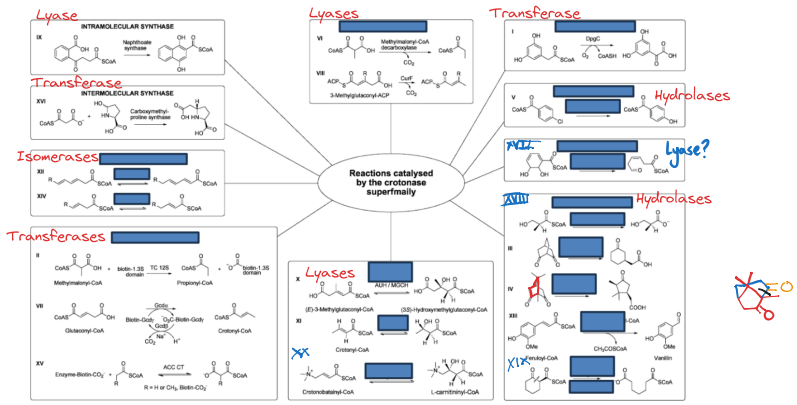
BIOC 425 Assignment 1

Question 1

Crotonase Family

Part A



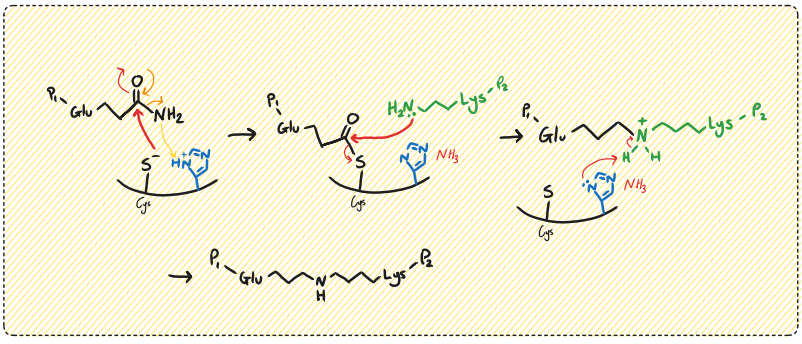
Part B

I believe that the family of lyases that are able to add water over a double bond are very important for synthesizing chiral molecules. Synthetic chemists could use this technique to activate a specific carbon, and by controlling the next reaction, the enzymatically established chiral centre could drive the reaction to a desired product.

Question 2

a) Reaction Mechanism

Transglutamination occurs by crosslinking of a glutamine side chain to a lysine side chain at the terminal amide and amino groups - respectively. This occurs by the acyl transfer of glutamine to a cysteine residue in the transglutaminase, and then the subsequent removal of the amide NH2 & protonation by histamine to NH3. Then, the resultant thioester provides an ample leaving group for attack of the lysine to the ipso carbon. This produces a peptide bond, thereby fusing two proteins together.



b) Industrial Processes

What industrial processes utilize transglutaminase?

Are there any other applications for its use?
It is frequently used in "molecular gastronomy" to transform some food into another which has the same taste, but different texture. This is done due to the fact that cross-linking proteins in food can have many different effects on the structure of it, but the chemical composition remains the same, so it still tastes the same.

c) Is the enzyme used in a kinetically or equilibrium controlled process?

The enzyme is used in a kinetically controlled process because it forms an acyl-enzyme intermediate, as shown in

d) EC Numbers

Transglutaminase (EC 2.3.2.13)

- **Class** → Transferase;
- **Subclass** → Transferred Group: Acyl group;
- **Subsubclass** → More information: Aminoacyl group;
- **Serial Number** → protein-glutamine gamma-glutamyltransferase
  Source

Question 3

BLAST

After BLASTing, I aligned sequences within 100% to 35% homology.
This included:

- Nitrosuccinate lyase
  - *S. cremeus*
  - *S. davaonensis*
- 3-carboxymuconate lactonizing enzyme
  - *B. diazoefficiens*
  - *P. aeruginosa*
  - *P. putida*
  - *A. baylyi*

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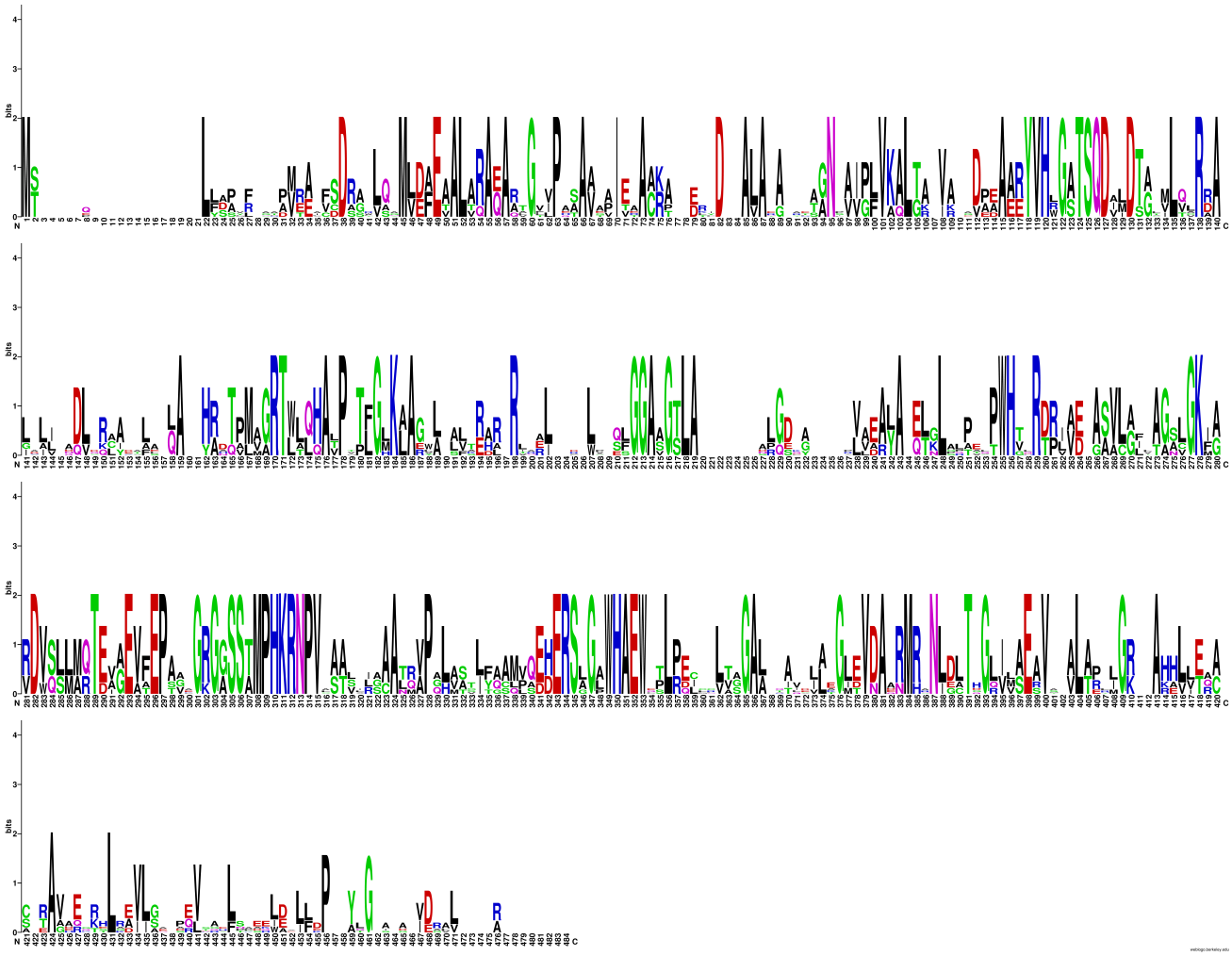

Oligonucleotides:

308-315

MPHKRNPV

ATG CCN CAY AAR CGN AAY CCN GUN

349-353

WHAEW

UGG CAY GCN GAR UGG