1. A 34 year-old male patient needs to take gentamicin (aminoglycosides) for treatment of gram-negative pneumonia infection. The body weight of this patient is 74kg. The volume distribution of gentamicin is 18 L.
   a. Calculate the Creatinine Clearance (CrCL) for this patient (1pt)
   b. Calculate the elimination rate constant (ke) (1pt)
   c. Calculate the total clearance (CLT) (1pt)
   d. Calculate the non-renal clearance (CLnonren) (Hint: using the intercept of ke) (1pt)
   e. Calculate the renal clearance (CLren) (1pt)

   Answers:
   a. CrCL=(140-age)*weight/70=(140-34)*74/70=112 mL/min
   b. ke=0.00293*CrCL+0.014=0.00293*112+0.014=0.34 /hr
   c. CLT = ke*Vd = 0.34*18 = 6.1 L/hr
   d. ke-nonren=0.014/ hr , so CLnonren=ke-nonren*Vd=0.014*18=0.3 L/hr
   e. CLren=CLT-CLnonren=6.1-0.3=5.8 L/hr
2. Drug X is a weak base with pKa=9.0. Its unionized form is non-polar. It has a volume distribution of 30L, t½ of 2 hour and fraction unbound (fu) of 0.2. The renal clearance accounts for 20% of the total clearance.

a. Calculate the total and renal clearance. (1pt)
b. Is secretion or reabsorption definitely involved in the renal clearance of drug X? Why? (1pt)
c. If we know that reabsorption is involved, will the renal clearance increase or decrease if pH of urine changes from 7.5 to 4.5? Why? (1pt)

**Answers:**
a. Ke=0.693/t½=0.35/hr  
CLtot=Ke*Vd=0.35*30=10.5 L/hr  
CLren=CLtot*0.2=10.5*0.2=2.1 L/hr  
b. Secretion is definitely involved because  
CLren=2.1 L/hr=35 mL/min>fu*GFR=0.2*130=26 mL/min.  
c. The renal clearance of drug X will increase if pH of urine changes from 7.5 to 4.5 because at pH 4.5 more drug X will be of ionized form and not be able to be reabsorbed (only the non-polar unionized form can be reabsorbed).

3. Which of the following factors does NOT influence glomerular filtration: (2pt)
a) molecular size  
b) protein binding  
c) lipid solubility  
d) renal blood flow  

**Answer:**
c) lipid solubility