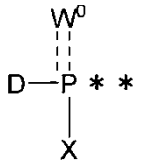
CLAIMS

1. A method for preparing a compound [C] by subjecting a compound [A] and a compound [B] to a condensation reaction, wherein:

the compound [A] has a hydroxyl group or a primary or secondary amino group;

the compound [B] has a substituent containing a phosphorus atom and represented by the following general formula [1]:



[1]

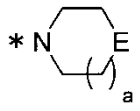
wherein

** represents a binding position,

D represents a halogen, 5- to 6-membered saturated cyclic amino, or di(C_{1-6} alkyl)amino,

W^0 represents a lone pair of electrons, an oxygen atom, or a sulfur atom, and

X represents a hydroxyl group substituted with a removable group under a neutral condition, 1,1,3,3-tetra(C_{1-6} alkyl)guanidyl, C_{1-6} alkoxy, di(C_{1-6} alkyl)amino, mono(amino-C_{1-6} alkyl substituted with a removable group under a basic condition)amino, di(amino-C_{1-6} alkyl substituted with a removable group under a basic condition)amino, or a substituent represented by the following general formula [2]:



[2]

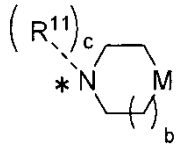
wherein

* represents a binding position with a phosphorus atom,

a represents an integer from 0 to 2,

E represents CH_2, CH-A^1, or N-A^2,

A^1 represents C_{1-6} alkyl, mono(C_{1-6} alkyl)amino-C_{1-6} alkyl substituted with a removable group under a basic condition, di(C_{1-6} alkyl)amino-C_{1-6} alkyl, tri(C_{1-6} alkyl)ammonio-C_{1-6} alkyl, amino substituted with a removable group under a basic condition, mono(C_{1-6} alkyl)amino substituted with a removable group under a basic condition, di(C_{1-6} alkyl)amino, tri(C_{1-6} alkyl)ammonio, amino substituted with amidino substituted with a removable group under a basic condition, or a substituent represented by the following general formula [3]:



[3]

wherein

* represents a binding position with E,

b represents an integer from 0 to 2,

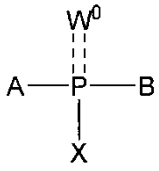
c represents 0 or 1,

R^{11} represents C_{1-6} alkyl, and

M represents CH_2, an oxygen atom, a sulfur atom, or N-(a removable group under a basic condition), and

A^2 represents C_{1-6} alkyl, mono(C_{1-6} alkyl)amino-C_{1-6} alkyl substituted with a removable group under a basic condition, di(C_{1-6} alkyl)amino-C_{1-6} alkyl, tri(C_{1-6} alkyl)ammonio-C_{1-6} alkyl, a removable group under a basic condition, aryl, or heteroaryl;

the compound [C] is represented by the following general formula [C]:



[C]

wherein

W^0 and X are as described above for compound [B],

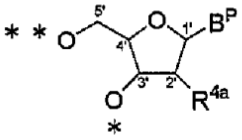
A represents a residue obtained by removing one hydrogen atom of the hydroxyl group or the primary or secondary amino group of the compound [A] from the compound [A], and

B represents a residue obtained by removing the substituent represented by the general formula [1] from the compound [B]; and

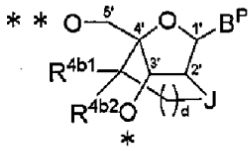
the reaction is carried out in a mixed solvent containing a polar solvent and a halogen solvent as a reaction solvent,

wherein, when each of the compound [A] and the compound [B] is a compound containing one or more nucleoside units in a molecule thereof and contains nucleoside units in the molecule thereof, adjacent nucleoside units in the compound are binding to each other via a phosphate bond,

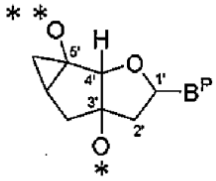
the nucleoside units of the compound [A] are the same or different and are each a nucleoside unit represented by one of the following general formulae [4a] to [4d]:



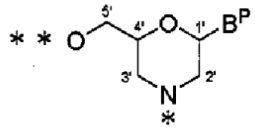
[4a]



[4b]



[4c]



[4d]

wherein

* represents

(1) a binding position with a phosphate bond to an oxygen atom at the 5′-position of an adjacent nucleoside unit,

(2) a binding position with a hydrogen atom, or

(3) a binding position with a substituent represented by the following general formula [6]:



[6]

wherein

* represents a binding position with the residue of the compound [A],

G represents

(1) a silyl substituent,

(2) long-chain alkyl-carbonyl,

(3) benzoyl substituted with 1 to 5 long-chain alkyloxy and/or long-chain alkenyloxy, or

(4) a substituent represented by the following general formula [7]:



[7]

wherein

* represents a binding position with T,

Z represents

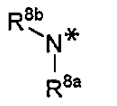
(1) (soluble polymer soluble in an organic solvent)-oxy,

(2) (soluble polymer soluble in an organic solvent)-amino,

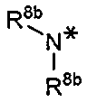
(3) long-chain alkyloxy,

(4) a solid phase carrier, or

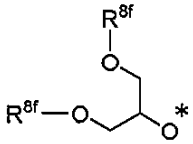
(5) a substituent represented by one of the following general formulae [8A] to [8N]:



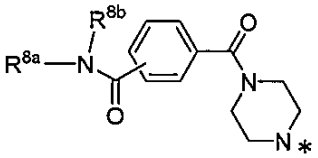
[8A]



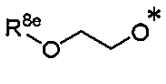
[8B]



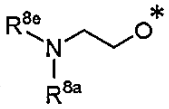
[8C]



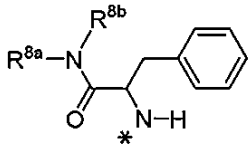
[8D]



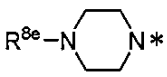
[8E]



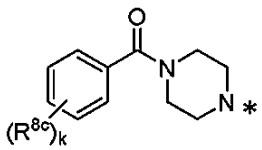
[8F]



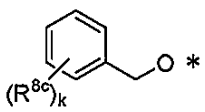
[8G]



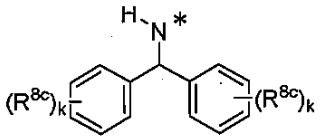
[8H]



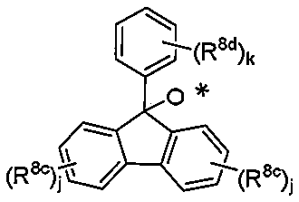
[8I]



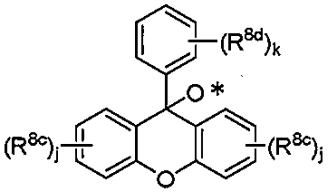
[8J]



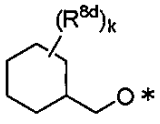
[8K]



[8L]



[8M]



[8N]

wherein

* represents a binding position with L,

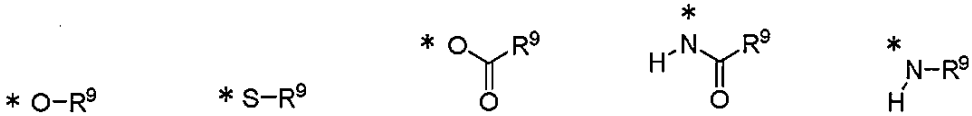
j represents an integer from 0 to 4,

k represents an integer from 0 to 5,

R^{8a} represents a hydrogen atom or C_{1-6} alkyl,

R^{8b}s are the same or different and each represent long-chain alkyl,

R^{8c}s are the same or different and each represent a substituent represented by one of the following general formulae [9A] to [9E]:



[9A] [9B] [9C] [9D] [9E]

wherein

* represents a binding position, and

R^9 represents long-chain alkyl and/or long-chain alkenyl,

R^{8d}s are the same or different and each represent a hydrogen atom, a halogen, long-chain alkyl optionally substituted with 1 to 13 halogens, or long-chain alkyloxy optionally substituted with 1 to 13 halogens,

R^{8e} represents

(1) long-chain alkyl,

(2) long-chain alkyl-carbonyl, or

(3) benzoyl substituted with 1 to 5 long-chain alkyloxy and/or long-chain alkenyloxy, and

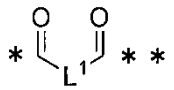
R^{8f} represents

(1) long-chain alkyl,

(2) long-chain alkyl-carbonyl, or

(3) long-chain alkenyl-carbonyl, and

L represents a substituent represented by general formula [10]:



[10]

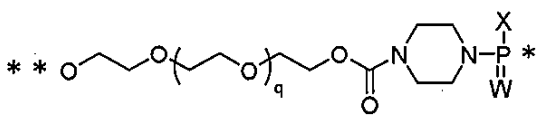
wherein

* represents a binding position with Z,

** represents a binding position with an oxygen atom, and

L^1 represents an optionally substituted C_{2-10} alkylene or an optionally substituted C_{6-10} arylene, and

T represents a single bond or a substituent represented by general formula [11]:



[11]

wherein

X is as described above for Compound [B],

W represents an oxygen atom or a sulfur atom,

* represents a binding position with O,

** represents a binding position with G, and

q represents an integer from 0 to 10, and

when G is a silyl substituent, T is a single bond,

** represents

(1) a binding position with a phosphate bond to an oxygen atom at the 3′-position of or a nitrogen atom at the 3′-position of an adjacent nucleoside unit,

(2) a binding position with a hydrogen atom, or

(3) a binding position with the substituent [6],

d represents 0 or 1,

B^P represents a protected nucleic acid base,

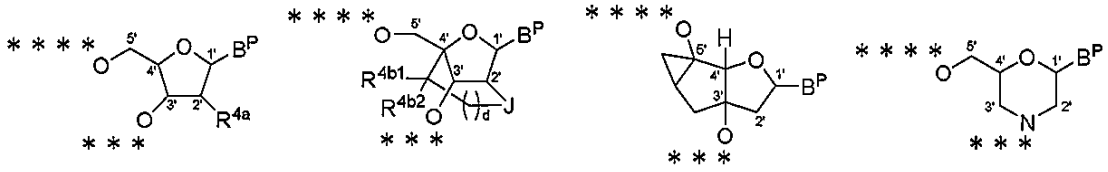
R^{4a} represents a hydrogen atom, a hydroxyl group substituted with a removable group under a neutral condition, C_{1-6} alkyl, C_{1-6} alkoxy, C_{1-6} alkoxy-C_{1-6} alkyl, a halogen, nitro, or cyano,

R^{4b1} and R^{4b2} are the same or different and each represent a hydrogen atom or C_{1-6} alkyl, or

R^{4b1} and R^{4b2} combine with an adjacent carbon atom to form carbonyl, and

J represents an oxygen atom or N—R^{4b3} (R^{4b3} represents $C_{1\text{-}6}$ alkyl); and

the nucleoside units of the compound [B] are the same or different and are each a nucleoside unit represented by one of the following general formulae [4e] to [4h]:



[4e] [4f] [4g] [4h]

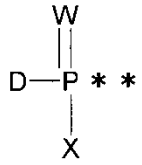
wherein

d, B^P, R^{4a}, R^{4b1}, and R^{4b2} are as described above for general formulae [4a] to [4d],

*** represents

(1) a binding position with a phosphate bond to an oxygen atom at the 5′-position of an adjacent nucleoside unit,

(2) a binding position with a substituent [1] containing a phosphorus atom and represented by the following general formula [1A]:



[1A]

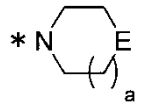
wherein

** represents a binding position,

D represents a halogen, 5- to 6-membered saturated cyclic amino, or di($C_{1\text{-}6}$ alkyl)amino,

W represents a lone pair of electrons, an oxygen atom, or a sulfur atom, and

X represents a hydroxyl group substituted with a removable group under a neutral condition, 1,1,3,3-tetra(C_{1-6} alkyl)guanidyl, C_{1-6} alkoxy, di(C_{1-6} alkyl)amino, mono(amino-C_{1-6} alkyl substituted with a removable group under a basic condition)amino, di(amino-C_{1-6} alkyl substituted with a removable group under a basic condition)amino, or a substituent represented by the following general formula [2]:



[2]

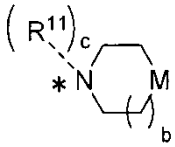
wherein

* represents a binding position with a phosphorus atom,

a represents an integer from 0 to 2,

E represents CH_2, CH-A^1, or N-A^2,

A^1 represents C_{1-6} alkyl, mono(C_{1-6} alkyl)amino-C_{1-6} alkyl substituted with a removable group under a basic condition, di(C_{1-6} alkyl)amino-C_{1-6} alkyl, tri(C_{1-6} alkyl)ammonio-C_{1-6} alkyl, amino substituted with a removable group under a basic condition, mono(C_{1-6} alkyl)amino substituted with a removable group under a basic condition, di(C_{1-6} alkyl)amino, tri(C_{1-6} alkyl)ammonio, amino substituted with amidino substituted with a removable group under a basic condition, or a substituent represented by the following general formula [3]:



[3]

wherein

* represents a binding position with E,

b represents an integer from 0 to 2,

c represents 0 or 1,

R^{11} represents C_{1-6} alkyl, and

M represents CH_2, an oxygen atom, a sulfur atom, or N-(a removable group under a basic condition), and

A^2 represents C_{1-6} alkyl, mono(C_{1-6} alkyl)amino-C_{1-6} alkyl substituted with a removable group under a basic condition, di(C_{1-6} alkyl)amino-C_{1-6} alkyl, tri(C_{1-6} alkyl)ammonio-C_{1-6} alkyl, a removable group under a basic condition, aryl, or heteroaryl, or (3) a binding position with a removable group under an acidic condition, and

**** represents

(1) a binding position with a phosphate bond to an oxygen atom at the 3′-position of or a nitrogen atom at the 3′-position of an adjacent nucleoside unit,

(2) a binding position with the substituent [1], or

(3) a binding position with a removable group under an acidic condition, and

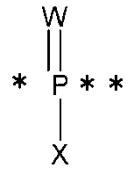
wherein the removable group under a basic condition is trifluoroacetyl, the removable group under an acidic condition is selected from the group consisting of trityl, monomethoxytrityl, and dimethoxytrityl, and the removable group under a neutral condition is selected from the group consisting of 2-cyanoethoxymethoxy, 2-cyanoethoxy-2-ethoxy, and tert-butyldimethylsilyl.

2. The method according to claim 1, wherein

the polar solvent is a solvent selected from the group consisting of dimethylacetamide, dimethylsulfoxide, dimethylformamide, sulfolane, N-methylpiperidone, 1,3-dimethyl-2-imidazolidinone, and N,N'-dimethylpropylene urea, and

the halogen solvent is a solvent selected from the group consisting of chloroform, dichloromethane, 1,1-dichloroethane, 1,2-dichloroethane, 1,1,2-trichloroethane, and 1,2-dichloroethylene.

3. The method according to claim 1, wherein the phosphate bonds between the nucleoside units of each of the compound [A] and the compound [B] are the same or different and are each a bond represented by the following general formula [5]:



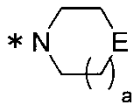
[5]

wherein

one of * and ** represents a binding position with an oxygen atom at the 3'-position of or a nitrogen atom at the 3'-position of a nucleoside unit, and the other of * and ** represents a binding position with an oxygen atom at the 5'-position of a nucleoside unit different from said nucleoside unit,

W represents an oxygen atom or a sulfur atom, and

X represents a hydroxyl group substituted with a removable group under a neutral condition, 1,1,3,3-tetra(C_{1-6} alkyl)guanidyl, C_{1-6} alkoxy, di(C_{1-6} alkyl)amino, mono(amino-C_{1-6} alkyl substituted with a removable group under a basic condition)amino, di(amino-C_{1-6} alkyl substituted with a removable group under a basic condition)amino, or a substituent represented by the following general formula [2]:



[2]

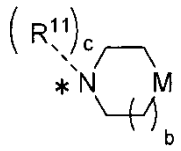
wherein

* represents a binding position with a phosphorus atom,

a represents an integer from 0 to 2,

E represents CH_2, CH-A^1, or N-A^2,

A^1 represents C_{1-6} alkyl, mono(C_{1-6} alkyl)amino-C_{1-6} alkyl substituted with a removable group under a basic condition, di(C_{1-6} alkyl)amino-C_{1-6} alkyl, tri(C_{1-6} alkyl)ammonio-C_{1-6} alkyl, amino substituted with a removable group under a basic condition, mono(C_{1-6} alkyl)amino substituted with a removable group under a basic condition, di(C_{1-6} alkyl)amino, tri(C_{1-6} alkyl)ammonio, amino substituted with amidino substituted with a removable group under a basic condition, or a substituent represented by the following general formula [3]:



[3]

wherein

* represents a binding position with E,

b represents an integer from 0 to 2,

c represents 0 or 1,

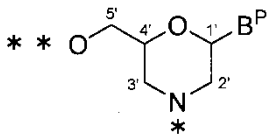
R^{11} represents C_{1-6} alkyl, and

M represents CH_2, an oxygen atom, a sulfur atom, or N-(a removable group under a basic condition), and

A^2 represents C_{1-6} alkyl, mono(C_{1-6} alkyl)amino-C_{1-6} alkyl substituted with a removable group under a basic condition, di(C_{1-6} alkyl)amino-C_{1-6} alkyl, tri(C_{1-6} alkyl)ammonio-C_{1-6} alkyl, a removable group under a basic condition, aryl, or heteroaryl.

4. The method according to claim 1, wherein:

the nucleoside units of the compound [A] are the same or different and are each a nucleoside unit represented by the following general formula [4d]:



[4d]

wherein

* represents

(1) a binding position with a phosphate bond to an oxygen atom at the 5'-position of an adjacent nucleoside unit,

(2) a binding position with a hydrogen atom, or

(3) a binding position with a substituent represented by the following general formula [6]:



[6]

wherein

* represents a binding position with the residue of the compound [A],

G represents

(1) a silyl substituent,

(2) long-chain alkyl-carbonyl,

(3) benzoyl substituted with 1 to 5 long-chain alkyloxy and/or long-chain alkenyloxy, or

(4) a substituent represented by the following general formula [7]:



[7]

wherein

* represents a binding position with T,

Z represents

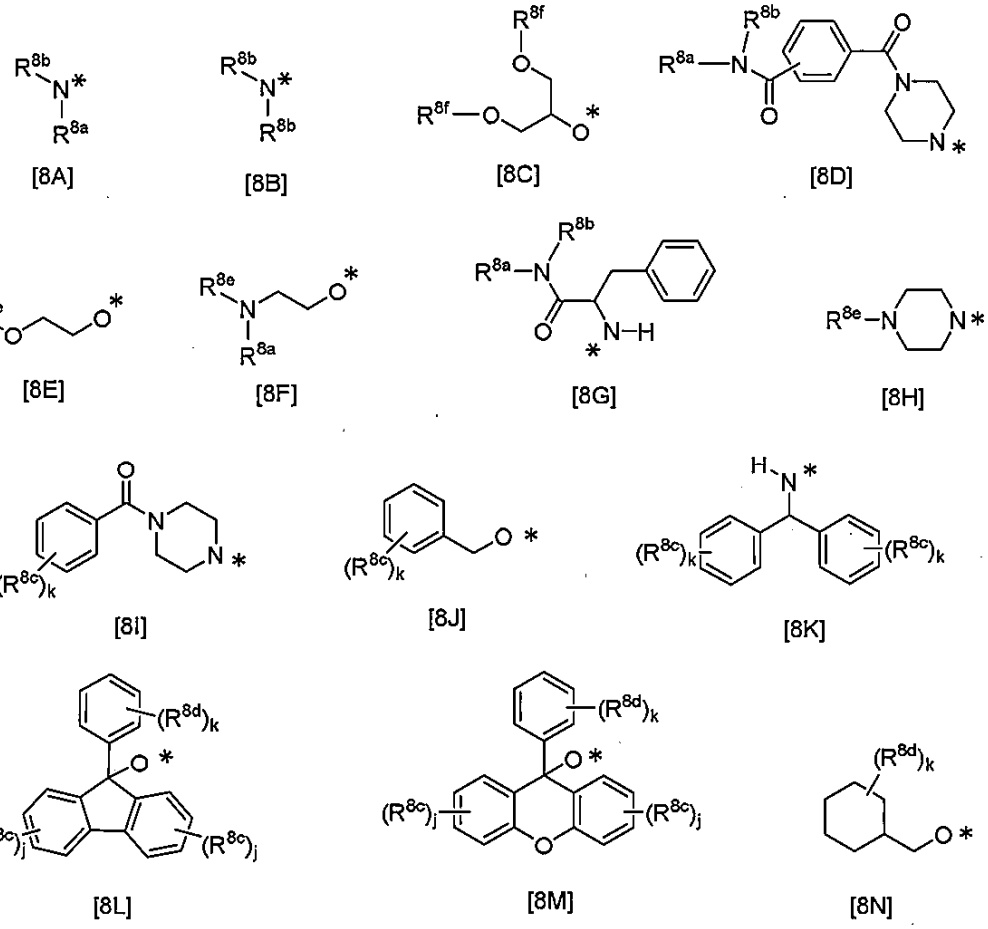
(1) (soluble polymer soluble in an organic solvent)-oxy,

(2) (soluble polymer soluble in an organic solvent)-amino,

(3) long-chain alkyloxy,

(4) a solid phase carrier, or

(5) a substituent represented by one of the following general formulae [8A] to [8N]:



wherein

* represents a binding position with L,

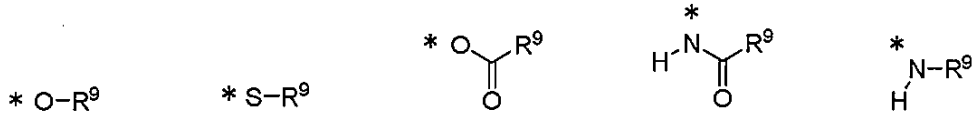
j represents an integer from 0 to 4,

k represents an integer from 0 to 5,

R^{8a} represents a hydrogen atom or C_{1-6} alkyl,

R^{8b}s are the same or different and each represent long-chain alkyl,

R^{8c}s are the same or different and each represent a substituent represented by one of the following general formulae [9A] to [9E]:



wherein

* represents a binding position, and

R^9 represents long-chain alkyl and/or long-chain alkenyl,

R^{8d}s are the same or different and each represent a hydrogen atom, a halogen, long-chain alkyl optionally substituted with 1 to 13 halogens, or long-chain alkyloxy optionally substituted with 1 to 13 halogens,

R^{8e} represents

(1) long-chain alkyl,

(2) long-chain alkyl-carbonyl, or

(3) benzoyl substituted with 1 to 5 long-chain alkyloxy and/or long-chain alkenyloxy,

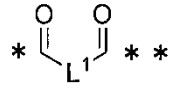
R^{8f} represents

(1) long-chain alkyl,

(2) long-chain alkyl-carbonyl, or

(3) long-chain alkenyl-carbonyl, and

L represents a substituent represented by general formula [10]:



[10]

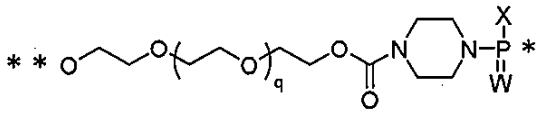
wherein

* represents a binding position with Z,

** represents a binding position with an oxygen atom, and

L^1 represents an optionally substituted $C_{2\text{-}10}$ alkylene or an optionally substituted $C_{6\text{-}10}$ arylene, and

T represents a single bond or a substituent represented by general formula [11]:



[11]

wherein

X and W are as described above,

* represents a binding position with O,

** represents a binding position with G, and

q represents an integer from 0 to 10, and

when G is a silyl substituent, T is a single bond,

** represents

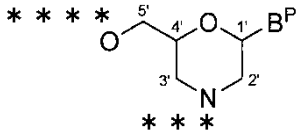
(1) a binding position with a phosphate bond to an oxygen atom at the 3'-position of or a nitrogen atom at the 3'-position of the adjacent nucleoside unit,

(2) a binding position with a hydrogen atom, or

(3) a binding position with the substituent [6]; and

B^P represents an optionally protected nucleic acid base, and

the nucleoside units of the compound [B] are the same or different and are each a nucleoside unit represented by the following general formula [4h]:



[4h]

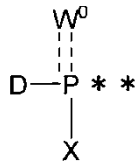
wherein

B^P represents an optionally protected nucleic acid base,

*** represents

(1) a binding position with a phosphate bond to an oxygen atom at the 5'-position of an adjacent nucleoside unit,

(2) a binding position with a substituent [1] containing a phosphorus atom and represented by the following general formula [1]:



[1]

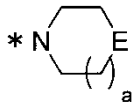
wherein

** represents a binding position,

D represents a halogen, 5- to 6-membered saturated cyclic amino, or di(C_{1-6} alkyl)amino,

W^0 represents a lone pair of electrons, an oxygen atom, or a sulfur atom, and

X represents a hydroxyl group substituted with a removable group under a neutral condition, 1,1,3,3-tetra(C_{1-6} alkyl)guanidyl, C_{1-6} alkoxy, di(C_{1-6} alkyl)amino, mono(amino-C_{1-6} alkyl substituted with a removable group under a basic condition)amino, di(amino-C_{1-6} alkyl substituted with a removable group under a basic condition)amino, or a substituent represented by the following general formula [2]:



[2]

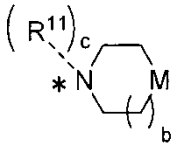
wherein

* represents a binding position with a phosphorus atom,

a represents an integer from 0 to 2,

E represents CH_2, CH-A^1, or N-A^2,

A^1 represents C_{1-6} alkyl, mono(C_{1-6} alkyl)amino-C_{1-6} alkyl substituted with a removable group under a basic condition, di(C_{1-6} alkyl)amino-C_{1-6} alkyl, tri(C_{1-6} alkyl)ammonio-C_{1-6} alkyl, amino substituted with a removable group under a basic condition, mono(C_{1-6} alkyl)amino substituted with a removable group under a basic condition, di(C_{1-6} alkyl)amino, tri(C_{1-6} alkyl)ammonio, amino substituted with amidino substituted with a removable group under a basic condition, or a substituent represented by the following general formula [3]:



[3]

wherein

* represents a binding position with E,

b represents an integer from 0 to 2,

c represents 0 or 1,

R^{11} represents C_{1-6} alkyl, and

M represents CH_2, an oxygen atom, a sulfur atom, or N-(a removable group under a basic condition), and

A^2 represents C_{1-6} alkyl, mono(C_{1-6} alkyl)amino-C_{1-6} alkyl substituted with a removable group under a basic condition, di(C_{1-6} alkyl)amino-C_{1-6} alkyl, tri(C_{1-6} alkyl)ammonio-C_{1-6} alkyl, a removable group under a basic condition, aryl, or heteroaryl, or

(3) a binding position with a removable group under an acidic condition, and

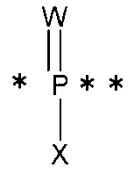
**** represents

(1) a binding position with a phosphate bond to a nitrogen atom at the 3'-position of an adjacent nucleoside unit

(2) a binding position with the substituent [1], or

(3) a binding position with a removable group under an acidic condition.

5. The method according to claim 1, wherein the phosphate bonds between the nucleoside units of each of the compound [A] and the compound [B] are the same or different and are each a bond represented by the following general formula [5]:



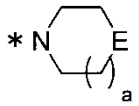
[5]

wherein

one of * and ** represents a binding position with a nitrogen atom at the 3'-position of a nucleoside unit, and the other of * and ** represents a binding position with an oxygen atom at the 5'-position of a nucleoside unit different from said nucleoside unit,

W represents an oxygen atom or a sulfur atom, and

X represents a hydroxyl group substituted with a removable group under a neutral condition, 1,1,3,3-tetra(C_{1-6} alkyl)guanidyl, C_{1-6} alkoxy, di(C_{1-6} alkyl)amino, mono(amino-C_{1-6} alkyl substituted with a removable group under a basic condition)amino, di(amino-C_{1-6} alkyl substituted with a removable group under a basic condition)amino, or a substituent represented by the following general formula [2]:



[2]

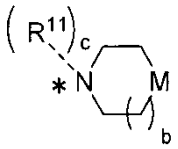
wherein

* represents a binding position with a phosphorus atom,

a represents an integer from 0 to 2,

E represents CH_2, CH-A^1, or N-A^2,

A^1 represents C_{1-6} alkyl, mono(C_{1-6} alkyl)amino-C_{1-6} alkyl substituted with a removable group under a basic condition, di(C_{1-6} alkyl)amino-C_{1-6} alkyl, tri(C_{1-6} alkyl)ammonio-C_{1-6} alkyl, amino substituted with a removable group under a basic condition, mono(C_{1-6} alkyl)amino substituted with a removable group under a basic condition, di(C_{1-6} alkyl)amino, tri(C_{1-6} alkyl)ammonio, amino substituted with amidino substituted with a removable group under a basic condition, or a substituent represented by the following general formula [3]:



[3]

wherein

* represents a binding position with E,

b represents an integer from 0 to 2,

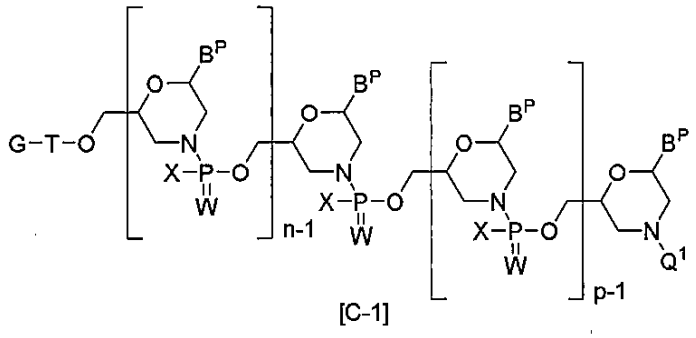
c represents 0 or 1,

R^{11} represents C_{1-6} alkyl, and

M represents CH_2, an oxygen atom, a sulfur atom, or N-(a removable group under a basic condition), and

A^2 represents C_{1-6} alkyl, mono(C_{1-6} alkyl)amino-C_{1-6} alkyl substituted with a removable group under a basic condition, di(C_{1-6} alkyl)amino-C_{1-6} alkyl, tri(C_{1-6} alkyl)ammonio-C_{1-6} alkyl, a removable group under a basic condition, aryl, or heteroaryl.

6. The method according to claim 1, further comprising removing Q^1 in situ subsequently by adding a solution containing an acid to a reaction mixture containing a compound [C-1]:



[C-1]

wherein

B^Ps are the same or different and each represent an optionally protected nucleic acid base,

Q^1 is a removable group under an acidic condition,

G represents

(1) a silyl substituent,

(2) long-chain alkyl-carbonyl,

(3) benzoyl substituted with 1 to 5 long-chain alkyloxy and/or long-chain alkenyloxy, or

(4) a substituent represented by the following general formula [7]:



[7]

wherein

* represents a binding position with T,

Z represents

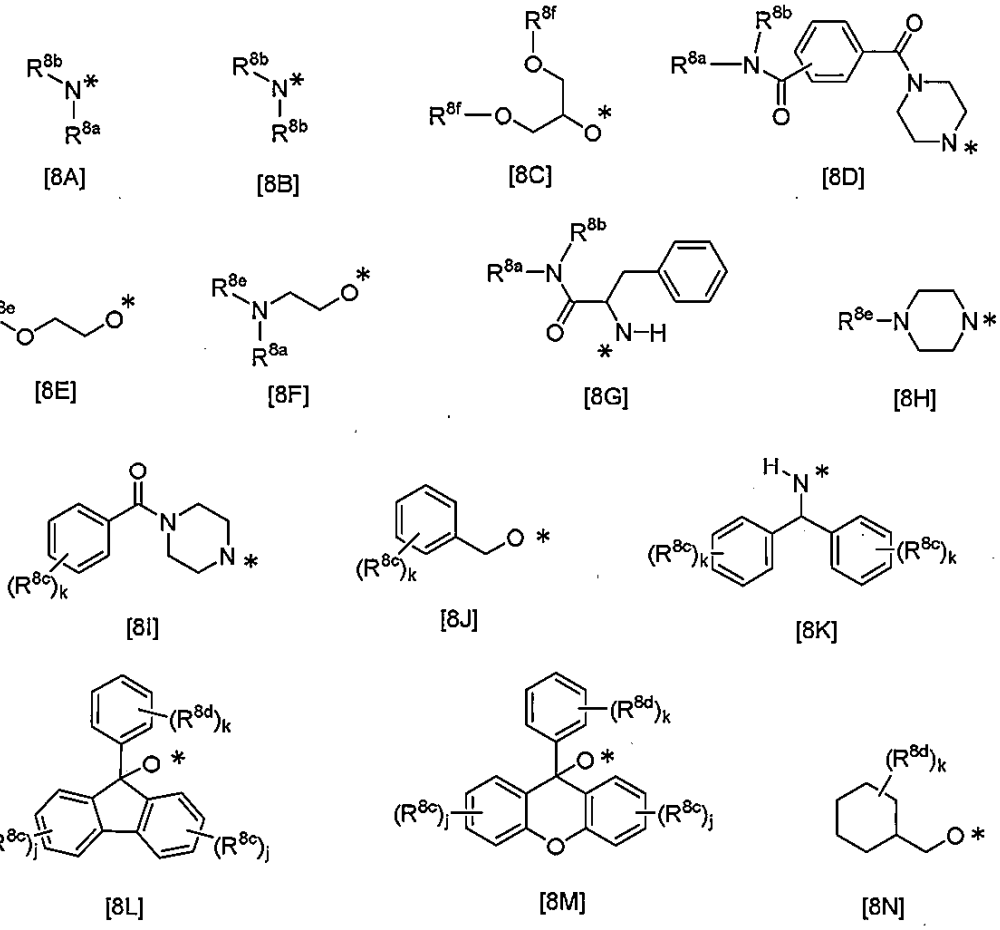
(1) (soluble polymer soluble in an organic solvent)-oxy,

(2) (soluble polymer soluble in an organic solvent)-amino,

(3) long-chain alkyloxy,

(4) a solid phase carrier, or

(5) a substituent represented by one of the following general formulae [8A] to [8N]:



wherein

* represents a binding position with L,

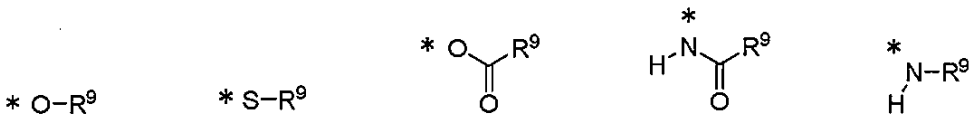
j represents an integer from 0 to 4,

k represents an integer from 0 to 5,

R^{8a} represents a hydrogen atom or C_{1-6} alkyl,

R^{8b}s are the same or different and each represent long-chain alkyl,

R^{8c}s are the same or different and each represent a substituent represented by one of the following general formulae [9A] to [9E]:



wherein

* represents a binding position, and

R^9 represents long-chain alkyl and/or long-chain alkenyl,

R^{8d}s are the same or different and each represent a hydrogen atom, a halogen, long-chain alkyl optionally substituted with 1 to 13 halogens, or long-chain alkyloxy optionally substituted with 1 to 13 halogens,

R^{8e} represents

(1) long-chain alkyl,

(2) long-chain alkyl-carbonyl, or

(3) benzoyl substituted with 1 to 5 long-chain alkyloxy and/or long-chain alkenyloxy, and

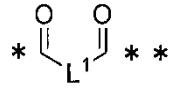
R^{8f} represents

(1) long-chain alkyl,

(2) long-chain alkyl-carbonyl, or

(3) long-chain alkenyl-carbonyl, and

L represents a substituent represented by general formula [10]:



[10]

wherein

* represents a binding position with Z,

** represents a binding position with an oxygen atom, and

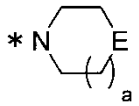
L^1 represents an optionally substituted $C_{2\text{-}10}$ alkylene or an optionally substituted $C_{6\text{-}10}$ arylene,

n represents an integer from 1 to 50,

p represents an integer from 1 to 10,

Ws are the same or different and each represent an oxygen atom or a sulfur atom,

Xs are the same or different and each represent a hydroxyl group substituted with a removable group under a neutral condition, 1,1,3,3-tetra($C_{1\text{-}6}$ alkyl)guanidyl, $C_{1\text{-}6}$ alkoxy, di($C_{1\text{-}6}$ alkyl)amino, mono(amino-$C_{1\text{-}6}$ alkyl substituted with a removable group under a basic condition)amino, di(amino-$C_{1\text{-}6}$ alkyl substituted with a removable group under a basic condition)amino, or a substituent represented by the following general formula [2]:



[2]

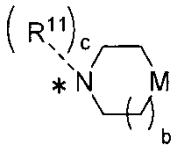
wherein

* represents a binding position with a phosphorus atom,

a represents an integer from 0 to 2,

E represents CH_2, CH-A^1, or N-A^2,

A^1 represents C_{1-6} alkyl, mono(C_{1-6} alkyl)amino-C_{1-6} alkyl substituted with a removable group under a basic condition, di(C_{1-6} alkyl)amino-C_{1-6} alkyl, tri(C_{1-6} alkyl)ammonio-C_{1-6} alkyl, amino substituted with a removable group under a basic condition, mono(C_{1-6} alkyl)amino substituted with a removable group under a basic condition, di(C_{1-6} alkyl)amino, tri(C_{1-6} alkyl)ammonio, amino substituted with amidino substituted with a removable group under a basic condition, or a substituent represented by the following general formula [3]:



[3]

wherein

* represents a binding position with E,

b represents an integer from 0 to 2,

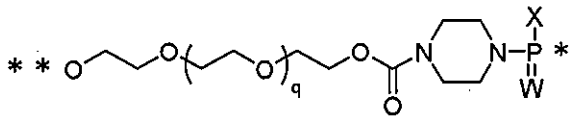
c represents 0 or 1,

R^{11} represents C_{1-6} alkyl, and

M represents CH_2, an oxygen atom, a sulfur atom, or N-(a removable group under a basic condition, and

A^2 represents C_{1-6} alkyl, mono(C_{1-6} alkyl)amino-C_{1-6} alkyl substituted with a removable group under a basic condition, di(C_{1-6} alkyl)amino-C_{1-6} alkyl, tri(C_{1-6} alkyl)ammonio-C_{1-6} alkyl, a removable group under a basic condition, aryl, or heteroaryl,

T represents a single bond or a substituent represented by general formula [11]:



[11]

wherein

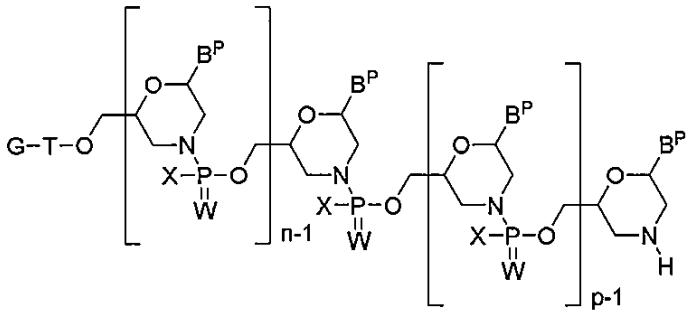
X and W are as described above for general formula [E-1],

* represents a binding position with O,

** represents a binding position with G, and

q represents an integer from 0 to 10, and

when G is a silyl substituent, T is a single bond prepared by the method, to form a compound represented by the following general formula [E-1]:



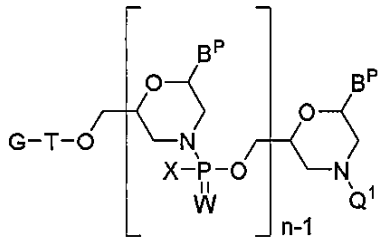
[E-1]

wherein n, p, B^P, W, X, G, and T are as described above.

7. The method according to claim 1, wherein the method includes,

in a mixed solvent containing a polar solvent and a halogen solvent,

removing Q^1 from a compound of general formula [A-1-1]:



[A-1-1]

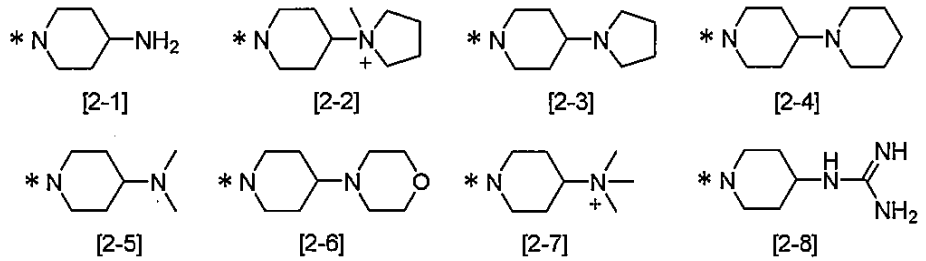
wherein

each B^P is an optionally protected nucleic acid base,

Q^1 is a removable group under an acidic condition,

W is an oxygen atom or a sulfur atom,

X is di(C_{1-6} alkyl)amino or selected from among substituents represented by general formulae [2-1] to [2-8]:



[2-1] [2-2] [2-3] [2-4]

[2-5] [2-6] [2-7] [2-8]

wherein * represents a binding position with a phosphorus atom,

G represents a substituent represented by general formula [7]:

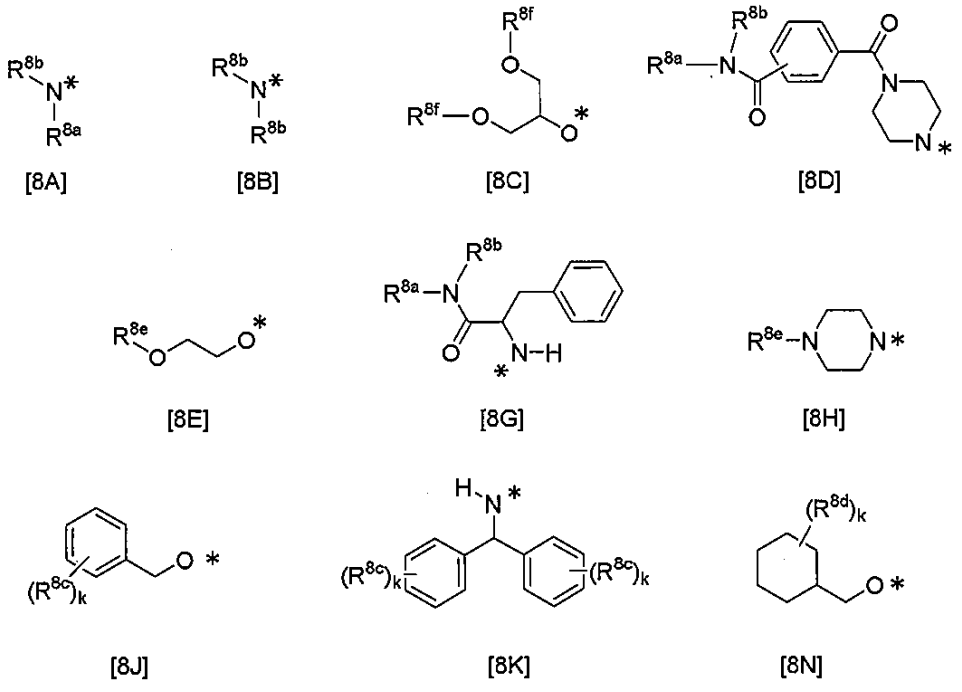


[7]

wherein

* represents a binding position with T,

Z is a substituent represented by one of general formulae [8A] to [8D], [8E], [8G], [8H], [8J], [8K], and [8N]:



[8A] [8B] [8C] [8D]

[8E] [8G] [8H]

[8J] [8K] [8N]

wherein

* represents a binding position with L,

k represents an integer from 0 to 50,

R^{8a} represents a hydrogen atom or C_{1-6} alkyl,

R^{8b}s are the same or different and each represent long-chain alkyl,

R^{8c}s are the same or different and each represent a substituent represented by the following general formula [9A]:



[9A]

wherein

* represents a binding position, and

R^9 represents long-chain alkyl and/or long-chain alkenyl,

R^{8d}s are the same or different and each represent a hydrogen atom, a halogen, long-chain alkyl optionally substituted with 1 to 13 halogens, or long-chain alkyloxy optionally substituted with 1 to 13 halogens,

R^{8e} represents

(1) long-chain alkyl,

(2) long-chain alkyl-carbonyl, or

(3) benzoyl substituted with 1 to 5 long-chain alkyloxy and/or long-chain alkenyloxy, and

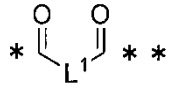
R^{8f} represents

(1) long-chain alkyl,

(2) long-chain alkyl-carbonyl, or

(3) long-chain alkenyl-carbonyl, and

L represents a substituent represented by general formula [10]:



[10]

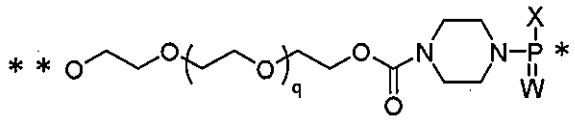
wherein

* represents a binding position with Z,

** represents a binding position with an oxygen atom, and

L^1 represents an optionally substituted C_{2-10} alkylene or an optionally substituted C_{6-10} arylene,

T is a single bond or a substituent represented by the following general formula [11]:



[11]

wherein

X and W are as described above for general formula [A-1-1],

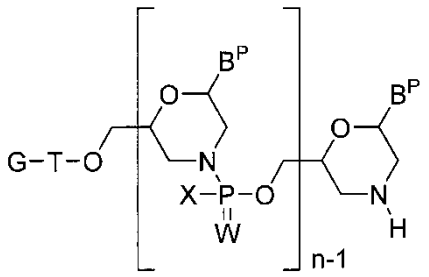
* represents a binding position with O,

** represents a binding position with G, and

q represents an integer from 0 to 10, and

n is 1 to 25,

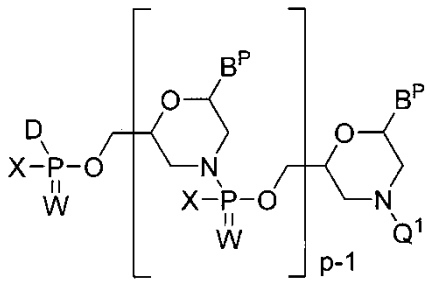
to form a compound of general formula [A-1]:



[A-1]

wherein B^P, W, X, G, T, and n are as described above for general formula [A-1-1], and then

reacting the compound of general formula [A-1] with a compound of general formula [B-1]:



[B-1]

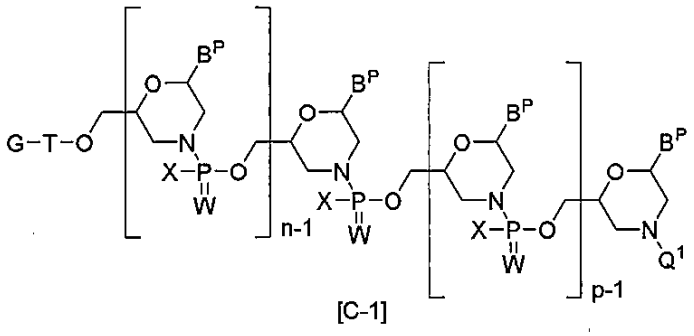
wherein

B^P, Q^1, W, X, G, and T are as described above for general formula [A-1-1],

D is a halogen, and

p is an integer from 1 to 10,

to obtain a compound of general formula [C-1]:



[C-1]

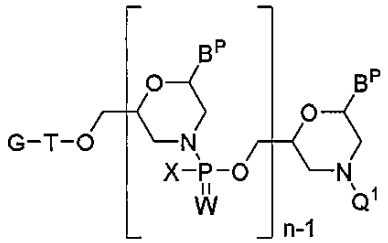
wherein n, p, B^P, Q^1, W, X, G, and T are as described above for general formula [A-1-1].

8. The method for preparing the compound of general formula [C-1] according to claim 7, wherein

the mixed solvent is a mixed solvent containing at least one polar solvent selected from the group consisting of dimethylacetamide, dimethylsulfoxide, N-methylpiperidone, 1,3-dimethyl-2-imidazolidinone, and N,N'-dimethylpropylene urea, and at least one halogen solvent selected from the group consisting of chloroform, dichloromethane, 1,1-dichloroethane, and 1,2-dichloroethane, and

a content of the polar solvent in the mixed solvent is 1% to 50% (v/v).

9. The method for preparing the compound of general formula [C-1] according to claim 10 or 11, further comprising removing Q^1, in the presence of trifluoroacetic acid and 2,2,2-trifluoroethanol, and optionally triisopropylsilane or ethanol, from a compound of general formula [A-1-1]:



[A-1-1]

wherein

Q^1 is trityl, monomethoxytrityl, or dimethoxytrityl, and

n, B^P, W, X, G, and T are as described for general formula [A-1-1] in claim 7.

10. The method for preparing the compound of general formula [C-1] according to claim 7, further comprising

supplying a solution containing the compound of general formula [A-1] and a solution containing the compound of general formula [B-1] to a flow reactor to form the compound of general formula [C-1], and

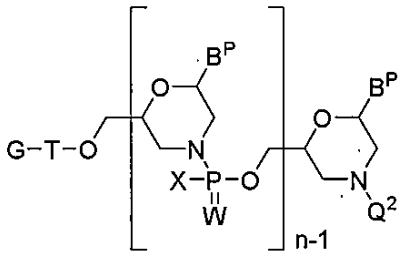
optionally, supplying a solution containing the compound of general formula [C-1] and a solution containing an acid to a flow reactor to remove Q^1 to form the compound of formula [E-1].

11. The method for preparing the compound of general formula [C-1] according to claim 7, further comprising

supplying a solution containing the compound of general formula [A-1-1] and a solution containing an acid to a flow reactor to remove Q^1 to form the compound of formula [A-1], and

supplying a solution containing the compound of general formula [A-1] and a solution containing the compound of general formula [B-1] to a subsequent flow reactor to form the compound of general formula [C-1].

12. A compound of general formula [A-1-2]



[A-1-2]

wherein

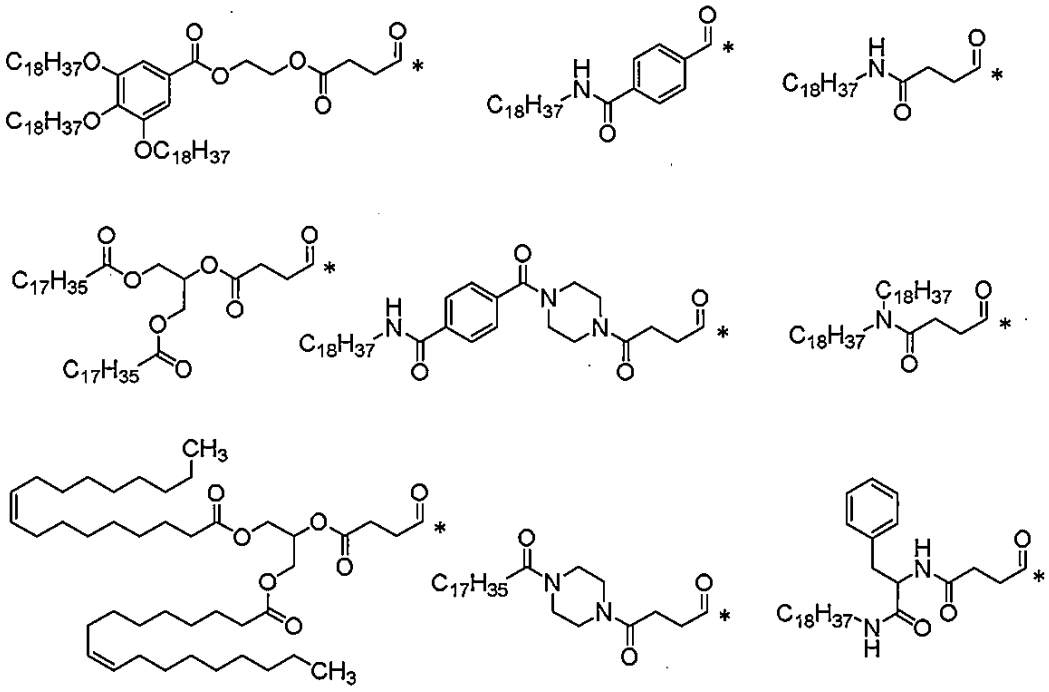
each B^P is an optionally protected nucleic acid base,

Q^2 is H or a removable group under an acidic condition,

W is an oxygen atom,

X is di(C_{1-6} alkyl)amino,

G is selected from the group consisting of the following formulae:



wherein

* represents a binding position with T,

T is a single bond, and

n is 1 to 25.