The Urinary System

BIO 105
Chapter 16

Functions of the Urinary System

1. Regulation of ECF volume, composition and osmolarity
2. Urine production
3. Blood pressure regulation
4. Acid-base regulation
5. Hormone production
6. Excretion of nitrogenous waste products
Kidneys

- Renal corpuscle
- Renal tubule
- Loop of the nephron
- Distal convoluted tubule
- Proximal convoluted tubule
- Glomerular capsule (glenmenus within)
- Arterioles
- Cortex
- Nephrons
- Modulla
- Glomerular capillaries
- Arterial tree
- Afferent arteriole
- Efferent arteriole
- Loop of the nephron
- Collecting duct

(c) Simplified view of a nephron, showing the basic structural components but not the associated capillaries.
Juxtaglomerular Apparatus

Nephron functions
1. Glomerular filtration
2. Tubular reabsorption
3. Tubular secretion
Collecting Duct

Acid-base balance
- Regulation of $\text{H}^+$/HCO$_3^-$ secretion/reabsorption

Water Conservation

Hormonal Regulation of Urine Production
- Antidiuretic hormone
- Aldosterone
- Atrial natriuretic peptide

<table>
<thead>
<tr>
<th>Substance</th>
<th>Amount filtered per day (in liters or grams)</th>
<th>% Reabsorbed (removed from filtrate and returned to blood)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>180 L</td>
<td>99</td>
</tr>
<tr>
<td>Glucose</td>
<td>180 g</td>
<td>100</td>
</tr>
<tr>
<td>Urea</td>
<td>52 g</td>
<td>50</td>
</tr>
<tr>
<td>Creatinine</td>
<td>1.6 g</td>
<td>0</td>
</tr>
<tr>
<td>Sodium ions (Na$^+$)</td>
<td>620 g</td>
<td>99</td>
</tr>
<tr>
<td>Potassium ions (K$^+$)</td>
<td>30 g</td>
<td>93</td>
</tr>
<tr>
<td>Bicarbonate (HCO$_3^-$)</td>
<td>275 g</td>
<td>100</td>
</tr>
</tbody>
</table>
Control of urination

- Urination is a reflex action controlled by the CNS

- When the bladder fills with about 250ml of urine then the motor nerve impulses cause the bladder to contract and the sphincters to relax so that urination is possible.
Renal failure

- Renal failure is a decrease or complete cessation of glomerular filtration.

- Dialysis is an artificial method of cleaning the blood.
Continuous Ambulatory Peritoneal Dialysis (CAPD)