Problem 3

Recently the production of mesaconate from glucose has been proposed in *E. coli* (Wang et al., 2018). The authors propose knocking out the *ptsG*, *fumA* and *sucA* genes (see biochemical pathway).

A) Given the proposed conversion of glucose to glucose-6P via glucokinase (glucose + ATP → glucose-6P + ADP + Pi), write the overall stoichiometric equation for the conversion of glucose to mesaconate.
B) What is the maximum theoretical yield?
C) Will this process be aerobic or anaerobic?
D) From the several reaction steps, is there any challenge (or opportunity) that you can identify which will need to be addressed?

J. Wang, J. Wang, Y. Tai, Q. Zhang, W. Bai, K. Zhang. 2018. Rerouting carbon flux for optimized biosynthesis of mesaconate in *Escherichia coli*, *Appl. Microbiol. Biotechnol.* 102:7377-7388.