CONCEPT: ENZYME CLASSIFICATION

Common Naming

- Unlike other compounds, enzymes are named based on their _____ rather than their _____.
  - □ Modify the ending of the substrate name by adding _____.

substrate-modifier

EXAMPLE: If chitin, a polysaccharide, represents the substrate in a catalyzed reaction, using the common rule determine the name of its enzyme.

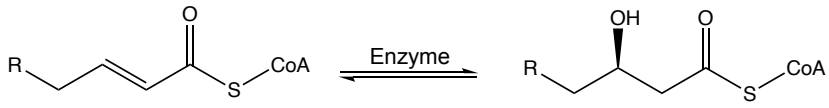
a) Chitintetase b) Chitinase c) Chitinose d) Chitinopsin

Systematic Naming

- For enzymes, the _____ attached and the _____ of catalyzed reaction can also determine the name.

substrate-enzyme class

EXAMPLE: Hydratase is a class of enzyme that catalyzes the addition of water to a molecule. What would be the name of the enzyme used in the following reaction?



Enoyl-CoA 3-hydroxyacyl-CoA

a) Enoyl-CoA dehydratase b) 3-hydroxyacyl-CoA hydratase

c) Enoyl-CoA hydratase d) Phosphoglycerate dehydratase

Six Main Classifications

- Enzymes can be divided into ____ main classes based on the type of _____ catalyzed.
  - □ Classes are further divided into subclasses, based on the type of _____.

__xidoreductases __ransferases __ydrolases __somerases __yases __igases

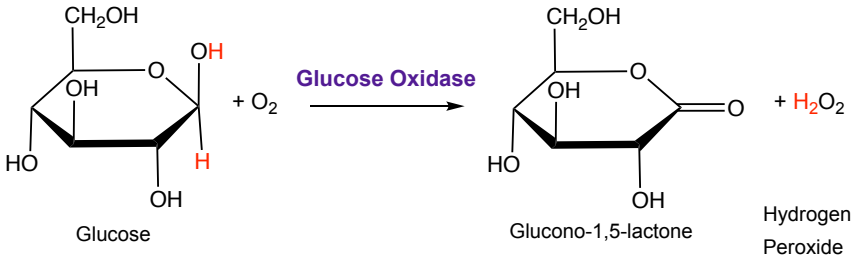
Help reactions get…

Over → The → HILL

CONCEPT: ENZYME CLASSIFICATION

1) Oxidoreductases

- Catalyze oxidation-reduction (redox) reactions by transferring _____ between molecules.
  - □ **Oxidation:** loss of ____ or gain of ____.
  - □ **Reduction:** gain of ____ or loss of ____.
- **Subclasses:**
  - a) Oxidases: _____ a substance.
  - b) Reductases: _____ a substance.



EXAMPLE: Which of the following is an indicator that a reaction is catalyzed by an oxidoreductase?

a) Loss of a function group

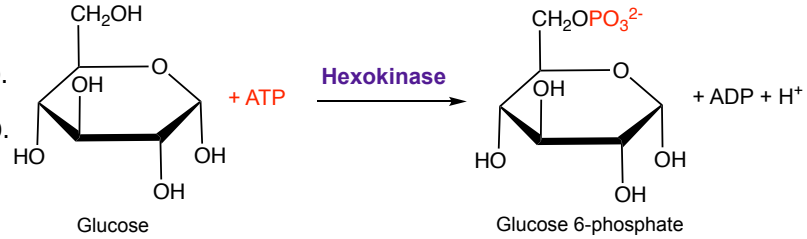
b) Loss of H_2O

c) Loss of a hydrogen

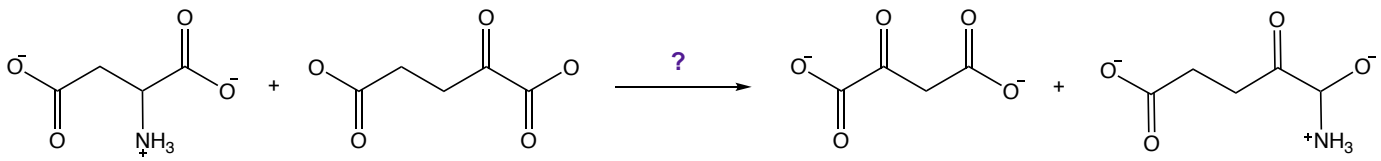
d) Loss of a substance

2) Transferases

- Catalyze transfer of _____ groups between molecules.
- **Subclasses:**
  - a) Transaminases: transfer an _____ group.
  - b) Kinases: transfer a _____ group.



EXAMPLE: Identify the type of enzyme subclass from the following reaction.



CONCEPT: ENZYME CLASSIFICATION

3) Hydrolases

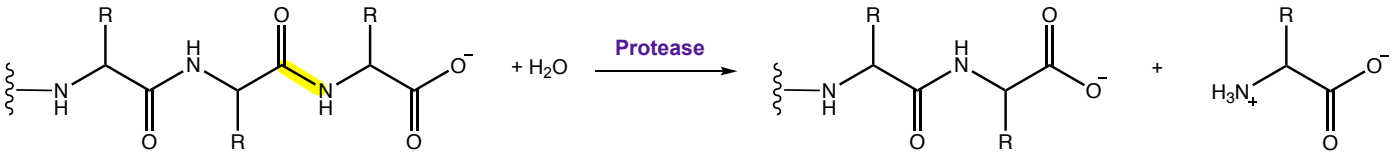
- Catalyze _____ reactions: breaks bonds by adding _____.
- **Subclasses:**

a) Lipases: hydrolyze ester bonds in _____.

b) Proteases: hydrolyze _____ into peptides and amino acids.

c) Nucleases: hydrolyze _____ and _____ into nucleic acids.

d) Phosphatases: hydrolyze _____-ester bonds.



Polypeptide Peptide Amino acid

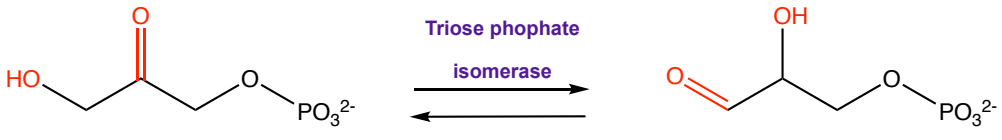
EXAMPLE: Which subclass of hydrolases is responsible for breakdown of triglycerides and other lipids into free fatty acids and glycerol?

a) nucleases c) proteases

b) lipases d) phosphatases

4) Isomerases

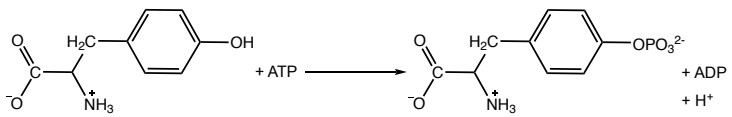
- Catalyze creation of an _____ by shifting functional groups to different _____ within the same molecule.



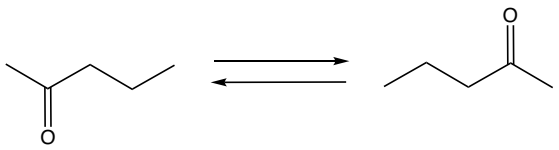
Dihydroxyacetone phosphate Glyceraldehyde 3-phosphate

EXAMPLE: Which of the following represents a reaction of isomerase?

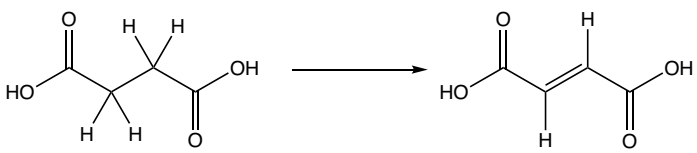
a)



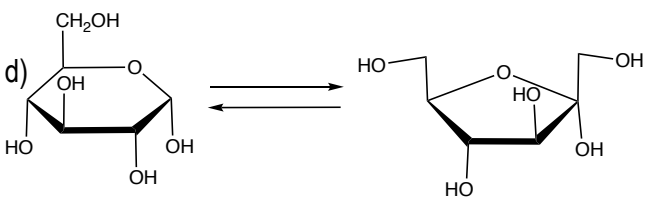
b)



c)



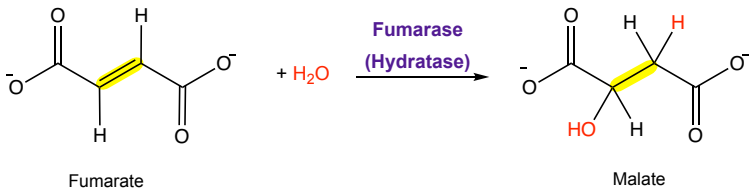
d)



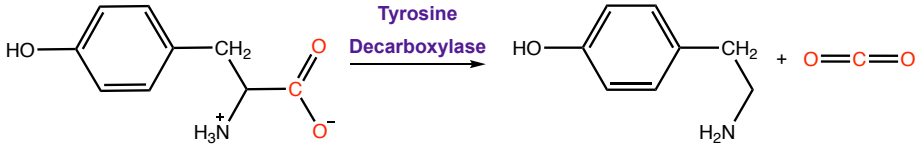
CONCEPT: ENZYME CLASSIFICATION

5) Lyases

- Catalyze _____ or _____ of functional groups without hydrolysis or redox reactions.
  - □ Addition and removal of groups _____ and _____ double bonds respectively.
- **Subclasses:**
  - a) Dehydratases: remove _____.
  - b) Hydratases: add H_2O.
  - c) Deaminases: remove _____.
  - d) Decarboxylases: remove _____.



Fumarate Malate



Tyrosine Tyramine

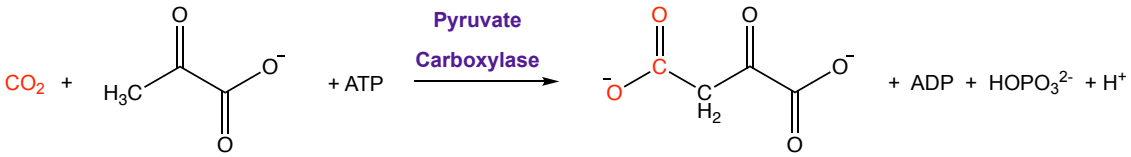
EXAMPLE: Which of the following subclasses of enzyme is responsible for catalyzing reactions where a molecule undergoes non-hydrolytic cleavage, forming multiple molecules, without addition or removal of water?

a) phosphatase c) dehydratase

b) deaminase d) transaminase

6) Ligases

- Catalyze _____ bonding of 2 molecules together with the use of _____.
- **Subclasses:**
  - a) Synthetases: form a bond between ___ molecules.
  - b) Carboxylases: form a bond between _____ and another molecule.

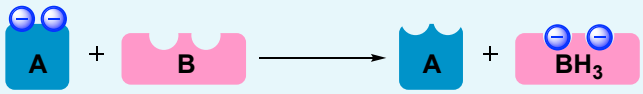
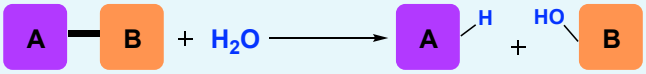
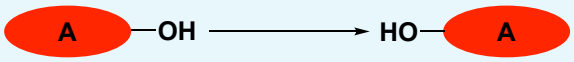
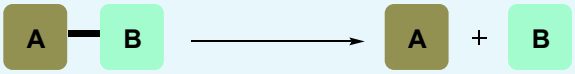


Pyruvate Oxaloacetate

EXAMPLE: During protein synthesis, _____ enzyme catalyzes the attachment of amino acid to a corresponding transfer RNA molecule through an ester bond.

CONCEPT: ENZYME CLASSIFICATION

Summary of 6 Enzyme Classes

Enzyme Class	Reaction Catalyzed	Description
___xidoreductases		Redox reaction via transfer of _____.
___ransferases		_____ of functional groups.
___ydrolases		Breaks bonds by adding _____.
___somerases		Rearranges atoms within a molecule to create an _____.
___yases		Breaks/forms bonds _____ redox reactions or H_2O.
___igases		Uses energy to covalently _____ molecules together.

PRACTICE: Which of the following could be the possible name of enzyme that involves the transference of a phosphate group between substrates?

a) Tyrosine Kinase

b) Cysteine Isomerase

c) Cellulase

d) Glutamate deaminase

PRACTICE: Which of the following enzyme name and function is incorrectly matched?

a) Glucose Oxidase – Catalyzes the oxidation of the glucose molecule.

b) Sucrase – Catalyzes the hydrolysis of sucrose.

c) Deaminase – Catalyzes the addition of NH_3 to a substrate.

d) Pepsin – Catalyzes the digestion of proteins from food that is consumed.

CONCEPT: ENZYME CLASSIFICATION

PRACTICE: Which of the following statements is true of ethanal reductase?

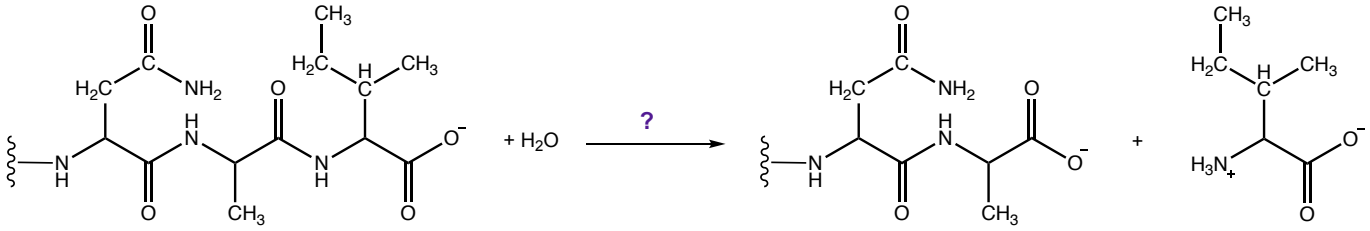
a) It represents a hydrolase that acts upon the ethanol substrate to oxidize it.

b) It represents an oxidoreductase that acts upon the ethanal substrate to oxidize it.

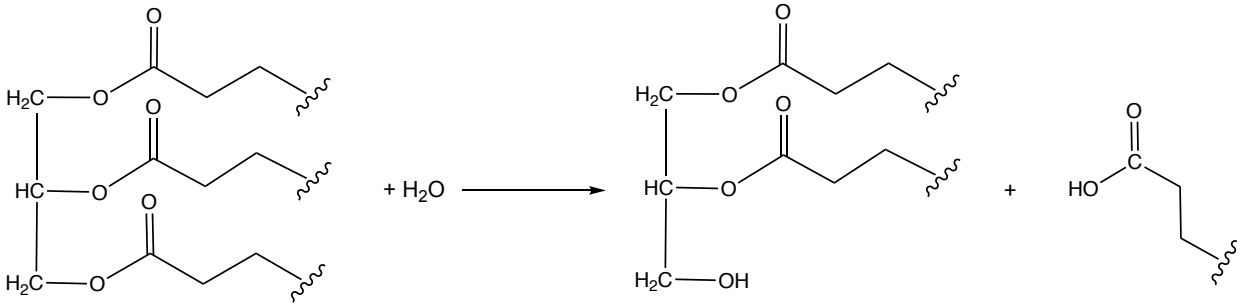
c) It represents a lyase that acts upon the ethanal enzyme to reduce it.

d) It represents an oxidoreductase that acts upon the ethanal substrate to reduce it.

PRACTICE: Identify the class and subclass of an enzyme that catalyzes the following reaction.



PRACTICE: Which of the following catalyzes the given reaction involving a triglyceride?



a) reductase

b) lipase

c) kinase

d) decarboxylase