

# EC Explorer



# Introduction to the EC-system:

## EC number:

The Enzyme Commission number (EC number) is a numerical classification scheme for enzymes, based on the chemical reactions they catalyze. As a system of enzyme nomenclature, every EC number is associated with a recommended name for the respective enzyme.

EC numbers do not specify enzymes, but enzyme-catalyzed reactions. If different enzymes catalyze the same reaction, then they receive the same EC number. By contrast, UniProt identifiers uniquely specify a protein by its amino acid sequence.

## Format of number:

Every enzyme code consists of the letters "EC" followed by four numbers. Those numbers contribute a finer classification of the enzyme.

For example: Tripeptide aminopeptidases have the code "EC 3.4.11.4":

EC 3 enzymes are hydrolases.

EC 3.4 are hydrolases that act on peptide bonds.

EC 3.4.11 are those hydrolases that cleave off the amino-terminal amino acid from a polypeptide.

EC 3.4.11.4 are those that cleave off the amino-terminal end from a tripeptide.

## Overview:

| Group                           | Reaction catalyzed  | Typical reaction   | Enzyme example(s) with trivial name |
|---------------------------------|---|--|-------------------------------------|
| <b>EC 1<br/>Oxidoreductases</b> | To catalyze oxidation/reduction reactions; transfer of H and O atoms or electrons from one substance to another.          | $AH + B \rightarrow A + BH$<br>(reduced)<br><br>$A + O \rightarrow AO$<br>(oxidized) | Dehydrogenase, oxidase              |
| <b>EC 2<br/>Transferases</b>    | Transfer of a functional group from one substance to another. The group may be methyl-, acyl-, amino- or phosphate group. | $AB + C \rightarrow A + BC$  | Transaminase, kinase                |
| <b>EC 3<br/>Hydrolases</b>      | Formation of two products from a substrate by hydrolysis.   | $AB + H_2O \rightarrow$<br>$AOH + BH$  | Lipase, amylase, peptidase          |
| <b>EC 4<br/>Lyases</b>          | Non-hydrolytic addition or removal of groups from substrates. C-C, C-N, C-O or C-S bonds may be cleaved.                  | $RCO_2COOH \rightarrow$<br>$RCO_2H + CO_2$   | Decarboxylase                       |
| <b>EC 5<br/>Isomerases</b>      | Intramolecule rearrangement, i.e. Isomerization changes within a single molecule.   | $AB \rightarrow BA$  | Isomerase, mutase                   |
| <b>EC 6<br/>Ligases</b>         | Join together two molecules by synthesis of new C-O, C-S, C-N or C-C bonds with simultaneous breakdown of ATP.            | $X + Y + ATP \rightarrow$<br>$XY + ADP + P_i$  | Synthetase                          |

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EC-Number Enzyme Name Organism Protein Full text Advanced Search

Search Display 10 entries

Latest BRENDA update 12/2007

| Nomenclature  | Reaction & Specificity  | Functional Parameters  |
|---|---|--|
| Enzyme Names<br>EC Number<br>Common/ Recommended Name<br>Systematic Name<br>Synonyms<br>CAS Registry Number | Pathway<br>Catalysed Reaction<br>Reaction Type<br>Natural Substrates and Products<br>Substrates and Products<br>Substrates<br>Natural Substrate<br>Products | Km Value<br>Ki Value<br>pI Value<br>Turnover Number<br>Specific Activity<br>pH Optimum<br>pH Range<br>Temperature Optimum<br>Temperature Range |
| Isolation & Preparation   | Natural Product<br>Inhibitors<br>Cofactors<br>Metals/Ions<br>Activating Compounds<br>Ligands  | Organism-related information   |
| Purification<br>Cloned<br>Renatured<br>Crystallization  |   | Organism<br>Source Tissue<br>Localization<br>Protein-Specific Search   |

**EC Explorer:**  
 Here you can get an overview on the different EC classes, subclasses etc..  
 You have the option to search or browse the information for the EC number you are looking for.

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1 Oxidoreductases  
2 Transferases  
3 Hydrolases  
4 Lyases  
5 Isomerases  
6 Ligases

EC Explorer options:  
- Search  
- Browse (Search through a directory tree of files)

In the **Search** mode BRENDA results are shown and in the **Browse** mode entries of the enzyme database ExplorEnz [www.enzyme-database.org](http://www.enzyme-database.org) are shown.

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**Download options:**

- Download sequences with E.C. number X. in fasta format
- Download sequences with E.C. number X. as a tabstop separated version
- Download 1652 PDB numbers (EC X.) as a tabstop separated file

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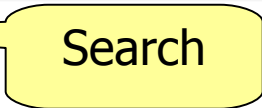
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Please use **AND** or **OR** in combination with **NOT** to refine you query

|                     |                                     |             |  |
|---------------------|-------------------------------------|-------------|--|
| EC number           | <input checked="" type="checkbox"/> | begins with |  |
| Common name         | <input checked="" type="checkbox"/> | contains    |  |
| Reaction            | <input checked="" type="checkbox"/> | contains    |  |
| Systematic name     | <input type="checkbox"/>            | contains    |  |
| Comment             | <input type="checkbox"/>            | contains    |  |
| CAS registry number | <input type="checkbox"/>            | contains    |  |
| Synonyms            | <input type="checkbox"/>            | contains    |  |
| History             | <input type="checkbox"/>            | contains    |  |

include  class (x)  subclass (xx)  sub-subclass (xxx)  serial number (xxxx)

show 10 results

**Search fields:**

- EC number
- Common name
- Reaction

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Please use **AND** or **OR** in combination with **NOT** to refine you query

EC number  contains  
Common name  contains  
Reaction  contains  
Systematic name  contains  
**exact**  
Comment  begins with  
CAS registry number  ends with  
Synonyms  use \* as joker  
History  not  
 not like  
 sounds like

include  class (x)  subclass (x.x)  sub-subclass (x.x.x)  serial number

show 10

**Search modes:**

- contains
- exact
- begins with
- ends with
- use \* as a joker
- not
- not like
- sounds like

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? Please use **AND** or **OR** in combination with **NOT** to refine you query

|                     |                                     |             |                      |
|---------------------|-------------------------------------|-------------|----------------------|
| EC number           | <input checked="" type="checkbox"/> | begins with | <input type="text"/> |
| Common name         | <input checked="" type="checkbox"/> | contains    | <input type="text"/> |
| Reaction            | <input checked="" type="checkbox"/> | contains    | <input type="text"/> |
| Systematic name     | <input type="checkbox"/>            | contains    | <input type="text"/> |
| Comment             | <input type="checkbox"/>            | contains    | <input type="text"/> |
| CAS registry number | <input type="checkbox"/>            | contains    | <input type="text"/> |
| Synonyms            | <input type="checkbox"/>            | contains    | <input type="text"/> |
| History             | <input type="checkbox"/>            | contains    | <input type="text"/> |

include  class (x)  subclass (xx)  sub-subclass (xxx)  serial number (xxxx)

show 10 results

Choose, if searching includes:

- class,
- subclass,
- sub-subclass,
- serial number

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**?** Please use **AND** or **OR** in combination with **NOT** to refine you query

EC number  contains 4.1.1.1 subset: 11

Common name  contains

Reaction  contains

Systematic name  contains

Comment  contains

CAS-registry number  contains

Synonyms  contains

History  contains

include  class (x)  subclass (xx)  sub-subclass (xxx)  serial number (xxxx) intersection: 0

10 results

1-10 of 11 results [of 2 pages] change to page no.

| EC       | Common name                    | Reaction   |
|----------|--------------------------------|--|
| 4.1.1.19 | arginine decarboxylase         | L-arginine = agmatine + CO <sub>2</sub>                              |
| 4.1.1.18 | lysine decarboxylase           | L-lysine = cadaverine + CO <sub>2</sub>                              |
| 4.1.1.17 | ornithine decarboxylase        | L-ornithine = putrescine + CO <sub>2</sub>                           |
| 4.1.1.16 | hydroxyglutamate decarboxylase | 3-hydroxy-L-glutamate = 4-amino-3-hydroxybutanoate + CO <sub>2</sub> |
| 4.1.1.15 | glutamate decarboxylase        | L-glutamate = 4-aminobutanoate + CO <sub>2</sub>                     |
| 4.1.1.14 | valine decarboxylase           | L-valine = 2-methylpropanamine + CO <sub>2</sub>                     |
| 4.1.1.13 | 4.1.1.13                       |  |
| 4.1.1.12 | aspartate 4-decarboxylase      | L-aspartate = L-alanine + CO <sub>2</sub>                            |
| 4.1.1.11 | aspartate 1-decarboxylase      | L-aspartate = β-alanine + CO <sub>2</sub>                            |
| 4.1.1.10 | 4.1.1.10                       |  |

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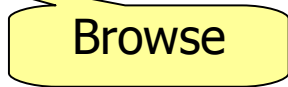
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  - 4.2 Carbon-oxygen
  - 4.3 Carbon-nitrogen lyases
  - 4.4 Carbon-sulfur lyases
  - 4.5 Carbon-halide lyases
  - 4.6 Phosphorus-oxygen lyases
  - 4.99 Other lyases
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class

subclass

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    - 4.1.1 Carboxy-lyases
    - 4.1.2 Aldehyde-lyases
    - 4.1.3 Oxo-acid-lyases
    - 4.1.99 Other carbon-carbon lyase
  - 4.2 Carbon-oxygen lyases
  - 4.3 Carbon-nitrogen lyases
  - 4.4 Carbon-sulfur lyases
  - 4.5 Carbon-halide lyases
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sub-subclass

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    - 4.1.1 Carboxy-lyases
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      - 4.1.1.2 oxalate decarboxylase
      - 4.1.1.3 oxaloacetate decarboxylase
      - 4.1.1.4 acetoacetate decarboxylase
      - 4.1.1.5 acetolactate decarboxylase
      - 4.1.1.6 aconitate decarboxylase
      - 4.1.1.7 benzoylformate decarboxylase
      - 4.1.1.8 oxalyl-CoA decarboxylase
      - 4.1.1.9 malonyl-CoA decarboxylase
      - 4.1.1.10 created 1961, deleted 1972
      - 4.1.1.11 aspartate 1-decarboxylase
      - 4.1.1.12 aspartate 4-decarboxylase
      - 4.1.1.13 created 1961, deleted 1972
      - 4.1.1.14 valine decarboxylase
      - 4.1.1.15 glutamate decarboxylase
      - 4.1.1.16 hydroxyglutamate decarboxylase
      - 4.1.1.17 ornithine decarboxylase
      - 4.1.1.18 lysine decarboxylase
      - 4.1.1.19 arginine decarboxylase
      - 4.1.1.20 diaminopimelate decarboxylase
      - 4.1.1.21 phosphoribosylaminoimidazole carboxylase
      - 4.1.1.22 histidine decarboxylase
      - 4.1.1.23 orotidine-5'-phosphate decarboxylase
      - 4.1.1.24 aminobenzoate decarboxylase
      - 4.1.1.25 tyrosine decarboxylase
      - 4.1.1.26 created 1961, deleted 1972
      - 4.1.1.27 created 1961, deleted 1972
      - 4.1.1.28 aromatic-L-amino-acid decarboxylase
      - 4.1.1.29 sulfinoalanine decarboxylase
      - 4.1.1.30 pantothenoylcysteine decarboxylase
      - 4.1.1.31 phosphoenolpyruvate carboxylase

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Details: [4.1.1.1 pyruvate decarboxylase](#)

|                      |   |
|----------------------|---|
| EC number:           | 4.1.1.1   |
| Accepted name:       | pyruvate decarboxylase  |
| Reaction:            | a 2-oxo acid = an aldehyde + CO <sub>2</sub>  |
| Other name(s):       | α<br>-carboxylase<br>pyruvic decarboxylase<br>α<br>ketoacid carboxylase<br>2-oxo-acid carboxy-lyase |
| Systematic name:     | 2-oxo-acid carboxylase (aldehyde-forming)   |
| CAS registry number: | 9001-04-1   |
| Comment:             | A thiamine-diphosphate...   |
| History:             | created 1961  |

The EC numbers are linked to the comprehensive view of all enzyme information (BRENDA).

- Details (Enzyme explorer, IUBMB):
- EC number
  - Accepted name
  - Reaction
  - Other name(s)
  - Systematic name
  - CAS registry number
  - History

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