Problem 1

A female patient (6’0” tall, 65.5 kg, 35 years old) shows a serum creatinine level of 1.1 mg/dL.

a) Use the Cockcroft-Gault-Equation to calculate her creatinine clearance and glomerular filtration rate (GFR).

b) Why do we use the creatinine clearance to estimate the GFR?

c) Drug A shows a plasma protein binding and tissue protein binding of 20% and 30%, respectively. Drug A is eliminated by hepatic (20%) and renal processes (80%). Calculate the total systemic clearance of drug A (in L/h) when administered to the patient. Assume that the drug is neither actively secreted nor reabsorbed.

d) Graph the plasma-concentration time profile for the first 48 hours when 200mg of drug A are administered to the patient via IV bolus injection. A blood sample taken at the time of injection showed a plasma concentration of 2mg/L. Assume that the drug is immediately distributed throughout the body and that all elimination processes are first-order processes.

Problem 2

Which properties does a drug need to have in order to demonstrate the following? Explain briefly.

a) Active tubular secretion
b) Glomerula secretion
c) Passive tubular reabsorption

Problem 3

Sketch the relationship between the following PK metrics and Dose for linear and non-linear pharmacokinetics.

a) CL vs. Dose
b) Vd vs. Dose
c) AUC vs. Dose
d) Ke vs. Dose