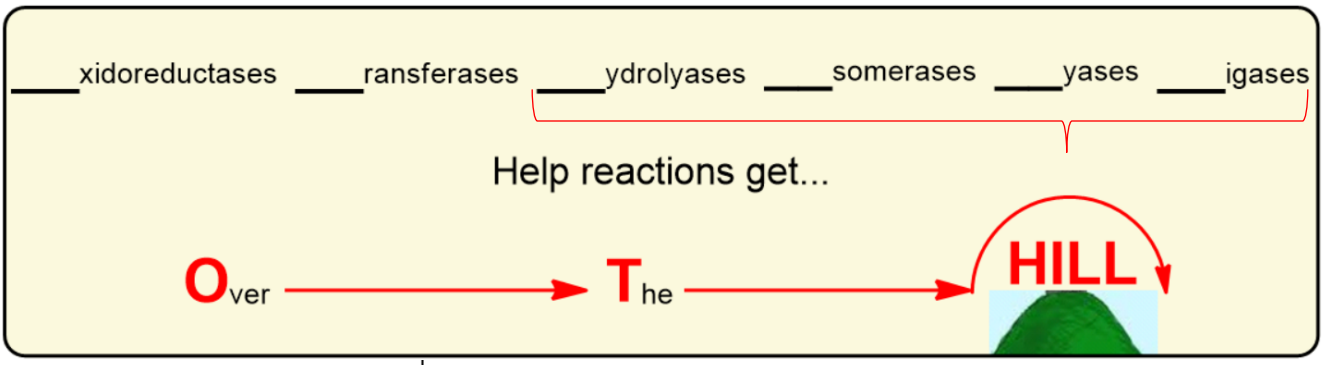
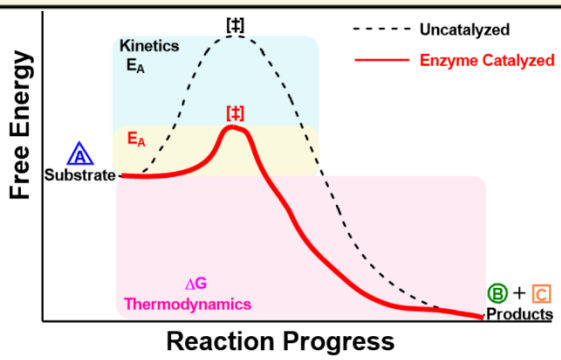
CONCEPT: TYPES OF ENZYMES

Six Major Classes of Enzymes

●Most enzymes fall under one of the _____ major classes:





1) Oxidoreductases

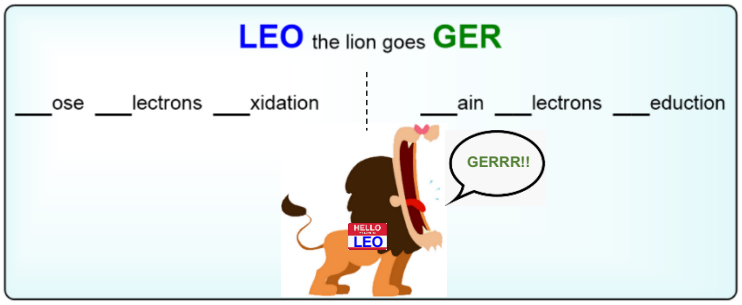
●_____: catalyze *oxidation-reduction* (redox) reactions by transferring _____ between molecules.

□ Recall: substances that *lose* electrons are _____ & those that *gain* electrons are _____.

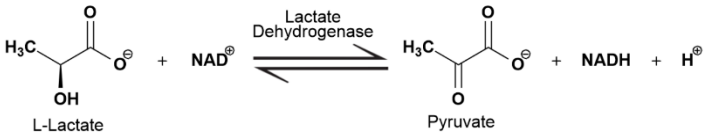
□ Electrons *typically* transferred via H or O atoms.

□ Lactate dehydrogenase (LDH) is an example of an oxidoreductase.

EXAMPLE:



Which molecule is oxidized, and which is reduced?



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

a) Loss of a functional group.

b) Loss of H_2O.

c) Loss of a hydrogen.

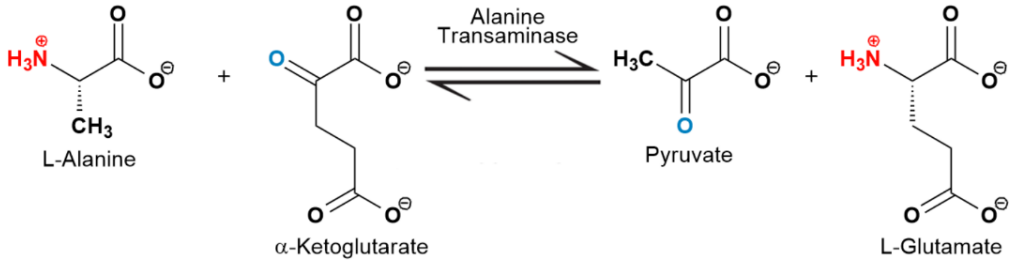
d) Loss of a substrate.

CONCEPT: TYPES OF ENZYMES

2) Transferases

- _____: *transfer* _____ groups between molecules.
  - □ *Aminotransferases* transfer _____ groups.

EXAMPLE:



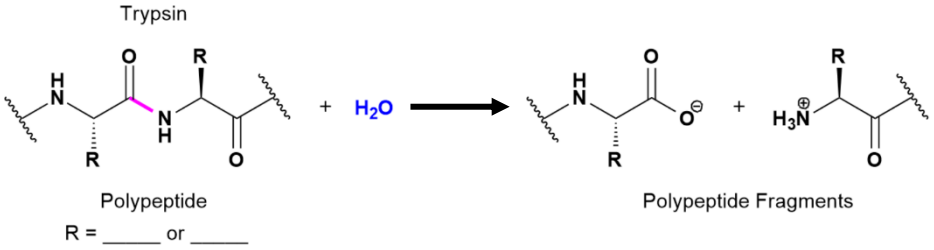
PRACTICE: Kinases add phosphate groups to molecules. Kinases are an example of which class of enzyme?

a) Oxidoreductase.
b) Phosphorylase.
c) Hydrolyase.
d) Transferase.

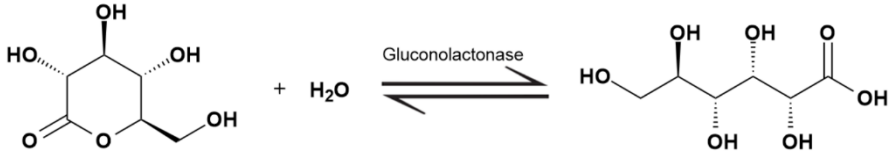
3) Hydrolyases

- _____: breaks bonds by adding H_2O (catalyze _____ reactions).
  - □ Peptidases, lipases, & nuclease respectively hydrolyze _____, _____ & _____ acids.
  - □ Recall: *Trypsin* is an example of a _____.

EXAMPLE:



PRACTICE: Below is a reaction in the oxidative phase of the pentose phosphate pathway catalyzed by the enzyme gluconolactonase. This enzyme would be classified as what type?



a) Transferase.
b) Hydrolyase.
c) Lyase.
d) Isomerase.

CONCEPT: TYPES OF ENZYMES

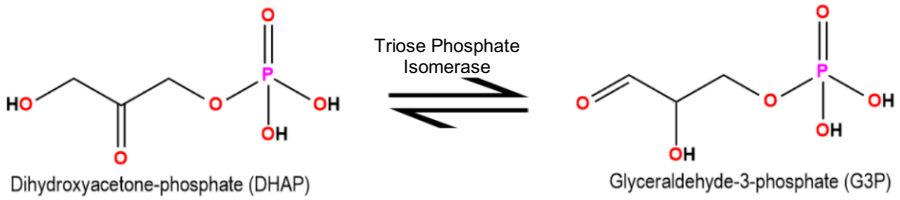
4) Isomerases

●*Isomerases*: create _____ by shifting functional groups to a different location within the same molecule.

□ Recall: *Isomers*: molecules with the _____ chemical formula but different *arrangement* of atoms.

□ *Triose phosphate isomerase* produces an isomer during glycolysis.

EXAMPLE:



PRACTICE: What class of enzyme is required to convert a cis-fatty acid into a trans-fatty acid?

a) Oxidoreductase.
b) Isomerase.
c) Hydrolyase.
d) Lyase.

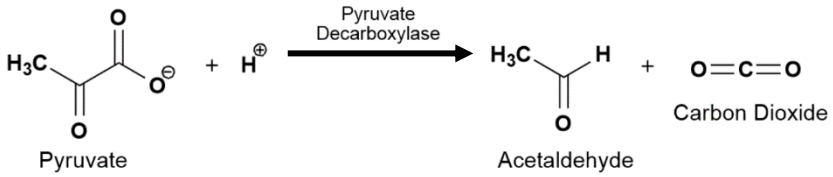
5) Lyases

●_____: forms/breaks bonds (*without* redox reactions or the addition of H_2O) via addition/elimination reactions.

□ Typically creates/removes *double bonds* or *rings* in the process.

□ *Pyruvate decarboxylase* is an example of a lyase.

EXAMPLE:



PRACTICE: Which of the following best describes the function of a lyase enzyme?

a) To facilitate a reaction where two substrates form one product without the use of water.
b) To facilitate a reaction where one substrate forms two products with the use of water.
c) To cleave bonds via the transfer of electrons between molecules.
d) To tell fibs.

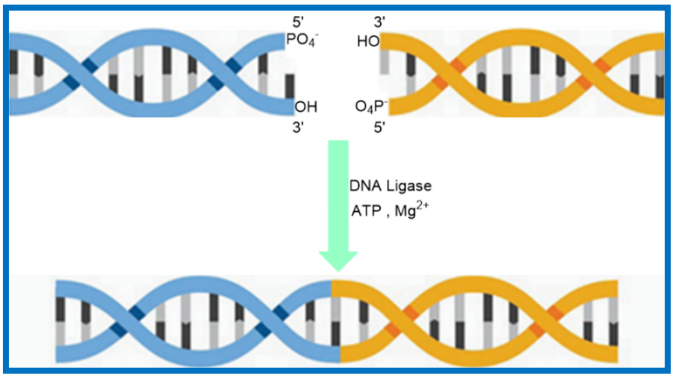
CONCEPT: TYPES OF ENZYMES

6) Ligases

●*Ligases*: uses energy (ex. ATP) to catalyze the ligation (or the _____ joining) of two molecules together.

□ *DNA Ligase* is critical for DNA replication.

EXAMPLE:



PRACTICE: Which of the following is not one of the six internationally accepted classes of enzymes?

a) Hydrolyases.
b) Ligases.
c) Oxidoreductases.
d) Polymerases.
e) Transferases.

Recap of Six Classes of Enzymes

Enzyme Class	Reaction Catalyzed	Description
___xidoreductases	A + B → A + B	Redox reaction via transfer of _____.
___ransferases	A + B → A + B	_____ of functional groups.
___ydrolyases	A–B + H_2O → A–H + HO–B	Breaks bonds by adding _____.
___somerases	A–OH → HO–A	Rearranges atoms within a molecule to create an _____.
___yases	A–B ⇌ A + B	Breaks/forms bonds _____ redox reactions or H_2O.
___igases	A + B + ATP → A–B	Uses energy to covalently _____ molecules together.

CONCEPT: TYPES OF ENZYMES

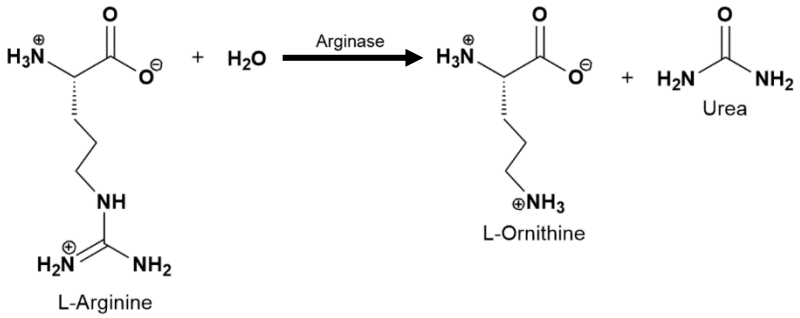
PRACTICE: The presence of an electron acceptor such as NAD^+ indicates which class of enzyme?

a) Oxidoreductase.
b) Isomerase.
c) Hydrolyase.
d) Transferase.

PRACTICE: Digestive enzymes are all examples of which class of enzyme?

a) Ligase. b) Lyase. c) Hydrolyase. d) Transferase.

PRACTICE: The reaction below is catalyzed by the enzyme arginase. What is the classification of this enzyme?



a) Hydrolyase. b) Oxidoreductase. c) Lyase. d) Ligase.

PRACTICE: Which class of enzyme catalyzes a reaction where the chemical formula does not change?

a) Isomerase.
b) Oxidoreductase.
c) Transferase.
d) Ligase.

PRACTICE: What class of enzyme is required to combine two molecules using ATP?

a) Lyase.
b) Transferase.
c) Oxidoreductase.
d) Ligase.