

Digestive System

A&P

Created by Ashley Berryhill

Digestive System

- ▶ AKA gastrointestinal system or GI system
- ▶ **Function**=responsible for the physical & chemical breakdown of food (digestion) so it can be taken into bloodstream & be used by body cells & tissues (absorption)
- ▶ **Structures**=divided into alimentary canal & accessory organs

Test your Knowledge

- ▶ What is the digestive system?
 - A) The body's breathing system
 - B) The body's system of nerves
 - C) The body's food-processing system
 - D) The body's blood transporting system

Test your Knowledge

- ▶ The main functions of the digestive system are
 - A) ingestion and digestion
 - B) propulsion and secretion
 - C) absorption and elimination
 - D) digestion and absorption

Test your Knowledge

▶ The movement of digestion products, vitamins, water, and electrolytes across the GI tract epithelium and into the blood vessels is called

- A) ingestion
- B) absorption
- C) digestion
- D) secretion

Alimentary Canal

▶ Long muscular tube

▶ Includes:

1. Mouth

2. Pharynx

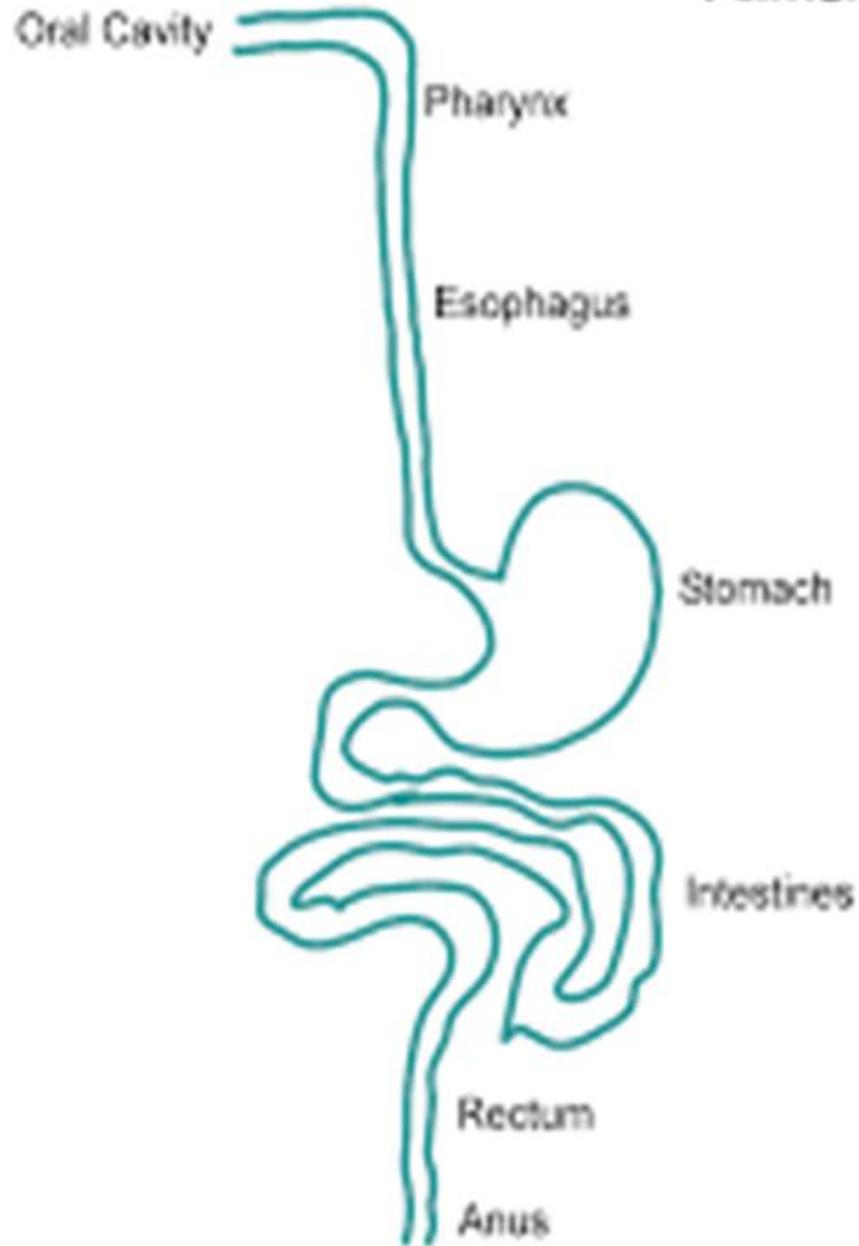
3. Esophagus

4. Stomach

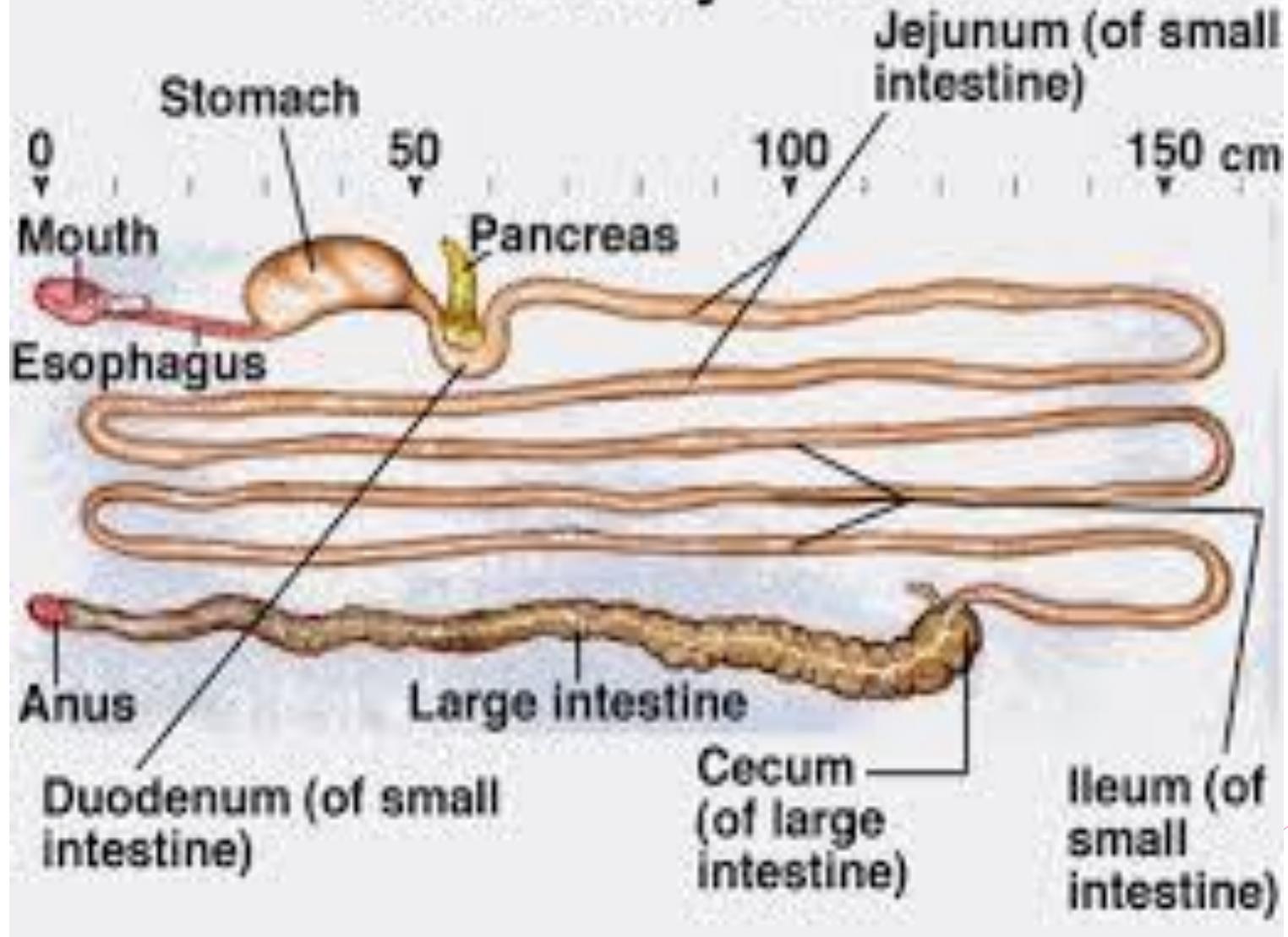
5. Small intestine

6. Large intestine

Alimentary Canal



Alimentary Canal



1. Mouth



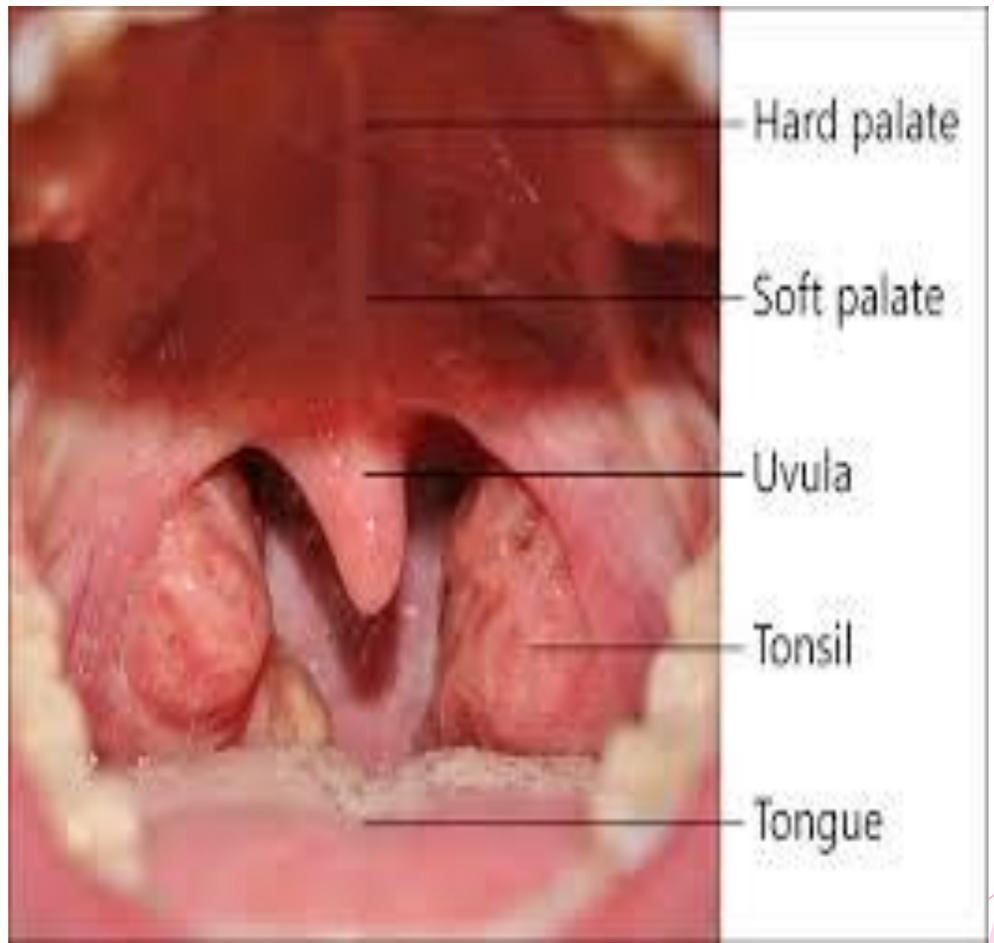
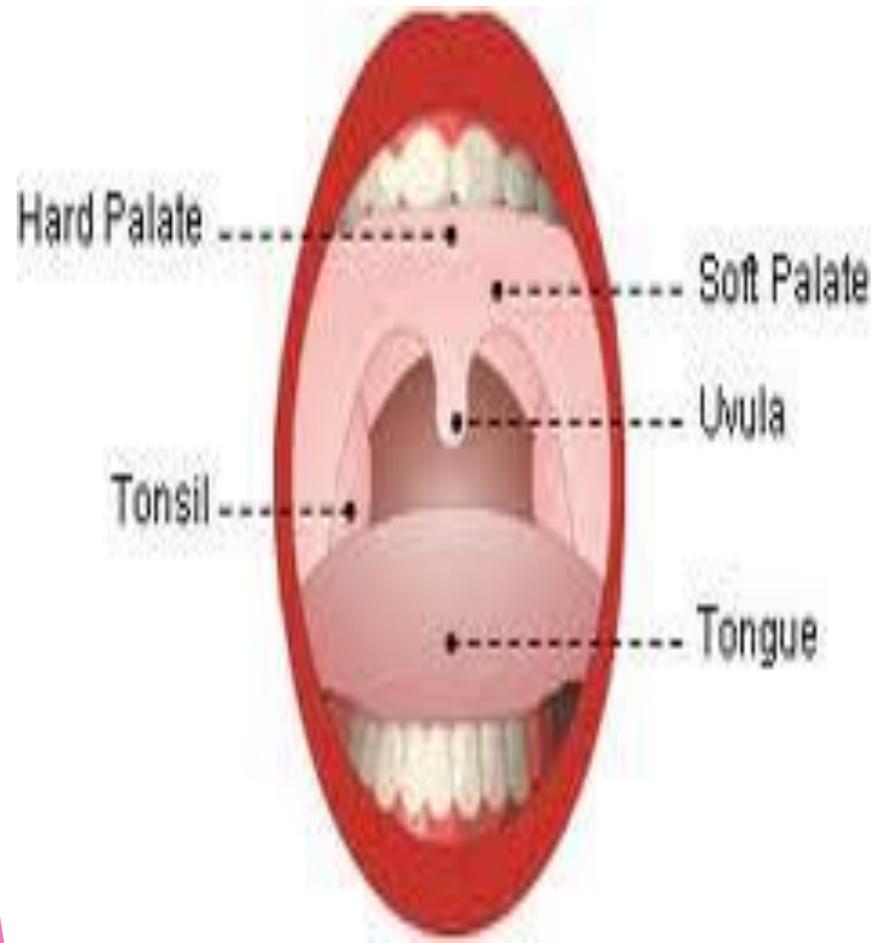
- ▶ Mouth=*buccal cavity*
- ▶ Where food enters body, is tasted, broken down physically by teeth, lubricated & partially digested by saliva, & swallowed
- ▶ **Teeth**=structures that physically break down food by chewing & grinding in a process called *mastication*

1. Mouth

- ▶ **Tongue**=muscular organ, contains taste buds which allow for sweet, salty, sour, & bitter sensations
- ▶ Tongue also aids in chewing & swallowing

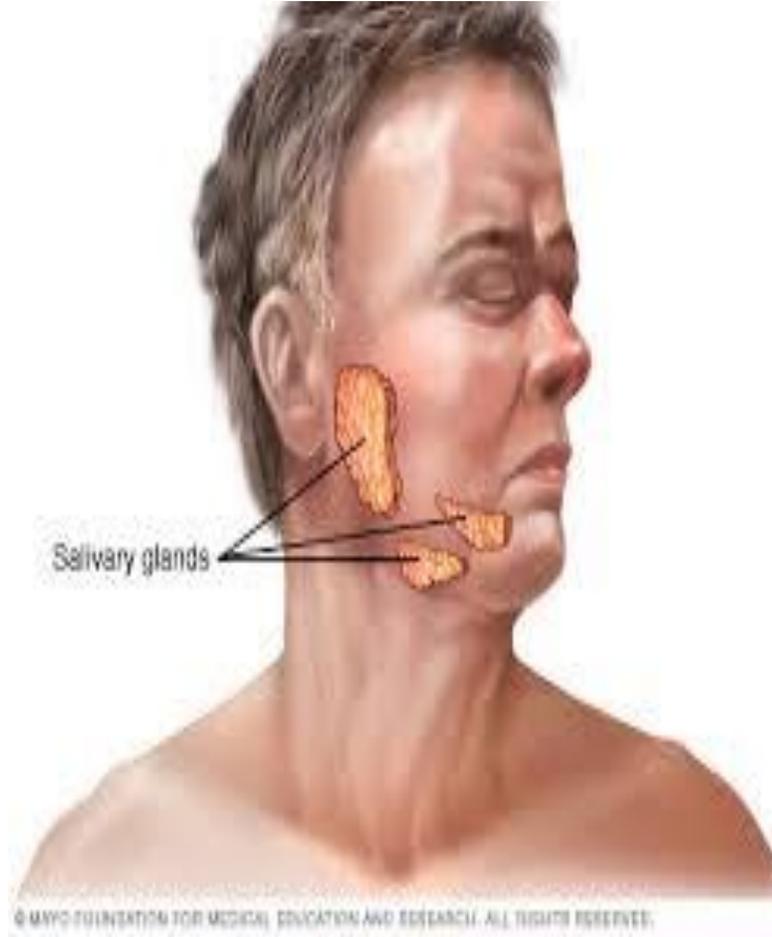
1. Mouth

- ▶ **Hard palate**=bony structure, forms roof of mouth, separates mouth from nasal cavities
- ▶ **Soft palate**=behind hard palate; separates mouth from nasopharynx
- ▶ **Uvula**=cone-shaped muscular structure, hangs from middle of soft palate; prevents food from entering nasopharynx during swallowing



1. Mouth

- ▶ **Salivary glands**=3 pairs (parotid, sublingual, & submandibular); produce saliva
- ▶ **Saliva**=liquid that lubricates mouth during speech & chewing, moistens food so it can be swallowed
- ▶ **Salivary amylase**=saliva enzyme (substance that speeds up a chemical reaction) starts the chemical breakdown of carbohydrates (starches) into sugar



Test your Knowledge

- ▶ Digestion begins in the mouth. Which statement is not correct?
 - A) The tongue aids in the digestion of the food.
 - B) The saliva changes some of the carbs/starches into sugar.
 - C) The tongue keeps the food in place in the mouth while the food is being chewed.
 - D) The digestive juices can react more easily with the food when chewed.

Test your Knowledge

- ▶ Digestive functions of the tongue include:
 - A) manipulating and mixing ingested materials during chewing
 - B) helping compress partially digested food to form a bolus
 - C) assisting in the swallowing process
 - D) all of the above

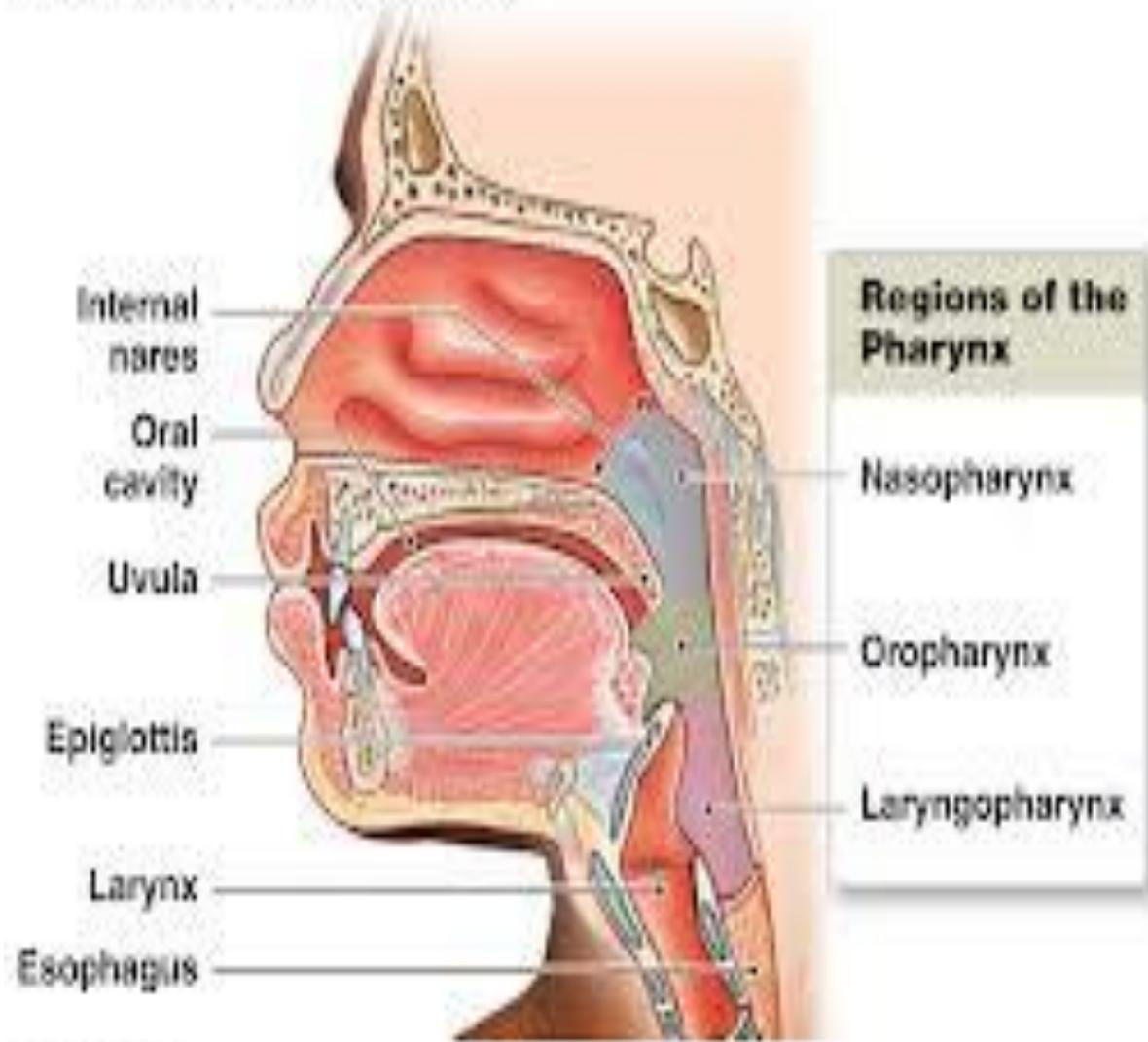
Test your Knowledge

- ▶ Parotid, submandibular, and sublingual all refer to:
 - A) secretions of the liver
 - B) types of absorbed nutrients
 - C) secretions of the small intestines
 - D) salivary glands

2. Pharynx

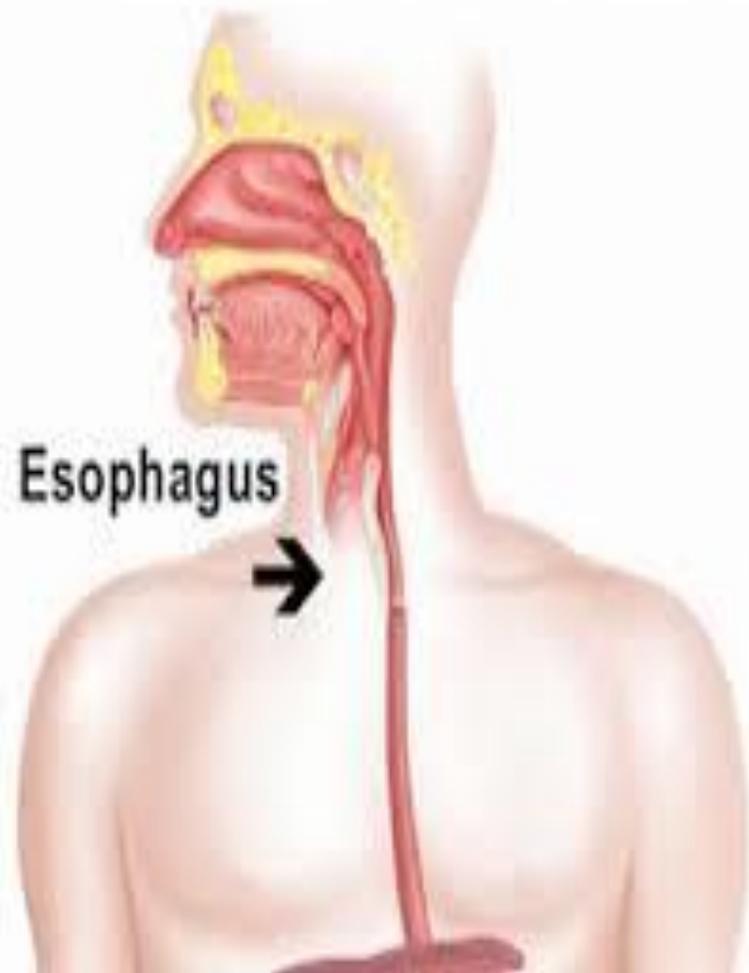
- ▶ **Bolus**=chewed food mixed with saliva
- ▶ **Pharynx**=throat; tube that carries air & food
- ▶ Air goes to trachea; food goes to esophagus
- ▶ When bolus is swallowed, epiglottis covers larynx which stops bolus from entering respiratory tract and makes it go into esophagus

The pharynx, a common passageway for solid food, liquids, and air

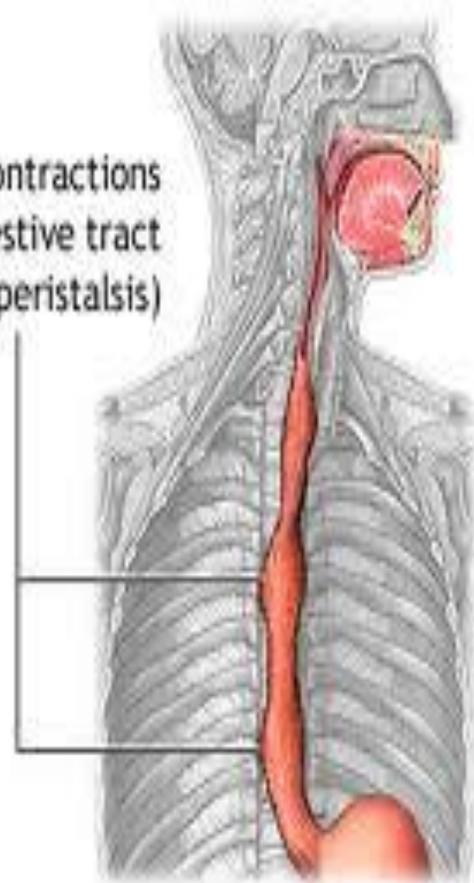


3. Esophagus

- ▶ **Esophagus**=muscular tube dorsal to trachea
- ▶ Receives bolus from pharynx & carries it to stomach
- ▶ Uses ***peristalsis*** (rhythmic, wavelike, involuntary muscular movement) to move food in a forward direction

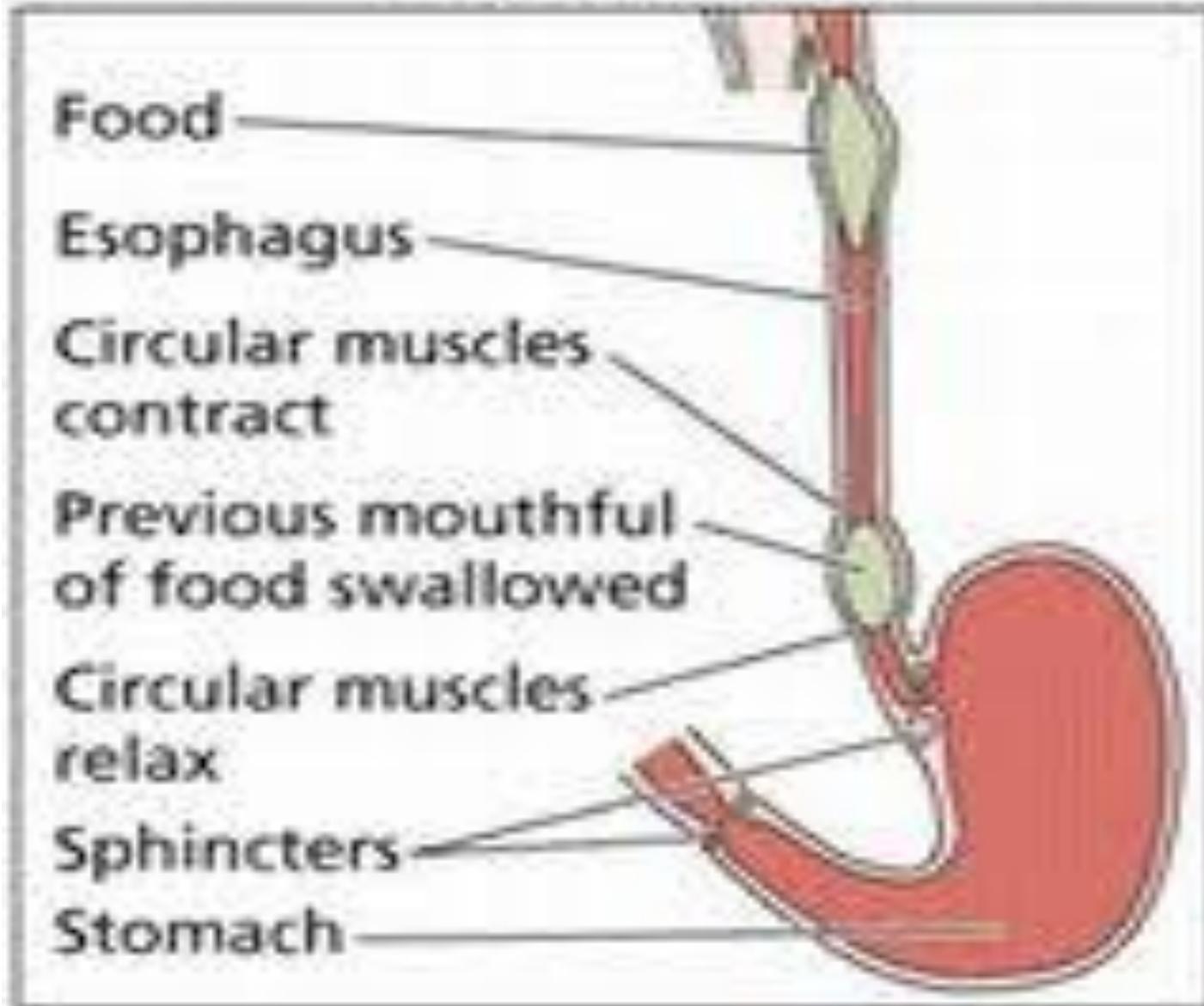


Muscular contractions
of digestive tract
(peristalsis)



*ADAM

Peristalsis



Test your Knowledge

- ▶ Where does food pass through between the mouth and the stomach?
 - A) the esophogus
 - B) the rectum
 - C) the small intestine
 - D) the large intestine

Test your Knowledge

► Our throat divides into 2 separate tubes: the trachea and esophogus. What prevents food from entering the trachea?

A the uvula

B)the tongue

C)the trachea

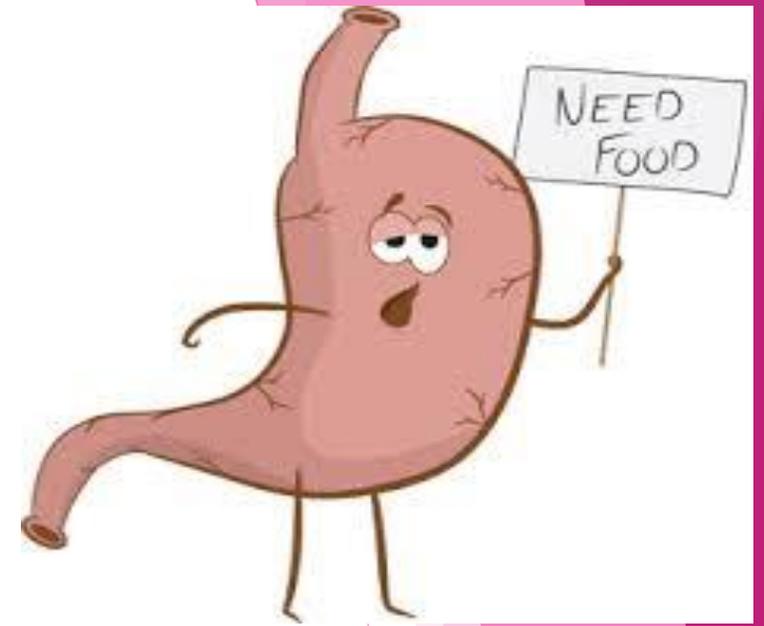
D)the epiglottis

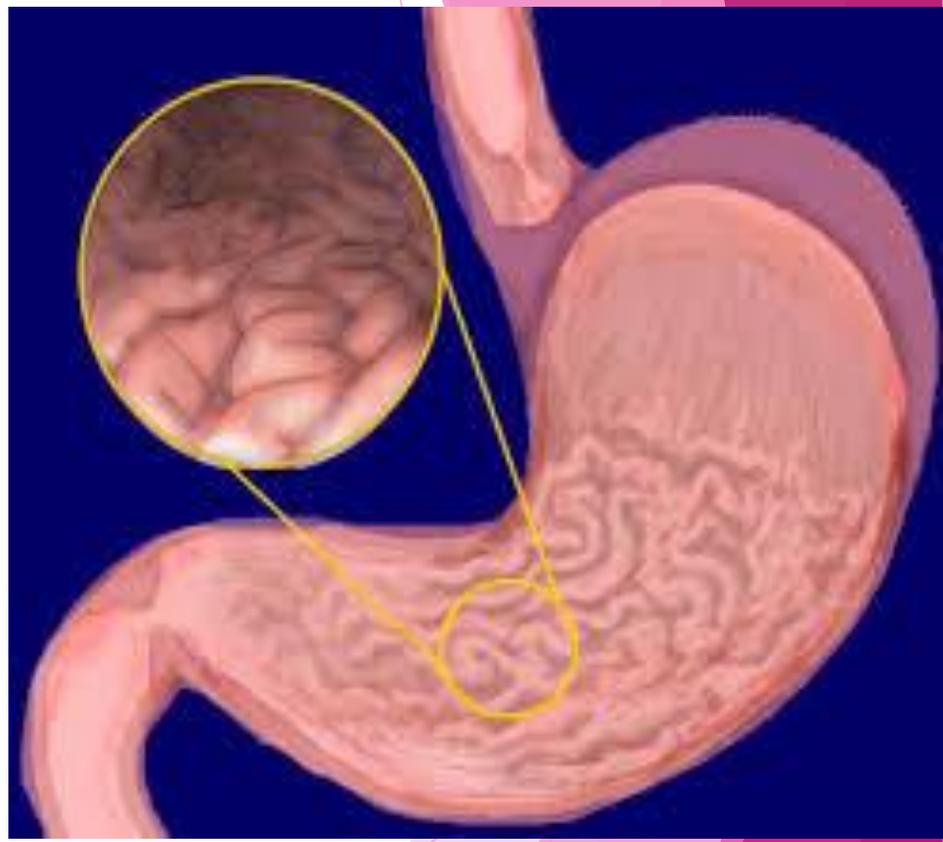
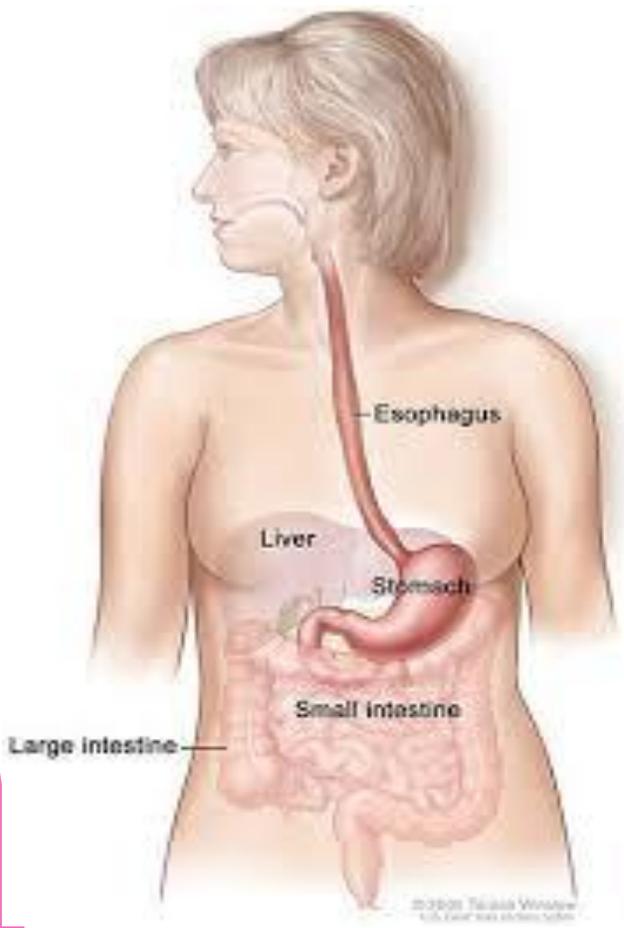
Test your Knowledge

- ▶ Which term describes the way of muscular contraction that moves material through the alimentary canal to the anus?
 - A) peristalsis
 - B) pendular motility
 - C) segmentation
 - D) haustral churning

4. Stomach

- ▶ Enlarged part of alimentary canal
- ▶ Receives food from esophagus
- ▶ **Rugae**=folds of the mucous membrane lining of the stomach
- ▶ Rugae flatten out and disappear as stomach fills with food & expands





4. Stomach

- ▶ ***Cardiac Sphincter***-circular muscle between esophagus & stomach; closes after food enters stomach to prevent food from going back up into esophagus
- ▶ ***Pyloric Sphincter***-between stomach and sm intestine, keeps food in stomach until food is ready to enter sm intestine

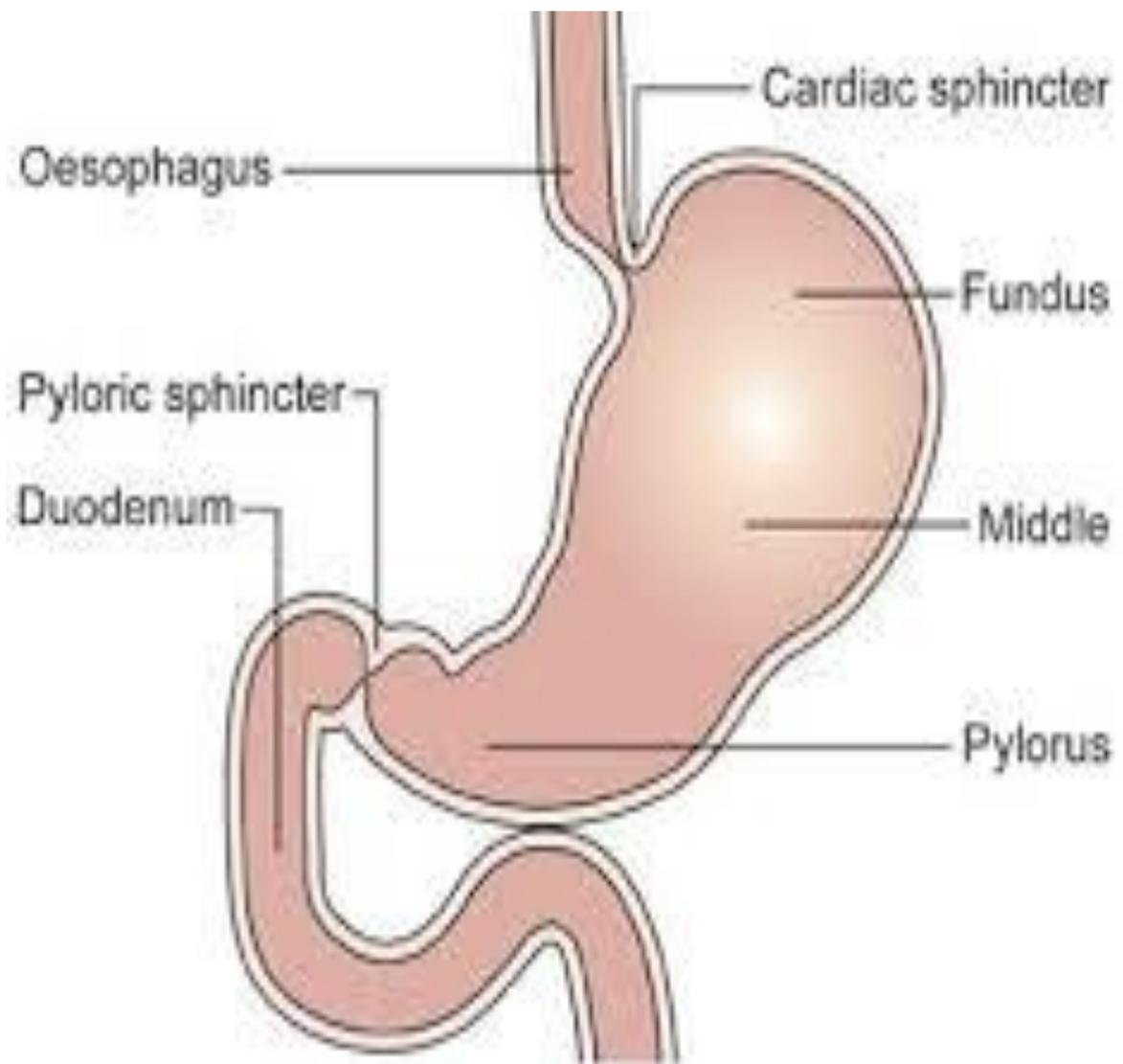
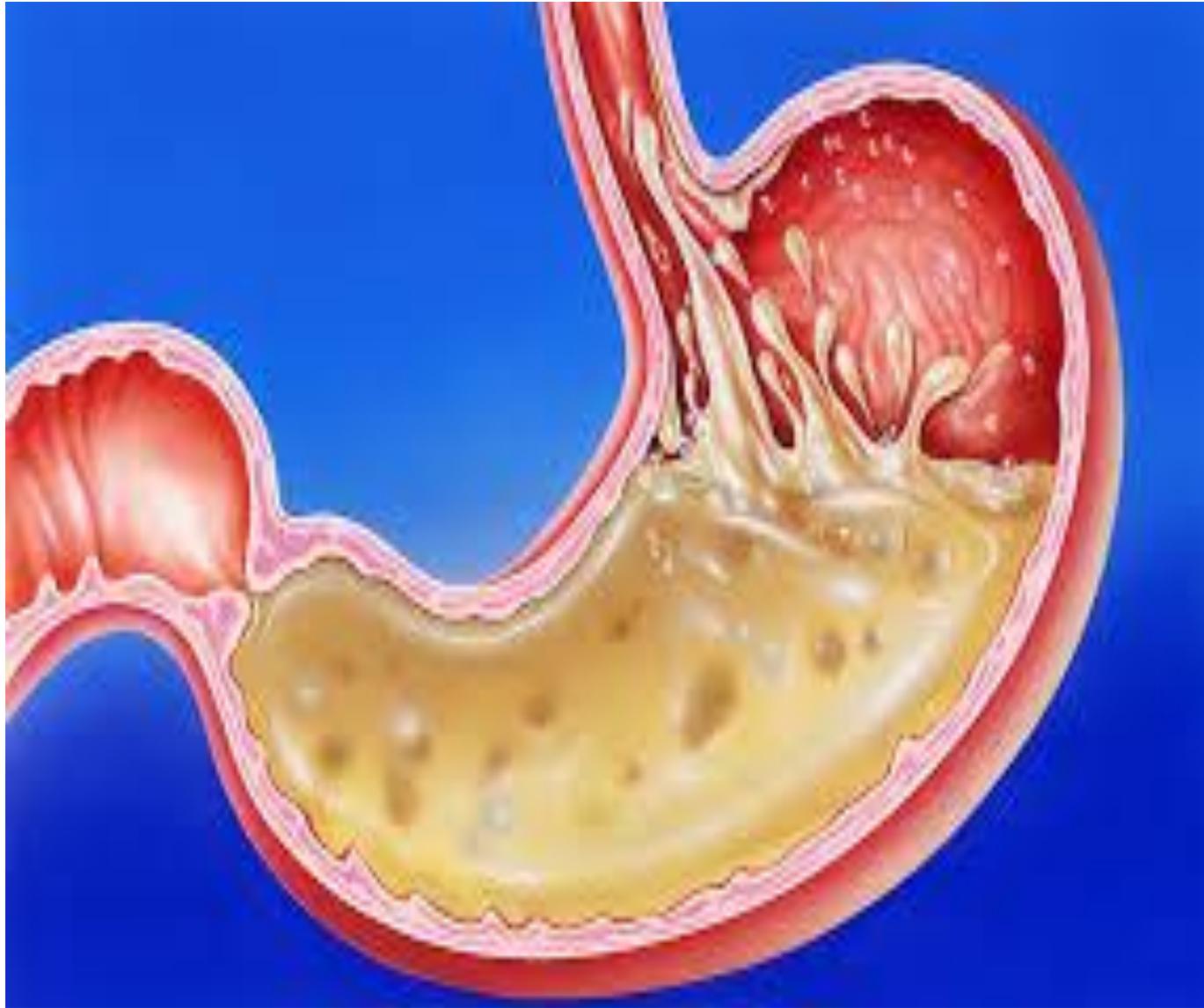


Diagram showing the parts of the stomach
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4. Stomach

- ▶ Food stays in stomach 2-4 hrs
- ▶ While in the stomach, gastric juices convert food into a semifluid=***chyme***
- ▶ Gastric juices are made by glands in the stomach and contain ***hydrochloric acid*** and ***enzymes***



4. Stomach

- ▶ ***Hydrochloric acid***-kills bacteria, helps iron absorption, & activates the enzyme pepsin
- ▶ Gastric juice ***enzymes*** include ***lipase*** and ***pepsin***
- ▶ ***Lipase***-starts the chemical breakdown of fats
- ▶ ***Pepsin***-starts protein digestion

Test your Knowledge

- ▶ Which digestive organ mechanically and chemically transforms food bolus into chyme?
 - A) esophogus
 - B) stomach
 - C) small intestine
 - D) large intestine

Test your knowledge

- ▶ The prominent folds of the mucosa that nearly disappear when the stomach expands are the
 - A) gastric pits
 - B) rugae
 - C) plicae
 - D) omenta

Test your Knowledge

▶ What happens when food reaches the stomach?

A) nothing. No digestion occurs in the stomach.

B) the food moves quickly into the intestines.

C) Juices mix with the food and stomach muscles squeeze it.

D) the food is completely digested and is absorbed by tiny blood vessels in the stomach.

Test your Knowledge

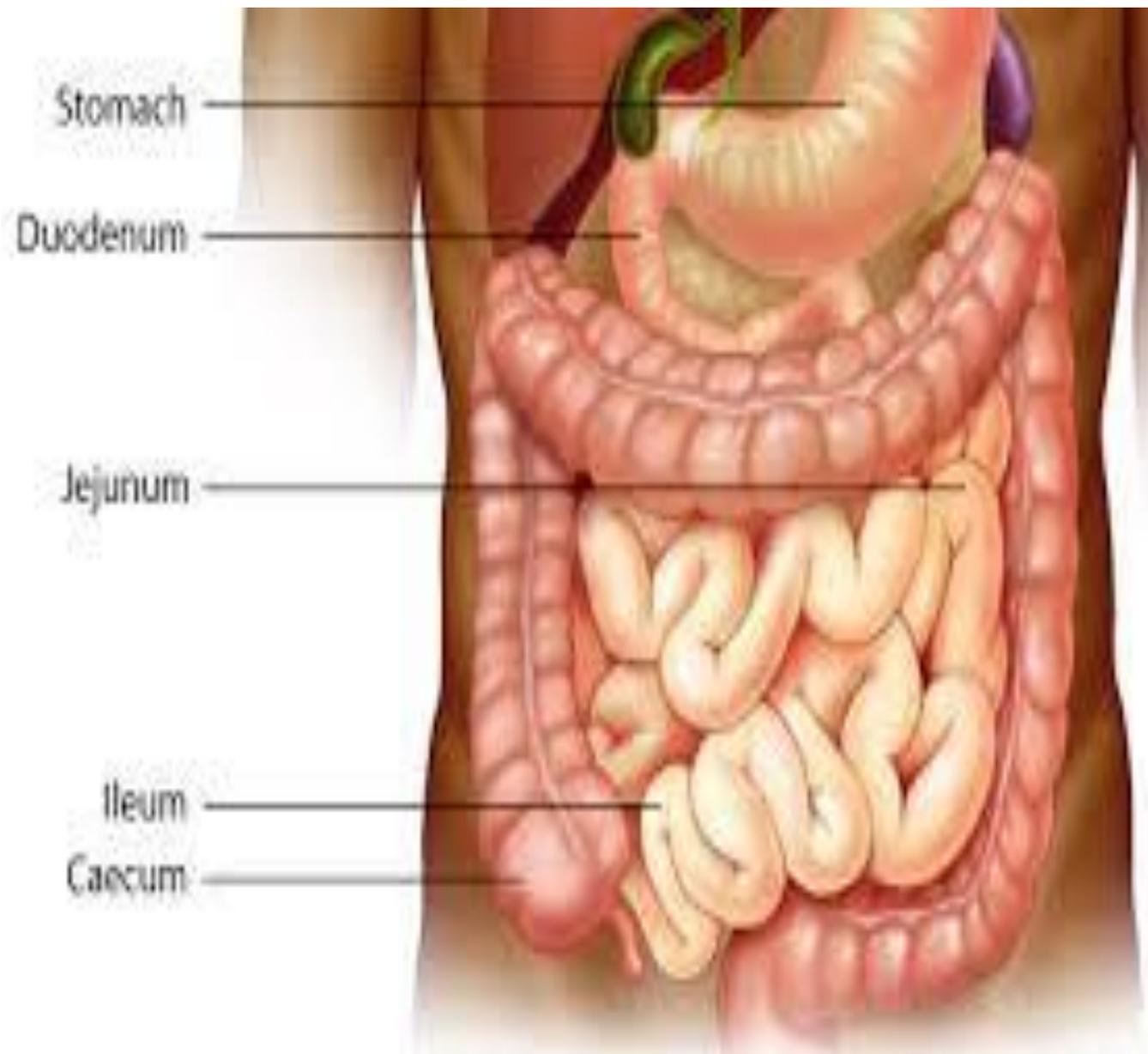
- ▶ This muscular valve prevents gastric juices from flowing back out of the stomach and into the esophogus
 - A) cecum
 - B) uvula
 - C) cardiac sphincter
 - D) pyloric sphincter

Test your Knowledge

- ▶ This muscular valve prevents gastric juices from flowing back out of the stomach and into the esophagus
- ▶ A) cecum
- ▶ B) uvula
- ▶ C) cardiac sphincter
- ▶ D) pyloric sphincter

5. Small Intestine

- ▶ ***Small intestine***=coiled section of alimentary canal, about 20 ft. long and 1” in diameter
- ▶ Chyme leaves stomach and enters sm intestine
- ▶ Sm intestine is divided into 3 sections: ***duodenum, jejunum, ileum***



Stomach

Duodenum

Jejunum

Ileum

Caecum

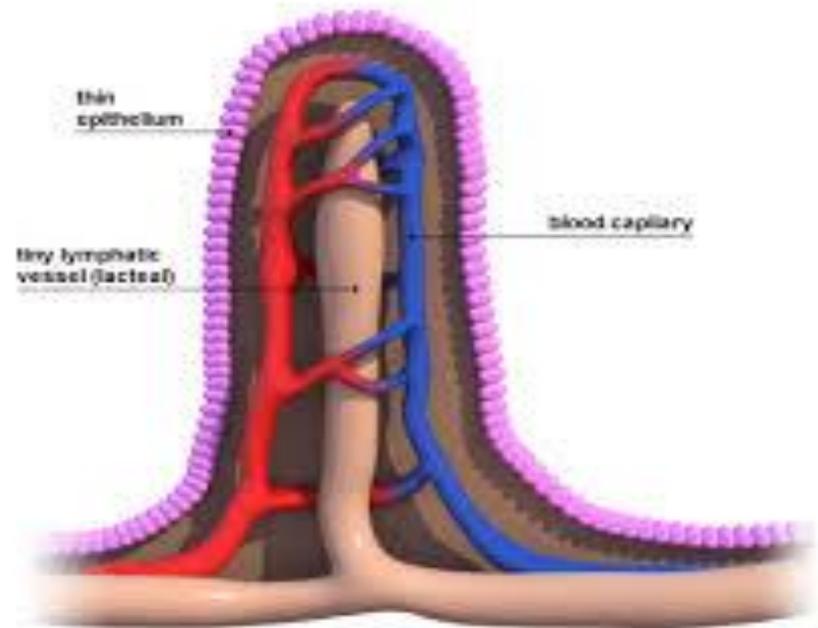
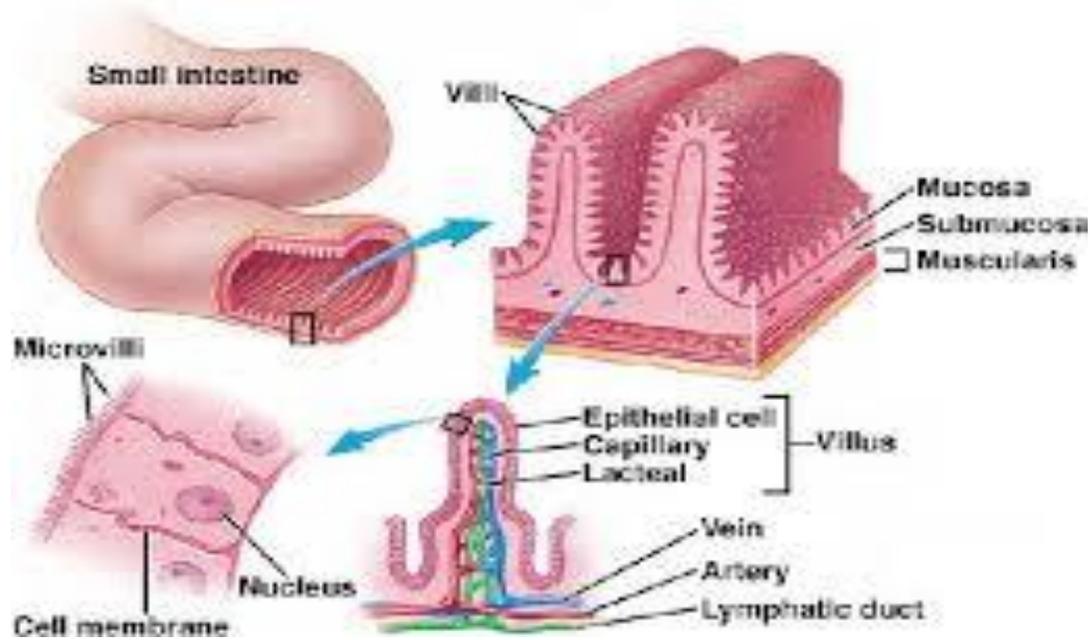
5. Small Intestine

- ▶ Sm intestine produces *intestinal juices* that break down food
- ▶ Digestion is completed in sm intestine
- ▶ Products of digestion are absorbed into bloodstream for use by body cells
- ▶ Walls of sm intestine are lined with *villi*
- ▶ *Villi*=fingerlike projections containing capillaries & lacteals



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Small Intestine



5. Small Intestine

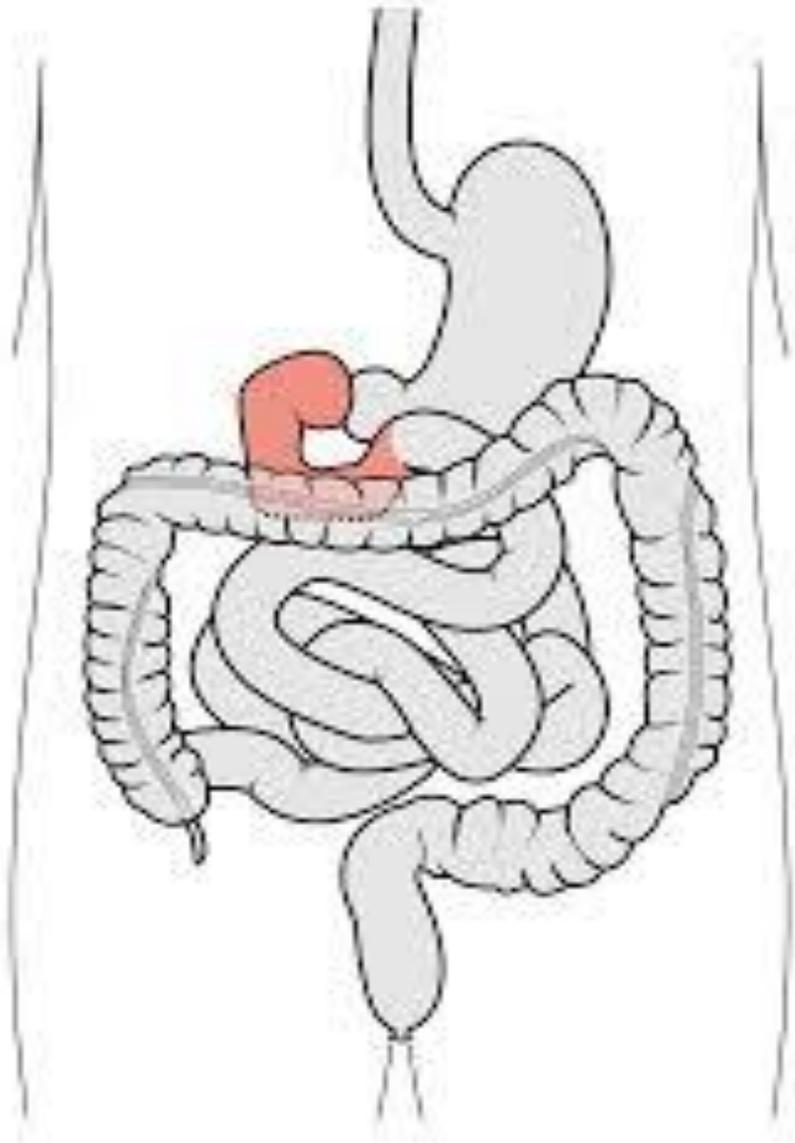
- ▶ *Capillaries* absorb the digested nutrients & carry them to the liver
- ▶ *Lacteals* absorb digested fats and carry them to the thoracic duct
- ▶ When food has completed its way through the sm intestine, only wastes, indigestible materials, & excess water is left

5. Sm Intestine-Intestinal Juices

- ▶ ***Maltase, sucrase, lactase***=enzymes that break down sugars into simpler forms
- ▶ **Peptidases**=enzymes that complete the digestion of proteins
- ▶ ***Steapsin (lipase)***=enzyme that aids in the digestion of fat

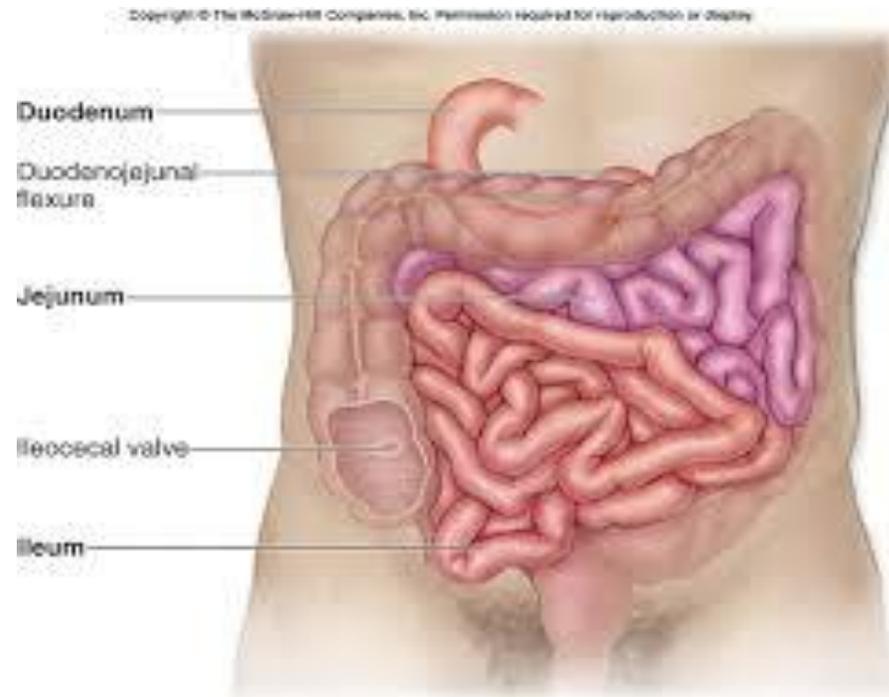
5. Small Intestine-Duodenum

- ▶ 1st 9-10 inches of the sm intestine
- ▶ ***Bile*** (from gallbladder and liver) and ***pancreatic juice*** enter duodenum through ducts or tubes



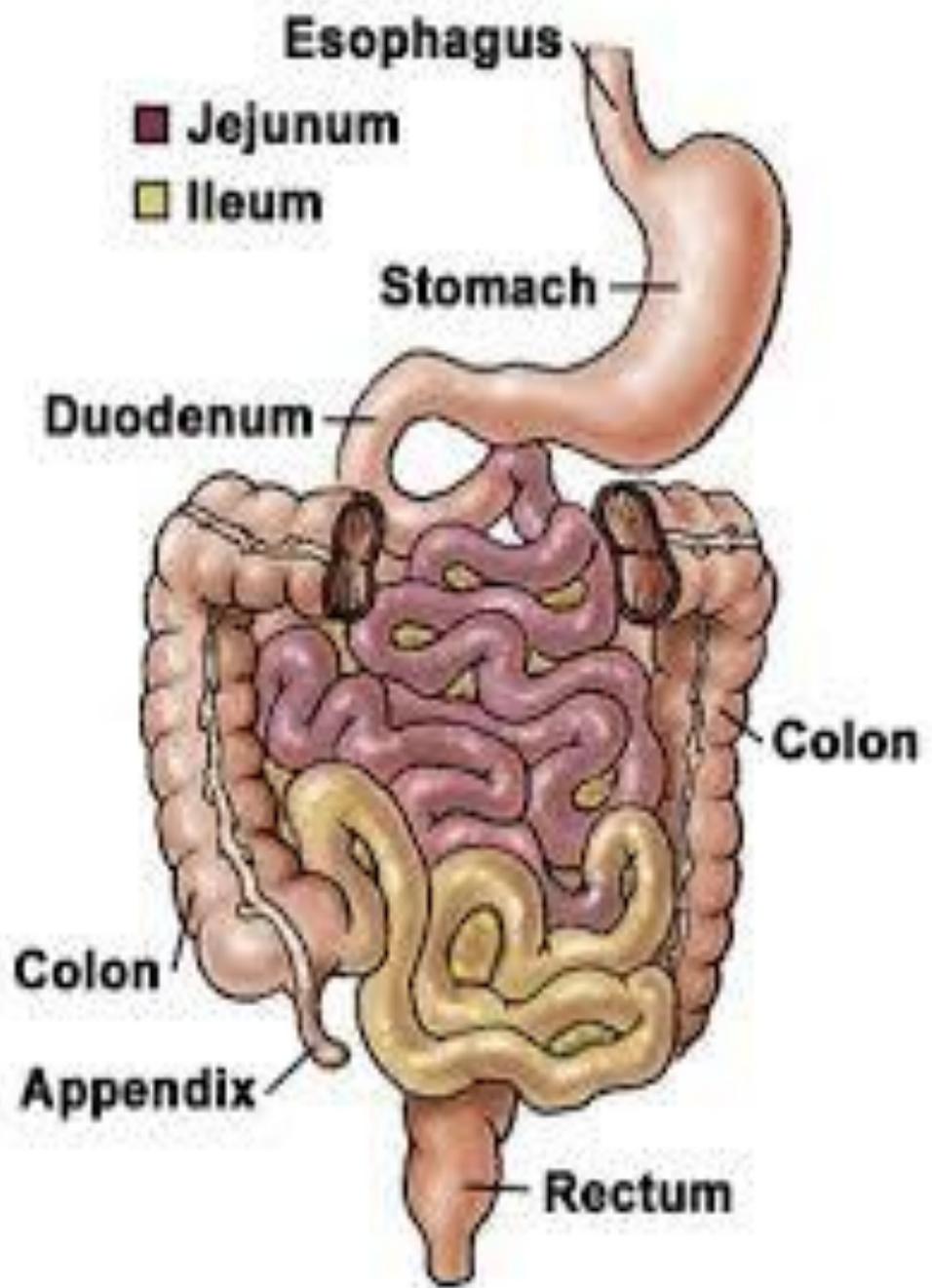
5. Small Intestine-Jejunum

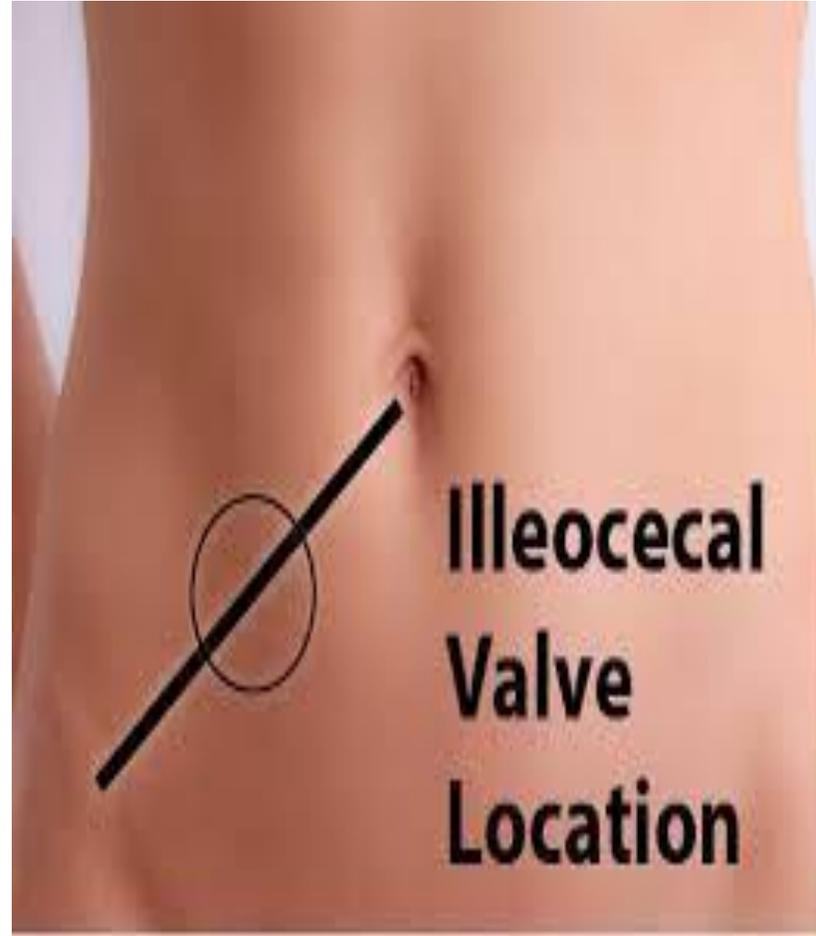
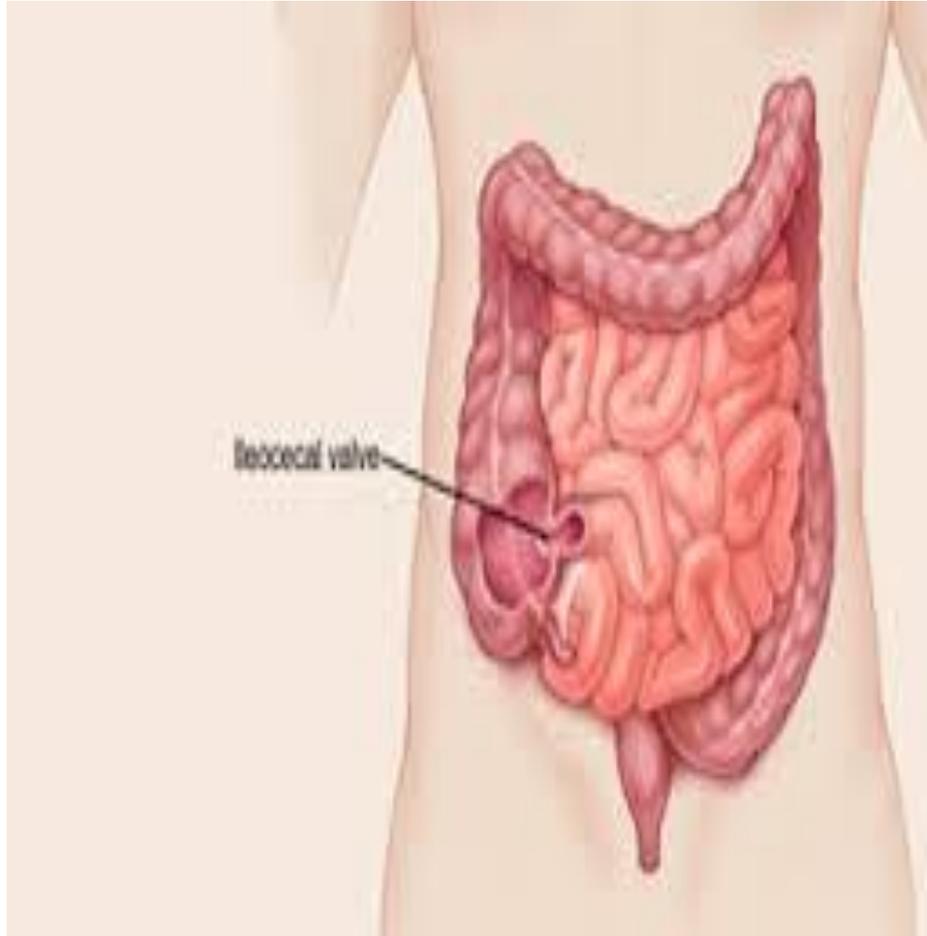
- ▶ Next 8 ft.
- ▶ Middle section of the sm intestine



5. Small Intestine-Ileum

- ▶ Final 12 ft.
- ▶ Connects with lg intestine at cecum
- ▶ ***Ileocecal Valve***= circular muscle, separates ileum & cecum; prevents food from returning to ileum





Test your Knowledge

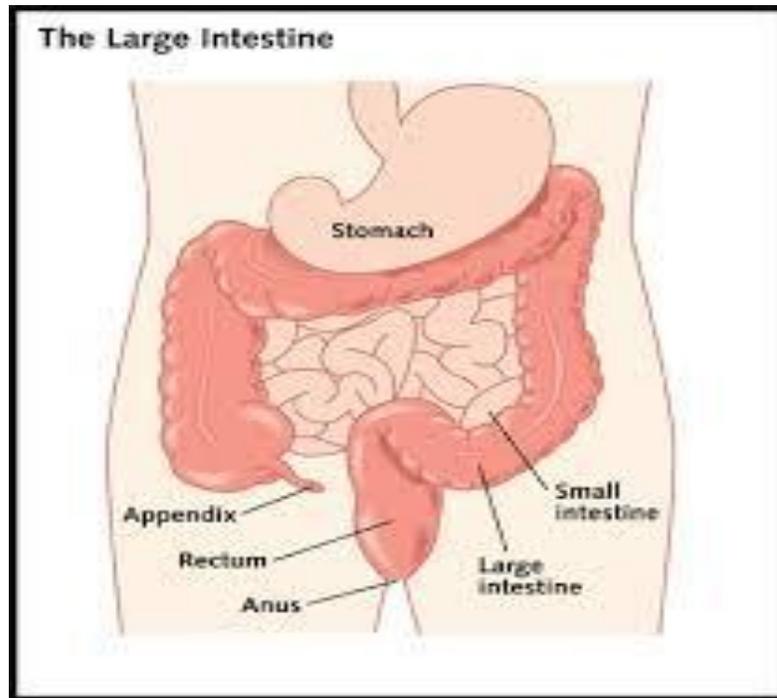
- ▶ What is the function of the villi in the small intestines?
 - A) to decrease the amount of exposed surface
 - B) to facilitate enzyme retention and dispersal
 - C) To increase the surface area for absorption and secretion
 - D) to sweep particles across the surface in a wavelike action

Test your Knowledge

- ▶ From the superior end downward, the 3 segments of the small intestines are
 - A) ileum, duodenum, jejunum
 - B) duodenum, jejunum, ileum
 - C) jejunum, ileum, duodenum
 - D) duodenum, ileum, jejunum

6. Large Intestine

- ▶ Final section of the alimentary canal
- ▶ About 5 ft long, 2 inches in diameter



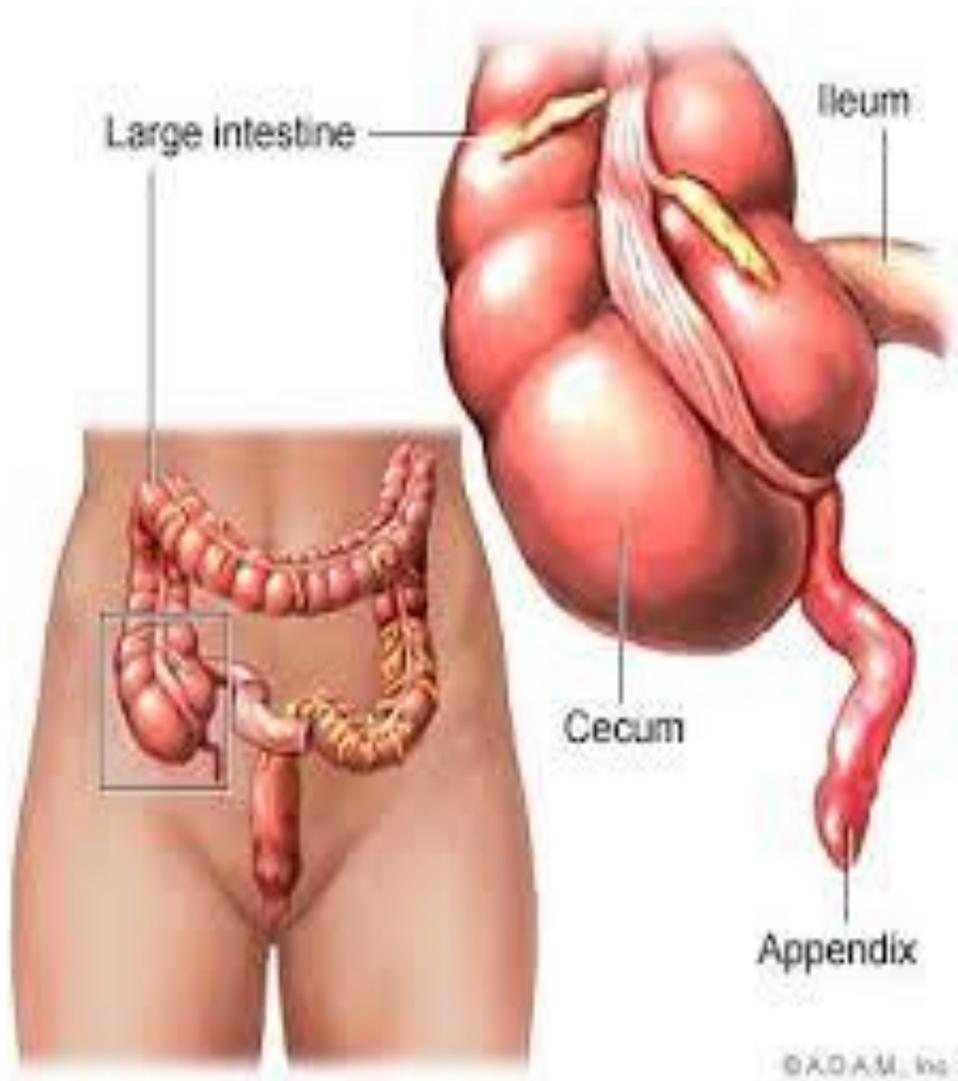
6. Large Intestine

► Functions:

- 1) **Absorb** water & any remaining nutrients
- 2) **Store** indigestible materials before they are eliminated from the body
- 3) **Synthesis** (formation) & **absorption** some B vitamins & vitamin K
- 4) **Transport** waste out of the alimentary canal

6. Large Intestine

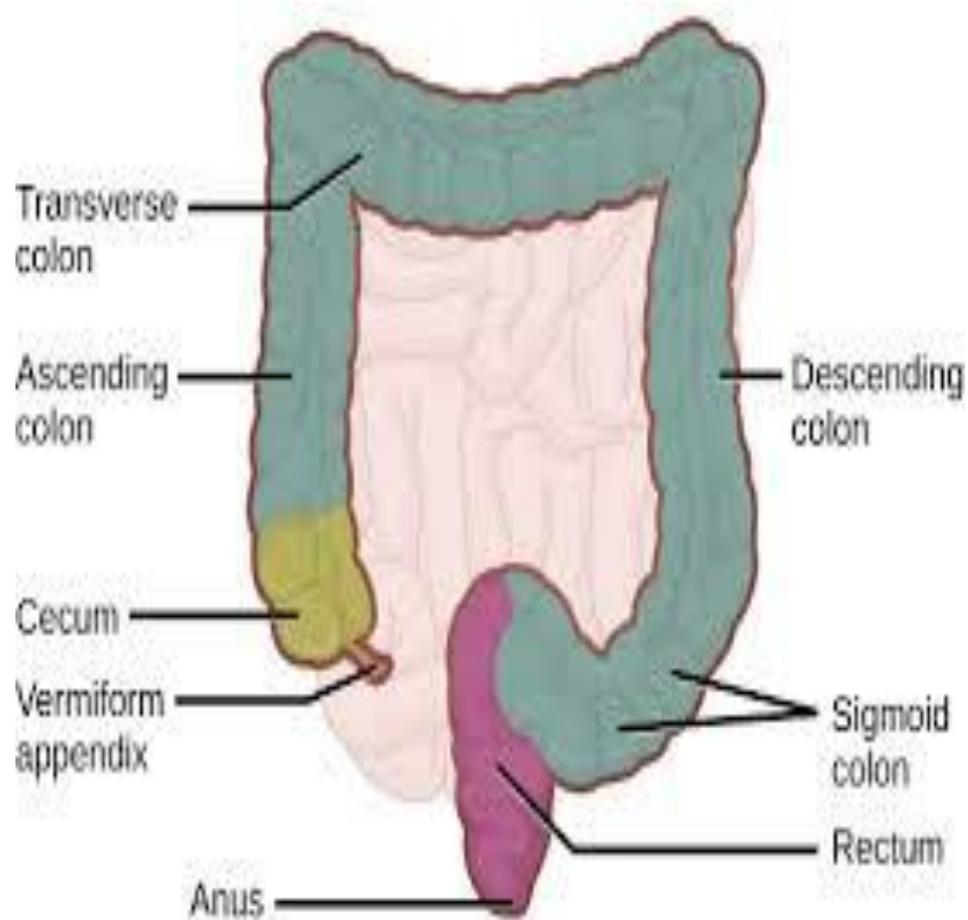
- ▶ Divided into a series of connected sections
- ▶ 1st section=***cecum***
- ▶ ***Cecum*** connects to ileum of sm intestine and contains ***vermiform appendix*** (small projection)
- ▶ 2nd section=***colon***
- ▶ ***Colon*** has 5 divisions



6. Large Intestine

► Divisions of the colon:

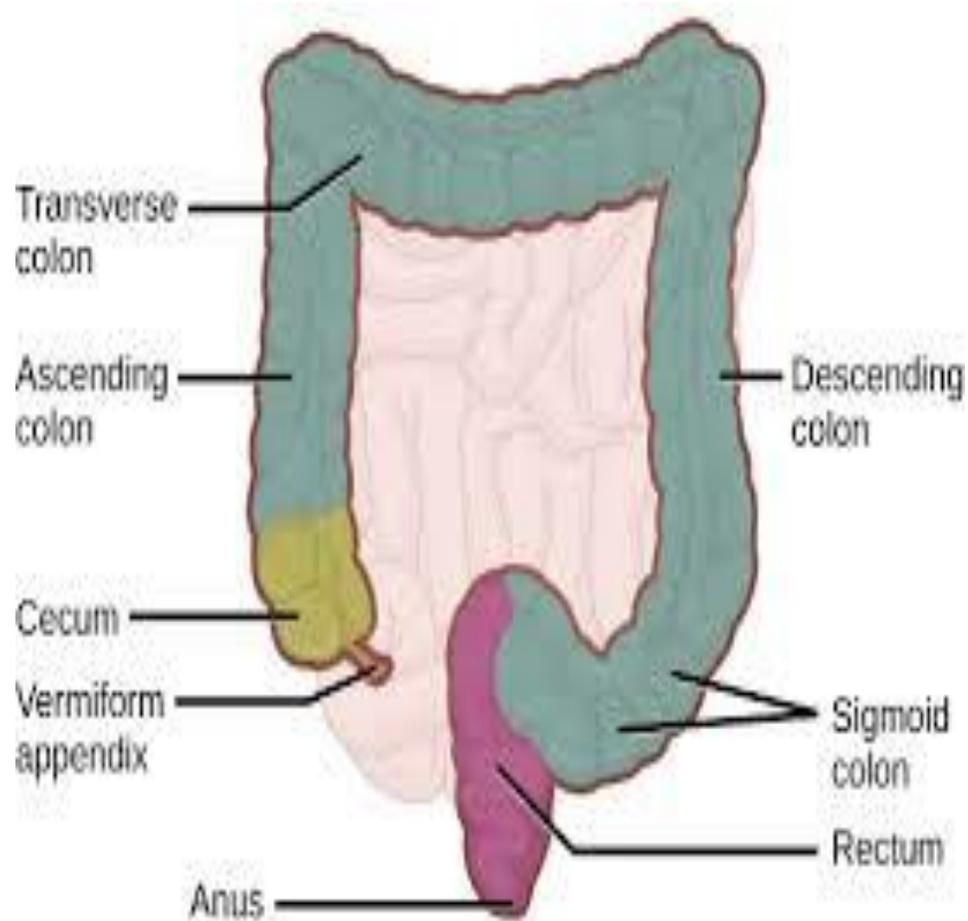
1. **Ascending colon**=continues up on the R side of the body from the cecum to the lower part of the liver



6. Large Intestine

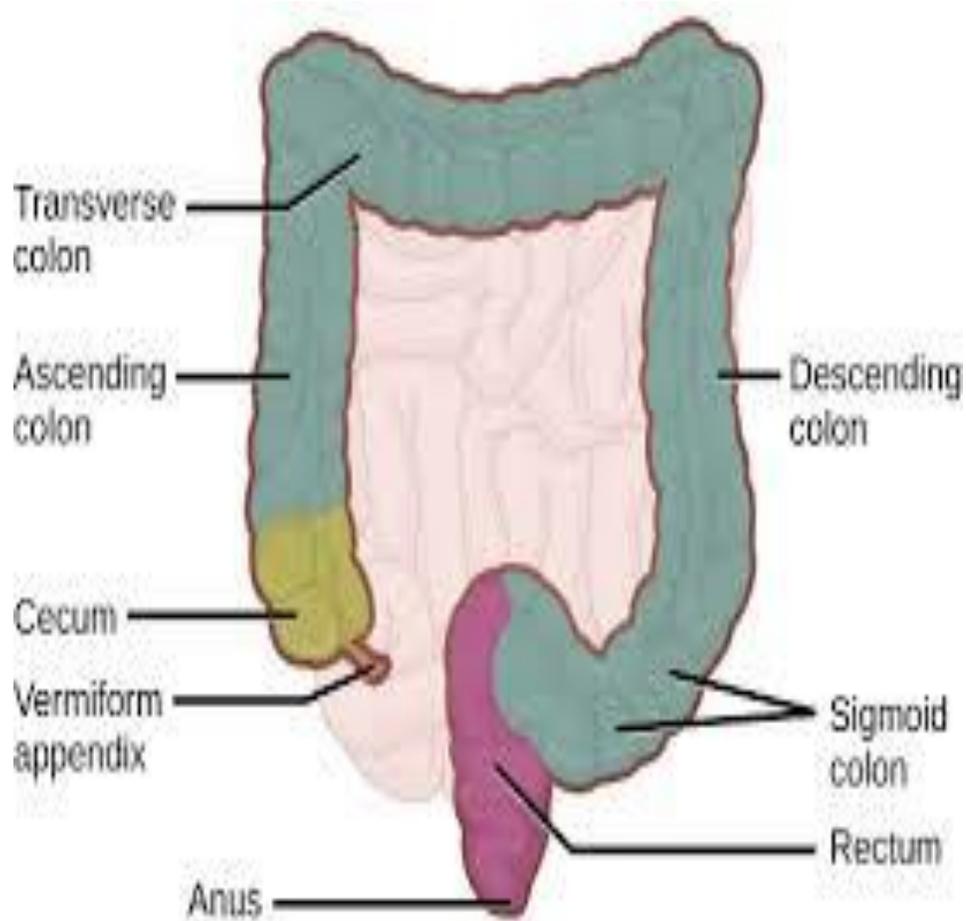
► Divisions of the colon:

2. ***Transverse colon***=extends across the abd, below the liver & stomach & above the sm intestine



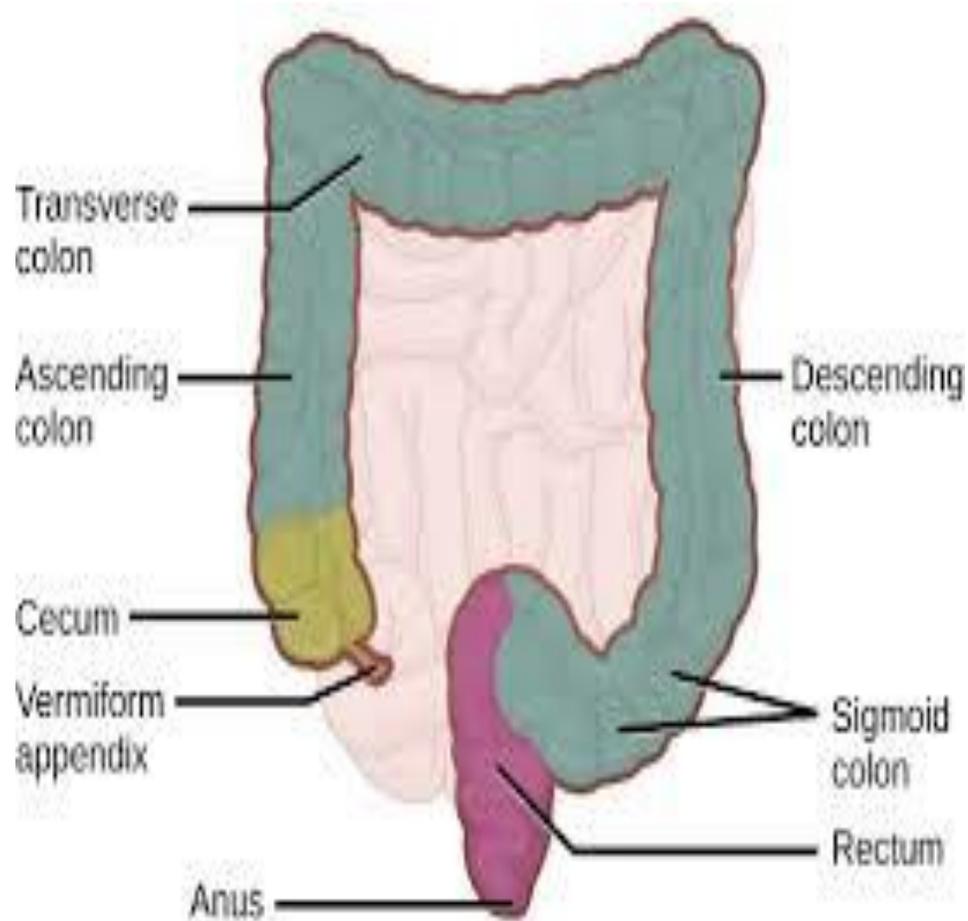
6. Large Intestine

- ▶ Divisions of the colon:
 2. ***Descending colon***=extends down the L side of the body, connects with sigmoid colon



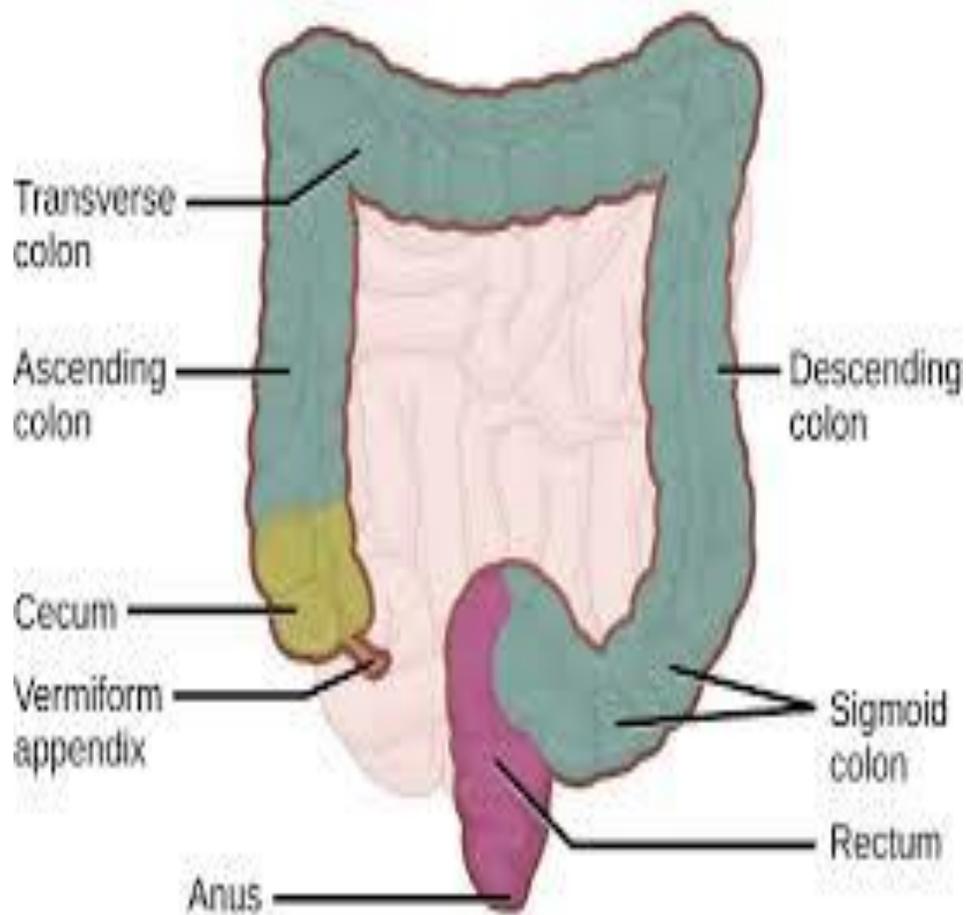
6. Large Intestine

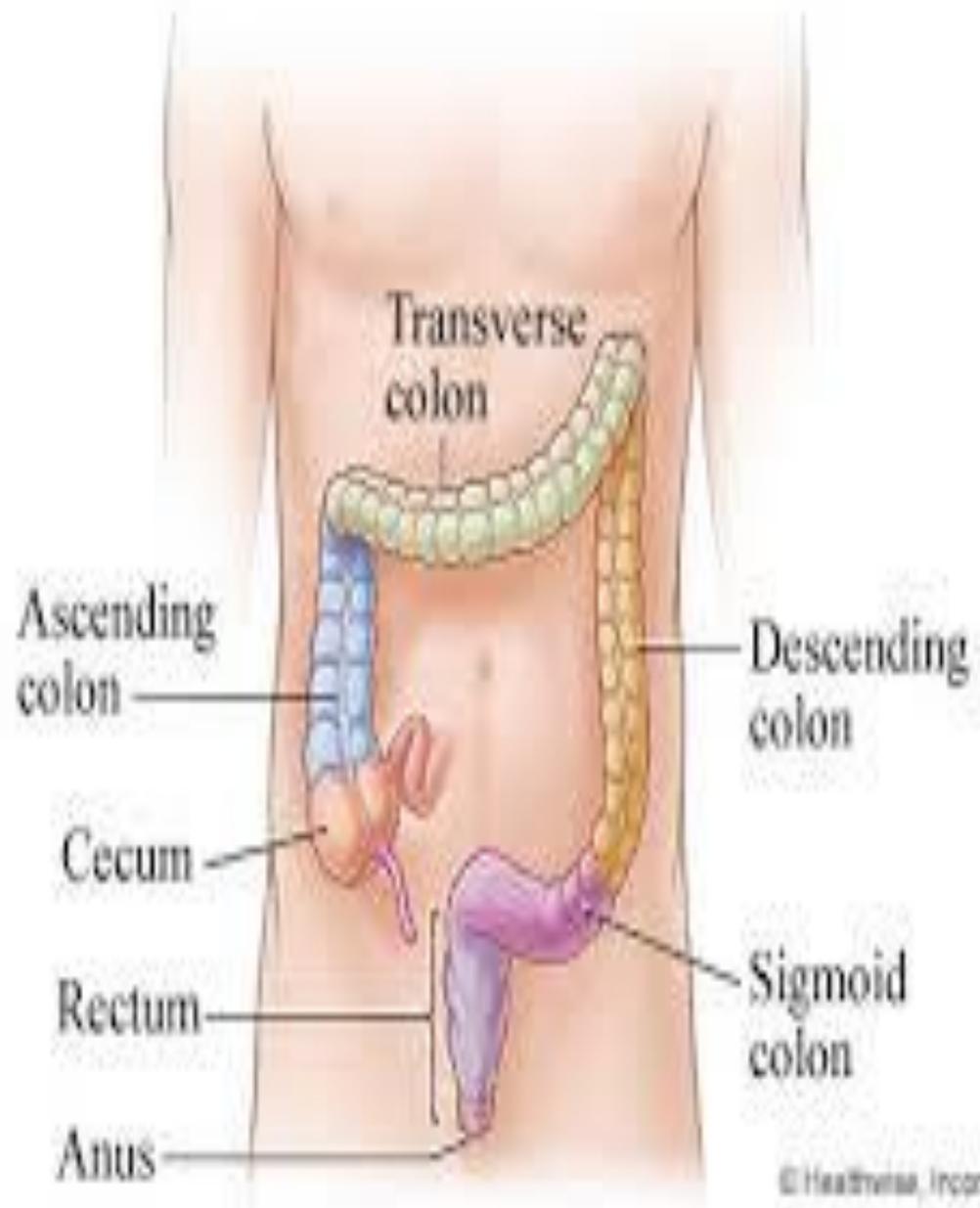
- ▶ Divisions of the colon:
 2. ***Sigmoid colon***= S-shaped section that joins with the rectum



6. Large Intestine

- ▶ Divisions of the colon:
 2. **Rectum**=final 6-8 inches; storage area for indigestibles & wastes. It has a narrow canal (**anal canal**) which opens at a hole called the **anus** where fecal material (**stool**) is expelled. Stool is the final waste product of digestion





Test your Knowledge

- ▶ Which sequence lists the sections of the large intestines in order, from the end of the ileum to the anus?
 - A) cecum, rectum, anal canal, colon
 - B) colon, rectum, anal canal, cecum
 - C) cecum, colon, rectum, anal canal
 - D) colon, cecum, rectum, anal canal

Test your Knowledge

▶ Arrange the segments of the colon in the sequence through which digested material passes prior to defecation: (1) sigmoid (2) transverse (3) descending (4) ascending

A) 4,2,3,1

B) 2,1,4,3

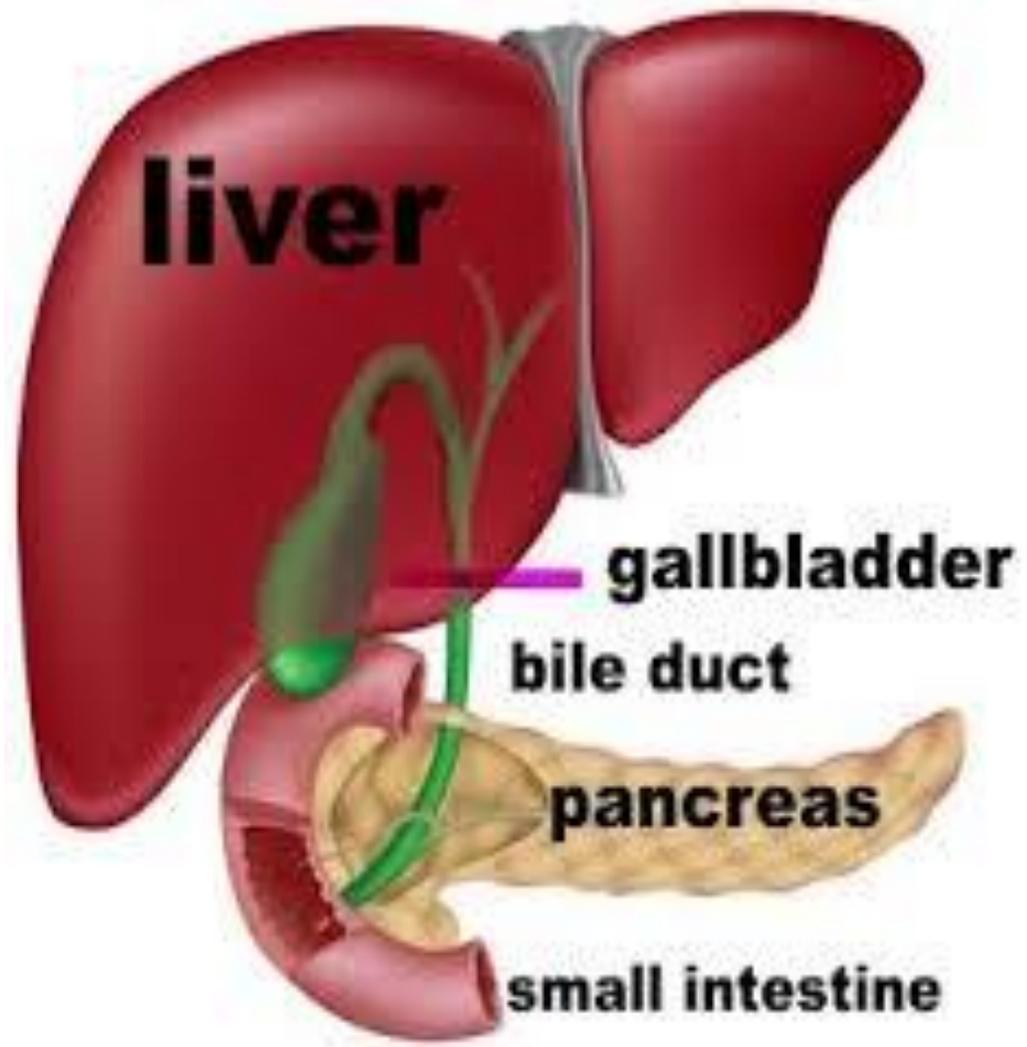
C) 1,3,4,2

D) 3,1,2,4

Accessory Organs

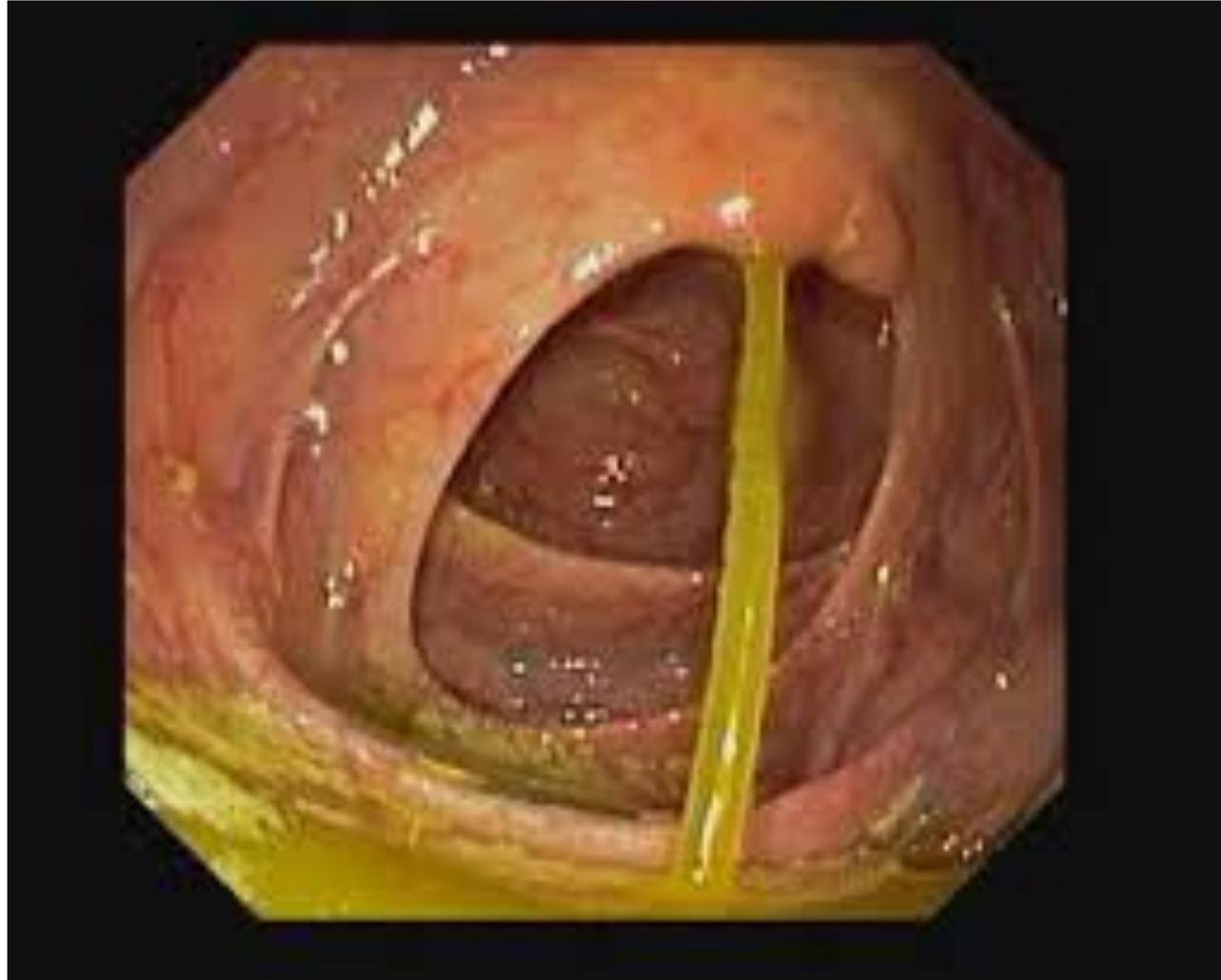
▶ Include:

1. Liver
2. Gallbladder
3. Pancreas



1. Liver

- ▶ Largest gland in the body
- ▶ Located in under diaphragm, in RUQ of abd
- ▶ Secretes **bile** into sm intestine
- ▶ **Bile**=enzyme that emulsifies (physically breaks down) fats & makes them water soluble

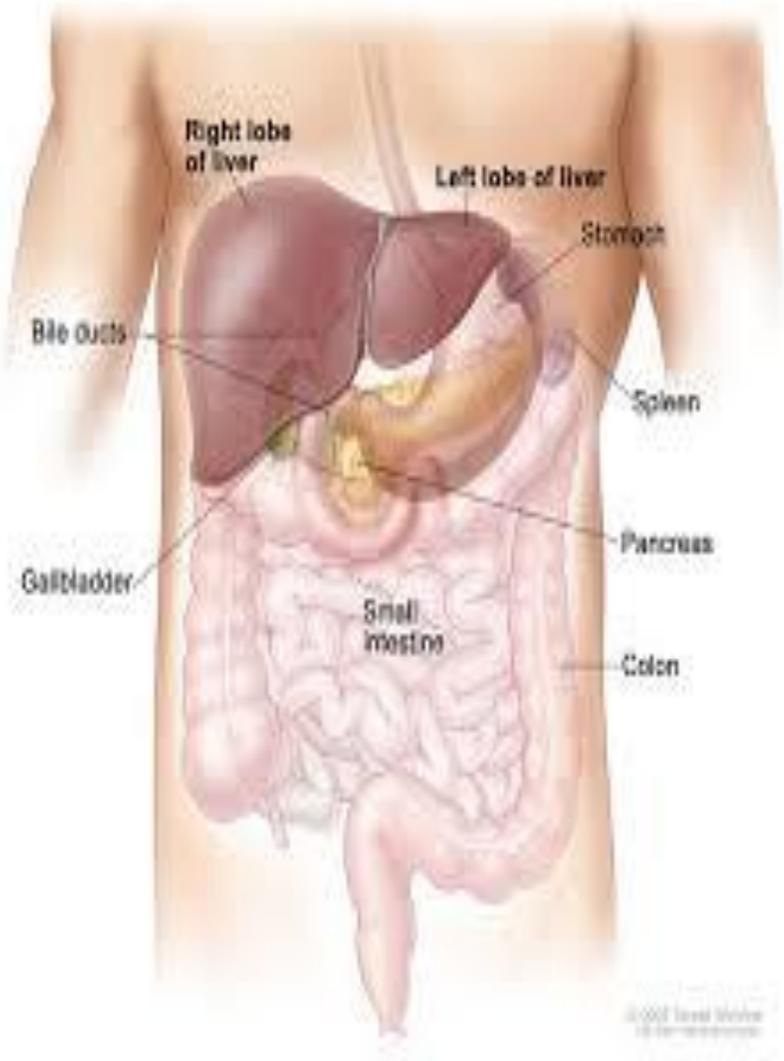


1. Liver

- ▶ Stores sugar in the form of ***glycogen***
- ▶ ***Glycogen*** is converted to glucose & released into blood when additional sugar is needed
- ▶ Stores ***iron & vitamins***
- ▶ Produces ***heparin*** (prevents clotting of blood)

1. Liver

- ▶ **Produces** blood proteins fibrinogen & prothrombin (aid in clotting)
- ▶ **Produces** cholesterol
- ▶ **Detoxifies** (renders harmless) substances like alcohol & pesticides
- ▶ **Destroys** bacteria have been taken into the blood from the intestine



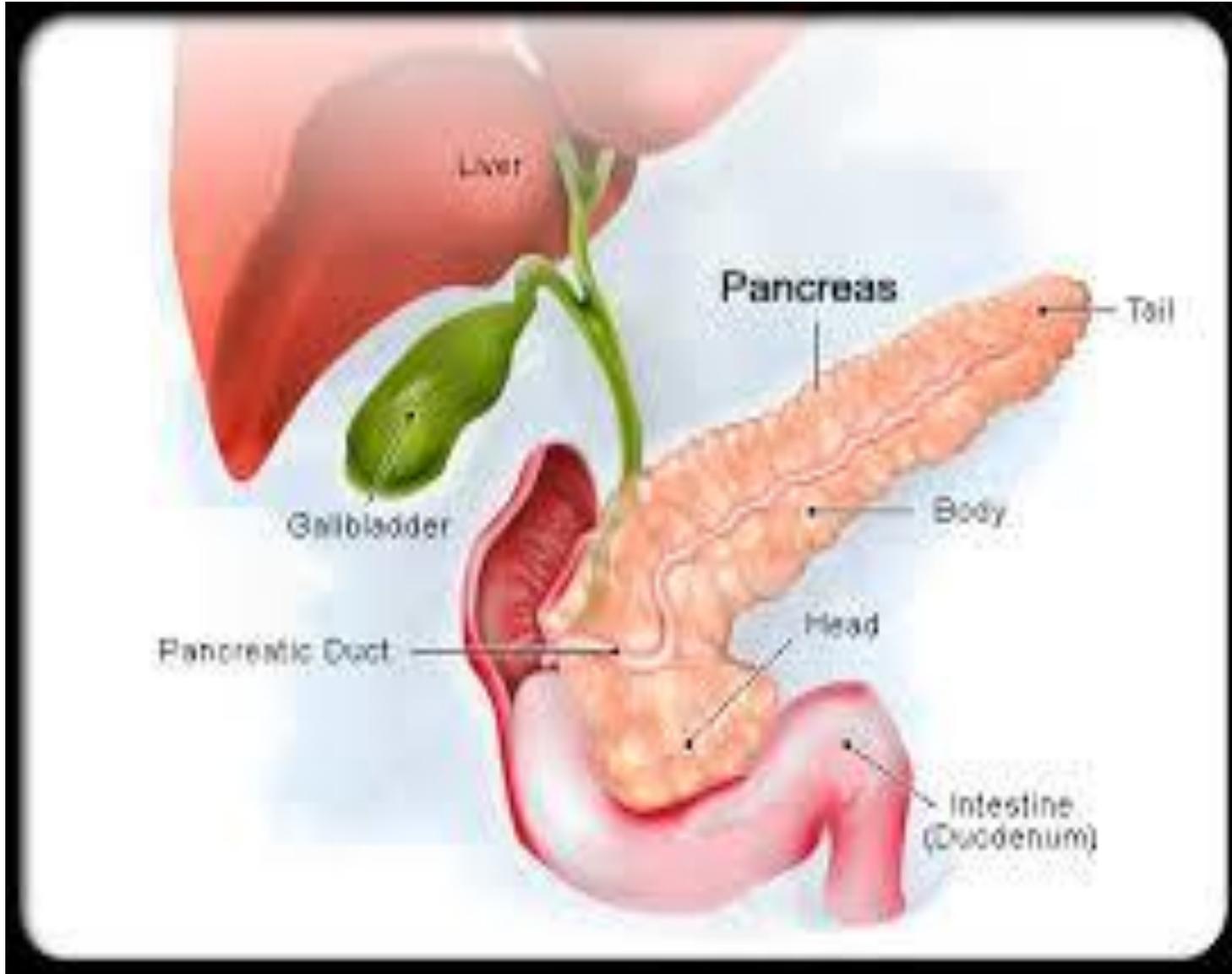
2. Gallbladder

- ▶ Small, muscular sac located under the liver
- ▶ Attached to liver by connective tissue
- ▶ **Receives, stores, & concentrates bile** from liver
- ▶ When bile is needed, gallbladder contracts & pushes bile through the ***cystic duct*** into the ***common duct*** which drains into the duodenum



4. Pancreas

- ▶ Glandular organ located behind the stomach
- ▶ Produces ***pancreatic juices*** which contain ***enzymes*** to digest food
- ▶ Juices enter duodenum through the ***pancreatic duct***



4. Pancreas

▶ Pancreatic enzymes:

1. ***Amylase (Amylopsin)***=breaks down sugars
2. ***Trypsin & Chymotrypsin***=breaks down proteins
3. ***Lipase (Steapsin)***=breaks down fats

▶ Pancreas also produces ***insulin*** which is secreted into the bloodstream

▶ ***Insulin*** regulates the metabolism (burning) of carbohydrates to convert glucose (blood sugar) to energy

