Problem 1: Without referring to the figure provided, draw a mechanism for the retroaldol reaction of fructose-1,6-bisphosphate with aldolase. A tyrosine residue acts as the general base.

Problem 2: What are the products of the retroaldol reaction of the enzyme transaldolase when it catalyzes the reaction of sedoheptulose-7-P?

Problem 3: For each reaction, draw the product of a decarboxylation reaction, and tell which cofactor is necessary.
Problem 4: Oxaloacetate can be decarboxylated without a cofactor. Which carboxylate group will be lost? Draw the product of the reaction:

With no cofactor, only the beta-carboxyl group can be lost

\[ 	ext{Oxaloacetate} \rightarrow \text{product} \]

\[
\begin{align*}
\text{O} & \quad \beta \\
\text{O} & \quad \alpha \\
\text{O} & \quad \alpha \\
\text{O} & \quad \beta
\end{align*}
\]

Decarboxylation

\[ \text{CO}_2^+ \]

\[ \text{Product} \]
Problem 5: Fill in the mechanistic arrows and resonance arrows for the formation of acetaldehyde from pyruvate. In words, explain the role of TPP. Why would the reaction be very slow without TPP?

TPP stabilizes the negative charge that forms when the decarboxylation happens. It stabilizes by resonance. Without TPP, an unstable charge would form:

Too unstable!