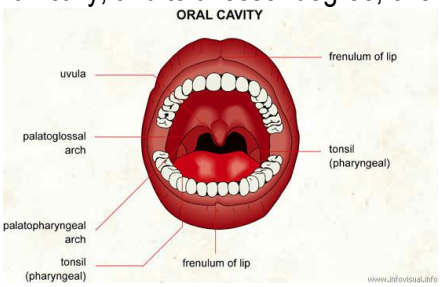
Digestive system Review

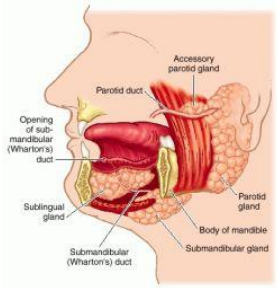
1. ***Distinguish between chemical digestion and mechanical digestion.***

The physical breakdown of food begins in the mouth with two types of processes.
The mouth is a complex structure in which food is broken down mechanically, and to a lesser degree, chemically.



1. Mechanical breakdown (mastication)
Food taken into the mouth is sliced into smaller by the sharp teeth in the front of the mouth. Then, food is grounded into a pulpy mass by the flatter teeth found in the back.

2. Chemical breakdown (Amylase)
As the food is pulverised, it is liquefied by saliva, a water secretion released by three sets of salivary glands. Saliva contains *amylase enzymes*, which breakdown complex carbohydrates into simple carbohydrates



a. **Parotid glands**: The largest pair located just anterior to the ears. This gland conveys its saliva through the parotid duct.

b. **Submandibular glands**: located inferior to the mandible, and secretes saliva on both side of the lingual frenulum.

c. **Sublingual Glands**: located inferior to the tongue, and have many tube that lead to secretions in the lower cavity of the mouth

2. ***Name all the organs that make up the digestive tract.***

The alimentary canal: the tube through which ingested products move, consists of:

A. The mouth
B. The esophagus
C. The stomach
D. The small intestine
E. The colon (Large intestine)
F. The rectum
G. The anus

3. ***Name the accessory organs in the digestive system.***

The accessory organs: have digestive functions but do not come into contact with the material passing through the digestive tract. They include

A. The salivary glands
   i. Parotid glands
   ii. Submandibular glands
   iii. Sublingual glands
B. The liver
C. The pancreas
D. Gall bladder

4. ***Name two parts of the digestive system in which absorption occurs.***
    i. The small Intestine
    ii. The large Intestine

5. ***Name the enzyme that helps break down:***
    a. Sucrose __Amylase____
    b. Lipids : __Lipidase___
    c. Protein : __Pepsin___

6. ***State two functions of saliva.***

1. It liquefies the food, making it easier to swallow.
2. It kills or neutralizes some bacteria via the enzymes and antibodies it contains
3. It dissolves substances so they can be tasted
4. It begins to breakdown starch molecules
5. Cleans teeth, washing away bacteria and food particles

7. ***What are two digestive functions of the tongue?***

The main function of the tongue is to allow an even breakdown of the food by the teeth. Imagine trying to chew your food without moving your tongue, only a small part of it will actually get chewed.

Secondly the tongue allows you to swallow your food. If someone did not have a tongue they would never be able to swallow any solid foods.

The tongue also coats the food with saliva which helps it get digested in the stomach.

Also, the tongue is responsible for taste, which does not affect digestion, but is a good thing to be able to do anyways.

8. ***What mechanism prevents food from entering the trachea and the lungs when swallowing? Explain.***

Food (bolus) propelled from the pharynx into the esophagus is prevented from entering the trachea (windpipe) by the **epiglottis**. This flap of tissue acts like a trap door, closing the trachea during swallowing.

9. ***How is heartburn caused?***

As food enters the lower esophagus, the esophageal sphincter opens, allowing the food to enter the stomach at a controlled rate. The sphincter then closes (*similarly to a drawstring on a bag*), preventing food and stomach acid from percolating upward (heartburn).

10. What macromolecule is mainly broken down by enzymes in the stomach?

Very little enzymatic digestion occurs in the stomach. The stomach's role is to prepare most food for enzymatic digestion that occurs in the small intestine. There are some exceptions however, and protein is one of them.

Hydrochloric acid (HCl) acts on **pepsinogen** converting it to its active form know as **pepsin**. Pepsin is an enzyme that catalyses the breakdown of protein into large fragments that will be broken down further in the small intestine.

11. Why don't the chemicals in the stomach digest the stomach itself?

If stomachs did not have a lining of mucus, your stomach would digest itself. The stomach produces more than just the acids, fluids and other chemicals for breaking down food. It also produces a lining of cells, or mucus, which protects the stomach walls. These cells are constantly being replaced by the body to maintain a coating that will protect the stomach from the acids.

12. Name the section of the small intestine.

The small intestine is a coiled tube in the abdominal cavity about 7 meters long in adults. So names because of its small diameter, the small diameter consists of three parts in the following order:

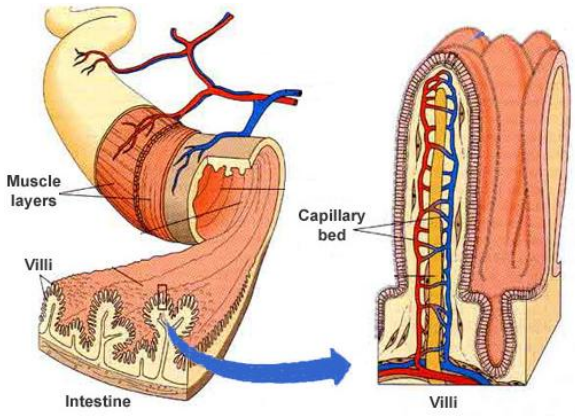
1) Duodenum
2) Jejunum
3) Ileum

13. Explain how the small intestine is designed to maximize surface area. Why is a large surface area important?

The lining of the small intestine is thrown into folds which increase the overall surface area. On the surface of the folds, are many fingerlike projections known as **villi**, which also increase the surface area available for the absorption of food molecules.

The intestinal surface area is further increased by microvilli, tiny protrusions of the plasma membrane of the epithelial cells lining the villi.

As shown in the figure, each villus is endowed with a rich supply of capillaries. These tiny vessels are responsible for the absorption of the nutrients that have passed the lining of the small intestine.



14. What does the pancreas secrete?

The **pancreas** is nestles in a loop formed by the first portion of the small intestine: the Duodenum. Each day, approximately 1500 millilitres of pancreatic juices are secreted in the small intestine. This liquid is composed of:

i. Water
ii. Sodium bicarbonate, and
iii. Several important digestive enzymes.

The **sodium bicarbonate**, produced by the pancreas, has two main many functions:

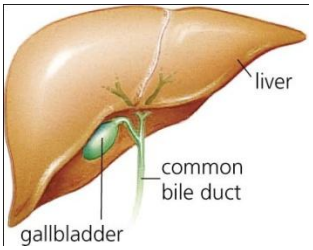
a. Neutralizes the acidic chime by the stomach, thus protecting the small intestine.
b. Creates an environment optimal for the function of the pancreatic enzymes

The pancreatic enzymes act on large molecules in food. As a result of pancreatic enzymatic activity:

1) Fats are completely reduced to monoglycerides and fatty acids **(Lipase)**
2) Proteins are broken down into small peptide fragment and some amino acids **(Trypsin, erepsins)**
3) Carbohydrates are broken down into monosaccharides and disaccharides. **(Amylase)**

15. What does the liver secrete?

The **liver** is one of the largest and most versatile organs in the body. This organ plays a key role in the digestion of fats through the production of a fluid called **bile**, which contains water, ions, and molecules such as cholesterol, fatty acids and bile salts. Bile salts emulsify fats, which means that they breakdown fat globule into smaller ones.



16. What are the functions of the duodenum, jejunum, and ileum?

<u>The duodenum:</u>
At the spot where the stomach and duodenum meet, is a muscle called the pyloric sphincter which prevents the regurgitation of material back into the stomach. The duodenum is responsible for further processing the material from the stomach (called chyme), by secreting enzymes which aid in digestion. Bile and pancreatic juice also enter the duodenum around its midpoint, and by moving the chyme in a shaking kind of motion, the duodenum mixes the chyme with these enzymes within its lumen, further aiding digestion.

<u>The jejunum</u>
The next portion of the small intestine has a lining which is specialized in the **absorption of carbohydrates and proteins**. The proteins have been broken down in the stomach by enzymes called pepsin and acid into amino acids. The carbohydrates are broken down in the duodenum by enzymes from the pancreas and liver into sugars. Fats are broken down in the duodenum by "lipase" from the pancreas into fatty acids.

<u>The ileum</u>
The last portion of the small intestine and it is responsible for absorption of fats, and bile salts which are a component of bile.

17. Describe peristalsis.

Involuntary contractions of the muscular wall of the esophagus propel food to the stomach. The muscles of the esophagus contract above the swallowed food mass, squeezing it along. This involuntary muscular action is called **peristalsis**. It is so powerful, that you can swallow while hanging upside down.

18. What factors affect enzyme activity?

The activity of an Enzyme is affected by its **environmental conditions**. Changing these alter the rate of reaction caused by the enzyme. In nature, organisms adjust the conditions of their enzymes to produce an Optimum rate of reaction, where necessary, or they may have enzymes which are adapted to function well in extreme conditions where they live. Specific factors include:

1. Temperature
2. pH Acidity and Basicity

19. ***Describe the digestive functions of the liver, gall bladder and pancreas***

Liver: 1. This organ plays a key role in the digestion of fats through the production of a fluid called **bile**, which contains water, ions, and molecules such as cholesterol, fatty acids and bile salts

Gallblader: 1. The gallbladder concentrated the bile by removing water from it.
2. Bile is stored in the gallbladder until needed.

Pancreas: 1. Secretes pancereatice juices that contain:
   a. Water
   b. Sodium bicarbonate, and
   c. Several important digestive enzymes.

20. Explain the importance of bile salts in digestion

Bile salts emulsify fats, which means that they breakdown fat globule into smaller ones.

21. Describe the main function of the colon in digestion.

Most of the large intestine consists of the colon. The material entering the large intestine consists of a mixture of **water**, **undigested or unabsorbed food molecules** and **undigested food residue such as cellulose** (fiber).

The colon absorbs approximately 90% of the water, the sodium and potassium that passes through it. Once these have been removed, the remaining content is referred to as **feces**. Bacteria account for approximately one third of the dry weight of feces.

22. Why is cellulose an important part of your diet?

Cellulose provides bulk (fiber or roughage) that the muscular wall of the digestive system can push against thereby facilitating the movement of the food.