Involves removing waste products from the body.

Aside from the kidneys, other organs involved in excretion include:

- Lungs (remove CO₂)
- Skin (excess heat)
- Liver (breaks down or alters toxins)
The Kidneys

Filters Blood.

Renal artery carries blood to the kidneys; blood is filtered into blood collect in the renal vein and returns to the heart by the inferior vena cava.

- Urine filtered from blood passes out of the kidneys into a tube called the ureter, and to the urinary bladder.
Filtering of the blood happen in the cortex & Medulla, in units called Nephrons. Filtrate is collected and drains through ducts into the pelvis.
Role of the Kidney in Excretion

Filtration: As blood flows through the kidneys, several chemical get removed: water, amino acids, glucose, salts, urea & uric acid.

Reabsorption: Most of the material filtered from the blood is reabsorbed, almost everything except urea & uric acid.

WAGS U

WAGS
Role of the Kidney in Excretion

Threshold Levels:

As blood is being filtered in the kidneys, the body monitors levels of glucose, amino acids, etc. If blood levels of these rise above a desired level (the threshold), the kidney stops reabsorption of this into the blood, and it is removed in the urine.
Filtration of WAGSU happens here; the WAGSU is called filtrate.

Reabsorption of WAGS happens here.

From the loop of Henle, remaining filtrate (urine) flows into a collecting duct, and then into the pelvis.
Read Pages 374-377 (stop at the section titled "The Artificial Kidney")

*Complete Questions #1&2 on page 381

*Create a flow-chart type diagram outlining the function of the kidney in excretion

*Aside from the kidneys, what are three other organs related to excretion, and what functions do they perform for this system?
Processes in the Kidney

**Filtration**

Location: **1** Bowman's capsule

Materials removed from blood:
- Water
- Salts
- Amino acids
- Glucose
- Urea
- Uric acid

**Reabsorption**

Location: **2** Loop of Henle

Materials returned to blood:
- Amino acids
- Glucose
- Water
- Proteins
- Salts
- Urea
- Uric acid
- Blood cells
- Lipids
- Water
Function of Skin

Some of the skin’s functions include:

1) Protection from pathogens (first line of defence of immune system)

2) Protection against water loss

3) Temperature regulation
   *If it is too cold, the muscles connected to hair follicles contract, making hairs stand up to trap warm air against body (results in goose bumps)

   *If it is too hot the skin releases sweat; sweat is composed of water, mineral salts, and a small amount of urea. Because sweat helps rid the body of excess heat and other metabolic wastes, sweat is considered an excretory product
Structure of Skin

- epidermis
- dermis
- hair follicle
- keratin layer
- sebaceous gland
- pore
- sweat gland
- adipose (fat) tissue

*Note that there are two types of sweat glands: those associated with hair follicles are called apocrine glands; those that connect directly with the skin surface are called eccrine glands.
Function of the Liver in Excretion

The liver has several roles related to excretion:

1) Detoxification of Blood

Any poisons/toxins, bacteria, drugs, or hormones in the blood are filtered out by the liver and changed into less poisonous, or inactive forms, by enzymes. These altered substances are put back into the blood to be filtered and removed permanently from the body by the kidneys of the urinary system.

Long term abuse of poisons (e.g. alcohol) may cause cirrhosis of the liver in which tissue overgrows and restricts blood flow into the organ, limiting the liver's ability to detoxify the blood. Eventually the liver may fail completely.
Normal Liver, Fatty Liver, and Cirrhosis
Function of the Liver in Excretion

2) Excretion of Bile

*Bile* is made by liver cells, and aids in digestion by neutralizing stomach acid and emulsifying fats in the small intestine.

Bile consists of cholesterol, partially broken down hemoglobin from worn out red blood cells (called *bilirubin*), and bile salts (mineral salts).

Bile is stored in the gall bladder, and released into the small intestine.

Most of the bile salts are reabsorbed into the blood at the end of the small intestine, and filtered out to be reused by the liver. However, bile is considered an excretory product because *some* of the bile salts leave the body in the feces.

If the liver is failing, the bile is not excreted properly and bilirubin is reabsorbed into the blood, giving the skin and whites of the eyes a yellow appearance (jaundice).
Amino acids are produced from the breakdown of protein. Excess amino acids cannot be stored in the body, so the liver will break down the amino acid and convert the amino group into ammonia, the most poisonous of the nitrogenous wastes. The liver converts ammonia to a less toxic form (urea) and releases it into the bloodstream, where it is permanently filtered and removed by the kidneys.
Homework

Read Pages 377-381

*Create a table listing all of the organs associated with excretion, and their major functions

*Describe the function of the hypothalamus in controlling kidney function. How do alcohol and caffeine affect this process?