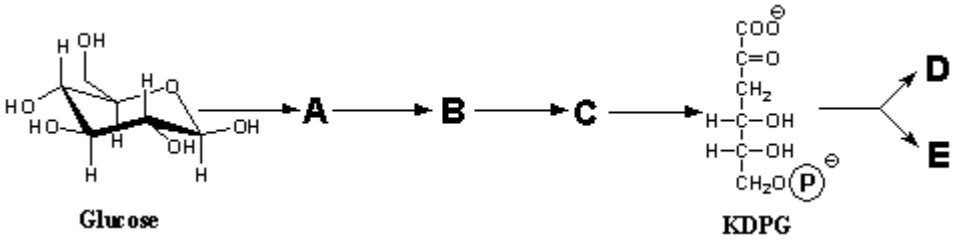
CHEM-527 Introductory Biochemistry
Alternatives to Glycolysis

The gram negative bacteria *Pseudomonas fluorescens* oxidizes glucose by a pathway different from glycolysis in its initial steps. A key intermediate in this pathway is 2-keto-3-deoxy-6-Phosphogluconate (KDPG) which is cleaved by KDPG aldolase in a reaction analogous to that of fructose 1,6-diphosphate aldolase in glycolysis. The products of this reaction are metabolized by reactions familiar to you. The structure of KDPG is given below.



1 What are the products (D and E) of the KDPG-aldolase reaction? How are they formed mechanistically?

2. What amino acid is likely to be at the active site of KDPG-aldolase? How could this residue be labeled specifically?

3. If l-^{14}C-glucose forms carboxyl-labeled KDPG, where would the label appear in the end products of fermentation, ethanol and CO_2? Compare this pattern to the glycolytic fermentation of l-^{14}C -glucose.

4. One ATP is used up in the formation of KDPG from glucose. How many net ATPs are generated in the conversion of glucose to ethanol and CO_2 by this pathway? Compare this to glycolysis. Which is more efficient?

5. Make an intelligent guess at the intermediates A, B, and C between glucose and KDPG. Indicate the coenzymes, if any, involved in these reactions. [A is an enzyme-bound intermediate]