

**CPC****COOPERATIVE PATENT CLASSIFICATION****C12P****FERMENTATION OR ENZYME-USING PROCESSES TO SYNTHESISE A DESIRED CHEMICAL COMPOUND OR COMPOSITION OR TO SEPARATE OPTICAL ISOMERS FROM A RACEMIC MIXTURE** {(brewing of beer [C12C](#); producing vinegar [C12J](#); producing specific peptides or proteins [C07K](#); producing enzymes [C12N 9/00](#); DNA or RNA concerning genetic engineering, vectors, e.g. plasmids, or their isolation, preparation or purification [C12N 15/00](#); measuring or testing processes involving enzymes or micro-organisms [C12Q](#); measuring or testing processes involving nucleic acid amplification reactions [C12Q 1/6844](#); fermentation processes to form a food composition, [A21](#) or [A23](#); compounds in general, see the relevant compound class, e.g. [C01](#), [C07](#))}

(brewing of beer [C12C](#); producing vinegar [C12J](#); producing specific peptides or proteins [C07K](#); producing enzymes [C12N 9/00](#); DNA or RNA concerning genetic engineering, vectors, e.g. plasmids, or their isolation, preparation or purification [C12N 15/00](#); measuring or testing processes involving enzymes or micro-organisms [C12Q](#); measuring or testing processes involving nucleic acid amplification reactions [C12Q 1/6844](#); fermentation processes to form a food composition, [A21](#) or [A23](#); compounds in general, see the relevant compound class, e.g. [C01](#), [C07](#))}

**NOTES**

1. This subclass covers the production of compounds or compositions by biochemical transformation of matter performed by using enzymes or micro-organisms, wherein micro-organisms are defined as any single-celled organisms, including bacteria, fungi, yeast or microalgae, or plant or mammalian cells in the form of cell cultures.
2. In this subclass, documents are primarily classified according to the compounds produced. In addition, if appropriate, classification according to the method or biocatalyst used to produce the compound is made.
3. Classification in groups [C12P 19/14](#) - [C12P 19/24](#), [C12P 39/00](#), [C12P 41/00](#) - [C12P 41/009](#) should only be made together with the corresponding product groups

**WARNING**

The following IPC groups are not used in the CPC scheme. Subject-matter covered by these groups is classified in the following CPC groups:

- |   |                            |            |                            |
|---|----------------------------|------------|----------------------------|
| - | <a href="#">C12P 21/04</a> | covered by | <a href="#">C07K 7/50</a>  |
| - | <a href="#">C12P 21/08</a> | covered by | <a href="#">C07K 16/00</a> |

**C12P 1/00**

**Preparation of compounds or compositions, not provided for in groups [C12P 3/00](#) to [C12P 39/00](#), by using micro-organisms or enzymes**

**NOTES**

1. This group is used for the classification of documents relating to the production of compounds of unknown structure
2. When classifying in this group, classification should be made also in [C12R](#)

**C12P 1/02**

- by using fungi

**C12P 1/04**

- by using bacteria

**C12P 1/06**

- by using actinomycetales

**C12P 3/00**

**Preparation of elements or inorganic compounds except carbon dioxide** {(Recovery of carbon dioxides as by-products [C12F 3/02](#))}

**C12P 5/00****Preparation of hydrocarbons {or halogenated hydrocarbons}**

C12P 5/002

- {cyclic (compounds containing at least three condensed carbocyclic rings [C12P 15/00](#))}

C12P 5/005

- . {aromatic (naphthalene [C12P 29/00](#))}

C12P 5/007

- {containing one or more isoprene units, i.e. terpenes (carotenes [C12P 23/00](#))}

C12P 5/02

- acyclic {([C12P 5/007](#) takes precedence)}

C12P 5/023

- . {Methane}

C12P 5/026

- . {Unsaturated compounds, i.e. alkenes, alkynes or allenes}

**C12P 7/00****Preparation of oxygen-containing organic compounds**

C12P 7/02

- containing a hydroxy group

C12P 7/04

- . acyclic

C12P 7/06

- . . Ethanol, i.e. non-beverage

C12P 7/065

- . . . {with micro-organisms other than yeasts}

C12P 7/08

- . . . . produced as by-product or from waste or cellulosic material substrate

C12P 7/10

- . . . . . substrate containing cellulosic material

C12P 7/12

- . . . . . substrate containing sulfite waste liquor or citrus waste

C12P 7/14

- . . . . Multiple stages of fermentation; Multiple types of micro-organisms or re-use of micro-organisms

C12P 7/16

- . . . Butanols

C12P 7/18

- . . . polyhydric

C12P 7/20

- . . . . Glycerol

C12P 7/22

- . . aromatic

C12P 7/24

- containing a carbonyl group

C12P 7/26

- . Ketones

C12P 7/28

- . . Acetone-containing products

C12P 7/30

- . . . . produced from substrate containing inorganic compounds other than water

C12P 7/32

- . . . . produced from substrate containing inorganic nitrogen source

C12P 7/34

- . . . . produced from substrate containing protein as nitrogen source

C12P 7/36

- . . . . produced from substrate containing grain or cereal material

C12P 7/38

- . . . Cyclopentanone- or cyclopentadione-containing products

C12P 7/40

- containing a carboxyl group {including Peroxycarboxylic acids (Fatty acids [C12P 7/6409](#))}

C12P 7/42

- . Hydroxy-carboxylic acids

C12P 7/44

- . Polycarboxylic acids

C12P 7/46

- . . Dicarboxylic acids having four or less carbon atoms, e.g. fumaric acid, maleic acid

C12P 7/48

- . . Tricarboxylic acids, e.g. citric acid

C12P 7/50

- . . having keto groups, e.g. 2-ketoglutaric acid

C12P 7/52

- . Propionic acid; Butyric acids

- C12P 7/54 . . Acetic acid ([vinegar C12J](#))
- C12P 7/56 . . Lactic acid
- C12P 7/58 . . Aldonic, keto-alldonic or saccharic acids ([uronic acids C12P 19/00](#))
- C12P 7/60 . . . 2-Ketogulonic acid
- C12P 7/62 . Carboxylic acid esters ([fatty acid esters C12P 7/6436](#))
- C12P 7/625 . . {[Polyesters of hydroxy-carboxylic acids](#)}
- C12P 7/64 . Fats; Fatty oils; Ester-type waxes; Higher fatty acids, i.e. having at least seven carbon atoms in an unbroken chain bound to a carboxyl group; Oxidised oils or fats
- C12P 7/6409 . . {[Fatty acids](#)}
- C12P 7/6418 . . . {by hydrolysis of Fatty acid esters}
- C12P 7/6427 . . . {[Polyunsaturated fatty acids \[PUFA\], i.e. having 2 or more double bonds in their backbone](#)}
- C12P 7/6436 . . {[Fatty acid esters](#)}
- C12P 7/6445 . . . {[Glycerides](#)}
- C12P 7/6454 . . . . {by esterification}
- C12P 7/6463 . . . . {obtained from glyceride producing microorganisms, e.g. single cell oil}
- C12P 7/6472 . . . . {containing polyunsaturated fatty acid [PUFA] residues, i.e. having 2 or more double bonds in their backbone}
- C12P 7/6481 . . . . {[Phosphoglycerides \(phosphoglycerides having carboxylic acids with less than 7 carbon atoms, C12P 7/62\)](#)}
- C12P 7/649 . . . {[Biodiesel, i.e. Fatty acid alkyl esters](#)}
- C12P 7/66 . containing the quinoid structure

**C12P 9/00** Preparation of organic compounds containing a metal or atom other than H, N, C, O, S or halogen ([phosphoglycerides, C12P 7/6481](#))

**C12P 11/00** Preparation of sulfur-containing organic compounds

**C12P 13/00** Preparation of nitrogen-containing organic compounds

- C12P 13/001 . {[Amines; Imines](#)}
- C12P 13/002 . {[Nitriles \(-CN\)](#)}
- C12P 13/004 . . {[Cyanohydrins](#)}
- C12P 13/005 . {[Amino acids other than alpha- or beta amino acids, e.g. gamma amino acids](#)}
- C12P 13/007 . {[Carnitine; Butyrobetaine; Crotonobetaine](#)}
- C12P 13/008 . {containing a N-O bond, e.g. nitro (-NO<sub>2</sub>), nitroso (-NO)}
- C12P 13/02 . Amides, e.g. chloramphenicol {or polyamides; Imides or polyimides; Urethanes , i.e. compounds comprising N-C=O structural element or polyurethanes ([peptides C12P 21/00 or C07K](#))}
- C12P 13/04 . Alpha- or beta- amino acids ([other amino acids C12P 13/005](#))
- C12P 13/06 . . Alanine; Leucine; Isoleucine; Serine; Homoserine
- C12P 13/08 . . Lysine; Diaminopimelic acid; Threonine; Valine
- C12P 13/10 . . Citrulline; Arginine; Ornithine

- C12P 13/12 . . Methionine; Cysteine; Cystine
- C12P 13/14 . . Glutamic acid; Glutamine
- C12P 13/16 . . . using surfactants, fatty acids or fatty acid esters, i.e. having at least seven carbon atoms in an unbroken chain bound to a carboxyl group or a carboxyl ester group
- C12P 13/18 . . . using biotin or its derivatives
- C12P 13/20 . . Aspartic acid; Asparagine
- C12P 13/22 . . Tryptophan; Tyrosine; Phenylalanine; 3,4-Dihydroxyphenylalanine

**NOTE**

Processes for the preparation of different amino acids covered by more than one of the groups [C12P 13/222](#) to [C12P 13/227](#) are classified in group [C12P 13/22](#)

- C12P 13/222 . . . {Phenylalanine}
- C12P 13/225 . . . {Tyrosine; 3,4-Dihydroxyphenylalanine}
- C12P 13/227 . . . {Tryptophan}
- C12P 13/24 . . Proline; Hydroxyproline; Histidine

**C12P 15/00** Preparation of compounds containing at least three condensed carbocyclic rings {(Gibbanes [C12P 27/00](#); naphthacenes [C12P 29/00](#))}

**C12P 17/00** Preparation of heterocyclic carbon compounds with only O, N, S, Se or Te as ring hetero atoms ([C12P 13/04](#) to [C12P 13/24](#) take precedence)

- C12P 17/02 . Oxygen as only ring hetero atom
- C12P 17/04 . . containing a five-membered hetero ring, e.g. griseofulvin, {vitamin C}
- C12P 17/06 . . containing a six-membered hetero ring, e.g. fluorescein
- C12P 17/08 . . containing a hetero ring of at least seven ring members, e.g. zearalenone, macrolide aglycons
- C12P 17/10 . Nitrogen as only ring hetero atom
- C12P 17/12 . . containing a six-membered hetero ring
- C12P 17/14 . Nitrogen or oxygen as hetero atom and at least one other diverse hetero ring atom in the same ring
- C12P 17/16 . containing two or more hetero rings {(Thiamine open chain analogs [C12P 17/167](#); i.e. not condensed among themselves or through a common carbocyclic ring system)}
- C12P 17/162 . . {Heterorings having oxygen atoms as the only ring heteroatoms e.g. Lasalocid}
- C12P 17/165 . . {Heterorings having nitrogen atoms as the only ring heteroatoms}
- C12P 17/167 . . {Heterorings having sulfur atoms as ring heteroatoms, e.g. vitamin B1, thiamine nucleus and open chain analogs}
- C12P 17/18 . containing at least two hetero rings condensed among themselves or condensed with a common carbocyclic ring system, e.g. rifamycin, {(e.g. Rifamycin [C12P 17/189](#))}
- C12P 17/181 . . {Heterocyclic compounds containing oxygen atoms as the only ring heteroatoms in the condensed system, e.g. Salinomycin, Septamycin}

- C12P 17/182
  - . . {Heterocyclic compounds containing nitrogen atoms as the only ring heteroatoms in the condensed system (Alloxazine or isoalloxazine, e.g. riboflavine [C12P 25/00](#))}
- C12P 17/183
  - . . . {containing an indolo[4,3-F,G]quinoline nucleus, e.g. compound containing the lysergic acid nucleus as well as the dimeric ergot nucleus}
- C12P 17/184
  - . . . {containing a beta-lactam ring, e.g. thienamycin}
- C12P 17/185
  - . . {Heterocyclic compounds containing sulfur atoms as ring hetero atoms in the condensed system (cepam nucleus [C12P 35/00](#); penam nucleus [C12P 37/00](#))}
- C12P 17/186
  - . . . {containing a 2-oxo-thieno[3,4-d]imidazol nucleus, e.g. Biotin}
- C12P 17/187
  - . . . {containing two or more directly linked sulfur atoms, e.g. epithiopiperazines}
- C12P 17/188
  - . . {Heterocyclic compound containing in the condensed system at least one hetero ring having nitrogen atoms and oxygen atoms as the only ring heteroatoms (ergot-alkaloids [C12P 17/183](#))}
- C12P 17/189
  - . . . {containing the rifamycin nucleus}
- C12P 19/00**

**Preparation of compounds containing saccharide radicals (keto-aldonic acids [C12P 7/58](#))**

**NOTE**

Attention is drawn to the term "saccharide radical" in the first Note following the title of subclass [C07H](#).

  - C12P 19/02
    - . Monosaccharides ([2-ketogulonic acid C12P 7/60](#))
  - C12P 19/04
    - . Polysaccharides, i.e. compounds containing more than five saccharide radicals attached to each other by glycosidic bonds
  - C12P 19/06
    - . . Xanthan, i.e. Xanthomonas-type heteropolysaccharides
  - C12P 19/08
    - . . Dextran
  - C12P 19/10
    - . . Pullulan
  - C12P 19/12
    - . Disaccharides
  - C12P 19/14
    - . produced by the action of a carbohydrase {(EC 3.2.x)}, e.g. by alpha-amylase, {e.g. by cellulase, hemicellulase}
  - C12P 19/16
    - . produced by the action of an alpha-1, 6-glucosidase, e.g. amylose, debranched amylopectin (non-biological hydrolysis of starch [C08B 30/00](#))
  - C12P 19/18
    - . produced by the action of a glycosyl transferase, e.g. alpha-, beta- or gamma-cyclodextrins
  - C12P 19/20
    - . produced by the action of an exo-1,4 alpha-glucosidase, e.g. dextrose
  - C12P 19/22
    - . produced by the action of a beta-amylase, e.g. maltose
  - C12P 19/24
    - . produced by the action of an isomerase, e.g. fructose
  - C12P 19/26
    - . Preparation of nitrogen-containing carbohydrates
  - C12P 19/28
    - . . N-glycosides
  - C12P 19/30
    - . . . Nucleotides
  - C12P 19/305
    - . . . . {Pyrimidine nucleotides}

- C12P 19/32 . . . . having a condensed ring system containing a six-membered ring having two N-atoms in the same ring, e.g. purine nucleotides, nicotineamide-adenine dinucleotide
- C12P 19/34 . . . . Polynucleotides, e.g. nucleic acids, oligoribonucleotides
- C12P 19/36 . . . . Dinucleotides, e.g. nicotineamide-adenine dinucleotide phosphate
- C12P 19/38 . . . . Nucleosides
- C12P 19/385 . . . . {Pyrimidine nucleosides}
- C12P 19/40 . . . . having a condensed ring system containing a six-membered ring having two nitrogen atoms in the same ring, e.g. purine nucleosides
- C12P 19/42 . . . . Cobalamins, i.e. vitamin B<sub>12</sub>, LLD factor
- C12P 19/44 . . Preparation of O-glycosides, e.g. glucosides {(Polysaccharides and not substituted disaccharides C12P 19/04, C12P 19/12)}
- C12P 19/445 . . {The saccharide radical is condensed with a heterocyclic radical, e.g. everninomycin, papulacandin}
- C12P 19/46 . . having an oxygen atom of the saccharide radical bound to a cyclohexyl radical, e.g. kasugamycin
- C12P 19/48 . . . . the cyclohexyl radical being substituted by two or more nitrogen atoms, e.g. destomycin, neamin
- C12P 19/485 . . . . {Having two saccharide radicals bound through only oxygen to non-adjacent ring carbons of the cyclohexyl radical, e.g. gentamycin, kanamycin, sisomycin, verdamycin, mutamycin, tobramycin, nebramycin, antibiotics 66-40B, 66-40D, XK-62-2, 66-40, G-418, G-52 (see also C12P 19/54)}
- C12P 19/50 . . . . having two saccharide radicals bound through only oxygen to adjacent ring carbon atoms of the cyclohexyl radical, e.g. ambutyrosin, ribostamycin
- C12P 19/52 . . . . . containing three or more saccharide radicals, e.g. neomycin, lividomycin
- C12P 19/54 . . . . the cyclohexyl radical being bound directly to a nitrogen atom of two or more  $\begin{array}{c} >N-C-N< \\ || \\ N \end{array}$  radicals, e.g. streptomycin
- C12P 19/56 . . having an oxygen atom of the saccharide radical directly bound to a condensed ring system having three or more carbocyclic rings, e.g. daunomycin, adriamycin
- C12P 19/58 . . having an oxygen atom of the saccharide radical directly bound through only acyclic carbon atoms to a non-saccharide hetero-cyclic ring, e.g. bleomycin, phleomycin
- C12P 19/60 . . having an oxygen of the saccharide radical directly bound to a non-saccharide heterocyclic ring or a condensed ring system containing a non-saccharide heterocyclic ring, e.g. coumermycin, novobiocin {(C12P 19/605)}
- C12P 19/605 . . . . {to a 1-benzopyran-2-on (or the chalcones and hydrogenated chalcones thereof, e.g. coumermycin, novobiocin, novenamin)}
- C12P 19/62 . . . . the hetero ring having eight or more ring members and only oxygen as ring hetero atoms, e.g. erythromycin, spiramycin, nystatin
- C12P 19/623 . . . . {Avermectin; Milbemycin; Ivermectin; C-076}
- C12P 19/626 . . . . {Natamycin; Pimaricin; Tենnecetin}

- C12P 19/64
- Preparation of S-glycosides, e.g. lincomycin
- C12P 21/00** Preparation of peptides or proteins (single cell protein [C12N 1/00](#))
- C12P 21/005 {Glycopeptides, glycoproteins}
- C12P 21/02
- having a known sequence of two or more amino acids, e.g. glutathione
- C12P 21/06
- produced by the hydrolysis of a peptide bond, e.g. hydrolysate products (preparing foodstuffs by protein hydrolysis [A23J 3/00](#))
- C12P 23/00** Preparation of compounds containing a cyclohexene ring having an unsaturated side chain containing at least ten carbon atoms bound by conjugated double bonds, e.g. carotenes (containing heterorings [C12P 17/00](#))
- C12P 25/00** Preparation of compounds containing alloxazine or isoalloxazine nucleus, e.g. riboflavin
- C12P 27/00** Preparation of compounds containing a gibbane ring system, e.g. gibberellin
- C12P 29/00** Preparation of compounds containing a naphthacene ring system, e.g. tetracycline ([C12P 19/00](#) takes precedence)
- C12P 31/00** Preparation of compounds containing a five-membered ring having two side-chains in ortho position to each other, and having at least one oxygen atom directly bound to the ring in ortho position to one of the side-chains, one side-chain containing, not directly bound to the ring, a carbon atom having three bonds to hetero atoms with at the most one bond to halogen, and the other side-chain having at least one oxygen atom bound in gamma-position to the ring, e.g. prostaglandins
- C12P 31/005
- {by fermentation or enzyme-using processes from marine organisms, e.g. Plexaura Homomalla}
- C12P 33/00** Preparation of steroids
- NOTES**
- Attention is drawn to the definition of steroids in the note following the title of subclass [C07J](#).
  - In groups [C12P 33/02](#) to [C12P 33/20](#), the terms "acting", "forming", "hydroxylating", "dehydroxylating" and "dehydrogenating" refer to the action of a micro-organism or enzyme rather than other chemical action.
- C12P 33/005
- {Degradation of the lateral chains at position 17}
- C12P 33/02
- Dehydrogenating; Dehydroxylating
- C12P 33/04
- Forming an aryl ring from A ring
- C12P 33/06
- Hydroxylating
- C12P 33/08
- at 11 position
- C12P 33/10
- at 11 alpha-position
- C12P 33/12
- Acting on D ring {(carbons 13 and 14 belong to the C ring; degradation of lateral chains [C12P 33/005](#))}
- C12P 33/14
- Hydroxylating at 16 position
- C12P 33/16
- Acting at 17 position

C12P 33/18	<ul style="list-style-type: none"> <li>• . . . Hydroxylating at 17 position</li> </ul>
C12P 33/20	<ul style="list-style-type: none"> <li>• containing heterocyclic rings {(reactions are also classified in groups <a href="#">C12P 33/00</a> to <a href="#">C12P 33/18</a>)}</li> </ul>
<b>C12P 35/00</b>	<b>Preparation of compounds having a 5-thia-1-azabicyclo [4.2.0] octane ring system, e.g. cephalosporin</b>
C12P 35/02	<ul style="list-style-type: none"> <li>• by desacylation of the substituent in the 7 position</li> </ul>
C12P 35/04	<ul style="list-style-type: none"> <li>• by acylation of the substituent in the 7 position</li> </ul>
C12P 35/06	<ul style="list-style-type: none"> <li>• Cephalosporin C; Derivatives thereof</li> </ul>
C12P 35/08	<ul style="list-style-type: none"> <li>• disubstituted in the 7 position</li> </ul>
<b>C12P 37/00</b>	<b>Preparation of compounds having a 4-thia-1-azabicyclo [3.2.0] heptane ring system, e.g. penicillin</b>
C12P 37/02	<ul style="list-style-type: none"> <li>• in presence of phenylacetic acid or phenylacetamide or their derivatives {not to be used}</li> </ul>
C12P 37/04	<ul style="list-style-type: none"> <li>• by acylation of the substituent in the 6 position</li> </ul>
C12P 37/06	<ul style="list-style-type: none"> <li>• by desacylation of the substituent in the 6 position</li> </ul>
<b>C12P 39/00</b>	<b>Processes involving micro-organisms of different genera in the same process, simultaneously</b>
<b>C12P 41/00</b>	<b>Processes using enzymes or micro-organisms to separate optical isomers from a racemic mixture</b>
C12P 41/001	<ul style="list-style-type: none"> <li>• {by metabolizing one of the enantiomers}</li> </ul>
C12P 41/002	<ul style="list-style-type: none"> <li>• {by oxidation/reduction reactions}</li> </ul>
C12P 41/003	<ul style="list-style-type: none"> <li>• {by ester formation, lactone formation or the inverse reactions}</li> </ul>
C12P 41/004	<ul style="list-style-type: none"> <li>• . . {by esterification of alcohol- or thiol groups in the enantiomers or the inverse reaction}</li> </ul>
C12P 41/005	<ul style="list-style-type: none"> <li>• . . {by esterification of carboxylic acid groups in the enantiomers or the inverse reaction}</li> </ul>
C12P 41/006	<ul style="list-style-type: none"> <li>• {by reactions involving C-N bonds, e.g. nitriles, amides, hydantoins, carbamates, lactames, transamination reactions, or keto group formation from racemic mixtures}</li> </ul>
C12P 41/007	<ul style="list-style-type: none"> <li>• . . {by reactions involving acyl derivatives of racemic amines}</li> </ul>
C12P 41/008	<ul style="list-style-type: none"> <li>• . . {by reactions involving carbamates}</li> </ul>
C12P 41/009	<ul style="list-style-type: none"> <li>• . . {by reactions involving hydantoins or carbamoylamino compounds}</li> </ul>
<b>C12P 2201/00</b>	<b>Pretreatment of cellulosic or lignocellulosic material for subsequent enzymatic treatment or hydrolysis</b>
<b>C12P 2203/00</b>	<b>Fermentation products obtained from optionally pretreated or hydrolyzed cellulosic or lignocellulosic material as the carbon source (<a href="#">ethanol C12P 7/10</a>)</b>