

Application of enzyme in organic chemistry assignment



Symmetric synthesis? Cofactor free or cofactor-dependent enzymes I

Organic chemistry is the science concerned with all aspects of organic compounds. It is a sub discipline within chemistry involving the scientific study of the structure, properties, composition, reactions, and preparation (by synthesis or by other means) of carbon-based compounds, hydrocarbons, and their derivatives. These compounds may contain any number of other elements, including hydrogen, nitrogen, oxygen, the halogens as well as phosphorus, silicon, and sulfur.

Organic synthesis is the methodology of their preparation. Organic compounds are molecules that contain carbon and hydrogen. All living things contain these organic molecules: carbohydrates, lipids, proteins, and nucleic acids. These molecules are often called macromolecules because they may be very large, containing thousands of carbon and hydrogen atoms and because they are typically composed of many smaller molecules bonded together. Enzymes are proteins that catalyze that is increase the rates of chemical reactions.

In enzymatic reactions, the molecules at the beginning of the process, called substrates, are converted into different molecules, called products. Almost all chemical reactions in a biological cell need enzymes in order to occur at rates sufficient for life. Since enzymes are selective for their substrates and speed up only a few reactions from among many possibilities, the set of enzymes made in a cell determines which metabolic pathways occur in that cell. The mechanism of enzyme in synthesis are: 1. Lock and key, developed by E. Fisher in 1894.

Assumes rigid structure 2. Induced fit, Ashland Jar. In late ass, enzyme can change its conformation 3. Desolation theory, 1986 MS Dewar – like gas phase RSN. Substrate replace H₂O molecules from active site, then formal gas RSN takes place. In solution approach, this process is impeded by H₂O. 4. Salvation Substitution theory, 1989 Harsher, Aquavit, and Creighton say no, energetically unfavorable. Solvent is displaced by another environment provided by active site of enzyme The first application of enzymes in organic chemistry date back almost a century.

As early as 1908, Rosenthal used a hydroxylation Ease-containing extract for the preparation of (R)-nondenominational from evenhandedly and hydrogen cyanide (HCl). Since then, an increasing number of enzymes have been identified, and their use in organic chemistry has steadily increased in parallel. In particular, since the mid-sass the number of reports of enzymes utilization-which at present stands at more than 13000-as well as the number of industrialized enzyme-related processes has increased substantially.

Several reasons can be identified for this development, including: * More organic chemists accept the use to bucolically * Biostatistics may save additional reaction steps compared to organic synthesis Enzymes are often highly chemo-, region-, and stereoscopic * Biostatistics is a safer and 'greener' technology * There is a substantially increased demand for optically pure compounds, specially for pharmaceutical applications * The production of biostatistics has been made easier due to the development of recombinant expression systems * Many enzymes are available

commercially The most important application of enzymes in organic
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chemistry is in the synthesis of optically active compounds. This is due to the excellence emanation- and stereotypically shown by many enzymes, which makes them attractive alternatives to asymmetric organic syntheses or reactions starting from the chiral pool. In addition, enzymes are used for the synthesis of chemicals lacking a chiral center.

Prominent examples are the production of creamily of about 100000 tons per annum scale and of inactivation (both using nitrite hydrates) and the synthesis of esters, for use in cosmetic application. In the following examples, the applications of biostatistics in organic chemistry are organized based on the division suggested by the Enzyme Commission. Thus, a brief introduction, the reaction principle and selected examples are provided for each enzyme class. Note that with a few exceptions only those reactions using isolated enzymes are included. During the past two decades, the application of enzymes in organic synthesis has emerged as an extremely broad field, and a wide variety of types of enzymes and examples of their use in commentating syntheses has been described.

Enzymatic synthesis of optically active compounds can begin from kinetic resolution of racemes mixtures, or can be performed via an asymmetric synthesis. Kinetic resolution will only lead to a maximum yield of 50% unless the unwanted mentioned is reclaimed. This can be achieved using a racemes, or by chemical recombination. If kinetic resolution can recombination are performed simultaneously, the process is named dynamic kinetic resolution. Asymmetric synthesis allows the production of one mentioned at up to 100% yield. Examples of this include the disintermediation of

progesterone's compounds using, for example an alcohol dehydrogenate in <https://assignbuster.com/application-of-enzyme-in-organic-chemistry-assignment/>

the reduction of a ketene or the formation of a choral compound by, for example, C-C bond formation using a Ease.

The inaccessibility is frequently used to estimate the selectivity of an enzyme in a kinetic resolution. The (R)/(S)- nomenclature is recommended for the assignment of absolute configurations. In the scientific literature on amino acids and sugars, the D, l-nomenclature is still the moon practice and is therefore used where the biostatistics of these compounds are treated in greater detail. SEDUCTRESSES Although it is estimated that about 25% of all presently known enzymes are seductresses, the most useful enzymes for preparative applications are dehydrogenates or reeducates. The mono- and diagnoses, oxides and peroxides also belong to this class.

All of these enzymes require NADIA or NADIA as a cofactor and due to this cofactor-dependency, recycling is necessary on order to conduct cost-detective processes, unless the reaction is performed in a whole-cell system. Currently, most seductresses are not used as isolated biostatistics and are not covered extensively in the following sections. OXYGENATES Oxygenates are enzyme which introduce either one (monocotyledon's) or two (diagnoses) oxygen atoms into their substrates. Typically, BAD and NADIA serve as reduction equivalents via electron-transfer proteins such as reeducates. The major interest in these enzymes for organic synthesis is due to their high-region and stereotypically.

Moreover, many of these reactions are difficult to perform by chemical methods, especially if non-activated hydrocarbon moieties need to be ransomed. Despite the fact that numerous oxygenates are known, their

application in organic aesthetes is limited due to a number of problems. These include limited availability of sufficient amount of enzyme, insufficient stability and often very low specific activity, requirement of costly cofactors and the presence of a reeducates. Many enzymes are also membrane-bound, which further limits their application. Some of the problems were overcome by the use of whole-cell systems, preferentially with overextension of the oxygenate. Diagnoses have been only used in whole- cell systems, and are not covered here.