

# CHAPTER 14

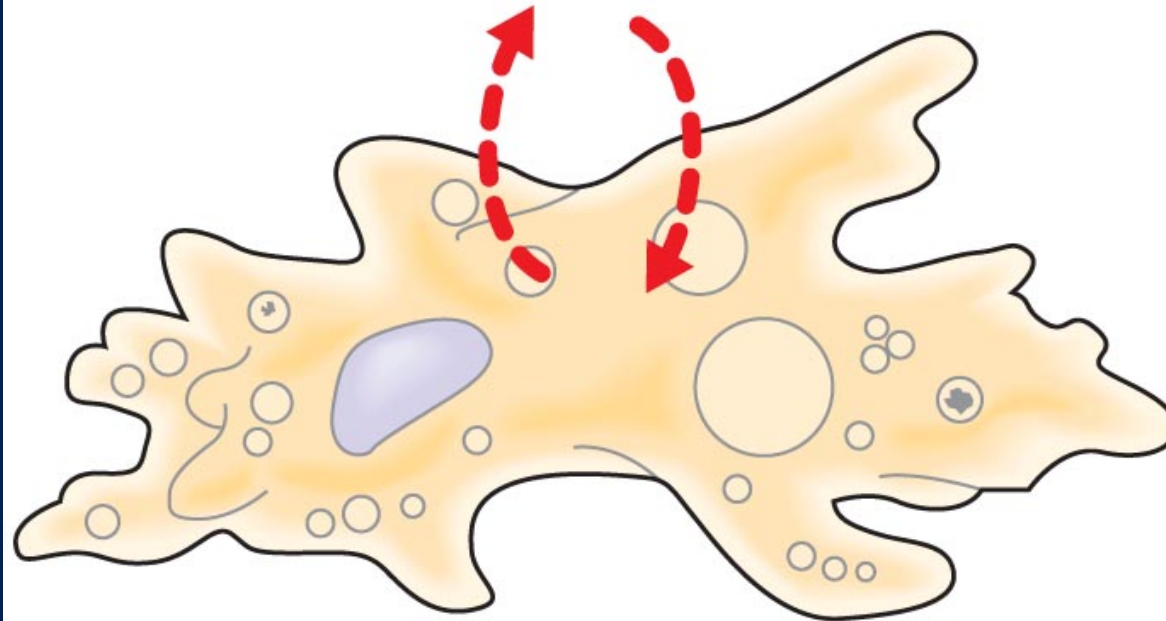
## Digestion

# Overarching principles

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- Maximize materials exchange
  - Contribute to homeostasis
-

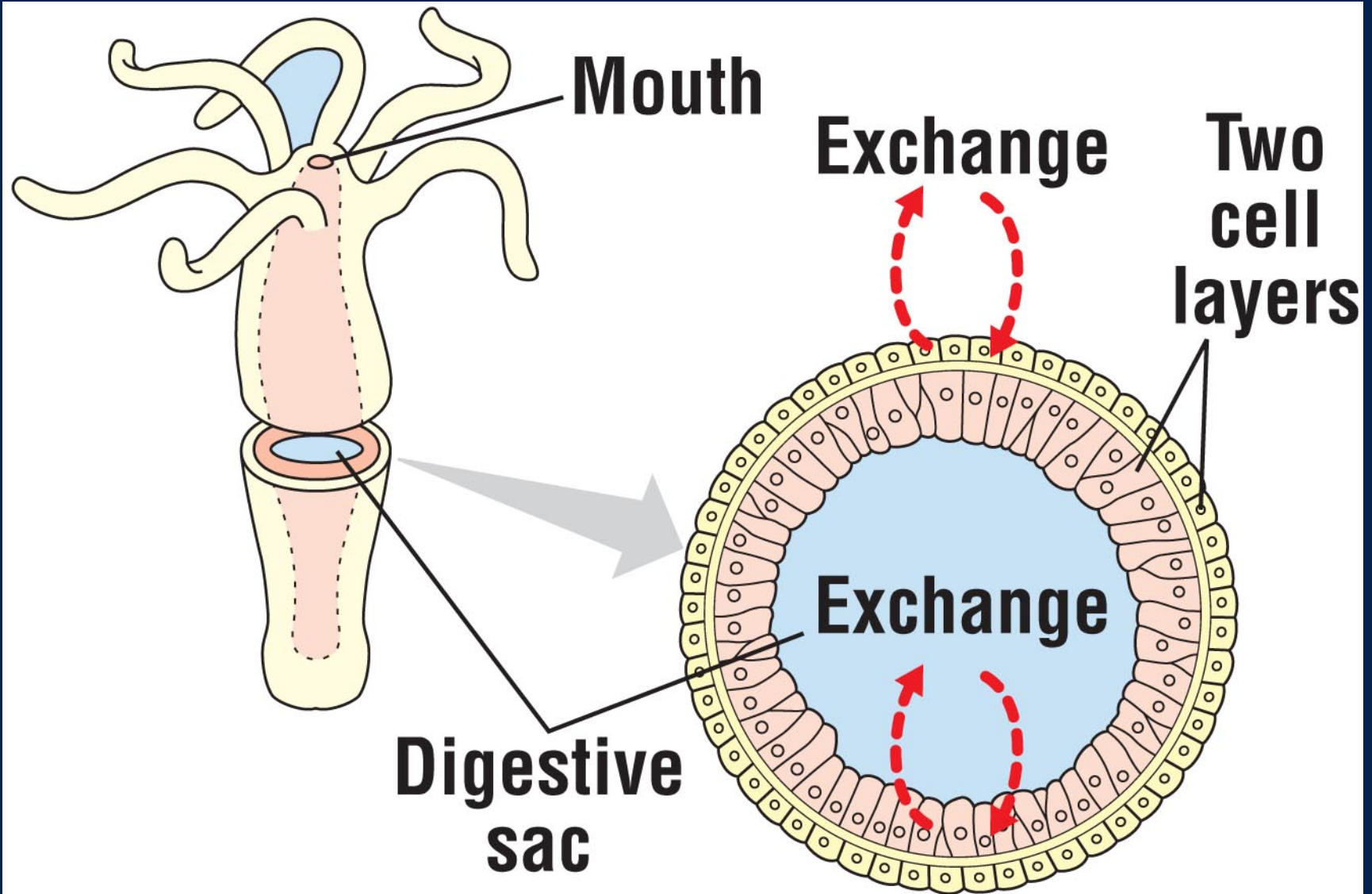
# Exchange



**(a) Single cell.**

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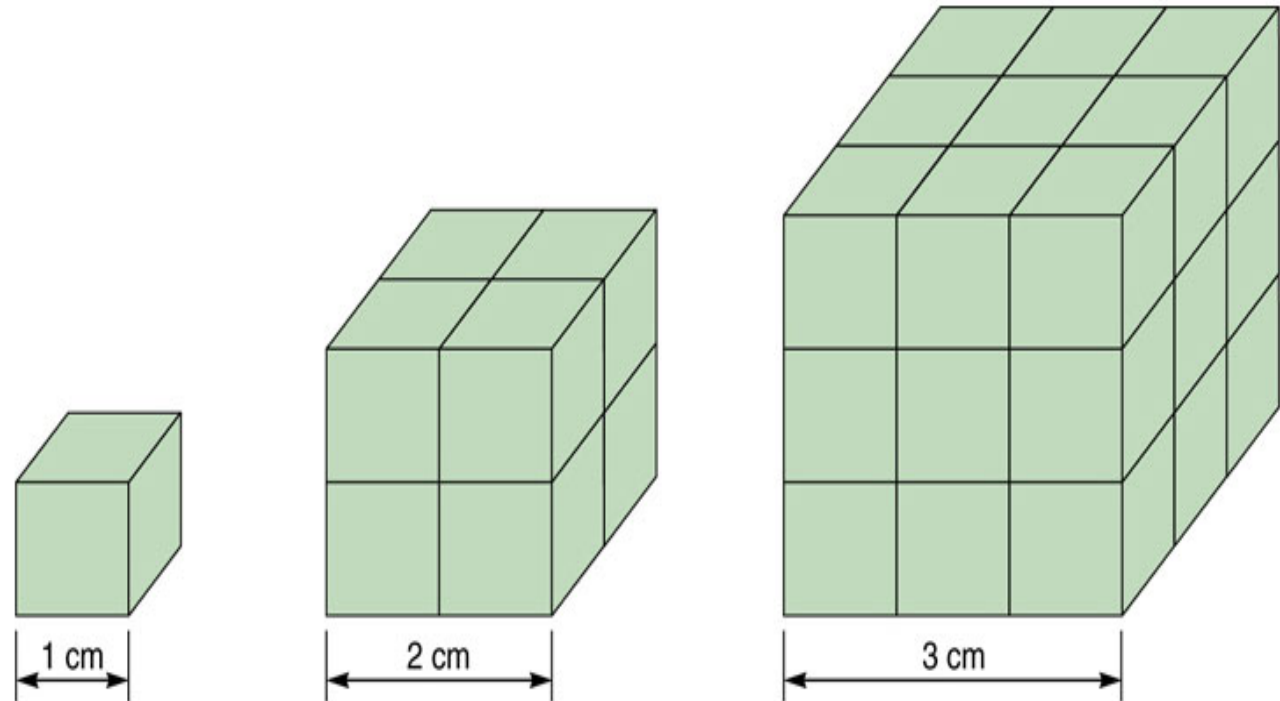
Figure 21.9a



**(b) Two cell layers.**

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Figure 21.9b



Surface area (length  $\times$  width  $\times$   
number of sides)

6 cm<sup>2</sup>

24 cm<sup>2</sup>

54 cm<sup>2</sup>

Volume (length  $\times$  width  $\times$  height)

1 cm<sup>3</sup>

8 cm<sup>3</sup>

27 cm<sup>3</sup>

Surface area-to-volume ratio

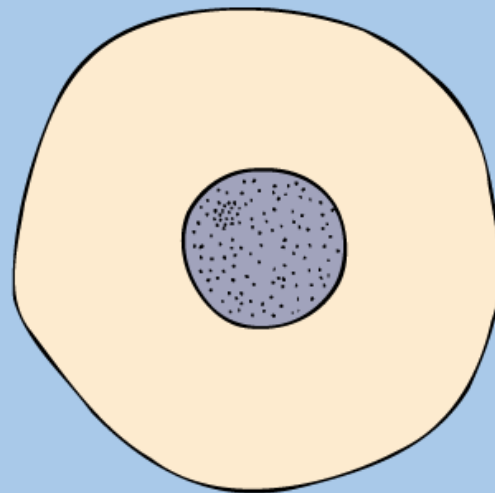
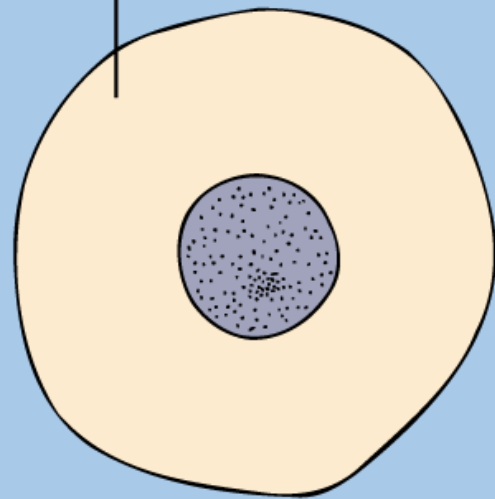
6:1

3:1

2:1

Cell

Interstitial fluid

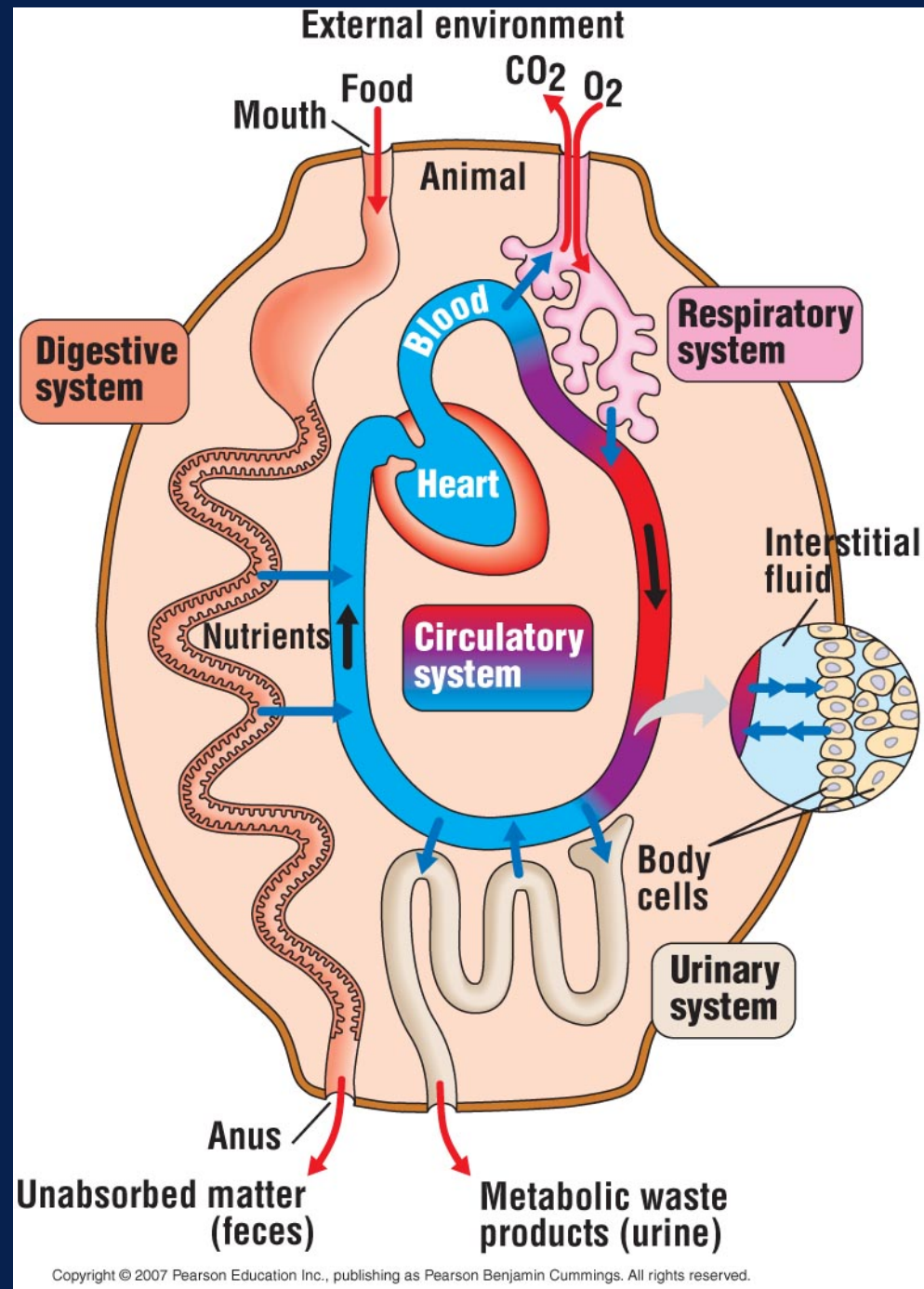


Blood vessel

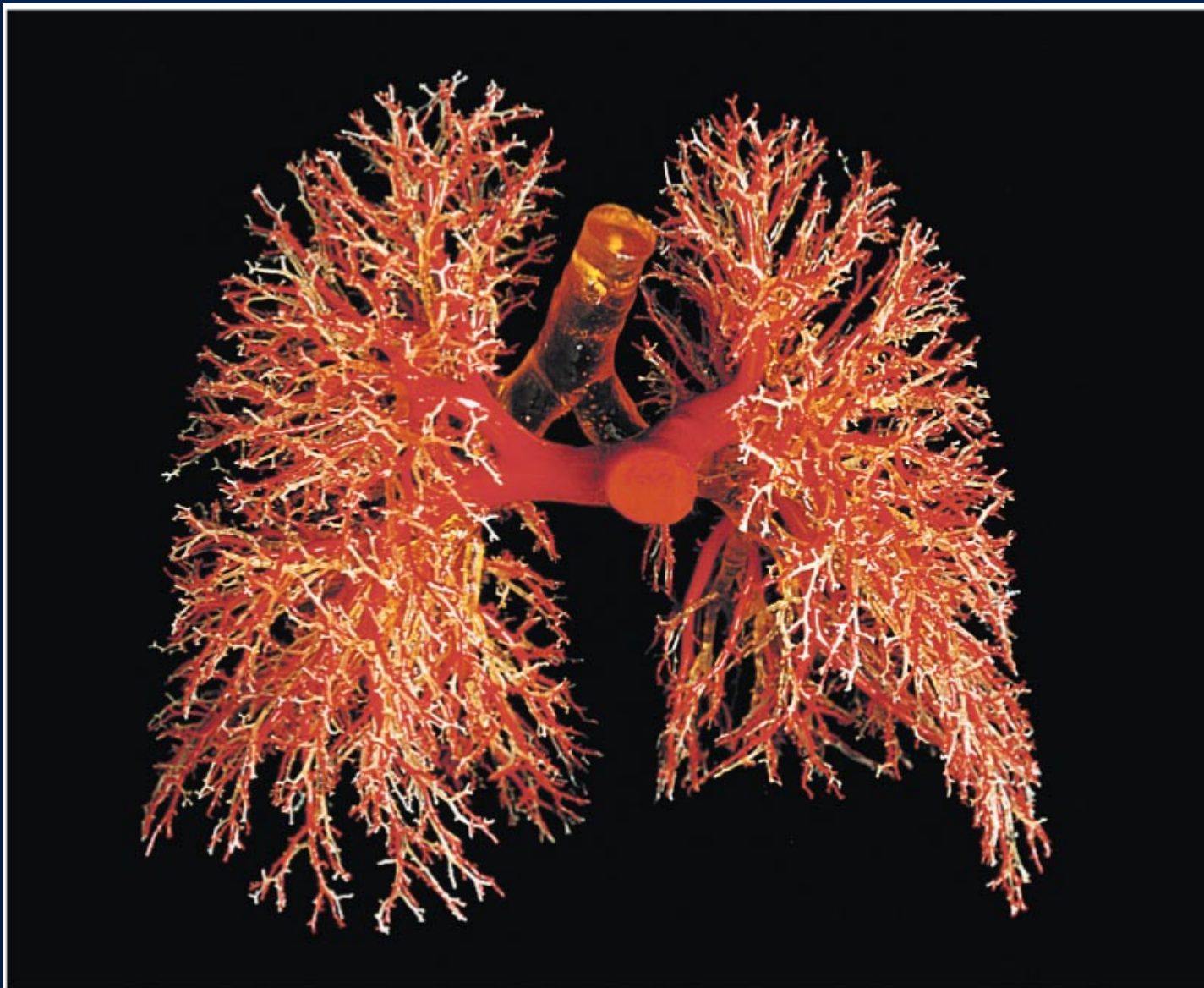
Plasma

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Extracellular fluid



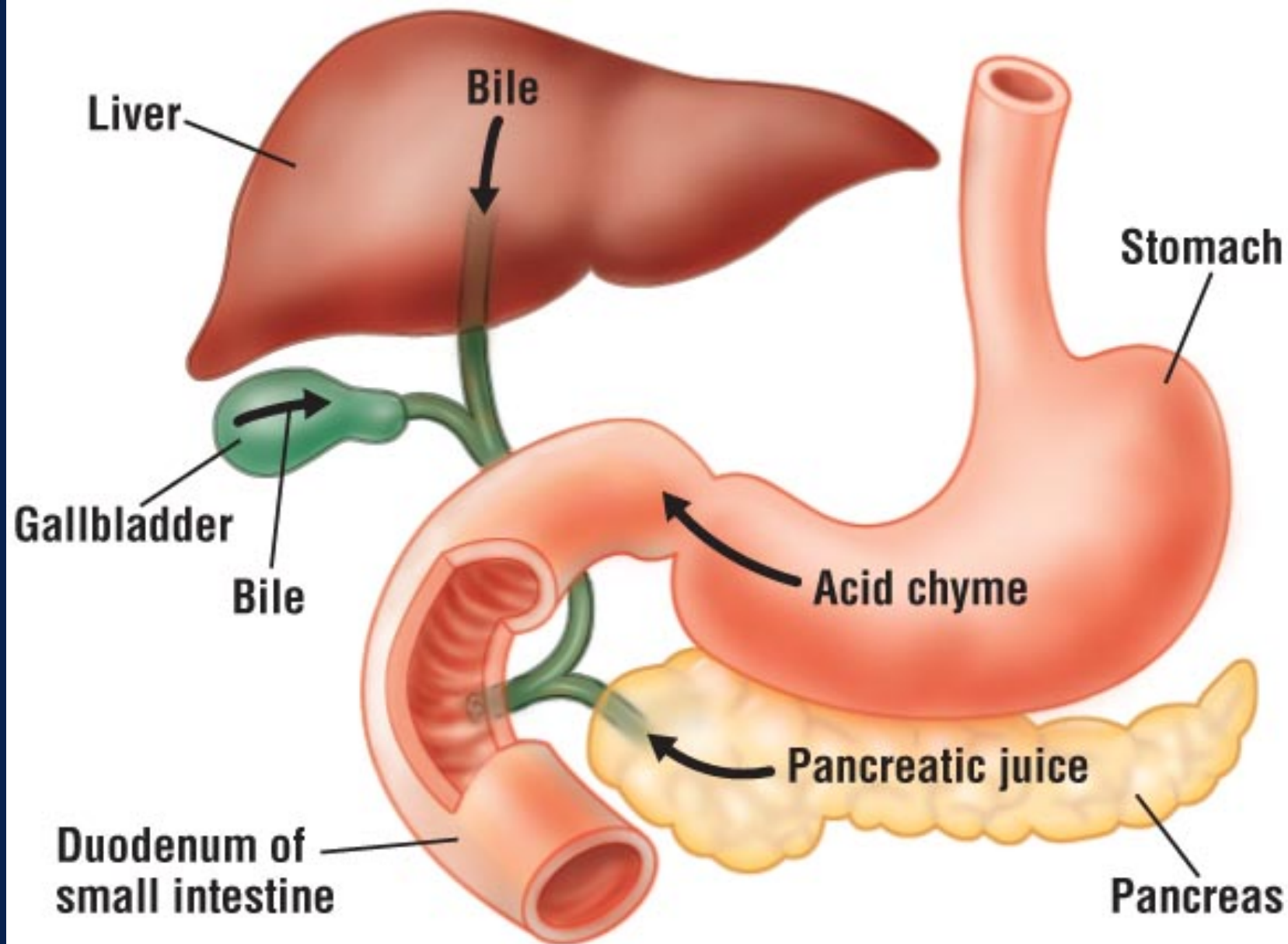




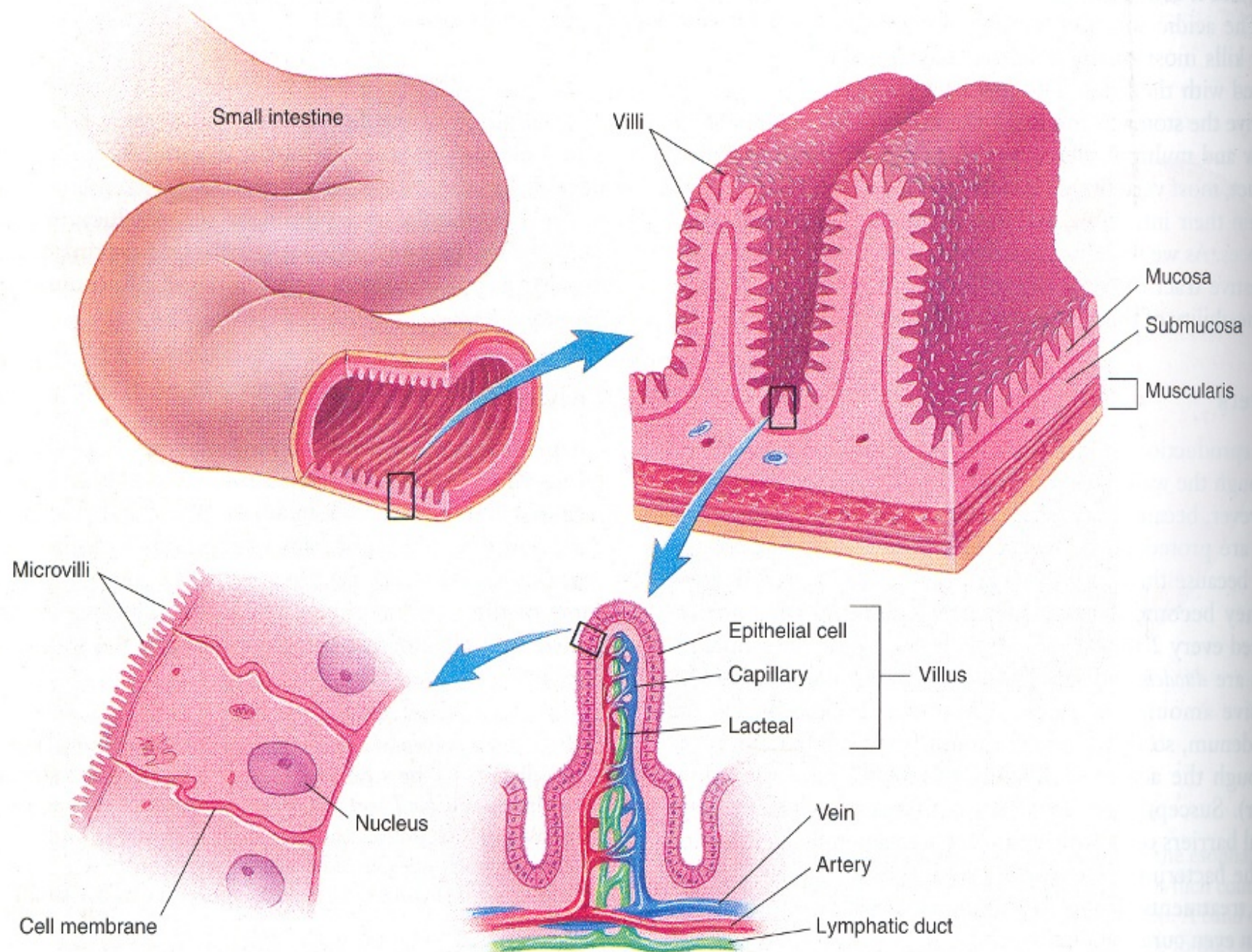
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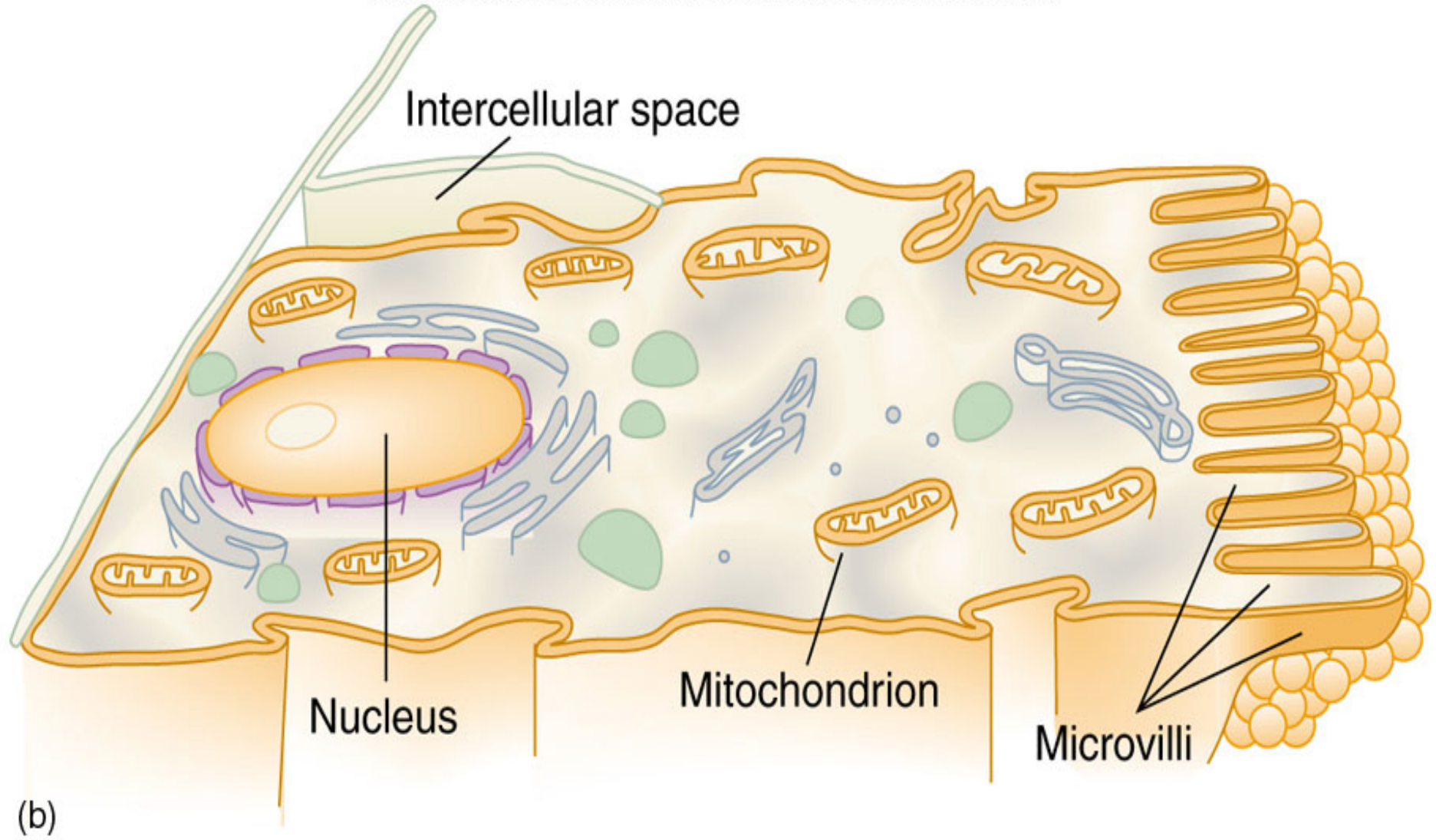
Figure 22.13



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### **Ingestion**

Food into mouth

### **Digestion**

#### **Mechanical digestion**

Chewing in the mouth

Churning in stomach

#### **Chemical digestion**

Saliva in mouth

Acid and pepsin in stomach

Hydrolases in small intestine

### **Absorption**

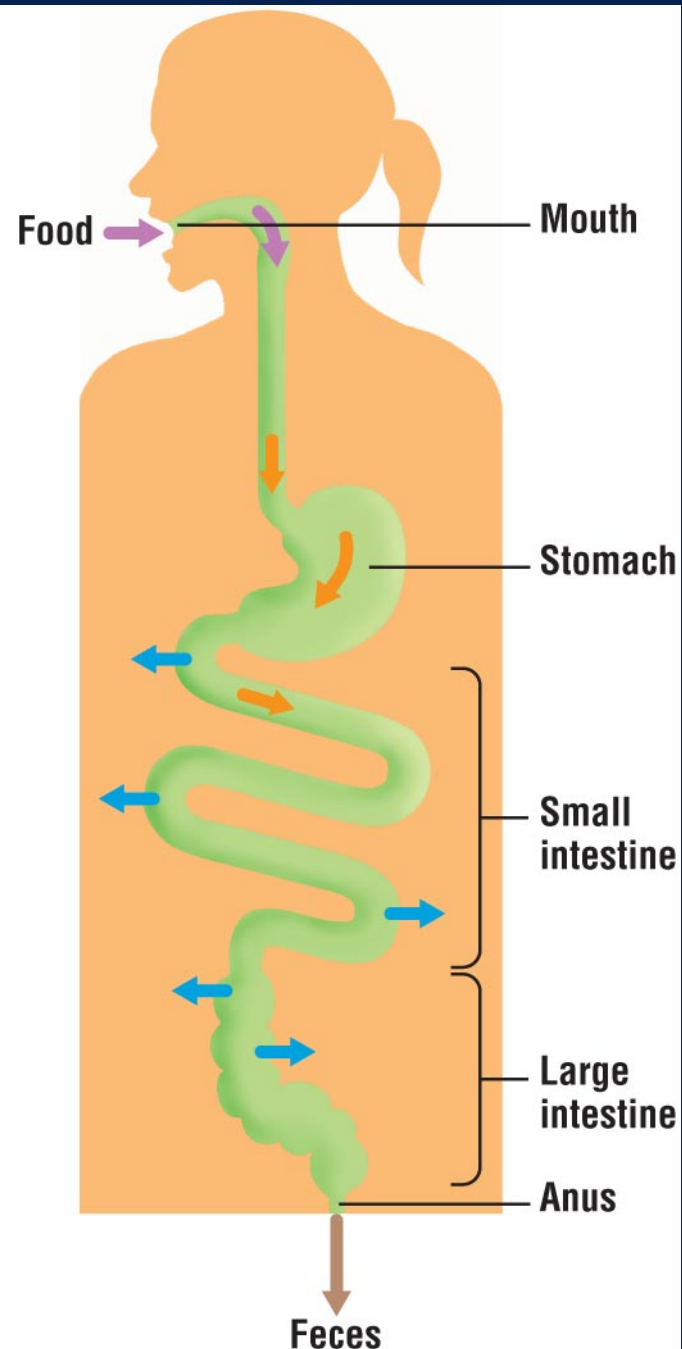
Nutrients and water in small intestine

Water in large intestine

### **Elimination**

Feces formed in large intestine

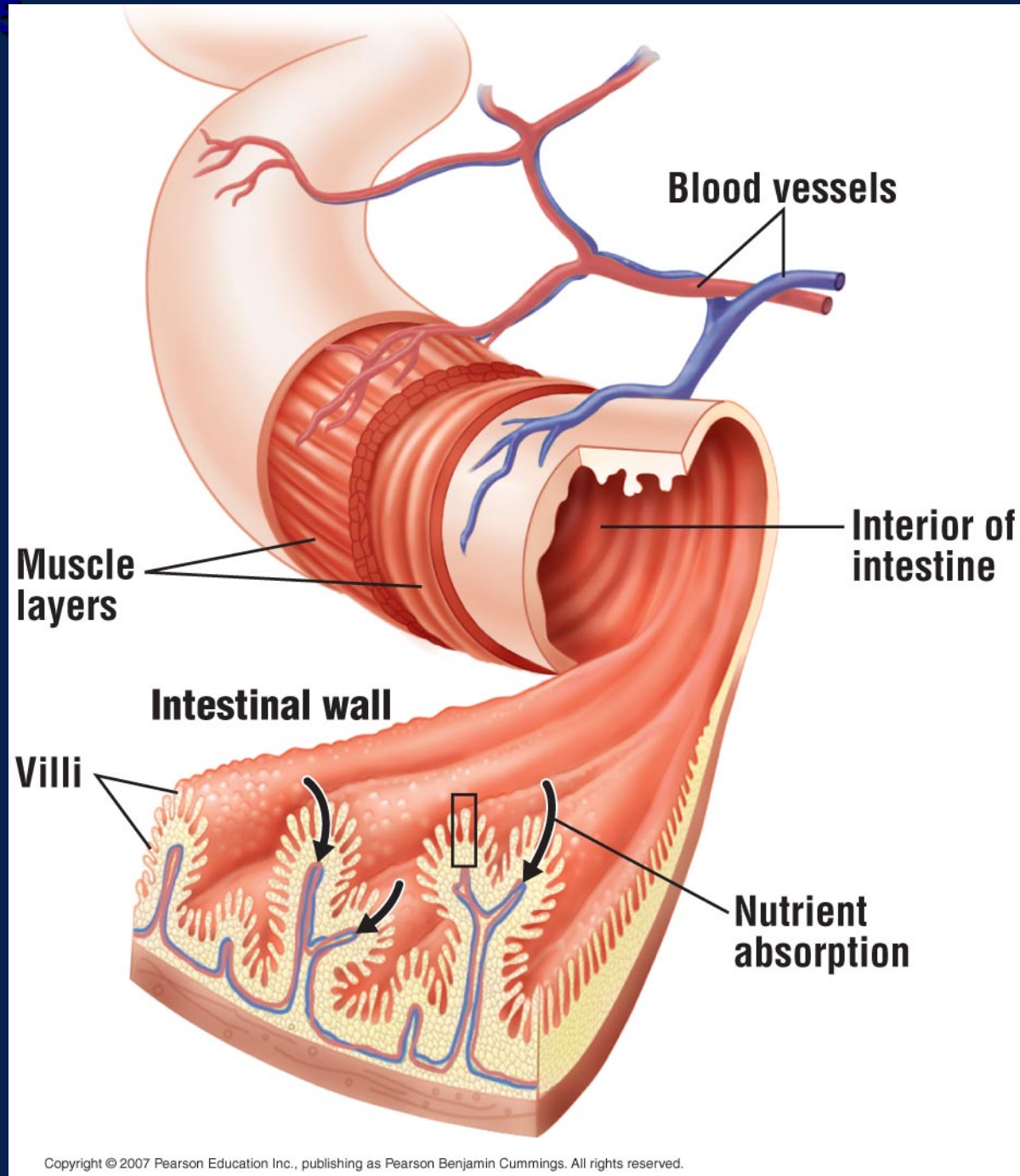
Elimination from anus



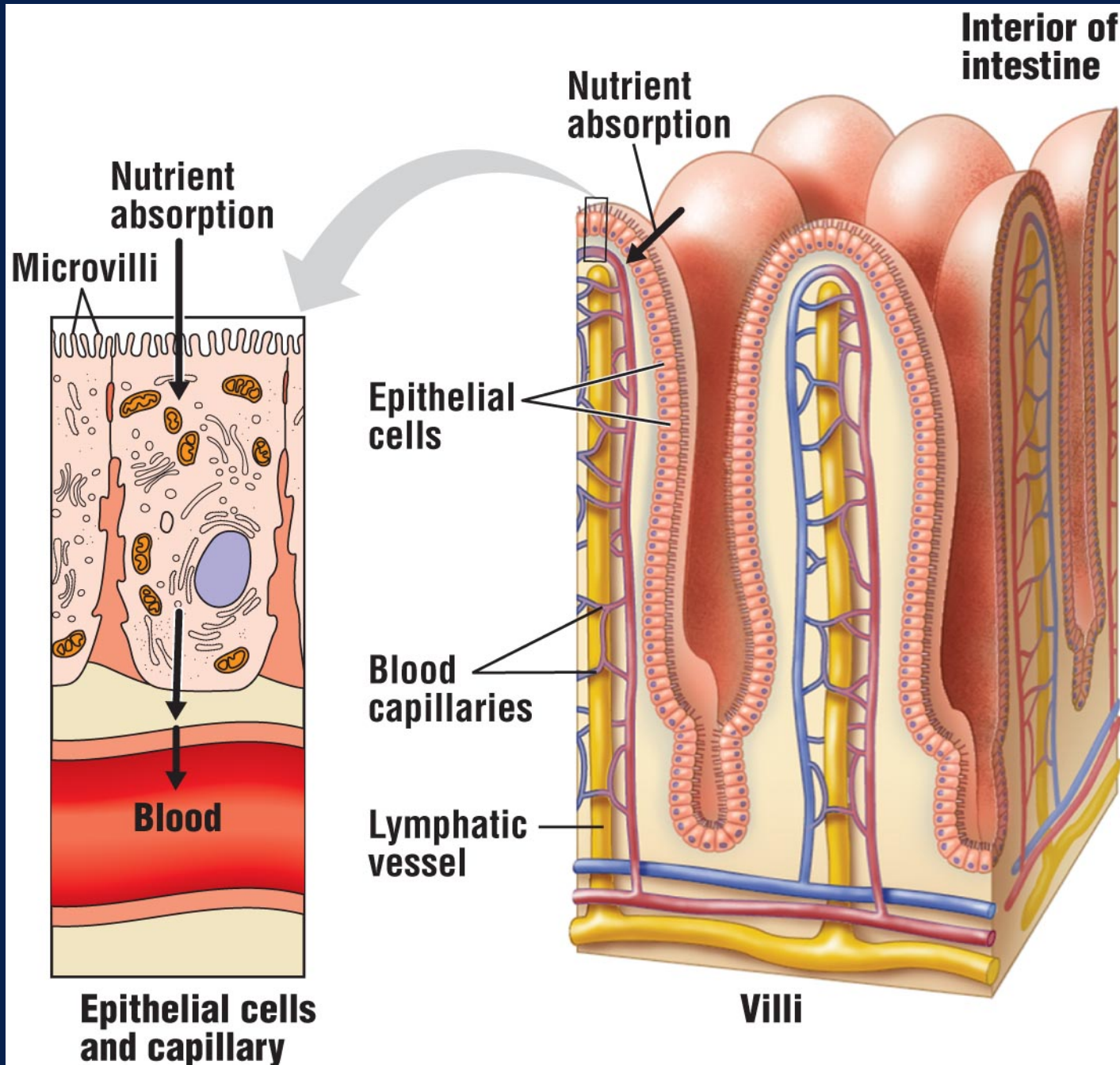
**Table 14.1 Major enzymes of digestion**

Enzyme	Source	Where Active	Substance Digested	Breakdown Products
<b>Carbohydrate Digestion</b>				
Salivary amylase	Salivary glands	Mouth	Polysaccharides	Disaccharides
Pancreatic amylase	Pancreas	Small intestine	Polysaccharides	Disaccharides
Intestinal enzymes	Small intestine	Small intestine	Disaccharides	Monosaccharides (e.g., glucose)
<b>Protein Digestion</b>				
Pepsin	Stomach	Stomach	Proteins	Peptides
Trypsin	Pancreas	Small intestine	Proteins	Peptides
Chymotrypsin	Pancreas	Small intestine	Proteins	Peptides
Carboxypeptidase	Pancreas	Small intestine	Peptides	Amino acids
Intestinal enzymes	Small intestine	Small intestine	Peptides	Amino acids
<b>Lipid Digestion</b>				
Lipase	Pancreas	Small intestine	Triglycerides	Free fatty acids, glycerol

Figure 22.15



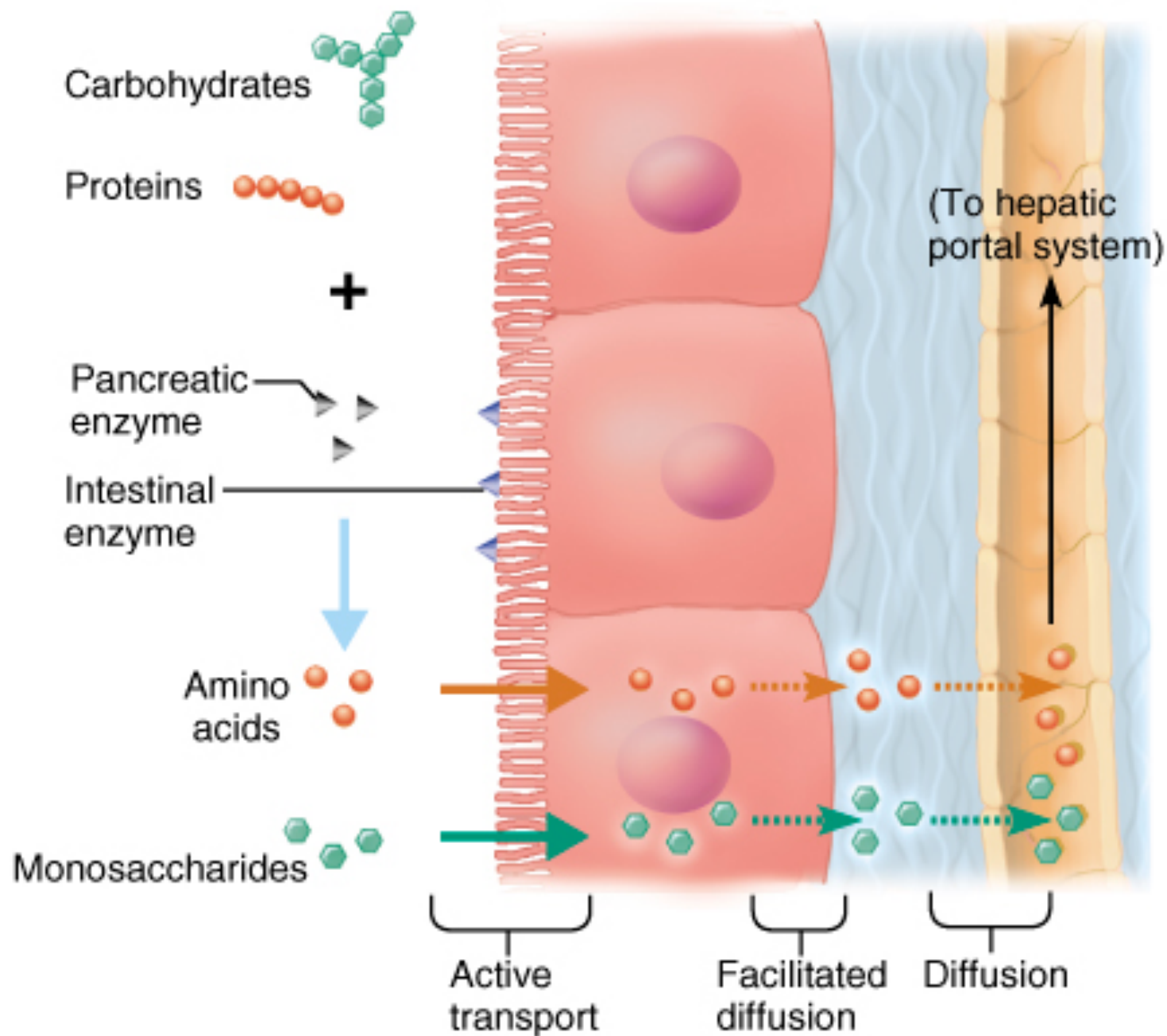


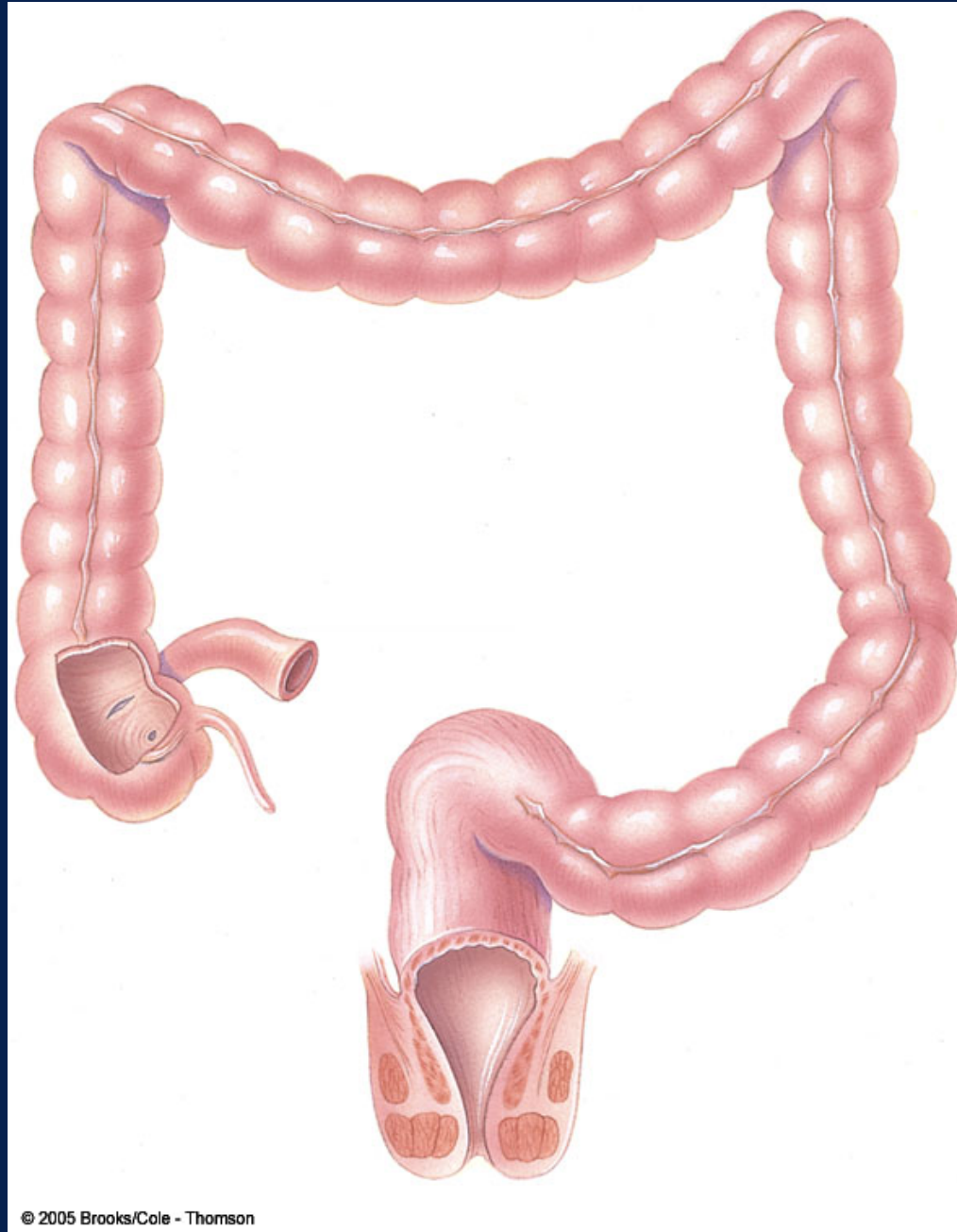


Intestinal lumen

Epithelial cell layer

Capillary





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Nutrients and water in small intestine

Water in large intestine

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