Biochem-725

2(2-0)

MEDICAL BIOCHEMISTRY

Assessment	**Marks**	**Sessional**	**Mid**	**Final**	**Total**
	Criteria Theory	Assignments	Paper	Paper	
		4 (10%)	12	24	40 (100%)
	Result		**Total: 40 Marks**		

- Mammals GIT – 3 major nutrients

  CARBS, LIPIDS, PROTEINS
- undergo enzymatic hydrolysis into their building blocks
- Necessary for utilization
- As small molecules can cross intestinal lining
- Although digestion begins in mouth and stomach
- Final stages of digestion & absorption into blood occur in intestine

Map of Human Digestive System

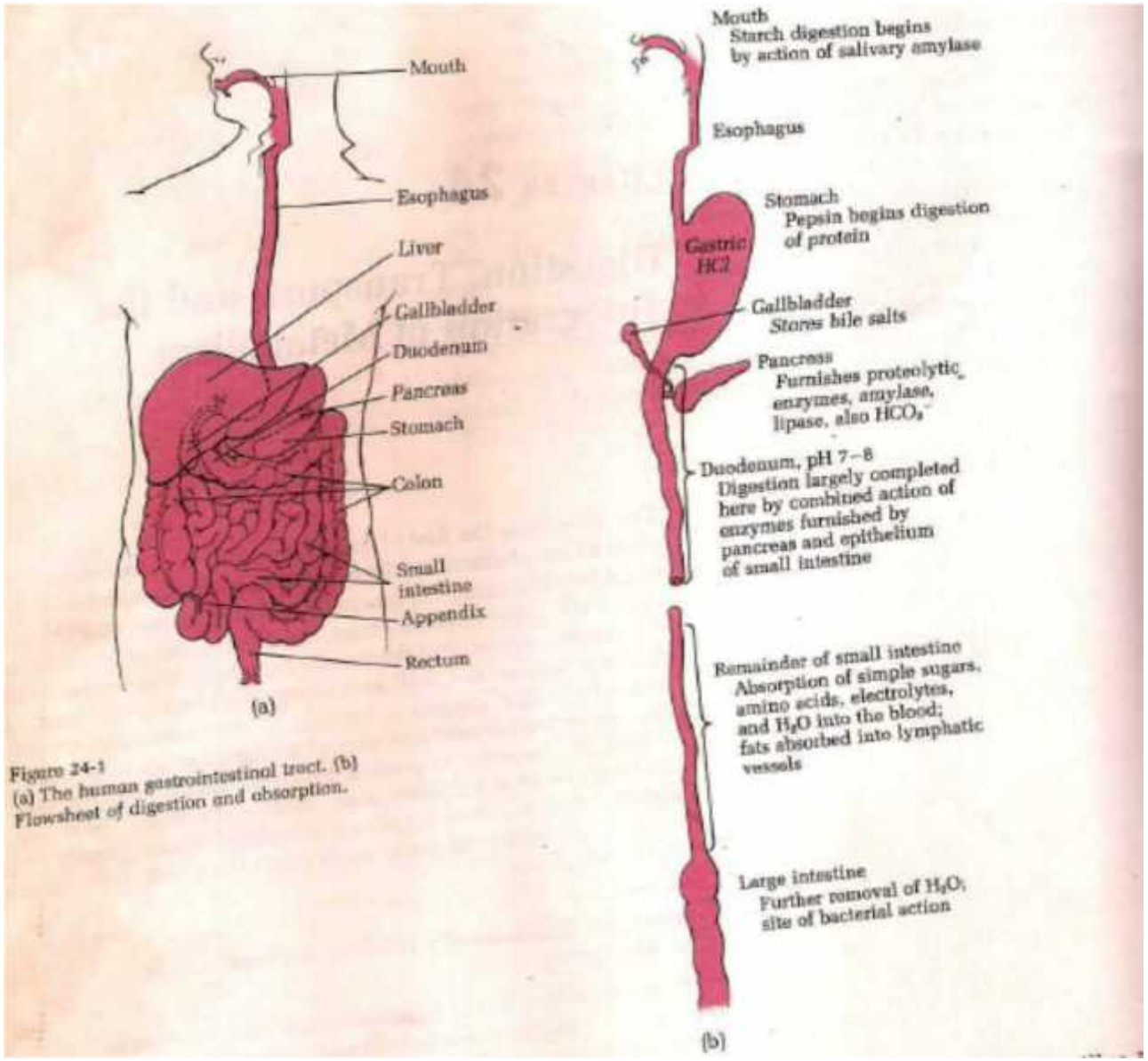
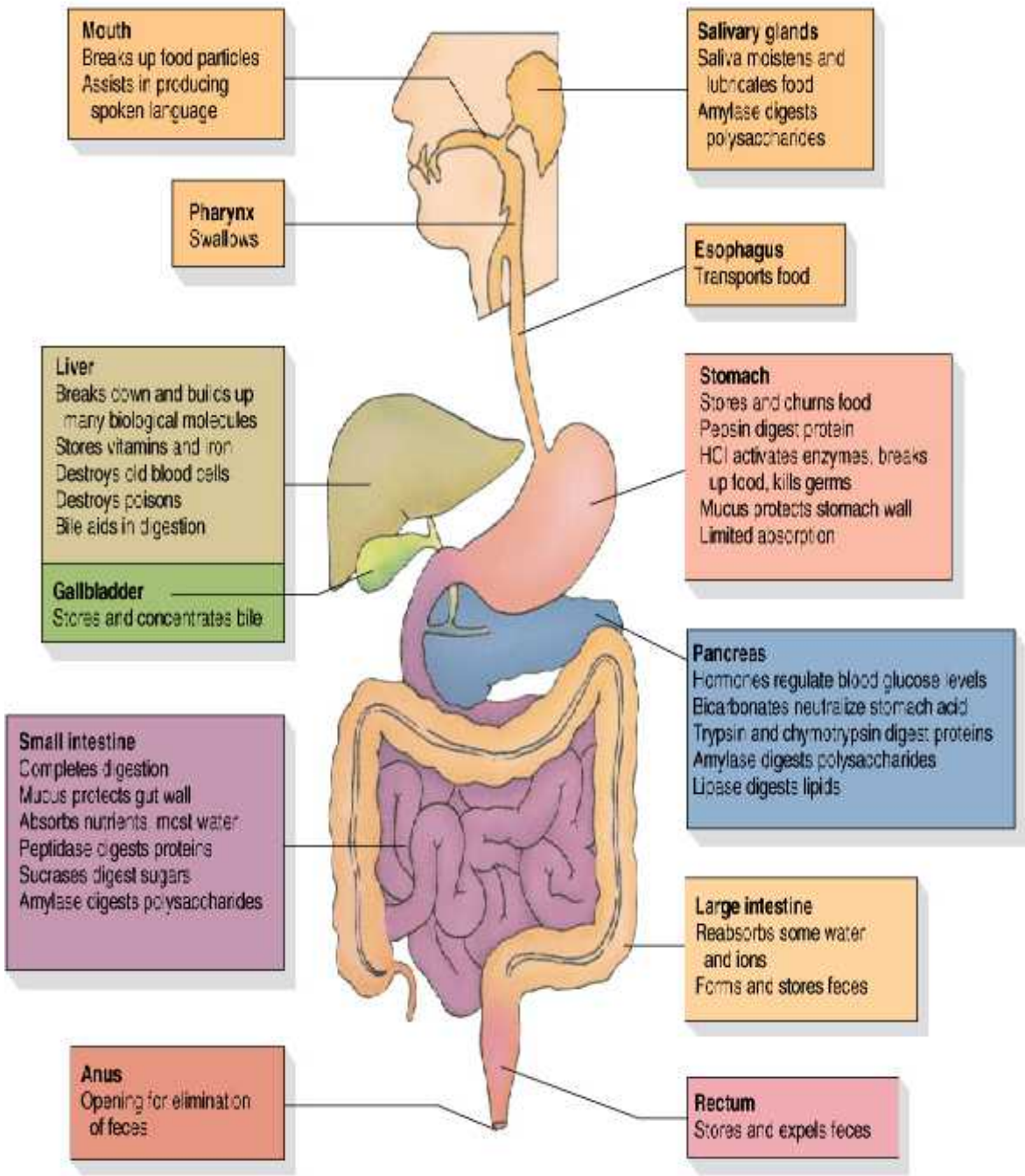
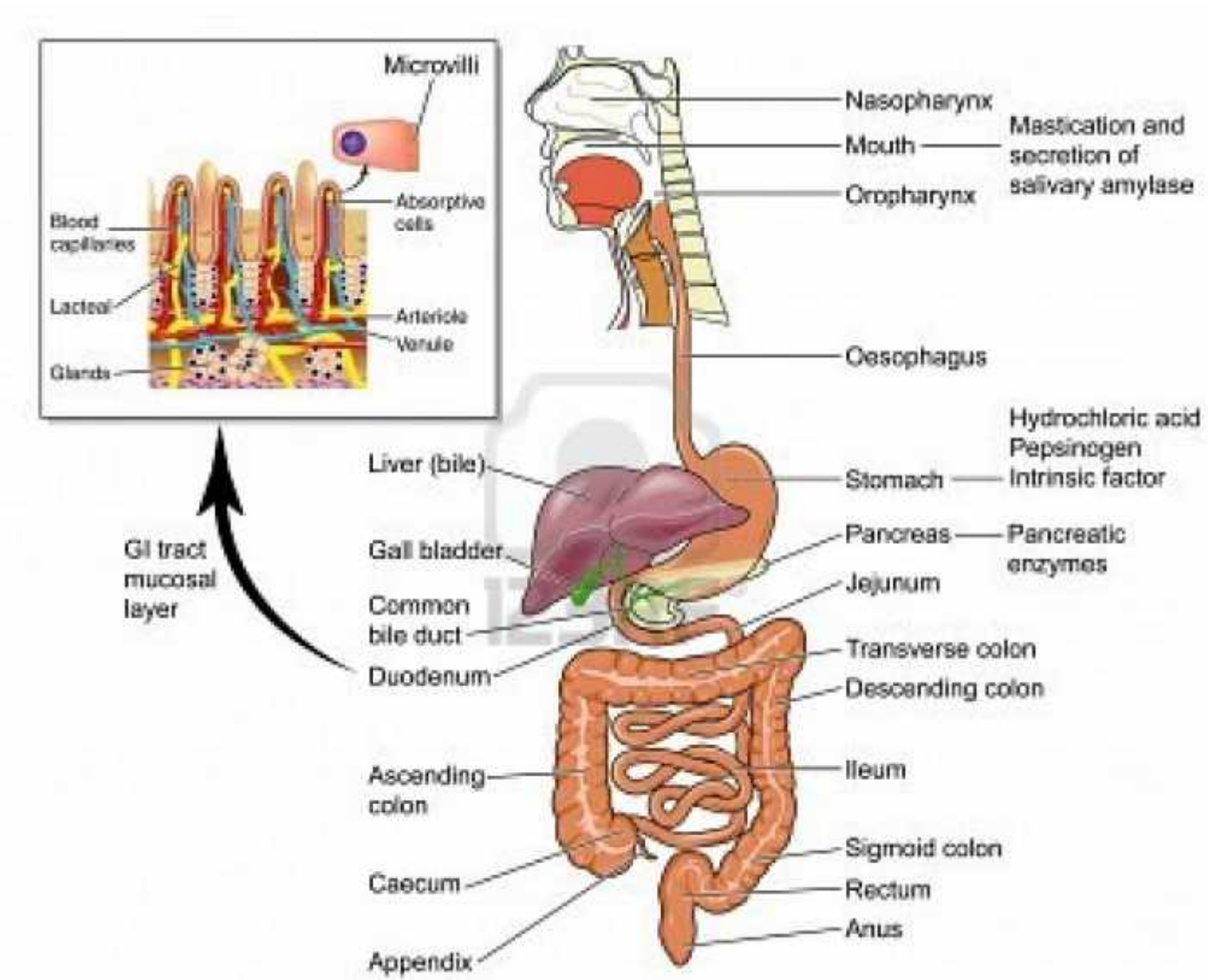


Figure 24-1
(a) The human gastrointestinal tract. (b) Flowsheet of digestion and absorption.


Mouth
Breaks up food particles
Assists in producing spoken language
Salivary glands
Saliva moistens and lubricates food
Amylase digests polysaccharides
Pharynx
Swallows
Esophagus
Transports food
Liver
Breaks down and builds up many biological molecules
Stores vitamins and iron
Destroys old blood cells
Destroys poisons
Bile aids in digestion
Gallbladder
Stores and concentrates bile
Stomach
Stores and churns food
Pepsin digest protein
HCl activates enzymes, breaks up food, kills germs
Mucus protects stomach wall
Limited absorption
Pancreas
Hormones regulate blood glucose levels
Bicarbonates neutralize stomach acid
Trypsin and chymotrypsin digest proteins
Amylase digests polysaccharides
Lipase digests lipids
Small intestine
Completes digestion
Mucus protects gut wall
Absorbs nutrients, most water
Peptidase digests proteins
Sucrases digest sugars
Amylase digests polysaccharides
Large intestine
Reabsorbs some water and ions
Forms and stores feces
Anus
Opening for elimination of feces
Rectum
Stores and expels feces

Anatomy - Intestine

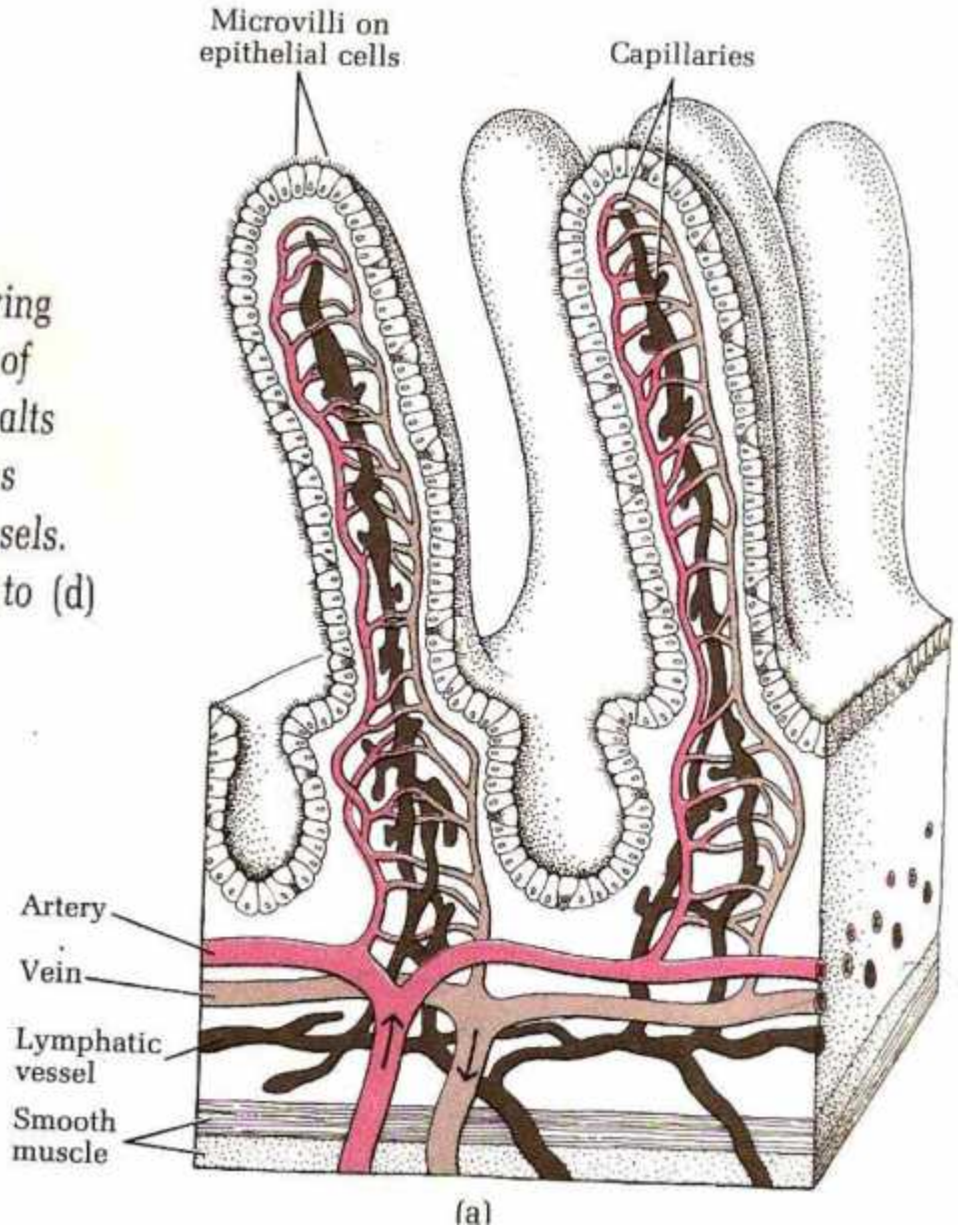
- Well adapted for its functions
- Large surface area for absorption
- Long small intestine: 12-14 ft
- Its inner surface has folds with numerous fingerlike protrusions, the villi
- Each villus is coated with many epithelial cells, having many microvilli.
- Villi provide large surface area end products can be rapidly transported through epithelial cells and into blood capillaries, lymph vessels

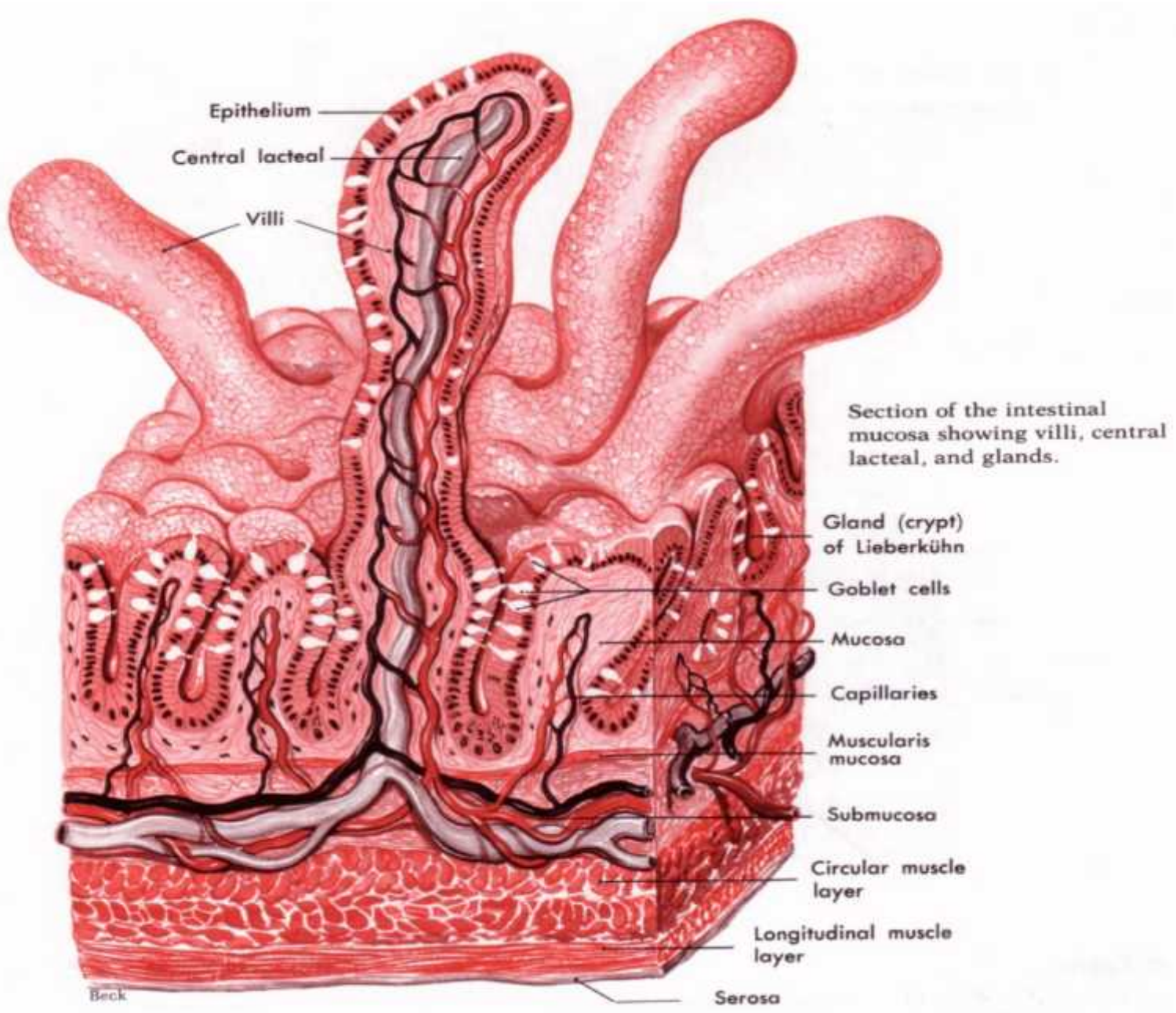

Microvilli
Absorptive cells
Blood capillaries
Lacteal
Arteriole
Venule
Glands
GI tract mucosal layer
Nasopharynx
Mouth
Oropharynx
Mastication and secretion of salivary amylase
Oesophagus
Hydrochloric acid
Pepsinogen
Intrinsic factor
Liver (bile)
Stomach
Gall bladder
Pancreas
Pancreatic enzymes
Jejunum
Common bile duct
Duodenum
Transverse colon
Descending colon
Ileum
Ascending colon
Sigmoid colon
Caecum
Rectum
Anus
Appendix

- Surface area of human small intestine is about 180 m^2

- A little less than the playing area of a tennis court
- Microvilli has bundles of actin microfilaments which connect with a web of myosin filaments at the base of microvilli.
- This filament system gives a wave like motion to microvilli
- Give local stirring to enhance nutrient absorption

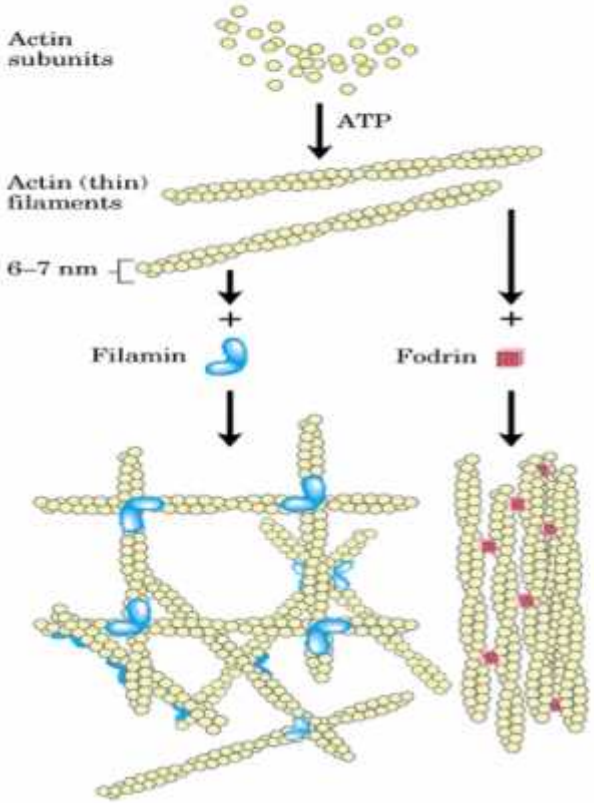
Figure 24-2
(a) A group of villi of the small intestine, showing the large surface area available for absorption of digestion products. Amino acids, sugars, and salts are absorbed into the blood capillaries, whereas triacylglycerols enter the central lymphatic vessels. Each epithelial cell has many microvilli. (b) to (d) Three views of mic...

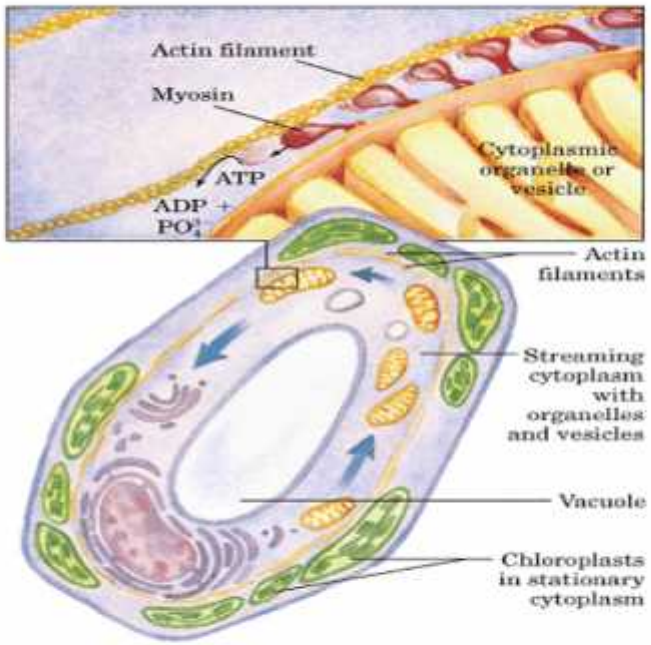


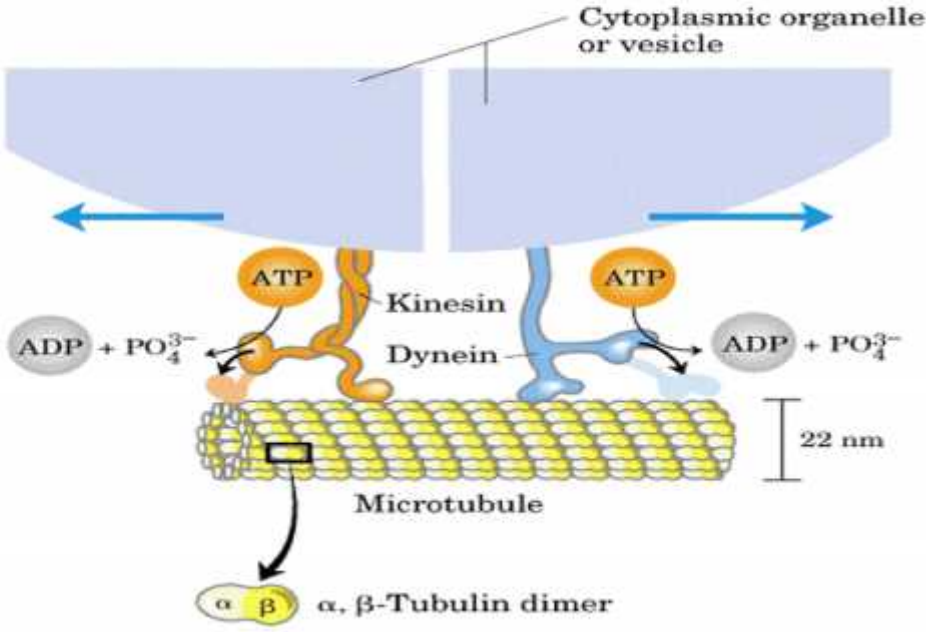


Section of the intestinal mucosa showing villi, central lacteal, and glands.

Cells have cytoskeletons

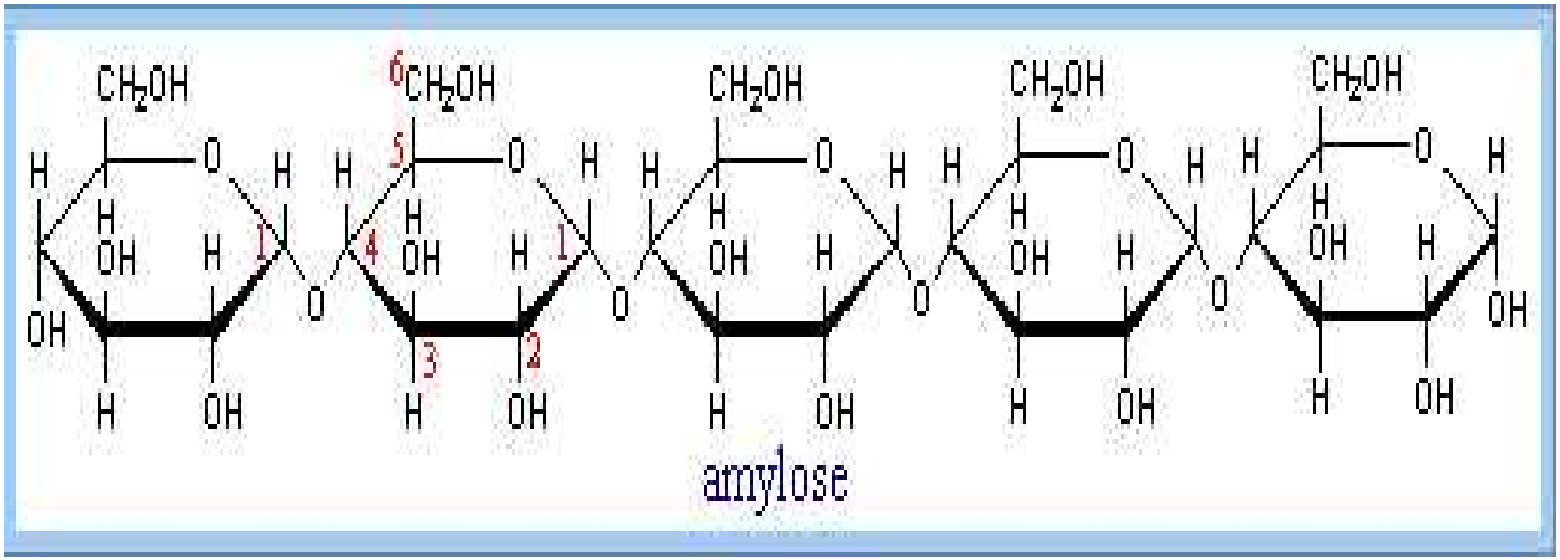


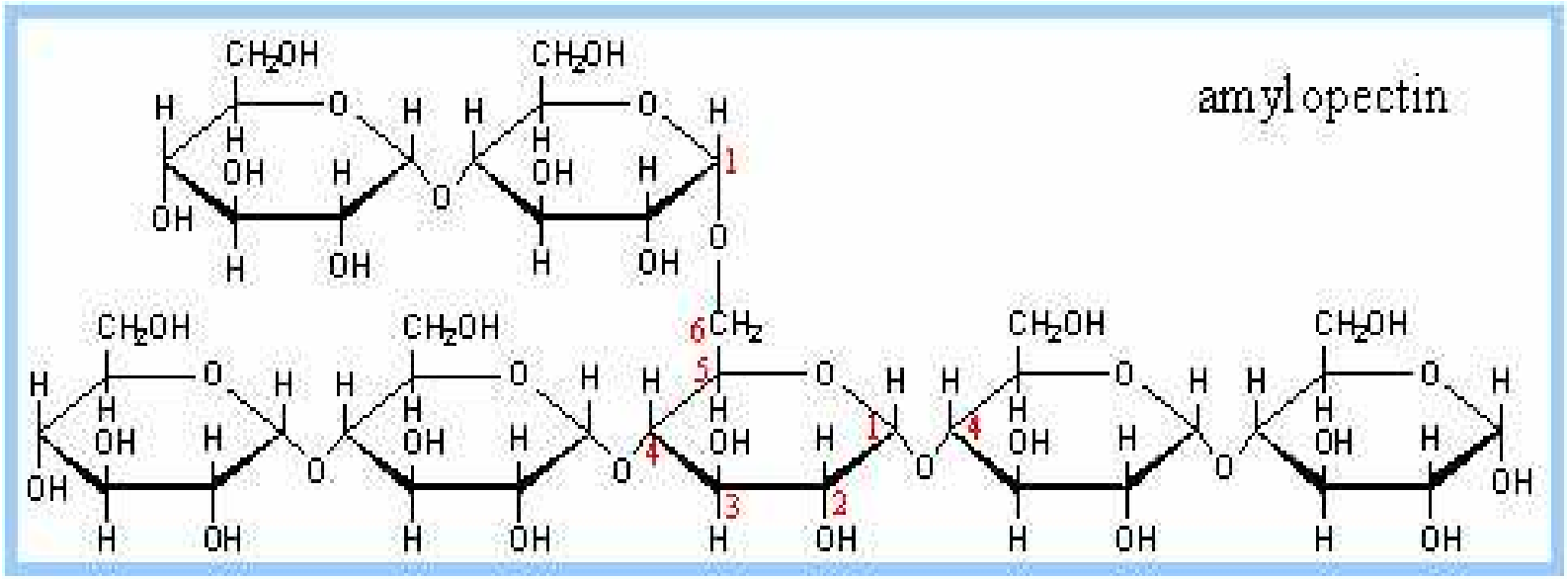


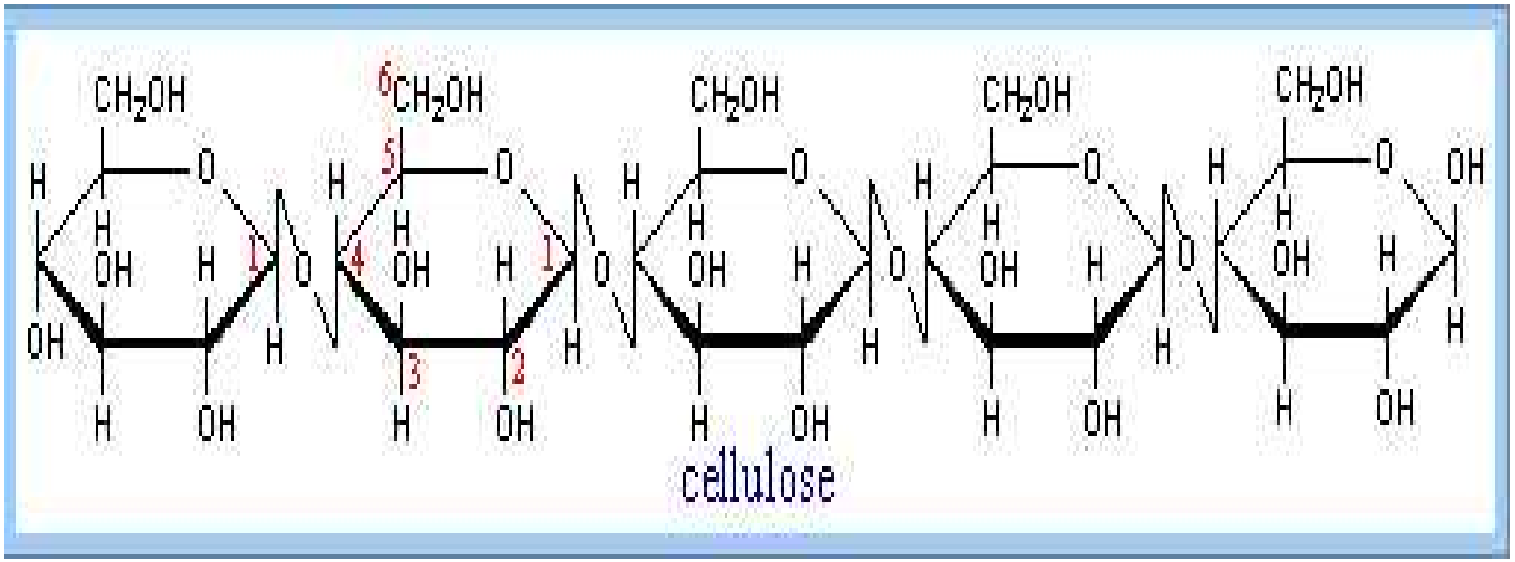


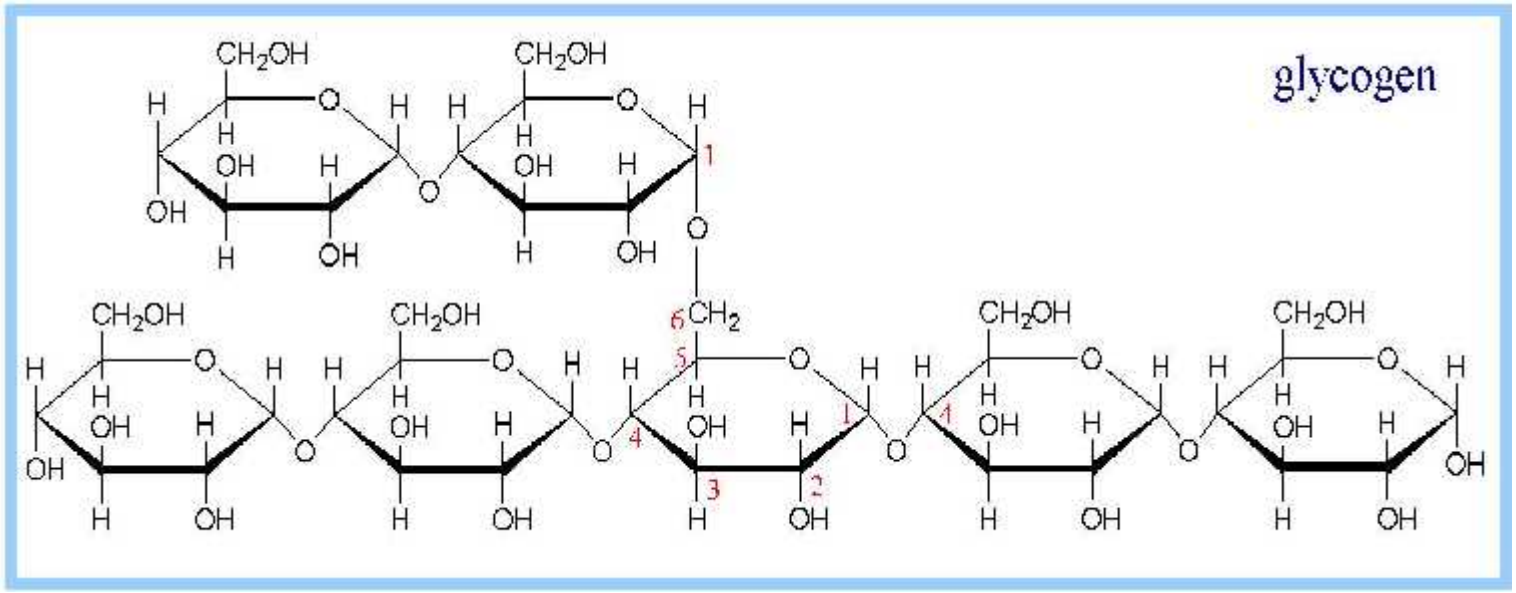
Digestion of Carbohydrates

- Polysaccharides – most abundant CARBS in diet
- Starch & cellulose – By plant food
- Glycogen – by food of animal origin
- Starch & glycogen digestion starts in mouth
- Salivary amylase hydrolyze alpha 1-4 glycosidic linkages
- Yield a mixture of maltose, glucose & oligosaccharides


amylose


amylopectin


cellulose


glycogen

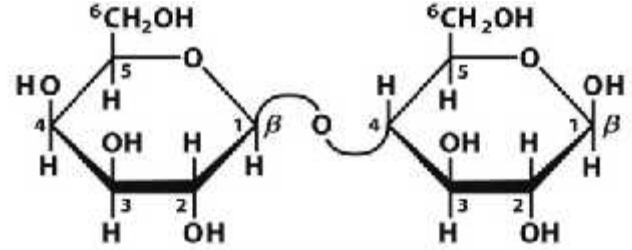
- Digestion stops in stomach
- Continue in small intestine, especially in duodenum
- By pancreatic amylase
- Cellulose cannot be digested
- Lack of enzyme to hydrolyze beta 1-4 linkage
- Undigested cellulose give bulk of fiber (roughage)
- This is desirable for proper motility of intestine

- Ruminant animals – cellulose digestion

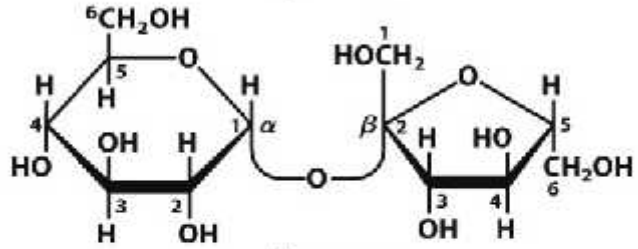
- Disaccharides digestion in small intestine

- Sucrose by sucrase (invertase)
- Lactose by lactase (β-galactosidase)
- Maltose by maltase

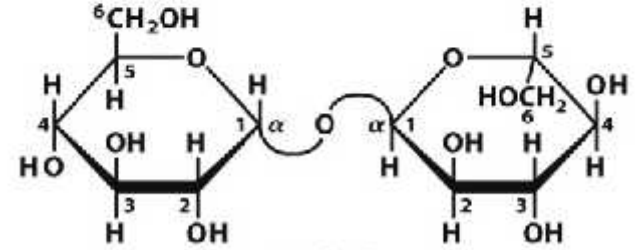
- Lactose intolerance



Lactose (β form)
β-D-galactopyranosyl-(1→4)-β-D-glucopyranose
Gal(β1→4)Glc

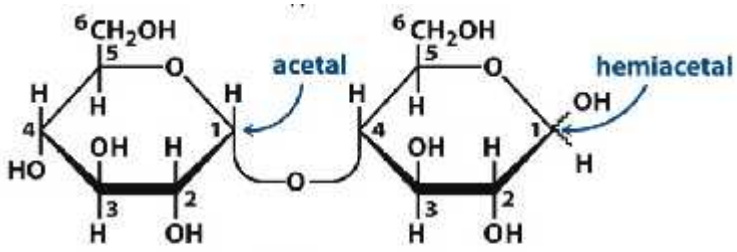


Sucrose
β-D-fructofuranosyl α-D-glucopyranoside
Fru($2\beta \leftrightarrow \alpha 1$)Glc ≡ Glc($\alpha 1 \leftrightarrow 2\beta$)Fru



Trehalose
α-D-glucopyranosyl α-D-glucopyranoside
Glc($\alpha 1 \leftrightarrow 1\alpha$)Glc

Figure 7-11
Lehninger Principles of Biochemistry, Sixth Edition



Maltose
α-D-glucopyranosyl-(1→4)-D-glucopyranose

Figure 7-10
Lehninger Principles of Biochemistry, Sixth Edition

- Mixture of hexoses absorbed in small intestine, brought to liver via blood