

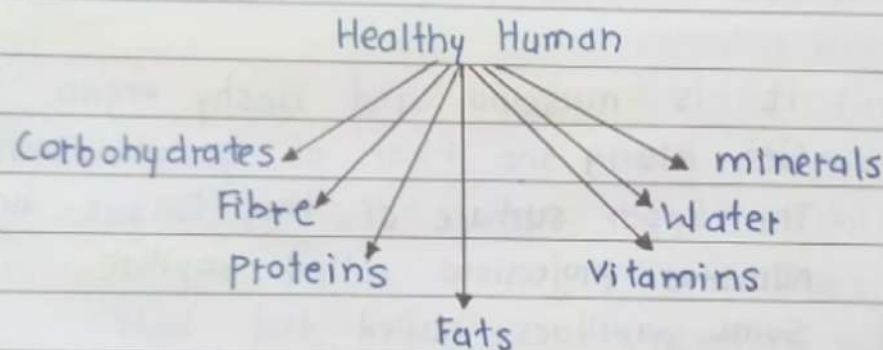


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**Nutrition** is the process sum of the process by which an organism consumes and utilises food substance.

Cell-Function  
|  
energy } Food material - Digestion

Food - Digestion - carbohydrate - ATP - Energy



**Digestive System** : Alimentary canal :

Alimentary canal is a long tubular structure starting from mouth and ending ~~at~~ with anus. It is about 8-10 meters long. consists of following organs.

**Mouth** : known as oral or buccal cavity - bounded by fleshy lips.

side walls chicks, there is also present palate and tongue.

Salivary glands open into the buccal cavity.

Teeth : 32 teeth present in buccal adult human.

Types  
 thecodont  
 diphyodont  
 heterodont

Teeth — milky teeth  
 permanent teeth

(I) incisors — two

(C) canines — one

(PM) Premolars — two

(M) molars — three

Tongue : it is muscular and fleshy organ.

lies along the floor of buccal cavity.

The upper surface of the tongue bears numerous projections called papillae.

Some papillae called taste buds.

Pharynx : The buccal cavity leads to short pharynx.

upper region of pharynx is called trachea.

trachea opens through glottis.

lower region of pharynx called oropharynx.

oropharynx opens through gullet in oesophagus.

Oesophagus : Thin, muscular tube. lies behind trachea.

25 cm long. passes through neck. pierces

diaphragm and joins stomach. It is lined by mucus cells.

mucus lubricates the passageway of food.

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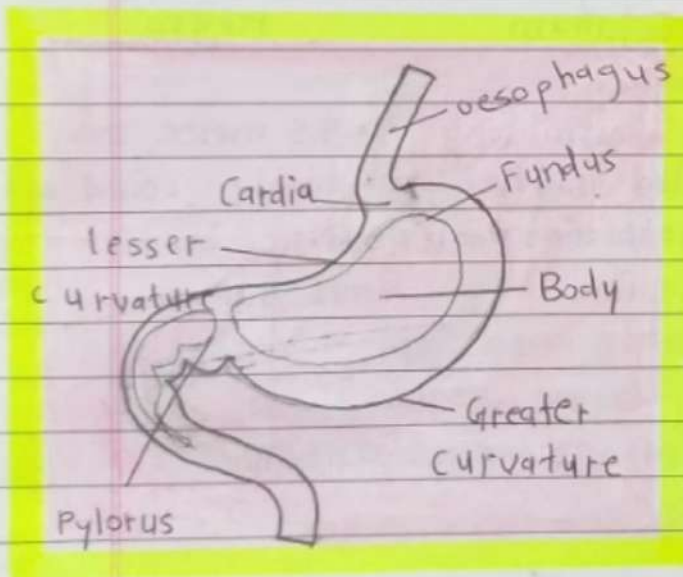
## Stomach

Stomach located in upper left portion of abdominal cavity. It is muscular sac-like J shaped organ. around to 25 to 30 cm length.

divided into

upper cardiac region      lower cardiac region

Cardia / cardiac : First part in oesophagus opens.



circular muscles cells present at the junction of oesophagus and stomach known as cardiac sphincter.

The cardiac sphincter prevents back flow of food material from stomach to mouth.

Fundus : It is the dome shaped region above and left of cardia.

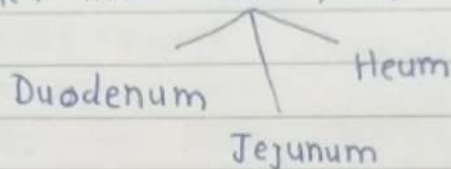
Body : It forms the large central portion of stomach that stores the food.

Pylorus : Is a narrow posterior region of stomach. opens into duodenum, initial part of small intestine. It regulates the flow of food from stomach to small intestine.



### Small Intestine

- 6 meters long
- 2.5 cms broad tube coiled within abdominal cavity.
- Supporting blood vessels, lymph vessels and nerves.
- Divided into three parts



#### Duodenum

#### Jejunum

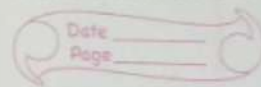
#### Ileum

- |  |                            |                              |
|--|----------------------------|------------------------------|
| • 26 cm long   | • 2.5 metre long           | • 3.5 metre long             |
| • U shaped structure.                                    | • coiled middle            | • highly coiled and          |
| • duodenum turns towards left sides of abdominal cavity. | portion of small intestine | little broader than Jejunum. |

### Large Intestine

- ileum opens in large intestine
- 1.5 meters in length
- wider in diameter & shorter than small intestine.
- It consists of caecum, colon and rectum.

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## Caecum

- 6 cm in length
- Small, blind
- Appendix is vestigial organ in human beings

## Colon

- caecum opens in colon
- tube-like organ
- consists three

## Parts

- ascending colon
- transverse colon
- descending colon

## Rectum

- posterior region of large intestine.
- stores undigested waste material called faeces

Anus :

- anus is the terminal opening of alimentary canal.
- It is ~~gated~~ guarded by sphincter.
- It expels faecal matter by a process called egestion or defaecation.

Canal

The entire gastrointestinal track is lined by four basic layers from inside to outside.

Serosa      mucosa  
 Muscularis      submucosa

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Serosa : it is the first outermost shell layer.  
made up of squamous epithelium tissue.  
called as mesothelium.  
and inner layer of connective tissue.

muscularis : This layer formed from smooth muscles.  
arranged in three concentric layers.  
outermost layer - longitudinal muscles.

Submucosa : formed of loose connective tissue.  
which containing blood vessels, lymph  
vessels and nerves.  
Duodenal submucosa shows the presence  
of glands.

Mucosa : lumen of alimentary canal is lined by  
mucosa.  
In stomach mucosa layer forms gastric  
glands that secrete gastric juice.  
mucosa of small intestine forms finger  
like folding called "villi."

### Digestive canal

The digestive canal associated with alimentary  
canal

includes

- salivary glands
- liver
- pancreas



### Salivary glands :

- have three pairs
- which opens in buccal cavity.

- Parotid - present in front of ear.
- Submandibular - present below lower jaw
- Sublingual - present below tongue.

### Salivary glands made up of two types of cells

Serous  
Cells

↓  
Secrete a fluid  
containing digestive  
enzyme.  
Known as  
(salivary amylase)

Mucous  
Cells

↓  
Produces mucus that  
lubricates food & helps  
swallowing.

### Liver :

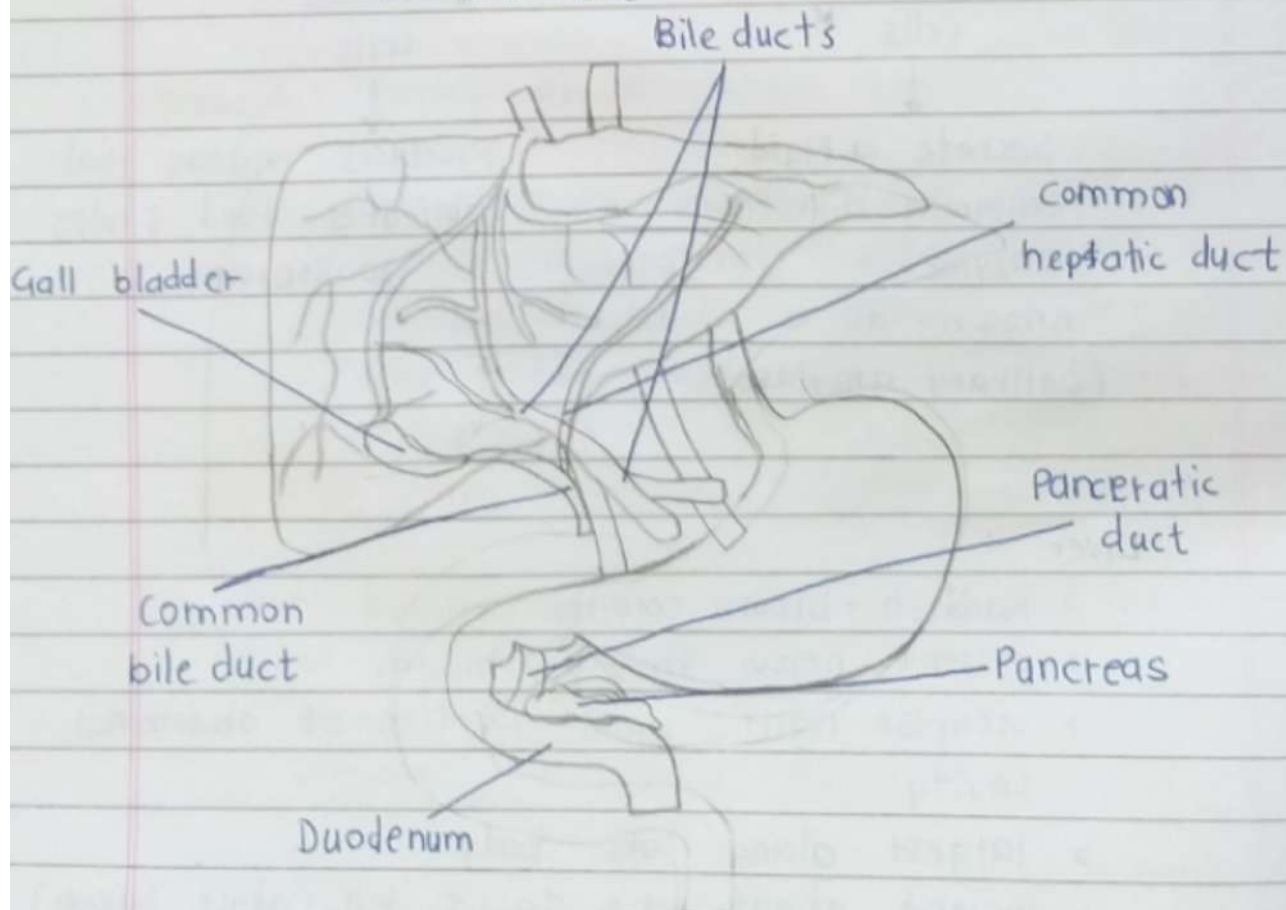
- > Raddish - brown colour
- > present below the diaphragm
- > occupise right upper portion of abdominal cavity
- > largest gland of body
- > weight about 1.2 to 1.5 kg. (adult human)
- > liver is a vital organ

- > involved in synthesis of **KINEMASTER**
- > also produces blood proteins [prothrombin / fibrinogen]
- > liver stores excess of glucose in form of glycogen
- > ~~Each~~ lobe liver has two lobe - Right & left
- > Each lobe is made up of thousands of hexagonally-shaped lobules. (which are very small)

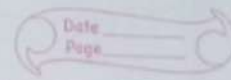
Kupffer cells :

- are macrophages found in the sinusoids of liver
- protect the liver from bacterial infection.
- These cells destroy the toxic substances and worn out blood cells and microorganisms.

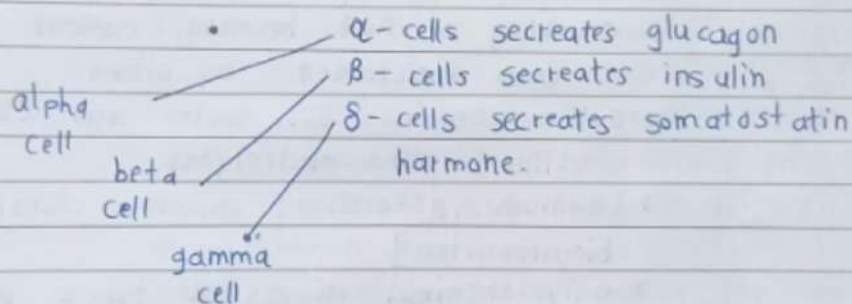
- helps in detoxification process and destruction of old RBCs.







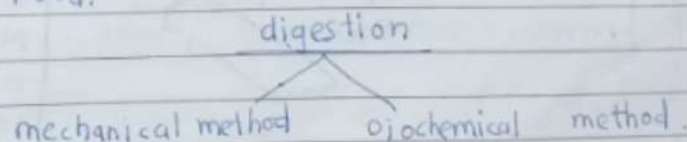
- Pancreas :
- leaf shaped heterocrine gland present
  - gap formed by bend of Duodenum under the stomach
  - Exocrine (Part of pancreas) made up of acini.
  - acinar cells contains alkaline pancreatic juice that secretes various digestive enzymes.
  - Endocrine part of pancreas made up of islets cells of Langerhans present between the acini.



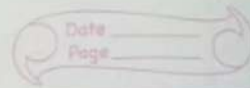
~~Physiology of digestion :~~ **Physiology of digestion :**

~~Physiology of digestion~~ includes various processes-

- Physiology of digestion includes various processes involved in simplification of food.



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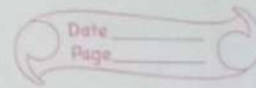
- digestion includes various movements of alimentary canal.
- Chemical digestion is a series of catabolic reactions that hydrolyse food.

### Digestion in buccal cavity:

- > Chewing of food takes place with the help of teeth.
- > tongue manipulates the food.
- > crushing of food becomes easier when it gets moistened by saliva.
- > Saliva contains 98% water and 2% other constituents like electrolytes.
- > [Sodium, potassium, calcium, chloride, bicarbonates]
- > only chemical digestion takes place in mouth. by the action salivary amylase.
- > It helps in conversion of starch into maltose.
- > About 30% starch gets converted to maltose in mouth.

Saliva contains lysozyme.  
It acts as ~~antibacter~~  
antibacterial agent that  
prevents infection.

Sometimes  
regurgitation or  
vomiting takes  
place due to  
reverse spasmo-  
dic peristalsis



## Digestion in stomach:

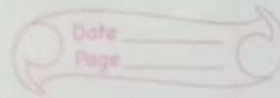
- > stomach stores food for 4-5 hours.
- > Thick muscular wall of stomach helps churning the food.
- > churning process breaks down the food into particles and also helps in thorough mixing of gastric juice with food.
- > The mucosa layer of stomach has gastric gland.
- > each gastric gland has three major types of cells
  - mucus cells — mucus
  - peptic cells — proenzyme pepsinogen.
  - chief cells — HCl
- > chief cells secrete HCl and intrinsic factor which is essential for absorption of vitamin B<sub>12</sub>.
- > HCl in gastric juice makes the food acidic & stops action of salivary amylase.
- > pepsin is absent in adults.
- > pepsin found in gastric juice

at the end of gastric digestion food is converted in semifluid acidic mass of partially digested food called chyme. it pushed in small intestine from stomach through pyloric sphincter



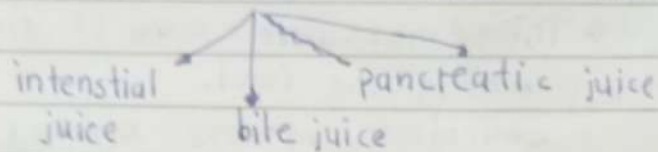
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30-04-2022



## Digestion in small intestine:

- > in small intestine juice mixed with food.



2. Bile

- > bile juice and intestinal juice are poured in the duodenum through hepato-pancreatic duct.
- > bile juice is dark green coloured fluid contains bile pigments, bile salts.
- > bile does not contain any digestive enzyme.
- > bile pigments impart colour to faecal matter.

## Pancreatic juice:

- > Pancreatic amylase acts on glycogen and starch & convert those to disaccharides.
- > Inactive trypsinogen present in pancreatic juice
- > Trypsin converts proteins as well as proteases and peptones to polypeptides.
- > Nucleases present in pancreatic juice help in digestion of nucleic acids to pentose sugar and nitrogenous base.

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### Digestive system disorders.

- Jaundice: Yellowing of eyes due to disposition of bile pigments.
- Vomiting: Ejection of food through Mouth.
- Diarrhoea: Frequent bowel movement and liquefied faecal discharge
- constipation: Irregular bowel movement
- Indigestion: Improper digestion of food.