Ex 41B: Renal Physiology – The Function of the Nephron:
Computer Simulation
Physioex Data Sheet

Activity: Investigating the Effect of Flow Tube Radius on Glomerular Filtration

What happens to the glomerular filtration rate as the afferent radius is increased?

Predict the effect of increasing or decreasing the efferent radius on glomerular filtration rate.

Activity: Studying the Effect of Pressure on Glomerular Filtration

What happened to the glomerular filtration rate as the beaker pressure was increased? Explain.

Activity: Assessing Combined Effects on Glomerular Filtration

How does the run with “valve closed” compare with those with “valve open”?

What might happen to the total glomerular filtration and therefore urine production in a human kidney if all of its collecting ducts were totally blocked?

Would kidney function as a whole be affected if a single nephron was blocked? Explain

Would the kidney be functioning if glomerular filtration was zero? Explain.

Explain how the body could increase glomerular filtration rate in a human kidney.
If you increased the pressure in the beaker, what other condition(s) could you adjust to keep the glomerular filtration rate constant?

Activity: Exploring the Role of the Solute Gradient on Maximum Urine Concentration Achievable

What happened to the urine concentration as the gradient concentration was increased?

What factor limits the maximum possible urine concentration?

What would be the maximum possible urine concentration if the maximum interstitial solute concentration were 3000 mosm instead of 1200 mosm? Explain

Activity: Studying the Effect of Glucose Carrier Proteins on Glucose Reabsorption

What happened to the amount of glucose present in the urine as the number of glucose carriers was increased?

Predict the consequence3 in the urine if there was more glucose than could be transported by the available number of glucose carrier proteins.

Explain why we would expect to find glucose in the urine of a diabetic person.

Activity: Testing the Effect of Hormones on Urine Formation
In this run, how does the volume of urine differ from the previously measured baseline volume?

Explain the difference in the total amount of potassium in the urine between this run and the baseline run.

In the ADH run, how does the volume of urine differ from the baseline measurement?

Is there a difference in the total amount of potassium in this run and the total amount of potassium in the baseline run? Explain.

Are the effects of Aldosterone and ADH similar or antagonistic?

How would you adjust Aldosterone and ADH to reabsorb sodium ion but not increase the volume of the blood from reabsorption?

Printing your Data: When you have finished, print your data for at least one activity and attach it to this report.