



# NEET - UG

NATIONAL TESTING AGENCY

## Zoology - 3

Volume - 1



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## Digestive System

Physiology Study of normal functioning of tissue, organ and organ system.

Pathology Study of defect and abnormal functioning of tissue, organ and organ system.

### "Digestion and Absorption"

Nutrition:- Sum total of all the process by which organism obtained the substance required for energy, growth & development is called nutrition.

Nutrient:- chemical present in food. Nutrient are of two types.

Macro Nutrients	Micro Nutrient
<p><b>Proximate</b> principle of food. Nutrient utilized in energy production, growth &amp; devolvement. <b>Example</b>:- Carbohydrate Protein Lipids</p>	<p>Protective principle of food. <b>Not involves in</b> Energy production, Growth &amp; Development. These nutrients are essential for <b>health</b>. <b>Example</b>:- Vitamins Minerals Water  (Their deficiency lead specific diseases or abnormalities.)</p>



## # Minerals (Two Types)

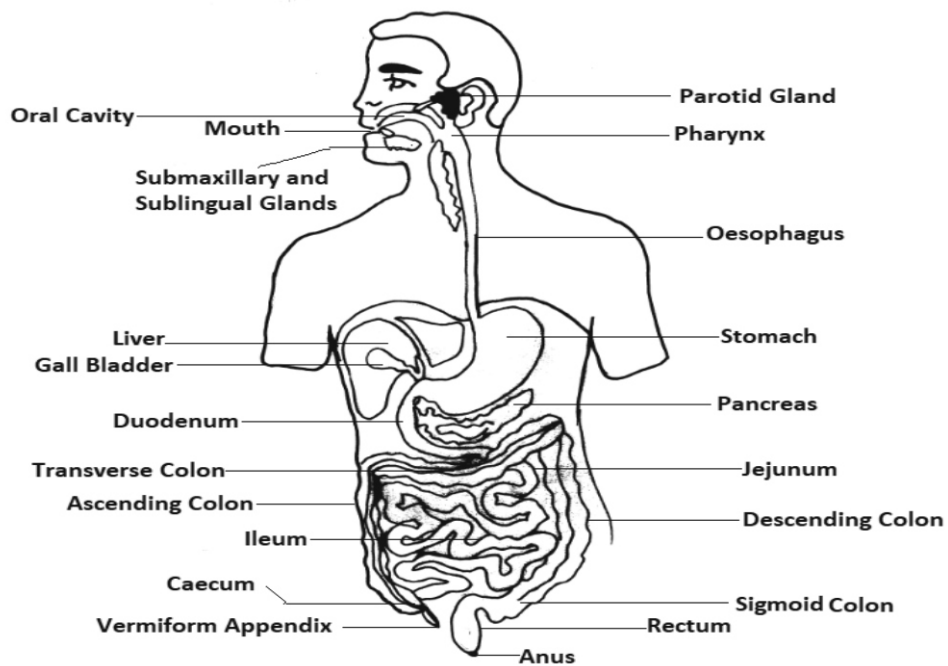
Macro elements = All (around 21 minerals.)	Micro elements
<ul style="list-style-type: none"> <li>* Required in more amount more than 100 mg/day.</li> <li>* Example:-               <ul style="list-style-type: none"> <li>o Na (Sodium)</li> <li>o K (Potassium)</li> <li>o Ca (Calcium)</li> <li>o Cl (Chloride)</li> <li>o P (Phosphorus)</li> <li>o S (Sulphur)</li> <li>o Mg (Magnesium)</li> </ul> </li> </ul>	<p>Required in small amount less than 100 mg/day.</p> <ul style="list-style-type: none"> <li>* Example:               <ul style="list-style-type: none"> <li>o Fe (Iron)</li> <li>o Zinc</li> <li>o I (Iodine)</li> <li>o Mn (Manganese)</li> <li>o Co (Cobalt)</li> <li>o Cu (Copper)</li> <li>o Mo (Molybdenum)</li> </ul> </li> </ul>

## Stages of Nutrition

- \* **1. Ingestion** - Food Intake.
- \* **2. Digestion** - Breakdown of complex food into simpler for absorption.
- \* **3. Absorption** - Transfer of end product of digestion into blood and lymph through intestinal mucosa.
- \* **4. Assimilation** - Utilization of nutrient by cells.
- \* **5. Egestion** - Removal of undigested food.

### "Human digestive system"

- \* Human is heterotrophic, holozoic & omnivores organism.
- \* Digestive system include → Alimentary canal.  
→ Digestive Gland.



## # Alimentary canal:-

- \* Tube of varying diameter starting from mouth and ends at anus.
- \* Produce by "Archenteron" in embryo.
- \* Part of alimentary canal:- It consist of

### 1. Buccopharyngeal chamber

- \* Oral vestibule
- \* B Cavity
  - o Tongue.
  - o Teeth
  - o Palate
  - o Hard
  - o Soft
- \* Pharynx

- Nasopharynx
- Oropharynx

## 2. Oesophagus

## 3. Stomach

- \* Cardiac
- \* Fundus
- \* Body
- \* Pyloric

## 4. Intestine

- \* Small
  - Duodenum
  - Jejunum
  - Ileum
- \* Large
  - Caecum
  - Colon
  - Rectum
  - Anal canal

## 5. Anus

## 7. Mouth

- \* Opening at face
- \* Having **orbicularis Oris** in both lips & Philtrum (Depression present in upper lip).
- \* Mouth open into buccal cavity.

\* Buccal cavity having following parts.

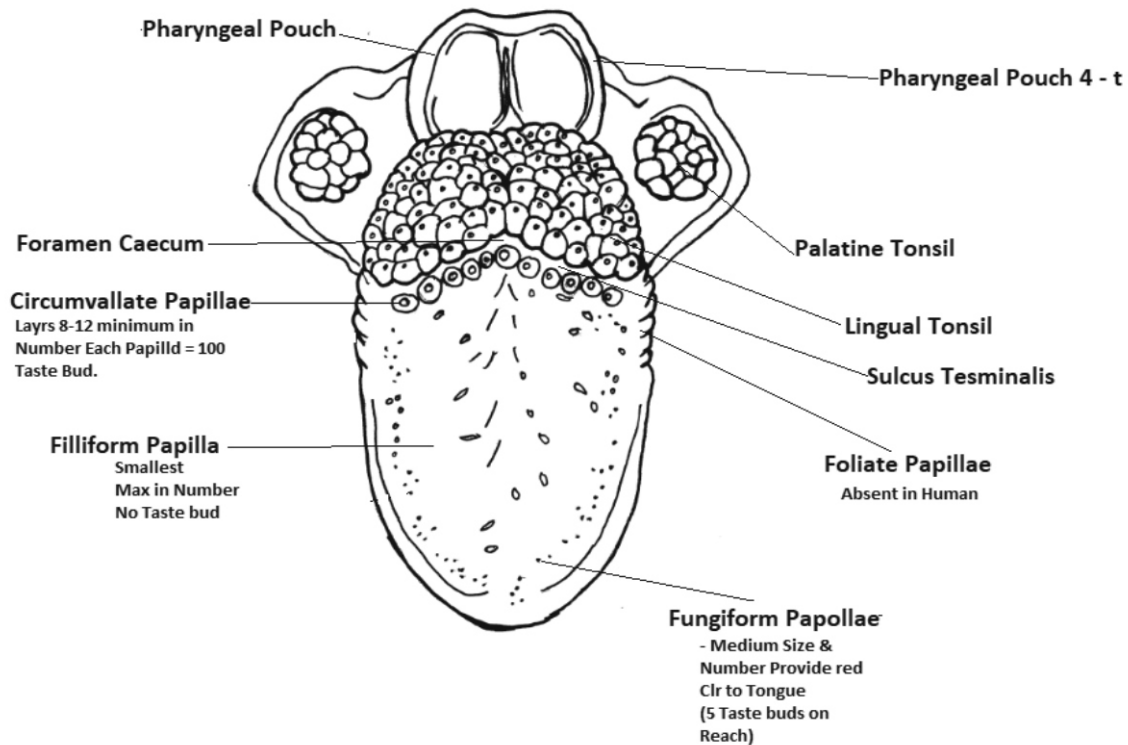
- Palate
- Tongue
- Teeth

#### # A. Palate:- Root of oral cavity

Hard Palate (Anterior)	Soft Palate (Posterior)
<ul style="list-style-type: none"> <li>* Consist of maxillar &amp; Palatine bone.</li> <li>* <u>Palatine Rugae</u> - Transverse ridge on ant. hard palate.</li> </ul>	<ul style="list-style-type: none"> <li>* Consist C.T &amp; Muscle.</li> <li>* UVULA (Velum palati)</li> <li>* Posterior median hanging part of soft palate</li> <li>* Which prevent entry food into nasopharynx.</li> </ul>

#### # B. Tongue

- \* Flat muscular structure (Voluntary muscle).
- \* **Ant part** - free, post part = attach to hyoid apparatus.
- \* **Lower/** Ventral surface attached to floor of mouth with help of frenulum lingui /Lingual frenulum.
- \* Dorsal surface of divided into two parts by V-shaped sulcus (Furrow) called **Sulcus terminal** is having central depression called foramen caecum.



## Type of taste buds -In mammal -4

\* In human 3 (Foliate absent.)

(a) **Circumvallate Papillae** (8-12)

-100 taste bud on papillae.

(b) **Fungiform Papillae**

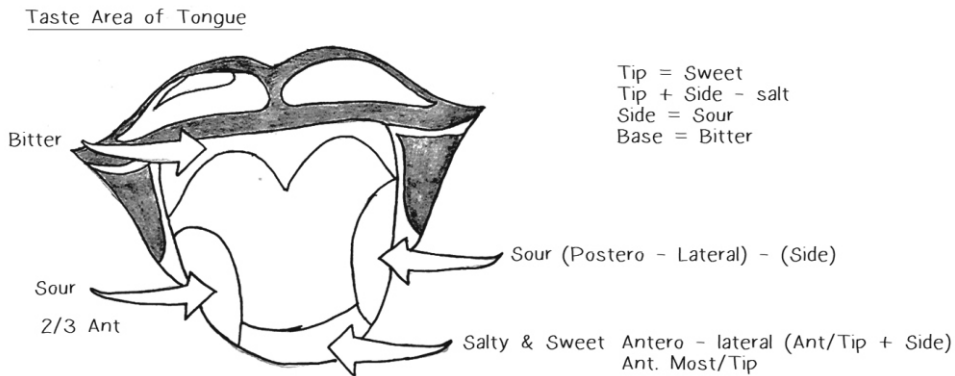
- o Rounded red dots on tongue.
- o Max number.
- o Each Papillae has 5 taste buds

(c) **Filliform/smallest** - Max in number.

- No taste buds.

(d) **Foliate Papillae** - absent in human

# Taste area of tongue.

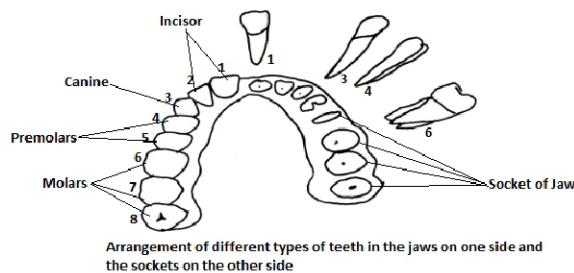


### # Note

- No taste bud for chillies only pain sensation.
- Dog tongue has sweat gland that help in thermoregulation in summer.

### # Teeth:-

- \* **Ecto-Mesodermal**
- \* **Enamel** - Ectodermal, **rest whole** = mesodermal.
- \* **Human (Mammalian) teeth** are.
  - **Diphyodont** - Erupt two times / 2 set of teeth.
- \* Milk (Deciduous)
- \* Permanent
  - **Thecodont** - Embedded in socket/alvedus.
  - **Heterodont** -More than one type.
    - Incisor (I)
    - Canine (C)
    - Pre Molar (Pm)
    - Molar (M)



**Diphyodont** - 2 set of teeth.

### Diphyodont - 2 Set of Teeth

**(A) Milk Teeth** Total 20, or Tempary Erupt at 6 Month.

**P - 8**  
**C - 4**  
**PM - 0**  
**M - 8/20**

**(B) Permanent Teeth** All Persent at End of 24 Month

**Total 32**  $\left\{ \begin{array}{l} \text{P - 8, PM - 8} \\ \text{C - 4, M - 12} \end{array} \right.$

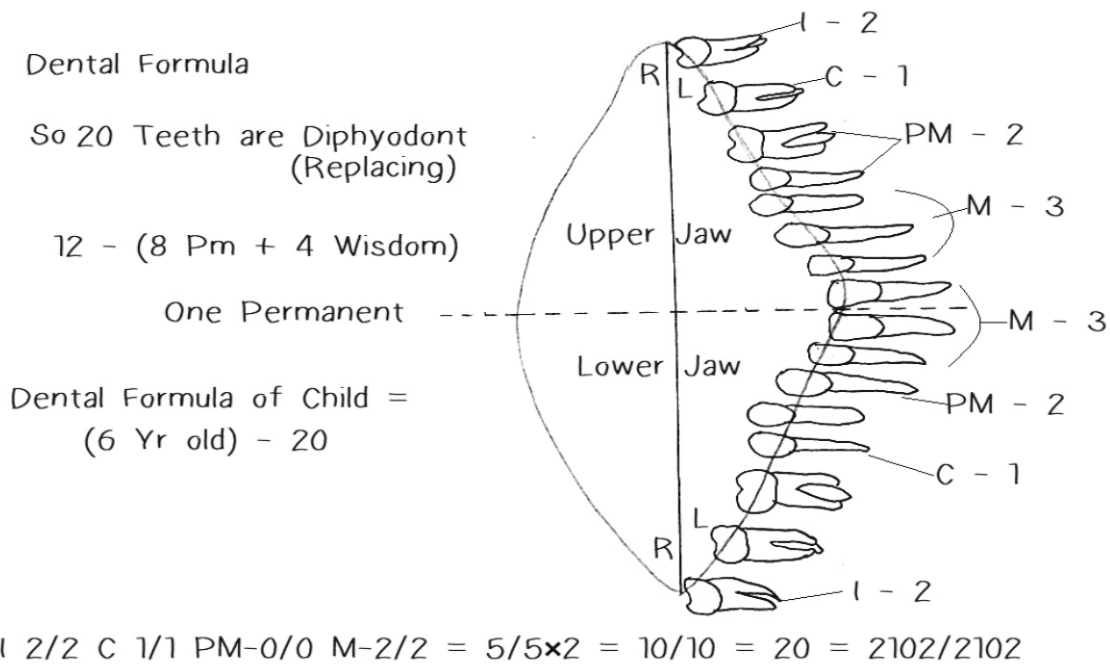
### Dental Formula

17 Year old: (28 Teeth)

$$I \frac{2}{2}, C - \frac{1}{1}, PM - \frac{2}{2}, M \frac{2}{2} = \frac{7}{7} \times 2 = \frac{14}{14} = 28 = \frac{2122}{2122}$$

(iii) Adult : (32 Teeth)

$$I \frac{2}{2}, C \frac{1}{1}, PM \frac{2}{2}, M \frac{3}{3} = \frac{8}{8} \times 2 = \frac{16}{16} = 32 = \frac{2123}{2123}$$

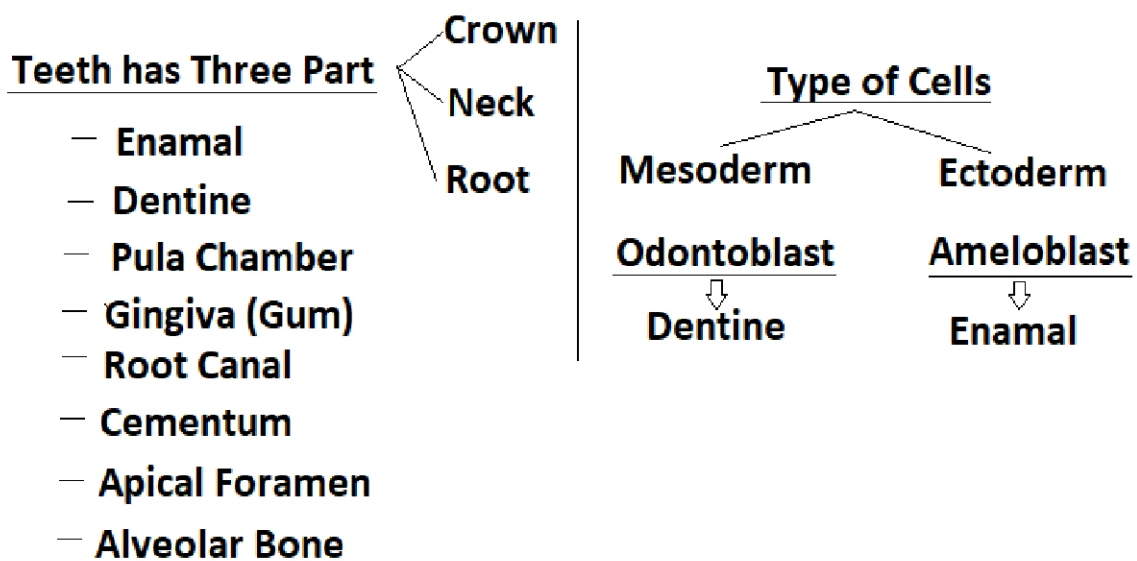


Last permanent tooth to be erupted is 3<sup>rd</sup> molar (Wisdom tooth) at age of 18-25 years

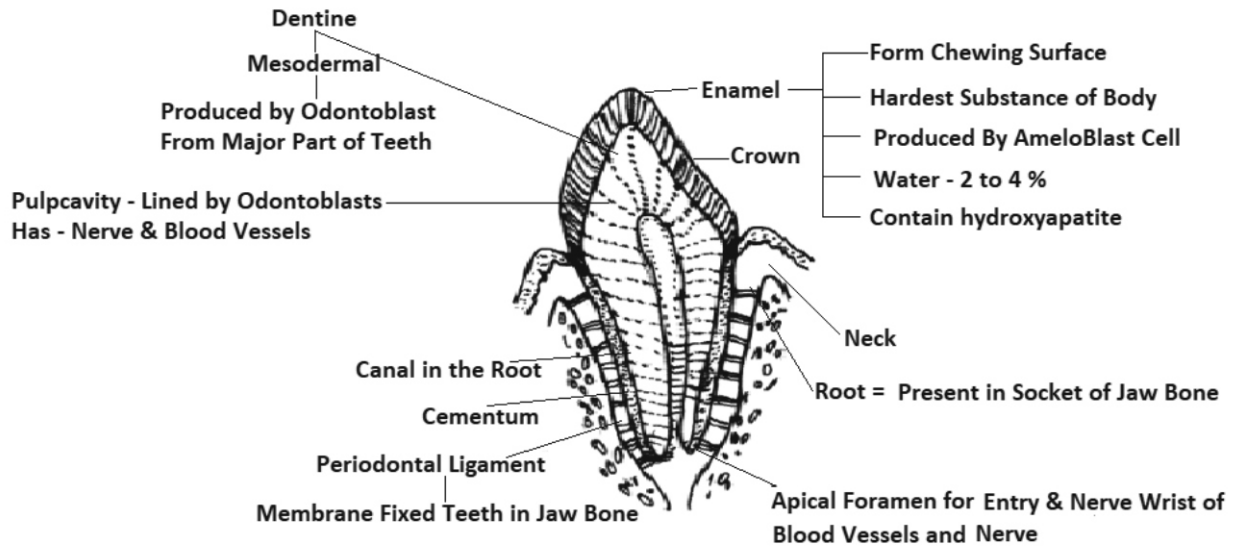
Monophyodont -  $M = \frac{1}{1} = \frac{3}{3} \times 2 = \frac{6}{6} = 12$

Diphyodont -  $I \frac{2}{2}, C \frac{1}{1}$  first 2M,  $\frac{2}{2} = \frac{5}{5} \times 2 = \frac{10}{10} = 20$

# Structure of teeth.







\* **Types** of joints of tooth with jaw bone = **Gomphosis**

\* Number of root in jaw bone.

- In lower jaw -1 Root → I, C, PM,
- 2 Root → M
- In Upper Jaw. -1 Root → I and C, and 1<sup>st</sup> PM
- 2 Root → 2<sup>nd</sup> PM
- 3 Root → Upper Molar.

# **Types of tooth on basis of cusp.**

\* **Bunodont**

- Brachydont (Rounded cusp)
- PM & M of human also called check teeth.

\* **Lophodont** - Elephant.

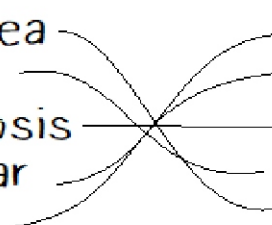
\* **Selenodont** - Cow, Sheep.

\* **Secodont** - Carnivorous (Pointed cusp)

\* **Aerodont** - Root less teeth (Fish and Amphibian)

\* **Walrus tusk** - Modified canine.

Q. Match the column.

- |  |   |   |
|--|---|---|
| 1. Pyorrhoea<br>2. Enamel<br>3. Gomphosis<br>4. Premolar<br>5. Incisor |  | a. Monophyodont<br>b. Diphyodont<br>c. Teeth Joint<br>d. Hardest Substance<br>e. Gum/Gingival Infection |
|--|---|---|

1. (e), 2. (d), 3. (c), 4. (a), 5. (b)

Q. Major Part of teeth formed by dentine. T/F.

Q. Dental carries /tooth decay is caused by acid producing bacteria. T/F.

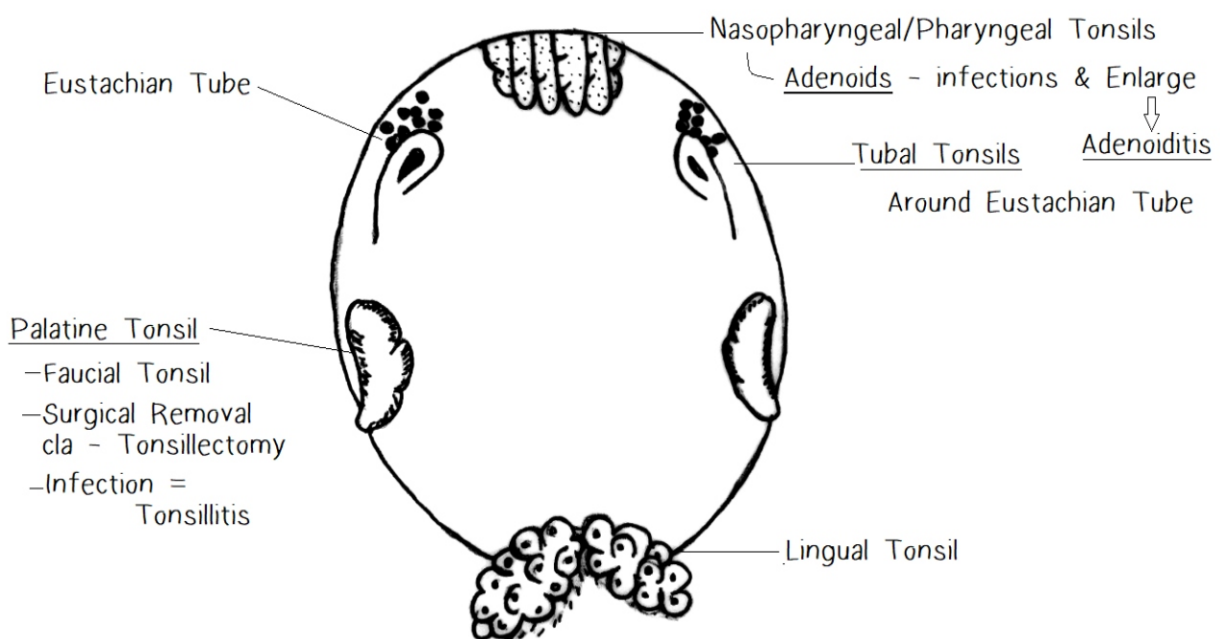
Q. Wisdom tooth is vestigial structure T/F.

# **Note** - Diastema -space between teeth.

Ankyloglossia - **Tongue tie.**

# **Waldayer's lymphatic ring of tonsils.**

(Ring like arrangement of lymphatic tissue of - Pharynx and Oral cavity.

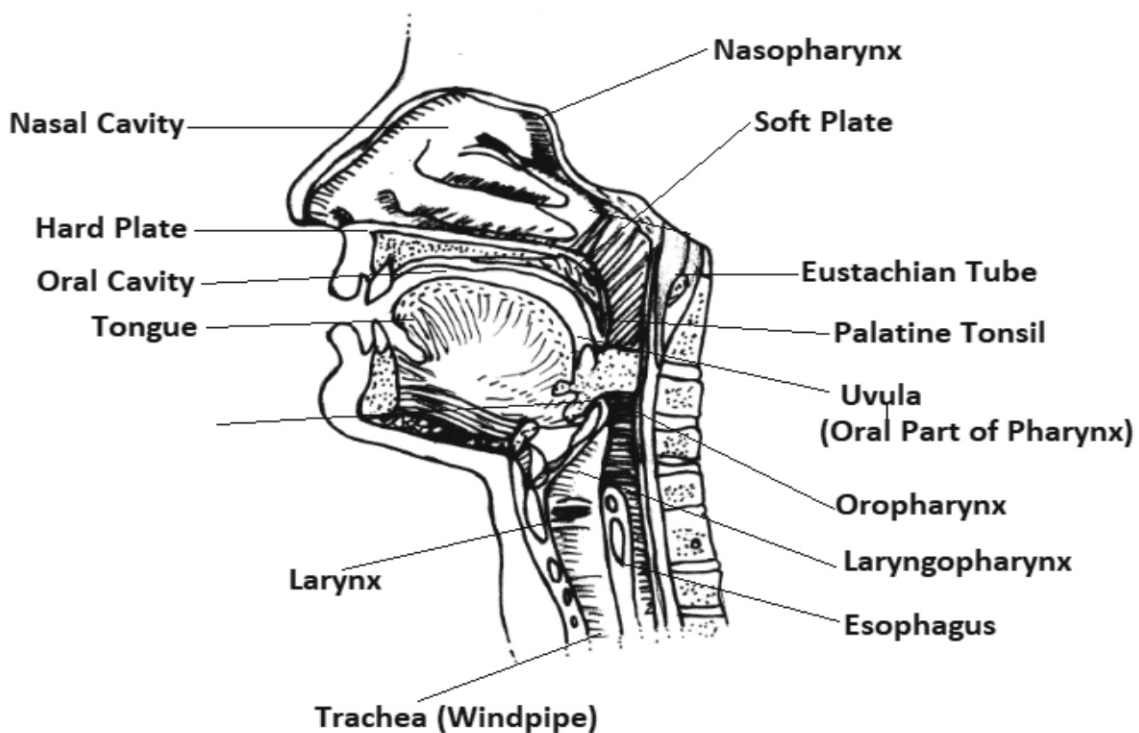


## 2. Pharynx

\* Common passage for food and air (NCERT)

\* 3 parts -

- nasopharynx → Upper only air.
- Oropharynx → Food + air
- Laryngopharynx → Food + air



# **Laryngopharynx (Laryngeal part of pharynx)**

- \* Most inferior part of pharynx.
- \* Lead to open into **two** openings.

Anterior = Glottis	Posterior = Gullet
<ul style="list-style-type: none"> <li>* Open into trachea.</li> <li>* Guarded by epiglottis (elastic cartilage that prevent entry of food into trachea).</li> </ul>	<ul style="list-style-type: none"> <li>* Open into oesophagus.</li> </ul>

# Note:- Swallowing or deglutition = movement of food from mouth into oesophagus (both voluntary & involuntary.)

### 3. Oesophagus:-

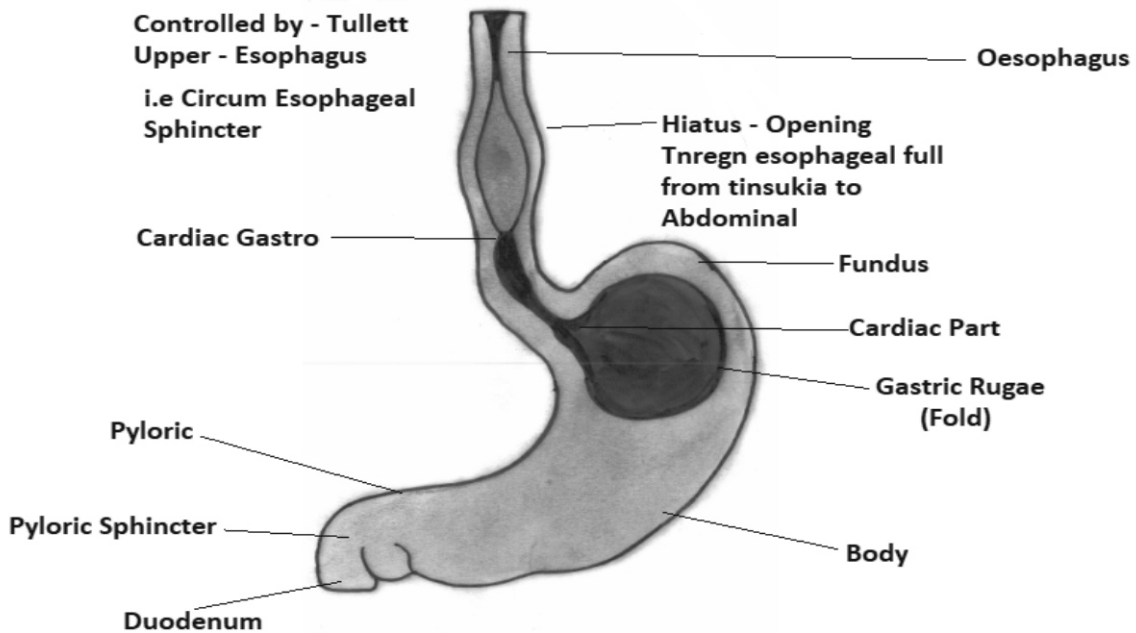
- \* Food Pipe - 25cm long.
- \* **No** digestive gland.
- \* Only mucous gland for lubrication.
- \* **Has following muscles.**
  - o **Upper 1/3<sup>rd</sup>** = only striated.
  - o Middle 1/3rd = Striated + Smooth.
  - o **Lower 1/3<sup>rd</sup>** = Smooth.

# Note:- Aurbachs & meissener plexus absent in upper 1/3 part of oesophagus.

#### Function:-

- o Transfer food from pharynx to stomach.
- o food move to downward due regular contraction & relaxation called Peristalsis.

# Note:- Open into stomach is regulated by M. Sphincter called gastro oesophaycal sphincter.



Q. Upper oesophageal /circumphonyngcal sphincter is skeletal and voluntary T/F.

Q. Cardiac sphincter is situated in cardiac (Heart) . T/F

# Note:- Situated between oesophagus and stomach.

**Fact:-** If cardiac sphincter fails to relaxed fully then achalasia cardia = leading to dilation of lower oesophagus.

**Fact:-** If cardiac sphincter fails to closed = heart burn or Pyrosis due to entry of acidic chyme in oesophagus.

- \* **Gastro oesophageal reflex** = which leads to vomiting.
- \* **Emesis** i.e rejection of stomach content through mouth.
- \* **Hiatus hernia:-** Part of stomach pushed above diaphragm through hiatus.

## 4. Stomach

- \* Widest part of A. canal.
- \* J-shaped.
- \* Situated below diaphragm in abdominal cavity.

- \* Max. Musculature and max peristalsis.
- \* **Gastrostomy**- surgical removal of part of stomach or whole stomach.
- \* Indication - Bariatric surgery (Surgery for weight loss).
- \* **Gastrectomy may lead to**
  - o **Achlorhydria** - Low or absence of HCl.
  - o **Pernicious anaemia** - Due to the absence or low castle intrinsic factor.
  - o **Iron deficiency anaemia** - Due to non-conversion of  $Fe^{+3}$  into  $Fe^{+2}$  due to the absence of HCl.
  - o Effect protein digestion.

#### Stomach

Human (Simple stomach)	Compound (In Ruminant)
<ul style="list-style-type: none"> <li>* 4 parts               <ul style="list-style-type: none"> <li>o <b>Cardiac</b> - Oesophagus open</li> <li>o <b>Fundus</b> - Above to cardiac.</li> <li>o Filled with gas (PMT)</li> <li>o <b>Body</b> - Main central region.</li> <li>o <b>Pylorus</b> - Open in duodenum.</li> </ul> </li> <li>* 2 - <b>Sphincter</b> <ul style="list-style-type: none"> <li>o Cardiac.</li> <li>o Pyloric.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>* 4 parts               <ul style="list-style-type: none"> <li>o <b>Rumen</b> - Largest.</li> <li>o <b>Reticulum</b>.</li> <li>o <b>Omanum</b></li> <li>o <b>Abomasum</b> (True stomach and contain gastric gland).</li> </ul> </li> <li>* Rumen and Reticulum has ruminococcus</li> <li>* Bacteria cellulose digestive.</li> </ul>

# **5. Small intestine:-** 6.25 meter long.

# **Note:-** Herbivorous has **long intestine to digest cellular** completely.

- \* Small intestine receive bile, pancreatic juice and intestinal juice.
- \* Main site of digestion and absorption (max. absorption).
- \* Diameter small, but length more than large intestine.