1. True or False (0.5 points each, total 3 point)
   A. Compared to adults, neonates usually have significantly more adipose tissue (as % of body weight) (F)
   B. Drugs with a high octanol/water lipid partition coefficient (LPD) will often exhibit a larger volume of distribution in obese patients (T)
   C. The effect of body weight on the volume of distribution depends on the lipophilicity of the drug. (T)
   D. Obese patients may experience an overdose of a weakly or moderately lipophillic drug, since they have a higher percentage of body fat. (T)
   E. Ideal body weight should always be used when determining the regimen for obese patients. (F)
   F. The degree of renal function can be quantified by the creatinine clearance. (T)
2. A 55-year-old female patient is treated with 100mg gentamicin i.v. short-term infusions (30min) TID. The steady-state clinical pharmacokinetic data is shown below:
   A) In 1 h after the infusion was started, the gentamicin concentration is 8.2 mg/L
   B) 30 mins before the next infusion, the gentamicin concentration is 1.8 mg/L

Predict the V_d, C_{max}, and trough concentration based on the given information (2 points)

\[ K = \frac{\text{ln}(c_1)}{t_2 - t_1} = \frac{\text{ln}(8.2)}{8 - 1 - 0.5} = 0.23/\text{h} \]

\[ C_{\text{max}} = \frac{C_{\text{max}'} e^{-k*t_1}}{e^{-0.23*(1-0.5)}} = 9.20 \text{ (mg/L)} \]

\[ C_{\text{min}} = C_{\text{max}} e^{-k*t_2} = 9.20 e^{-0.23*(8-0.5)} = 1.64 \text{ (mg/L)} \]

\[ V_d = \frac{\text{dose}}{C_{\text{max}'}K*T *(\frac{1-e^{-k*T}}{1-e^{-k*T}})} = \frac{100}{9.20*0.23*0.5*(\frac{1-e^{-0.23*8}}{1-e^{-0.23*0.5}})} = 12.21 \text{ (L)} \]
3. A male patient (50-year-old, 67kg, Cpcreat=1.0mg/dL, 165cm) is treated with 300mg Amikacin i.v. short-term infusions (30mins) every 12hrs. Assuming linear pharmacokinetics (Vd=0.25L/kg, Cl=Clcreat). Calculate “new” C<sub>max</sub> and compare it to the previous one when
A) Interval time is changed to 8hrs
B) Infusion time is changed to 45mins

(3 points)

For male: IBW (kg) = 50 + 0.9*(height in cm - 150) =50+0.9*(165-150) =63.5(kg)

TBW is smaller than 120% IBW (67<63.5* 120%) so we can use TBW to calculate their Cl<sub>cr</sub>

\[
CL_{cr} = \frac{(140-\text{age}) \cdot \text{BW}}{\text{Cp}_{cr} \cdot 72}
\]

\[
CL_{cr} = (140-50) \cdot 67/1.0/72 =83.75 \text{ (ml/min) } \approx 5 \text{ (L/h)}
\]

Vd=0.25*67=16.75(L)

K= Cl/Vd=5/16.75=0.30 (/h)

\[
C_{max} = \frac{\text{dose}}{Vd \cdot K \cdot T \cdot \left(1 - e^{-K \cdot T}\right)}
\]

When interval time is 12h, infusion time is 30mins

\[
C_{max} = \frac{300}{16.75 \cdot 0.30 \cdot 0.5 \cdot \left(1 - e^{-0.030 \cdot 12}\right)} =17.1(\text{mg/L})
\]

When A) Interval time is changed to 8hrs

\[
C_{max} = \frac{300}{16.75 \cdot 0.30 \cdot 0.5 \cdot \left(1 - e^{-0.030 \cdot 8}\right)} =18.3(\text{mg/L})
\]

When B) Infusion time is changed to 45mins
\[ C_{\text{max}} = \frac{300}{16.75 \times 0.30 + 0.75 \times \left( \frac{1 - e^{-0.30 \times 12}}{1 - e^{-0.30 + 0.75}} \right)} = 16.5 \text{(mg/L)} \]

\[ C_{\text{max}} \text{ A} > C_{\text{max}} \text{ previous} \quad C_{\text{max}} \text{ B} < C_{\text{max}} \text{ previous} \]

4. A patient (75kg) is admitted with an acute drug X overdose. Serum concentration is measured at 35μg/ml. Assuming linear pharmacokinetics (\( V_d = 0.25 \text{L/kg}, \ Cl = 2.5 \text{L/h} \)) and no further drug absorption, how long will it take for the serum level to drop to the upper limit of the therapeutic range (10μg/mL)? **(2 points)**

\[ V_d = 0.25 \times 75 = 18.75 \text{(L)} \]

\[ K = \frac{\text{Cl}}{V_d} = \frac{2.5}{18.75} = 0.13 \text{ (/h)} \]

\[ t = \frac{\ln \left( \frac{c_1}{c_2} \right)}{K} = \frac{\ln \left( \frac{35}{10} \right)}{0.13} = 9.42 \text{(h)} \]