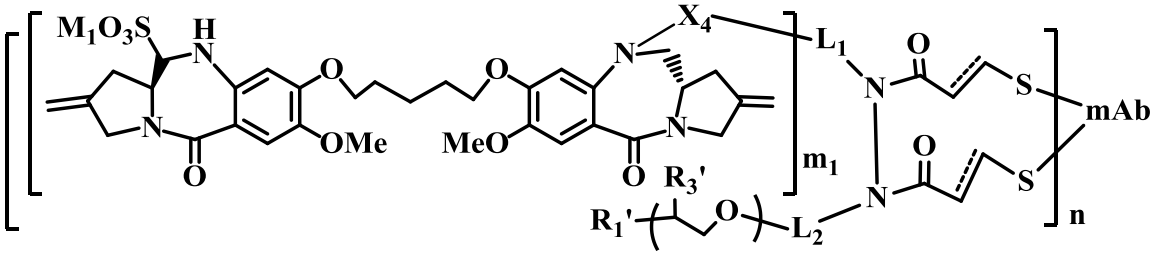
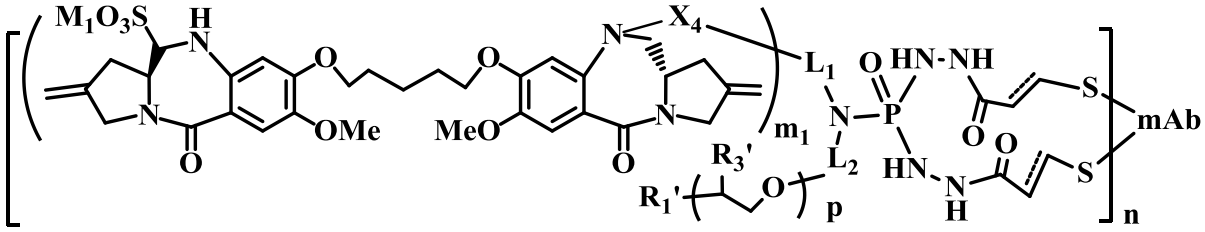


PB09



PB10

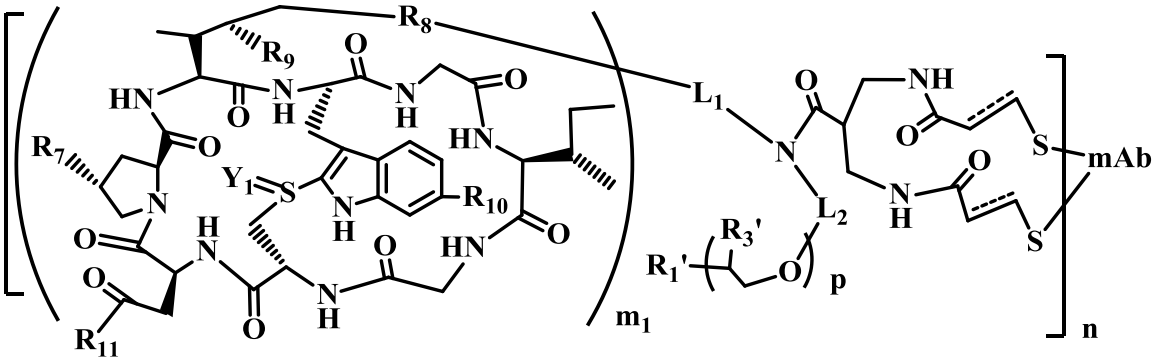


PB11

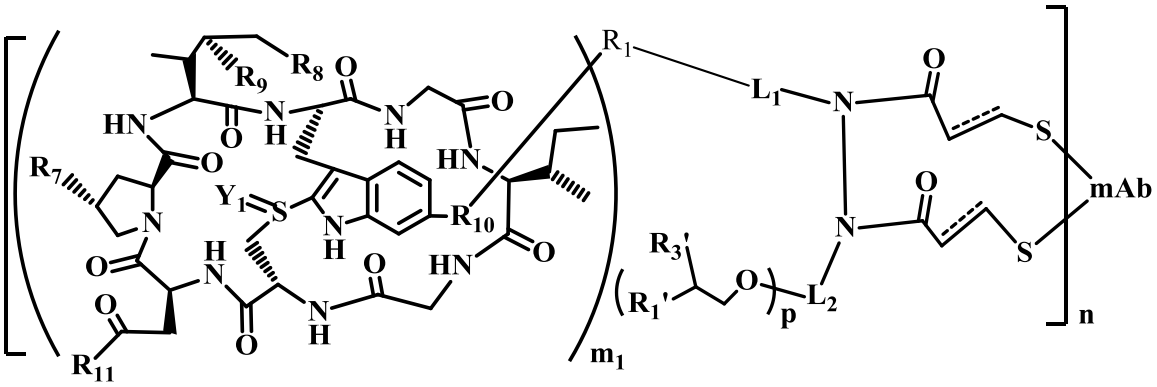
wherein "═══", n, m_1, m_2, X_1, X_2, L_1, L_2, R_1, R_2, R_3, are the same defined in Claim 1 or Claim 2; mAb is an antibody, or a cell-binding molecule; X_3 is CH_2, O, NH, NHC(O),

NHC(O)NH, C(O), OC(O), OC(O)(NR_3), R_1,NHR_1, NR_1,$C(O)R_1$ or absent; X_4 is CH_2, C(O), C(O)NH, C(O)N(R_1), R_1,NHR_1, NR_1,$C(O)R_1$ or C(O)O; M_1 and M_2 are independently H, Na, K, Ca, Mg, NH_4, $NR_1R_2R_3$; R_1' and R_3' are independently H or C_1-C_6 lineal or branched alkyl; p is 0 -2000; In addition, R_1' can be a cytotoxic agent, selected from in Claim 8.

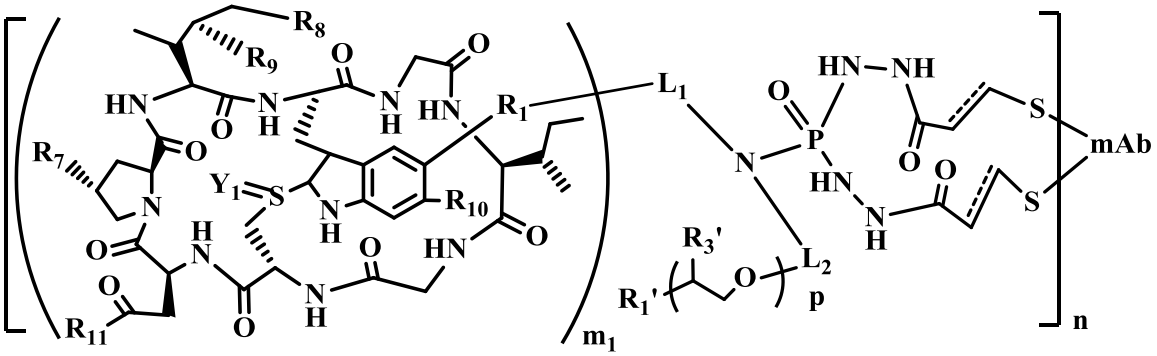
28. The conjugate compound of claim **2**, wherein Drug, Drug', or Drug" is an amanitin analogue, the conjugate compound is selected from structures of Am01, Am02, Am03, Am04 below.



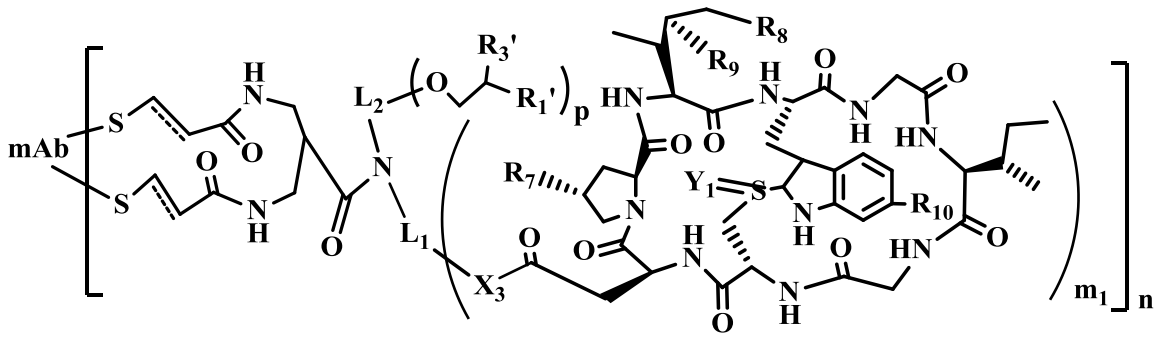
Am01



Am02



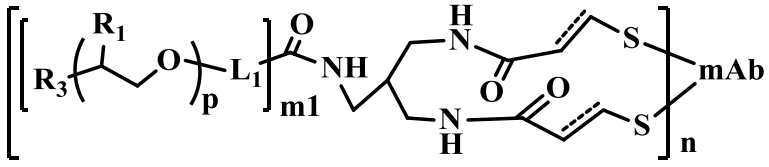
Am03



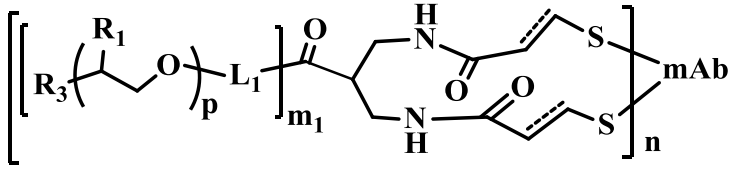
Am04

wherein "═══", n, m_1, m_2, L_1, L_2, R_1, R_2, R_3, are the same defined in Claim 1 or Claim 2; mAb is an antibody, or a cell-binding molecule; X_3 is CH_2, O, NH, NHC(O), NHC(O)NH, C(O), OC(O), OC(O)(NR_3), R_1,NHR_1, NR_1,C(O)R_1 or absent; R_7, R_8, R_9, R_{10} and R_{11} are independently H, OH, OR_1, NH_2, NHR_1, C_1-C_6 alkyl, or absent; Y_1 is O, O_2, S, NH, or absent; R_1' and R_3' are independently H or C_1-C_6 lineal or branched alkyl; p is 0 -2000; In addition, R_1' can be a cytotoxic agent, selected from in Claim 8.

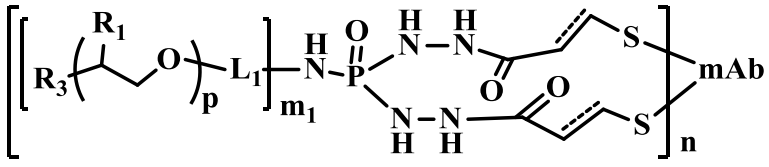
29. The conjugate compound of claim **2**, wherein Drug, Drug', or Drug" is a polyalkylene glycol analog, the conjugate compound is selected from structures of Pg01, Pg02, Pg03, Pg04, Pg05, Pg06, and Pg07:



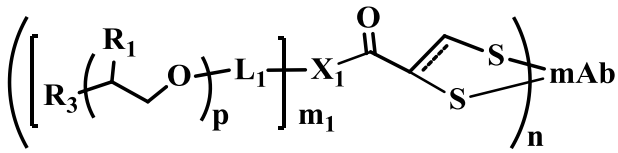
Pg01



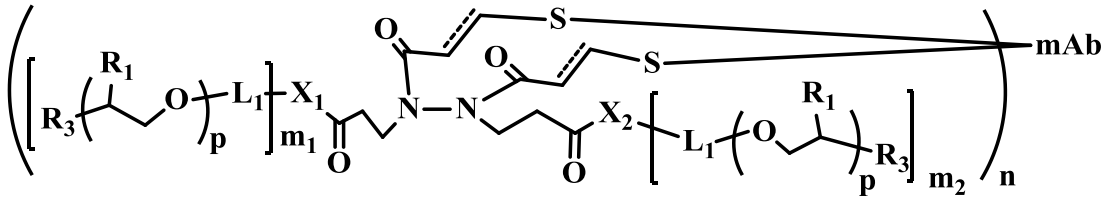
Pg02



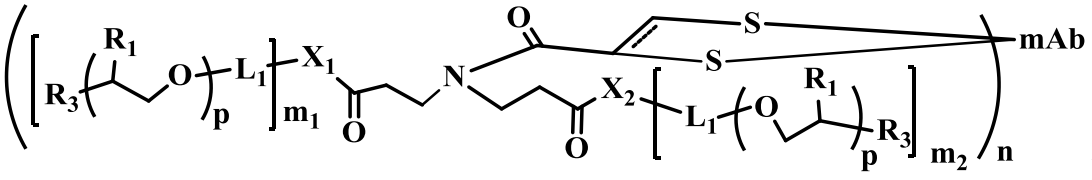
Pg03



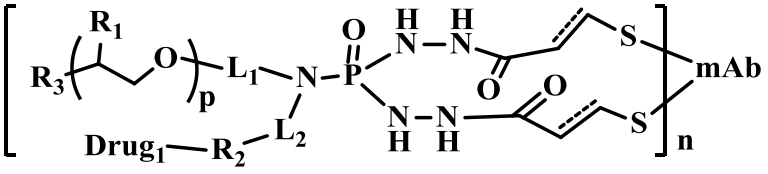
Pg04



Pg05



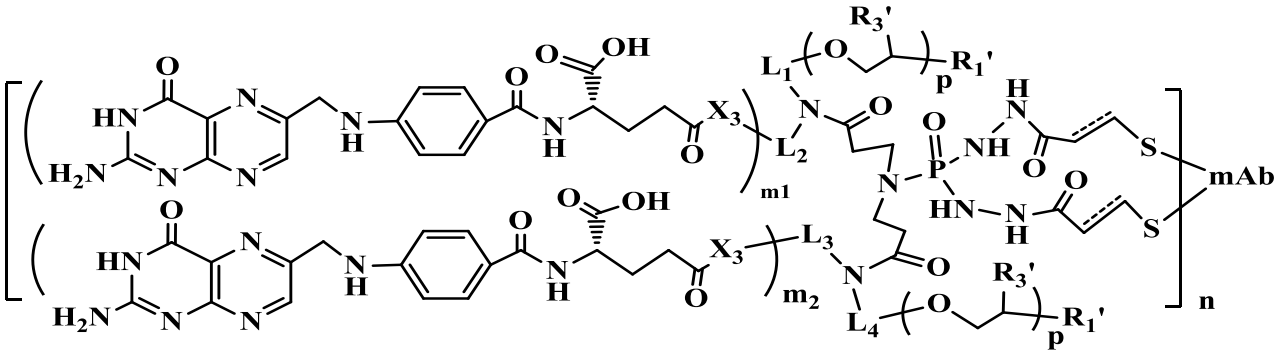
Pg06



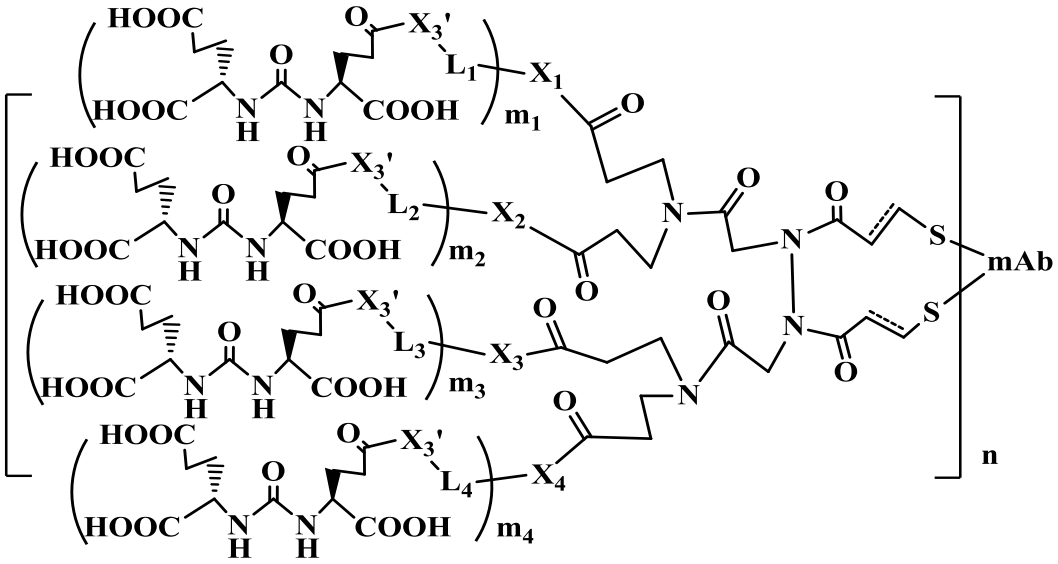
Pg07

wherein "═══", n, m_1, m_2, X_1, X_2, L_1, L_2, R_1, R_2, and R_3 are the same defined in Claim 1 or Claim 2; mAb is an antibody, or a cell-binding molecule; p is 0 -2000; $Drug_1$ is a cytotoxic agent that is selected from in Claim 8.

30. The conjugate compound of claim **2**, wherein Drug, Drug', or Drug" is a cell-binding ligand or cell receptor agonist and its analog, the conjugate compound is selected from structures as: LB01 (Folate conjugate conjugate), LB02 (PMSA ligand conjugate), LB03 (PMSA ligand conjugate), LB04 (Somatostatin conjugate), LB05 (Octreotide, a Somatostatin analog conjugate), LB06 (Lanreotide, a Somatostatin analog conjugate), LB07 (Vapreotide (Sanvar) , a Somatostatin analog conjugate), LB08 (CAIX ligand conjugate), LB09 (CAIX ligand conjugate), LB10 (Gastrin releasing peptide receptor (GRPr), MBA conjugate), LB11 (luteinizing hormone-releasing hormone (LH-RH) ligand and GnRH conjugate), LB12 (luteinizing hormone-releasing hormone (LH-RH) and GnRH ligand conjugate), LB13 (GnRH antagonist, Abarelix conjugate), LB14 (cobalamin, vitamin B12 analog conjugate), LB15 (cobalamin, vitamin B12 analog conjugate), LB16 (for $\alpha_v\beta_3$ integrin receptor, cyclic RGD pentapeptide conjugate), LB17 (heterobivalent peptide ligand conjugate for VEGF receptor), LB18 (Neuromedin B conjugate), LB19 (bombesin conjugate for a G-protein coupled receptor), LB20 (TLR_2 conjugate for a Toll-like receptor,), LB21 (for an androgen receptor), LB22 (Cilengitide/cyclo(-RGDfV-) conjugate for an α_v intergrin receptor, LB23 (Fludrocortisone conjugate), LB24 (Dexamethasone conjugate), LB25 (fluticasone propionate conjugate), LB26 (Beclometasone dipropionate), LB27 (Triamcinolone acetonide conjugate), LB28 (Prednisone conjugate), LB29 (Prednisolone conjugate), LB30 (Methylprednisolone conjugate), LB31 (Betamethasone conjugate), LB32 (Irinotecan analog), LB33 (Crizotinib analog**),** LB34 (Bortezomib analog), LB35 (Carfilzomib analog), LB36 (Carfilzomib analog), LB37 (Leuprolide analog), LB38 (Triptorelin analog), LB39 (Liraglutide analog), LB40 (Semaglutide analog), and LB41 (Lixisenatide analog), which are shown in the following structures:

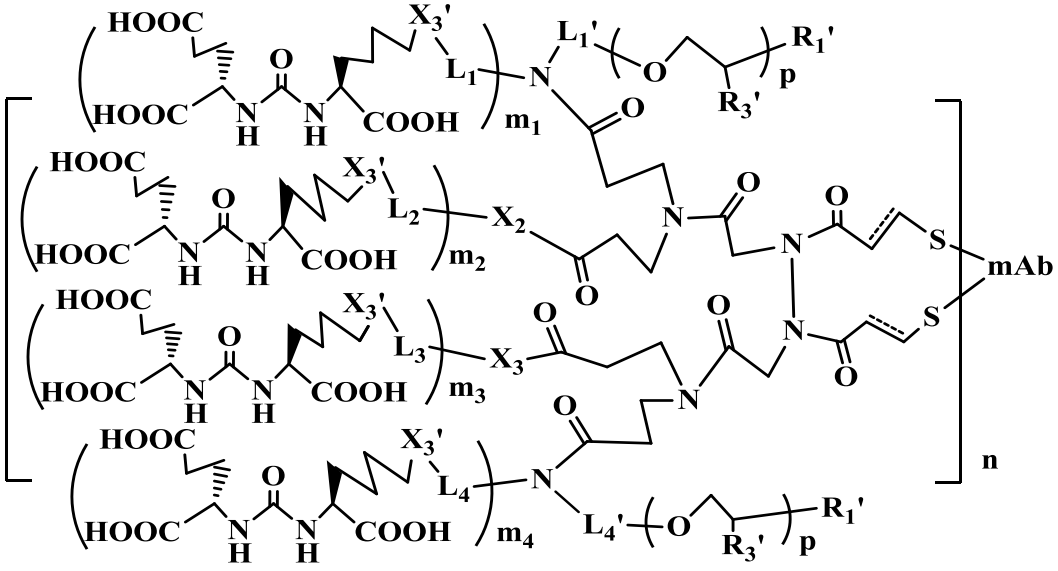


LB01 (Folate conjugate),



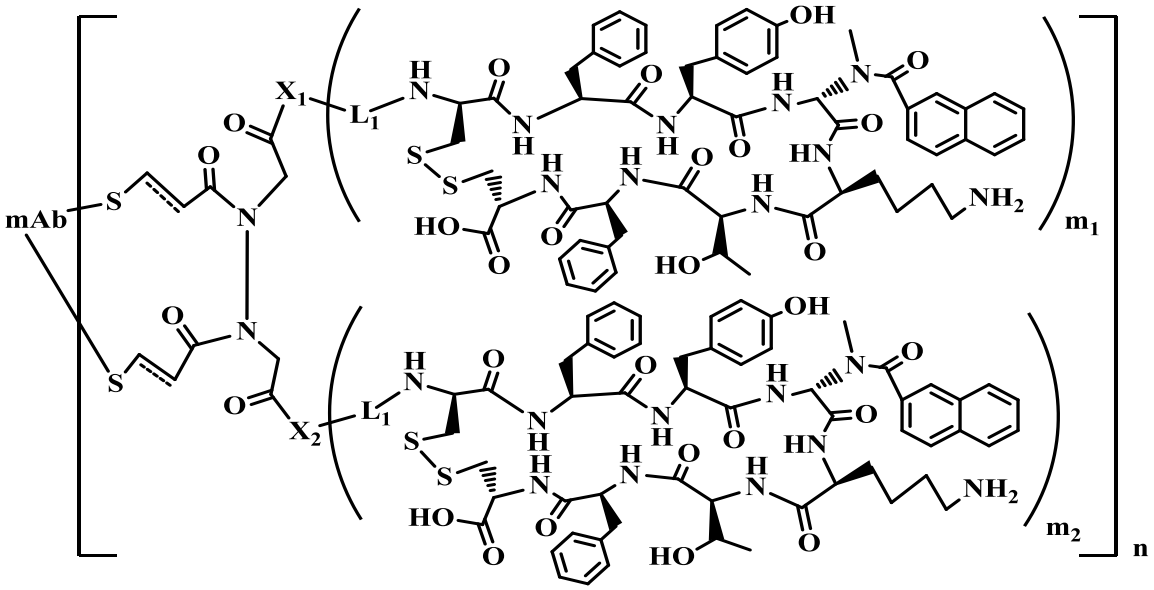
LB02

(PMSA ligand conjugate),

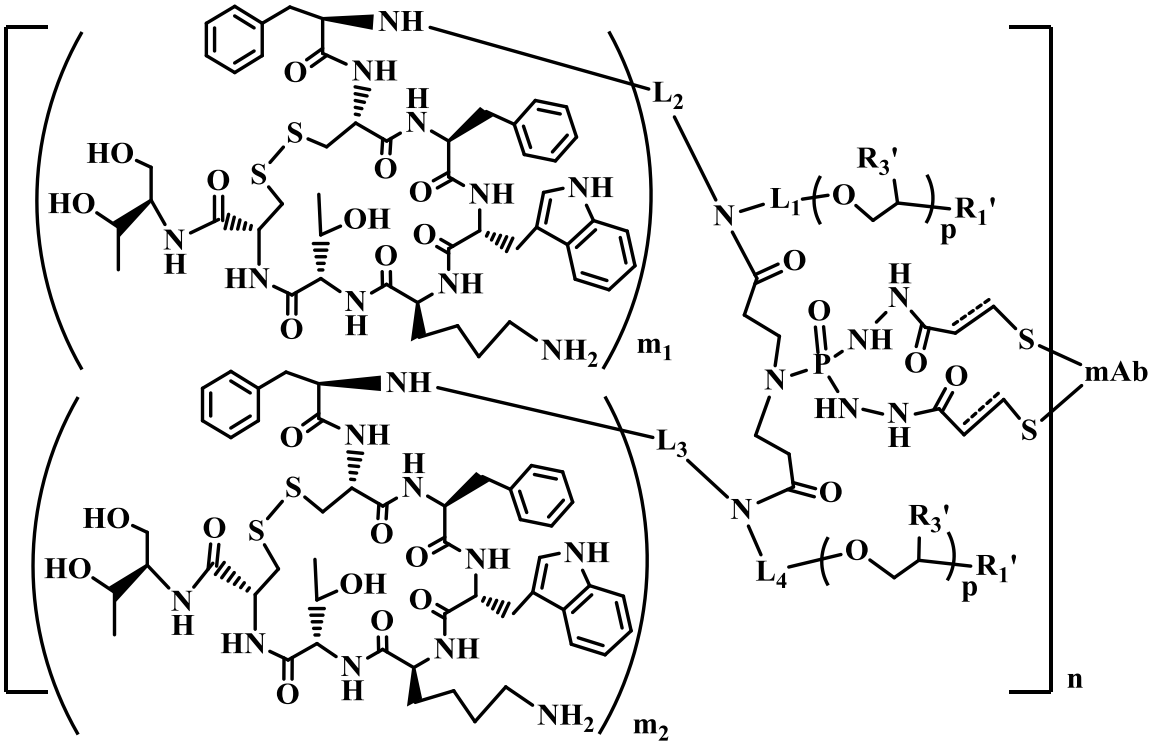


LB03

(PMSA ligand conjugate),

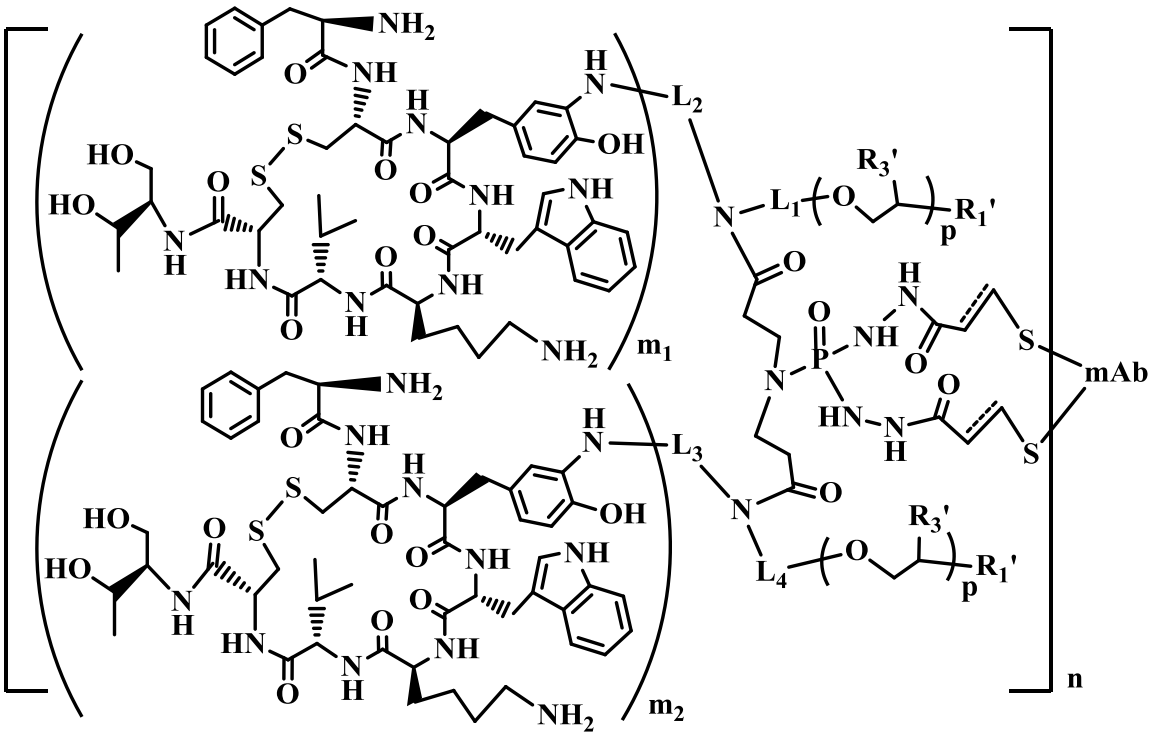


LB04 (Somatostatin conjugate),



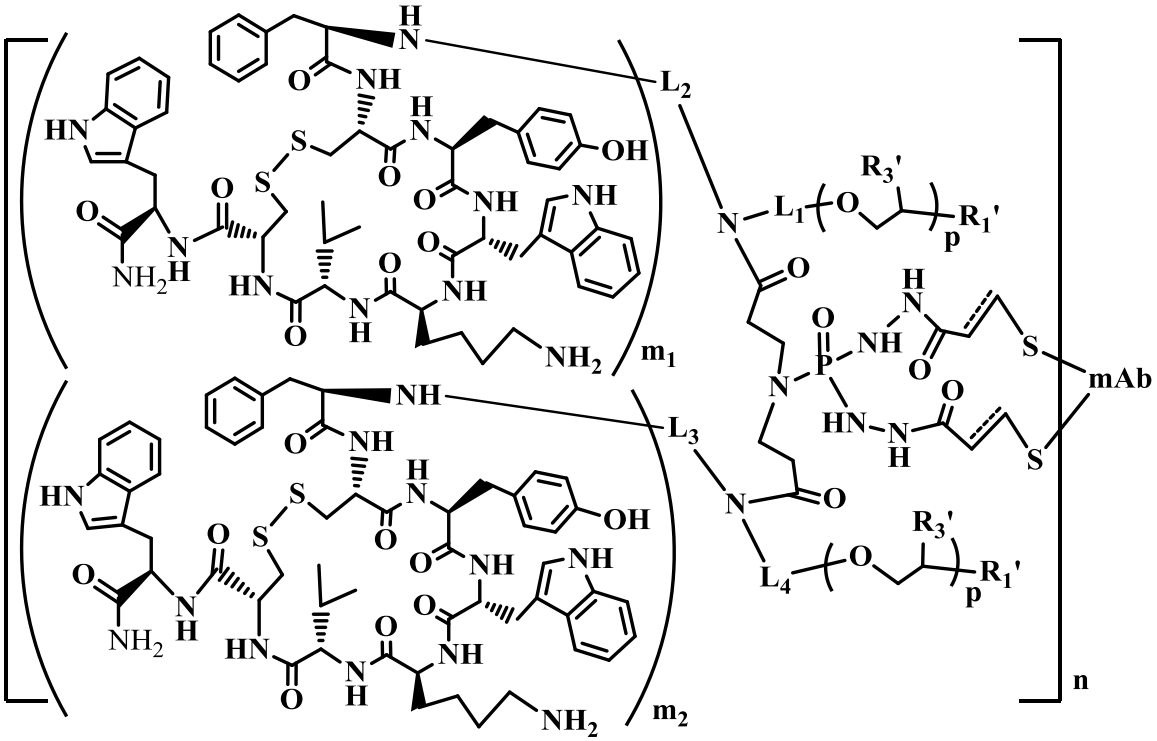
LB05

(Octreotide, a Somatostatin analog conjugate),

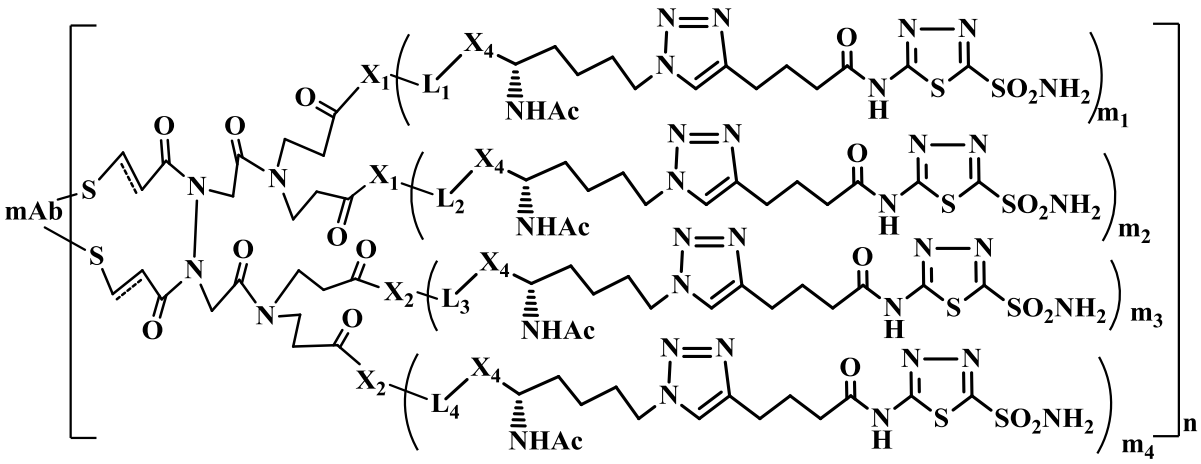


LB06

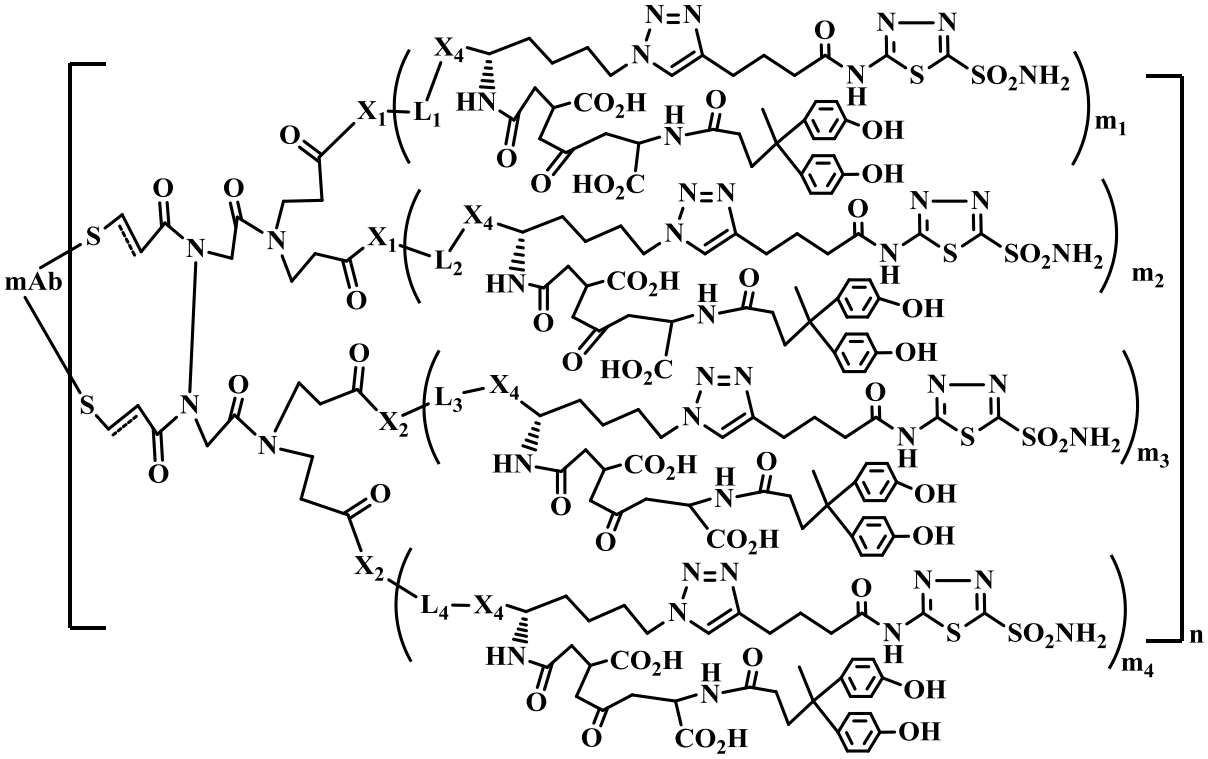
(Lanreotide, a Somatostatin analog conjugate),



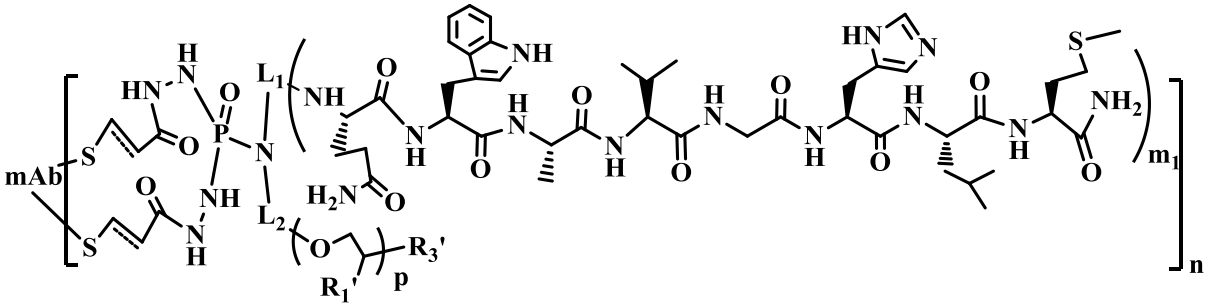
LB07 (Vapreotide (Sanvar), a Somatostatin analog conjugate),



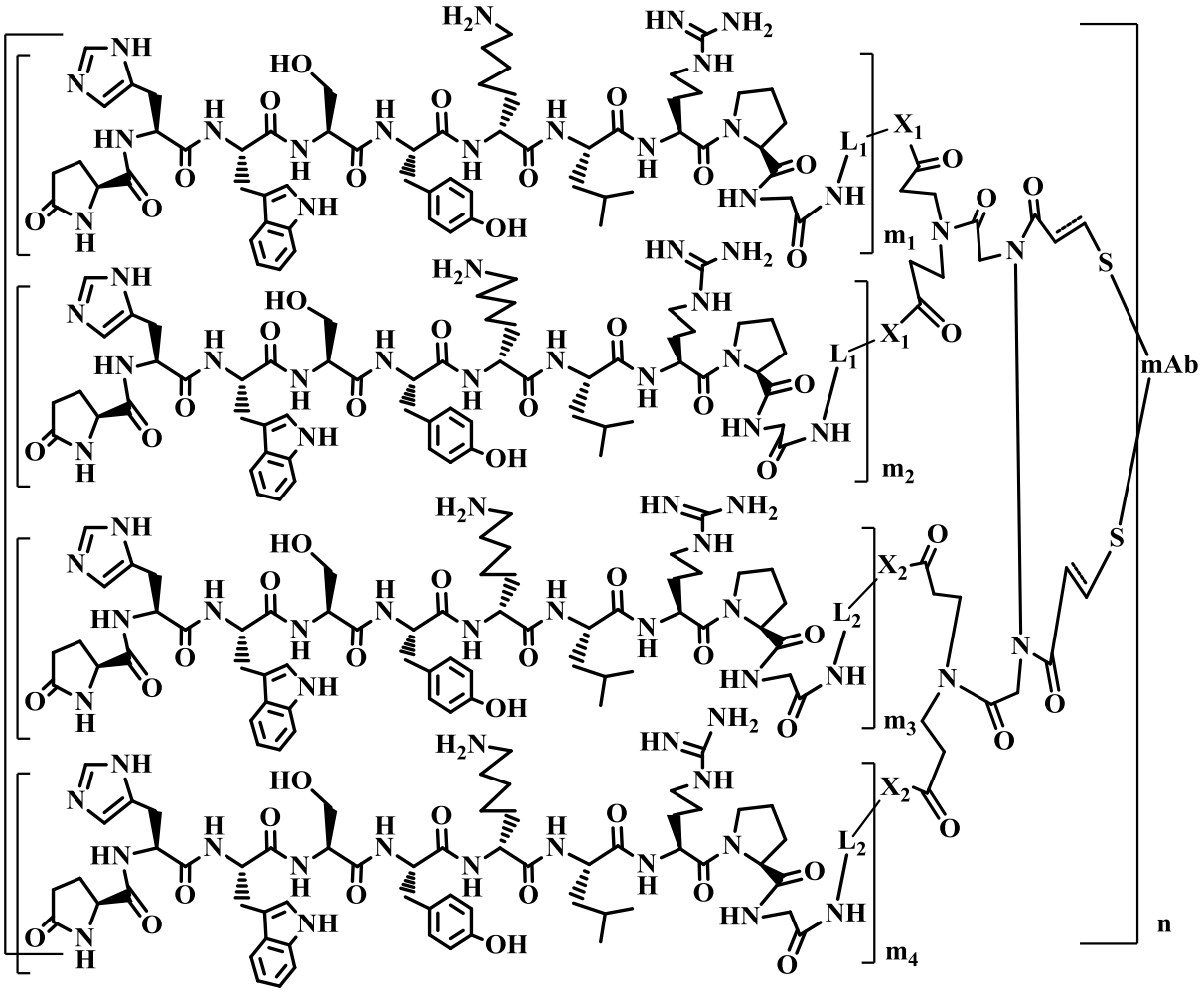
LB08 (CAIX ligand conjugate),



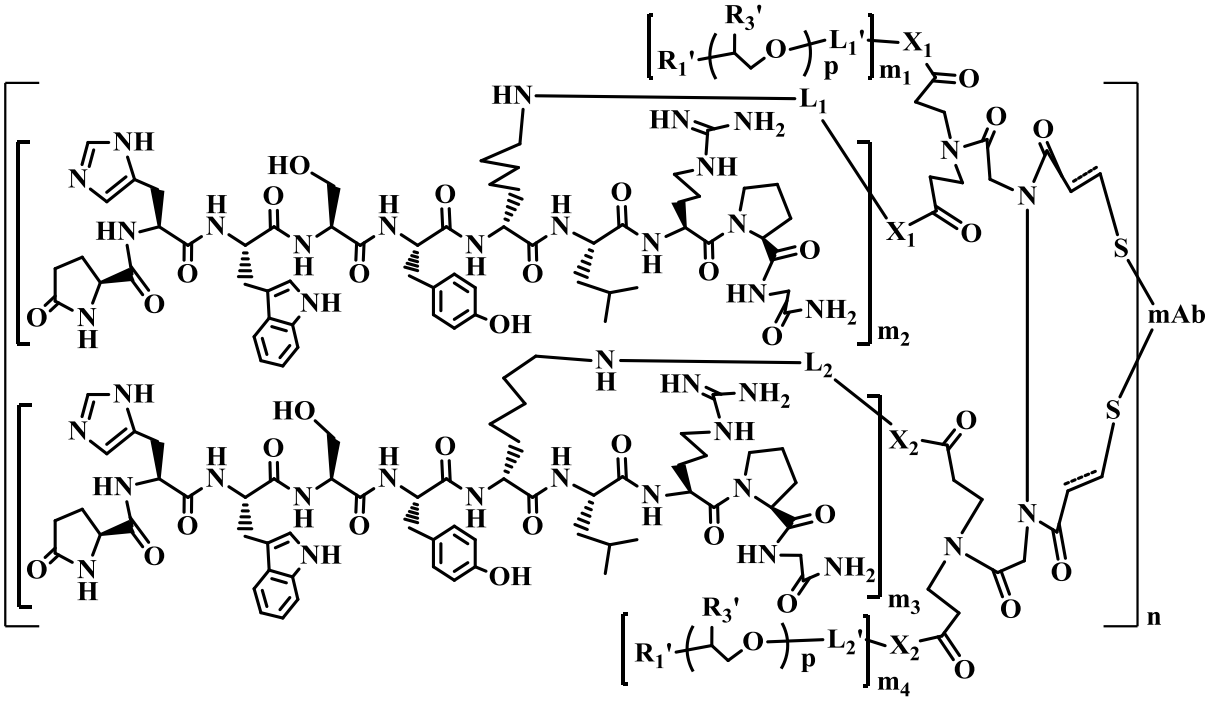
LB09 (CAIX ligand conjugate),



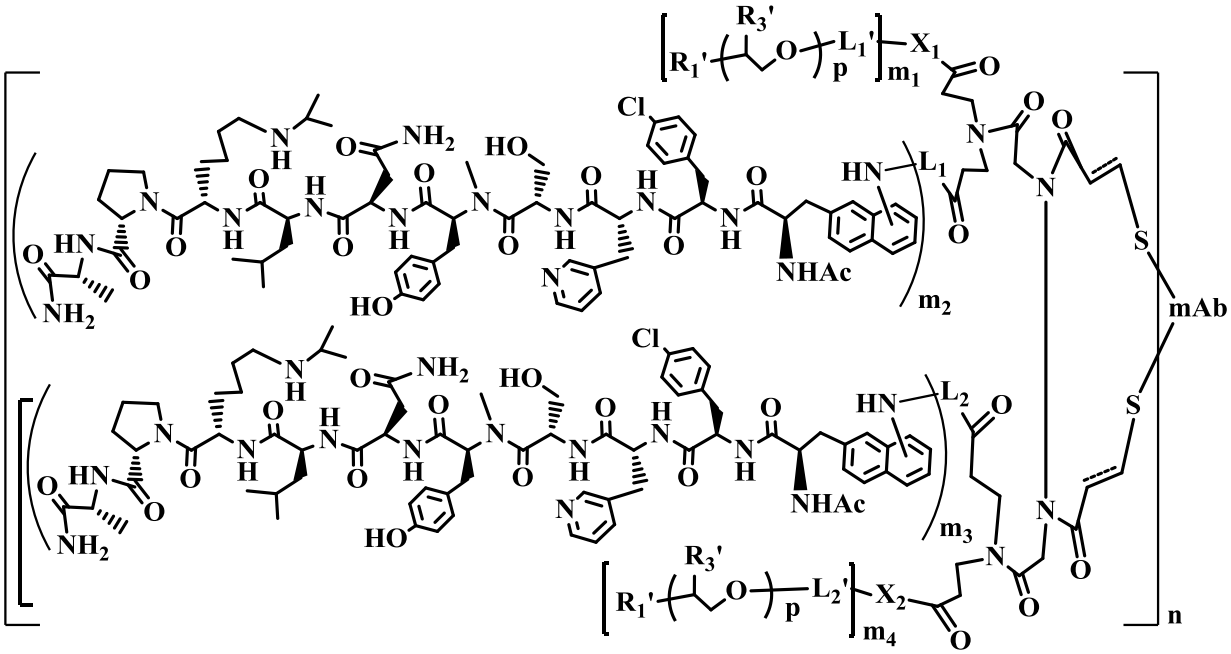
LB10 (Gastrin releasing peptide receptor (GRPr), MBA conjugate),



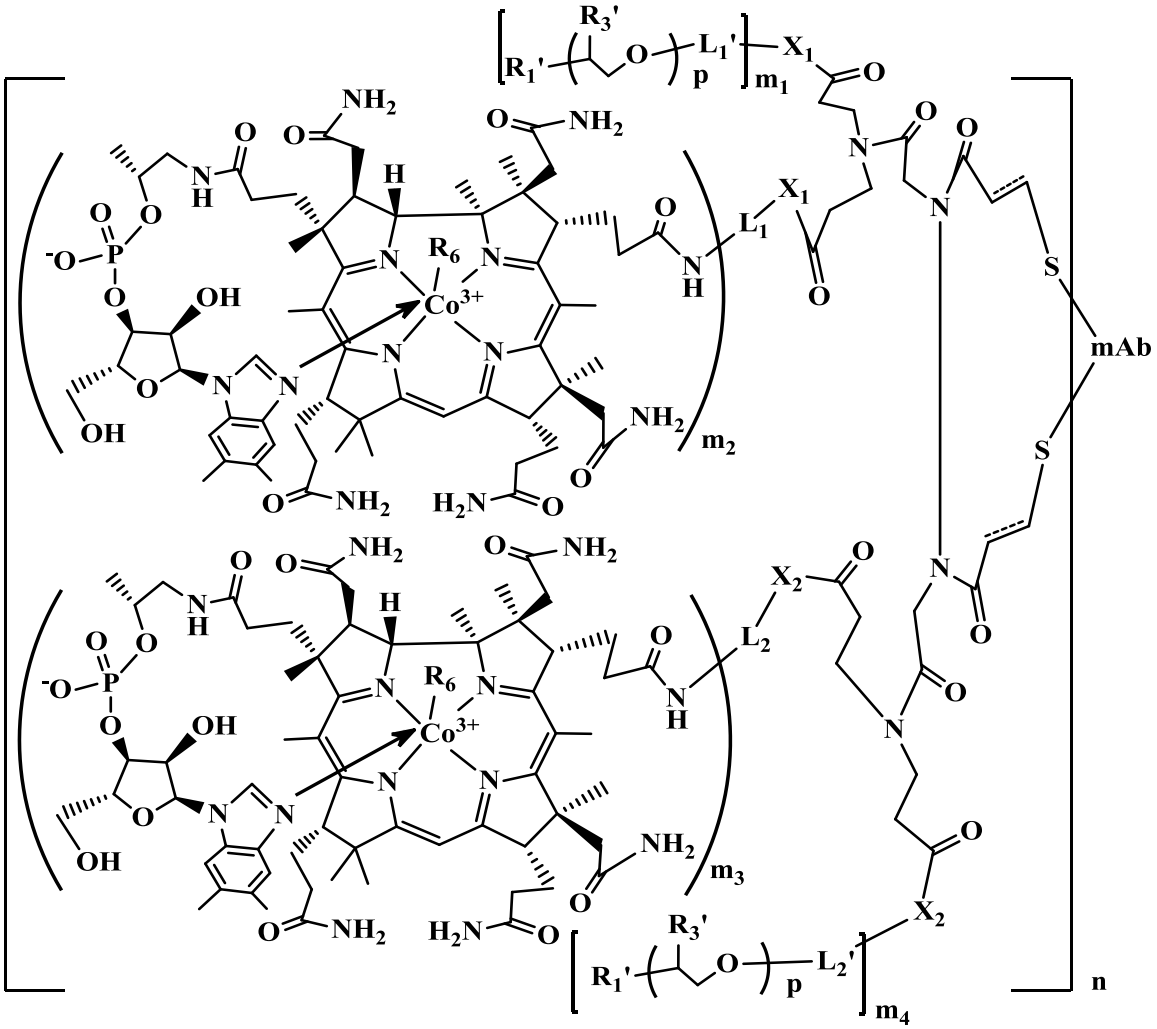
LB11 (luteinizing hormone-releasing hormone (LH-RH) ligand and GnRH conjugate),



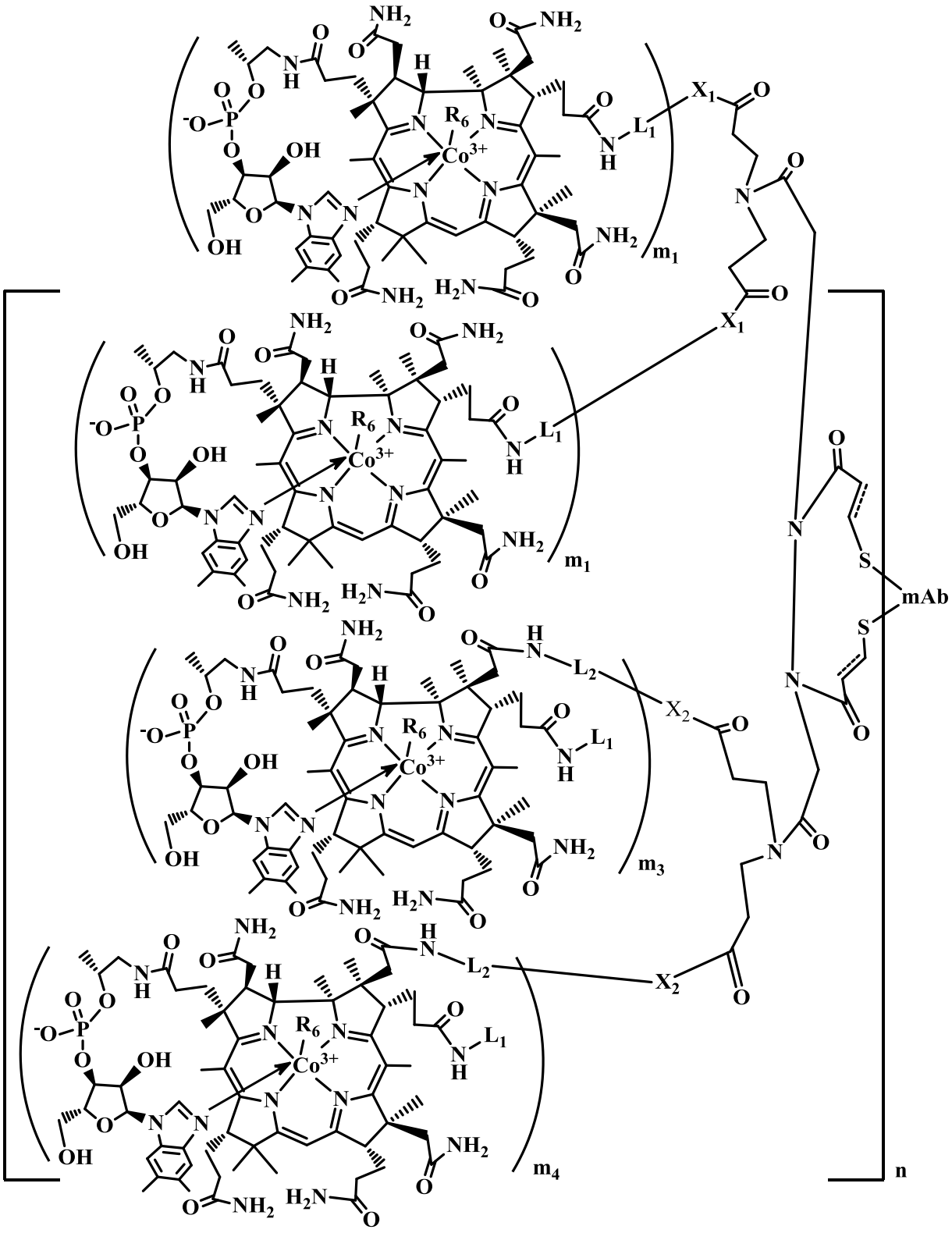
LB12 (luteinizing hormone-releasing hormone (LH-RH) and GnRH ligand conjugate),



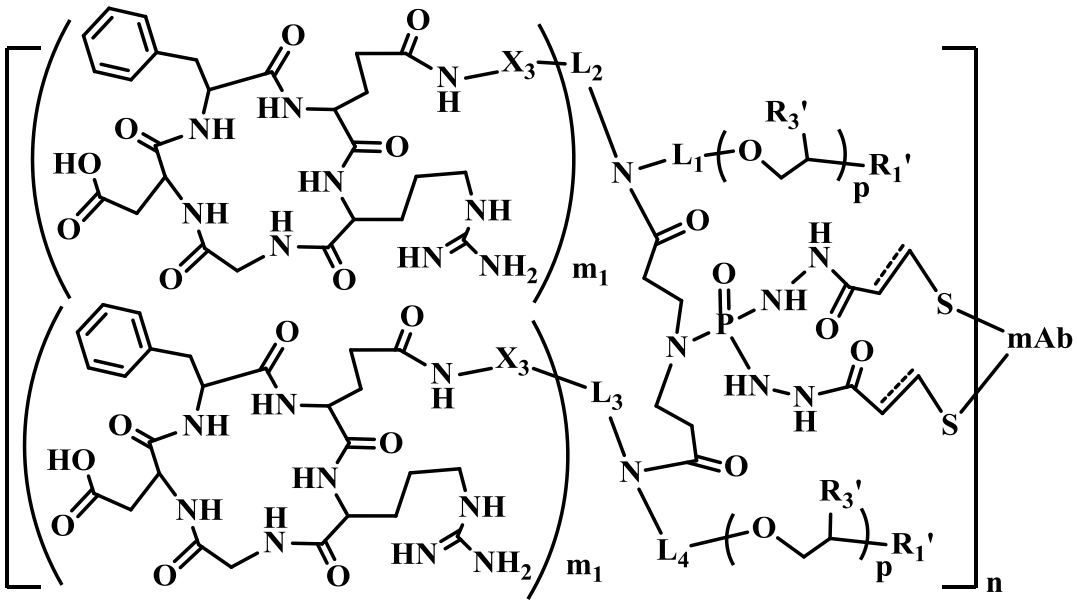
LB13 (GnRH antagonist, Abarelix conjugate),



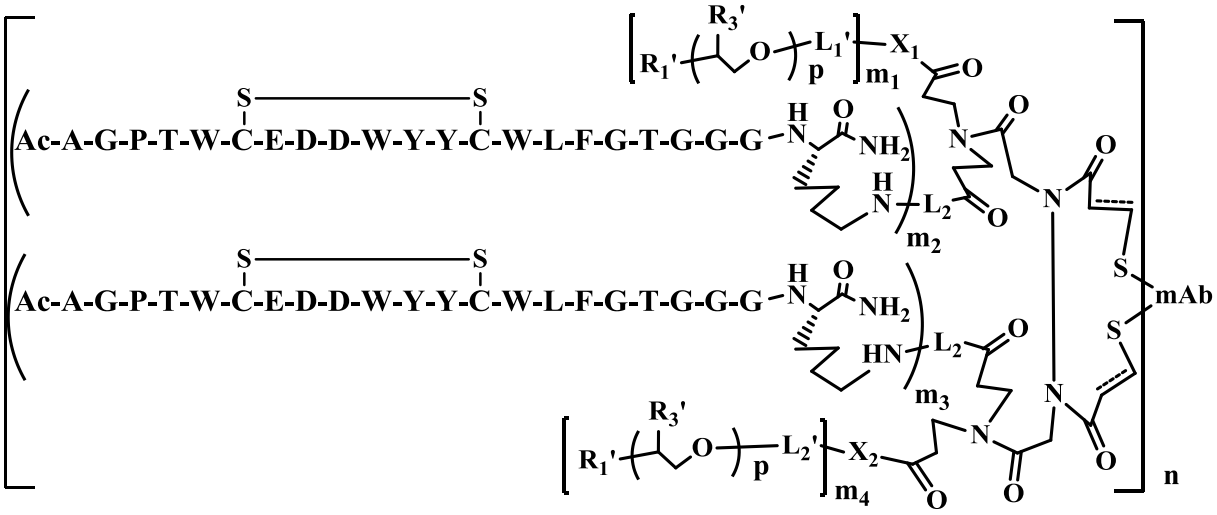
LB14 (cobalamin, VB12 analog conjugate),



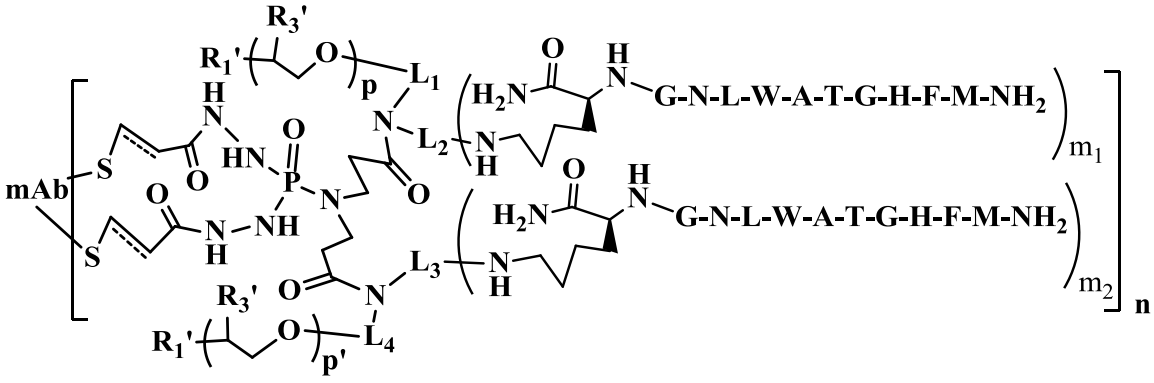
LB15 (cobalamin, VB12 analog conjugate),



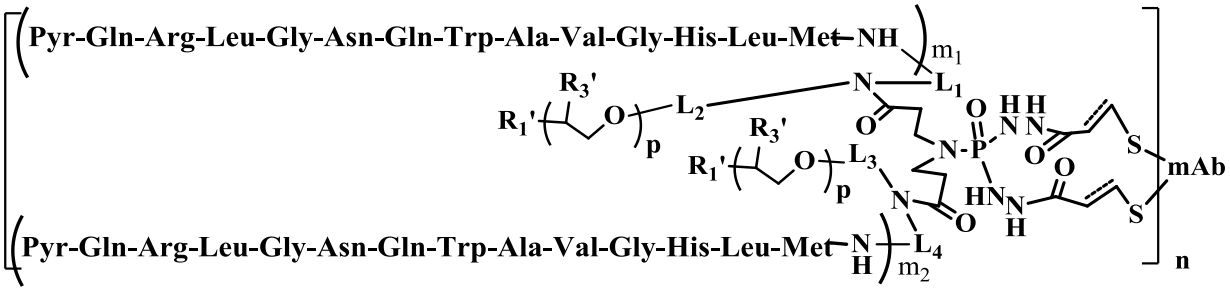
LB16 (for $\alpha_v\beta_3$ integrin receptor, cyclic RGD pentapeptide conjugate),



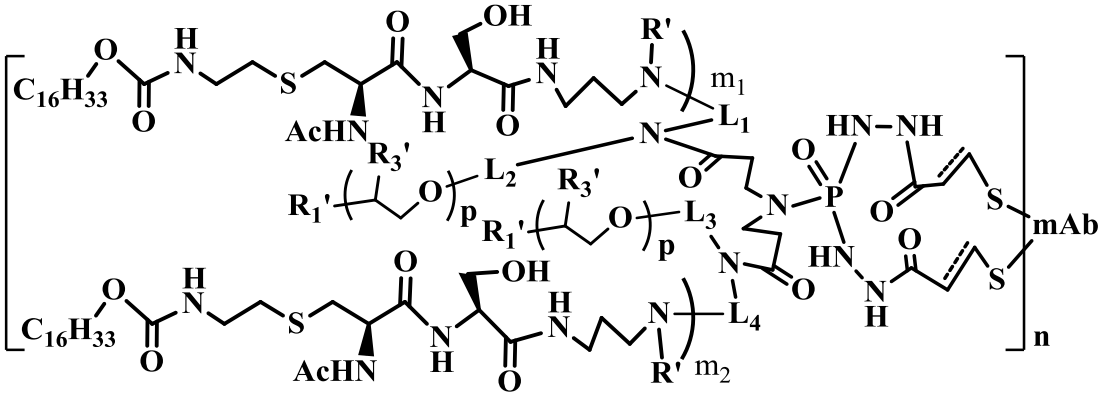
LB17 (hetero-bivalent peptide ligand conjugate for VEGF receptor),



LB18 (Neuromedin B conjugate),

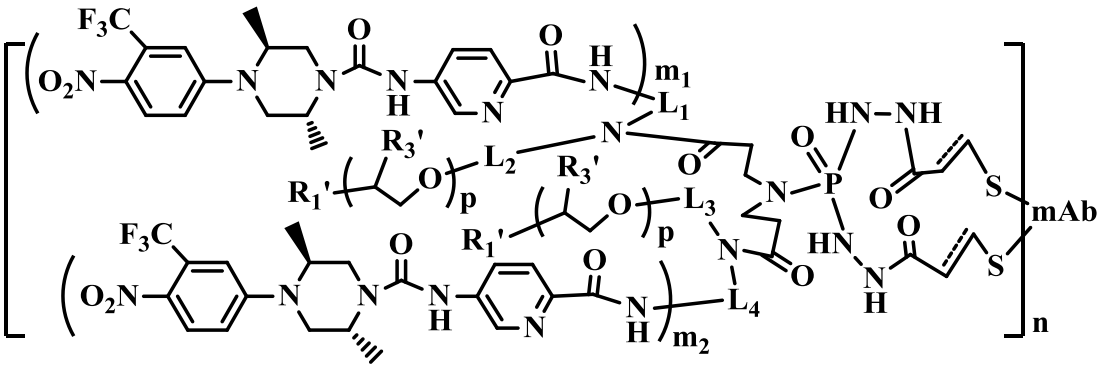


LB19 (bombesin conjugate for a G-protein coupled receptor),

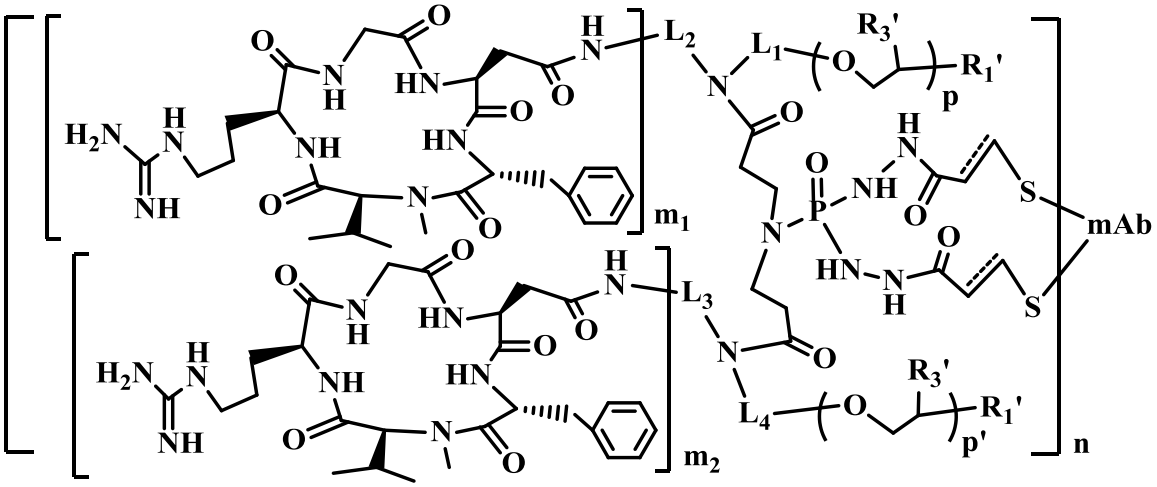


LB20

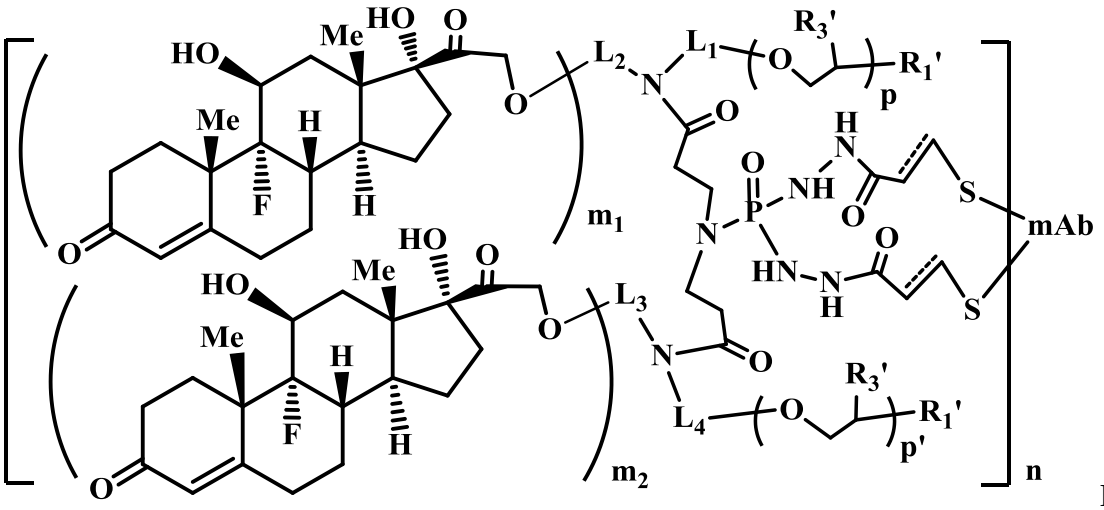
(TLR_2 conjugate for a Toll-like receptor,),



LB21 (an androgen receptor),

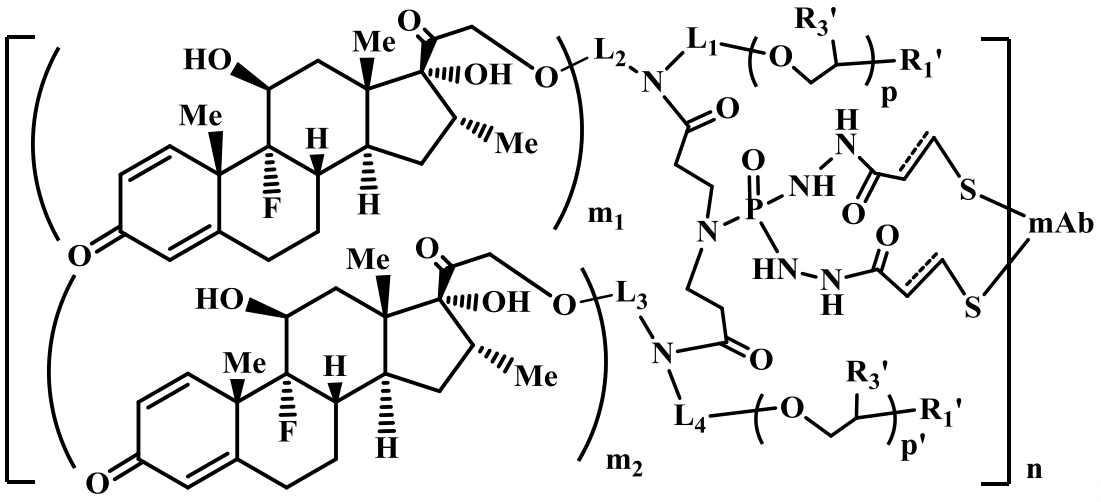


LB22 (Cilengitide/cyclo(-RGDfV-) conjugate for an α_v intergrin receptor)



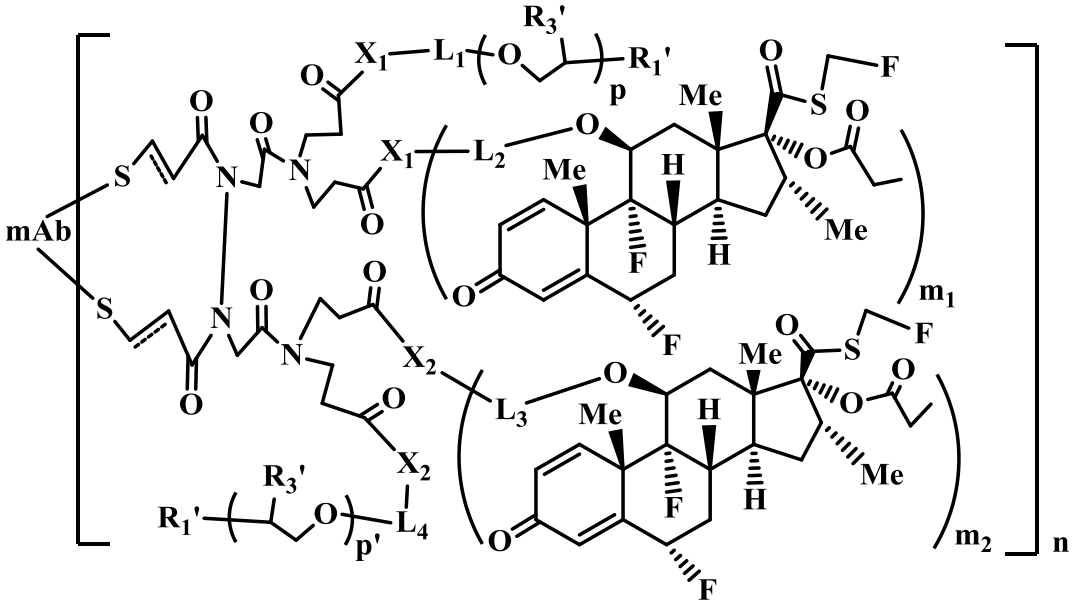
LB23

(Fludrocortisone conjugate)



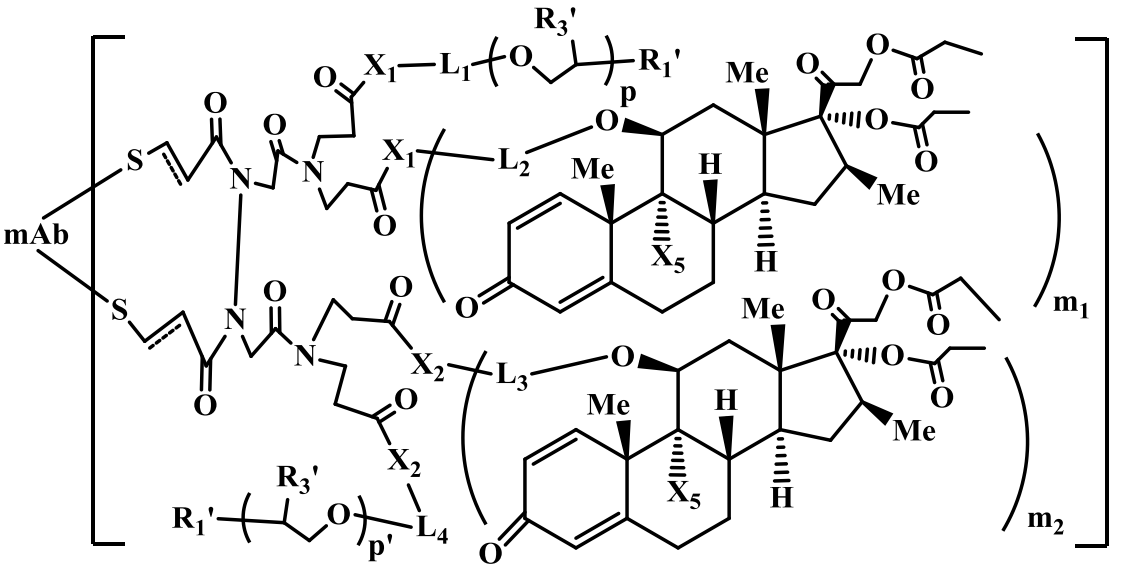
LB24

(Dexamethasone conjugate)



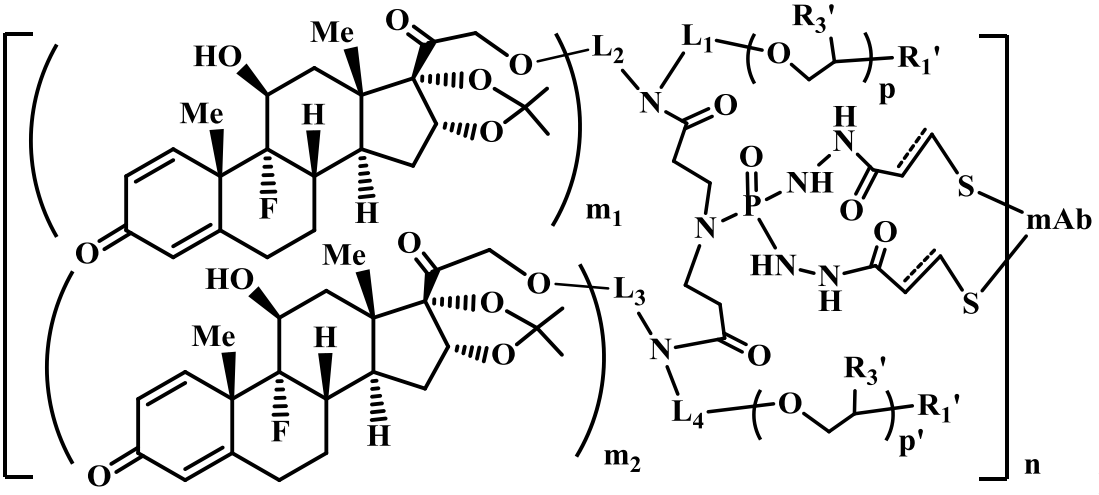
LB25

(fluticasone propionate conjugate)



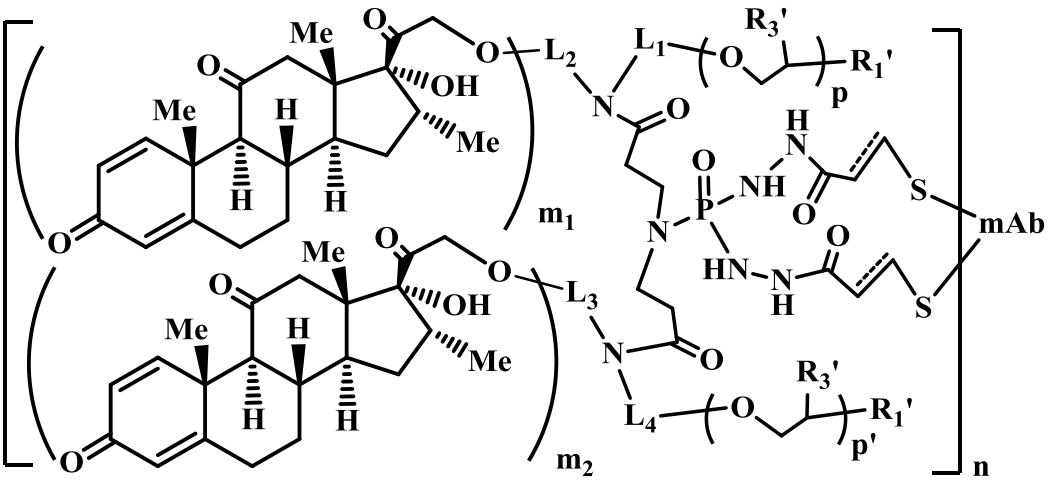
LB26

(Beclometasone dipropionate)



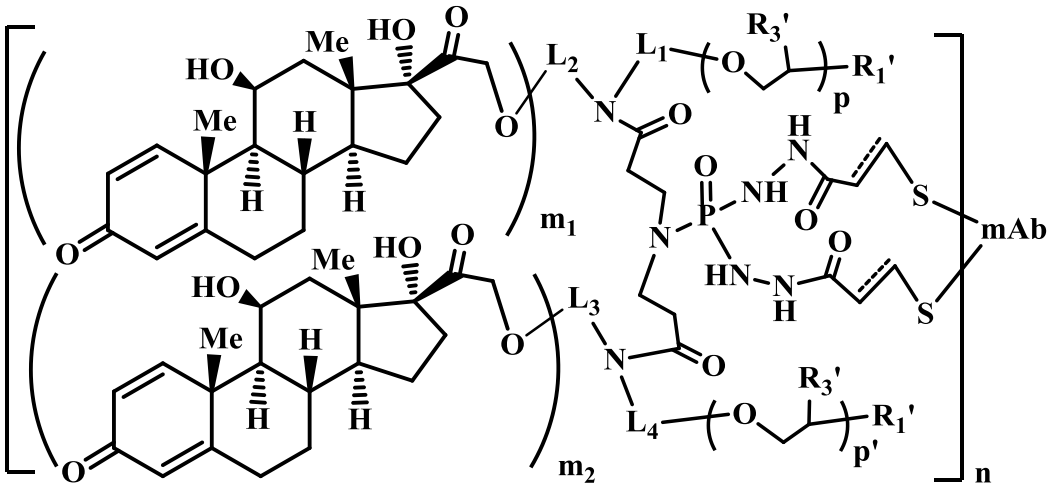
LB27

(Triamcinolone acetonide conjugate)

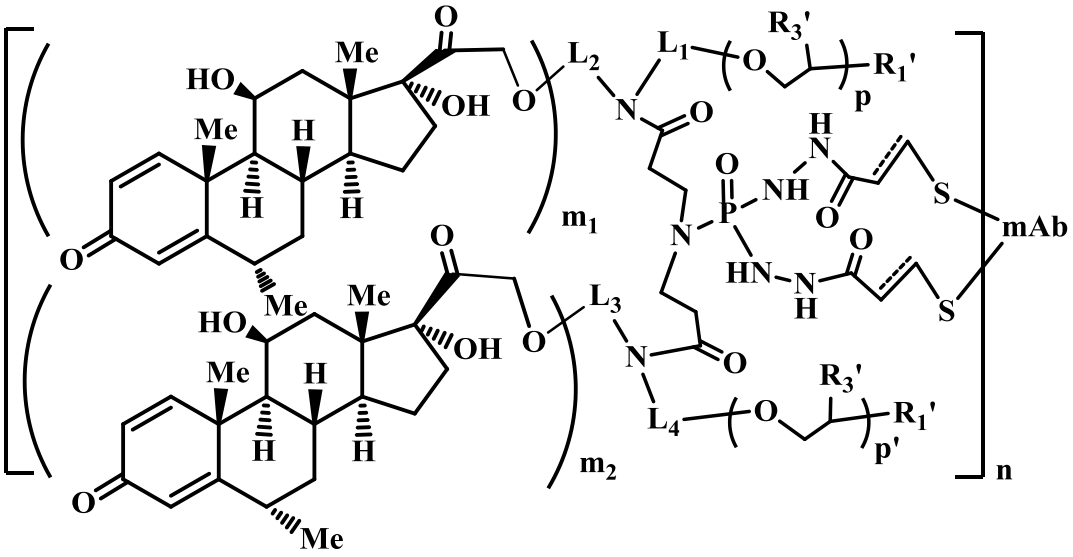


LB28 (Pred-

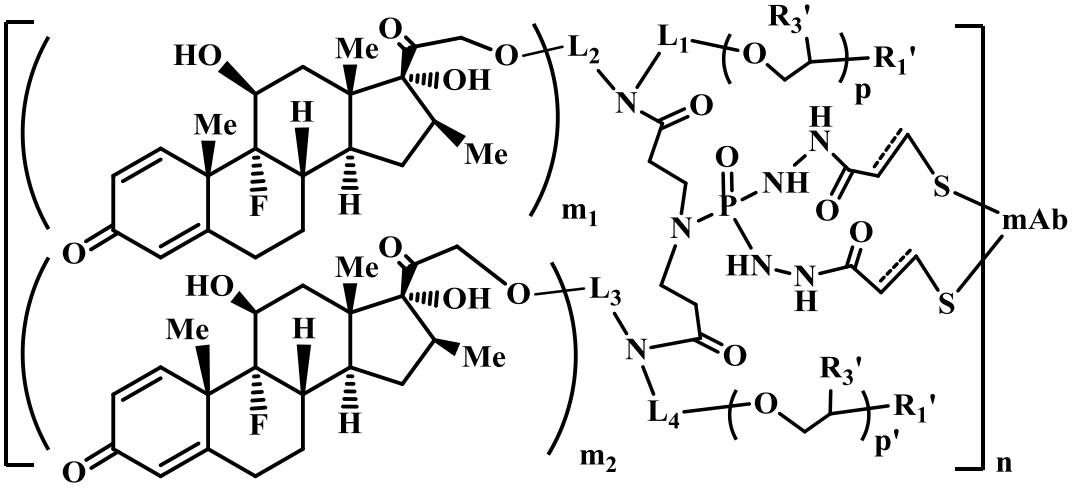
nisone conjugate)



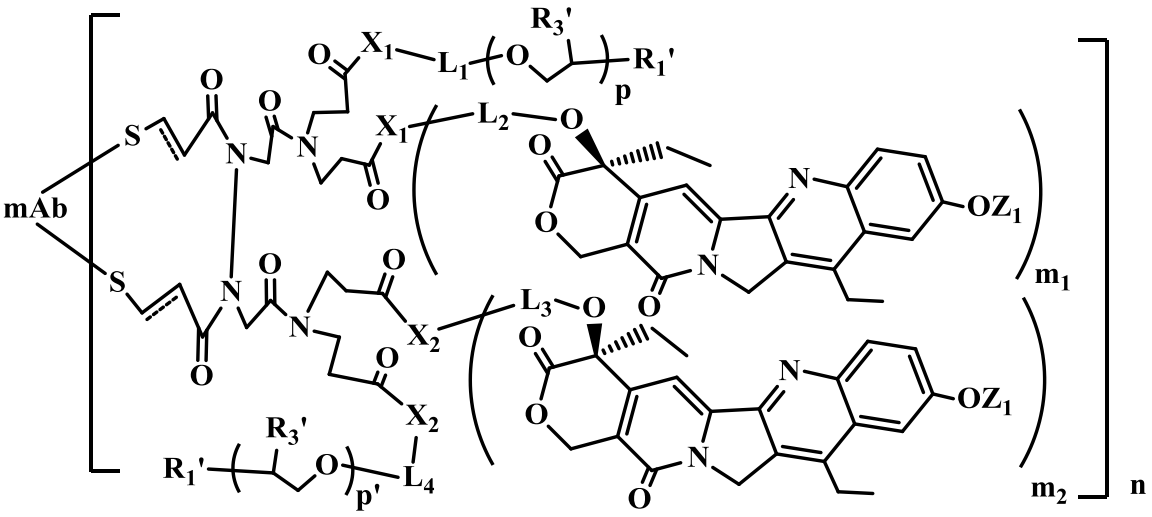
LB29 (Prednisolone conjugate)



LB30 (Methylprednisolone conjugate)

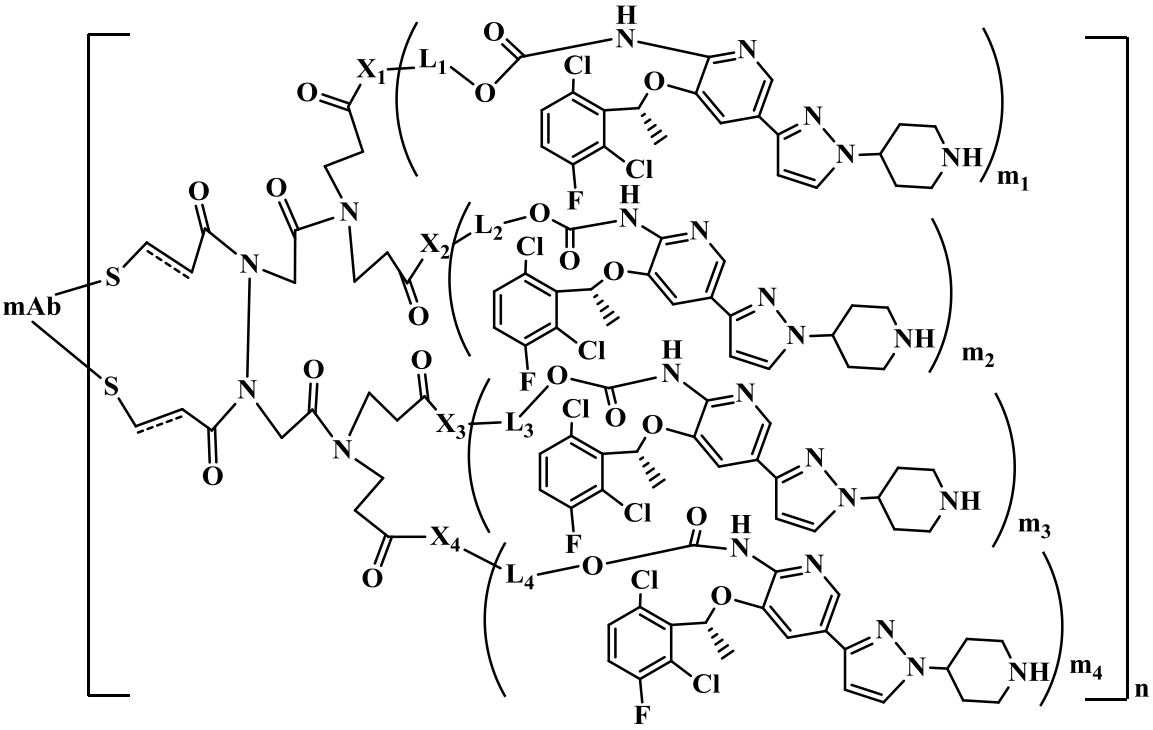


LB31 (Betamethasone conjugate)

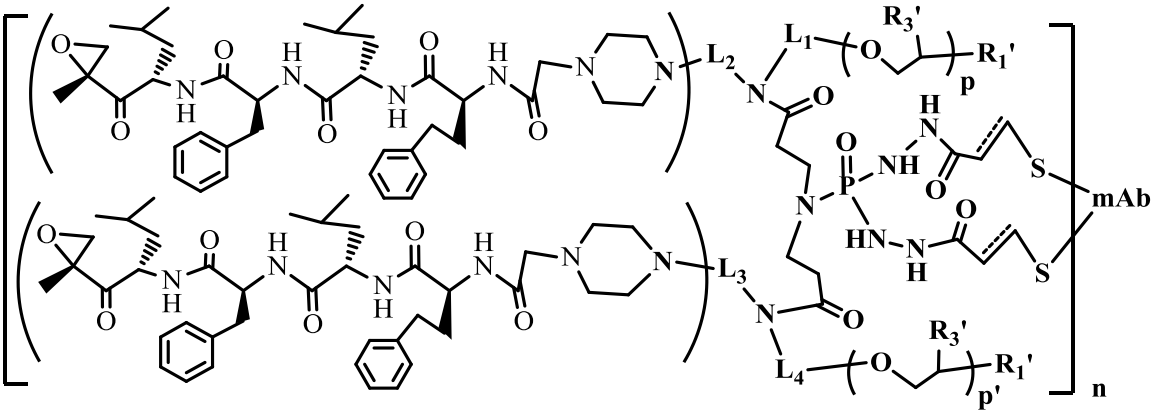


LB32

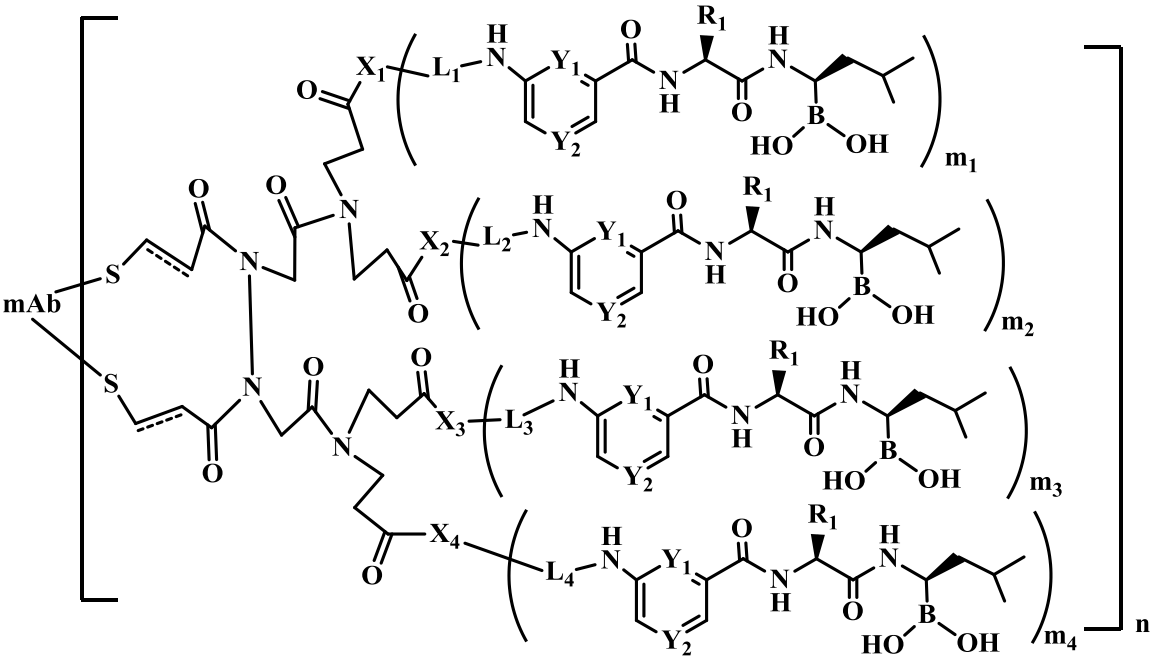
(Irinotecan analog),



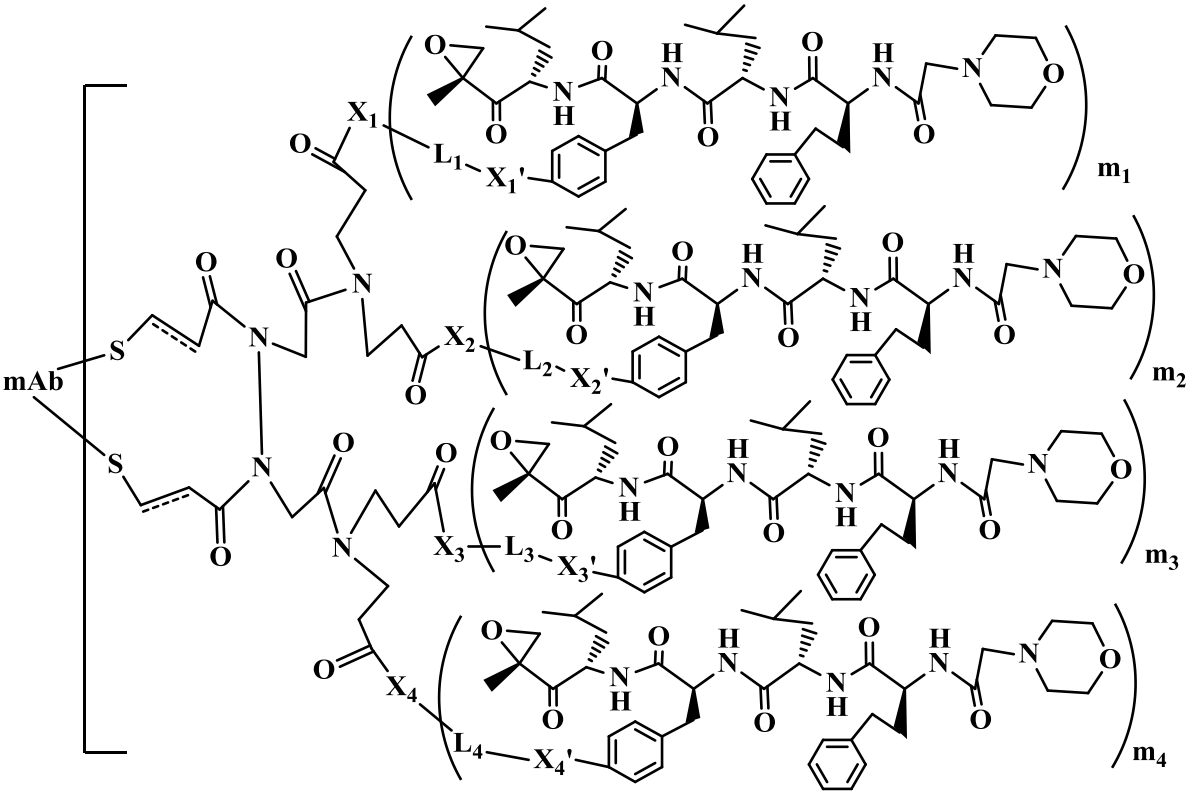
LB33 (Crizotinib analog**),**



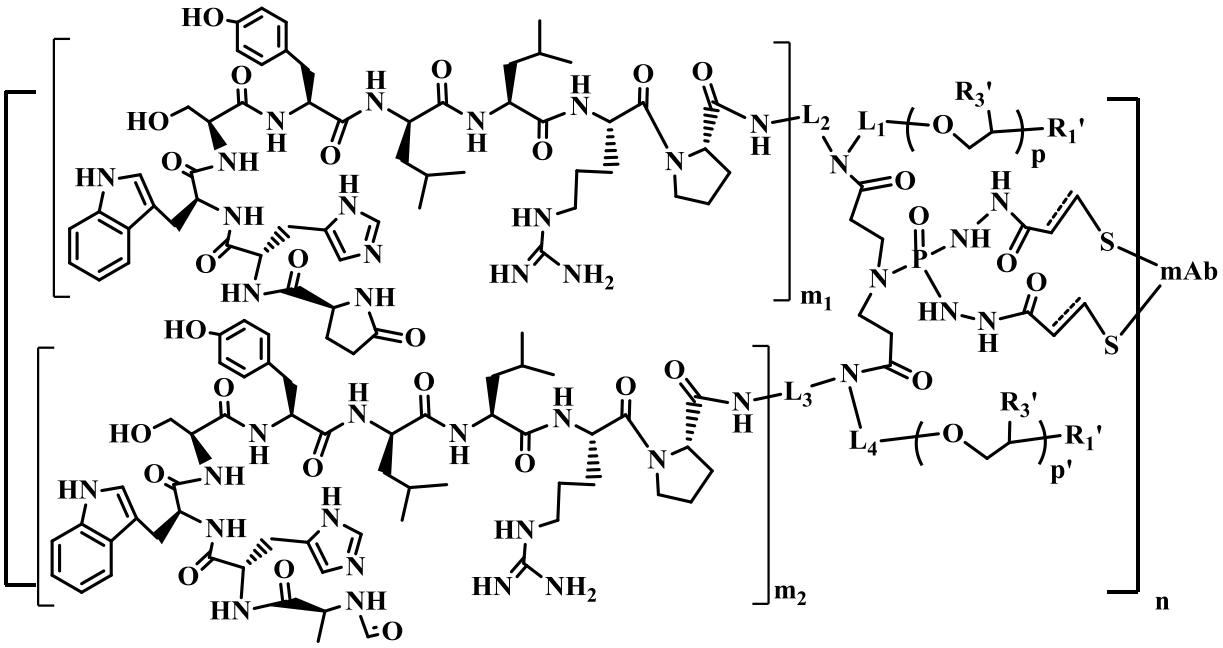
LB35 (Carfilzomib analog),



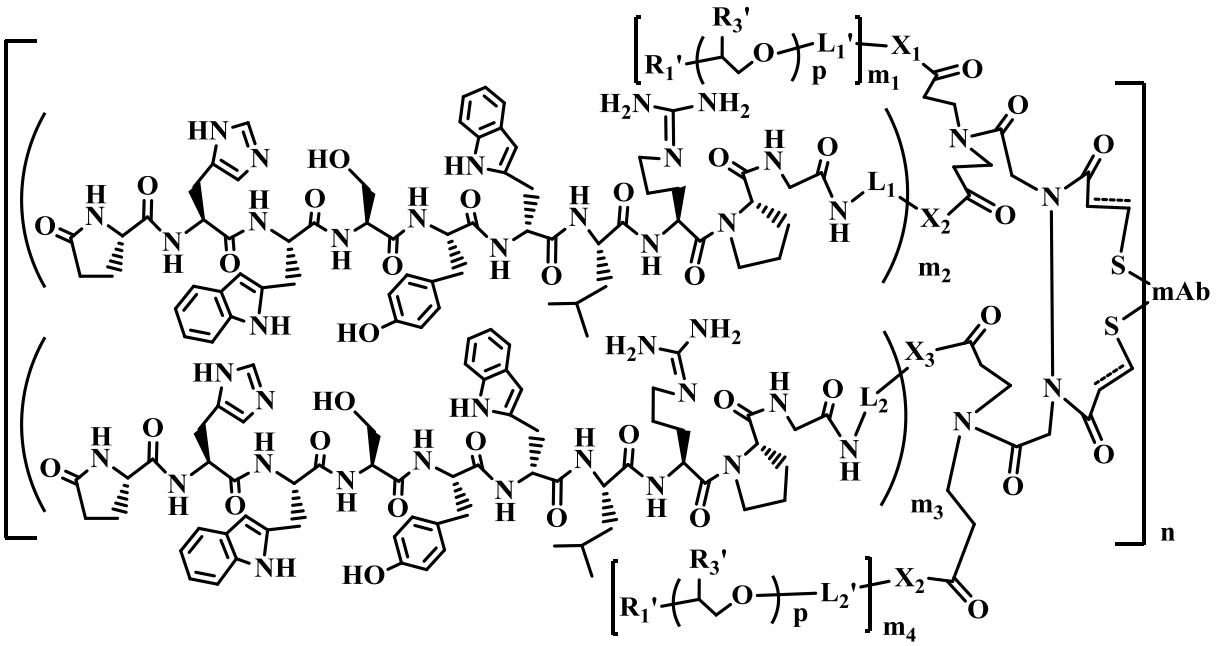
LB34 (Bortezomib analog), Y_1, Y_2 is N, CH, C(Cl), C(CH3), C($COOR_1$) independently, R_1 is H, C_1-C_6 of Alkyl, C_3-C_8 of Ar.



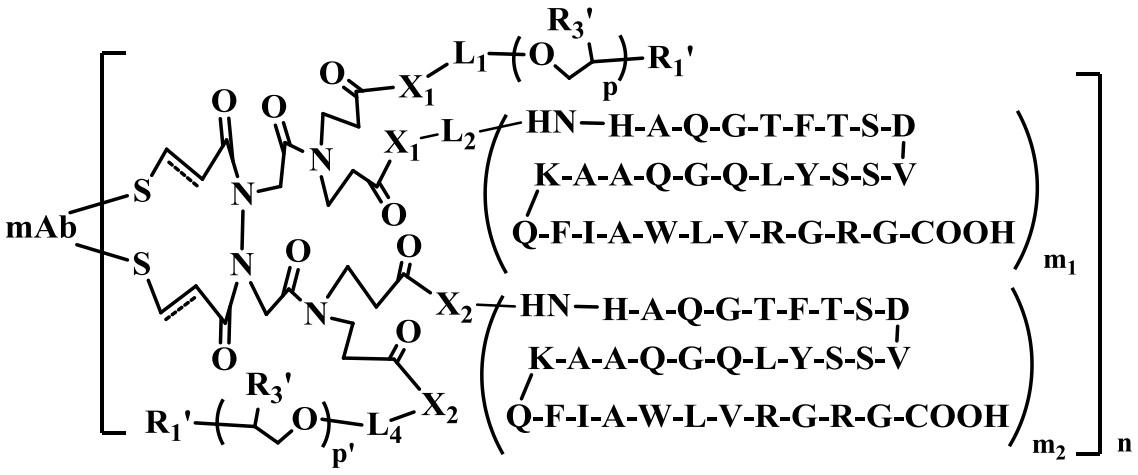
LB36 (Carfilzomib analog),



LB37 （Leuprolide analog），

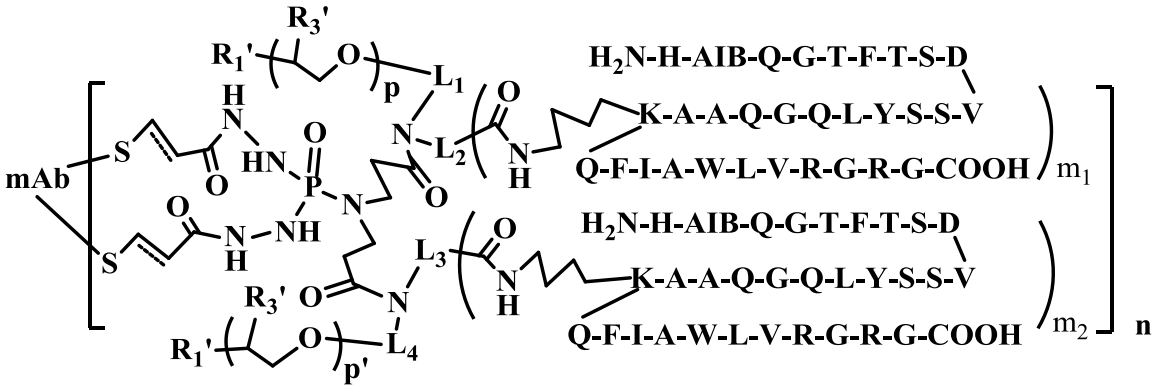


LB38 （Triptorelin analog），



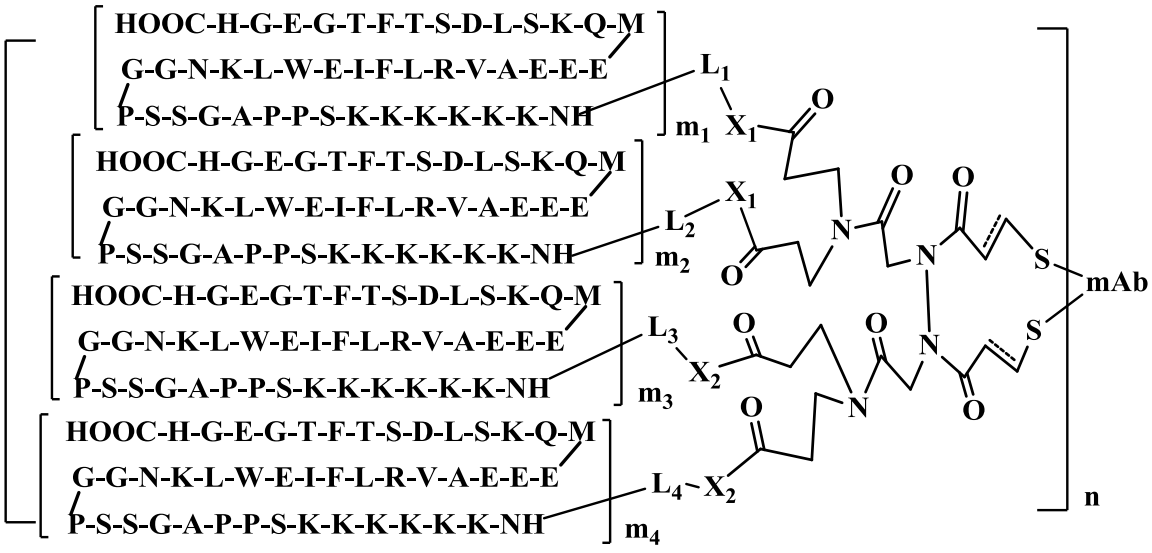
LB39

(Liraglutide analog)



LB40

(Semaglutide analog).



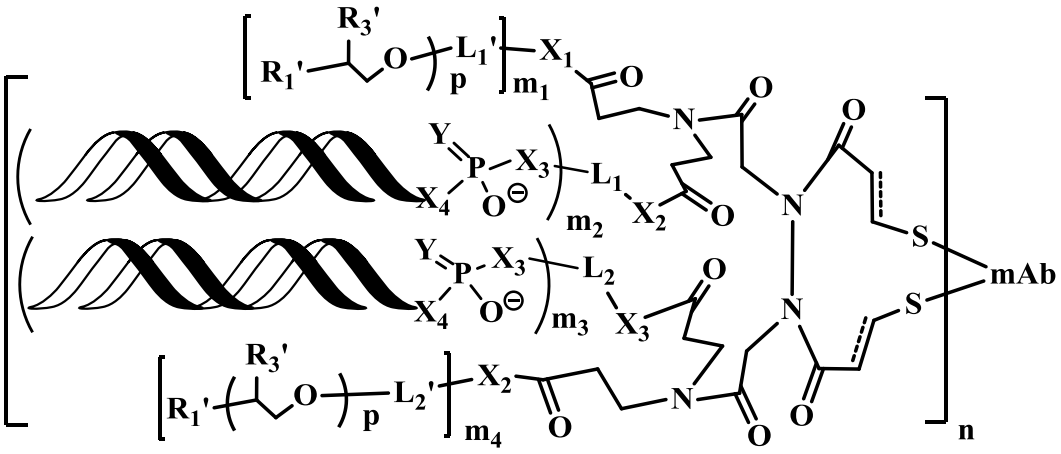
LB41

(Lixisenatide analog),

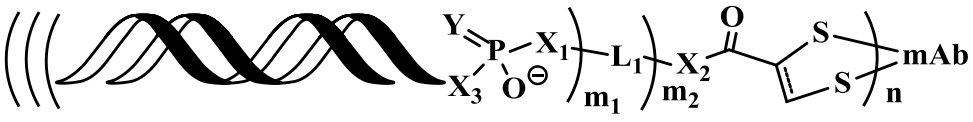
wherein "----", n, m_1, m_2, X_1, X_2, R_1, R_2, R_3, and R_4 are the same defined in Claim 1 or Claim 2; mAb is an antibody, or a cell-binding molecule; L_1, L_2, L_3, L_4, are independently defined as L_1 in Claim 1; X_3 is CH_2, O, NH, NHC(O), NHC(O)NH, C(O), OC(O), OC(O)(NR_3), R_1, NHR_1, NR_1, C(O)R_1 or absent; X_4 is H, CH_2, OH, O, C(O), C(O)NH, C(O)N(R_1), R_1, NHR_1, NR_1,

$C(O)R_1$ or C(O)O; M_1 and M_2 are independently H, Na, K, Ca, Mg, NH_4, $NR_1R_2R_3$; R_6 =5'-deoxyadenosyl, Me, OH, or CN; R_1' and R_3' are independently H or C_1-C_6 lineal or branched alkyl; p is 0 -2000; In addition, R_1' can be a cytotoxic agent, selected from in Claim 8;In further addition, R_1 can be absent and R_2 can be H.

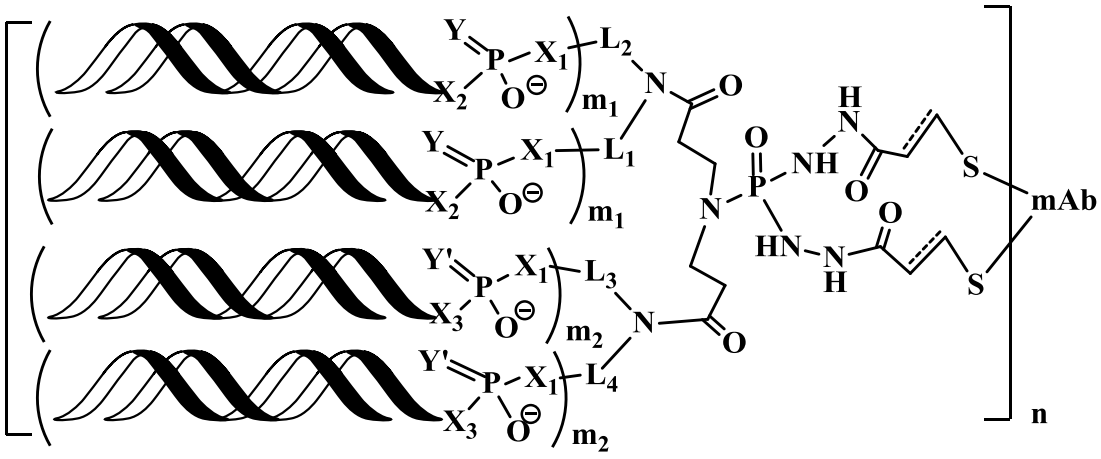
31. The conjugate compound of claim **2**, wherein Drug, Drug', or Drug" is a DNA, RNA, mRNA, small interfering RNA (siRNA), microRNA (miRNA), or PIWI interacting RNAs (piRNA), the conjugate compound is selected from structures of SI-1, SI-2, SI-3, SI-4, SI-5, or SI-6 below.



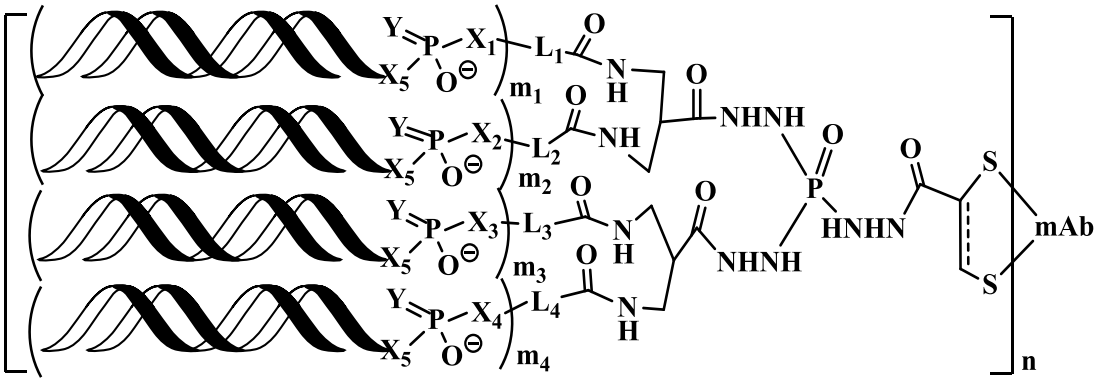
, SI-2



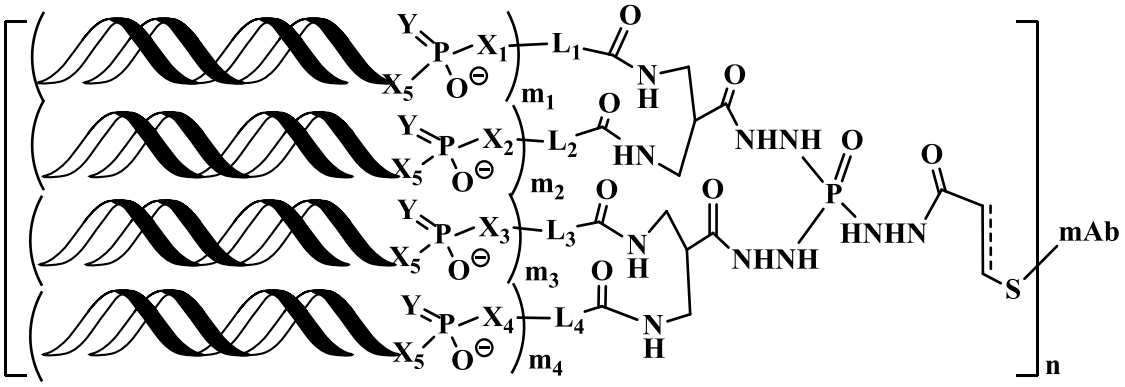
, SI-3



, SI-4



, SI-5

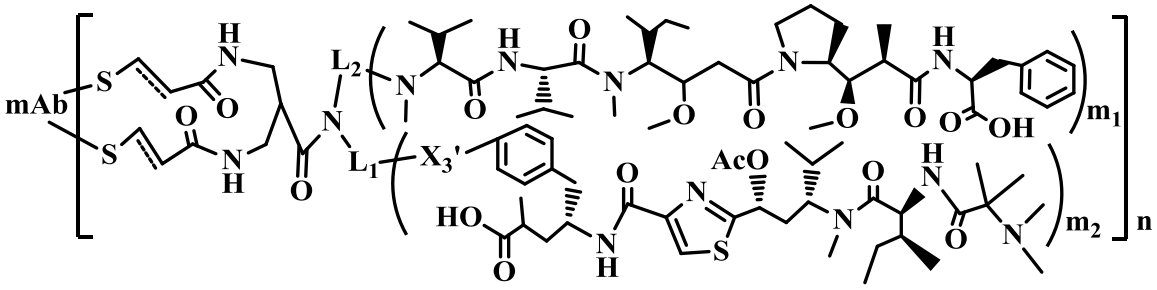


, SI-6

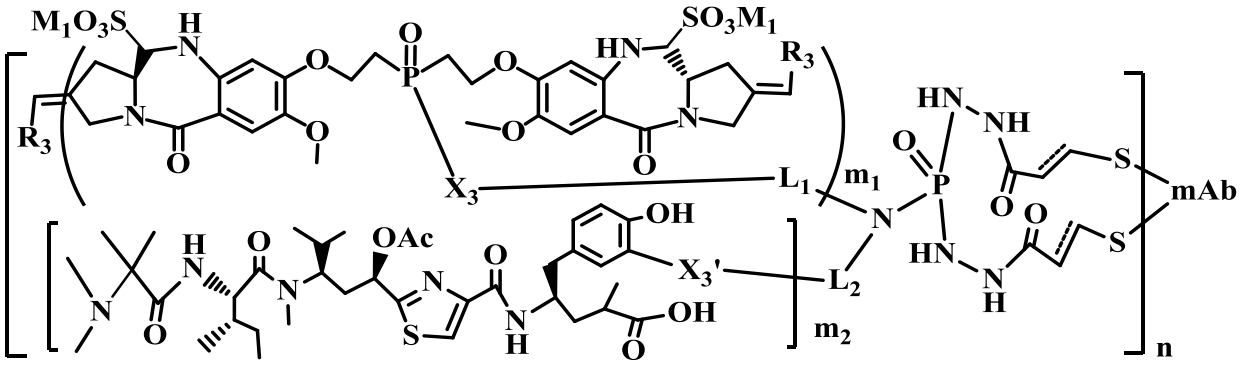
wherein mAb is an antibody or a cell-binding molecule; "----", n, m_1, m_2, m_3, m_4, X_1, X_2, X_3, X_4, X_5, are defined the same in Claim 1; R_1' and R_3' are independently H or C_1-C_6 of lineal or branched alkyl; p is 0 -2000;  is single or double strands of DNA, RNA, mRNA; Y and Y' are independently O, S, NH, CH_2, N-R_1; L_1, L_2, L_3, L_4, L_1' and L_2' are independently defined as L_1 in Claim 1; In addition, R_1' can be a cytotoxic agent, selected from in Claim 8.

32. The conjugate according to Claim **2**, wherein two or more different function molecules of Claim **8** can be conjugated to a cell-binding molecule via the Formula (I) or (II) of Claim **1** or via the Formula (XVII) or (XVIII) of Claim **4**.

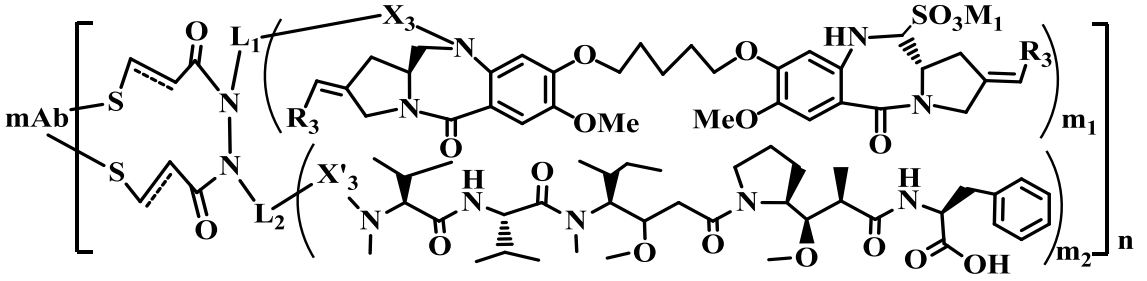
33. The conjugate according to Claim **32** can be selected from one of the following structures, Z01, Z02, Z02, Z04, Z05, Z06, Z07, Z08, Z09, Z10, Z12, Z13, Z14, Z15, Z16, Z17 and Z18:



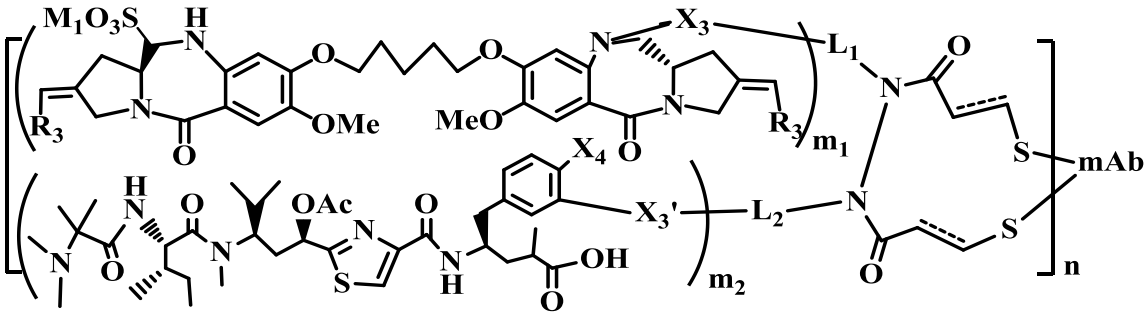
Z01



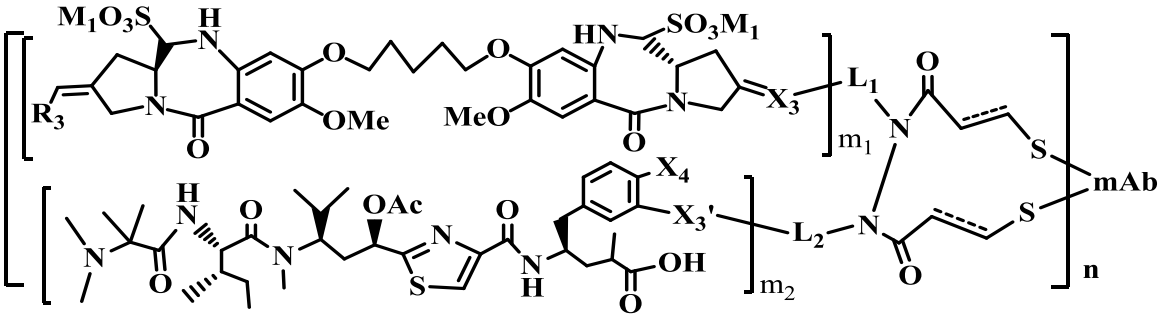
Z02



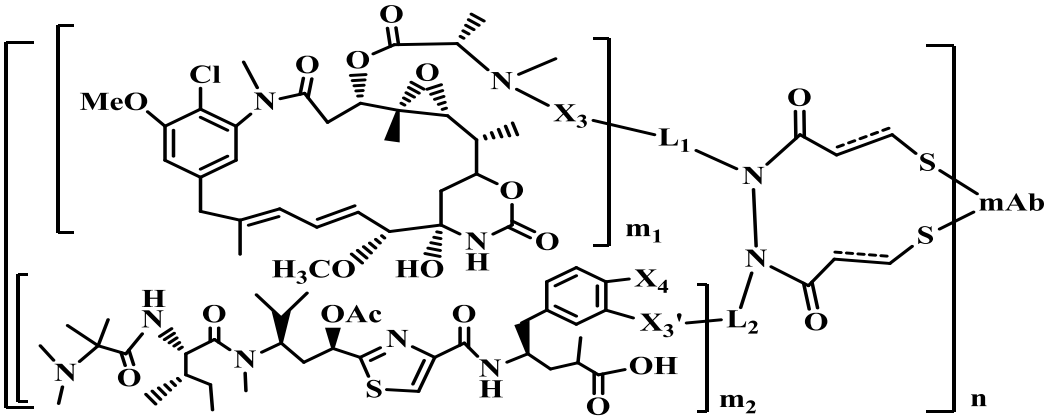
Z03



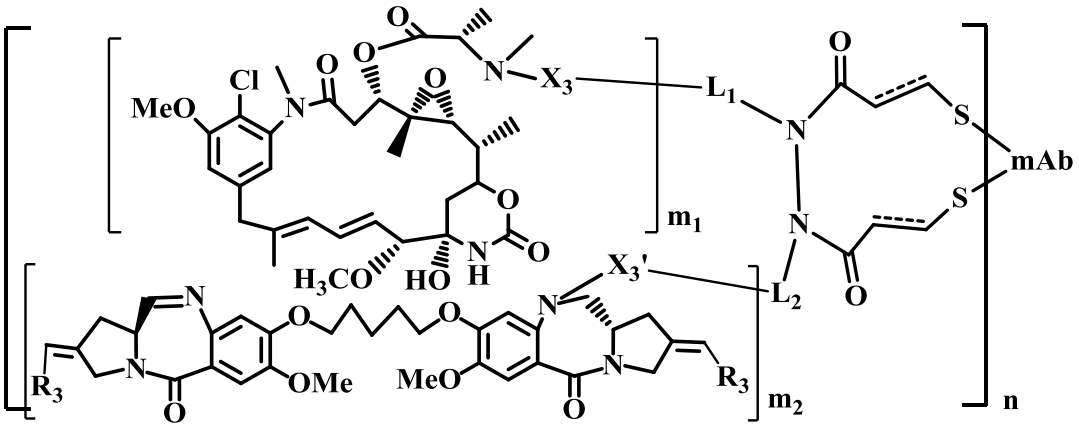
Z04



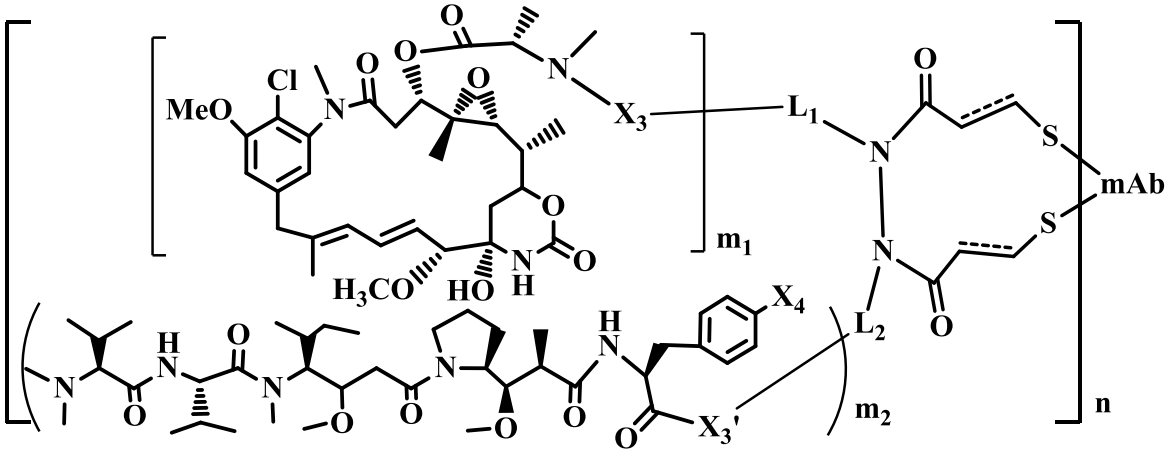
Z05



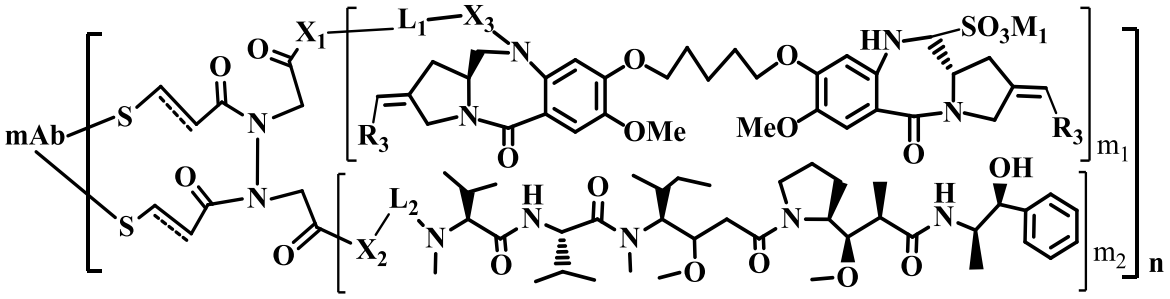
Z06



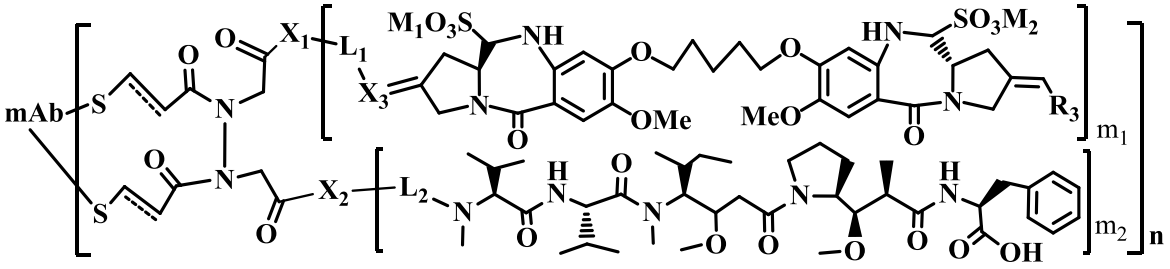
Z07



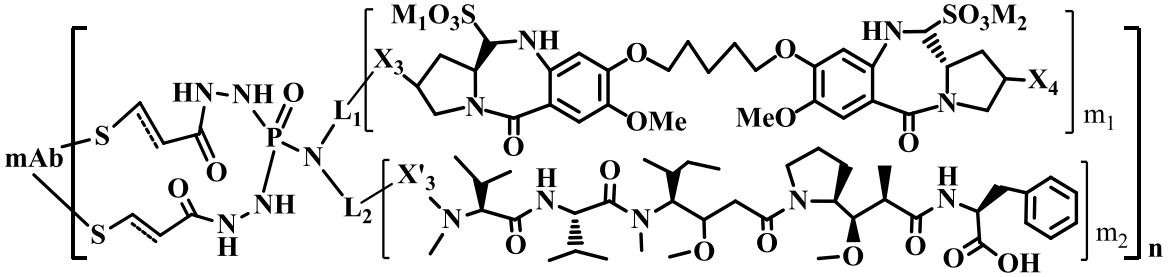
Z08



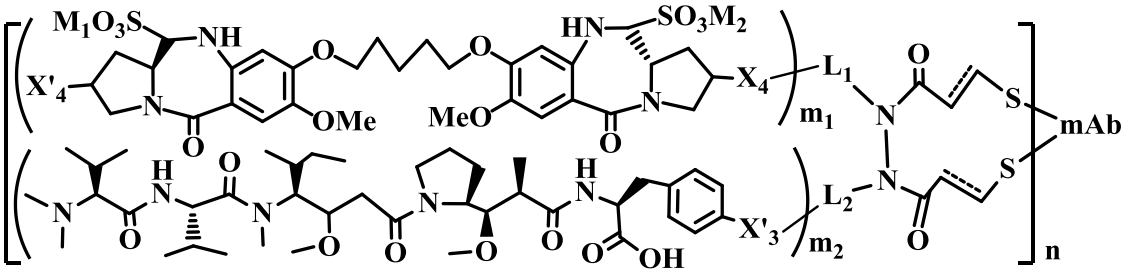
Z09



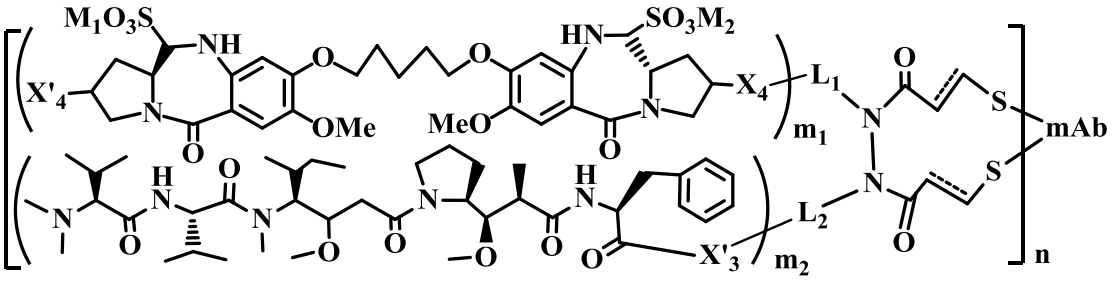
Z10



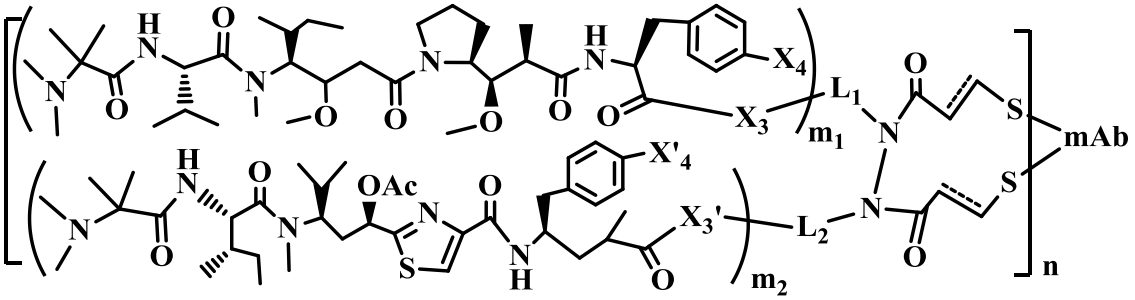
Z11



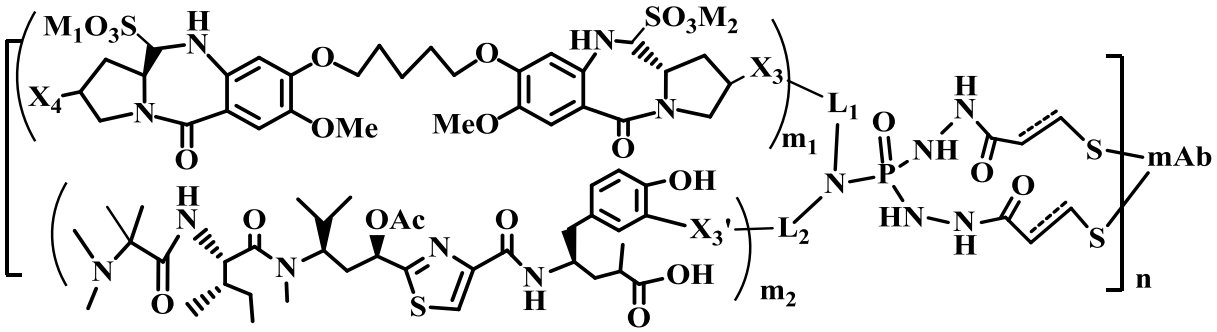
Z12



Z13



Z14



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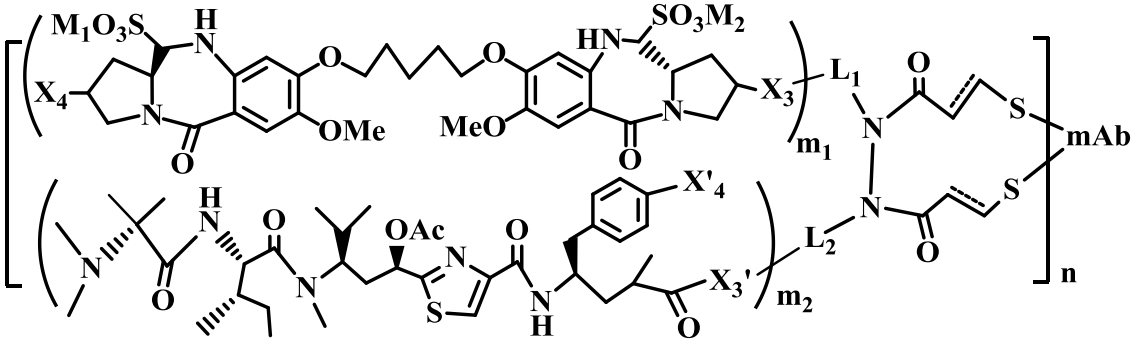
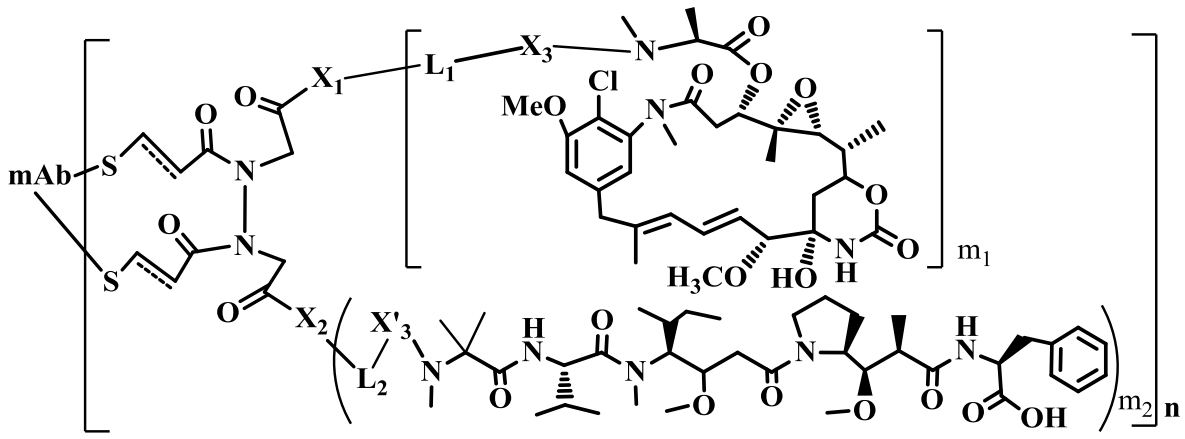
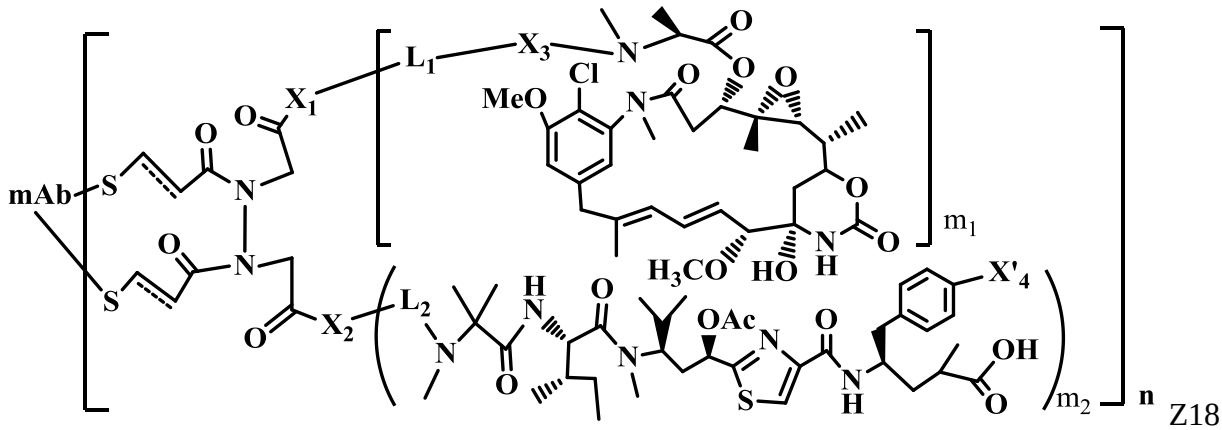


Z16



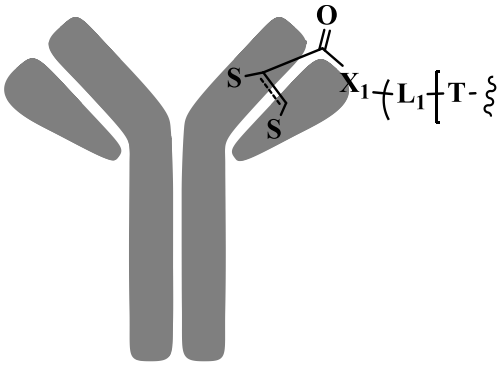
Z17



Z18

wherein "═══", n, m_1, m_2, X_1, X_2, L_1, L_2, R_1, R_2, R_3, are the same defined in Claim 1 or Claim 2; mAb is an antibody, or a cell-binding molecule; X_3 and X'_3 are independently CH_2, O, NH, NHC(O), NHC(O)NH, C(O), OC(O), OC(O)(NR_3), R_1, NHR_1, $NR_1C(O)R_1$ or absent; X_4 and X'_4 are independently H, CH_2, OH, O, C(O), C(O)NH, C(O)N(R_1), R_1, NHR_1, $NR_1C(O)R_1$ or C(O)O; M_1 and M_2 are independently H, Na, K, Ca, Mg, NH_4, $NR_1R_2R_3$; In addition, R_1 and/or R_2 can be absent independently.

34. The conjugate according to claim **2, 3**, **13**, **14, 15, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32** or **33,** wherein cell-binding molecule/agent is selected from an IgG antibody, monoclonal antibody, or an IgG antibody-like protein, the conjugate containing one, or two, or more the same or differently function molecules or cytotoxic agents of claim **8** are conjugated specifically to a pair of thiols through reduction of the disulfide bonds of the cell-binding molecule/agent between the light chain and heavy chain, the upper disulfide bonds between the two heavy chains and the lower disulfide bonds between the two heavy chains, as shown in the following structures, ST1, ST2, ST3, ST4, ST5, ST6, ST7, ST8, ST9, ST10, ST11, ST12, ST13 or ST14.



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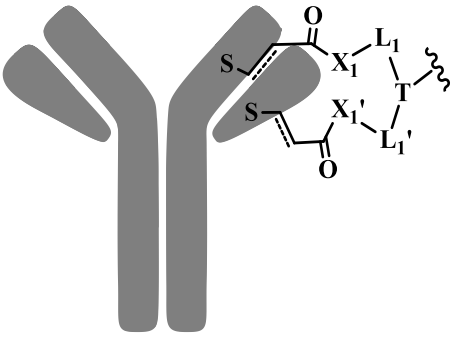
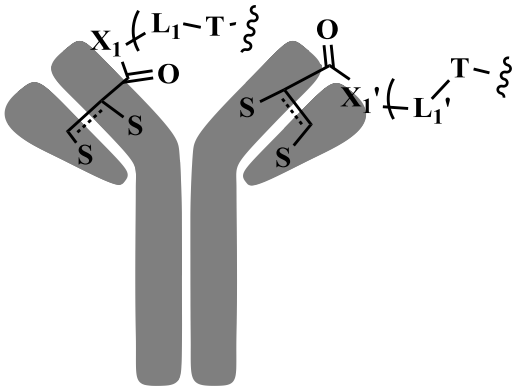


ST1，

ST2



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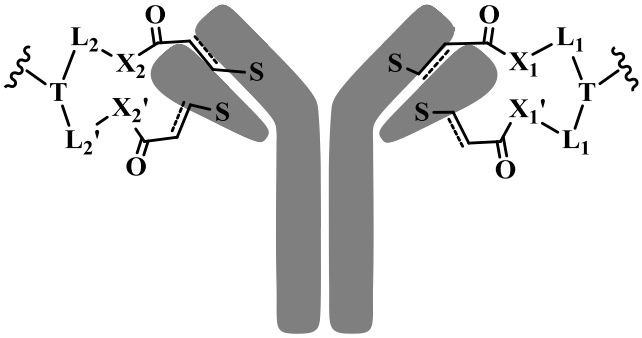
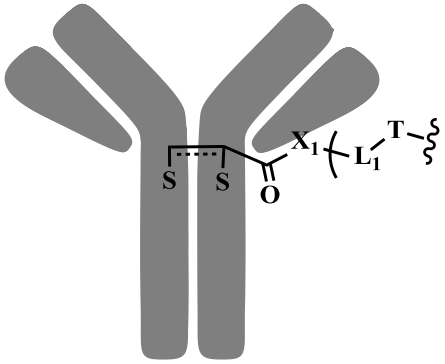
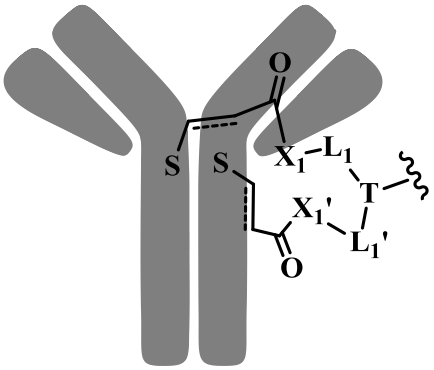


ST3

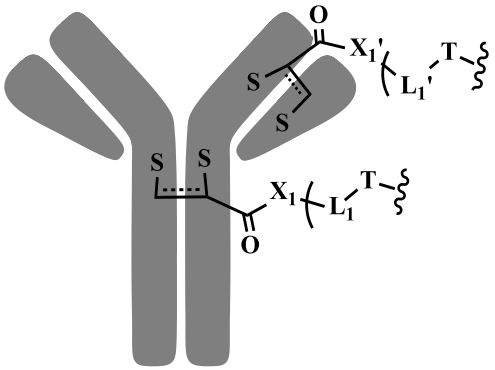
ST4





ST5，

ST6，



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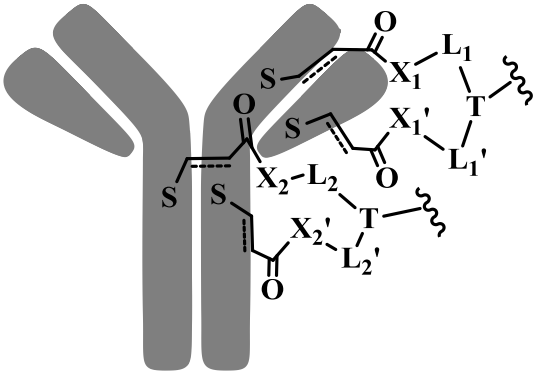

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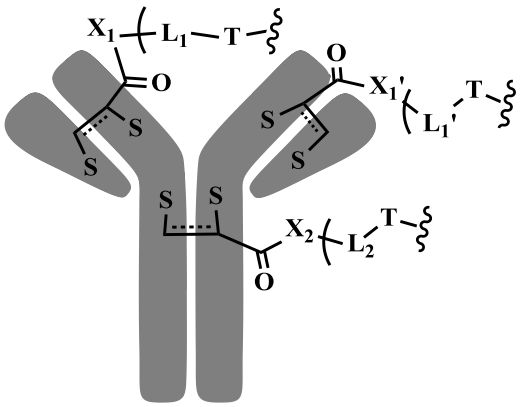
ST7，

ST8，



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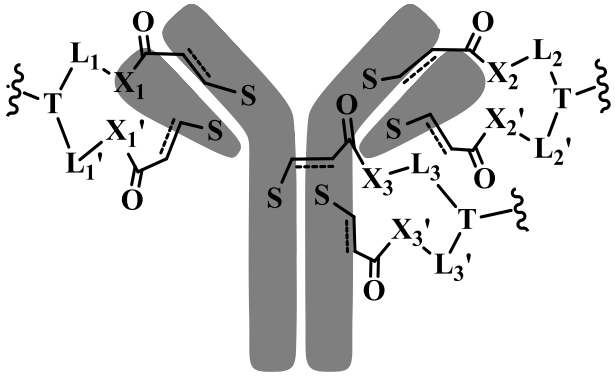
ST9，



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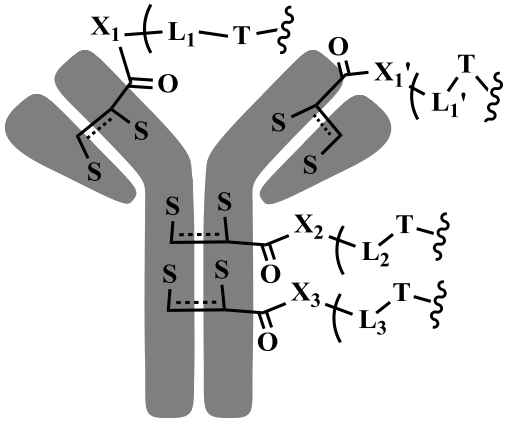
ST10,



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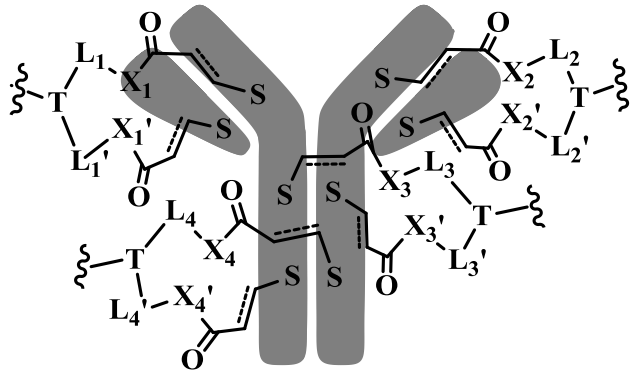
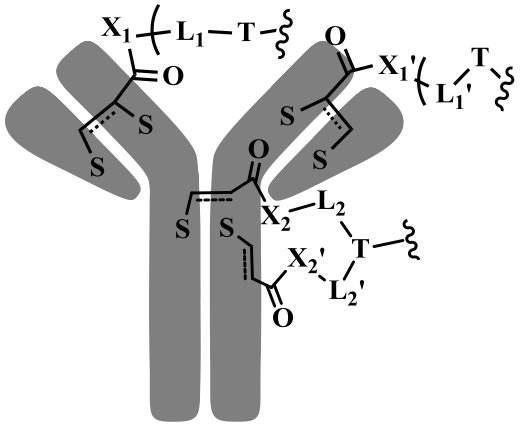
ST11，



ST12，



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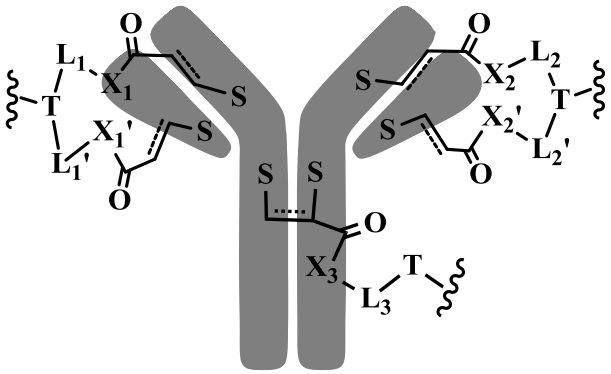
ST13,



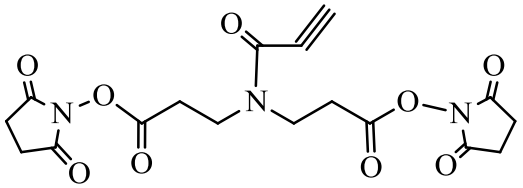
ST14

Wherein X_1, X_1', X_2, X_2', X_3, X_3', X_4, T, L_1, L_1', L_2, L_2', L_3, L_3', L_4, L_4', and "═══"are defined the same in Claim 1; "$\overset{S}{\smile}$" is the site to link a function molecule or cytotoxic agent. In addition, X_1, X_1', X_2, X_2', X_3, X_3', X_4, can be independently absent.

35. The conjugate according to claim **34**, wherein the cytotoxic agent is selected from tubulysins, maytansinoids, taxanoids (taxanes), CC-1065 analogs, daunorubicin and doxorubicin compounds, benzodiazepine dimers (selected from dimers of pyrrolobenzodiazepine (PBD), tomaymycin, anthramycin, indolinobenzodiazepines, imidazobenzothiadiazepines, or oxazolidinobenzodiazepines), calicheamicins and the enediyne antibiotics, actinomycin, amanitins

(amatoxins), azaserines, bleomycins, epirubicin, tamoxifen, idarubicin, dolastatins, auristatins (selected from monomethyl auristatin E, MMAE , MMAF, auristatin PYE, auristatin TP, Auristatins 2-AQ, 6-AQ, EB (AEB), and EFP (AEFP)), duocarmycins, thiotepa, vincristines, hemiasterlins, nazumamides, microginins, radiosumins, alterobactins, microsclerodermins, theonellamides, esperamicins, PNU-159682, and their analogues and derivatives above.

36. The linker compound according to Claim **1**, having the following structures: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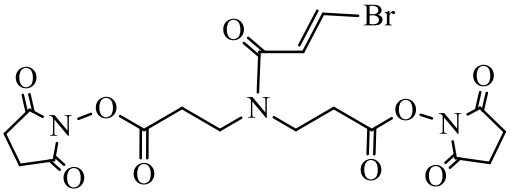
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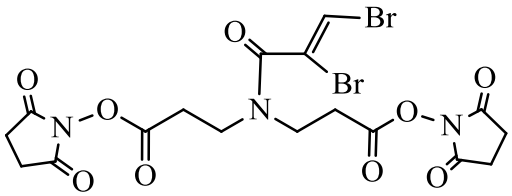
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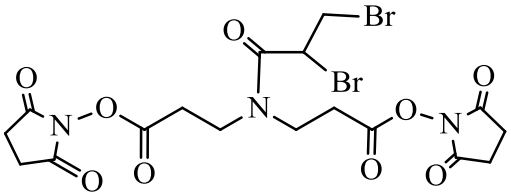
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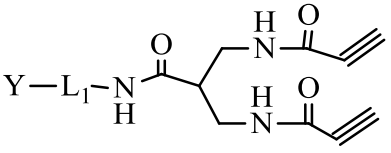
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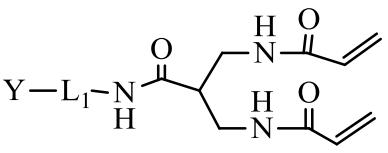
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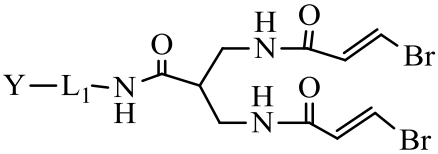
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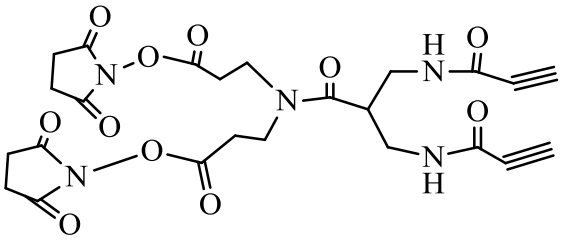
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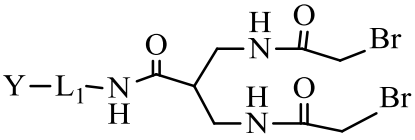
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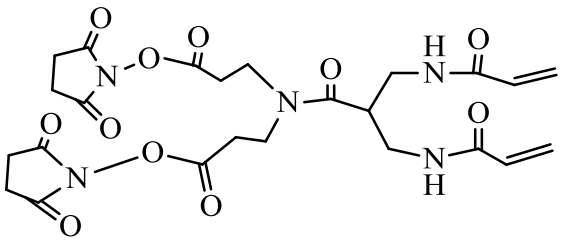
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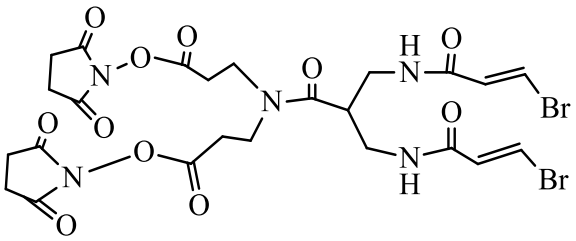
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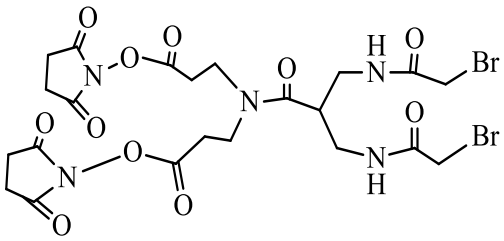
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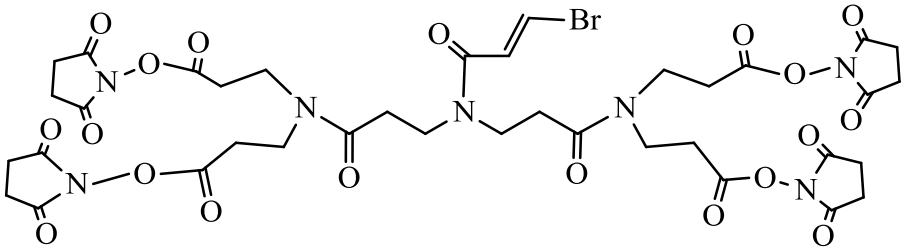

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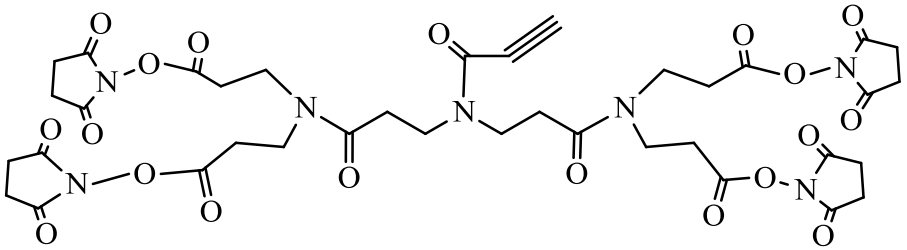

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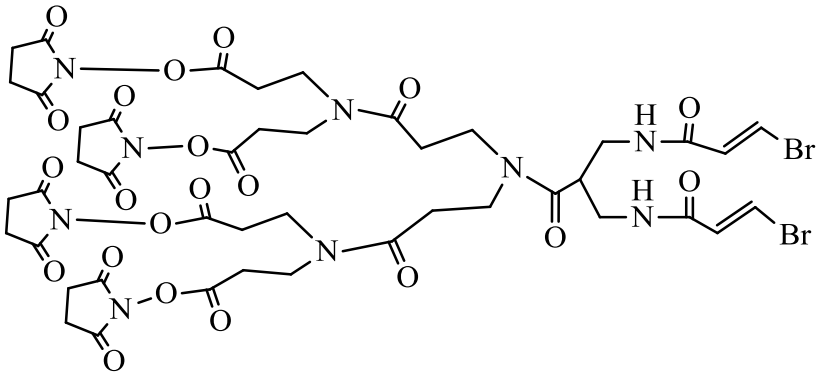

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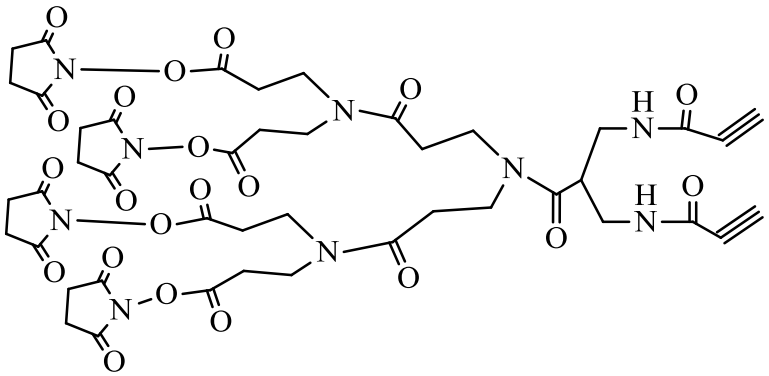

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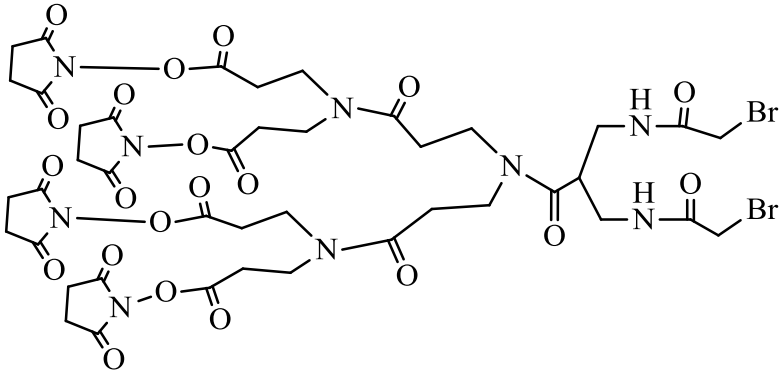

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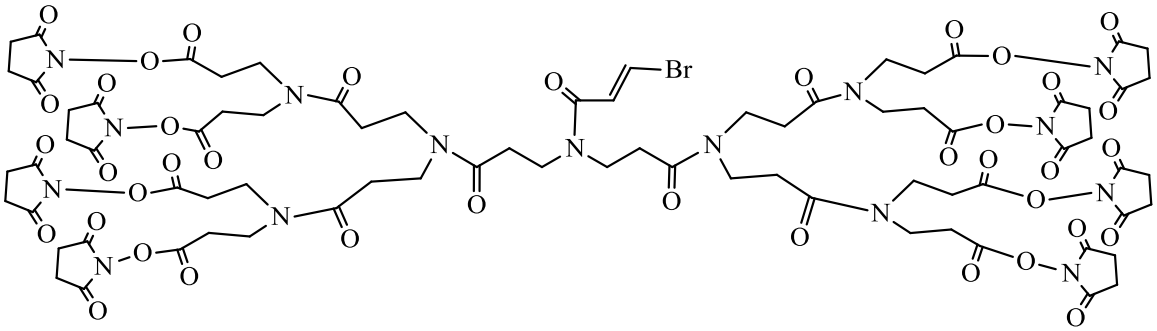

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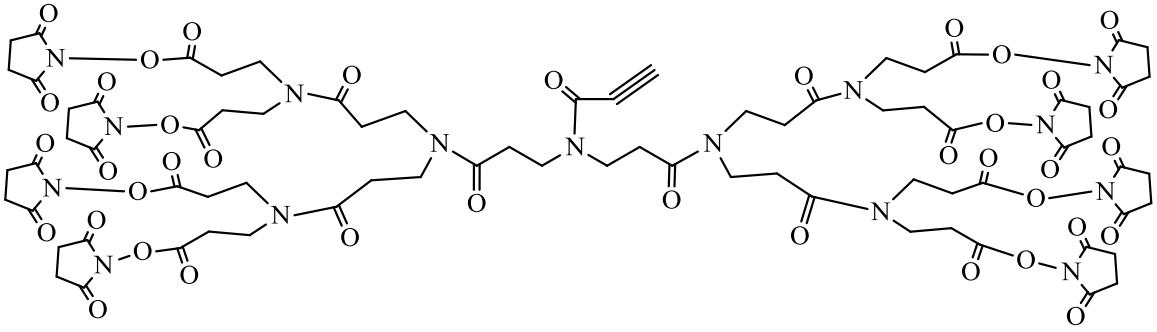

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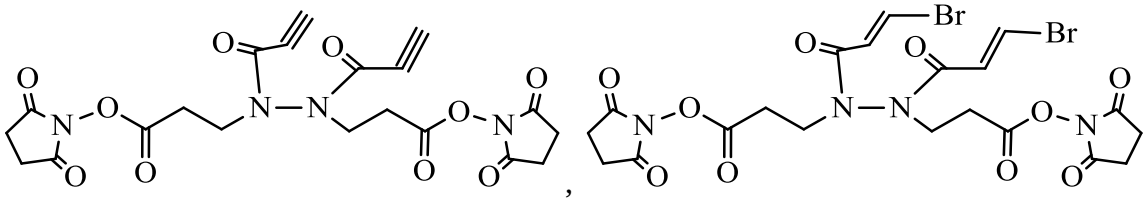

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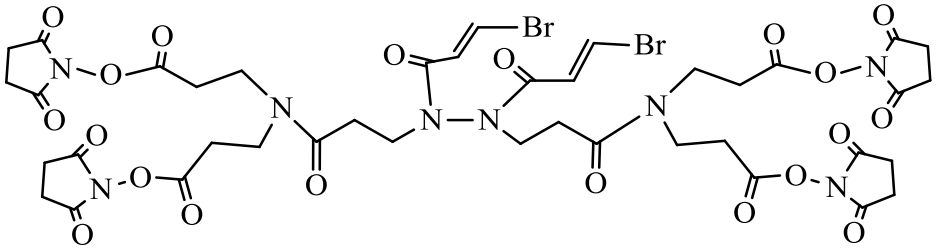

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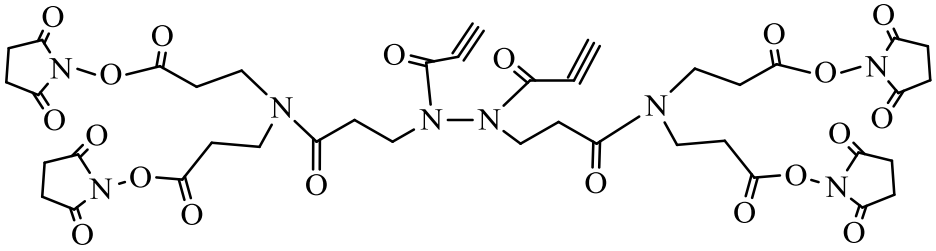

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37. The compound of claim **1**, when reacted with an antibody (mAB) and Drug, Drug1, Drug1, Drug1, Drug1, or a cytotoxic agent to yield a conjugate having the Formula of 2-1, 2-2, 2-3, 2-4, 2-5, 2-6, 2-7, 2-8, 2-9, 2-10, 2-11, 2-12, 2-13, 2-14,2-15, 2-16, 2-17, 2-18, 2-19, 2-20, 2-21, 2-22, 2-23, 2-24, 2-25, 2-26, 2-27, 2-28, 2-29, 2-30, 2-31, 2-32, 2-33, 2-34, 2-35, F2-1, F2-2, F2-3, F2-4, F2-5, F2-6, F2-7, F2-8, F2-9, F2-10, F2-11, F2-12, F2-13, F2-14, F2-15, F2-16, F2-17, F2-18, F2-19, F2-20, F2-21, F2-22, F2-23, F2-24, F2-25, F2-26, F2-27, F2-28, F2-29, F2-30, F2-31, F2-32, F2-33, F2-34, F2-35, F2-36, F2-37, F2-38, F2-39, F2-40, F2-41, F2-

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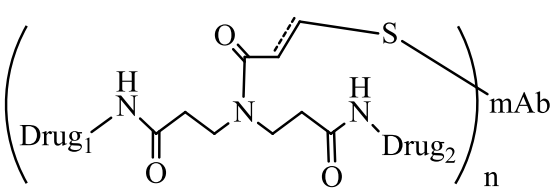
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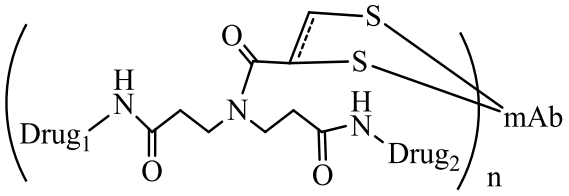
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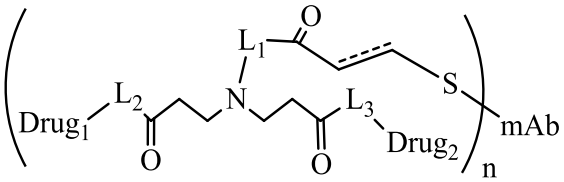
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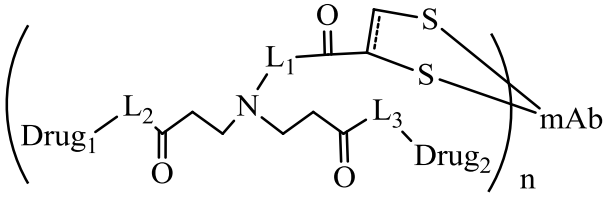

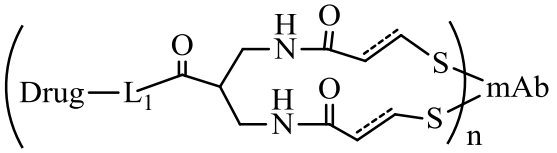
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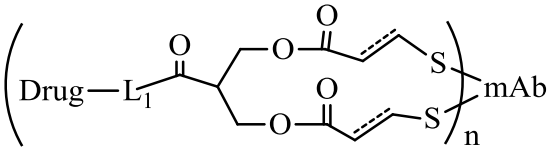
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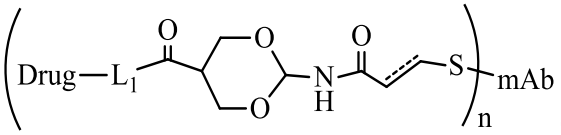
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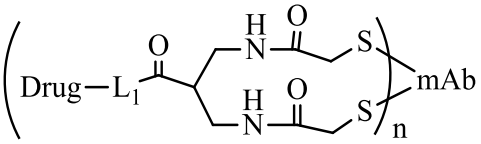
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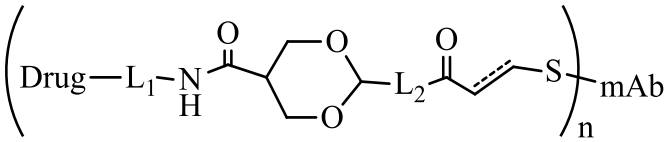
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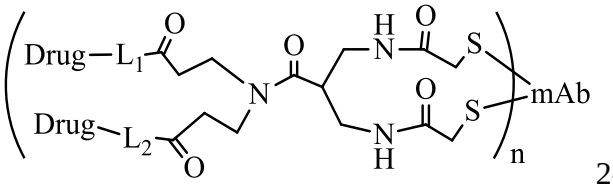
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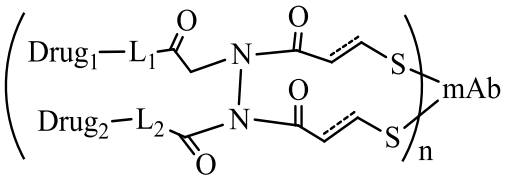
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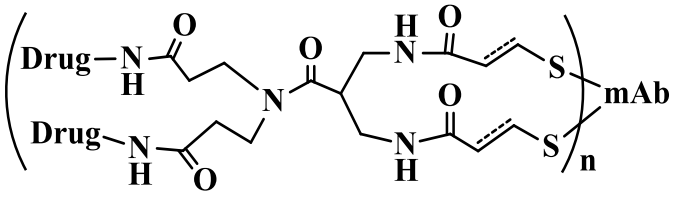
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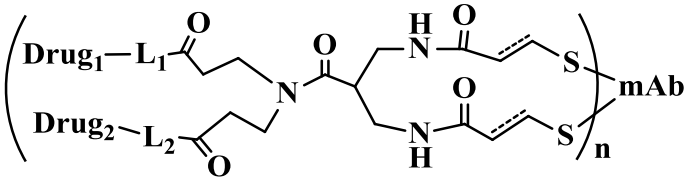

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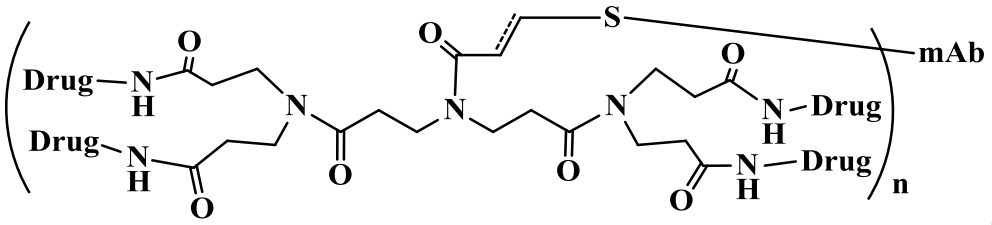

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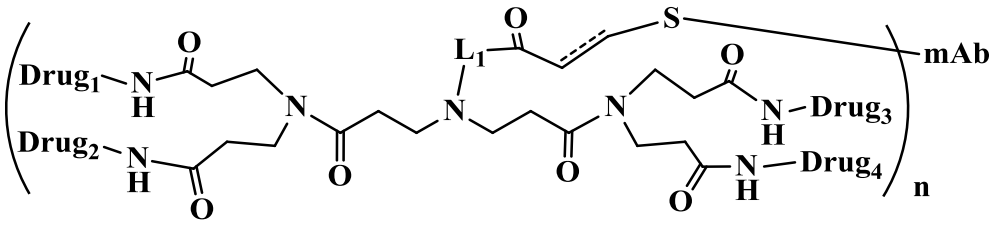

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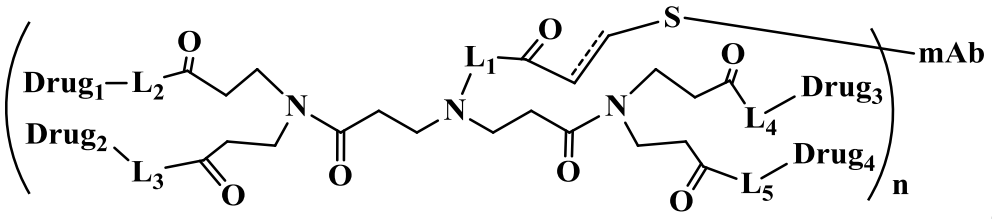

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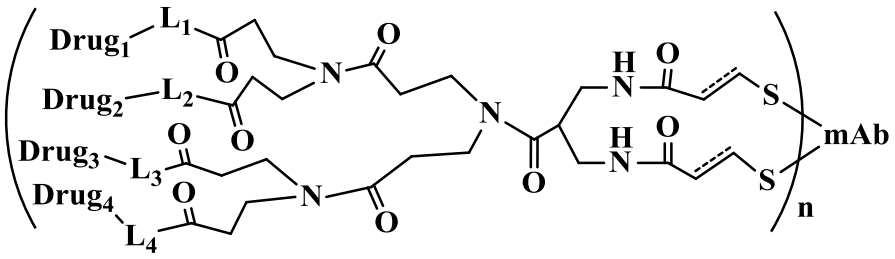

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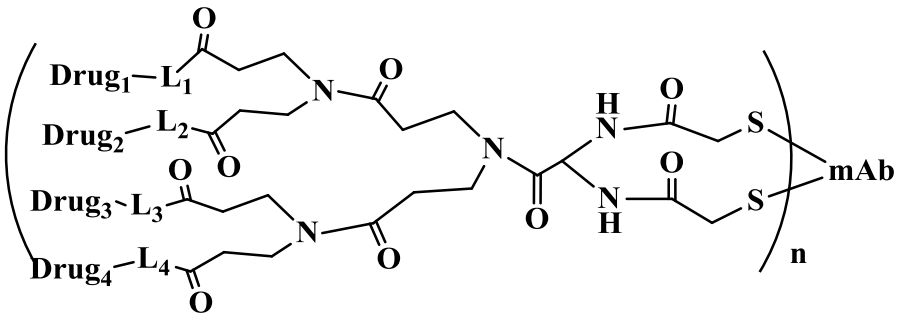

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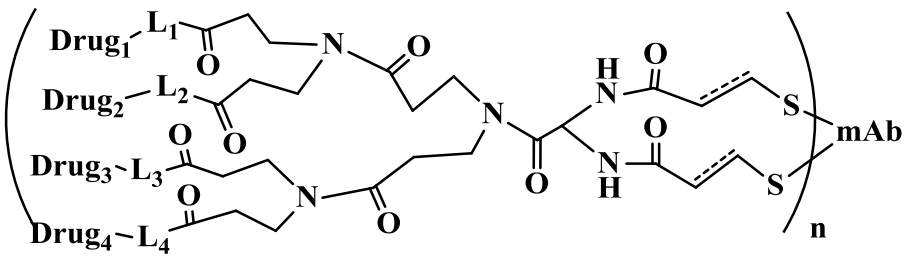

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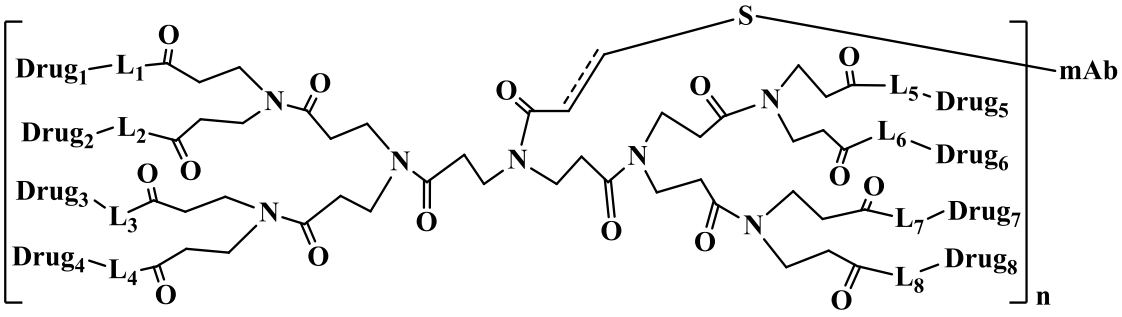

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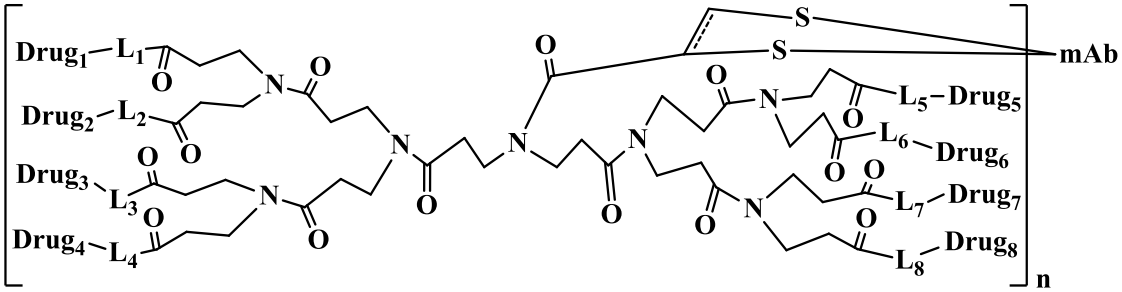

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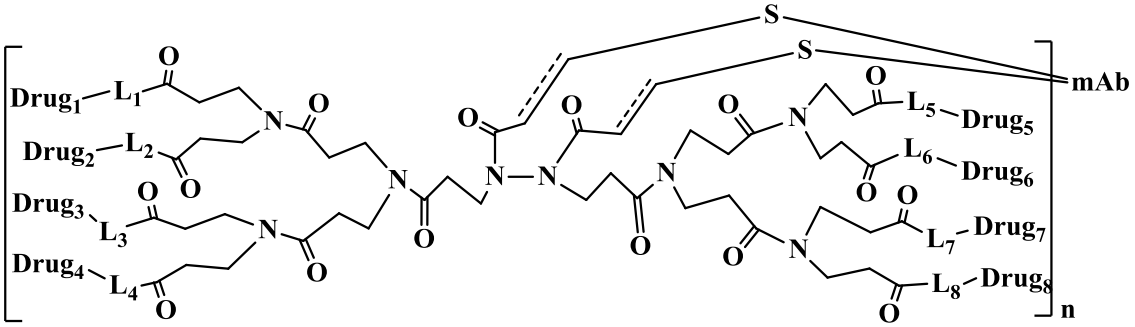

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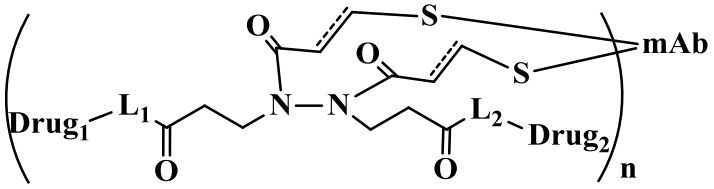

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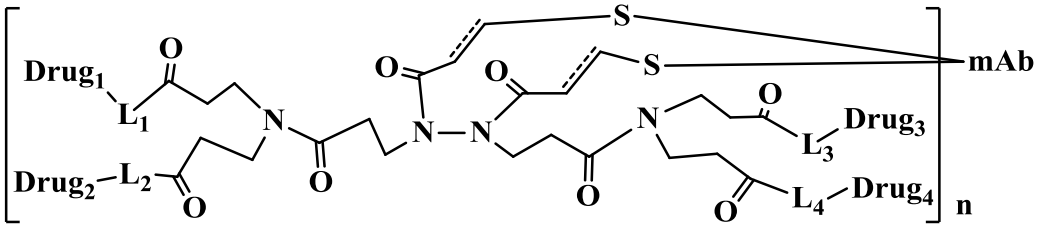

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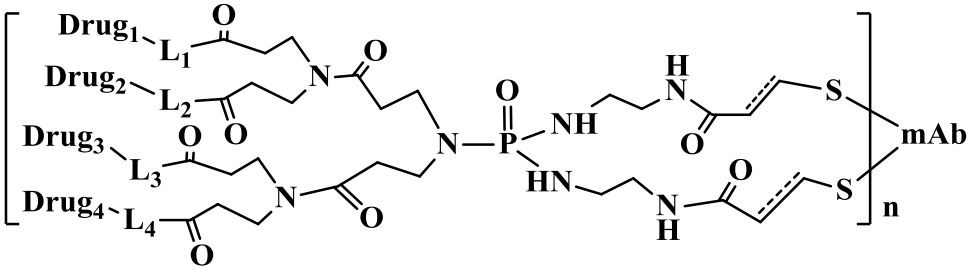

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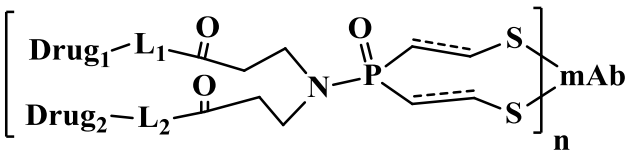

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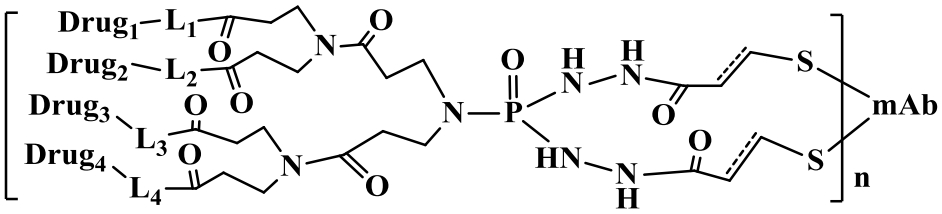

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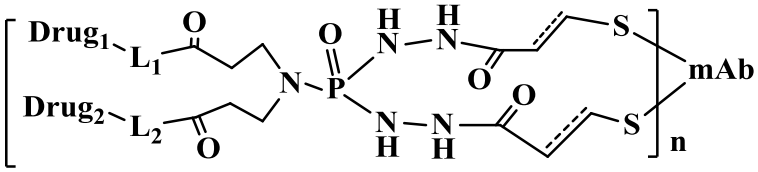

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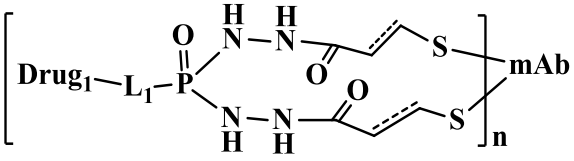

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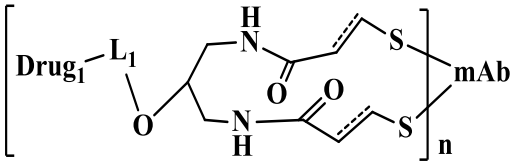

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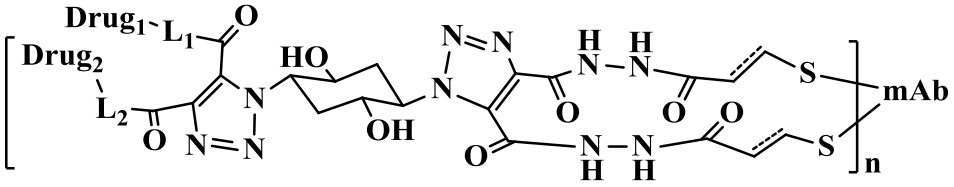

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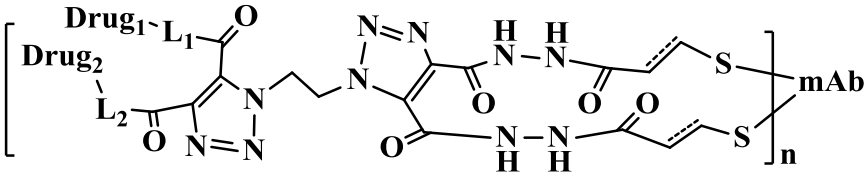

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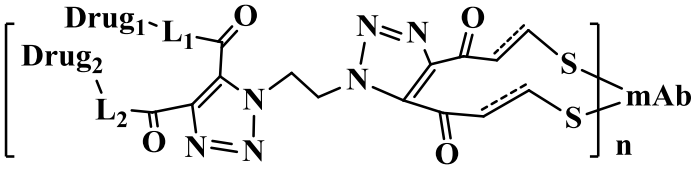

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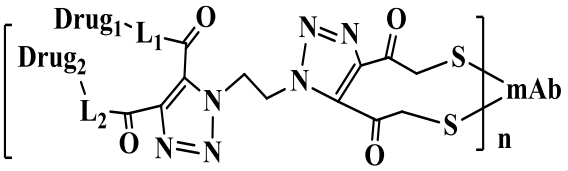

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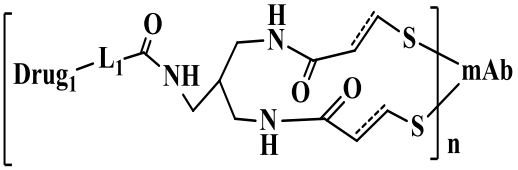

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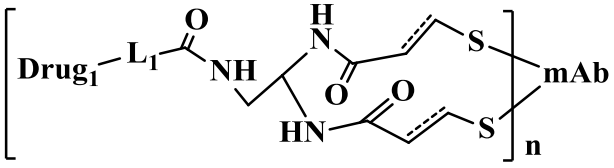

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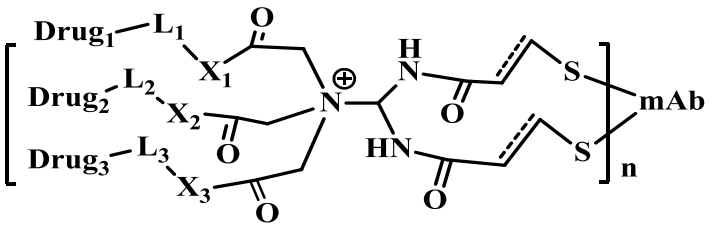

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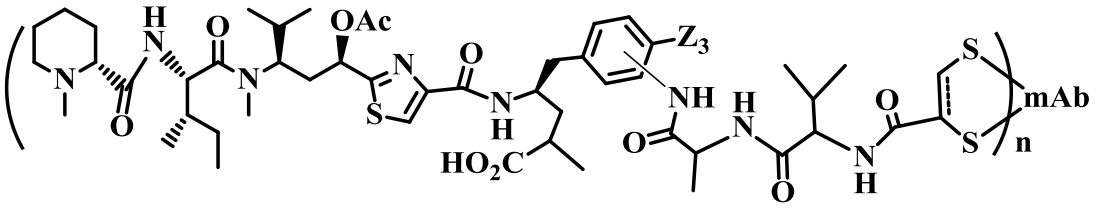

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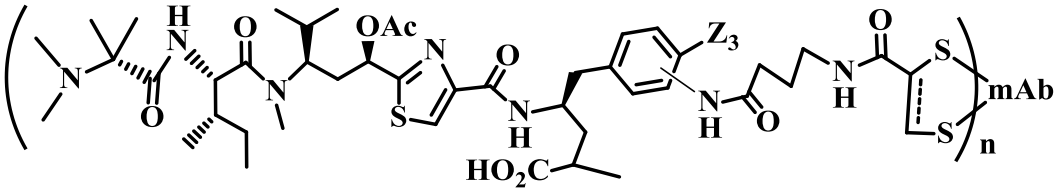

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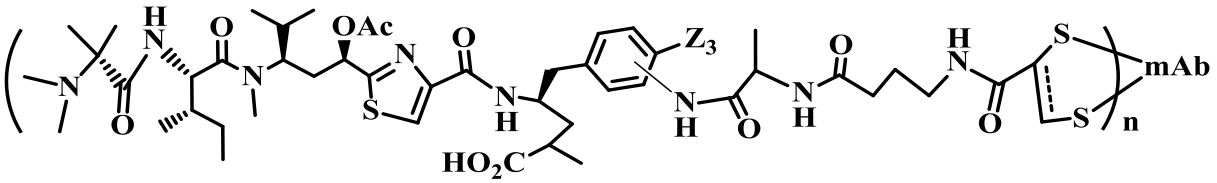

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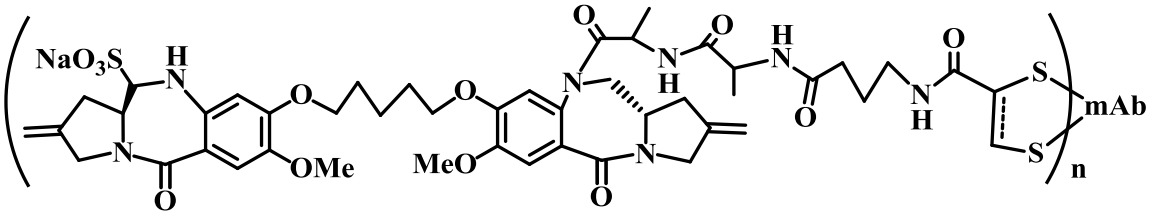

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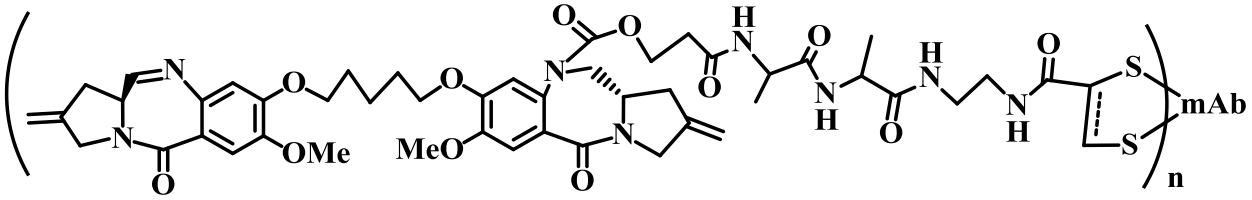

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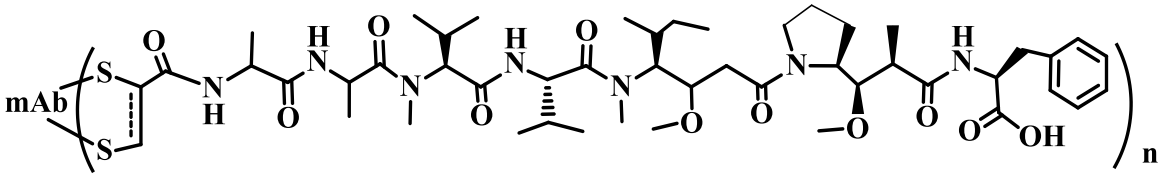

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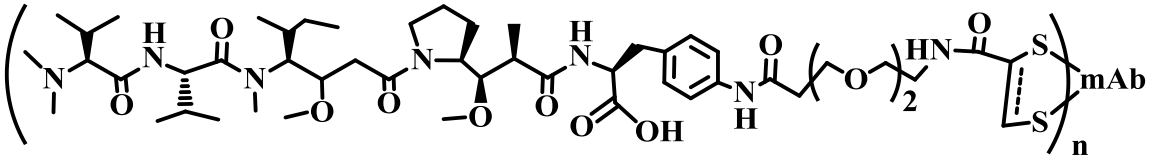

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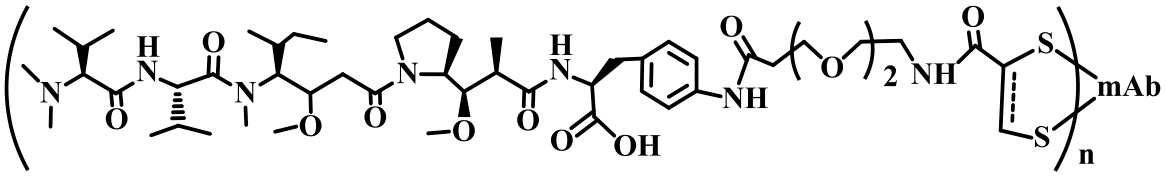

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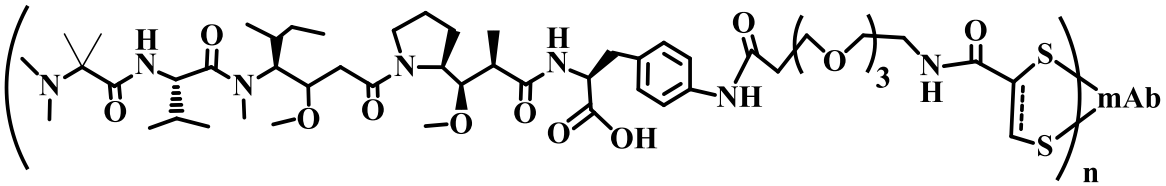

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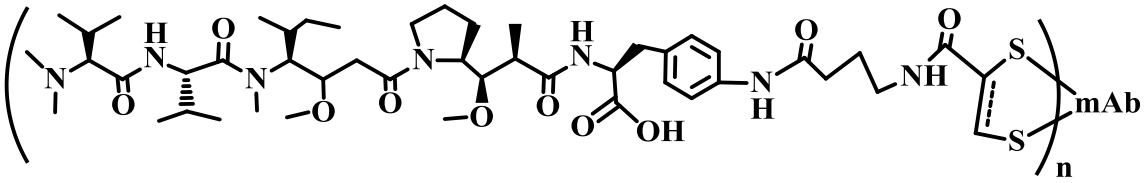

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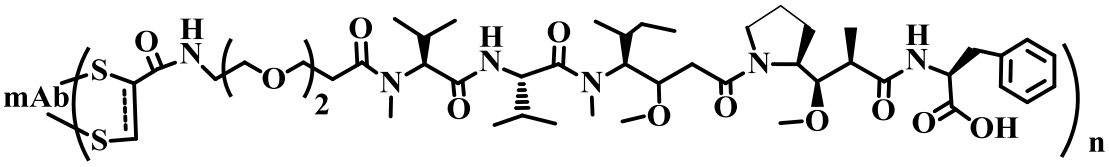

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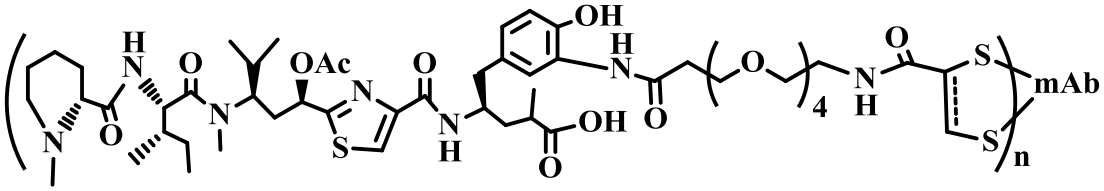

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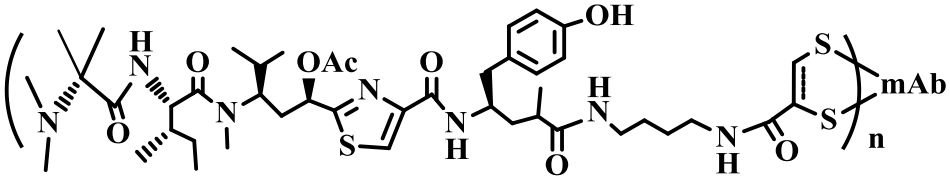

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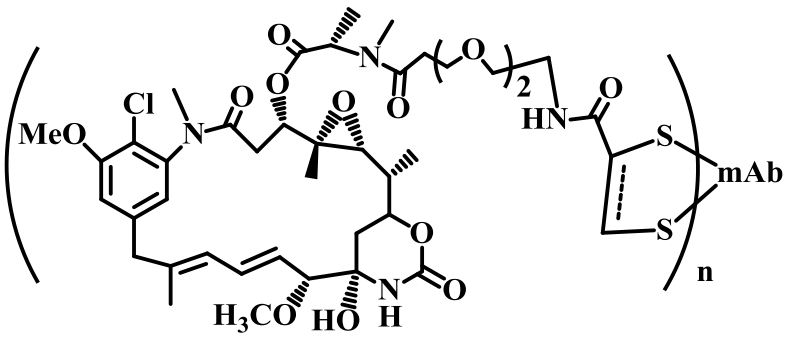

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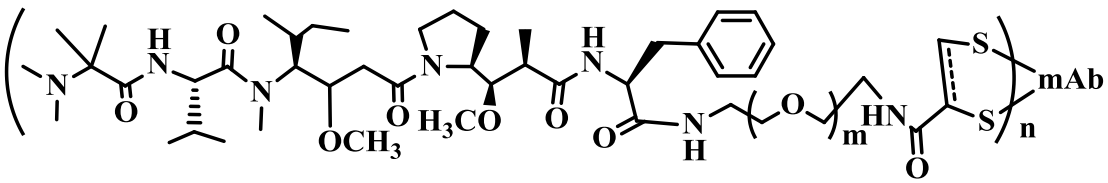

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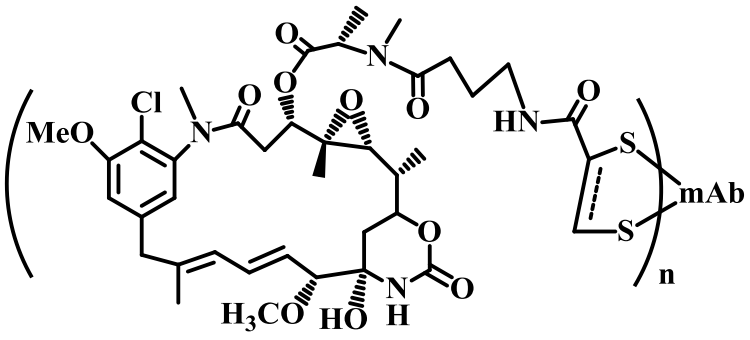

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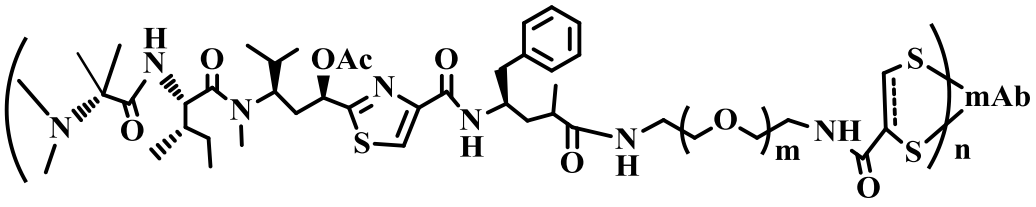

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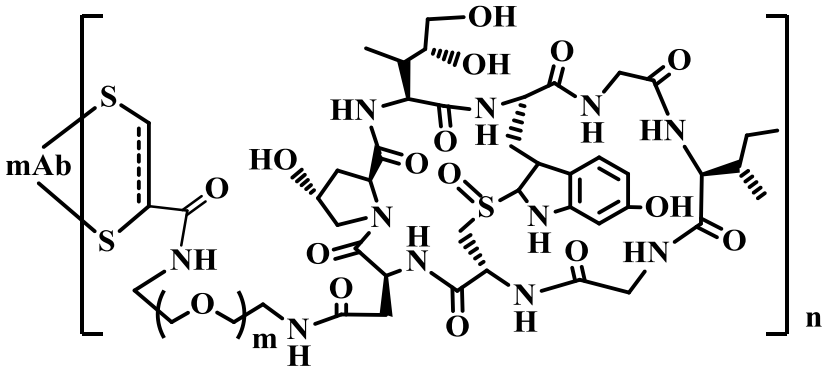

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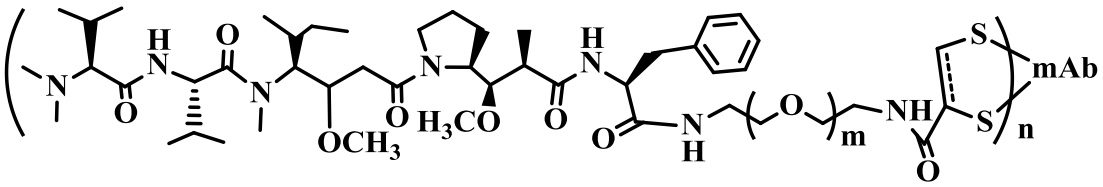

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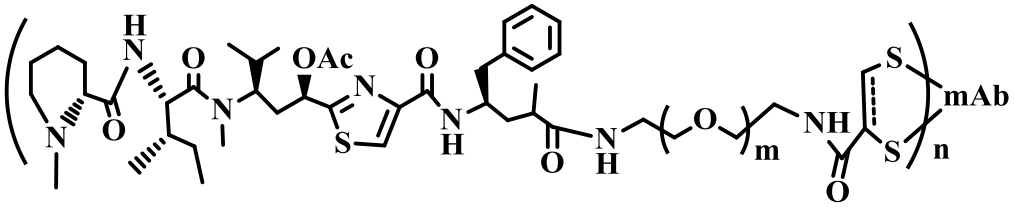

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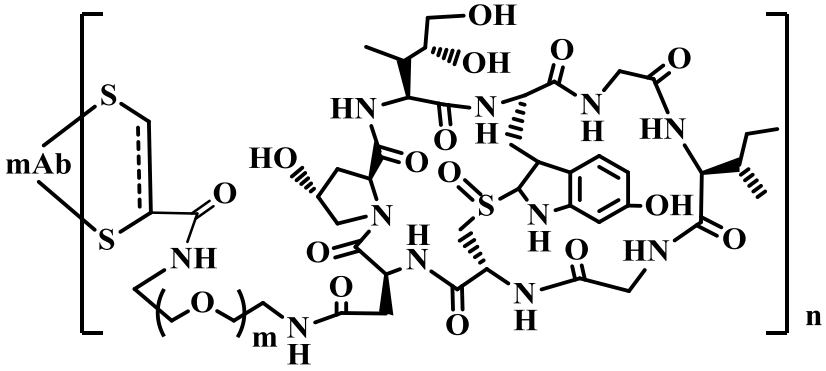

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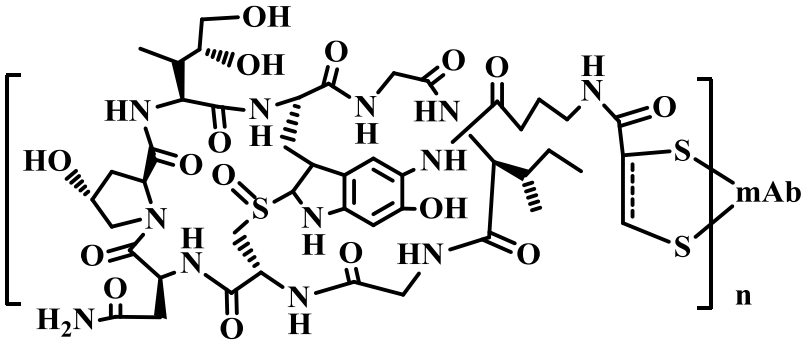

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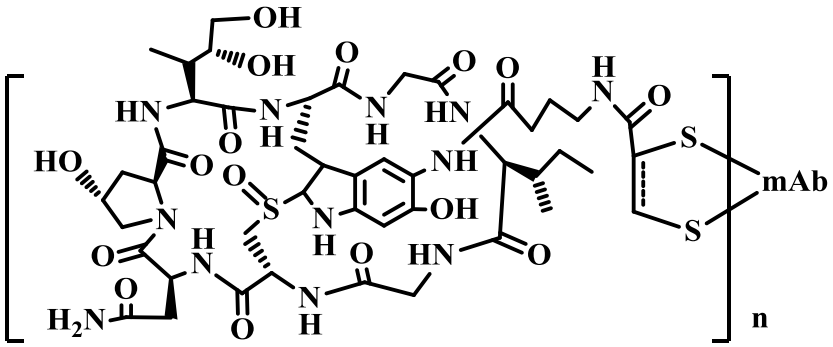

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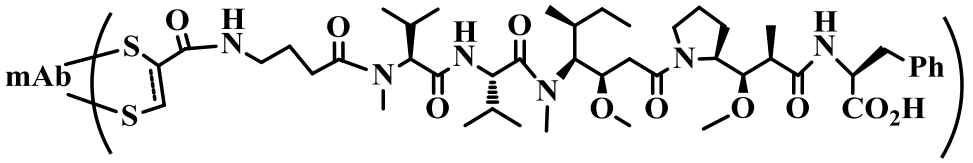

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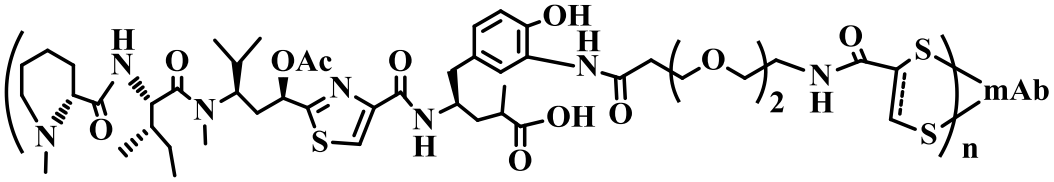

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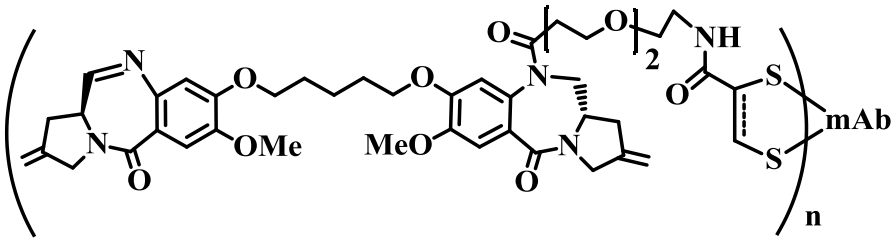

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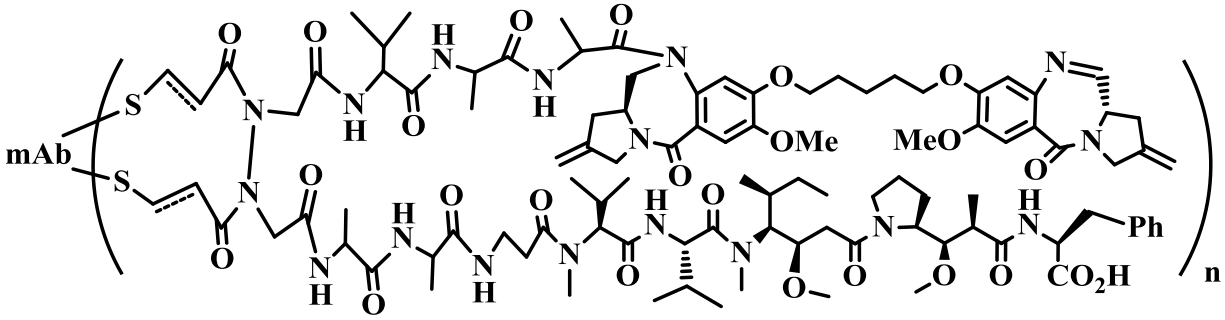

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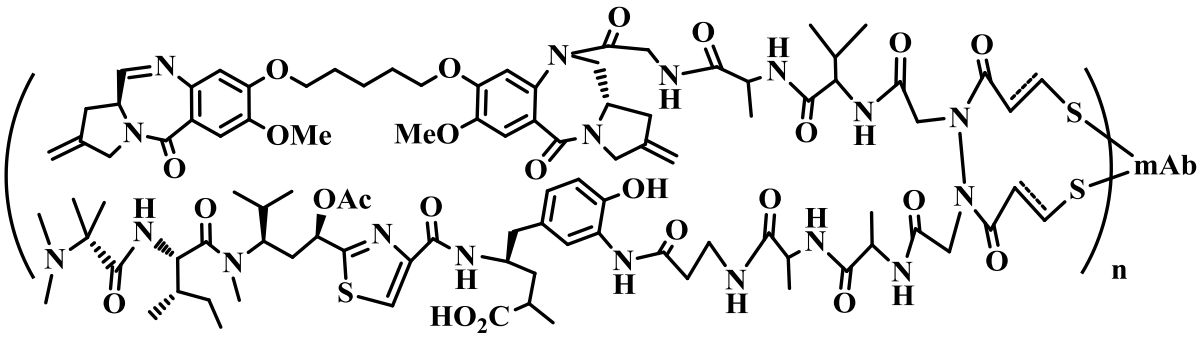

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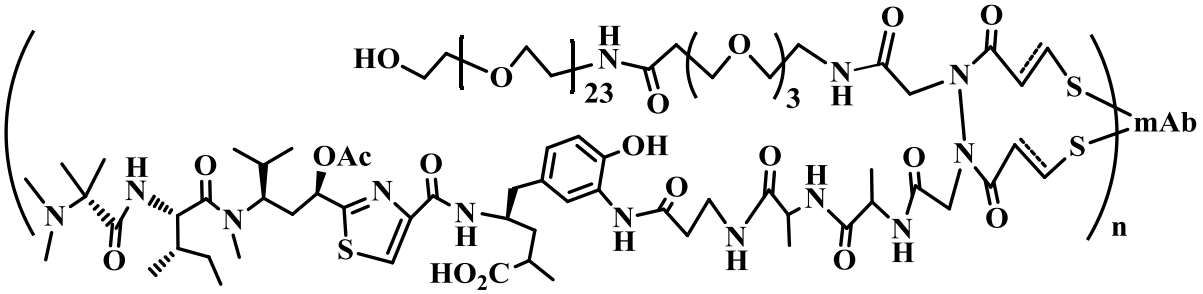

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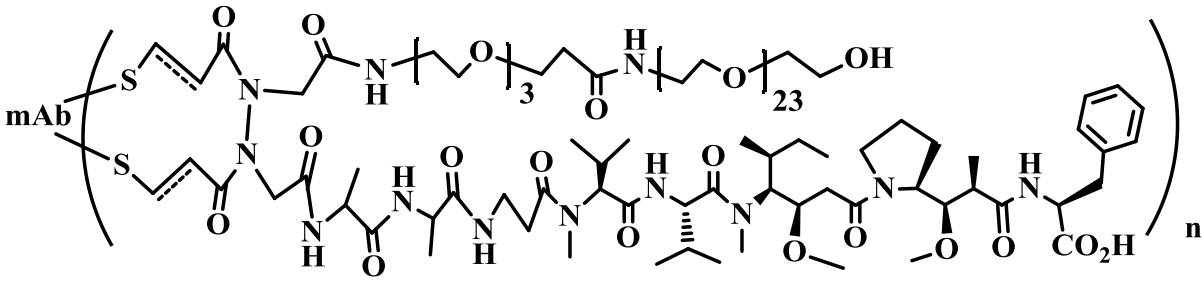

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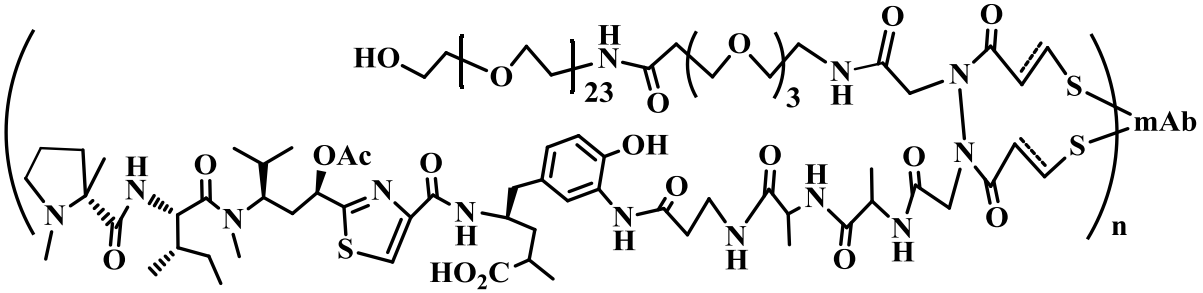

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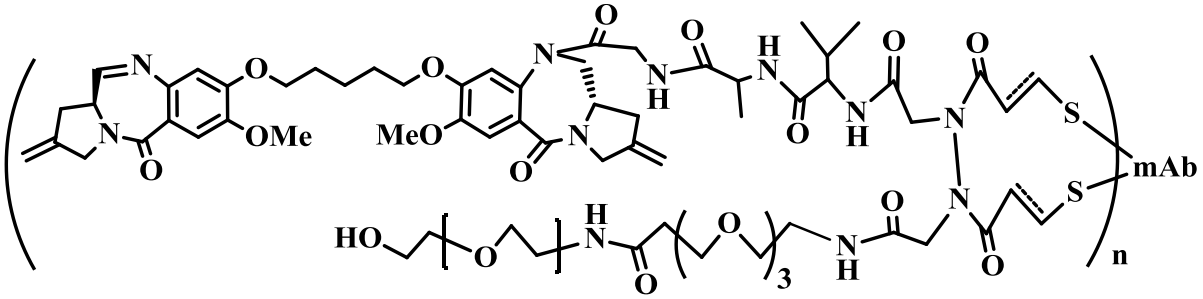

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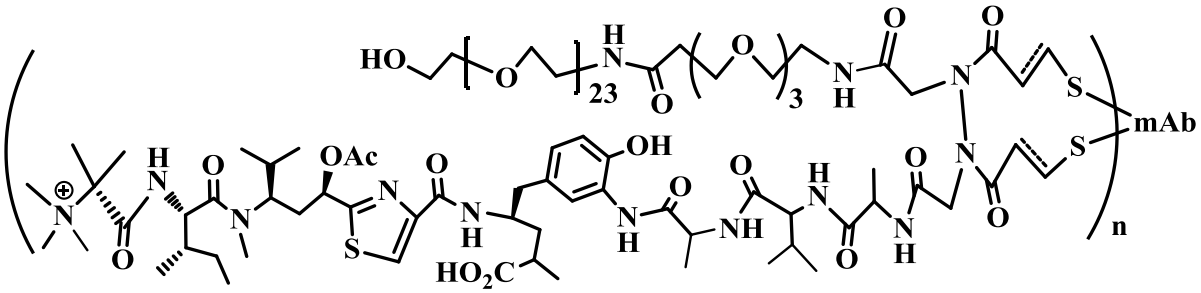

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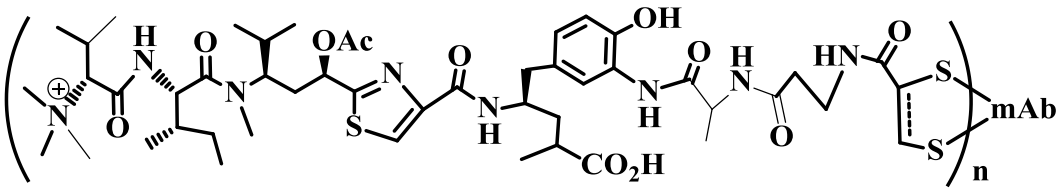

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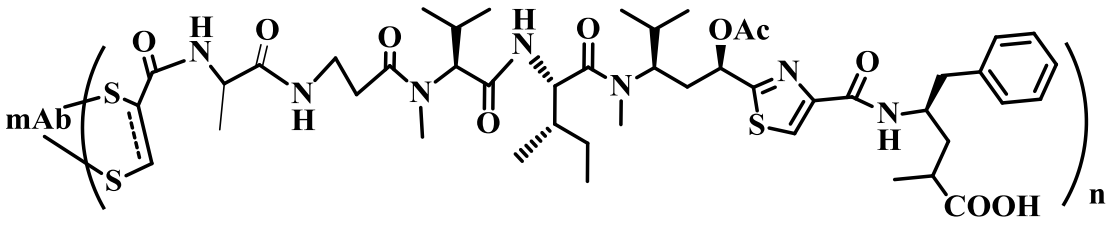

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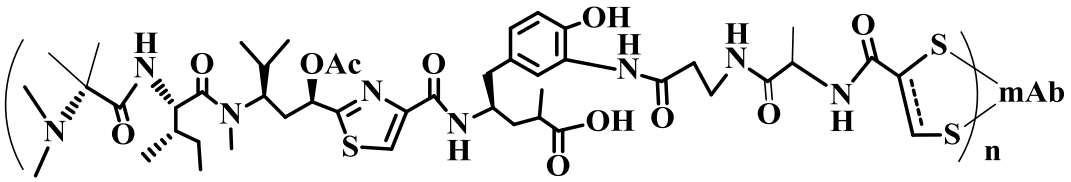

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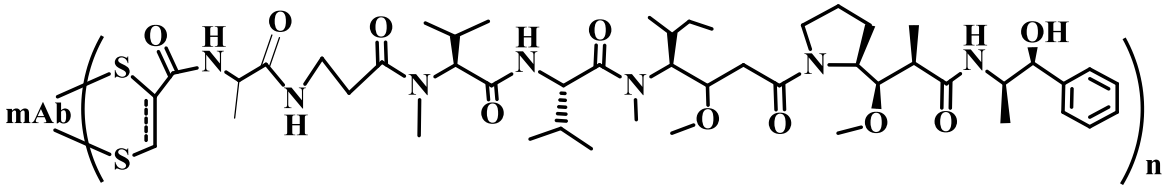

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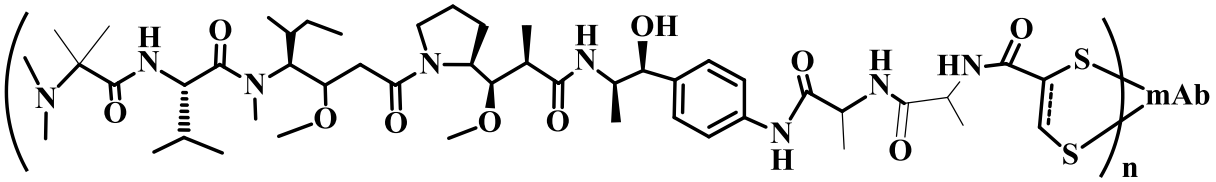

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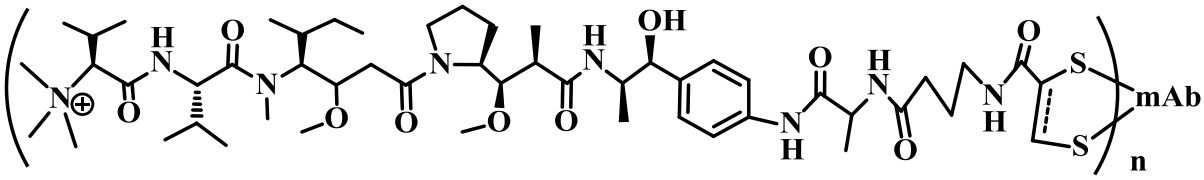

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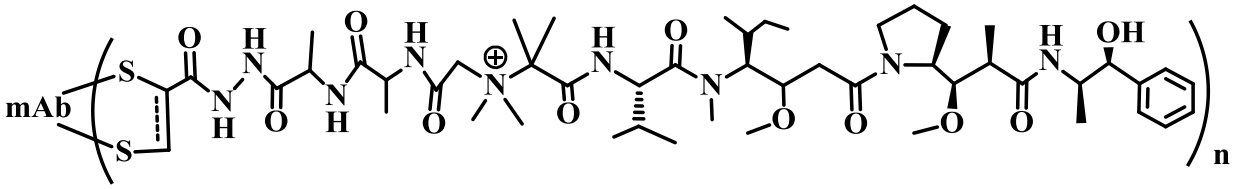

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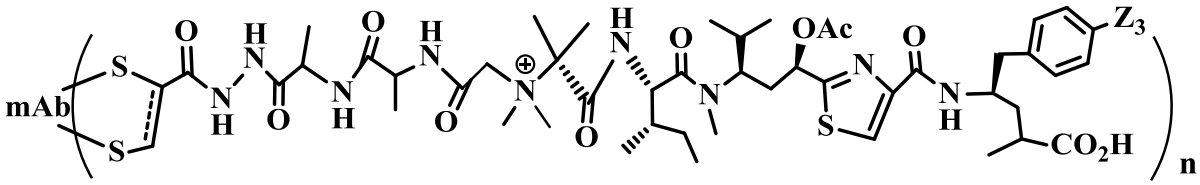

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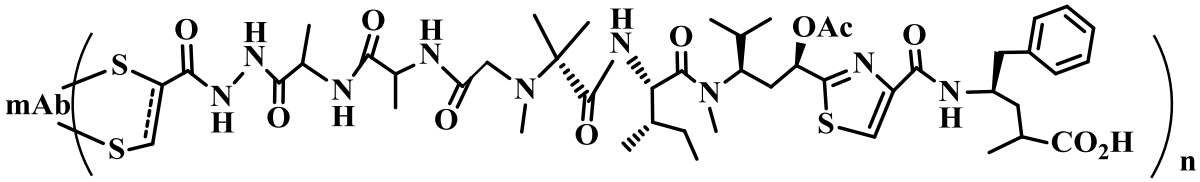

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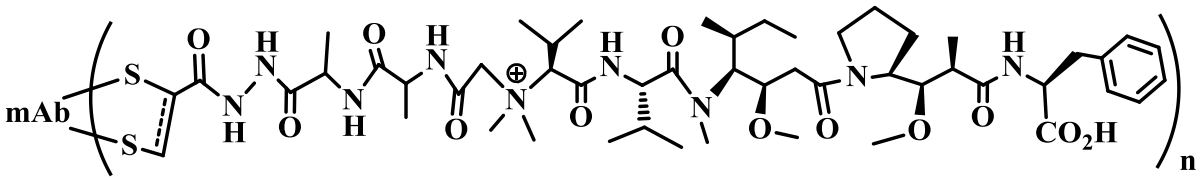

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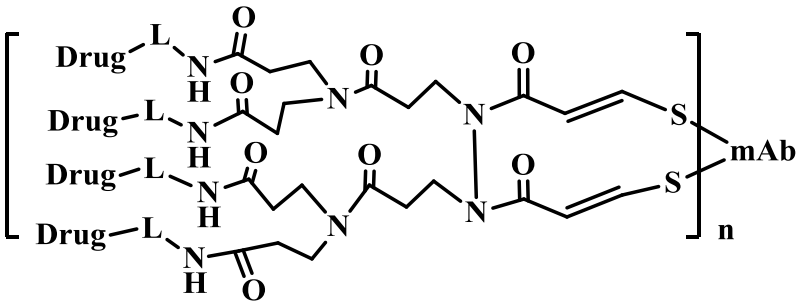

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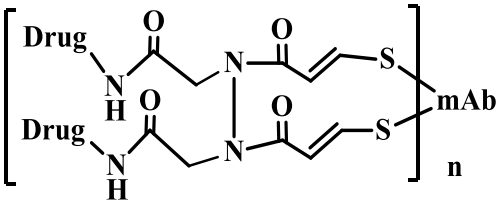

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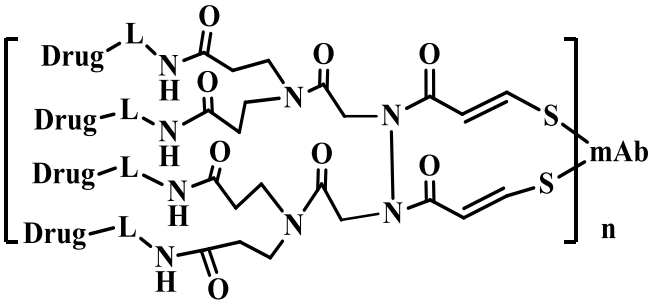

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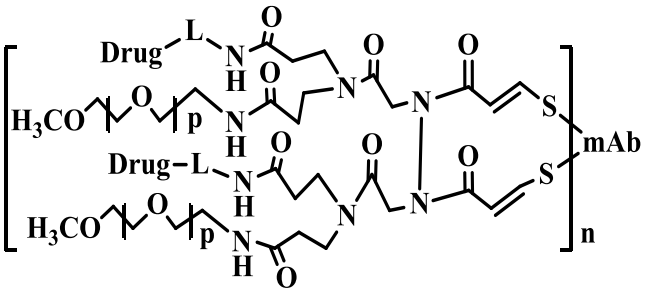

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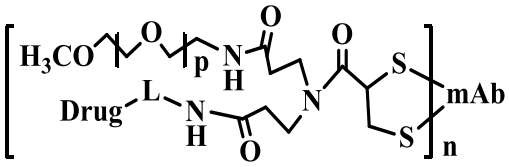

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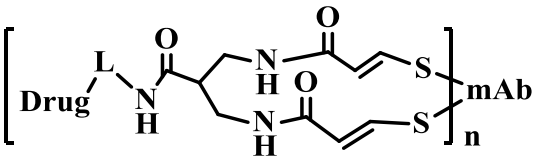

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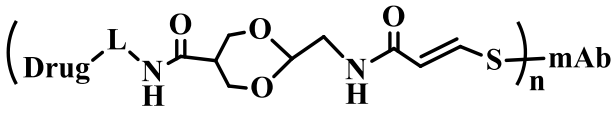

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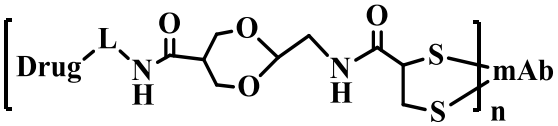

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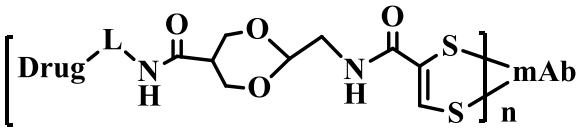

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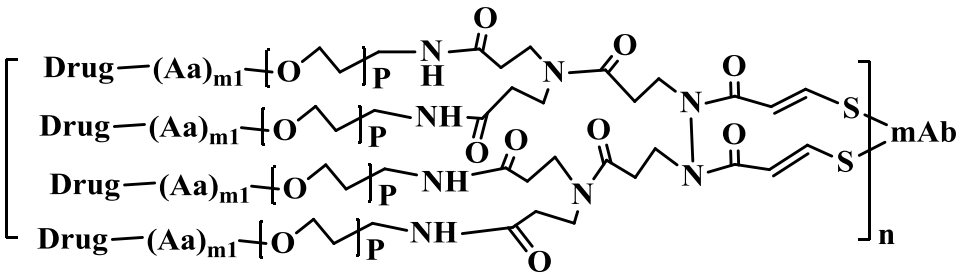

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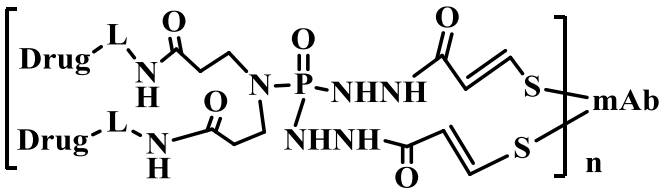

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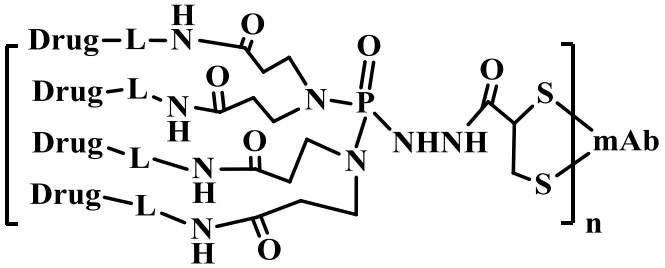

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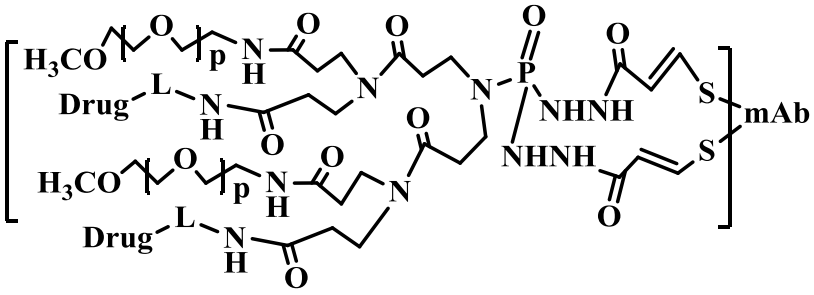

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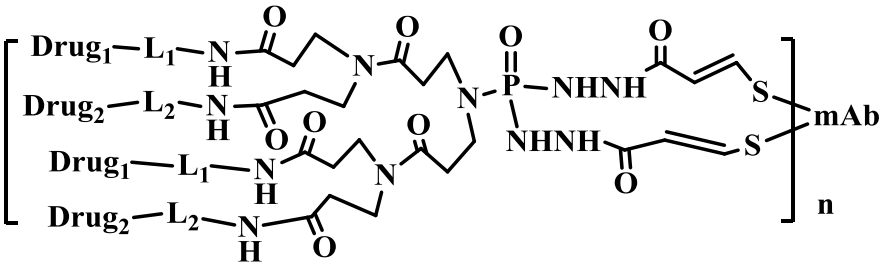

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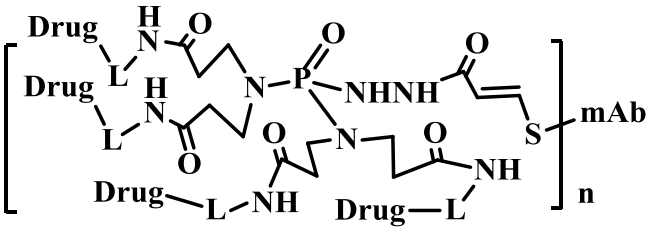

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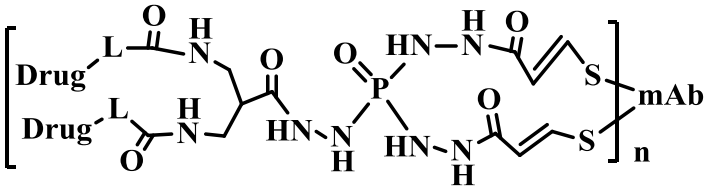

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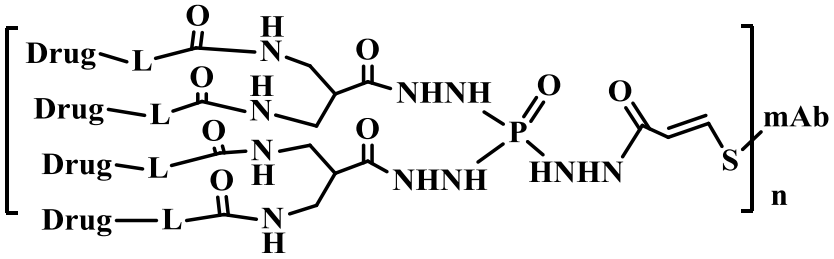

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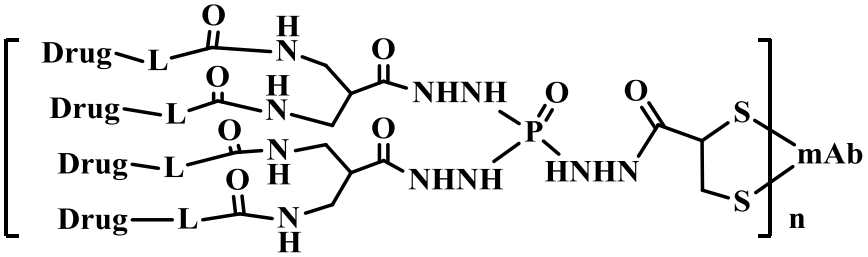

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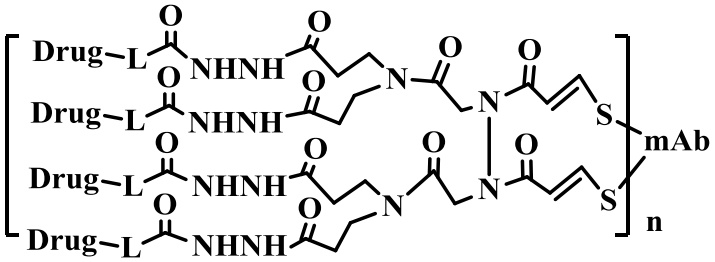

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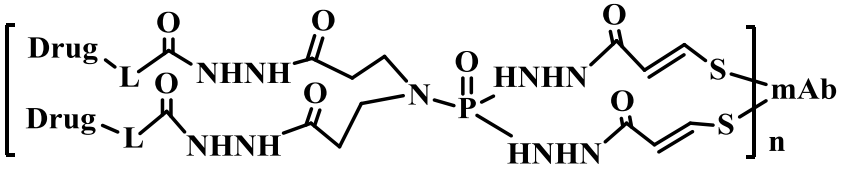

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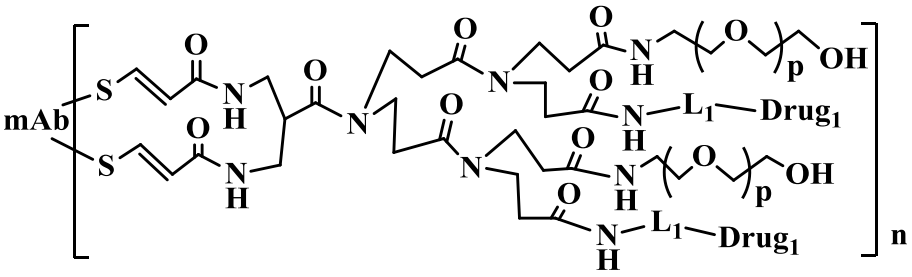

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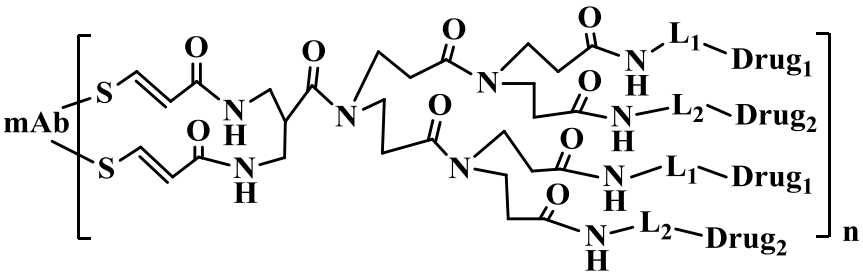

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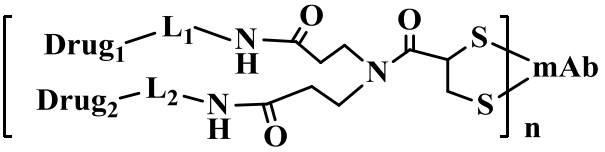

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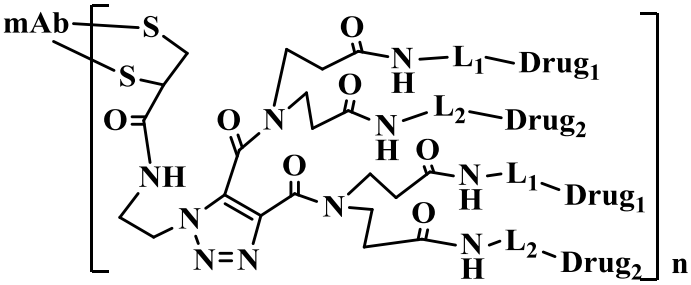

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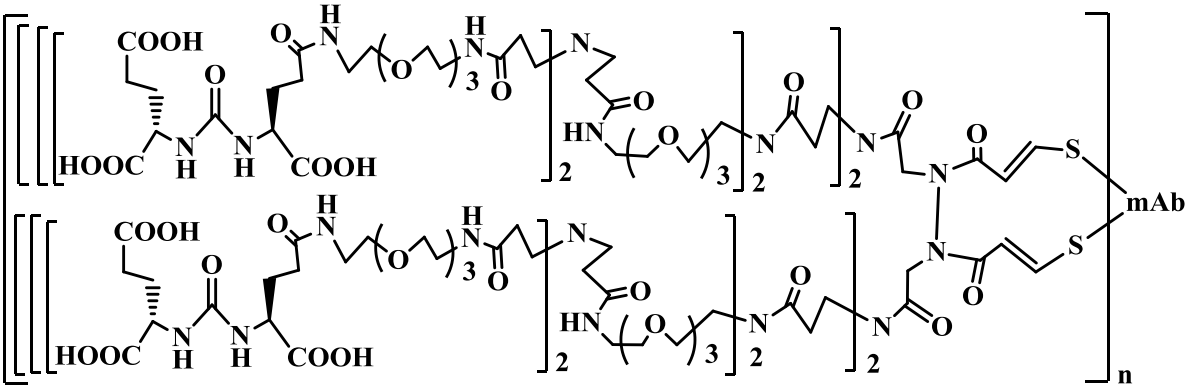

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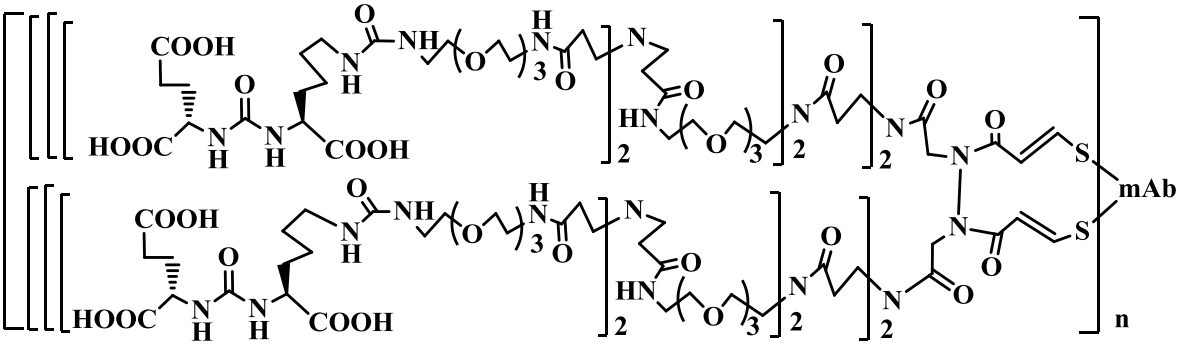

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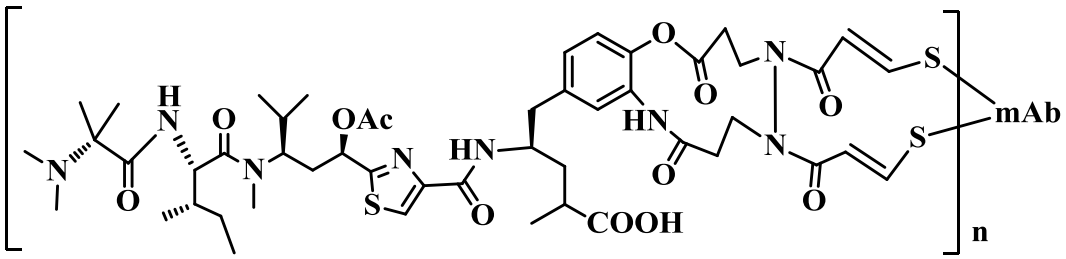

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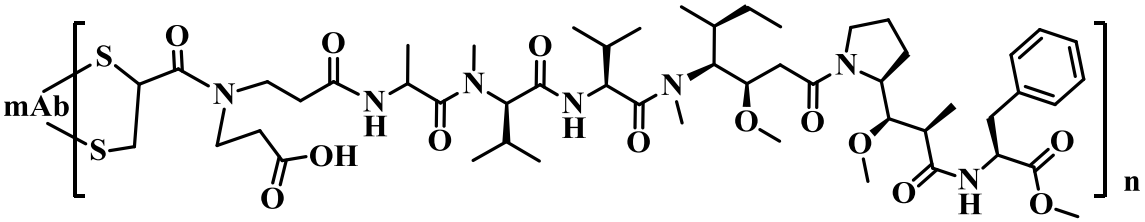

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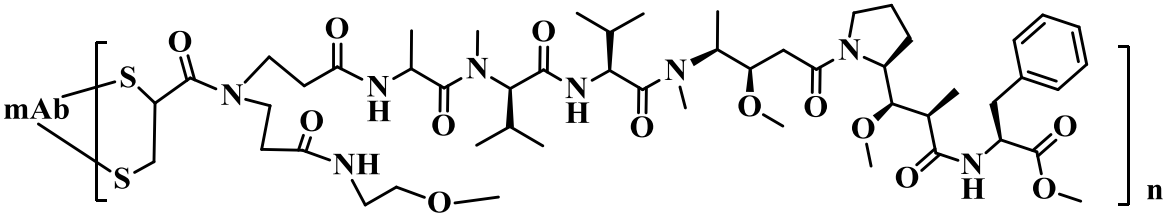

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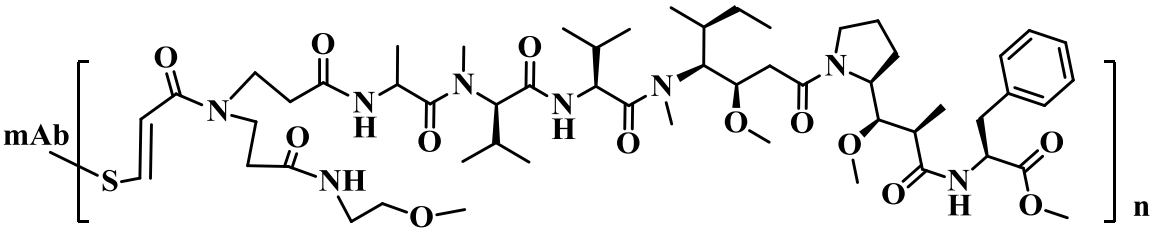

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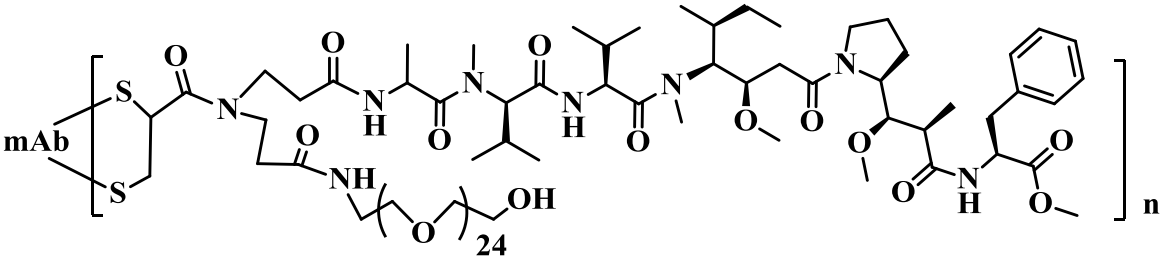

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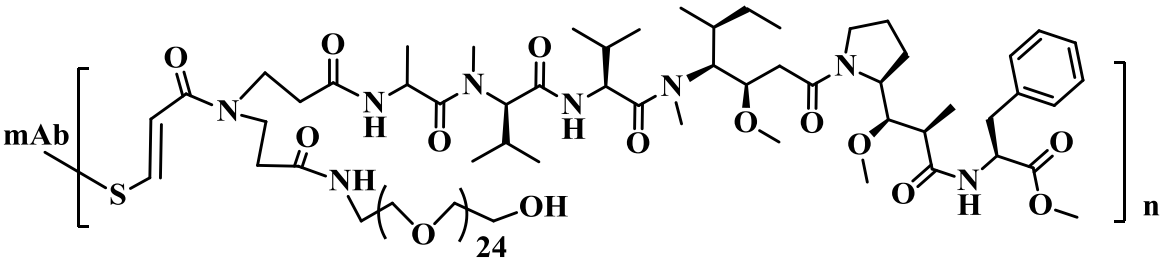

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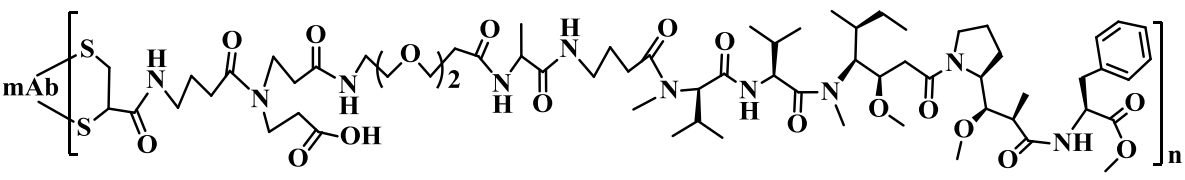

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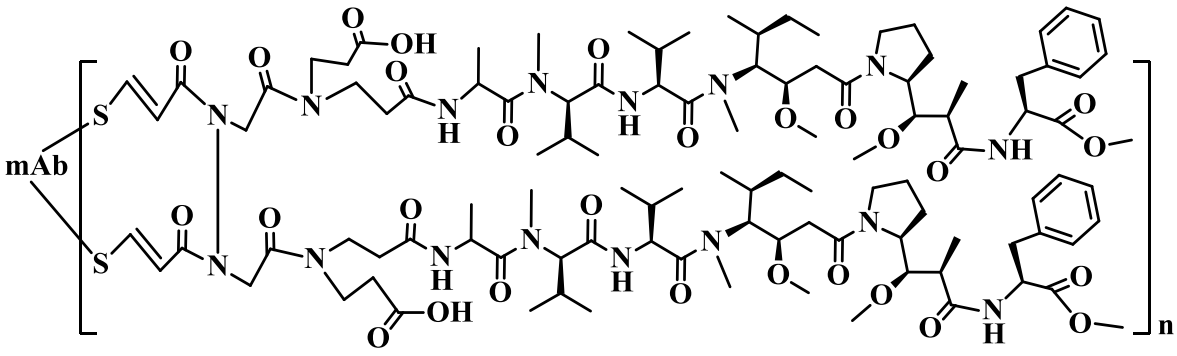

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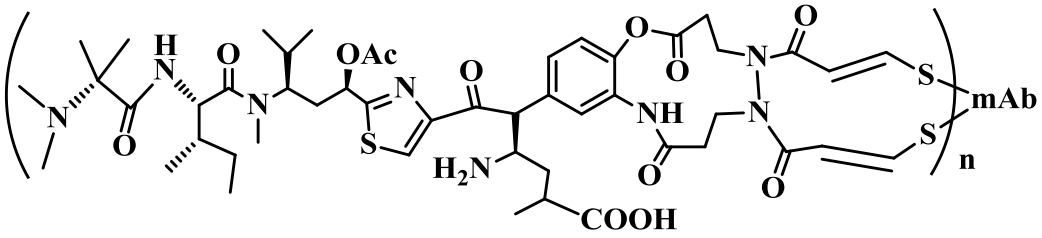

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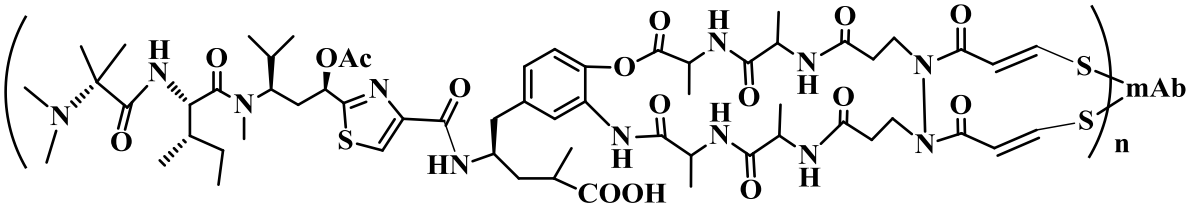

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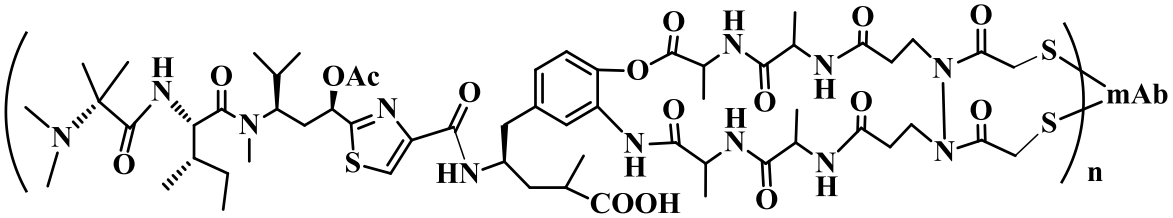

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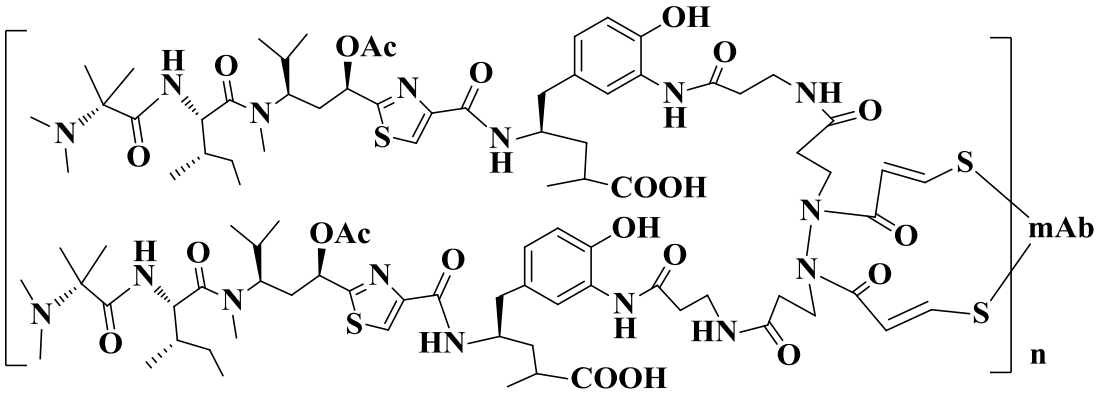

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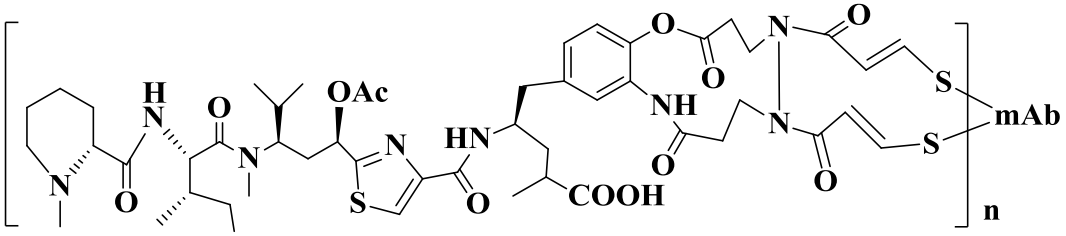

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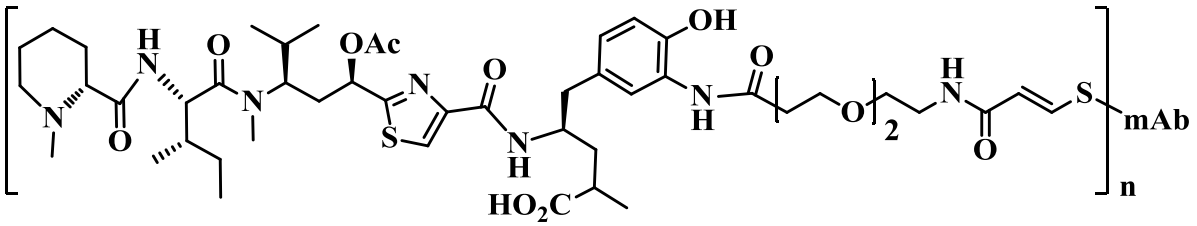

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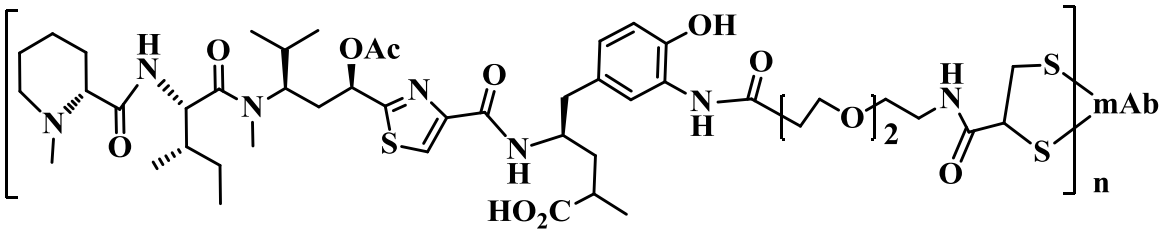

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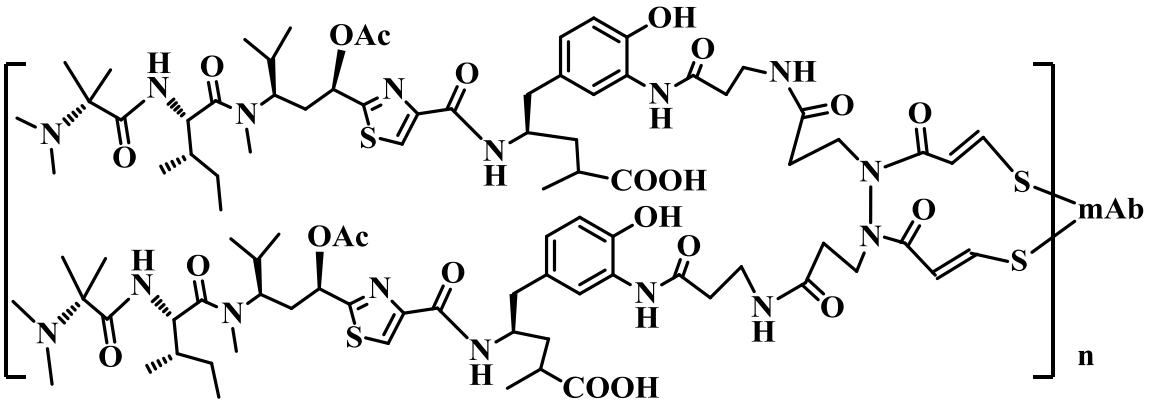

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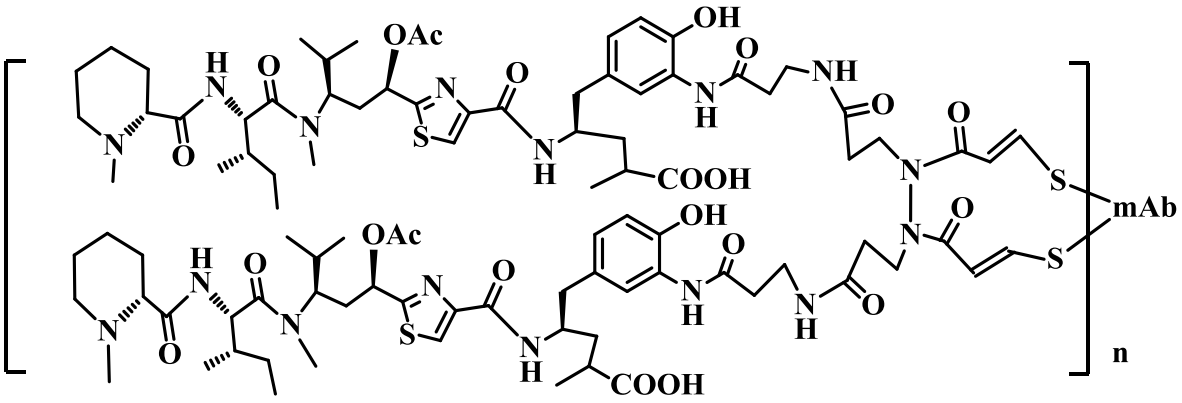

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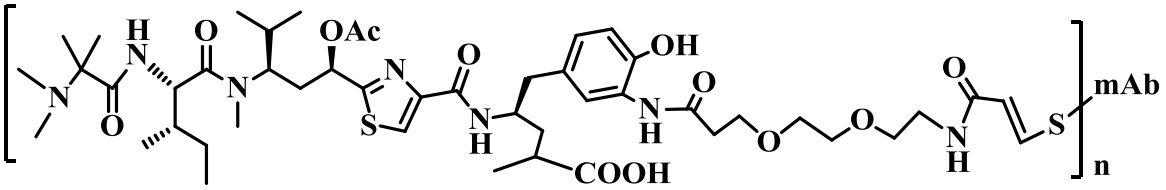

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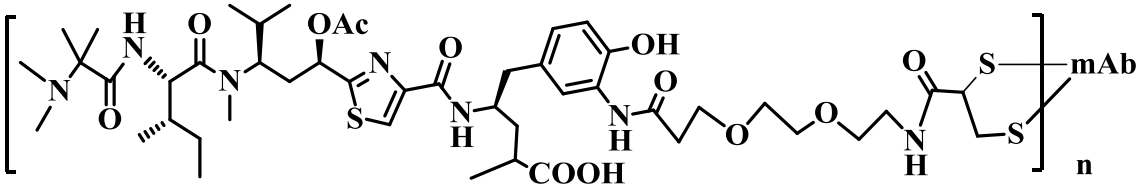

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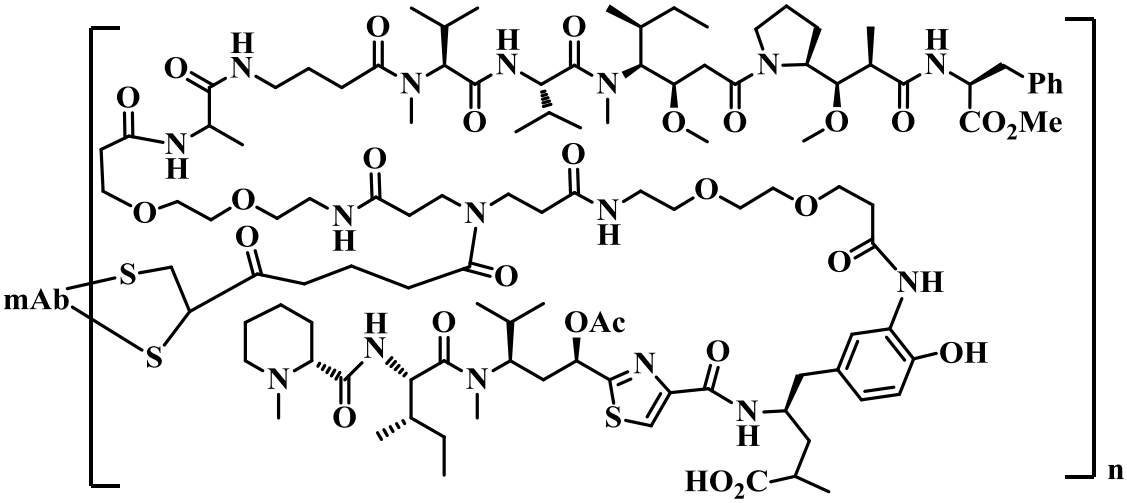

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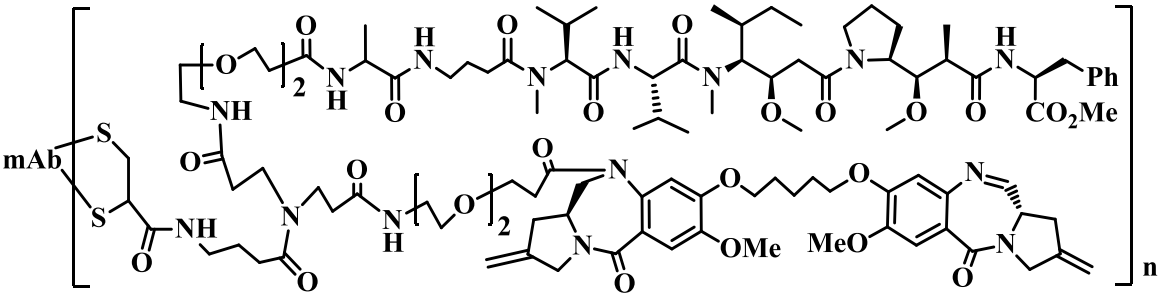

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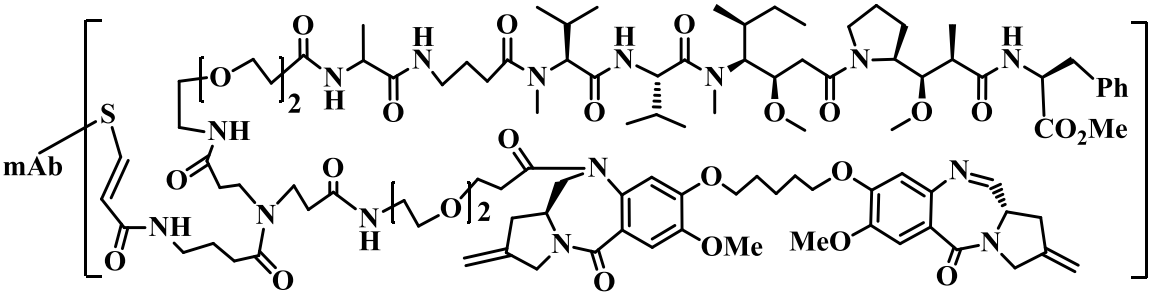

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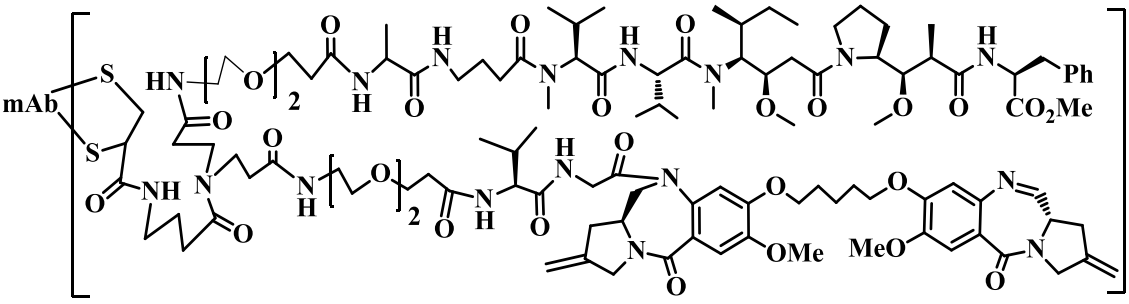

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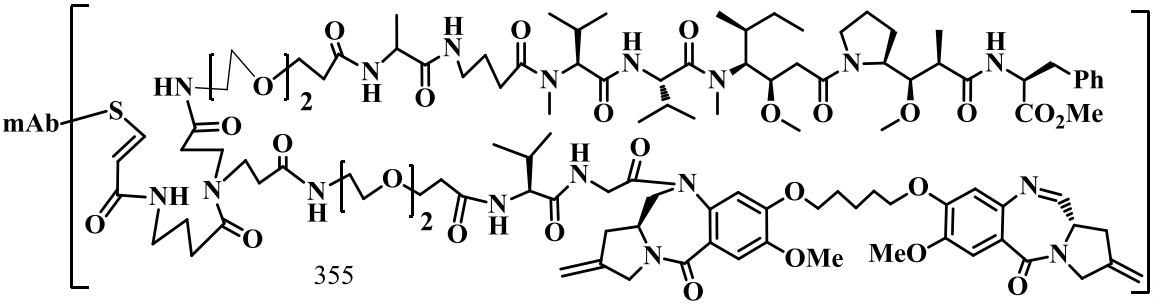

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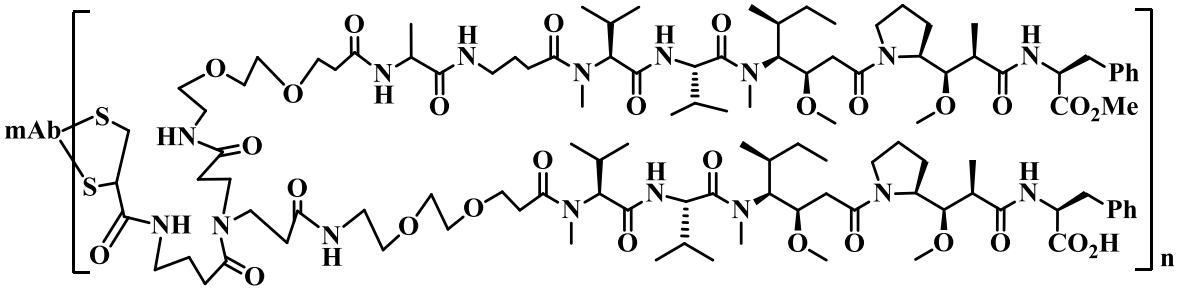

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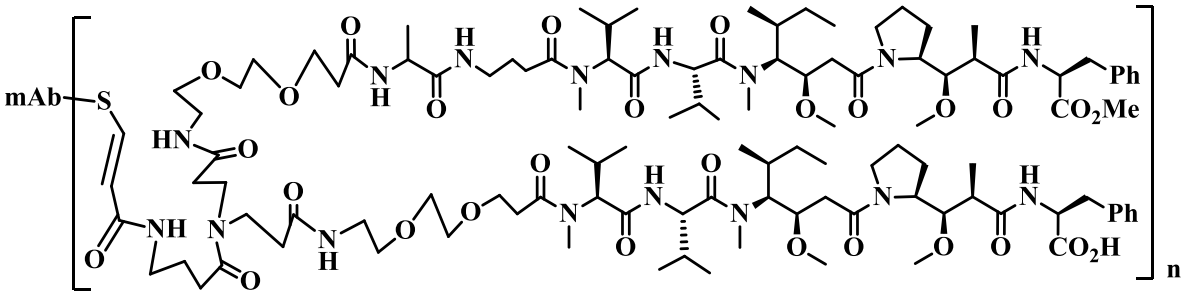

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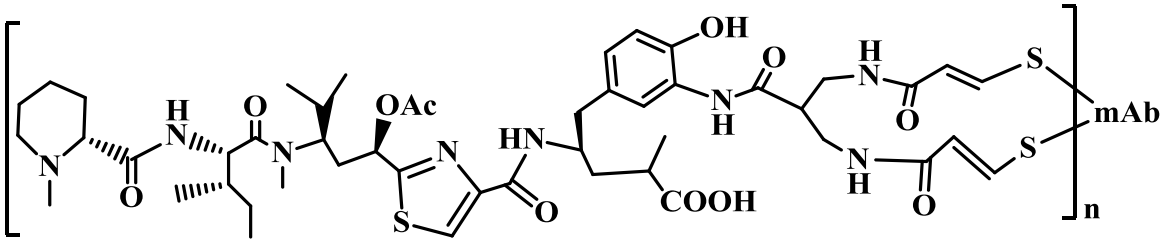

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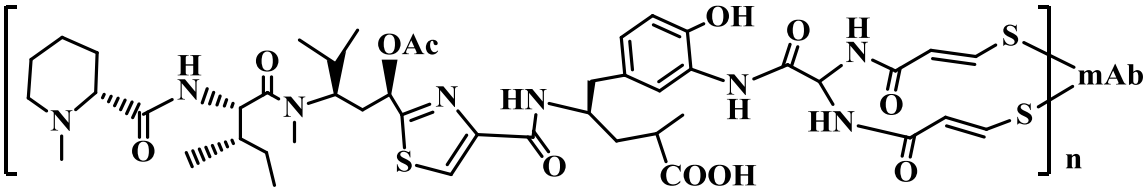

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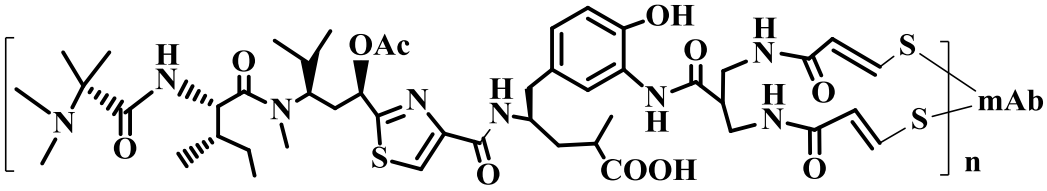

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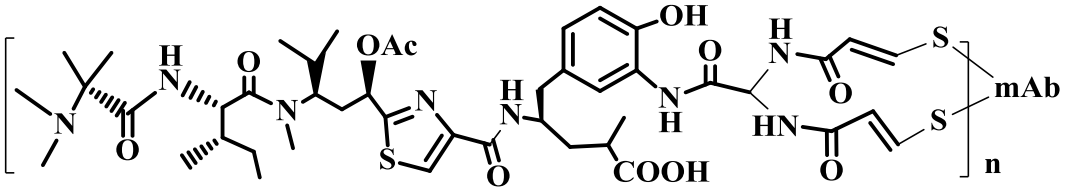

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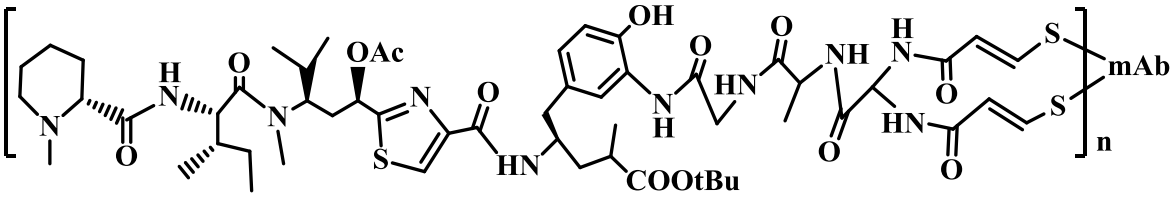

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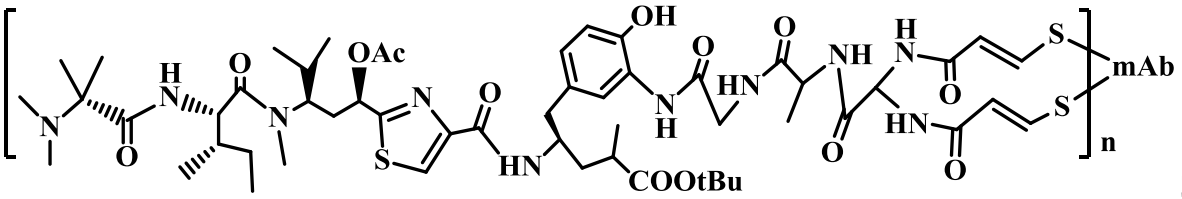
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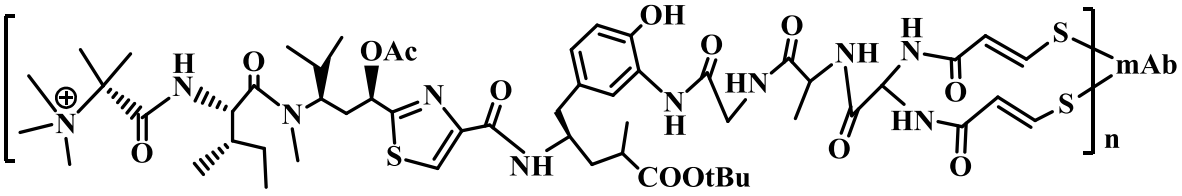
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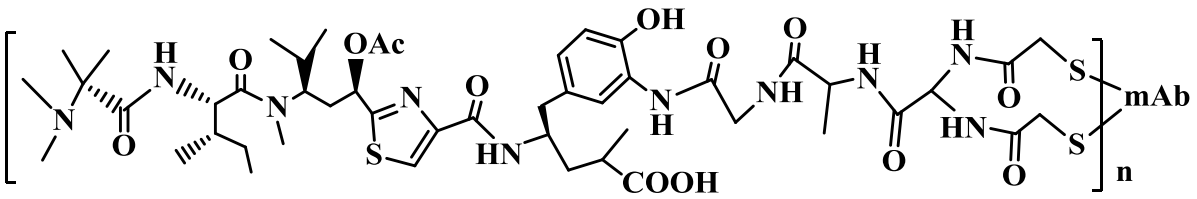
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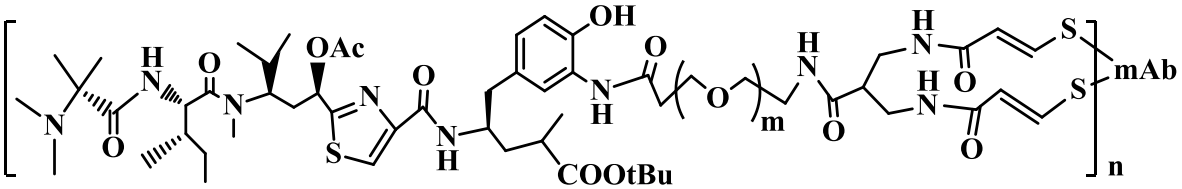
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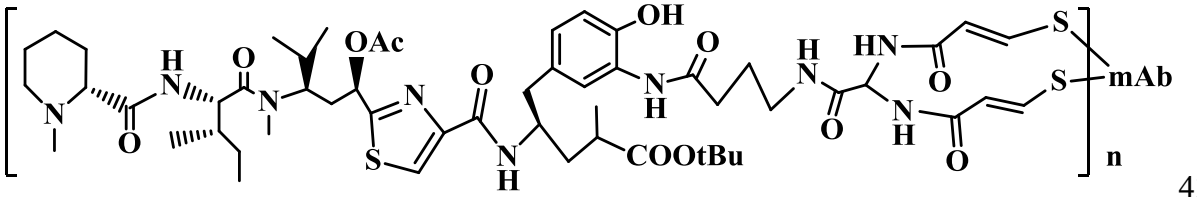
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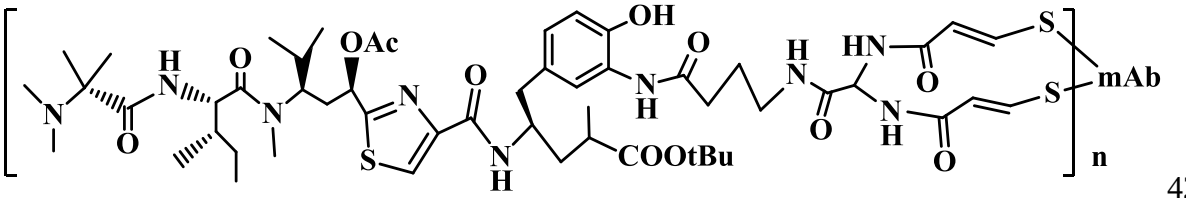
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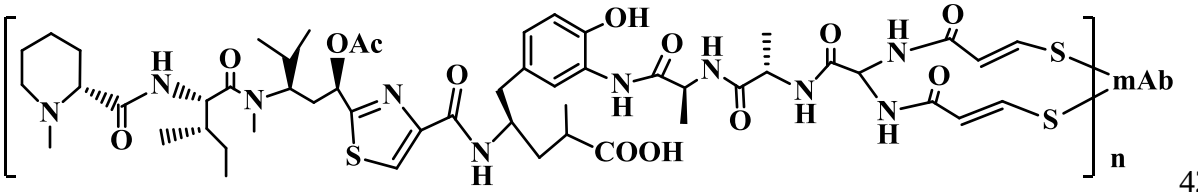
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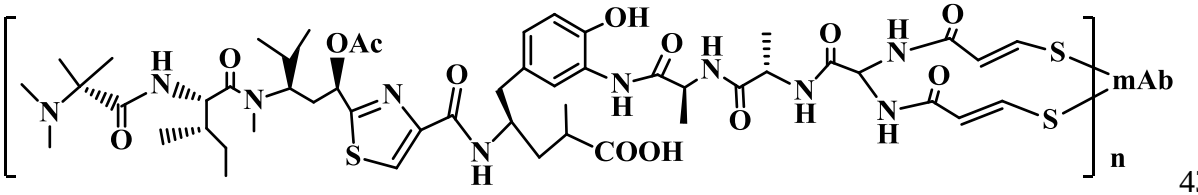
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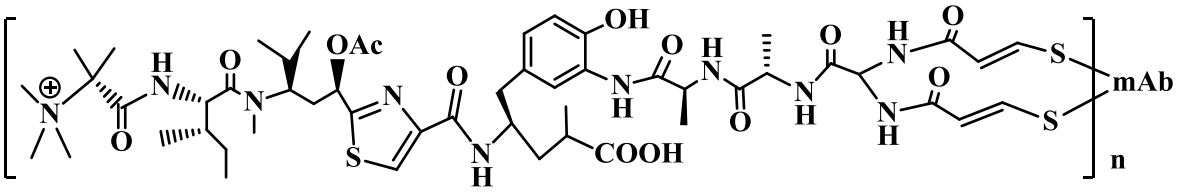

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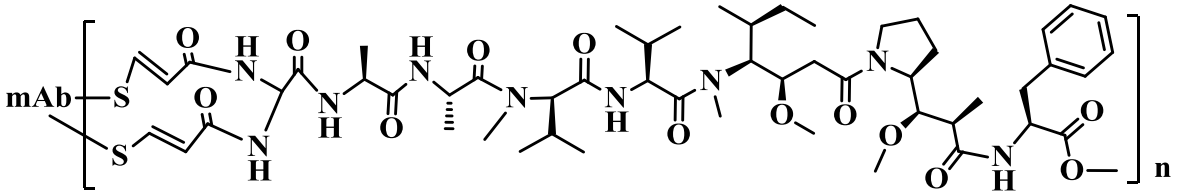

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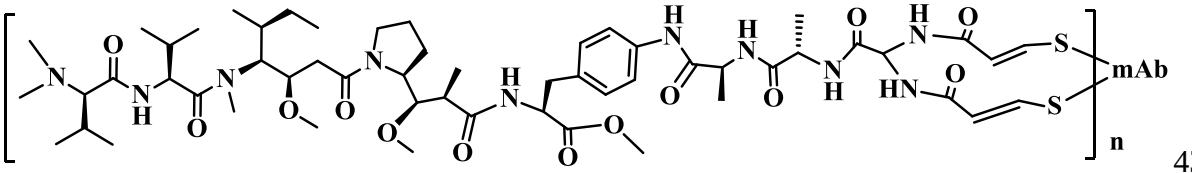

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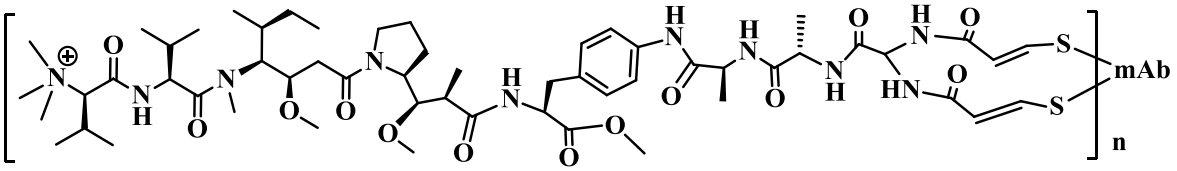

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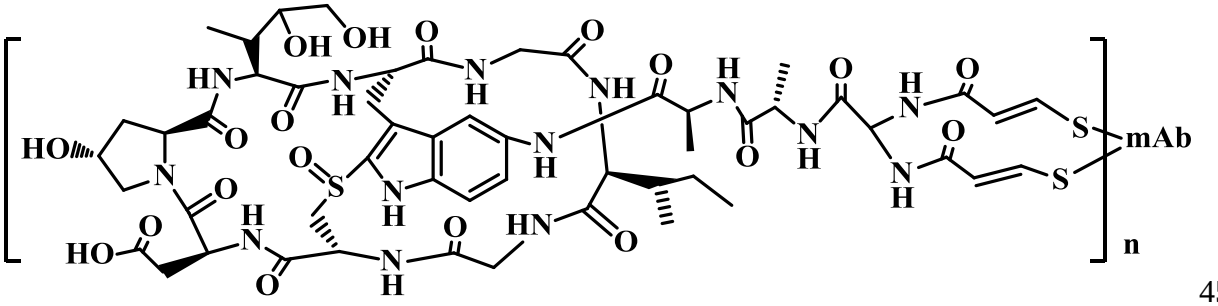

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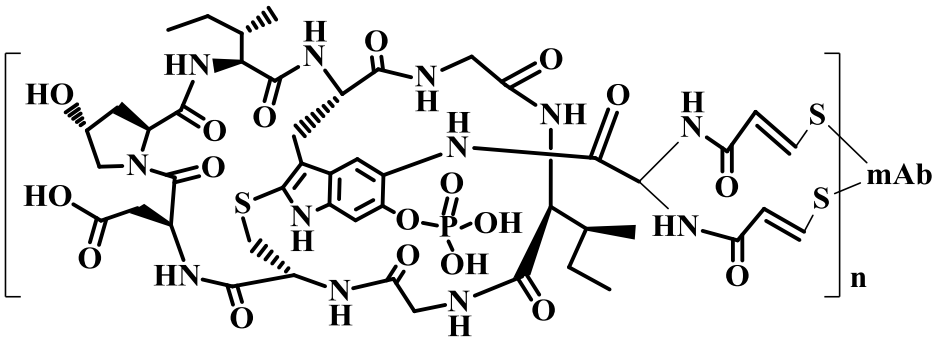

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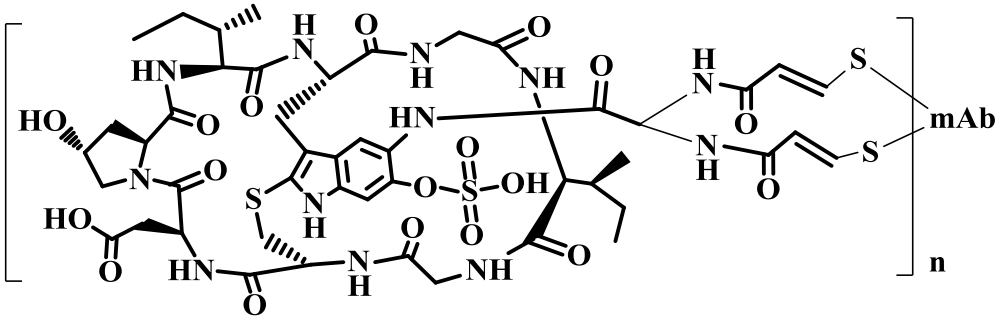

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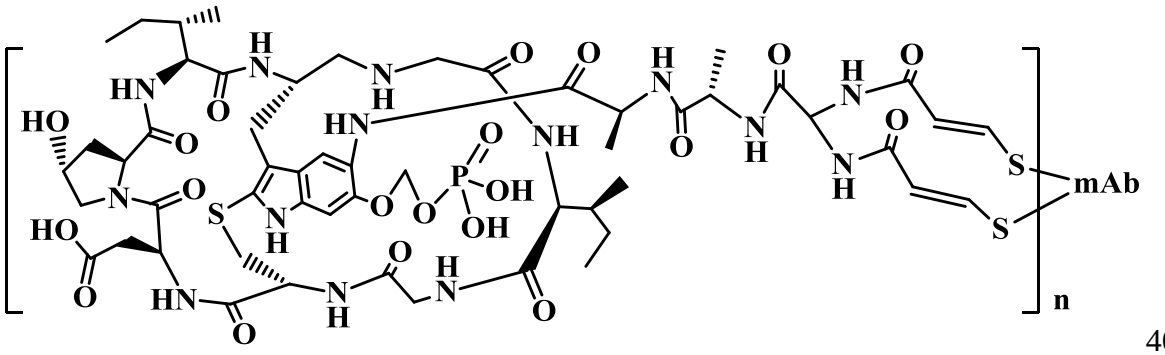

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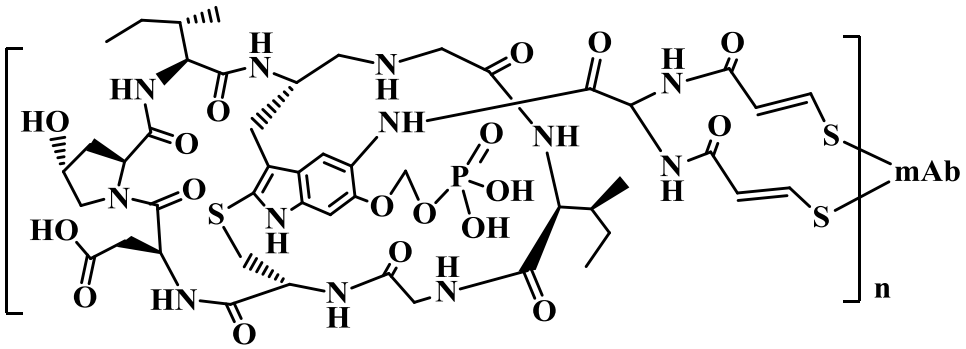

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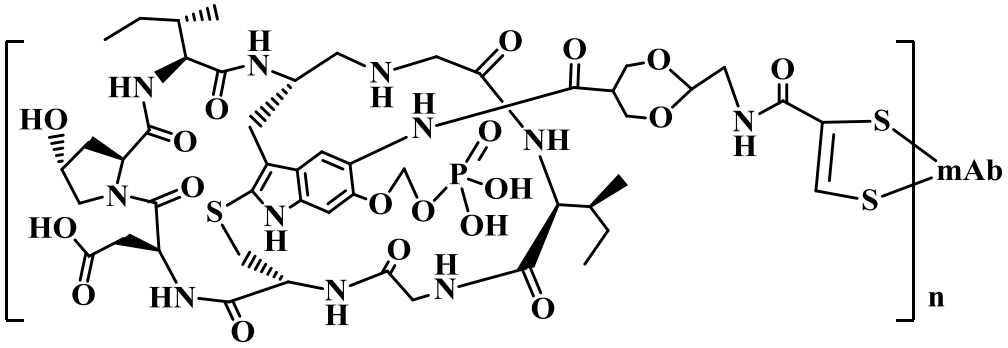

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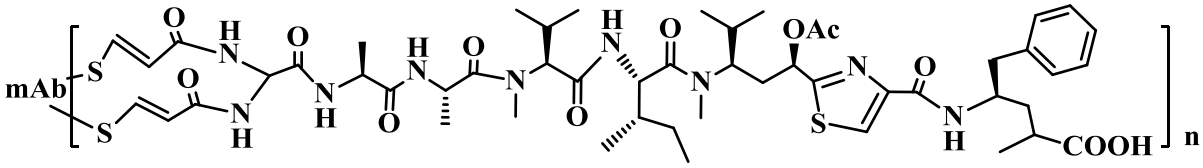

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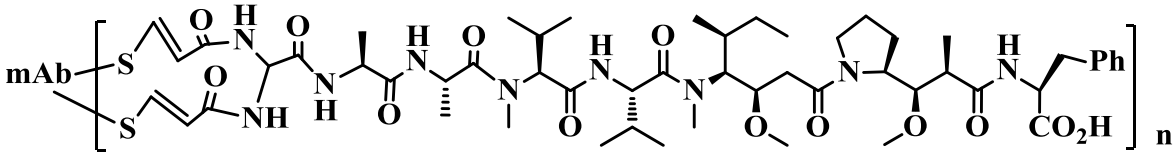

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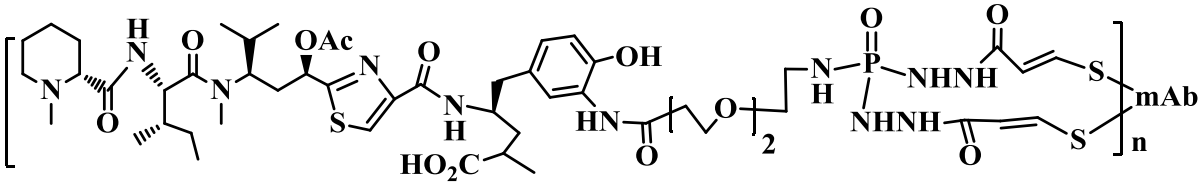

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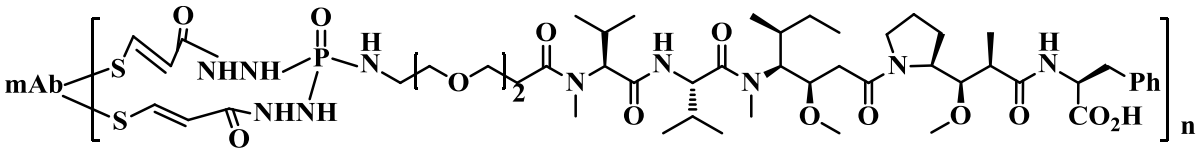

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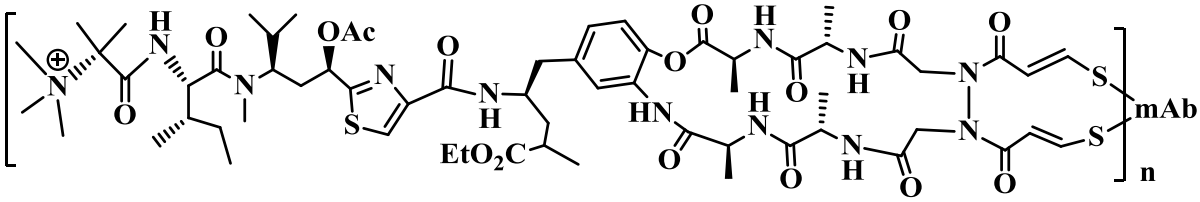

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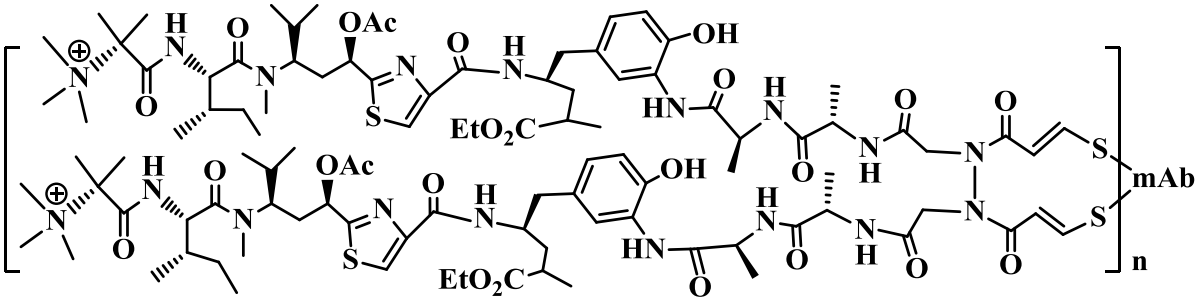

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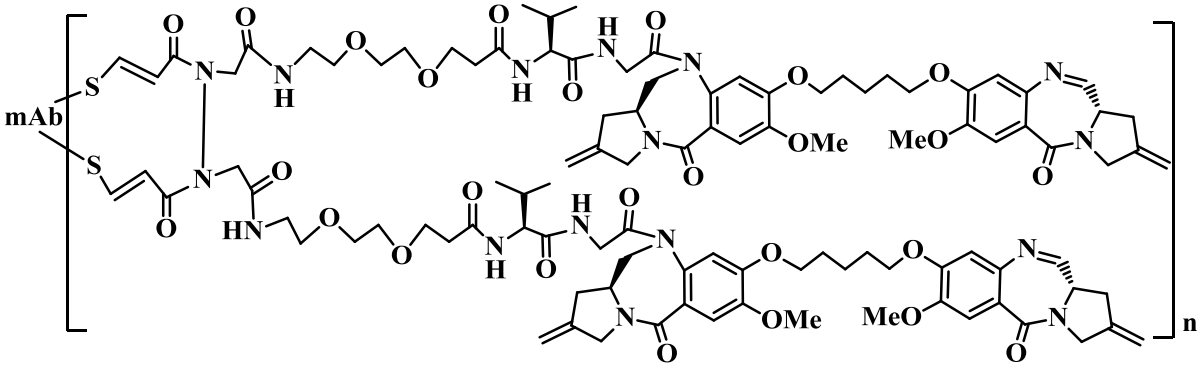

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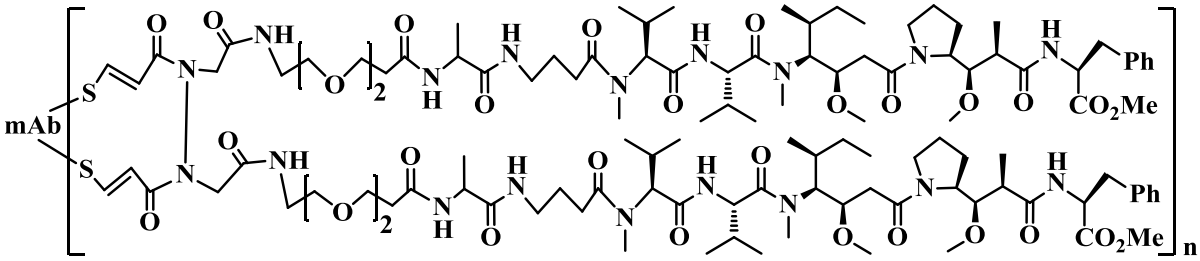

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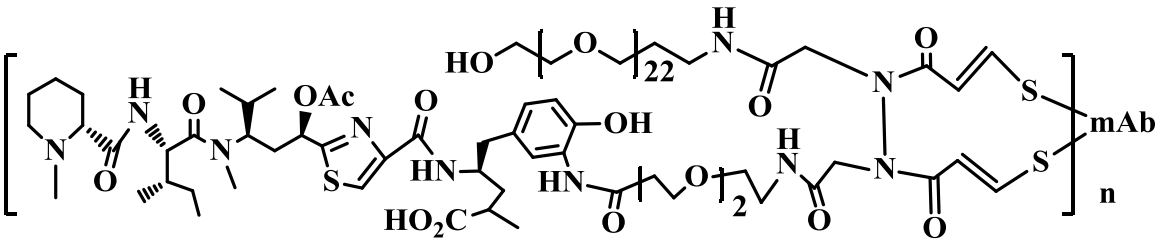

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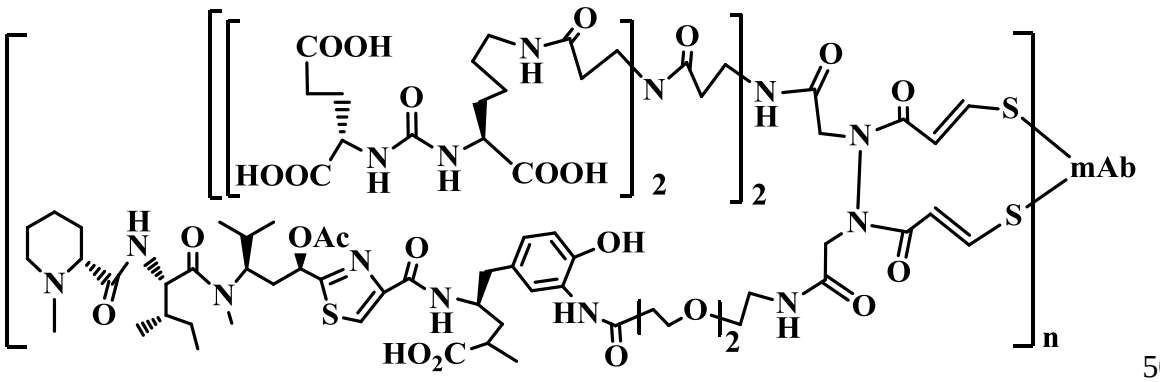
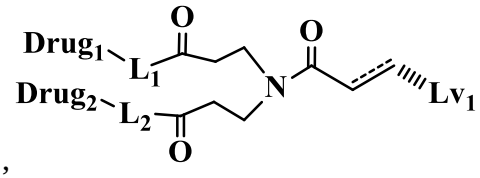


506,

wherein R' is C_1-C_4 alkyl; "═══", m_1, m_2, p, drug, Z_3, $drug_1$, $drug_2$, $drug_3$, $drug_4$, $drug_5$, $drug_6$, $drug_7$, $drug_8$, $drug_{1'}$, m, and n are defined the same as in Claim **1** and Claim **2**; L_1, L_2, L_3, L_4, L_5, L_6, L_7, and L_8 are defined independently the same as L_1 in Claim 1.

38. The compounds according to claim **4** having the Formula of 4-1, 4-2, 4-3, 4-4, 4-5, 4-6, 4-7, 4-8, 4-9, 4-10, 4-11, 4-12, 4-13, 4-14, 4-15, 4-16, 4-17, 17, 27, 31, 44, 52, 54, 63, 68, 77, 80, 82, 85, 87, 92, 94, 96, 100, 102, 110, 115, 123, 126, 140, 143, 145, 153, 166, 172, 219, 231, 233, 237, 260, 267, 272, 280, 288, 292, 295, 306, 312, 314, 325, 338, 343, 353, 359, 370, 376, 378, 380, 390, 392, 394, 403, 410, 417, 419, 427, 429, 431, 433, 438, 442, 451, 457, 462, 466, 469, 472, 475, 477, 480, 482, 493, 495, 497, 499, 505 and 507 as shown in below:



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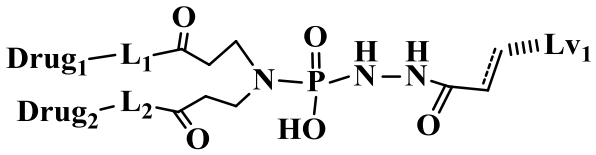

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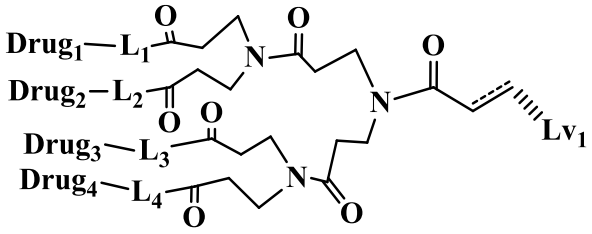

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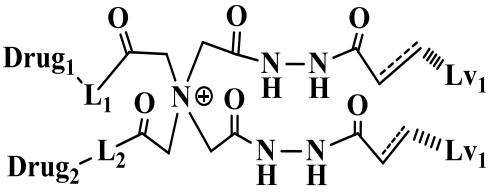

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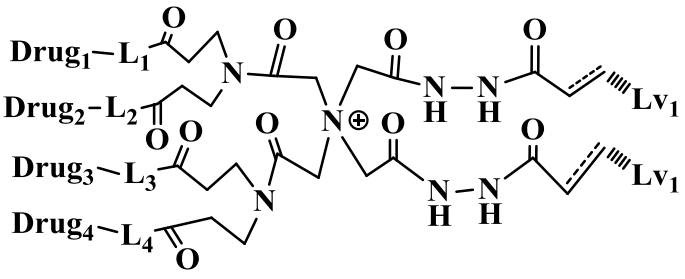

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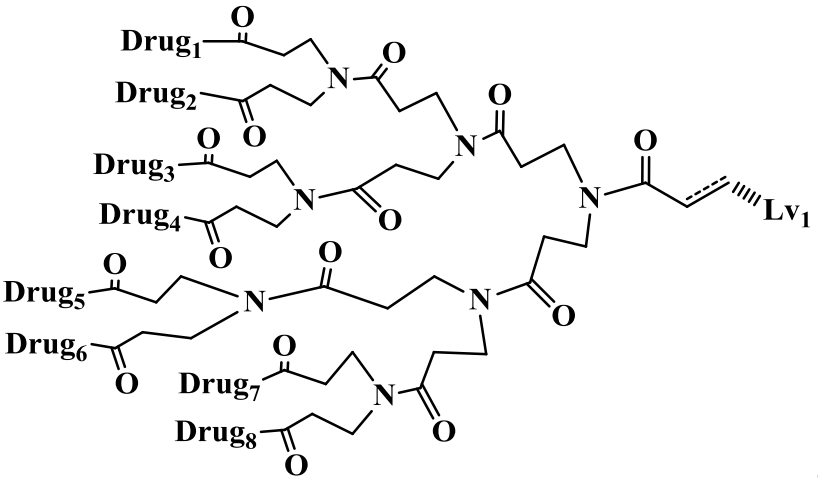

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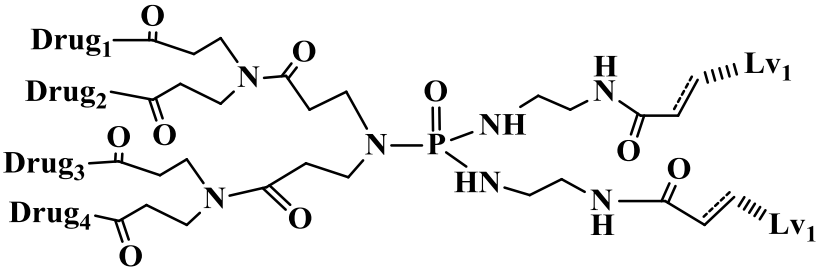

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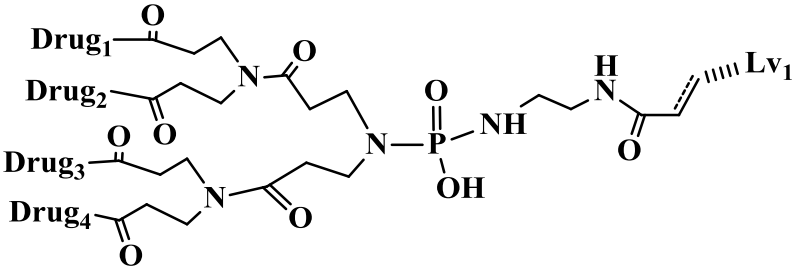

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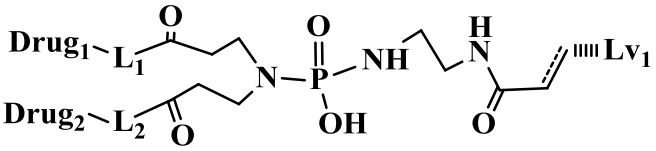

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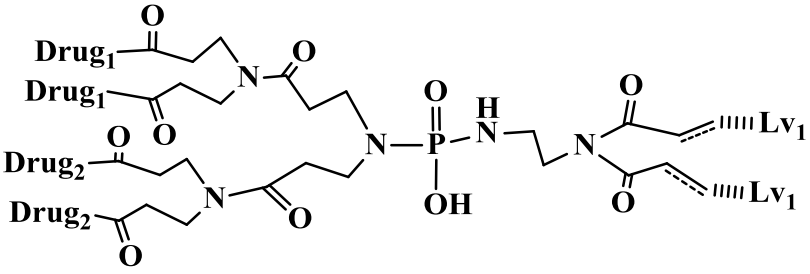

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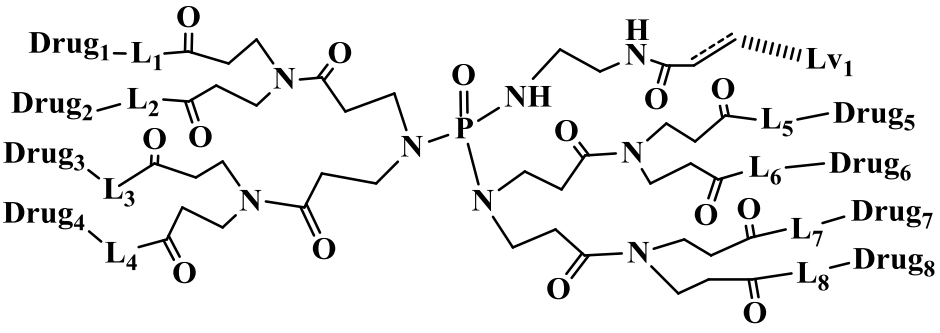

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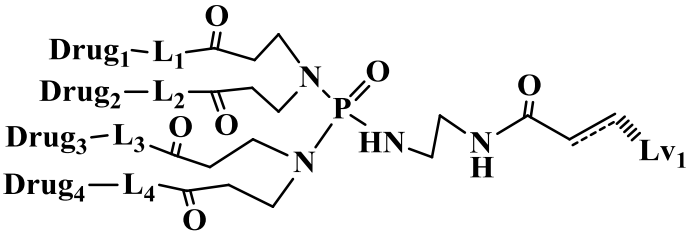

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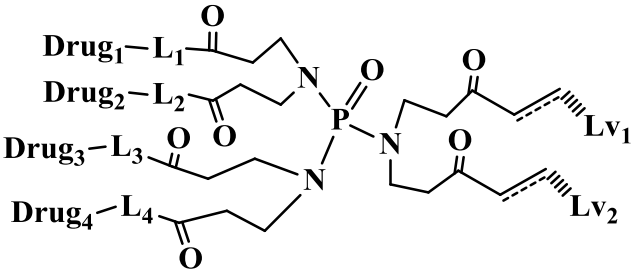

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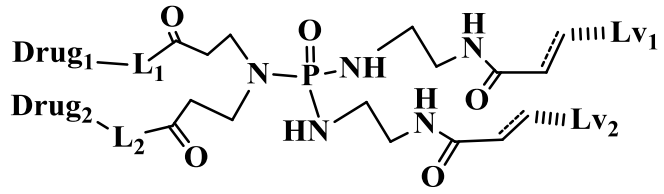

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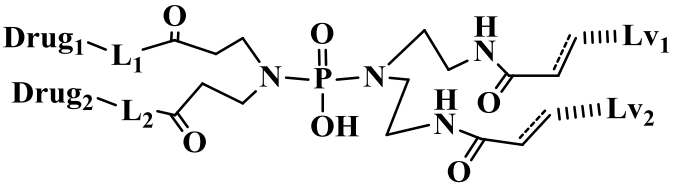

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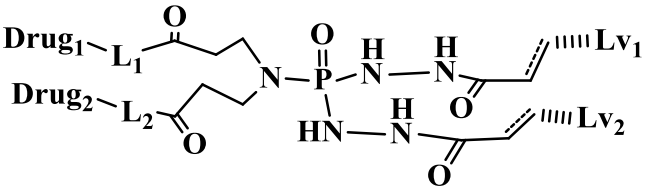

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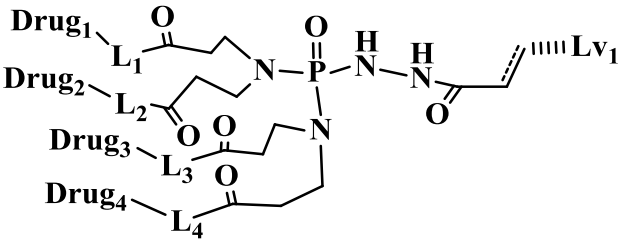

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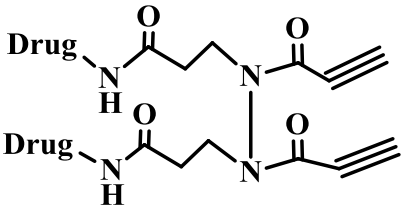

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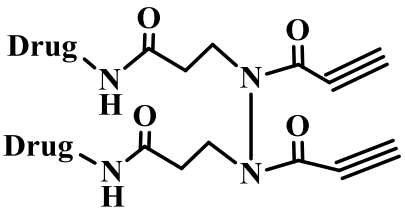

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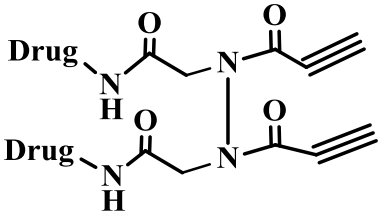

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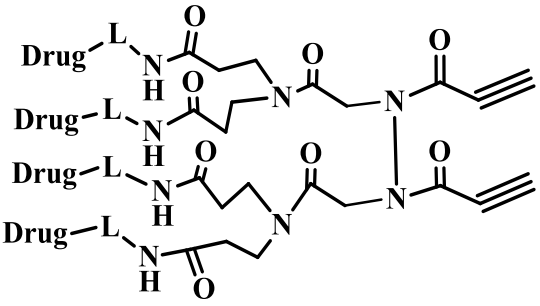

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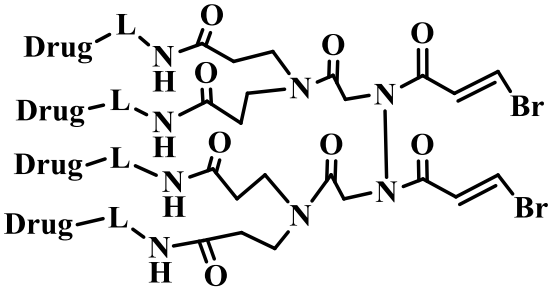

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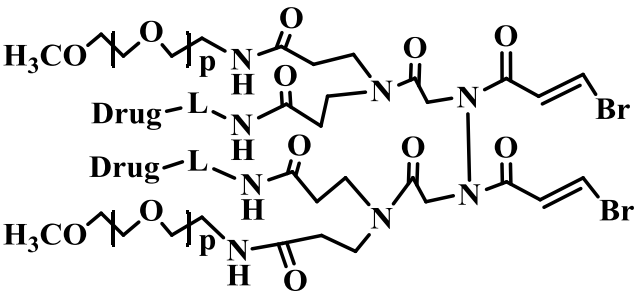

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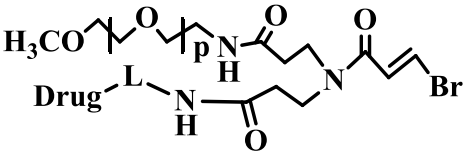

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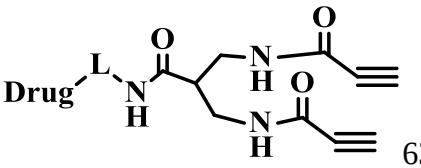

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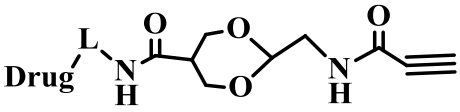

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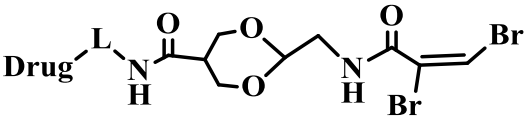

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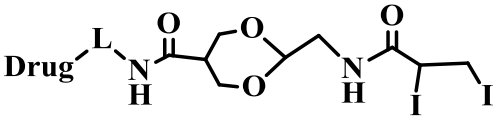

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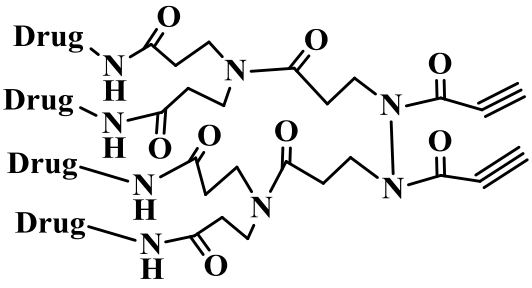

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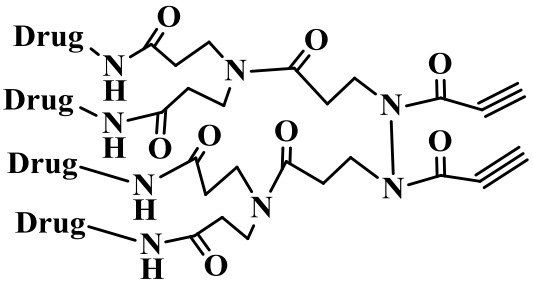

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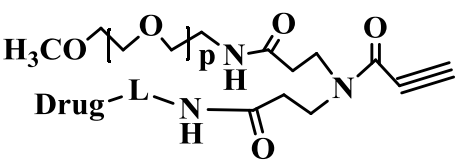

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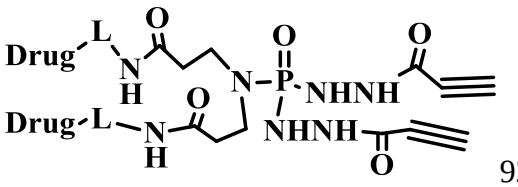

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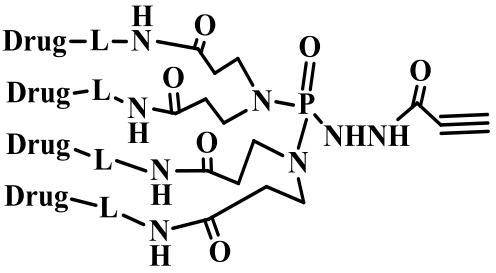

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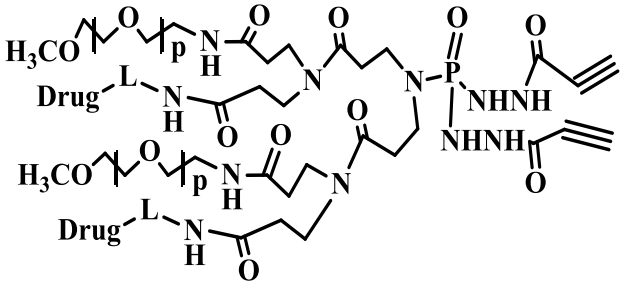

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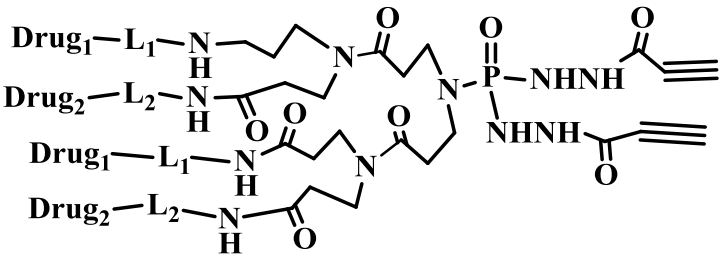

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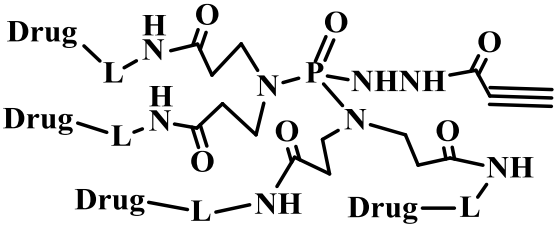

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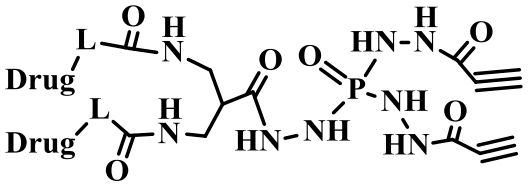

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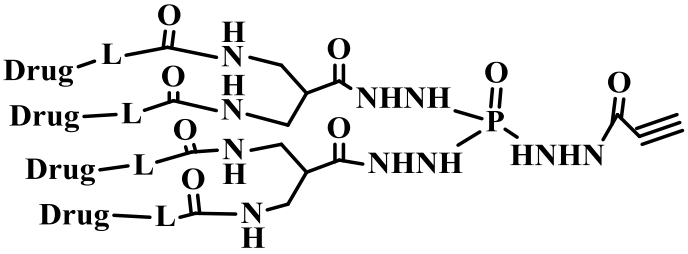

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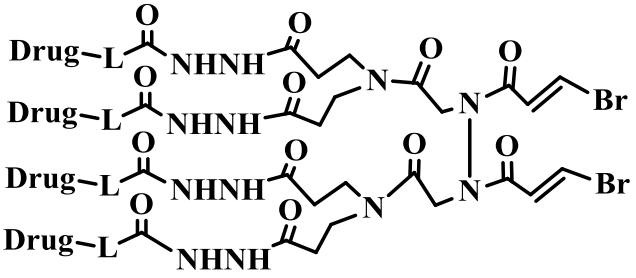

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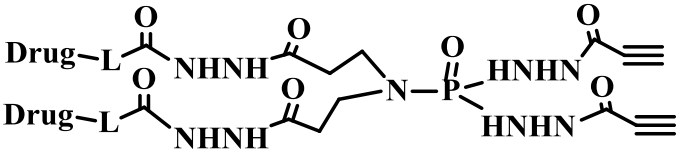

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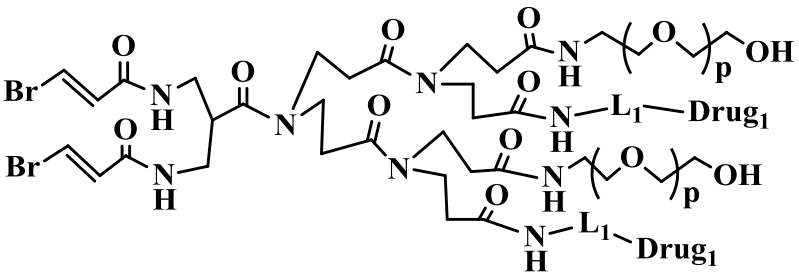

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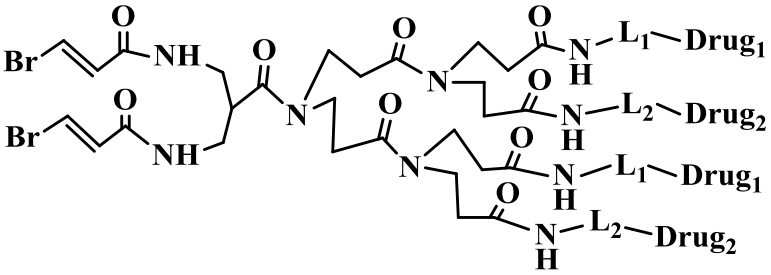

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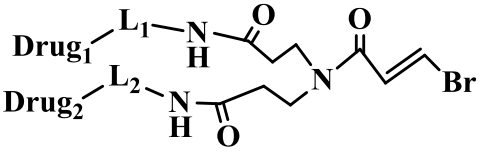

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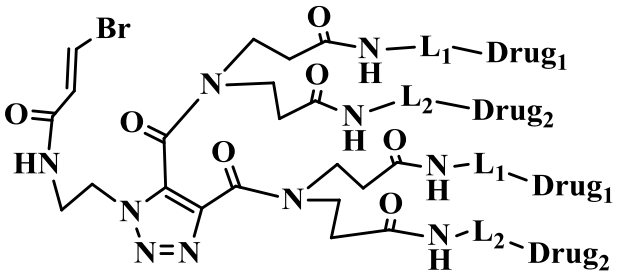

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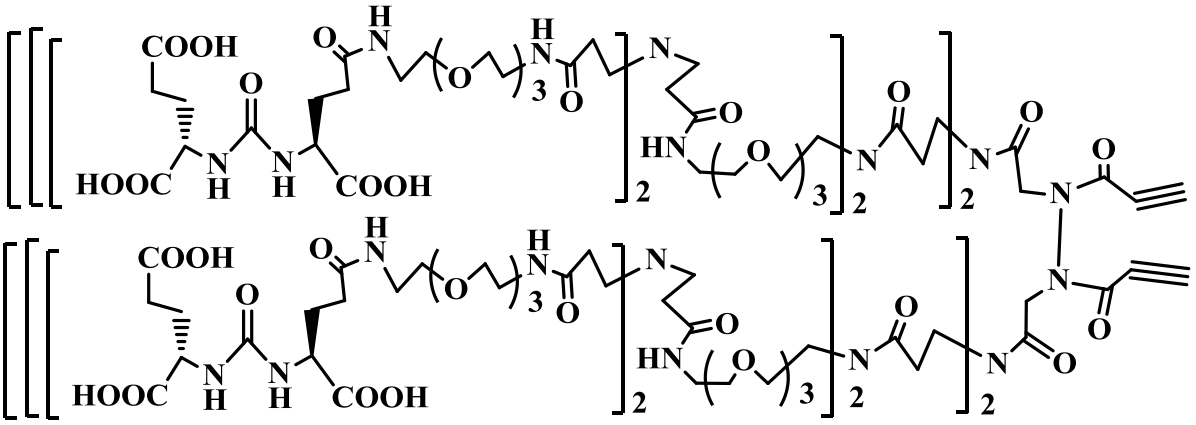

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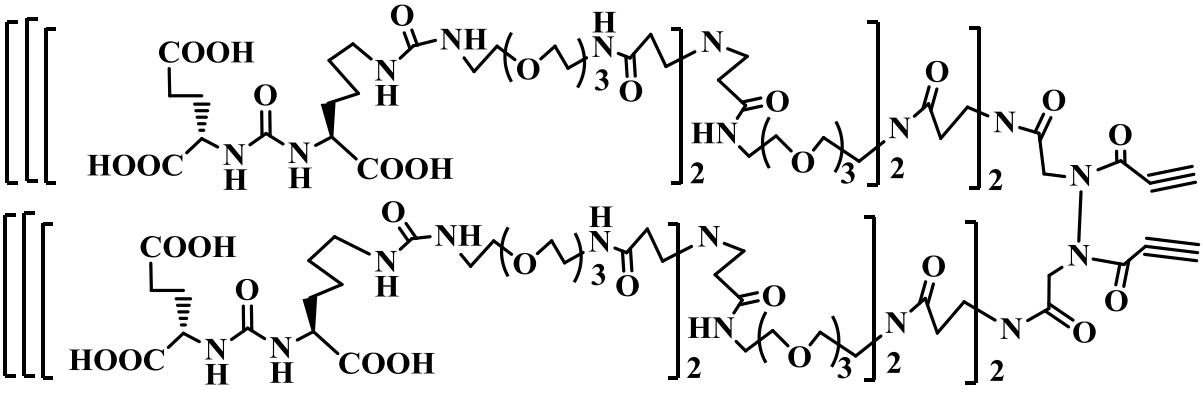

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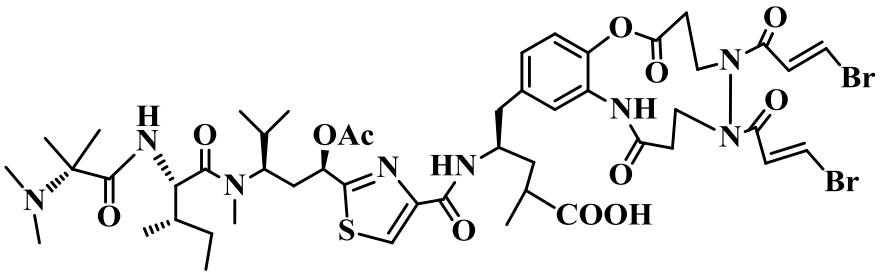

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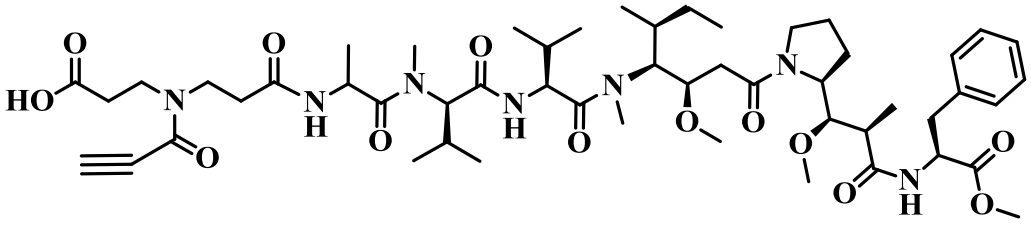

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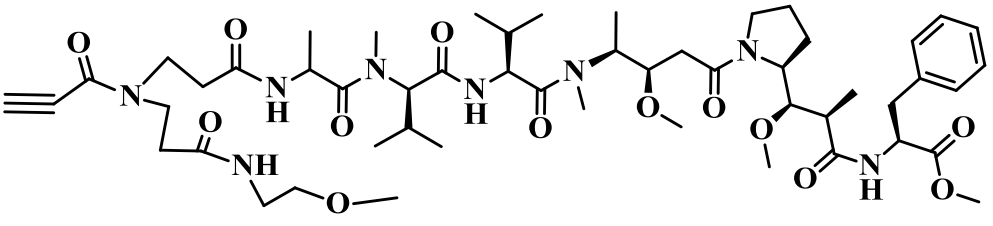

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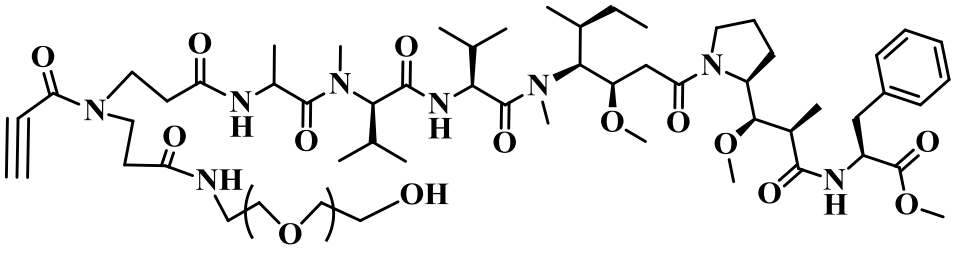

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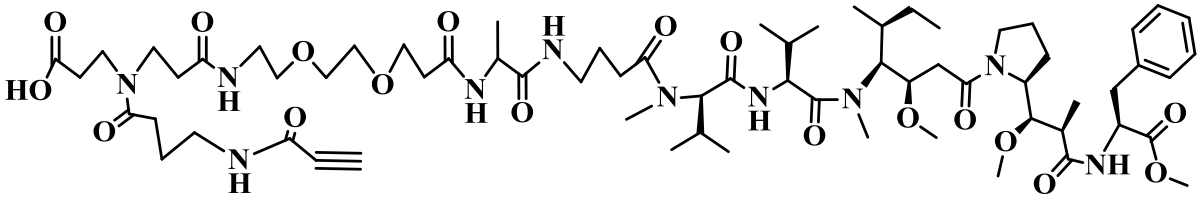

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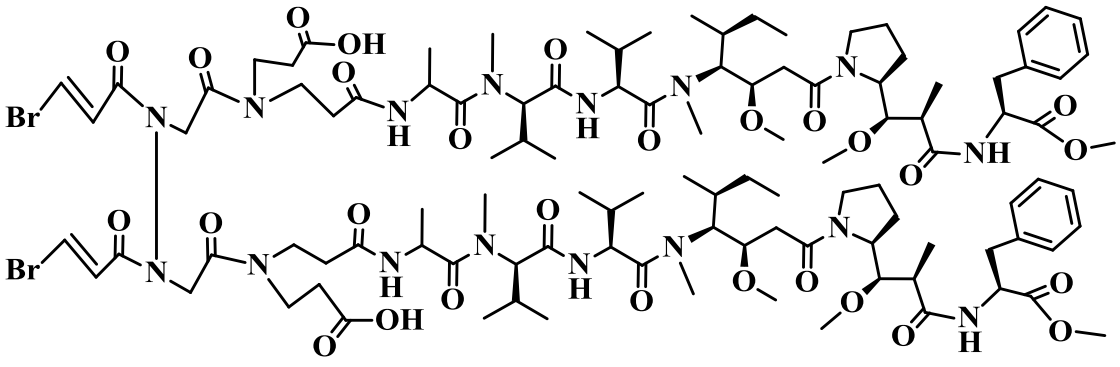

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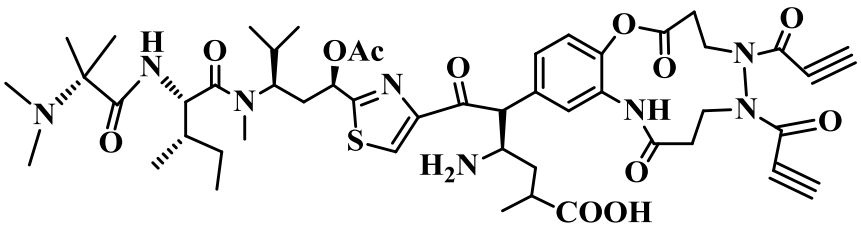

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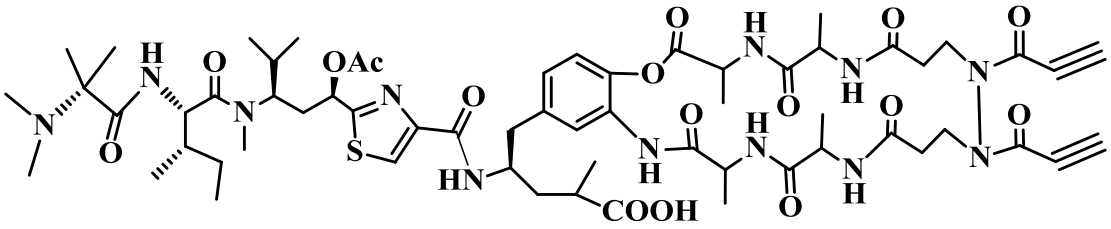

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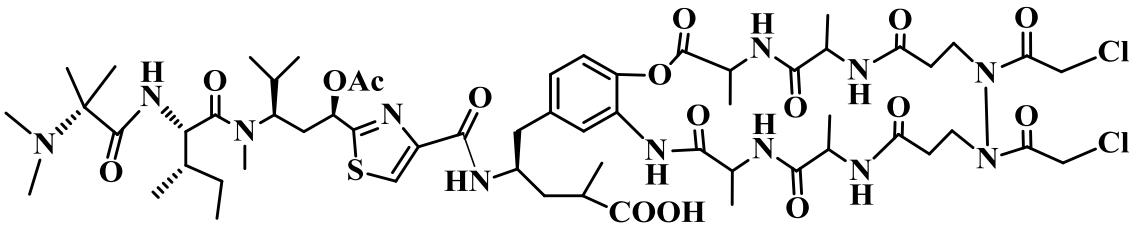

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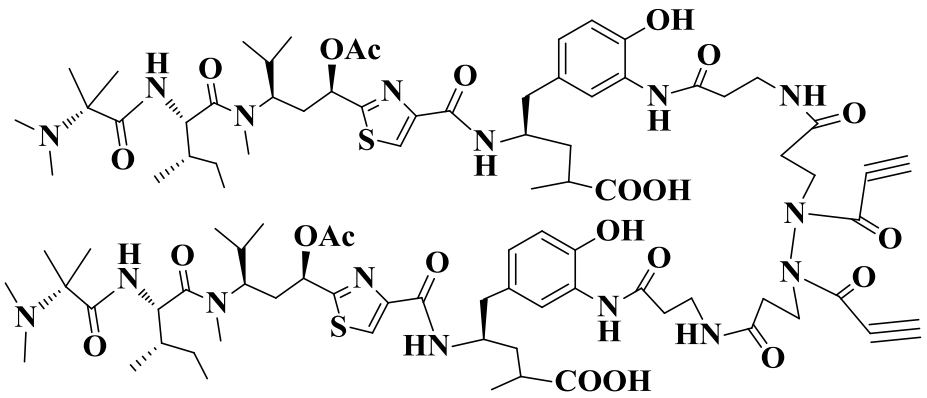

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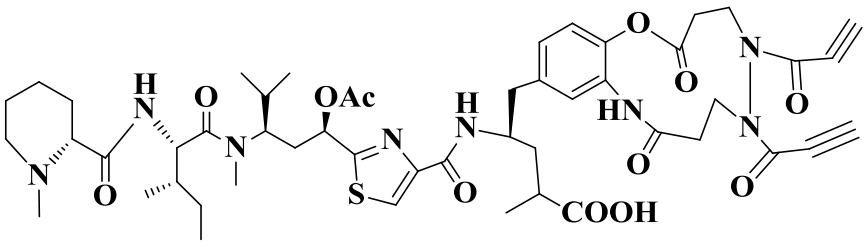

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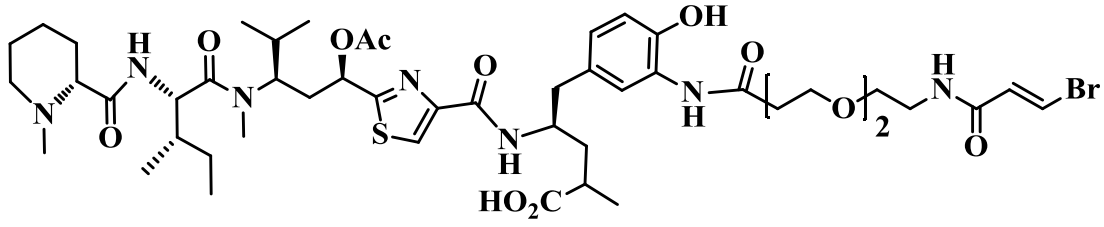

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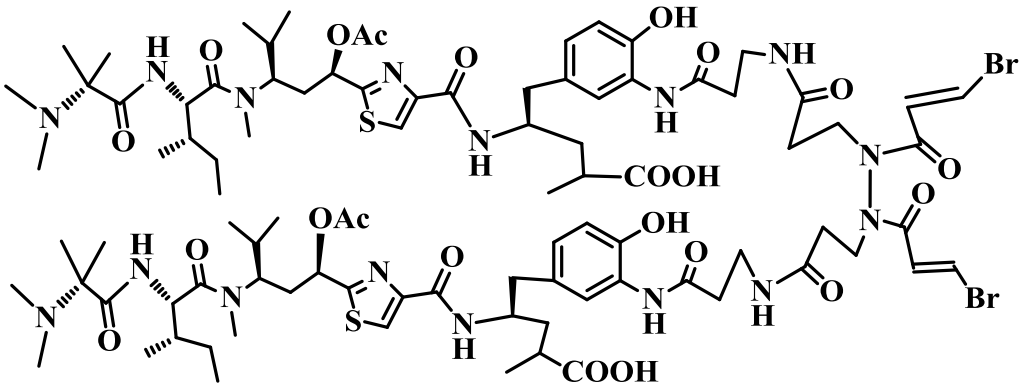

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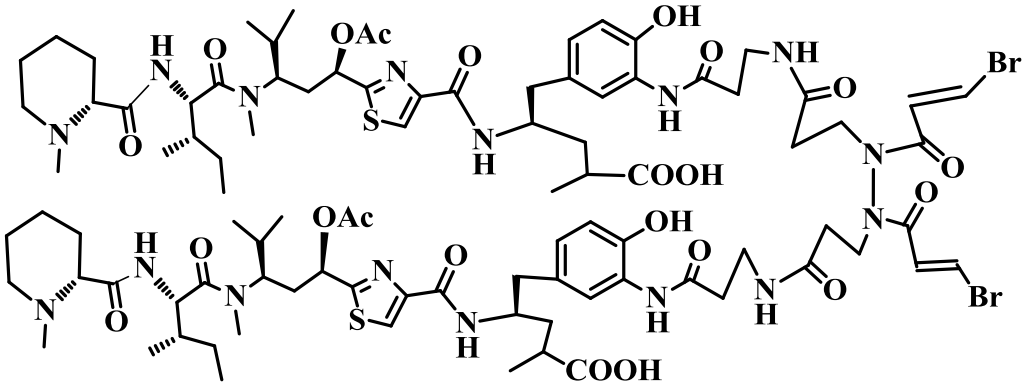

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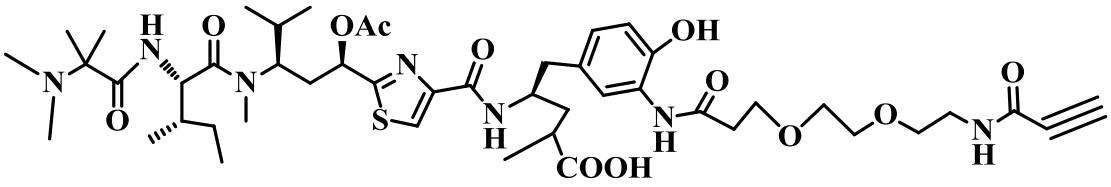

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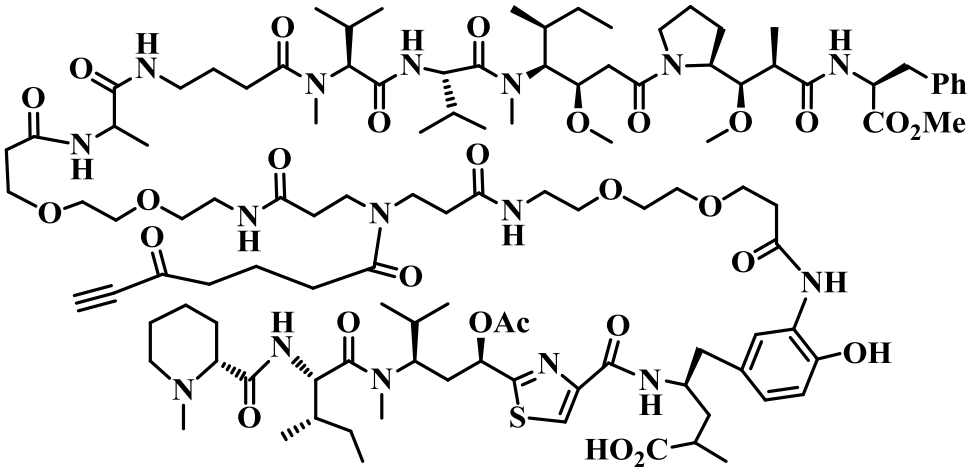

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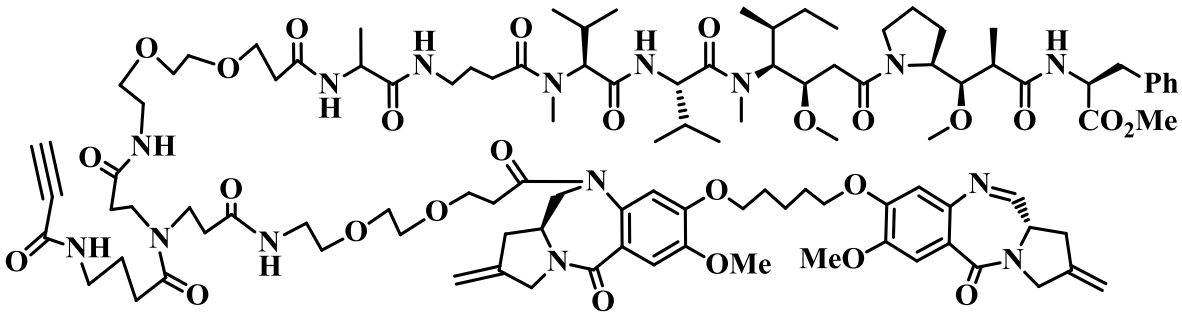

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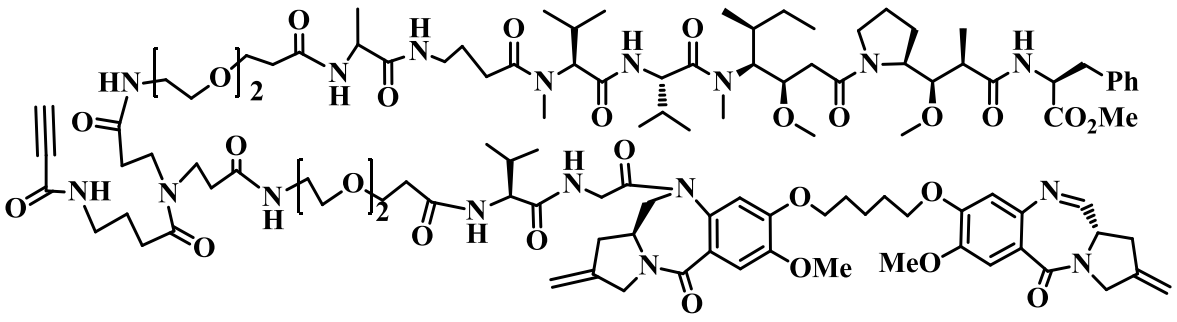

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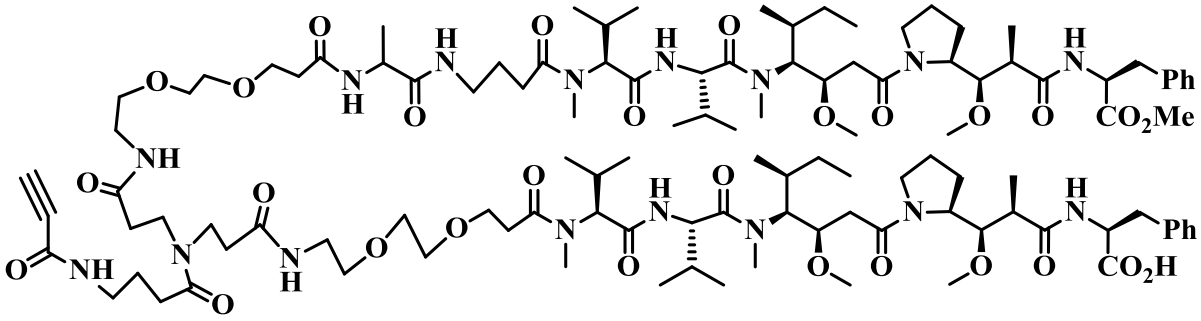

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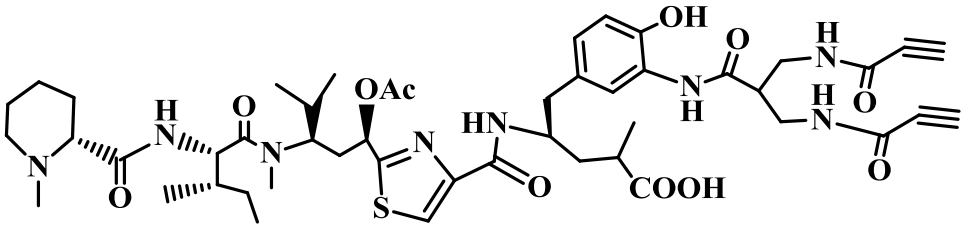

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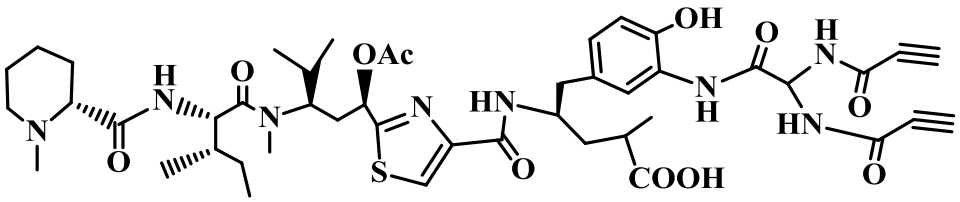

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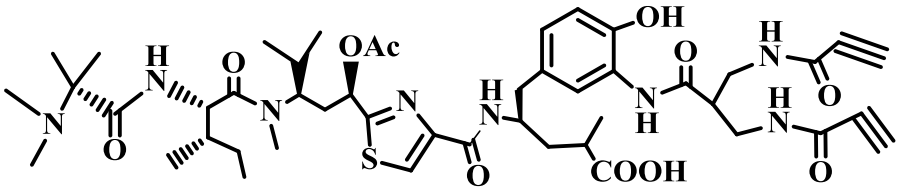

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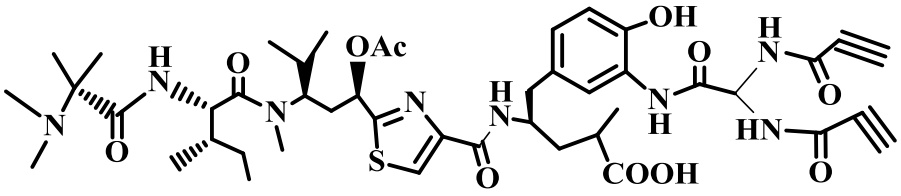

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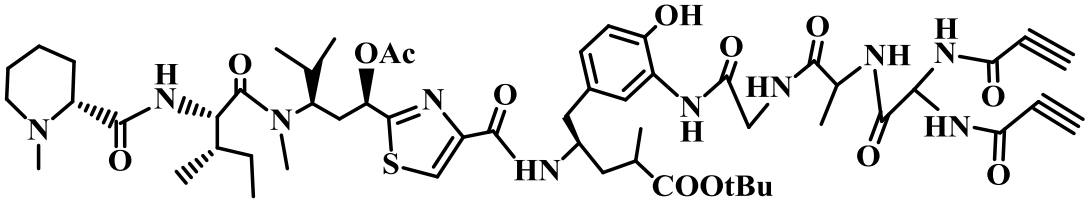

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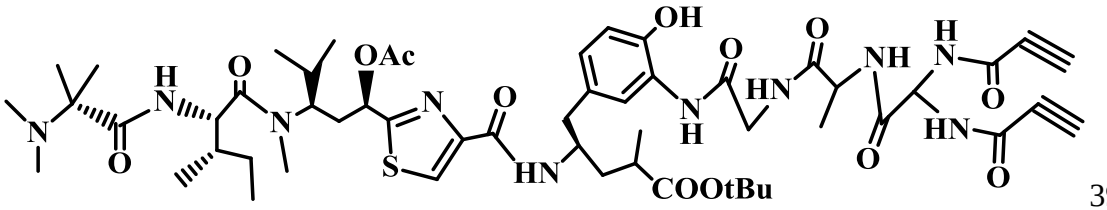

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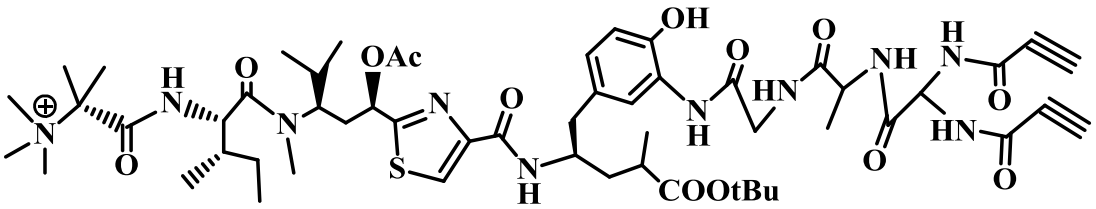

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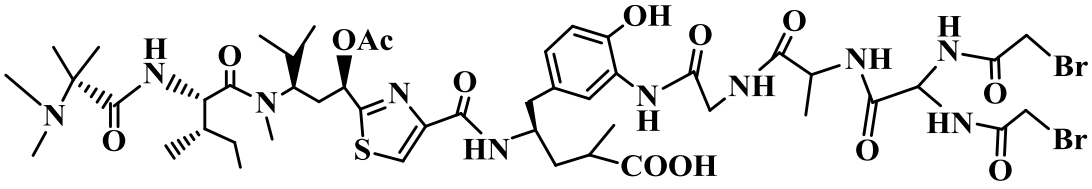

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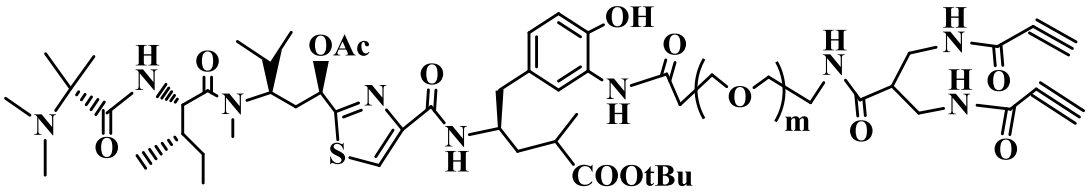

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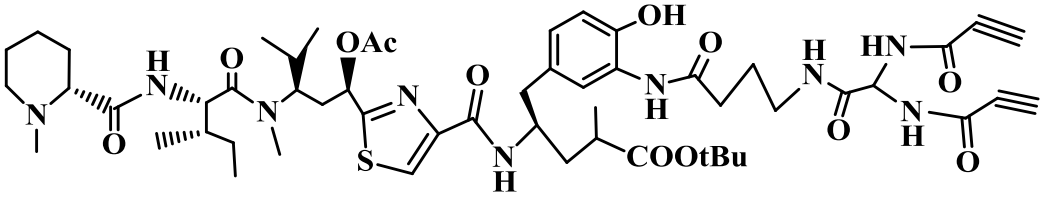

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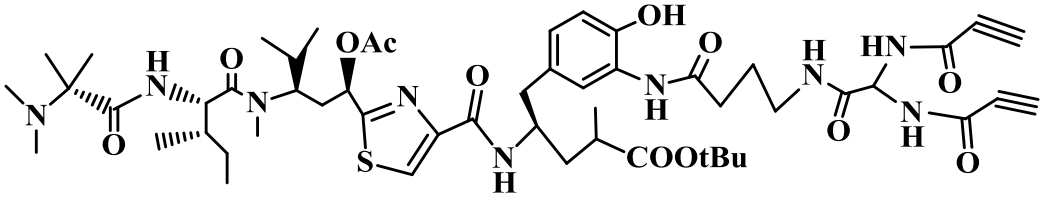

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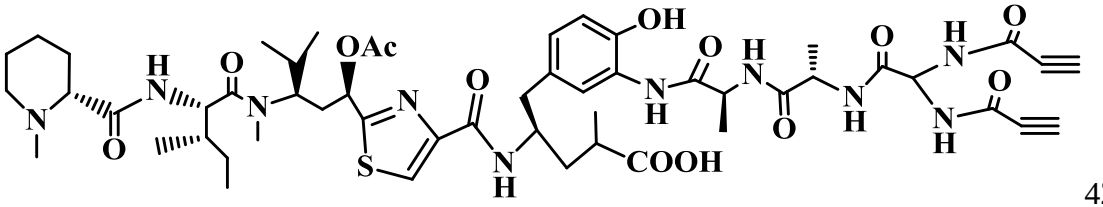

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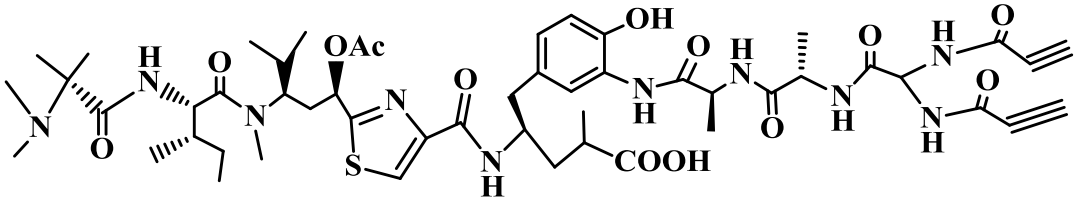

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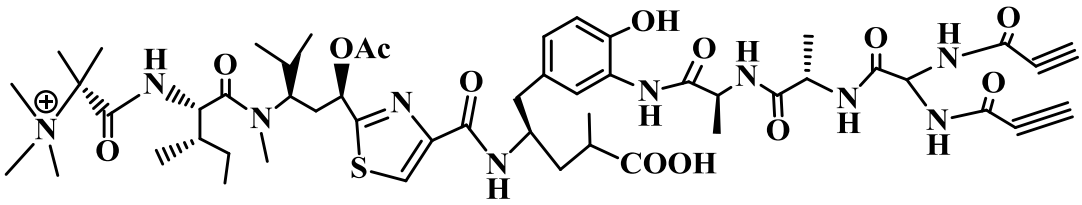

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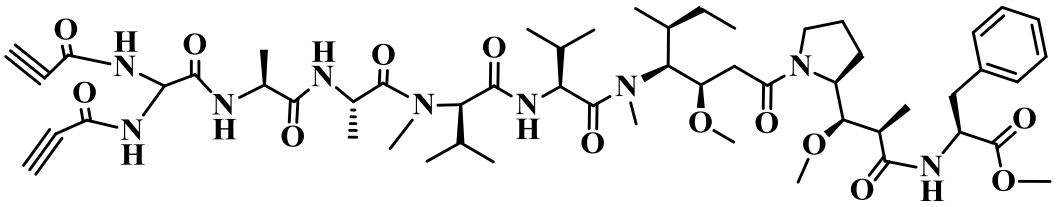

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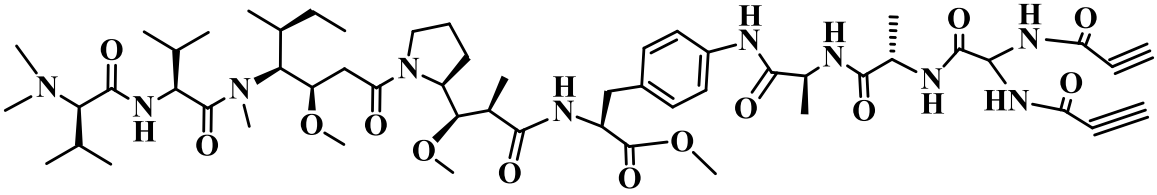

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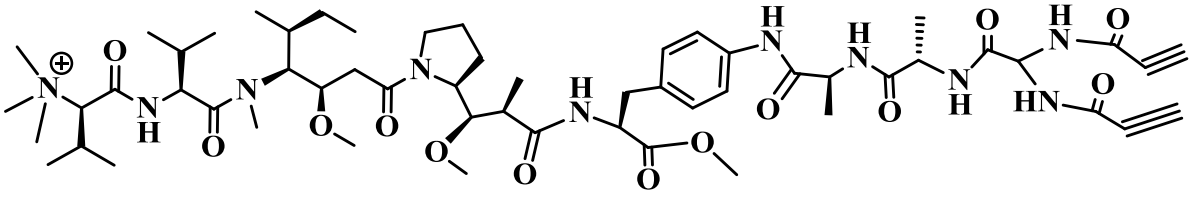

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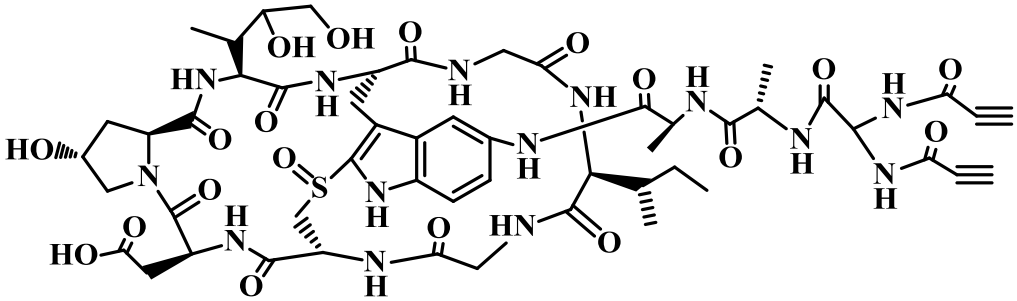

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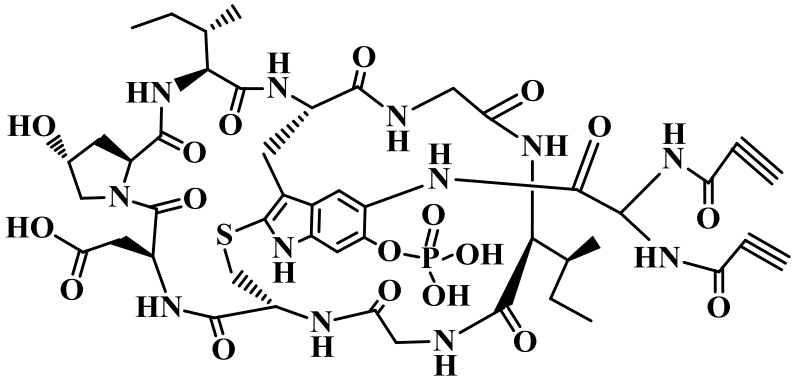

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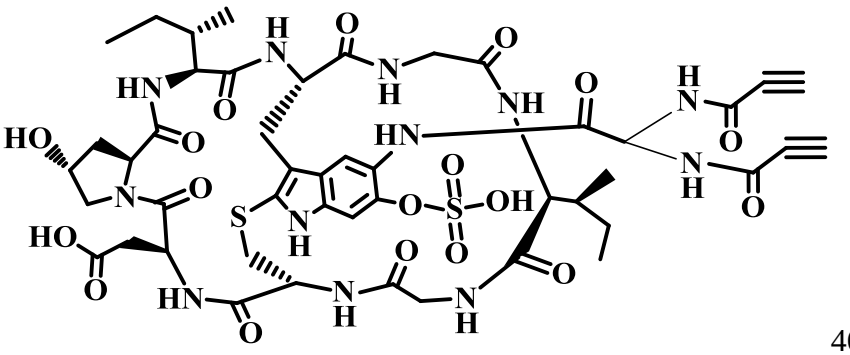

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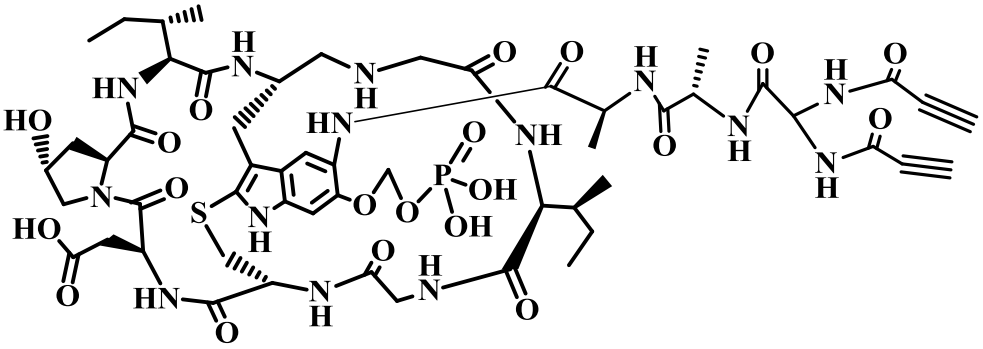

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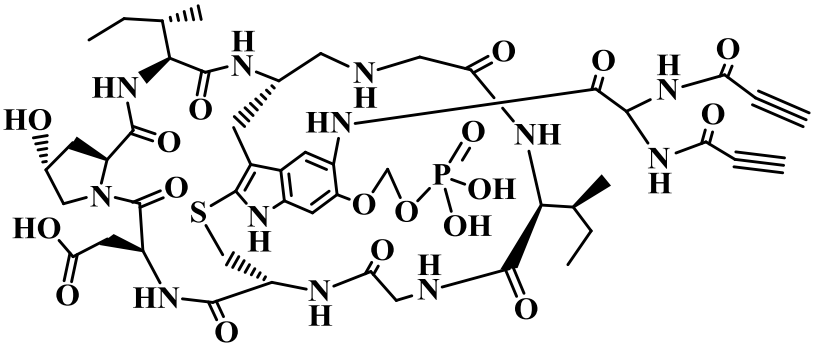

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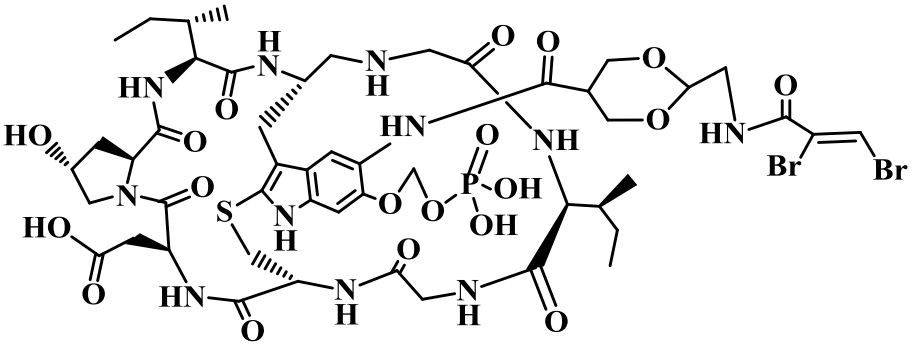

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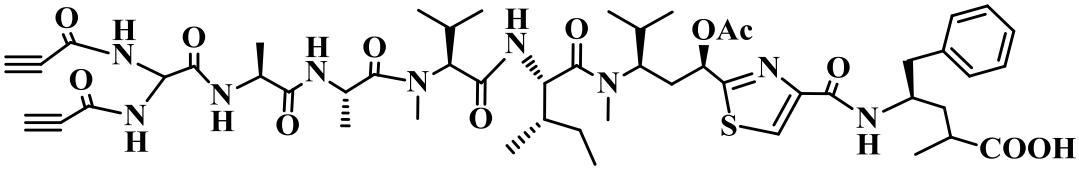

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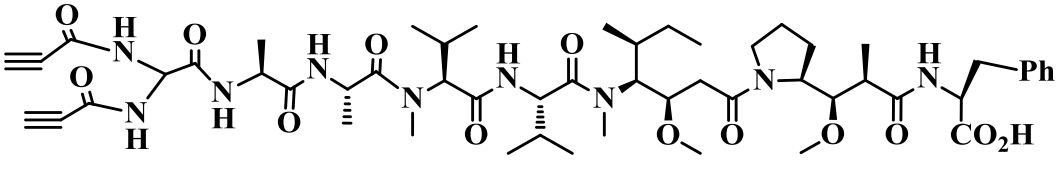

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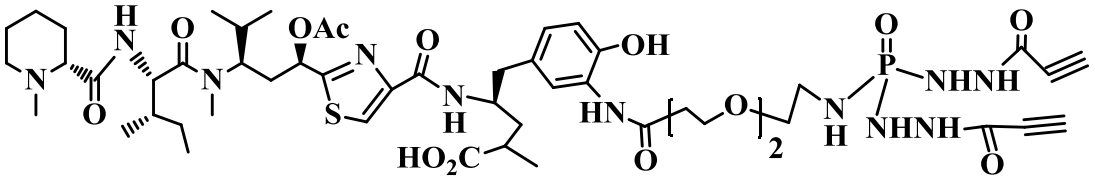

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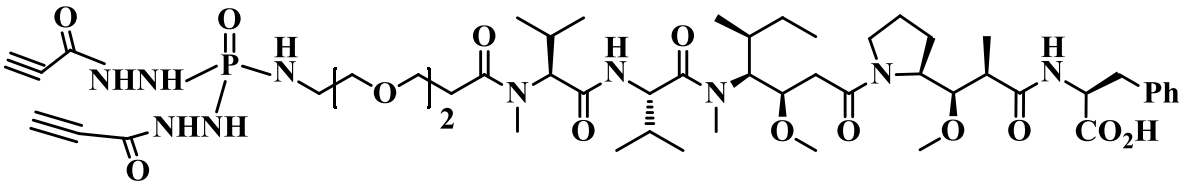

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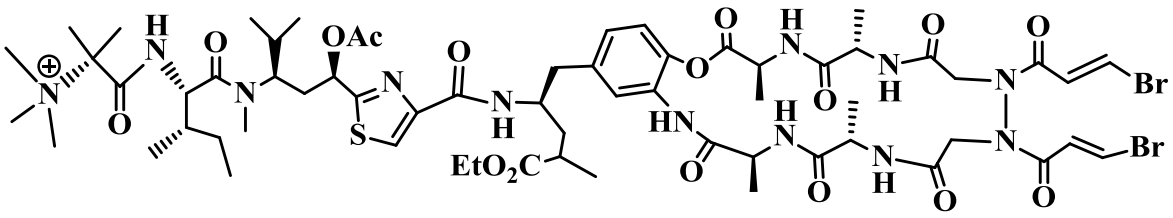

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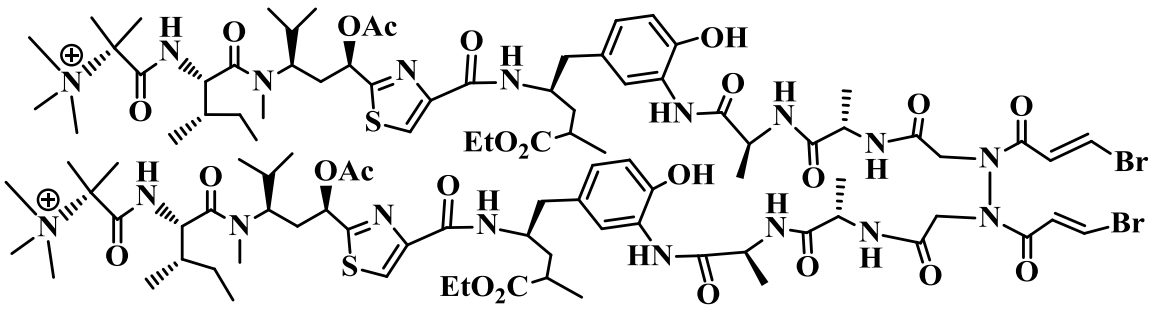

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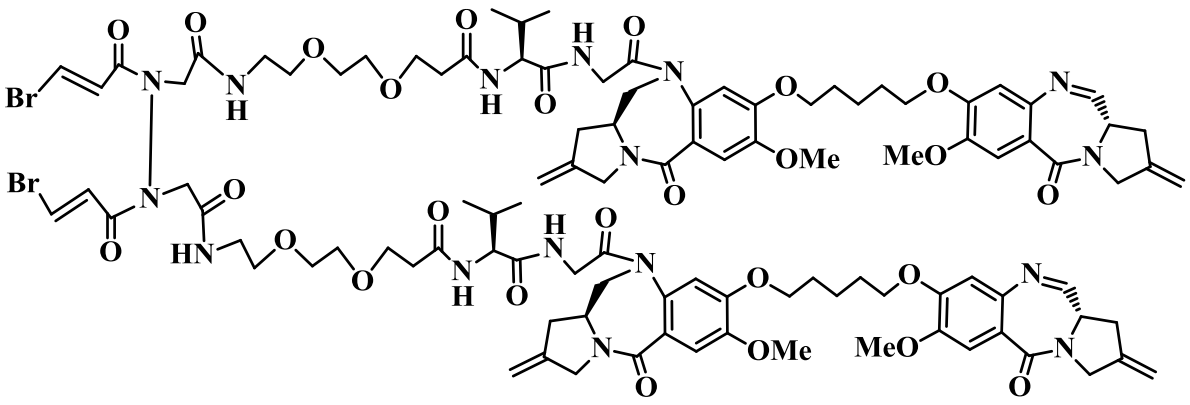

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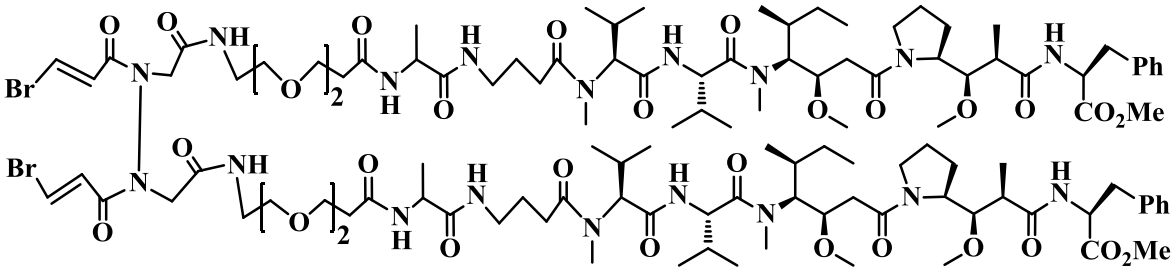

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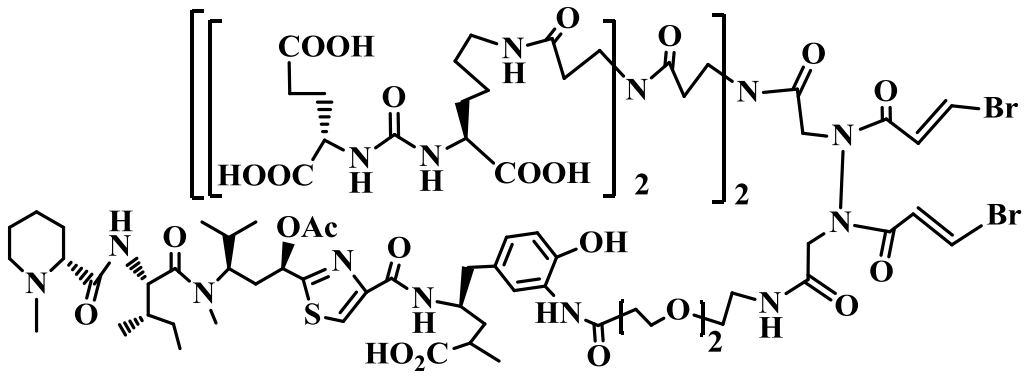

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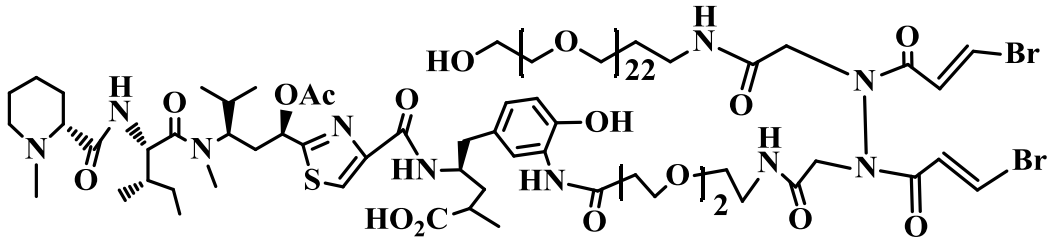

507.

Wherein ═══, ıılıılı, p, drug, Lv_1, and Lv_2 are defined the same in Claim 1; L, L_1, L_2, L_3, L_4, L_5, L_6, L_7 and L_8 are the same or different, and are defined the same as L_1 in Claim 1; Drug, $Drug_1$, $Drug_2$, $Drug_3$, $Drug_4$, $Drug_5$, $Drug_6$, $Drug_7$, and $Drug_8$ are the same or different, and areselected from in Claim 8.

39. A pharmaceutical composition comprising a therapeutically effective amount of the conjugate compounds of claim **2, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35,** or **37,** and a pharmaceutically acceptable salt, carrier, diluent, or excipient therefore, or a combination thereof, for the treatment or prevention of a cancer, or an autoimmune disease, or an infectious disease.

40. The conjugate of claim **2, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 37,** or **39,** having in vitro, in vivo or ex vivo cell killing activity.

41. The compound of claim 1, **2, 3, 4, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 33, 34, 36, 37,** or **38**, wherein the linkage components the linker component, R_1, R_2, L, L_1, L_1', L_1'', L_1''', L_2, L_2', L_2'' L_3, L_4, and L_5 is independently cleavable by a protease.