Cell Growth Problem Set 1

A) The data available in an Excel spreadsheet "Cell Growth Problem A data" were collected for cell dry mass concentration (X) versus time (t) for bacteria growing in the presence of an inhibitor (I).

i) For each I concentration, calculate the specific growth rate (h^{-1}) and doubling time (minutes).

ii) Calculate the value of K_I using the Monod-like "noncompetitive" inhibition model. Do this by plotting (1-R) vs. R[I] ("x" vs. "y") where $R = \mu/\mu_{MAX}$. Note that μ_{MAX} is the true maximum specific growth rate without inhibitor.

B) When growing on glucose as the sole carbon and energy source, a bacterial species has a maintenance coefficient of 0.063 g/gh and a (true) cell mass yield coefficient of 0.43 g/g. Assuming no glucose is converted into a extracellular product,

i) What is the specific glucose consumption rate when the specific growth rate is 0.70 h^{-1}? 0.05 h^{-1}?

ii) What fraction of the substrate goes toward maintenance when the specific growth rate is 0.70 h^{-1}? 0.05 h^{-1}?

iii) How fast is glucose being consumed in a 100 liter reactor containing 20 g/L cells growing at 0.70 h^{-1} (kg/h)?

C) The following data were obtained for the growth rate of *Grandia profius* as a function of temperature. Calculate the values for the two Ratkowsky parameters (b and T_O). For what range is the Ratkowsky equation suitable?

T (°C)	μ (h^{-1})
20	0.000
22	0.005
24	0.040
26	0.120
28	0.220
30	0.380
32	0.550
34	0.770
36	1.030
38	0.860
40	0.520
42	0.220