Worksheet: MODELS OF BIOCHEMICAL SYSTEMS [part 1]
(8. May 2012)
Lecture "Computational Systems Biology", Dr. Jürgen Pahle

1) Research the main reactions in the glycolysis pathway. Build a topological / qualitative model.

2) Set up an ordinary differential equation system for the irreversible Michaelis-Menten reaction mechanism $S + E \leftrightarrow ES \rightarrow P + E$

3) Derive the irreversible Michaelis-Menten kinetic function for the reaction system $S + E \leftrightarrow ES \rightarrow P + E$ using the assumption of Briggs-Haldane, i.e. that the concentration of the enzyme/substrate complex *[ES]* stays constant.

4) Navigate to http://www.copasi.org. Download the COPASI software for your computer platform and install it. Have a look at the documentation and make yourself familiar with the software.

5) Input a model for the following reaction system in COPASI, inspect the corresponding ODE, simulate it using the LSODA method for the numerical integration of ODEs and generate a plot for the resulting time course.

Reaction 1: $R \rightarrow 2\ R$

Reaction 2: $R + F \rightarrow 2\ F$

Reaction 3: $F \rightarrow$

Rate laws for all three reactions should be mass action with rate constant $k = 0.1$ and initial conditions should be $[R](0), [F](0) = 0.1$