



# NEET - UG

NATIONAL TESTING AGENCY

## Zoology - 3



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

## # Minerals (Two Types)

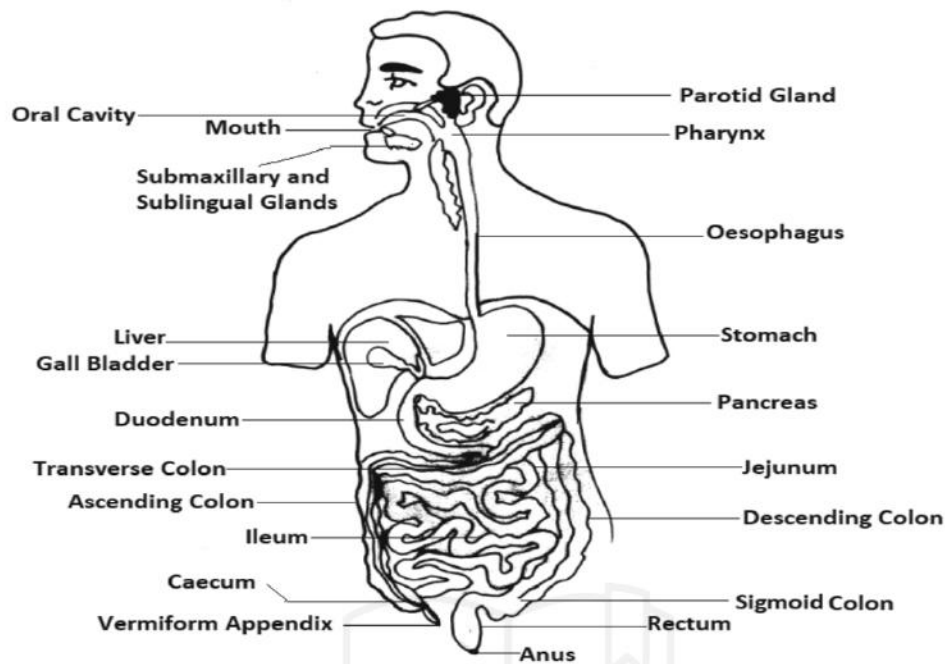
Macro elements = All (around 21 minerals.)	Micro elements
<ul style="list-style-type: none"> <li>* Required in more amount more than 100 mg/day.</li> <li>* Example:-               <ul style="list-style-type: none"> <li>o Na (Sodium)</li> <li>o K (Potassium)</li> <li>o Ca (Calcium)</li> <li>o Cl (Chloride)</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

## 1. 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.

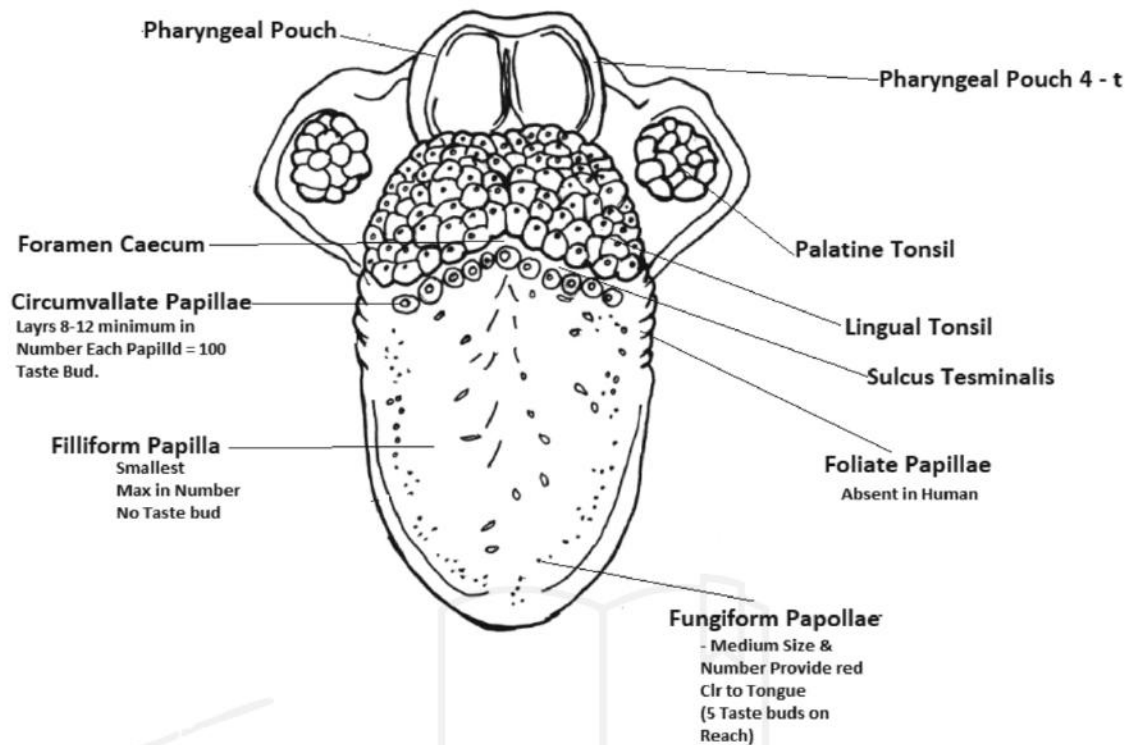
- o Palate
- o Tongue
- o Teeth

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

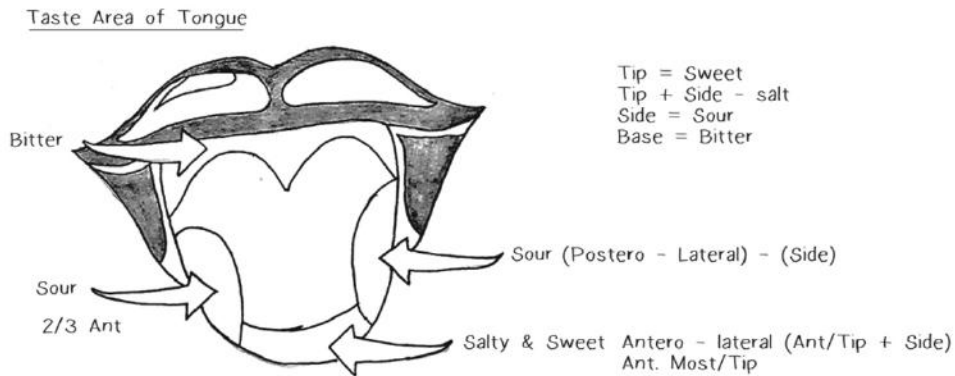
(c) **Filiform/smallest - Max in number.**

- 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.

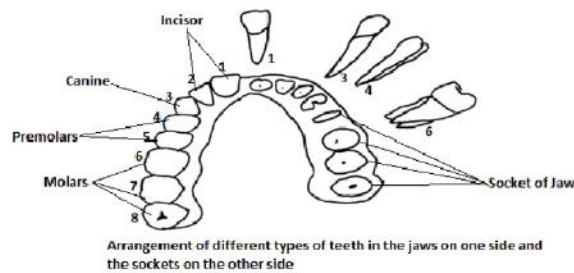
\* **Milk (Deciduous)**

\* **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**      **P - 8, PM - 8**  
                          **C - 4, M - 12**

**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)

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

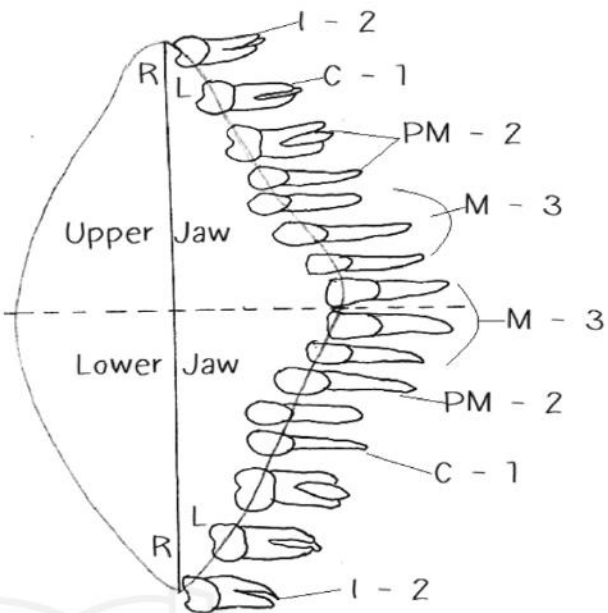
Dental Formula

So 20 Teeth are Diphyodont (Replacing)

12 - (8 Pm + 4 Wisdom)

One Permanent

Dental Formula of Child =  
(6 Yr old) - 20



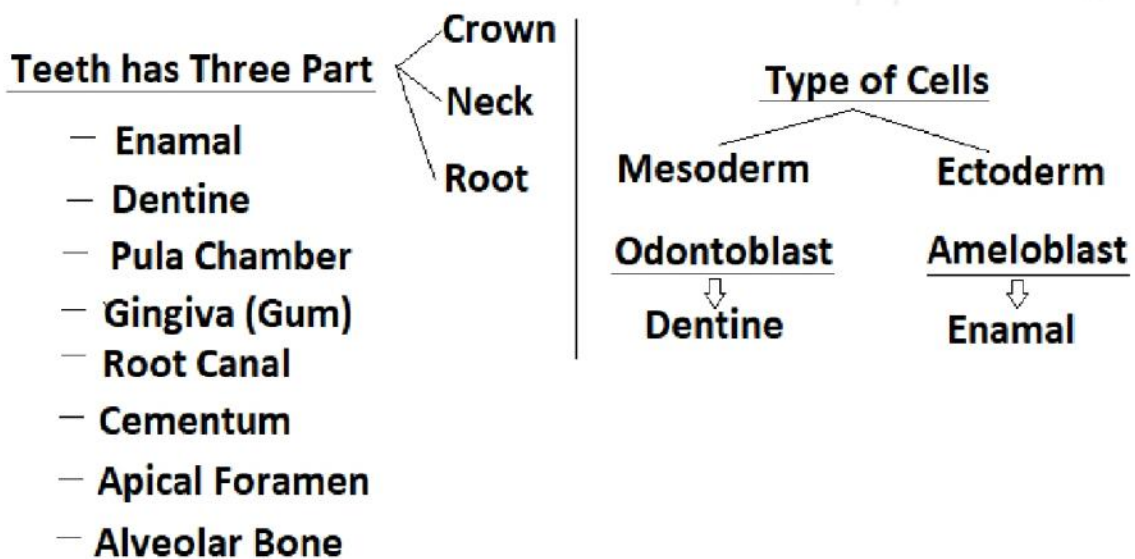
$$I \frac{2}{2} C \frac{1}{1} PM \frac{0}{0} M \frac{2}{2} = \frac{5}{5} \times 2 = \frac{10}{10} = 20 = \frac{2102}{2102}$$

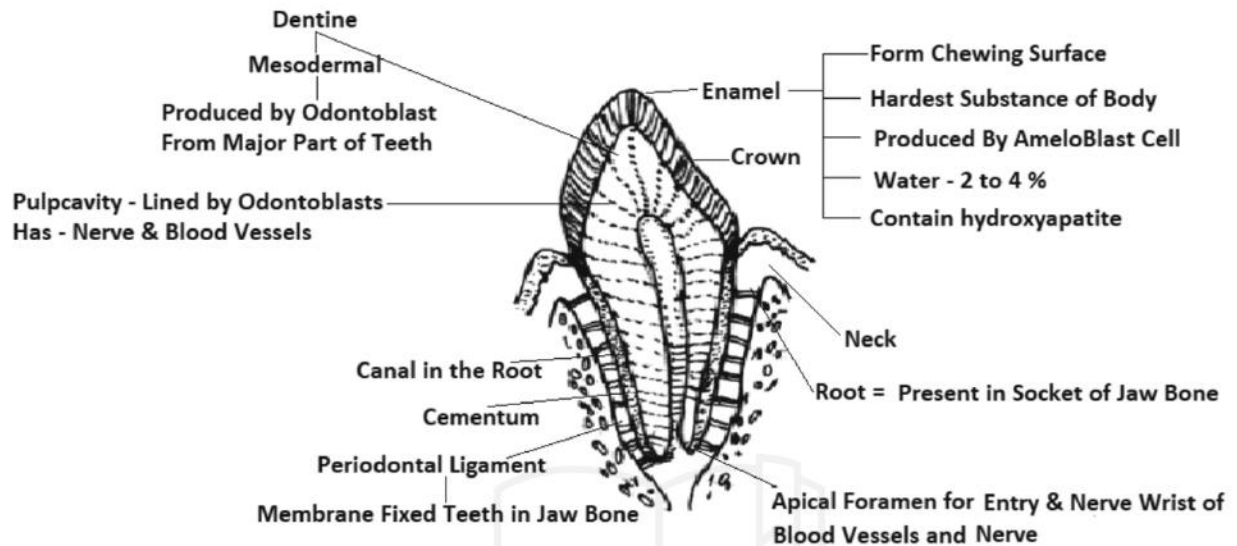
Last permanent tooth to be erupted is 3<sup>rd</sup> molar (Wisdom tooth) at age of 18-25 years

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

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

# Structure of teeth.





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

\* Number of root in jaw bone.

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

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

\* **Bunodont**

- o Brachydont (Rounded cusp)
- o 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.

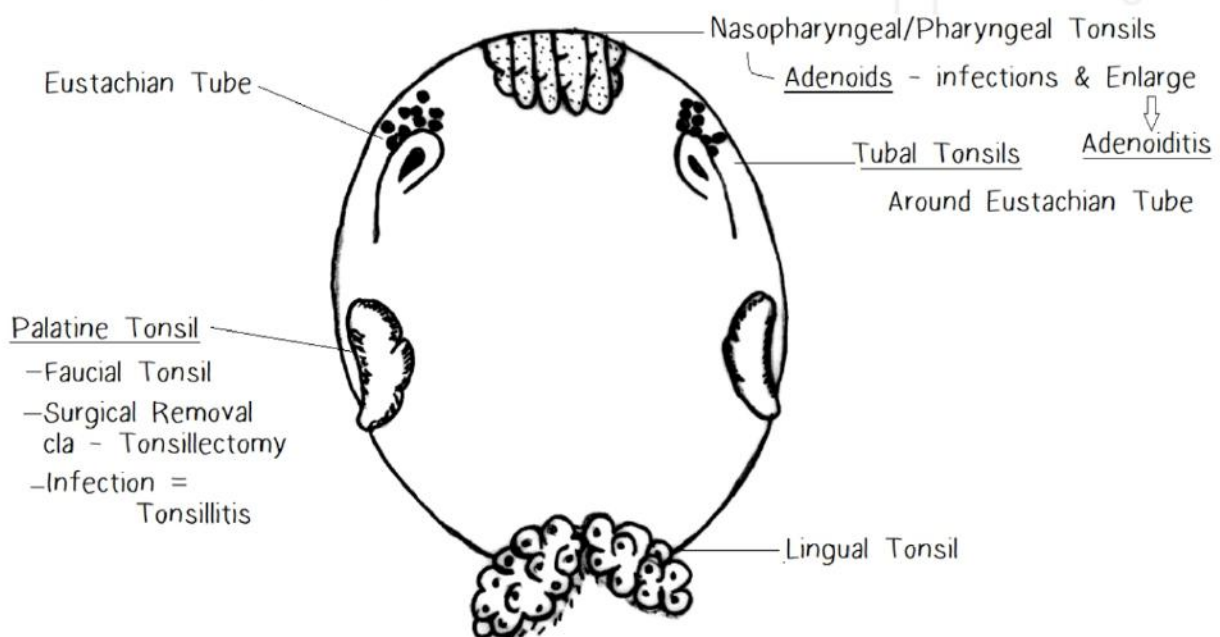
Q. Wisdom tooth is vestigial structure T/F.

# **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.

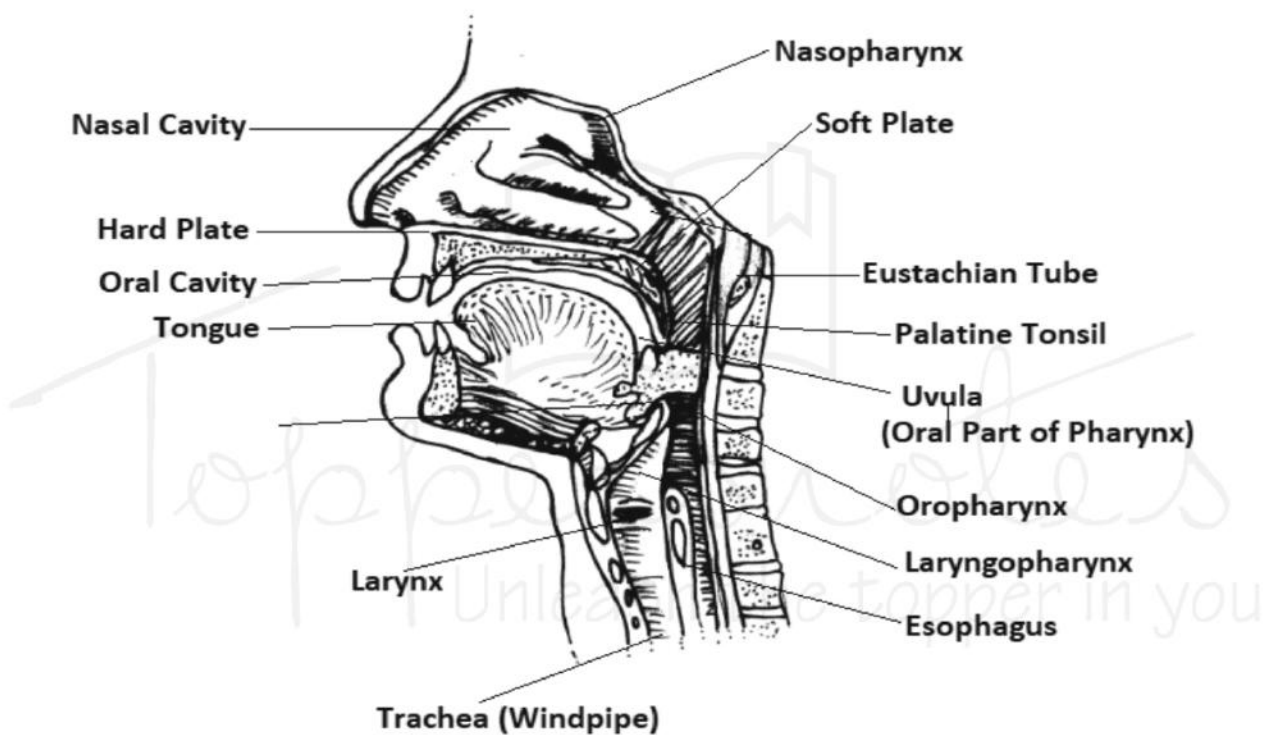


## 2. Pharynx

\* 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:-

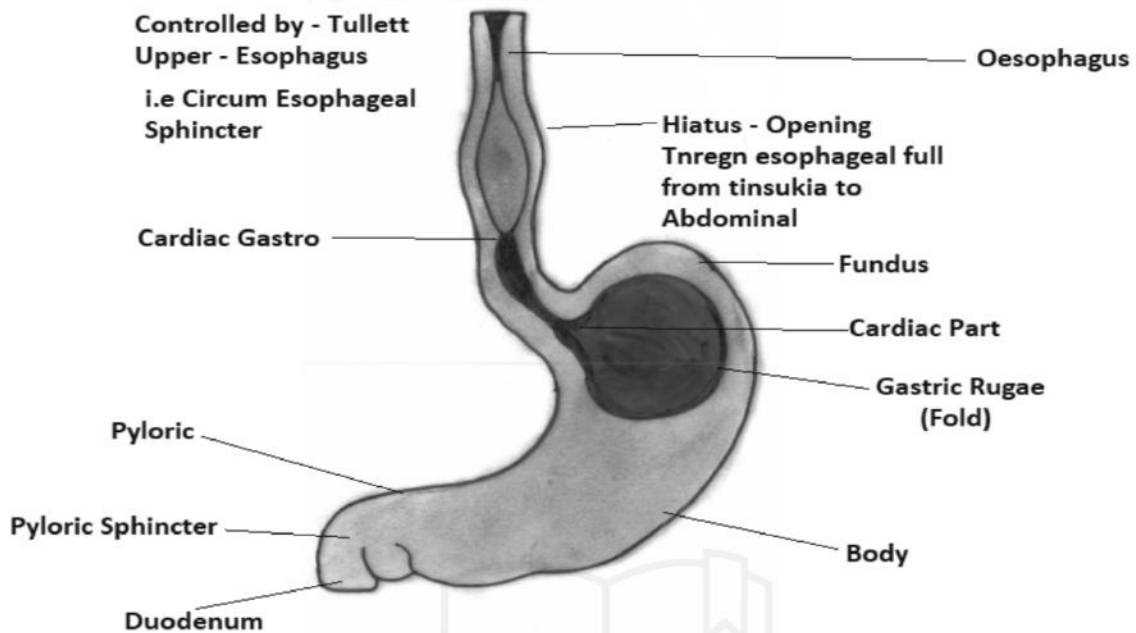
- \* Food Pipe - 25cm long.
- \* No digestive gland.
- \* Only mucous gland for lubrication.
- \* Has following muscles.
  - o Upper 1/3<sup>rd</sup> = only striated.
  - o Middle 1/3<sup>rd</sup> = Striated + Smooth.
  - o Lower 1/3<sup>rd</sup> = Smooth.

# **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.