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Kidney Filtration Lab Job Sheet

Materials Needed:

- 2 large cups
- 1 small cup
- "Components of Blood" bead bag
- 1 piece of mesh
- 1 spoon
- 1 rubber band
- Water

Procedure and Analysis

Blood Enters the Kidneys

Blood enters the kidney through the _____

1. Remove the bag labeled “components of blood”
2. Using the following key, identify how many of each of the components of blood you have. (please note that blood components change based on animal health and nutrition)

Components	# Present
Red Blood Cells = large red beads	
White blood cells = large white beads	
Proteins = large green beads	
Amino Acids = small green beads	
Glucose = small blue beads	
Salt = small white beads	
Urea = small yellow beads	

3. Label one of the large cups “Blood in the renal artery entering the kidneys”
4. Label the other large cup “Nephron”
5. Label the small cup “Blood in Renal Vein”
6. Add the contents of the bag labeled “Blood Components” to the cup labeled “Blood in the renal artery entering the kidneys”
7. Blood also contains water. Add enough water to fill the cup containing the beads about $\frac{3}{4}$ full of water.

- a. What five blood components should be **kept** in the blood as they pass through the kidney?

- b. What type of bead represents each of these components?

- c. What three substances would you expect to find in urine that is excreted by the kidneys?

Filtering Blood

The renal arteries branch to supply blood to the tiny balls of capillaries called _____ which filter blood to holding areas called _____.

8. Prepare a simulated glomerulus and nephron by stretching the piece of mesh tightly over the cup labeled Nephron and securing it with a rubber band. (The mesh is the thin wall of the glomerulus)
9. Pour the contents of the blood in the renal artery cup through the glomerulus into the nephron.
 - d. What is the material collected in the nephron called? _____
10. The materials trapped on top of the screen remain in the blood. Pour the materials that stay on top of the screen into the cup labeled "Blood in the Renal Vein." Note: some of the small beads might remain on top of the screen. This is OK. In fact, this actually occurs in the kidneys. Most, but not all of the substances leave the blood.
 - e. Write the names of the three blood components that are kept in the blood because they are too large to pass through the pores of the glomerulus. (see the table on the first page)

f. The substances that pass through the screen and into the nephron form a fluid called filtrate. What five substances form the filtrate?

g. Does the process of filtration alone completely separate the wastes from the essential materials? Support your answer with observations of what is present in the nephron cup.

Complete Reabsorption.

Some essential molecules, such as glucose and amino acids, are kept by being reabsorbed. These molecules should be completely returned to the blood and should not end up in the urine. The kidneys use energy to transport these molecules back into the blood.

What two substances in the filtrate are essential and need to be completely reabsorbed?

11. Use the spoon to move ALL of the completely reabsorbed substances from the "Nephron" cup to the "Blood in the Renal Vein" cup.

Selective Reabsorption

Other molecules such as water and salt are balanced by being selectively reabsorbed to maintain proper salt and water balance in the body. Their reabsorption is regulated so that they are returned to the blood if needed but excreted in the urine if present in

excess amounts. Specific transport proteins in the nephron use energy to move these molecules from the nephron into the capillaries that surround the nephron.

What two substances should be balanced by being selectively reabsorbed?

12. Use the spoon to collect 5 white salt beads and place them in the “Blood in the Renal Vein” cup. Leave the remaining (excess) salt in the “Nephron” cup so it can be excreted.

How many white beads are left over so they can be excreted? _____

Returning Blood to the Body

The “Blood in the Renal Vein” cup contains “cleaned” blood.

After reabsorption has occurred, what seven substances are present in the “clean” blood in the renal vein?

What do you think happens to the “clean” blood in the renal vein?
