**Question 1:**

Drug X follows a one-compartment body model after an IV bolus injection. After a patient was given 200 mg through IV bolus administration, the drug concentrations at 0.5 hour and 5 hour were measured as 2.3 ug/ml and 0.5 ug/ml, respectively. Please find out:

1.) What is the elimination rate constant $K_e$?
2.) What is half-life of the drug?
3.) What is initial concentration of drug, $C_0$?
4.) Please find out $V_d$.
5.) Calculate $AUC_{0-\infty}$.
6.) What is the clearance value?

**Answer:**

1.) $K_e = (\ln C_1 - \ln C_2) / (t_2 - t_1) = (\ln 2.3 - \ln 0.5) / (5 - 0.5) = 0.3391$ (hr. $^{-1}$)
2.) $T_{1/2} = 0.693 / 0.3391 = 2.04$ (hr.)
3.) $C_0 = C_t * e^{K_e * t} = 2.3 * e^{0.3391 * 0.5} = 2.7250$ (mg / L)
4.) $V_d = \text{Dose} / C_0 = 200 / 2.7250 = 73.3945$ (L)
5.) $AUC_{0-\infty} = C_0 / K_e = 2.7250 / 0.3391 = 8.0360$ (mg * hr / L)
6.) $CL = K_e * V_d = 0.3391 * 73.3945 = 24.8881$ (L / hr.)

**Question 2:**

Drug Y follows one compartment body model after an IV bolus injection. The half-life of the drug is reported as 1.5 hour. The volume of distribution is 100 L and fraction unbound (fu) is 0.5. Please answer the following questions.

1.) Please find out the rate of elimination.
2.) Calculate the total body clearance.
3.) In lab, researchers found out that in kidney, drug Y is only eliminated through glomerula filtration, (No reabsorption, no secretion), what is the renal clearance? (Assume GFR = 130 ml /min).
4.) Is the renal clearance only route for drug Y to eliminate?
5.) If you answer is no to question 4, Please find out what is the non-renal clearance.

**Answer:**

1.) $K_e = 0.693 / 1.5 = 0.462$ (hr. $^{-1}$)
2.) $CL = K_e * V_d = 0.462 * 100 = 46.2$ (L / hr.)
3.) $CL_{renal} = fu * GFR = 0.5 * 130 = 65$ (ml /min) = 3.9 (L/hr.)
4.) No. Since $CL > CL_{renal}$. 

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5.) CL non-renal = CL – CL renal = 46.2 – 3.9 = 42.3 (L/hr.)

**Question 3:**

Please find out if the following relationship is correct.

1.) CL (hepatic) > CL (total)  
   **Answer:** F

2.) Larger value of CL indicates larger value of Vd.  
   **Answer:** F

3.) Ke (renal) > Ke  
   **Answer:** F

4.) Larger value of Vd indicates that more drug is outside of the plasma.  
   **Answer:** T

5.) Ionized and hydrophilic drug is more likely to cross the biological membrane.  
   **Answer:** F