1. For the following situations, indicate whether the drug is: filtered, reabsorbed (if fully or if reabsorbed through transporters), or actively secreted (Assume GFR is 130mL/min, urine flow is 1.5mL/min)

(1) Drug with fu= 0.3 and a Cl_{ren}=39mL/min
   \[ fu \times GFR = 0.3 \times 130mL/min = 39mL/min \]
   \[ Cl_{ren} = fu \times GFR \rightarrow \text{filtered} \]

(2) Drug with fu=0.6 and a Cl_{ren}=30mL/min
   \[ fu \times GFR = 0.6 \times 130mL/min = 78mL/min \]
   \[ Cl_{ren} < fu \times GFR \rightarrow \text{reabsorbed} \]
   \[ fu \times \text{urine flow} = 0.6 \times 1.5mL/min = 0.9mL/min \]
   \[ (Cl_{ren} > fu \times \text{urine flow}) \rightarrow \text{not fully reabsorbed} \]

(3) Drug with fu=0.05 and a Cl_{ren}=15mL/min
   \[ fu \times GFR = 0.05 \times 130mL/min = 6.5mL/min \]
   \[ Cl_{ren} > fu \times GFR \rightarrow \text{actively secreted} \]

(4) Drug with fu=0.2 and a Cl_{ren}=0.3mL/min
   \[ fu \times GFR = 0.2 \times 130mL/min = 26mL/min \]
   \[ Cl_{ren} < fu \times GFR \rightarrow \text{reabsorbed} \]
   \[ fu \times \text{urine flow} = 0.2 \times 1.5mL/min = 0.3mL/min \]
   \[ Cl_{ren} = fu \times \text{urine flow} \rightarrow \text{fully reabsorbed} \]

(5) Drug with fu=0.8 and a Cl_{ren}=0.3mL/min
   \[ fu \times GFR = 0.8 \times 130mL/min = 104mL/min \]
   \[ Cl_{ren} < fu \times GFR \rightarrow \text{reabsorbed} \]
   \[ fu \times \text{urine flow} = 0.8 \times 1.5mL/min = 1.2mL/min \]
   \[ (Cl_{ren} < fu \times \text{urine flow}) \rightarrow \text{reabsorbed through transporters} \]

2. A 25 year old, 5’6”, 80kg male patient with a serum creatinine concentration of 1.8mg/dL was given a drug treatment. Knowing this drug is mainly eliminated by glomerula filtration and has 60% plasma protein binding. Please estimate the Clearance of this drug (with Cockcroft-Gault equation)

IBW=50kg + 2.3kg * 6=63.8kg
TBW=80kg > 120%IBW=76.56 → This is an obese patient, so use ABW
ABW= IBW+0.4*(TBW-IBW)=63.8 + 0.4*(80-63.8)=70.28kg
GFR≈ CrCl = (140-age)*IBW/(72*serum creatinine)=
(140-25)*70.28/(72*1.8)=62.36mL/min=3.74L/hr
CL= GFR*fu=3.74*(1-0.6)=1.496L/hr
3. **TRUE (T) or FALSE (F)**

For a high extraction drug, liver blood flow is important to both hepatic clearance and oral bioavailability.

T  F

For low extraction drug, $f_u$ (fraction of unbound drug in plasma) is important to both hepatic clearance and oral bioavailability.

T  F

Basic drugs that are polar in their unionized form, the extent of re-absorption depends on the degree of its ionization.

T  F

Secretion is indicated when renal clearance is larger than GFR*fu.

T  F

It is possible for renal clearance to be close to the kidney blood flow.

T  F

Assuming no plasma protein binding, the renal clearance equals the urine flow when full reabsorption occurs.

T  F