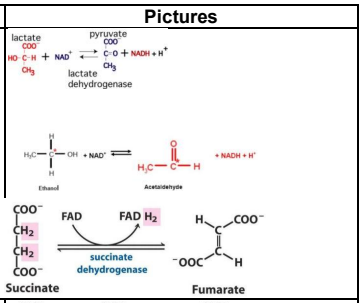
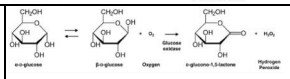
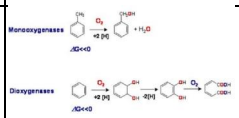
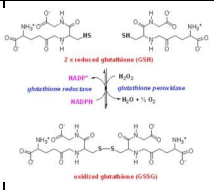
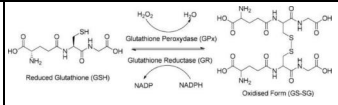
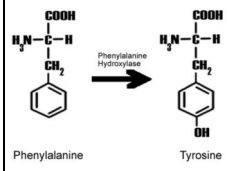
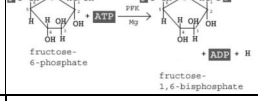
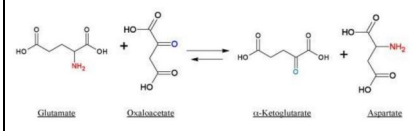
ENZYMES' Classifications Summary

EC1 — OXIDOREDUCTASES: catalysis of redox reactions.

Subtype	Function	clue	Examples	Pictures
Dehydrogenases	Transfer H as hydride (H^-) or hydrogen atoms using **electron-transfer coenzymes**	NAD^+/NADH or FAD/$FADH_2$ or FMN or $NADP^+$	Lactate dehydrogenase alcohol dehydrogenase succinate dehydrogenase	
Oxidases	Transfer H from substrate to oxygen (O_2)	Peroxide(H_2O_2) in the products	Glucose oxidase	
Oxygenases	Oxidize substrate by **introducing oxygen** into it	Oxygen becomes part of substrate(monoxygenation and dioxygenation)	Monooxygenase (Lactate-2-monooxygenase) Dioxygenase (Tryptophan 2,3-dioxygenase)	
Peroxidases	Oxidize substrate using hydrogen peroxide	H_2O_2 is a substrate	Glutathione peroxidase (cysteine related)	
Reductases	Catalyze reduction of substrate	Reduction reactions(hydrogen addition)	Glutathione reductase	
Hydroxylases	Add a hydroxyl group to substrate	Product gains OH	Phenylalanine Hydroxylase (Remember the phenylketonuria disease)	

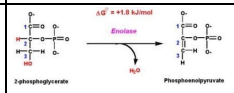
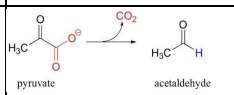
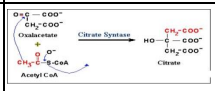
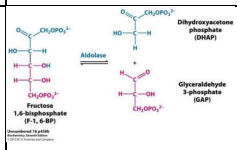
EC2 — TRANSFERASES: changing the place of the functional groups

Type	Function	clue	Pictures
Kinases	ATP's Phosphate → transferred to substrate	Substrate becomes phosphorylated	
Transaminases	Amino group ($-NH_2$) Amino acid + keto acid ⇌ keto acid + amino acid	NH_2 moves from amino acid to keto acid	

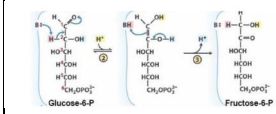
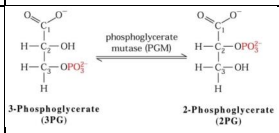
EC3 — HYDROLASES : Bond breaking by H_2O hydrolysis

Proteases ,Glycosidase, Lipases, Esterases& Phosphatase.

EC4 — LYASES: cleave C-C, C-O, C-N, and other bonds by means other than Hydrolysis oxidation & add groups to double bonds without hydrolysis our doctor said any enzyme u can't classify it will probably be a lyase because it is a broad rangeof enzymes.

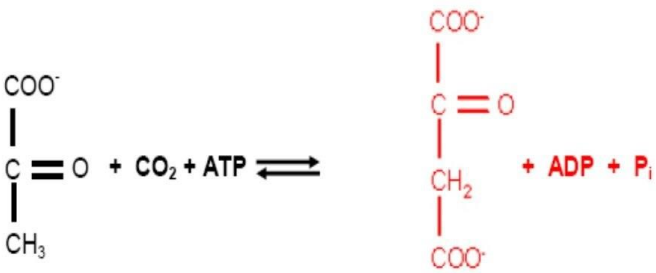
Subtype	What happens	Recognition clue	Example	Pictures
Dehydrase	H_2O removed from substrate → double bond formation	H_2O → C=C forms	Enolase	
Decarboxylase	Carboxyl group is replaced by H (CO_2) release	Carboxyl group removal	Pyruvate decarboxylase	
Synthase	Addition of molecule to double bond (formation of C–C bond)	Bond formation without ATP-	Citrate synthase	
Aldolase	Fructose-1,6-bisphosphate → DHAP + glyceraldehyde-3-phosphate	Glycolysis cleavage	----------	

EC5 — ISOMERASES: changing the bond pattern(Intramolecular rearrangement)

Type	What changes?	Example	Pictures
Isomerase	Arrangement of bonds & atoms within a compound	Phosphoglucoisomerase: Glu-6-phosphate⇌ fru-6-phosphate	
Mutase	Reposition of phosphate within same molecule in a different atom	Phosphoglycerate mutase: Glycerate-3-phosphate→Glycerate-2-phosphate	

EC6 — LIGASES: join C-C, C-O, C-N, C-S, and C-halogen bonds by consumption of a high-energy compound such as ATP.

Synthetase: derives energy from the cleavage of high-energy phosphate bonds.



Non categorized comparisons

- ## KINASE vs Ligase

Feature	Kinase(Transferase)	Ligase
Purpose of ATP	Donates phosphate group	Provides energy for joining
phosphate	Phosphate becomes part of substrate	Free phosphate is produced
Phosphorylation	YES	NO
Function	ATP for P transfer	ATP for energy for bond formation

- ## Synthase vs Synthetase

Feature	Synthetase	Synthase
Purpose	Uses The cleavage energy to form once	Forms bonds by the addition of molecules
ATP need	Needs ATP for energy	No need
Class	Ligase	Lyase

- ## EXCEPTIONS

Type	Description	Function
Abzyme	Antibody(immunoglobulin) acting as an enzyme, produced against transition-state analogs	Mimics enzyme active-site binding to transition state(cocaine esterase)
Ribozyme	RNA molecule acting as enzymes	RNA splicing and catalysis in ribosomes

Quiz time,,,,,,Good Luck👍

https://share.gemini.google/ie17rsFOZGPN

All the info. in this file is based on my perception of Dr. Mamoun's lecture and slides.