Directions: In the space provided, answer in well-organized sentences and paragraphs, unless otherwise noted. This is your last chance to demonstrate you understand the inter-relationship of form and function and importance of details and concepts. (Note point values.)

1. Across the two semester course, calcium has been studied as an important ion. Use two different examples of calcium's physiological role—provide details (15)
   a) 
   b) 

2. Surface area has been a key concept in our discussions of histology and physiology across both semesters. Choose three different examples, one of which will be the kidney, to demonstrate the role of surface area, histology, and function. (3x5=15)
   a) 
   b) 
   c)
3. Define “ultrafiltration”. Demonstrate the role of ultrafiltration in two different units of study across the year—one of which will be the choice of the kidney. What is being filtered, where, and how does the ultrafiltration process contribute to the system under study? Use anatomical and/or physiological details. (10,10)

Defined:

a)

b)

4. Demonstrate the kidney’s role in maintaining pH of body fluids at the proper level. Use a compartmental diagram and be sure to note cell types and locations. Describe the “proof” that your class collected to support the role of the kidney in pH balance. (10,5)
5. Use the graphs (27.4, 27.7) to explain how the kidney normally "handles" glucose and why glucose "spills over into the urine" in uncontrolled Diabetes Mellitus. Explain the associated polyuria/phagia/dipsia (25)
6. Given the following information, prove that lots of sodium reabsorption occurs at the kidney: (10pts)
Urine flow rate = 1ml/min
[Urine sodium] = 70 uEq/ml
[Plasma sodium] = 140 uEq/ml
GFR = 100ml/min

Show your work to earn partial credit...

7. Torsemide (generic name) or Demadex (trade name) is a drug that acts upon the ascending Loop of Henle to "inhibit the Na+/K+/2Cl- carrier system" (source page 2722 2008 PDR). So What Big Deal? What kind of drug is it and why would the drug insert note that it does not affect GFR, renal plasma flow, or acid base balance? (10)
8. What cells are involved in aldosterone secretion and binding—and what occurs following hormone binding. Use figure 29-13 to help you out—but think beyond this also... and consider the indirect effect of renin on long term blood pressure control. (25)
9. We say that the nephron loop (aka Loop of Henle) is essential to the formation of a concentrated urine. Yet, the osmolarity of the tubular fluid is about 300mOsm before the loop and 100mOsm after the loop. How is it then, that a concentrated urine can be formed and what happens along the loop and ducts to allow that formation? (25)