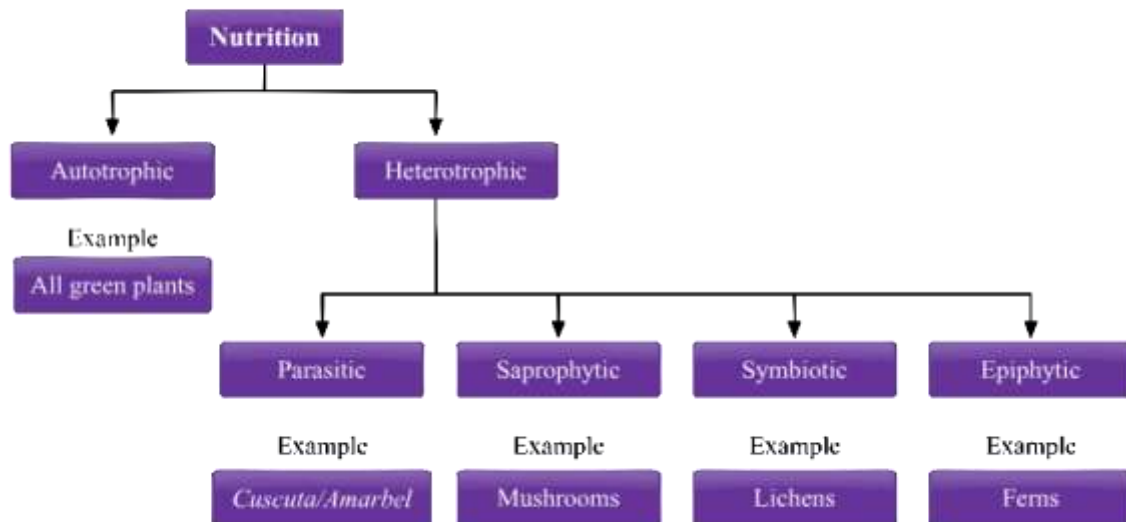


**NUTRITION**  
**TYPES OF NUTRITION**



**Holotrophic / Holozoic**

- (1) Herbivorous
- (2) Frugivorous: Feeds upon fruits  
eg. Parrot, Bats
- (3) Carnivorous
- (4) Insectivorous: Upon insects only  
eg. Spiny Anteater wall Lizard
- (5) Omnivorous: Dog, Human Crow, Cockroach
- (6) Scavenger: vulture
- (7) Detritivorous: Eating small decomposed fragments of plants and animal.
- (8) Coprophagous: Feeding on fecal matter  
eg. Pig
- (9) Sanguinivorous: Feeding on blood  
eg. Leech, female Mosquito, Vampire bats
- (10) Fluid Feeders : feeds on plant fluid  
eg. Butterflies, male mosquito

**Parasitic:**

- (i) Ecto-outside from host  
eg. Leech, limex, Lice mosquito (female)
- (ii) Endo-inside the body – Trypanosoma (Fluid), Plasmodium (cell), Ancylostoma (tissue)

**Type of nutrients :**

- (i) Macronutrients: Carbohydrate, lipids, proteins.
- (ii) Micronutrients: 20 vitamins, 21 minerals

## DIGESTIVE SYSTEM OF VERTEBRATES

8 to 10 m long tube called alimentary canal

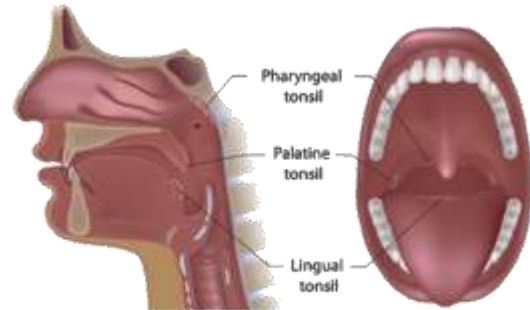
### Mouth

divides into two parts.

1. Vestibule
2. Proper

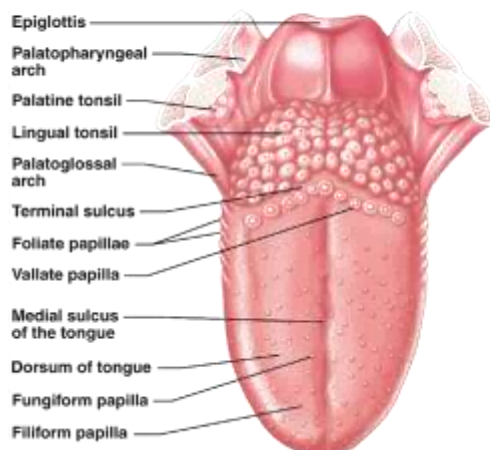
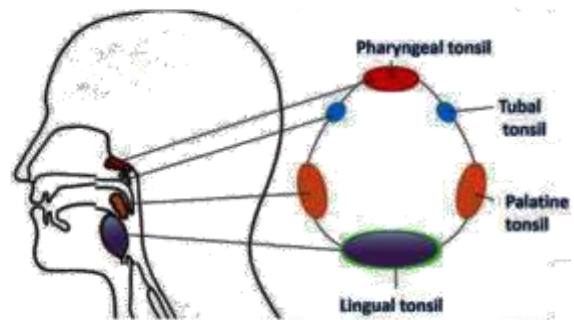
### Palate

Soft palate---- soft palate hangs in the throat called *uvula*



### Waldeyer's ring

*Uvula* is surrounded by a ring of tonsils called Waldeyer's ring.



### Tongue-- musculo-sensory organ.

**Filiform:** Most abundant short filamentous (absent in Rabbit).

Taste buds are absent

**Fungiform:** Small mushroom shaped on the upper part with taste buds.

**Foliate:** Small leaf-like folds.

**Circumvallate:** Largest cup like, on the posterior part

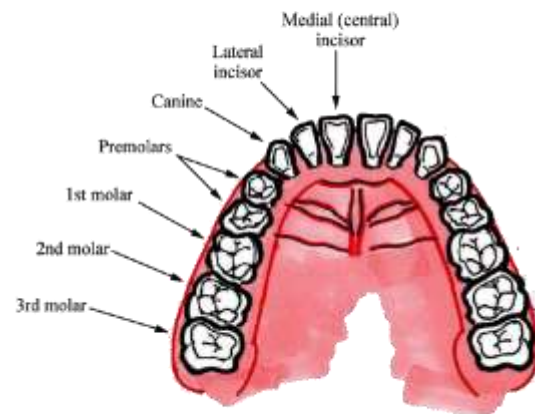
**Frenulum linguae**

## Teeth

Crown:

Neck

Root



## Dental Formula

$$\text{Man} \quad \frac{2, 1, 2, 3}{2, 1, 2, 3} \times 2 = 32$$

$$\text{Rat} \quad \frac{1, 0, 0, 3}{1, 0, 0, 3} \times 2 = 16$$

$$\text{Elephant} \quad \frac{1, 0, 0, 3}{0, 0, 0, 3} \times 2 = 14$$

$$\text{Rabbit} \quad \frac{2, 0, 3, 3}{1, 0, 2, 3} \times 2 = 28$$

$$\text{Dog} \quad \frac{3, 1, 4, 2}{3, 1, 4, 3} \times 2 = 42$$

$$\text{Monkey} \quad \frac{2, 1, 2, 3}{2, 1, 2, 3} \times 2 = 32$$

## Type of Teeth

Attachment of teeth

1. Acrodont— Amphibia (frog), lizards
2. Pleurodont— lizards
3. Thecodont— in mammals and crocodiles

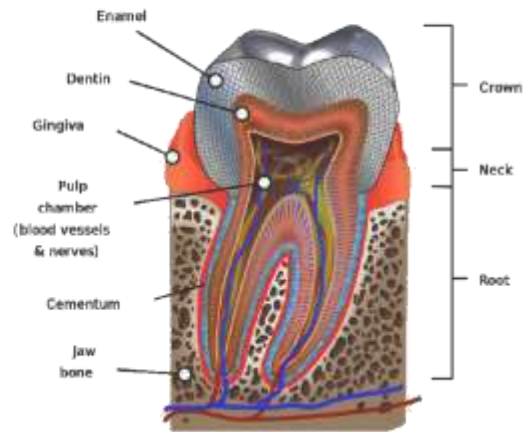
## Succection of Teeth

1. Monophyodont--- Platypus, marsupials, moles, (some mammals)
2. Diphyodont--- Most mammals
3. Polyphyodont--- lower vertebrates frogs

## Different shape of teeth

1. Homodont--- Fishes, Amphibians, Reptiles

2. Hetrodont--- in mammals.



Parotid gland-- *Stenson's duct*-- opens behind the upper second molar.

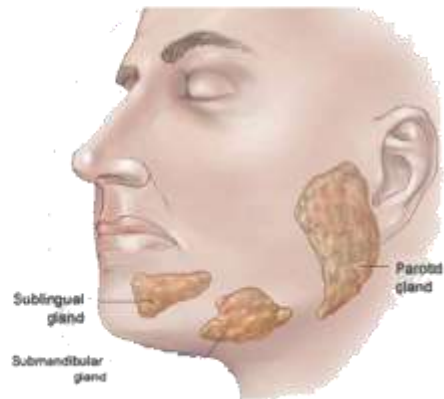
Submandibular or submaxillary glands-- *Wharton's duct* opens behind the lower central incisors

Sub-lingual glands-- ducts of Rivinus-- below the tip of Tongue

Infra-orbital (or zygomatic) glands-- absent in human (but present in rabbit)

## Salivary Glands

(3 pairs in man, 4 pairs in rabbit, 5 pairs in cat)



Q. An adolescent human below 17 years of age normally has dental formula as:

(1)  $\frac{2, 1, 2, 0}{2, 1, 2, 0}$

(2)  $\frac{2, 1, 2, 2}{2, 1, 2, 2}$

(3)  $\frac{2, 1, 3, 2}{2, 1, 3, 2}$

(4)  $\frac{2, 2, 3, 2}{2, 2, 3, 2}$

Q. What is a correct dental formula for the child falling under age group 5-6 yrs:

(1)  $i = 2/2, c = 1/1, pm = 0/0, m = 2/2$

(2)  $i = 2/2, c = 1/1, pm = 2/2, m = 3/3$

(3)  $i = 1/1, c = 2/2, pm = 2/2, m = 3/3$

(4)  $i = 2/2, c = 2/2, pm = 1/1, m = 3/3$

Q. Dentition in man is

- (1) the codont, heterodont and polyphyodont
- (2) the codont homodont and polyphyodont
- (3) the codont, heterodont and diphyodont
- (4) acrodont, heterodont and diphyodont

### Saliva

*Mucin* → lubricates the food passage ;

*Lysozyme*-antibacterial enzyme

*ptyalin* → digests starch

secretions of saliva-- controlled by  
parasympathetic system

Q. Submaxillary glands of man pour their secretions through:

- (1) Stenson's duct
- (2) Wharton's duct
- (3) Nasopalatine duct
- (4) Bartholin's duct.

**Pharynx** → Uvula divides the pharynx

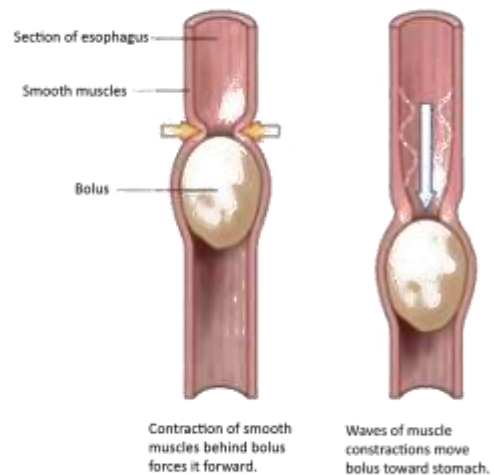
*Nasopharynx*

*Oropharynx*

Epiglottis → covers the glottis

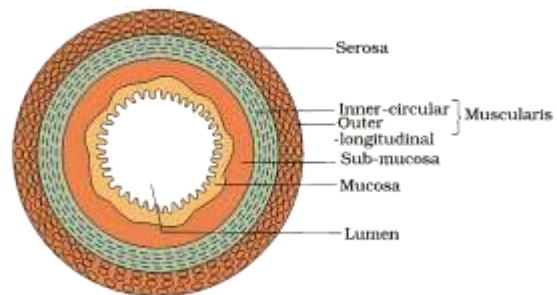
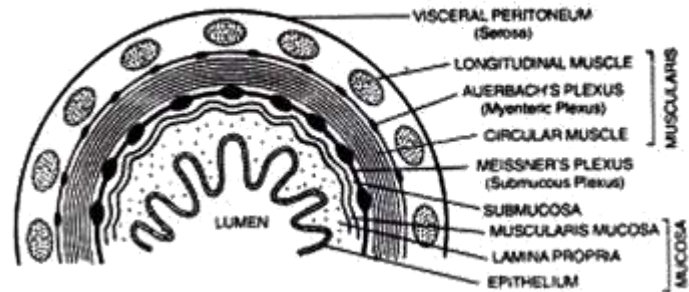
Mouth and Pharynx → Lined with stratified  
squamous epithelium → ectodermal origin

### OESOPHAGUS



Q. The wave like contraction of the smooth muscles of digestive tract is called:

- (1) Peristalsis
- (2) Deglutition
- (3) Fibrillation
- (4) Mastication.



### Stomach

(i) Rumen— first largest part— digestion of cellulose by symbiotic bacteria living here, (*Rumenococcus*)

**Reticulum (honey comb)-**

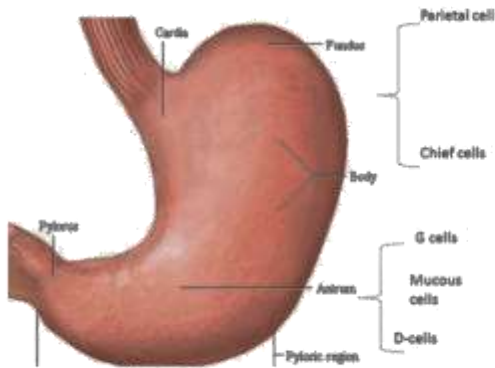
**Omasum (psalterium)-** concentrates the food by absorbing  $H_2O$  and  $HCO_3$  (absent in camel and deer)

**Abomasum or true stomach—** secretion of gastric juice

Q. Which one of the following is true stomach in ruminants?

- (1) Rumen
- (2) Reticulum
- (3) Abomasum
- (4) Omasum

## Stomach Secretions



## Humans Stomach

1. Fundus 2. Corpus 3. Pylorus

gastric glands are present — two types

1. Chief Glands or Oxyntic glands

2. Pyloric glands

**Mucosa forms glands**

- (i) Mucous (Goblet) cells secrete mucin
- (ii) Oxyntic (Parietal) cells secrete HCl
- (iii) Chief cells (Peptic or zymogenic) cells secrete enzymes.
- (iv) Argentaffin cells

## Gastric Glands

Cell Types	Substance Secreted
Mucous neck cell	Mucus (protects lining)
	Bicarbonate
Parietal cells	Gastric acid (HCl)
	Intrinsic factor (Ca <sup>++</sup> absorption)
Enterochromaffin-like cell	Histamine (stimulates acid)
Chief cells	Pepsin(ogen)
	Gastric lipase
D cells	Somatostatin (inhibits acid)
G cells	Gastrin (stimulates acid)

**Q.** Find out the correctly matched pair:

- (1) HCl – Goblet cells
- (2) Ptyalin – Acinar cells
- (3) Mucus – Oxyntic cells
- (4) Pepsinogen – Zymogenic cell

**Q.** The gastric juice contains:

- (1) Trypsin, pepsin, lipase
- (2) Pepsin, lipase, rennin
- (3) Pepsin, amylase, trypsin
- (4) Trypsin, pepsin, rennin

**Q.** Identify the correct set which shows the name of the enzymes from where it is secreted and substrate upon which it acts:

- (1) Pepsin – Stomach wall – Caesin
- (2) Ptyalin – Intestine – Maltose
- (3) Chymotrypsin – Salivary gland – Lactose
- (4) Ptyalin – Pancreas – Lipid.

**Q.** Oxyntic cells are located in

- (1) Islets of Langerhans
- (2) Kidney and secrete rennin
- (3) Gastric epithelium and secrete HCl
- (4) Gastric epithelium and secrete pepsin.

**Q.** What will happen if the secretion of parietal cells of the gastric glands is blocked with an inhibitor?

- (1) Gastric juice will be deficient in chymosin
- (2) Gastric juice will be deficient in pepsinogen
- (3) In the absence of HCl secretion, inactive pepsinogen is not converted into the active enzyme pepsin
- (4) Enterokinase will not be released from the duodenal mucosa and so trypsinogen is not converted to trypsin.

Match column I with column II and choose the correct option:

	Column I		Column II
A	Saliva	1	Proteins
B	Bile salts	2	Milk proteins
C	Rennin	3	Starch
D	Pepsin	4	Lipids
E	Steapsin	5	Emulsification of fats

Answer Codes:

- (1) (A – 5); (B – 4); (C – 1); (D – 2); (E – 3)
- (2) (A – 2); (B – 3); (C – 4); (D – 5); (E – 1)
- (3) (A – 2); (B – 4); (C – 3); (D – 1); (E – 5)
- (4) (A – 3); (B – 5); (C – 2); (D – 1); (E – 4)

**Q.** Match the type of cells listed under Column I and their secretions given under Column II Choose the answer which gives the correct combination of the alphabets of the two columns.

	Column I		Column II
	(Type of cells)		(Secretions)
A	Peptic cells	p	Mucus
B	Oxyntic cells	q	Alkaline fluid
C	Goblet cells	r	Pro-enzymes
		s	HCl

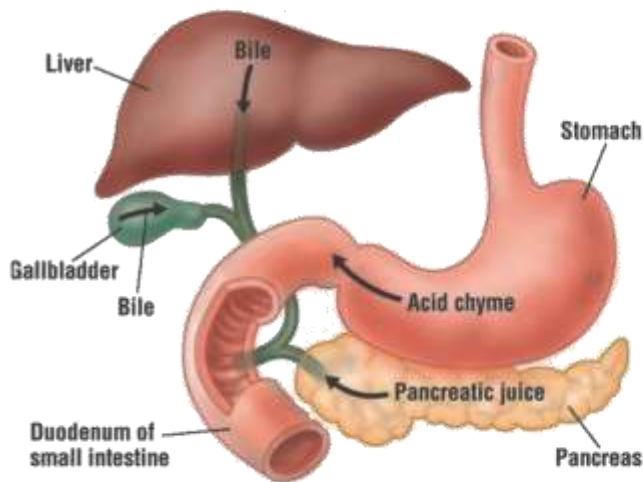
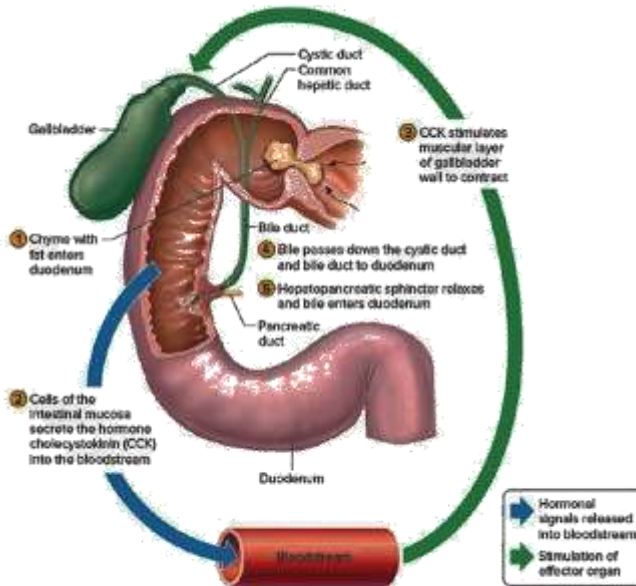
- (1) A = q, B = p, C = s
- (2) A = s, B = r, C = q
- (3) A = s, B = p, C = q
- (4) A = r, B = s, C = p



## SMALL INTESTINE

6.25 m long---

1. Duodenum---25 cm
2. Jejunum---2.5 m long
3. Ileum---3.5 m long



**Brunner's gland** -- submucosa -- secrete secretin and cholecystokinin---

**Crypts of Lieberkuhn**-- flasked-shaped gland-- have four different kind of cells

1. Cells of Paneth in it secrete digestive enzymes
2. Undifferentiated cells
3. Mucus cells
4. Argentaffin cells secrete intestinal hormones

**Q.** Bile can be prevented to release into the duodenum by:

- (1) Pyloric valve
- (2) Sphincter of Oddi
- (3) Cardiac sphincter
- (4) Sphincter of Boyden.

**Q.** In humans, sphincter of Oddi is associated with the opening of:

- (1) Oesophagus
- (2) Pyloric stomach
- (3) Common hepatic duct
- (4) Hepatopancreatic ampulla.