1. Patient A.M. is given a 60 mg dose of gentamicin. The volume of distribution for this patient is 10 L and the concentration after 8 hours is 1.4 mg/L. Calculate the $k_e$. What is the half-life?

Answer: $C_e = \frac{\text{Dose}}{\text{Volume of distribution}} = \frac{60 \text{mg}}{10 \text{L}} = 6 \text{mg/L}$

$C = C_o * e^{-k_e t}$

$(\ln C - \ln C_o) = - k_e t$  →  $-(\ln C - \ln C_o)/t = k_e$  →  $k_e = (\ln1.4\text{mg/L} - \ln6\text{mg/L})/8 \text{ hours}$

→ $k_e = 0.182 \text{ hours}^{-1}$

$t_{1/2} = 0.693/k_e$ → $t_{1/2} = 0.693/0.182 \text{ hours}^{-1} = 3.81 \text{ hours}$

2. Assuming a one compartment body model and a 1st order process, please graph the following on semilog paper and predict the concentration after 6 hours.

<table>
<thead>
<tr>
<th>Time (hours)</th>
<th>Concentration (mg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>80</td>
</tr>
<tr>
<td>3</td>
<td>42</td>
</tr>
<tr>
<td>5</td>
<td>22</td>
</tr>
</tbody>
</table>

Answer=~16 mg/L

3. Using 110 mg/L as the starting concentration and a $k_e$ of 0.318 hour$^{-1}$ calculate the concentration after 6 hours.

Answer: $C = C_o * e^{-k_e t}$ $C = 110 \text{ mg/L} * e^{(-0.318\text{hour}^{-1}*6\text{hour})} = 16.3 \text{ mg/L}$

4. True of False

a. In a one-compartment body model it is assumed that a drug distributes to all areas of the body instantaneously. True.

b. Pharmacodynamics is the study of the time course of a drug’s absorption, distribution, metabolism, and elimination. False.

Pharmacodynamics refers to the relationship between concentration at the site of action and the resulting effect.
c. The $k_e$ of a drug is $0.00333 \text{ min}^{-1}$. After 2 hours 67% of the drug is remaining in the body. True.

Answer: $e^{-k_e t} =$ fraction remaining  
$e^{(-0.00333 \text{ min}^{-1} \times 60 \text{ min/hour} \times 2 \text{ hours})} = 0.67$