Digestive System
Mouth

• Digestion begins in the ________ . __________ begins the process of digestion

• Mechanical digestion - is the physical breakdown of large pieces of food into smaller pieces.

• Chemical digestion - large food molecules are broken down into smaller food molecules with the help of different enzymes.
Mouth

• **salivary glands** secrete saliva, which contains the enzyme **amylase** to break the bonds in **starches** (which is what type of macromolecule: **Carbohydrate**) and releases sugar. It also contains the enzyme **lysozyme** that fights infection by digesting the cell walls of **bacteria**. The saliva also helps **moisten** the food and make it easier to chew. The release of saliva is under the control of the **nervous system**.
Esophagus

- Your **tongue** and your **throat** muscles help you swallow your food, which (after swallowing) is now called a **bolus**. As you swallow, the **epiglottis** closes over the **trachea** and the bolus enters the **esophagus**. **Gravity** is not responsible for food going down into the stomach.
Esophagus

• A series of contractions of **smooth** muscle squeeze the food through the **esophagus**. This is called **peristalsis**. A thick ring of muscle called the **cardiac sphincter** closes the esophagus and prevents the contents of the **stomach** from moving back into the esophagus (also known as acid **reflux**).

***Remember: No **Digestion** occurs in the esophagus.***
Stomach

• Food from the esophagus empties into a large muscular sac called the **stomach**. Alternating contractions of the stomach’s **3** smooth muscle layers **churn** and mix the **food**.
Stomach - **Chemical digestion**:

- The stomach contains microscopic **Gastric glands** that produce and release various substances. Some of these include:
- **Mucus** - a fluid that **lubricates** and **protects** the stomach wall.
- **HCl (Hydrochloric Acid)** - makes the contents of the stomach very **acidic**, & activates pepsin.
- **Pepsin** - an enzyme that begins the digestion of **proteins** & works best under the **acidic** conditions.
- One enzyme, **amylase**, is destroyed in the stomach due to the high level of **acid**. This means that digestion of **carbohydrates** stops until the food reaches the **small intestine**.
Stomach- **Mechanical digestion:**
Stomach muscles **contract** to churn and mix the food & fluids in the stomach, producing a substance called **chyme**. After some time, usually about **1** to **2** hours, this new substance enters the **small intestine** through the **pyloric** valve.
Small Intestine

- The **duodenum** is the first part of the small intestine and is where most of the **Chemical absorption** digestion and **absorption** of the food you eat occurs here. The small intestine is specialized to absorb **nutrients**. The structure that aids in this absorption are the tiny folded projections called **villi**. These structures increase the **surface area for absorption**. Most of the products of **carbohydrates** and **protein** digestion are absorbed into the **capillaries** in the villi.
Small Intestine

- Molecules of undigested **fat** and some **fatty** acids are absorbed by **lymph** vessels. By the time food is ready to leave the small intestine, it is basically **nutrient** - free….. only **cellulose**, **water**, and other indigestible substances are left. Accessory structures that aid in digestion:
Small Intestine

- **Pancreas**- produces:
  - enzymes - that help break down carbohydrates, proteins, lipids, and nucleic acids
- **Sodium bicarbonate** - a base that neutralizes stomach acid so these enzymes can be effective
- **Liver**- produces **bile**, a fluid loaded with lipids and other salts. It helps make it easier for enzymes to break down **fat**. Bile is stored in the **Gall bladder**
Large Intestine

• Another name is **Colon**. When **chyme** leaves the small intestine, it enters the large intestine. The function of the large intestine is to remove **water** from undigested material. Colonies of **bacteria** produce **vitamin K** and other substances for the body to use. Concentrated **waste** material that remains after **water** has been removed passes through the **rectum** and is eliminated from the body.
Disorders of the Digestive System-

**Peptic ulcers**- most caused by bacterium *Helicobacter pylori*, infection affects the lining of the stomach allowing the acid to produce holes in stomach wall.

**Diarrhea**- not enough water is absorbed by large intestines

**Constipation**- too much water is absorbed by the large intestines

**Crohn’s disease**- a type of inflammatory bowel disease that can affect any part of the gastrointestinal tract. Symptoms include abdominal pain, diarrhea (could be bloody) fever, & weight loss. Other complications may occur outside the gastrointestinal tract and include anemia, skin rashes, arthritis, inflammation of the eye & tiredness.
Ch. 38 Excretory System
Excretory System Functions:

• The elimination of chemical wastes from the body is known as **excretion**

• For example; lungs **excretes carbon dioxide** & the skin excretes **water** and **salt** in sweat.

• Therefore, the lungs and skin are part of the excretory system.
Excretory System Functions:

• The excretory system is a system of organs that remove _______ from the body.

• The mains organ of the excretion are the kidneys __________

• The removal of urea- a substance that is the result of __________ of ________ in the body cells- along with the regulation of ________ in the __________, maintain __________, & __________ are the principal job of the kidneys.
Structure of the kidneys:

• Each about the size of the fist

• Located on either side of the spinal column in the lower back

• Blood flows into each kidney through a renal artery

• Blood leaves through a renal vein
Structure of the kidneys:

• A tube called the **ureter**, leaves each, carrying **urine** to the bladder.

• The **urinary bladder** is a saclike organ where urine is stored before being excreted through a tube called the urethra
The 3 parts of the kidneys:

- Renal cortex - outer part
- Renal medulla - inner part
- Renal pelvis - middle part
The main functional unit of the kidneys:

- NEPHRONS - each is a small, independent processing unit, located mostly in the **Renal cortex**, each has its own blood supply and releases fluids to a collecting duct, which leads to the **ureter**
NEPHRONS

• **Glomerulus**: mechanically filters blood

• **Bowman's Capsule**: mechanically filters blood

• **Proximal Convoluted Tubule**: Reabsorbs 75% of the water, salts, glucose, and amino acids

• **Loop of Henle**: Countercurrent exchange, which maintains the concentration gradient

• **Distal Convoluted Tubule**: Tubular secretion of H ions, potassium, and certain drugs.
Kidney Filtration

• Passing a liquid or gas through a filter to remove wastes is called filtration.

• The filtration of blood mainly takes place in the part of the **nephron** called the **glomerulus**.

• Nephron is a small network of **capillaries** encased in the upper end by a hollow, cup-shaped structure- called the **Bowman’s capsule**.
Kidney Filtration

- Substance such as water, urea, glucose, salts, amino acids & some vitamins diffuse into the Bowman’s capsule to be filtrated.

- The kidneys filter all the blood in the body about every 45 minutes.
Kidney Re-absorption:

- Most material removed from the blood at the **Bowman’s capsule** makes its way into the **blood**
- Re-absorption is the process in which liquid is taken back into a vessel.
  - **Amino acids, fats, & glucose** are reabsorbed into the capillaries by **active transport**.
  - Water enters by **osmosis**. **99%** of the water is reabsorbed into the blood
Kidney Re-absorption:

- Urine is what remains after re-absorption. It is emptied into a collecting duct, which leads to the Ureter.

- Urine contains urea, excess salts & water among other substances.

- Purified blood is returned to circulation & urine is collected in the urinary bladder.
<table>
<thead>
<tr>
<th>Excretory Disorder</th>
<th>Brief Description</th>
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<tbody>
<tr>
<td>Nephritis</td>
<td>Inflammation of the glomeruli can lead to inflammation of the whole kidney and to kidney failure</td>
</tr>
<tr>
<td>Kidney stones</td>
<td>Hard deposits form in kidney, can block urine flow. Can lead to infection</td>
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<tr>
<td>Urinary tract blockage</td>
<td>Malformations present at birth; lead to blockage of normal flow of urine</td>
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<tr>
<td>Polycystic kidney disease</td>
<td>Genetic disorder- growth of fluid filled cysts in kidney; reduce function lead to failure</td>
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<tr>
<td>Kidney cancer</td>
<td>Often begins in the cells line the tubules within the kidneys. Lead to blood in urine or mass in kidney</td>
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</tbody>
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Random Facts about Urine:

• A nice cold drink of... urine? Although urine is sterile and made up mostly of water there are many trace amount of other chemicals and it is not recommended to drink it because of this fact. These trace chemicals give it the salty taste, but if you are generally a healthy person free of disease than tasting your urine will not harm you.
Random Facts about Urine:

• Urine Therapy? This is the application of urine to your body to solve all of your bodily woes such as massaging it into the skin, or ingesting it. The definition of "urine therapy" is using your urine to benefit your health. It has been claimed to alleviate itching, and an anti-cancer precaution as well as throat aches. There are certain rules to engaging in urine therapy. Urine should be sipped, not guzzled and it should be midstream urine - first thing in the morning. While using urine therapy, you should also drink plenty of water and avoid salty foods.
Random Facts about Urine:

• There are 45.2% of people that pee in the shower.

• There are 44.9% of people who pee in the ocean and there are 28.1% of people who pee in the pool.