1) The pharmacokinetic profile of vancomycin after an intravenous bolus administration is best characterized by the two compartment model equation: \( \text{Conc} = A \exp(-\alpha t) + B \exp(-\beta t) \), where the concentration is in mg/L and time is in hour. \( A=53 \text{ mg/L} \) and \( B=26 \text{ mg/L} \) and the \( t_{1/2} \) for the \( \alpha \) and \( \beta \) phases are 5 hours and 9 hours respectively. Compute the area under the curve of vancomycin. MIC of vancomycin against the infection was estimated to be 1.5 ug/mL. Determine whether the AUC/MIC ratio is greater than 400. (Hint: \( \text{AUC} = \frac{A}{\alpha} + \frac{B}{\beta} \))

(2.5 points)
2) S.J., a 43 year old female, weighing 126 lbs, was started on 1000mg vancomycin administered as a 30 minute IV infusion q12h for the treatment of staphylococcal infection. Her vancomycin plasma concentrations measured 1.5 hours after the start of infusion and 15 minutes before the second dose were 39.4 mg/L and 12.3 mg/L respectively. Compute the elimination rate constant. What are the estimated steady state peak and trough vancomycin plasma concentrations for S.J.? (2.5 points)
3) Which of the following is/are true in case of the elderly population? **(1 point)**

1) Extent of oral absorption is usually unaltered.
2) Increased total body water and less fat tissue.
3) \( CP_s_{free} = \frac{R_0}{Cl_{int}} \) for low extraction drugs, therefore unbound plasma concentration remains unchanged but total plasma concentration will change with changes in protein binding.
4) No change in liver blood flow and liver mass.
5) \( CPs_{free} = \frac{f_u \cdot R_0}{Q} \) for high extraction drugs, therefore total plasma concentration remains unchanged but unbound plasma concentration will change with changes in protein binding.
6) There is age related increase in the volume of distribution of many hydrophilic drugs.

A) 1, 4, 5
B) 1, 2, 6
C) 3, 5, 1
D) 3, 2, 5
E) None of these
4) B.R., a 65 year old male, is 5’5” tall, weighs 61 kg and has a serum creatinine of 0.9 mg/dL. He was started with 1000 mg vancomycin by one hour IV infusion administration q12h for the treatment of MRSA infection. During the course of his therapy his serum creatinine level increased by 25%. Use the nomogram to adjust his dosing regimen based on his increased serum creatinine level. Calculate the steady state peak and trough concentrations of vancomycin based on the adjusted dosing regimen for an IV bolus administration. Is the therapeutic goal attained with the new dosing regimen (i.e. is the steady-state trough concentration less than 20mg/L and between 15 and 20mg/L)? If the therapeutic goal is not attained then compute a dosing regimen for B.R. for IV bolus administration to achieve a desired steady-state peak concentration of 45 mg/L and trough concentration of 15 mg/L. (3 points)

![Nomogram](image_url)
5) Which of the following statements is/are incorrect about vancomycin pharmacokinetics and pharmacodynamics? (1 point)

1) AUC/MIC is a predictive pharmacokinetic parameter for vancomycin.
2) Peak plasma concentrations are monitored for vancomycin efficacy and dose adjustments.
3) Vancomycin exhibits concentration-dependent killing
4) Vancomycin has good oral absorption
5) Vancomycin is 80-90% eliminated by kidneys and has good tissue penetration except in bile, eye and noninflamed meninges.
6) Conventional dosing strategies fail when MIC ≥ 2

A) 1, 2, 4
B) 3, 4, 6
C) 1, 2, 3
D) 2, 3, 4
E) 1, 3, 5