PAL Worksheet

Week 13 Problem Set 1

Renal Physiology

Define the following in your own terms:

Glomerular filtration

Reabsorption

Secretion

Excretion

Glomerular Filtration Rate

1. A. List all pressures that can influence glomerular filtration rate.

    B. Describe how, at the glomerular capillary level, changes could be made to <u>increase glomerular filtration rate (GFR)</u>. List as many possibilities as you can.

2. The main function of the proximal convoluted tubule is:

    The main function of the loop of Henle is:

    The main function of the distal convoluted tubule and collecting duct are:

3. Excretion = Filtration – Reabsorption + Secretion
    Filtration rate of X = GFR x plasma concentration of X
    Excretion rate of X = urine flow rate x urine concentration of X
    Clearance of X = excretion rate of X / plasma concentration of X

    A. Tamika goes in for a routine physical examination. Her urinalysis shows proteinuria and slight swelling in her lower extremities (pedal edema), according to her physical exam. Her lab data show:

Serum creatinine:	1.8 mg/dL	WW2
Urine creatinine:	276 mg/dL	
Urine volume:	1100 mL in 24 hours	

a) Why is protein in the urine (proteinuria) considered "abnormal"?

b) Why might Tamika have pedal edema?

c) Calculate Tamika's creatinine clearance and GFR.

    B. Monroe is given an injection of inulin to assess his renal function. Inulin is a small substance that is freely filtered, but neither reabsorbed nor secreted. Following administration, his plasma concentration of inulin is 1 mg/mL, the same as the plasma concentration of another substance, X, which is also 1 mg/mL. Monroe's GFR is 125 mL/min.

a) What is the filtration rate of inulin? Of X?

b) What is the excretion rate of inulin? Of X? Is there additional information you might need? Explain.

4. A. Glucose is easily filtered by the kidneys. Why is glucose normally absent in the urine?

B. Explain why glucose starts to appear in the urine in a person with diabetes mellitus – use the term transport maximum in your explanation.