



KWAZULU-NATAL PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA



LIFE SCIENCES GRADE 11

Animal Nutrition

TERMS 2

MARCH 2025

GROWING KWAZULU-NATAL TOGETHER
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Errors and Misconceptions

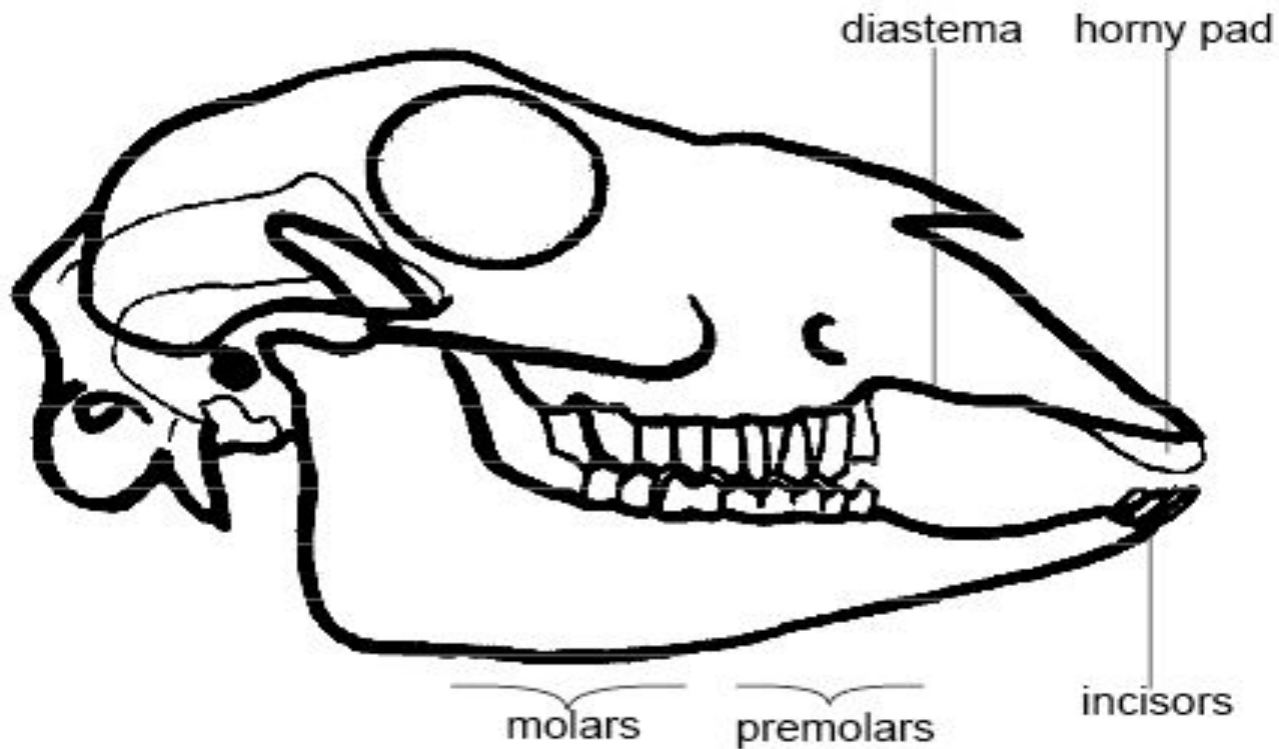
- **Chewing and swallowing**
- **Ingestion and egestion**
- **Misunderstanding of the process of the digestion**
- **Absorption and Assimilation (often use interchangeably)**
- **Misunderstanding of the role of Insulin and Glucagon in controlling blood glucose levels.**

Animal Nutrition

- All animals need to eat food to give them nutrients that they will use every day.
- These nutrients are used in the body to provide energy, repair damaged tissue and to regulate bodily processes.
- These nutrients are amino acids, fatty acids, vitamins and minerals
- Animals are classified into three groups i.e **herbivores**, **carnivores** and **omnivores**

Herbivores

- Herbivores examples are sheep, cattle, antelope and giraffe



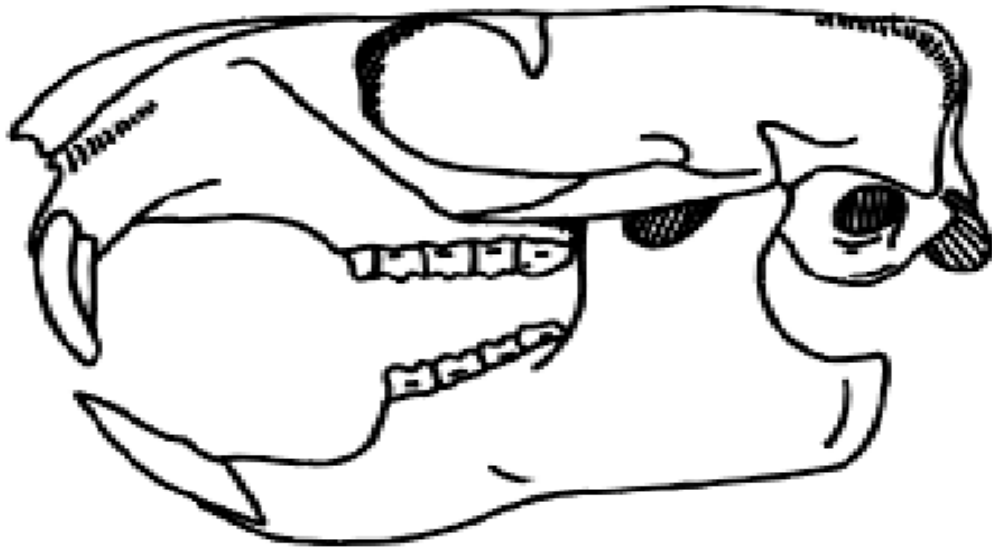
Herbivores teeth adaptations

1. Sharp incisors
2. Canines are absent
3. Large molars and premolars

Omnivores

- Omnivores e.g baboon, pigs consume both plant and animals materials

1



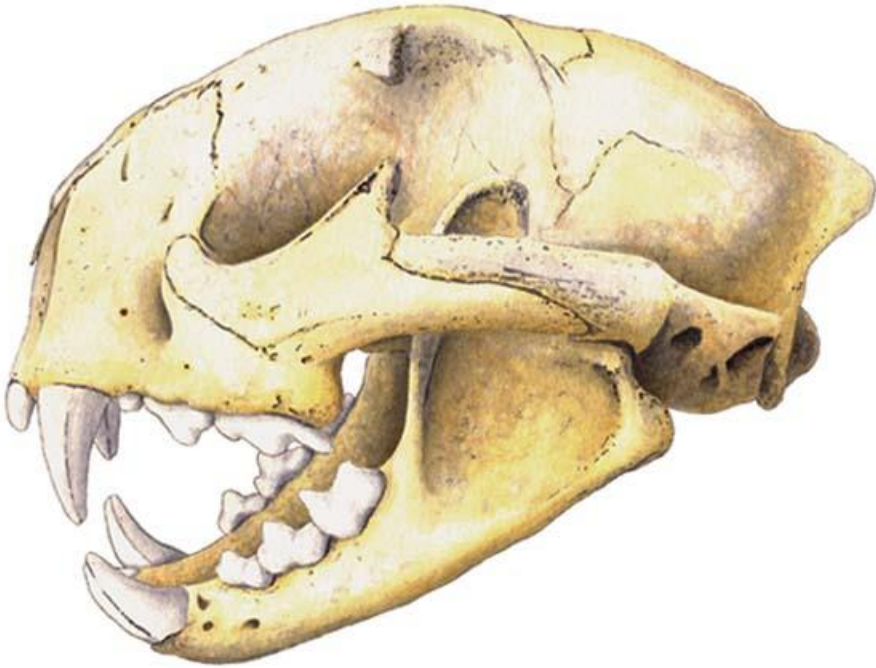
Omnivores teeth adaptations

1. Large canines
2. Molars similar to carnivores

Carnivores

➤ Carnivores examples are lions, cats, and leopard

1. Sharp incisors
2. Long canines
3. Sharp molars and premolars

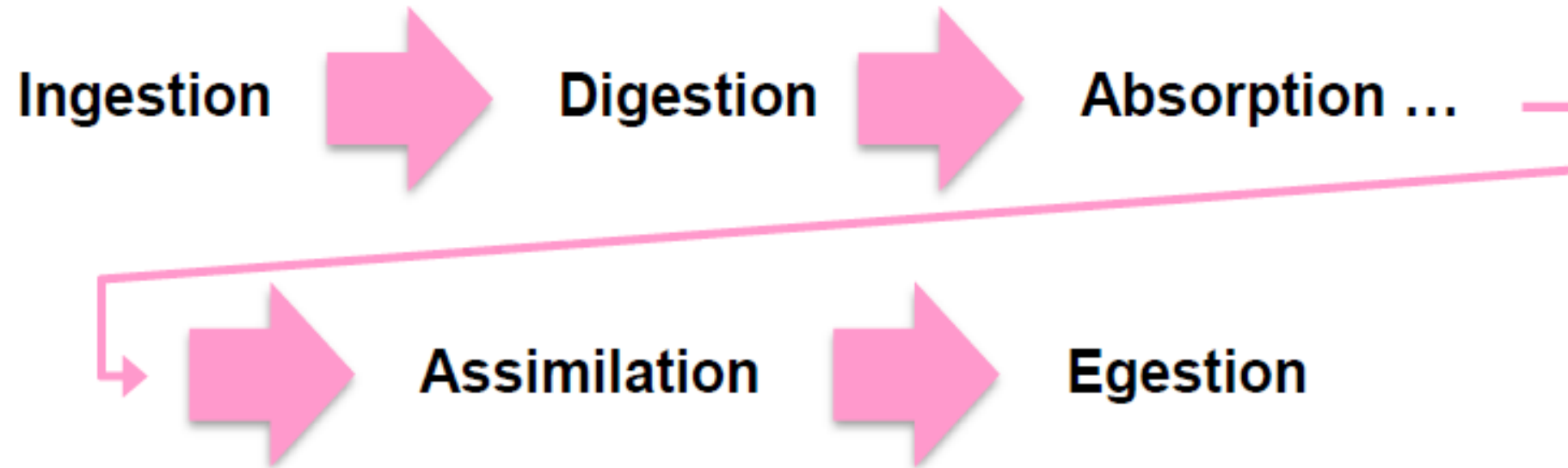


Human Dentition

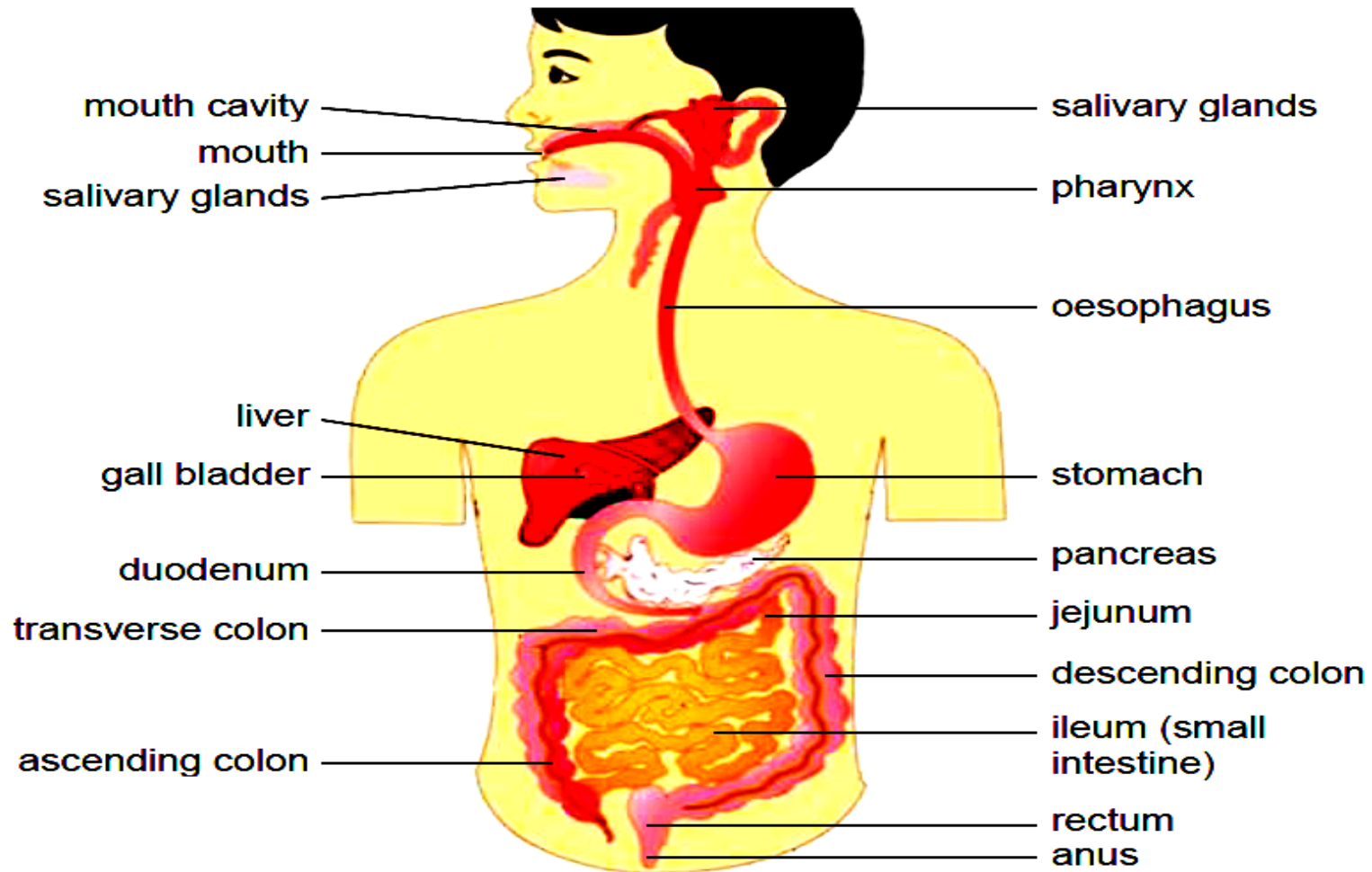
- Humans have 2 incisors, 1 canine, 2 premolars and 3 molars in one half of the upper jaw and the exact same in the lower jaw. Total of 32 teeth
- Human dental formula:
$$\frac{2.1.2.3}{2.1.2.3}$$



Animal nutrition



Alimentary canal



Processes

- **Ingestion:** the food is taken in and enters the alimentary canal.
- **Digestion:** food is exposed to mechanical and chemical processes that change solid, insoluble food to simpler, soluble substances.
- **Absorption:** the end products of digestion are absorbed into the bloodstream.
- **Assimilation:** the cells absorb the nutrients from the blood and use it build new cells structures and compounds.
- **Egestion:** the processes through which undigested remains are removed from the body in the form of faeces.

Different parts and functions

- **Mouth cavity** : it is where mechanical digestion occurs
Tongue is rolled with saliva to form a bolus
- **Oesophagus**: Food is pushed down by Peristalsis
- **Stomach** : It is where chemical digestion occurs food mixes with gastric juice to form a chyme.
- **Liver and gall bladder**: Liver produces bile that is stored in the gall bladder. Bile is used for fat emulsification (breaking down fats into small droplets, neutralizes chyme acidity.
- **Pancreas**: secretes insulin and glucagon to neutralize chyme

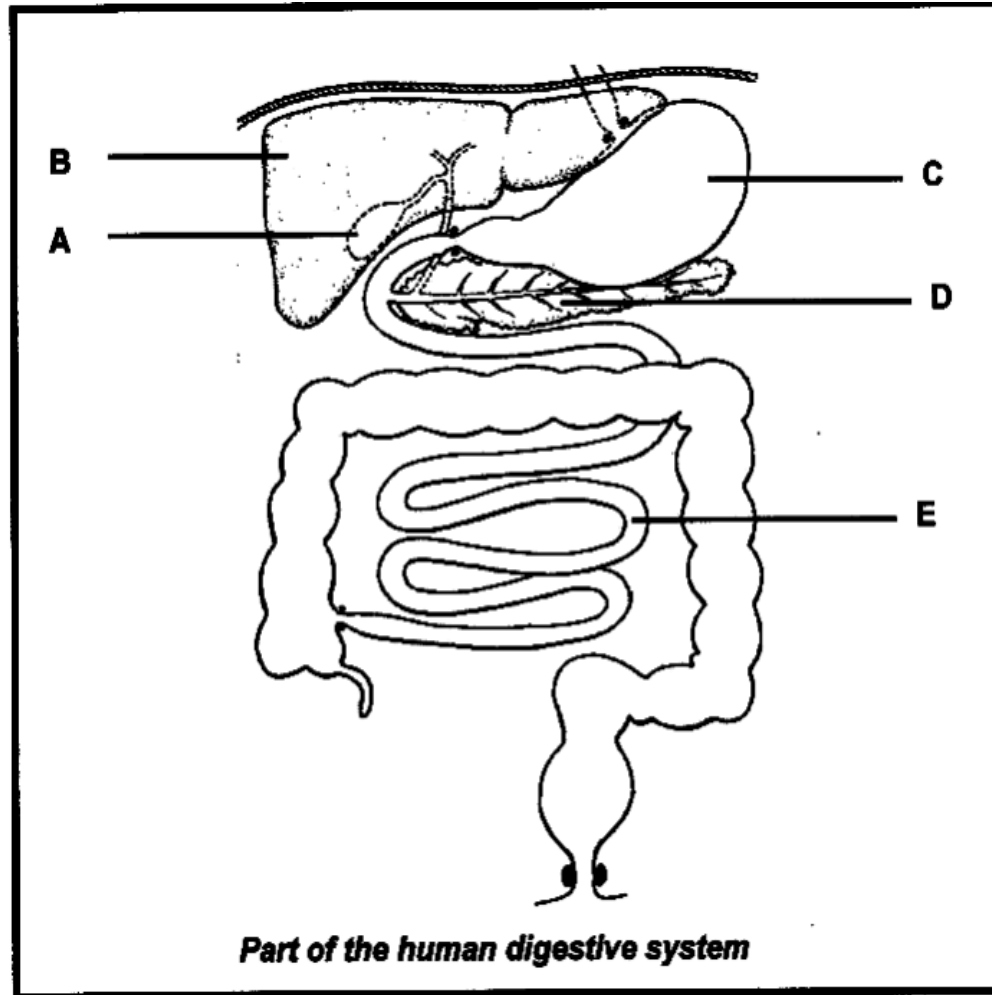
Different parts and functions

- **Small intestine:** long, folded it is where most absorption occurs.
- **Large intestine:** it is where most water and mineral salts are absorbed.
- <https://youtu.be/s06XzaKqELk>
- <https://youtu.be/Z4N0cgpgAMc>

The diagram below shows the human digestive system

1. Identify parts B, C and E respectively.

(3)



The diagram below shows a human digestive system.

1. Identify parts **B**, **C** and **E** respectively. (3)

B - Liver✓

C - Stomach✓

E – Small intestine ✓

2. Name **TWO** functions of part **B** that are related to nutrition. (2)

Stores iron✓

Stores vitamins A, D, E, K✓

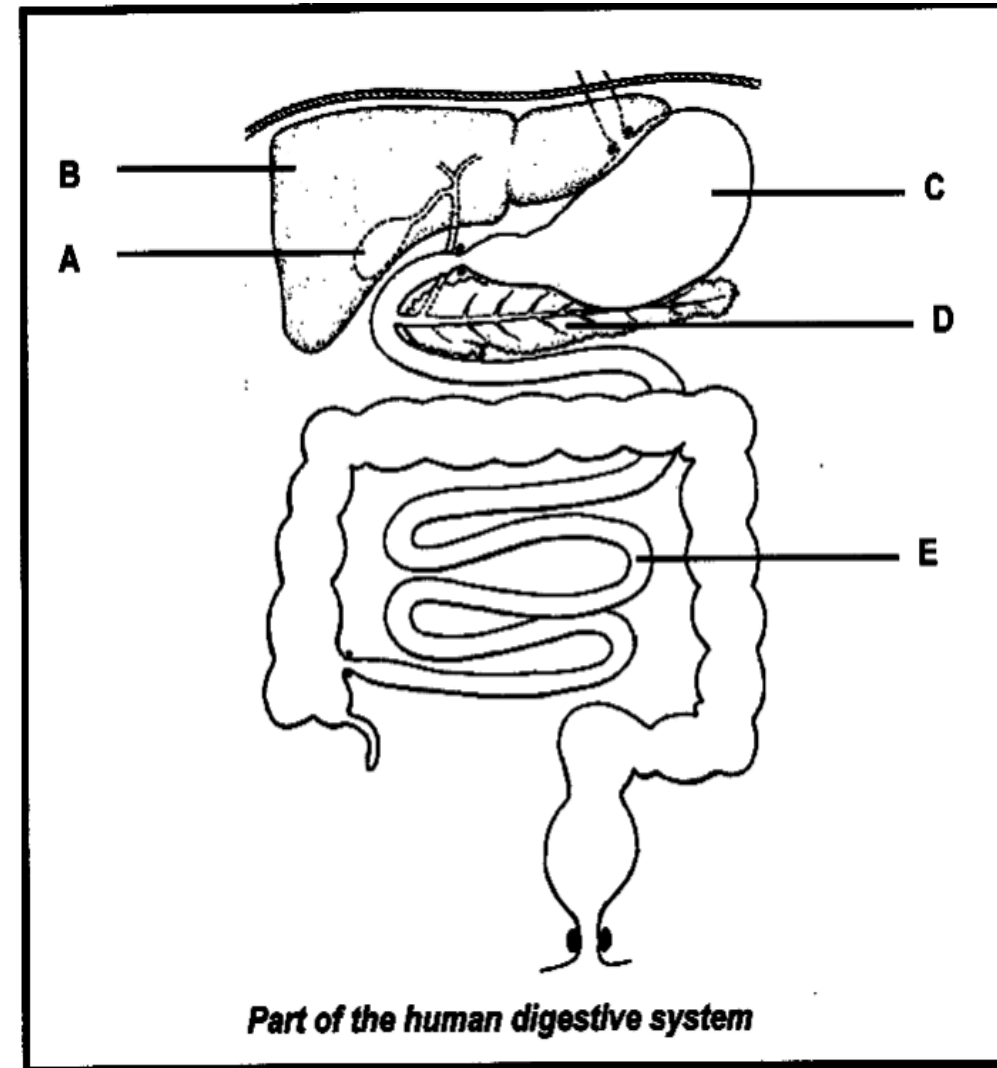
Stores glycogen✓

Produces bile✓

Deaminates excess amino acids ✓

3. Name the fluid that is stored in part **A**. (1)

Bile✓



Liver

- Stores iron
- Produces bile
- Stores vitamins A, D, E and K
- Stores excess glucose and glycogen
- Deaminates excess amino acids into urea and glucose
- Detoxifies blood

Gallbladder

- Stores bile
- Bile aids in fat digestion by emulsifying fat into smaller fat droplets (this creates a larger surface area for enzyme function)
- Bile helps to neutralise the acidic chyme from the stomach

Large intestine/Colon

Appendix

Stomach

- Digests proteins
- Contains hydrochloric acid that can hydrolyse sucrose

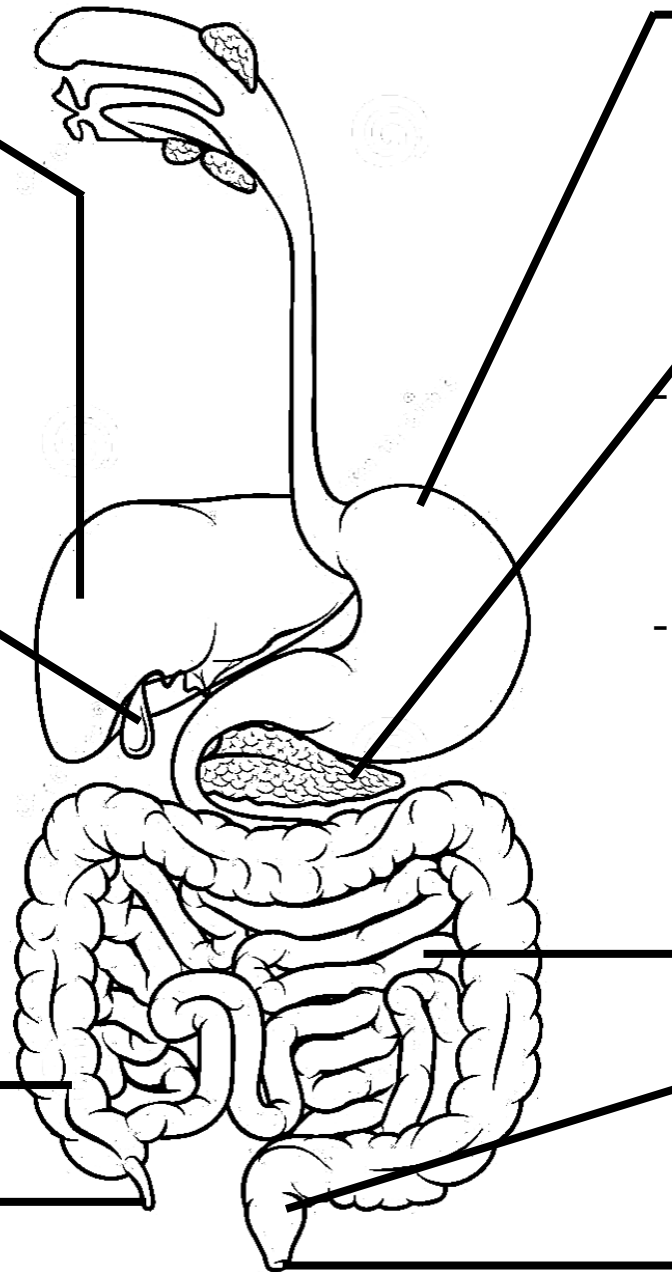
Pancreas

- Exocrine function: Releases pancreatic juice with digestive enzymes to aid in digestion in the small intestine
- Endocrine function: Releases hormones (Insulin & Glucagon) into the bloodstream to regulate blood glucose concentrations

Small intestine

Rectum

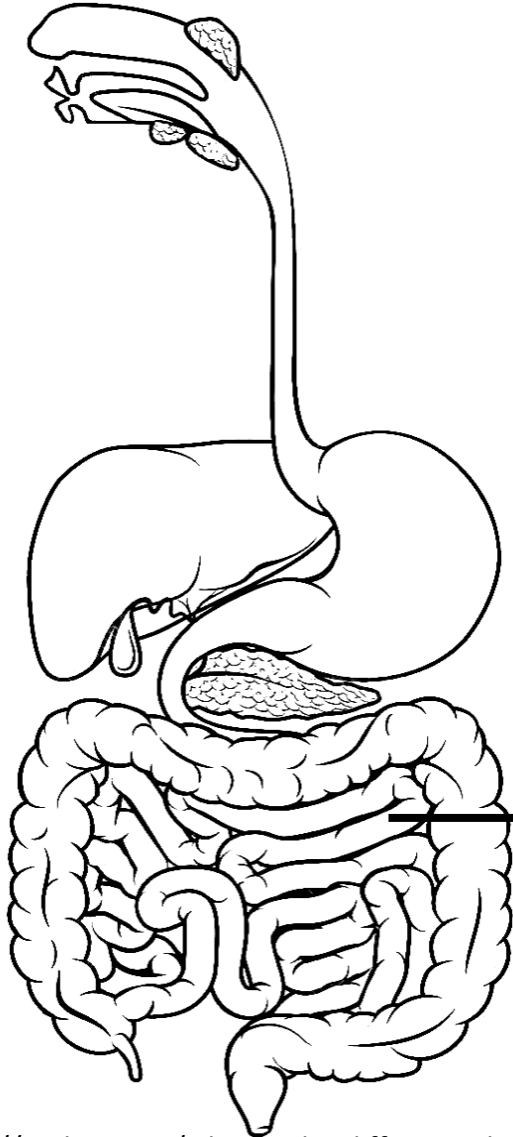
Anus



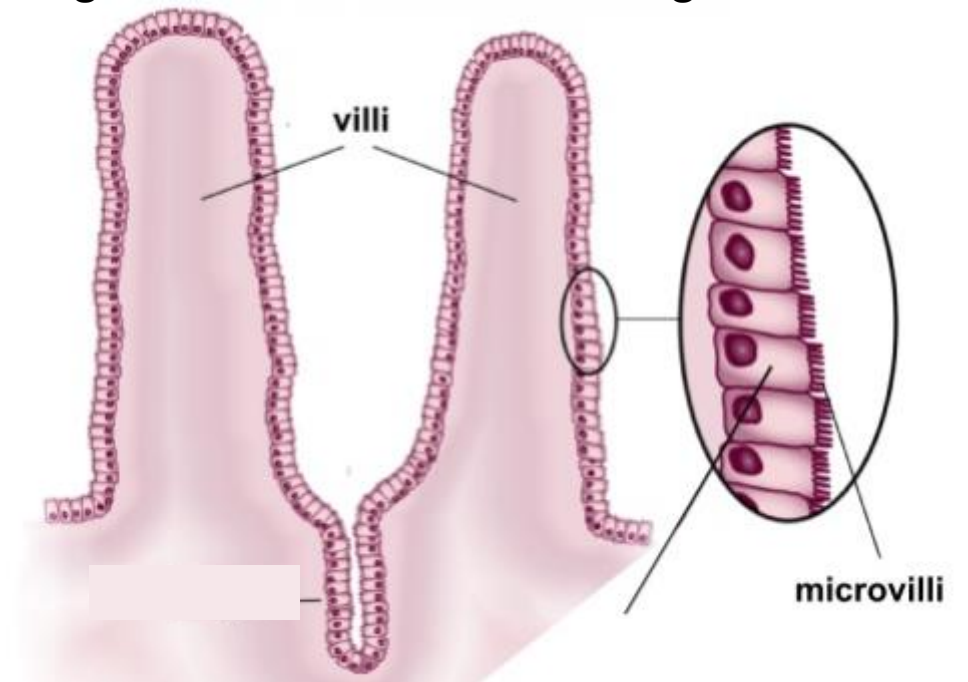
<https://www.dreamstime.com/stock-illustration-human-digestive-tract-black-white-illustration-system-alimentary-canal-image62784012>

The small intestine is:

- **Long** (3 – 4 m) creating a large surface area for digestion and absorption
- **Highly folded** which slows the movement of food creating more time for digestion and absorption
- **Contains glands** that secrete intestinal juice containing enzymes that aid in digestion (and creates an alkaline medium)
- **Contains villi and microvilli** that enlarges the surface area for digestion and absorption

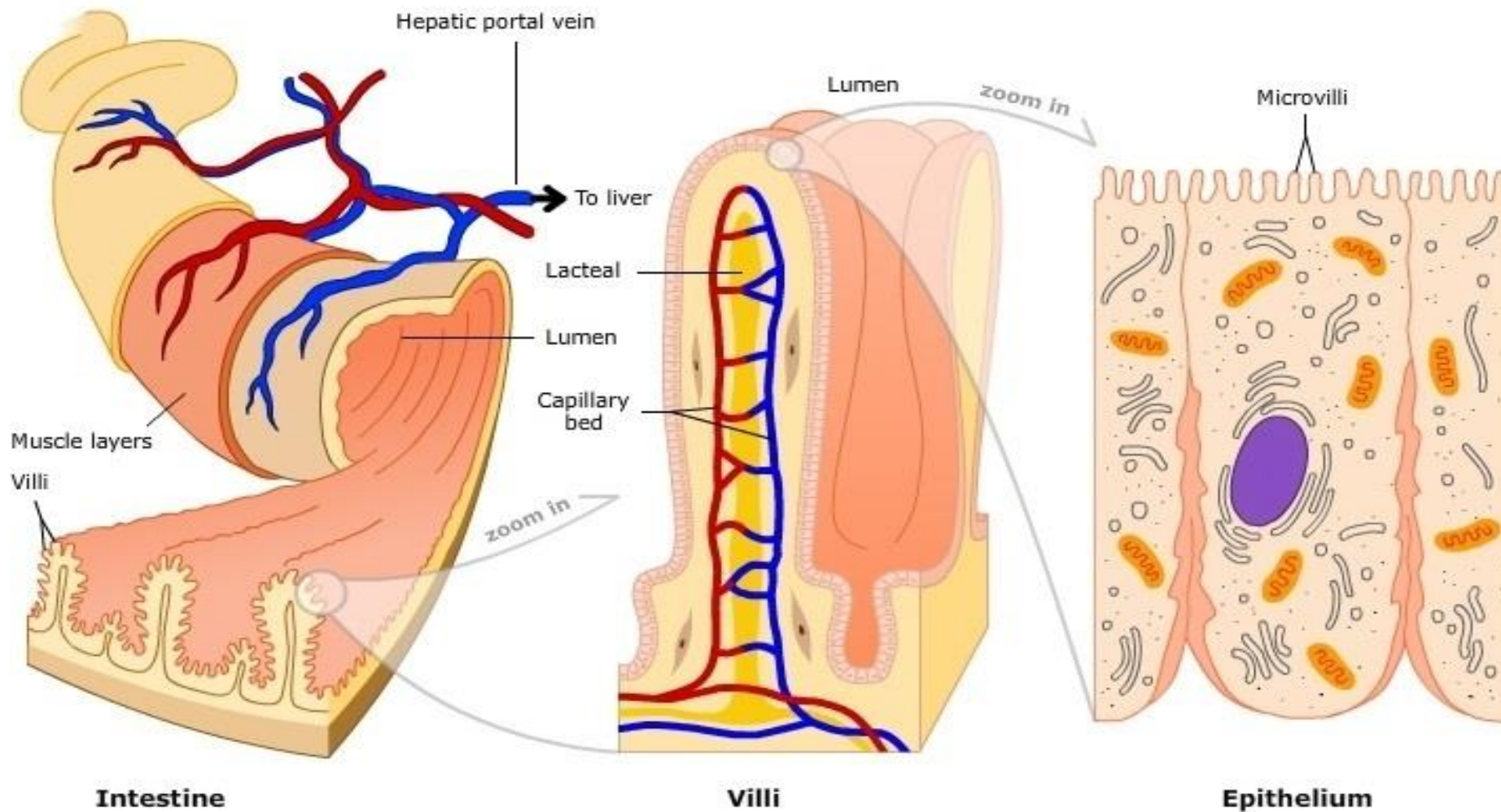


Small intestine



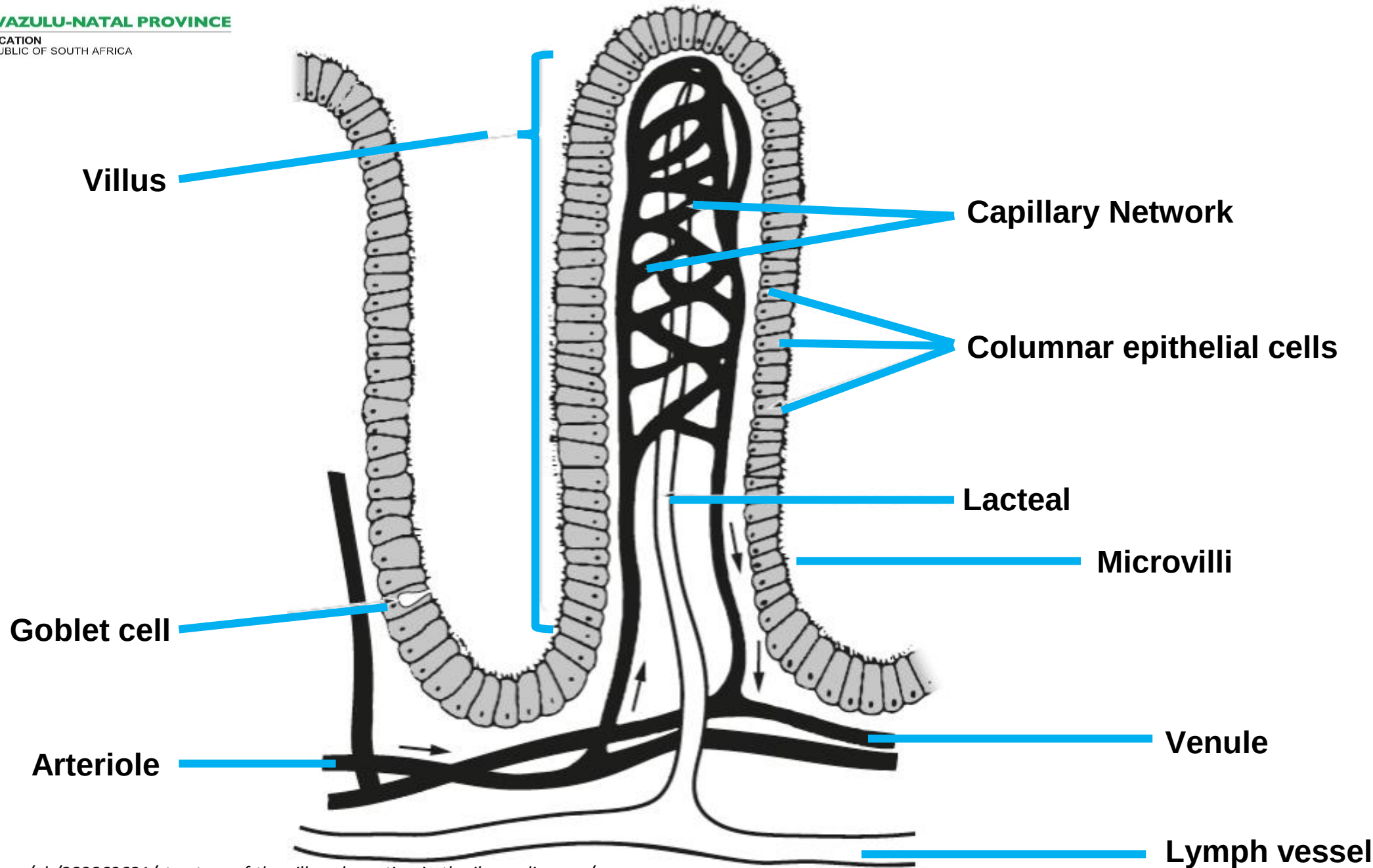
<https://pediaa.com/what-is-the-difference-between-villi-and-microvilli/>

<https://www.dreamstime.com/stock-illustration-human-digestive-tract-black-white-illustration-system-alimentary-canal-image62784012>



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<https://quizlet.com/qb/283869621/structure-of-the-villus-absorption-in-the-ileum-diagram/>



Structural Adaptations of a Villus

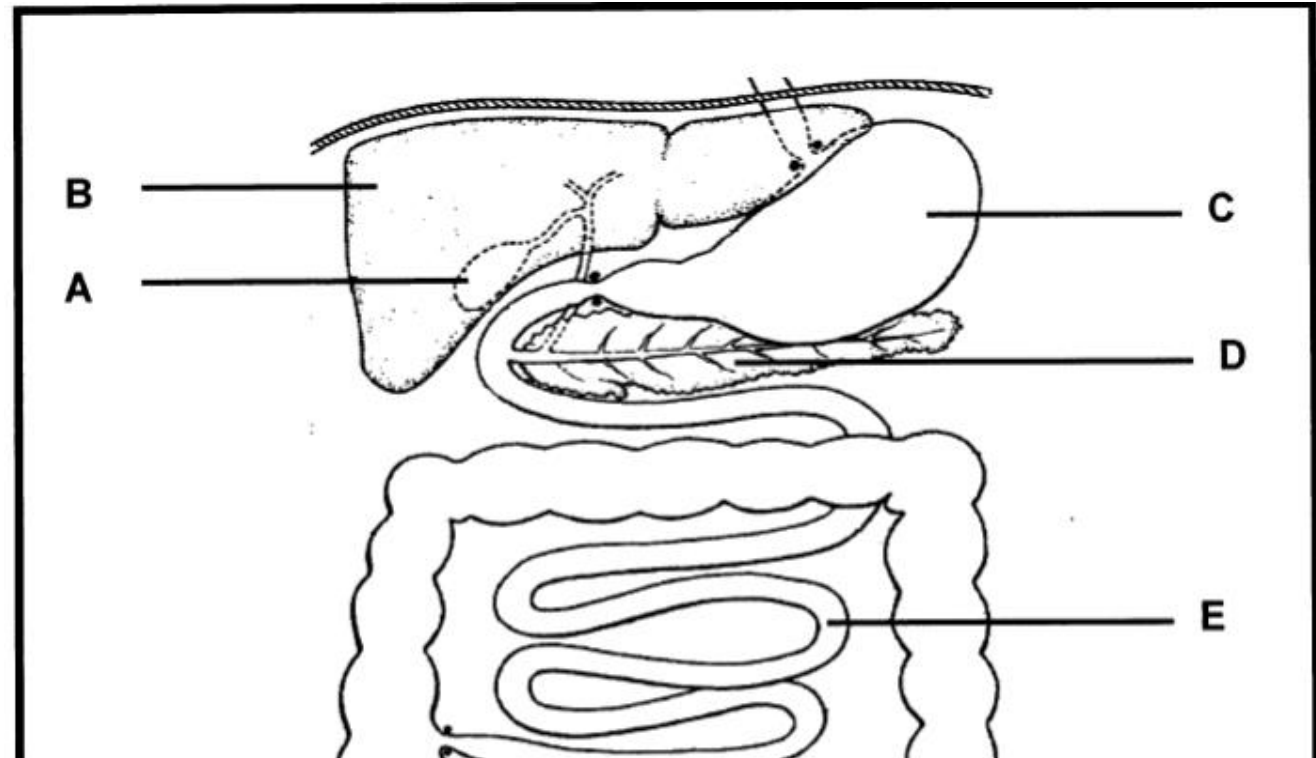
- It has a **single layer of columnar epithelium**✓ - for efficient diffusion✓
- It has a **rich supply of capillaries**✓ – for efficient absorption of glucose, amino acids, vitamins, mineral salts and water✓
- It has **lacteal** ✓ – for the absorption of fats✓
- It has **numerous mitochondria**✓ – **which provide energy for active transport**✓
- It has **microvilli**✓ – **for maximum absorption of nutrients**✓
- It contains **goblet cell**✓ – **which secretes mucus which is the medium in which nutrients dissolve**✓

Study the diagram below

4. Name TWO ways in which the fluid mentioned in QUESTION 1.3 aids in digestion. (2)

Emulsifies fat✓
Neutralises the acidic chyme from the stomach✓

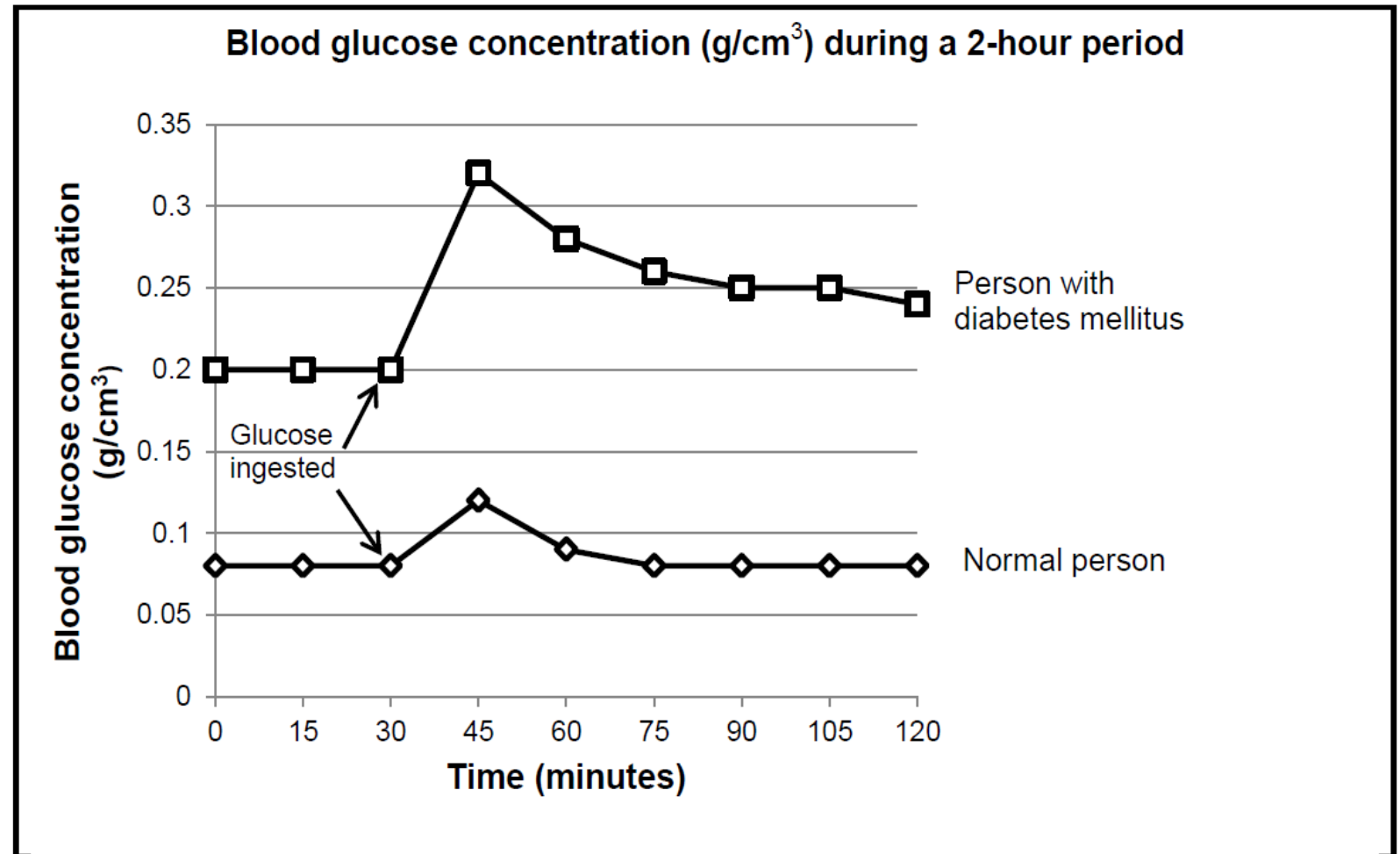
5. Explain THREE structural adaptations of E for digestion. (6)



- Long✓ providing a larger surface area for digestion/absorption ✓
- Contains villi & micro-villi✓ providing a larger surface area for digestion/absorption
- Highly coiled/folded✓ slowing the movement of food to allow for enough time✓ for digestion/absorption
- Contains glands that secrete intestinal juice ✓ containing enzymes that aid in digestion ✓/creates an alkaline medium



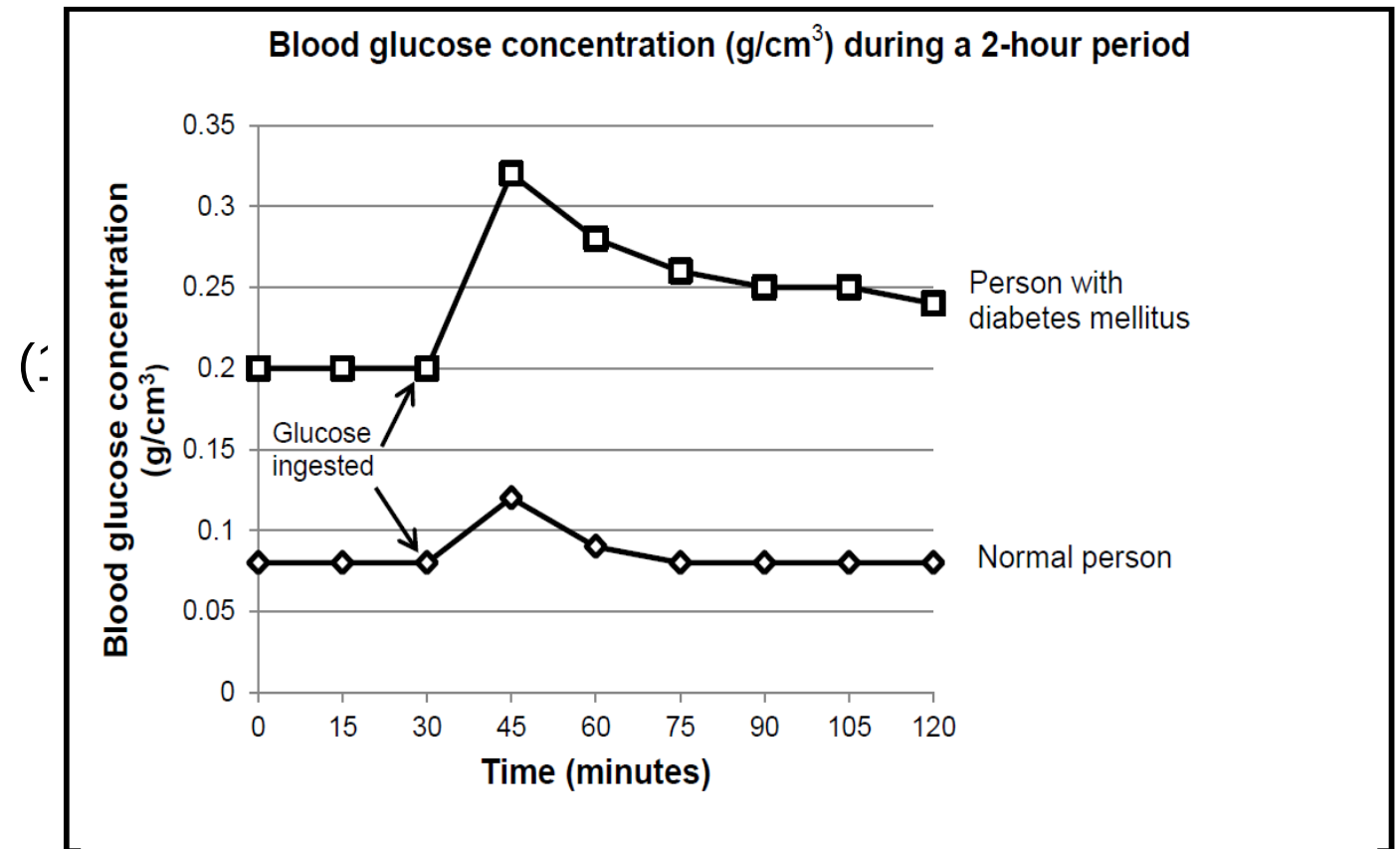
The graph below shows the blood glucose concentration in a normal person and in a person with diabetes mellitus. Both persons ingested 100 mL of glucose solution at 30 minutes.



1. What is the blood glucose concentration (g/cm^3) of the person with diabetes mellitus at 90 minutes? (1)

0.25 g/cm^3 ✓

2. How many minutes after the ingestion of glucose did the glucose concentration reach its highest level in the normal person?



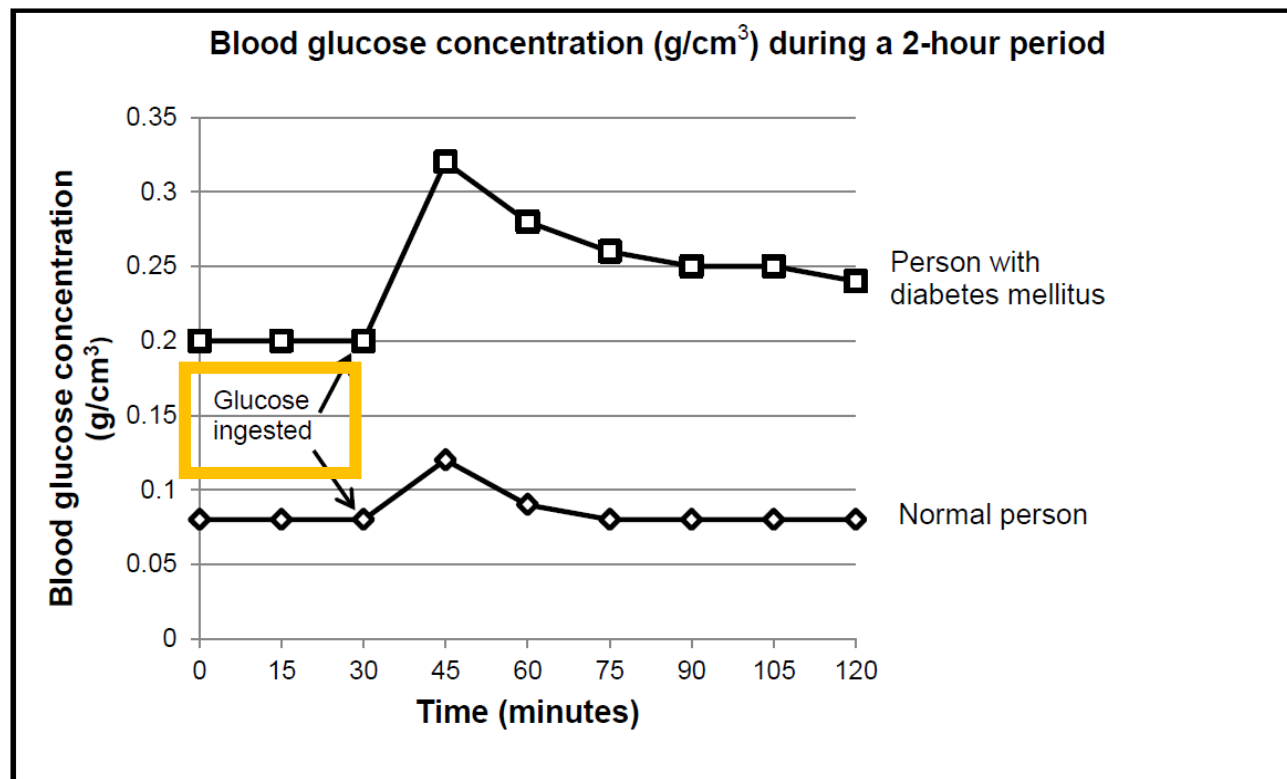


3. What is the blood glucose concentration (g/cm^3) of the person with diabetes mellitus at 90 minutes? (1)

0.25 g/cm^3 ✓

4. How many minutes after the ingestion of glucose did the glucose concentration reach its highest level in the normal person?

15 minutes✓

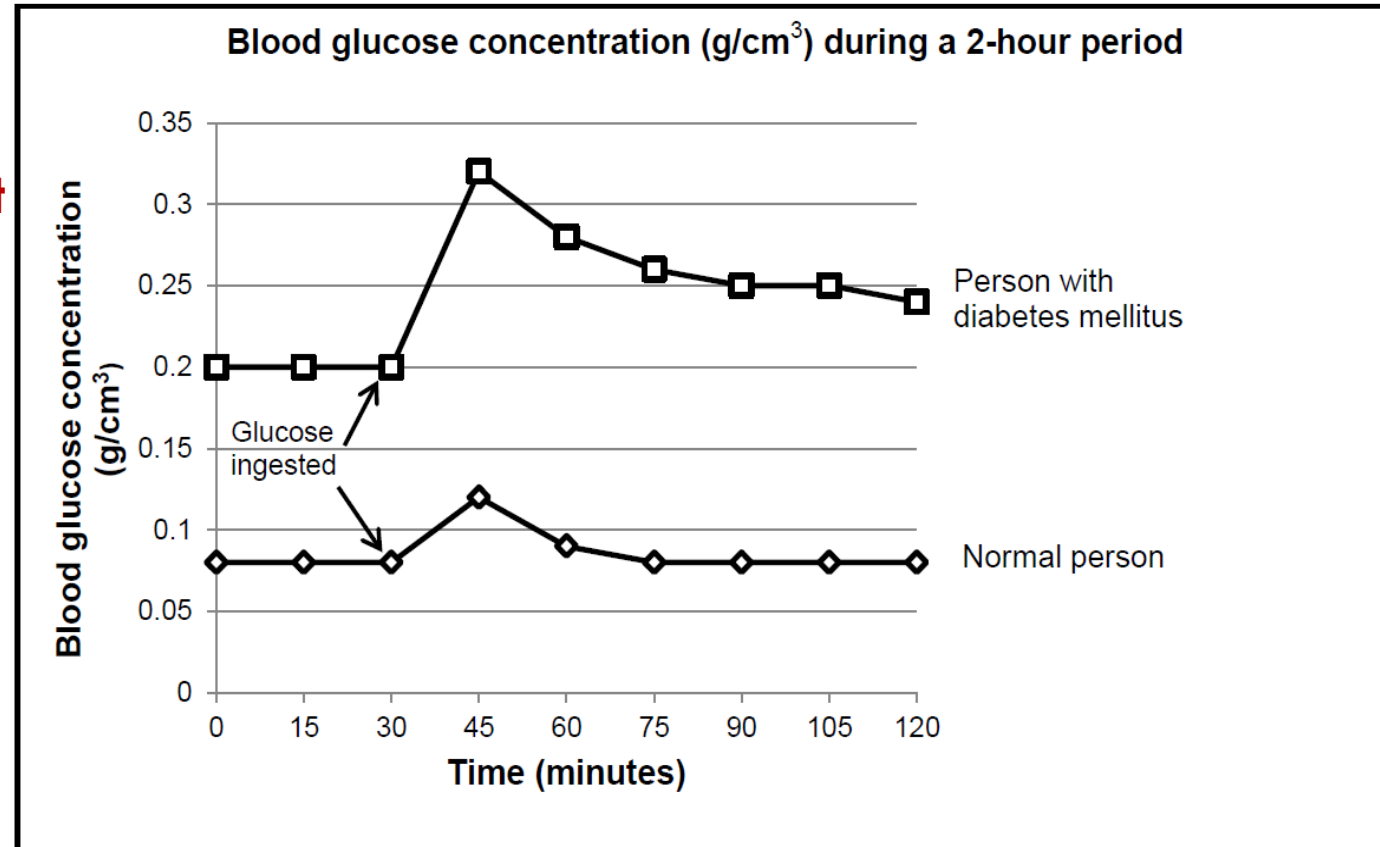




5. Describe TWO differences in the pattern of the blood glucose concentration for the person with diabetes mellitus and a normal person.

(4)

- Blood glucose level of a person with diabetes mellitus is higher✓ than that of a normal person at all times✓
- There is a greater increase in the blood glucose level of a person with diabetes mellitus after ingestion of glucose✓ compared to the normal person✓
- It takes longer for the blood glucose level to stabilise for the person with diabetes mellitus✓ compared to a normal person✓ (any 2x2)



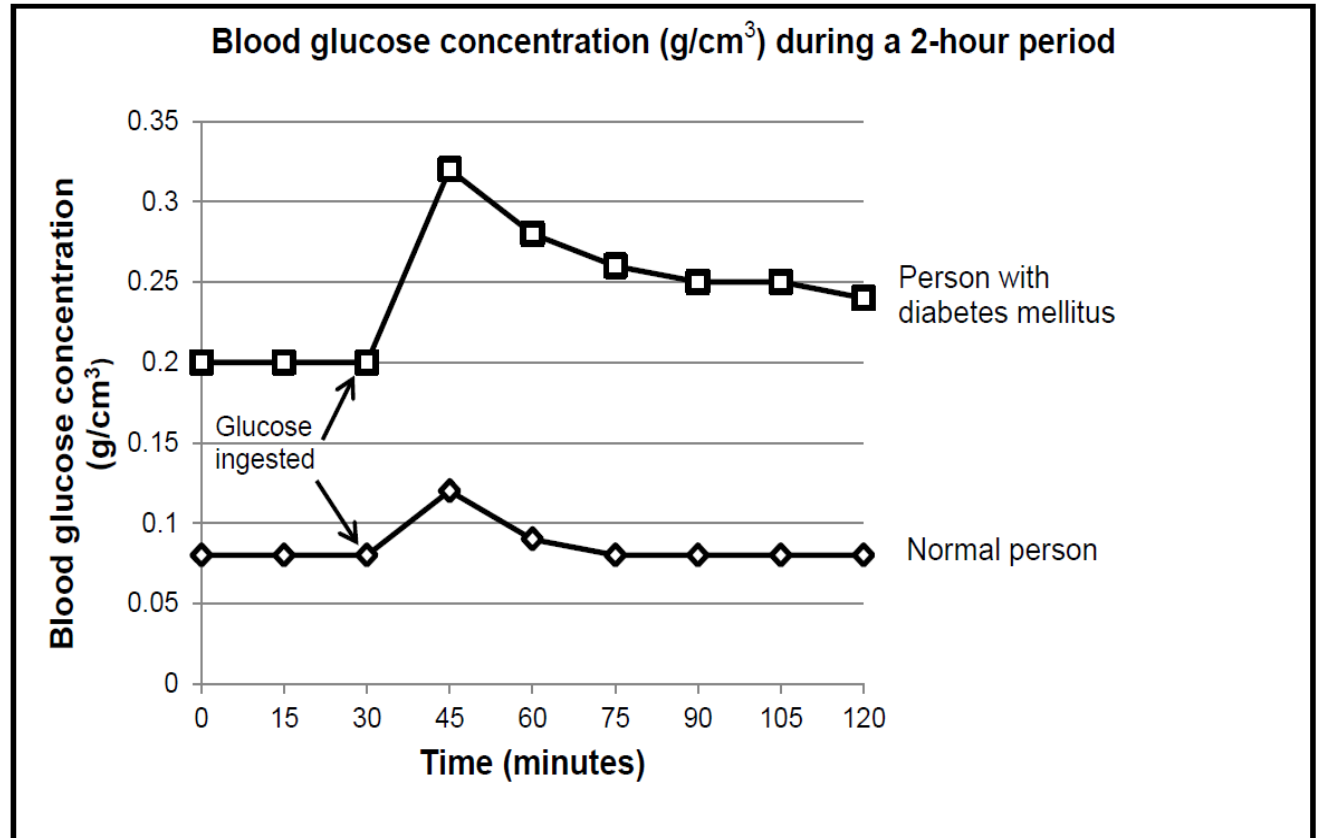
6. Explain the reason for the differences mentioned in QUESTION 3.3.

(2)

- Because the person with diabetes mellitus does not produce insulin✓ /is insulin resistant
- therefore blood glucose is not converted to glycogen✓

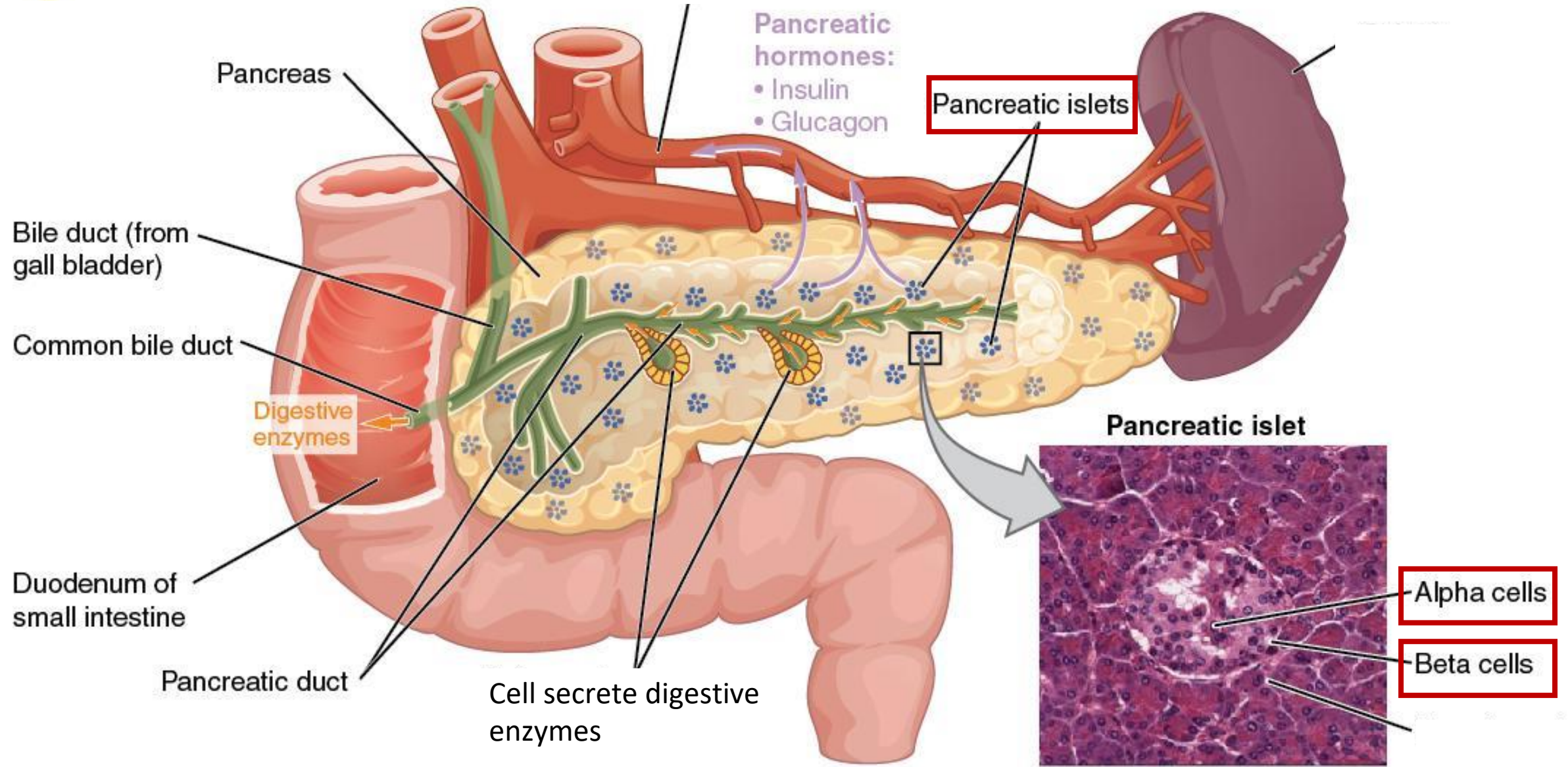
7. Name ONE hormone that has the opposite effect to that of insulin.

Glucagon✓



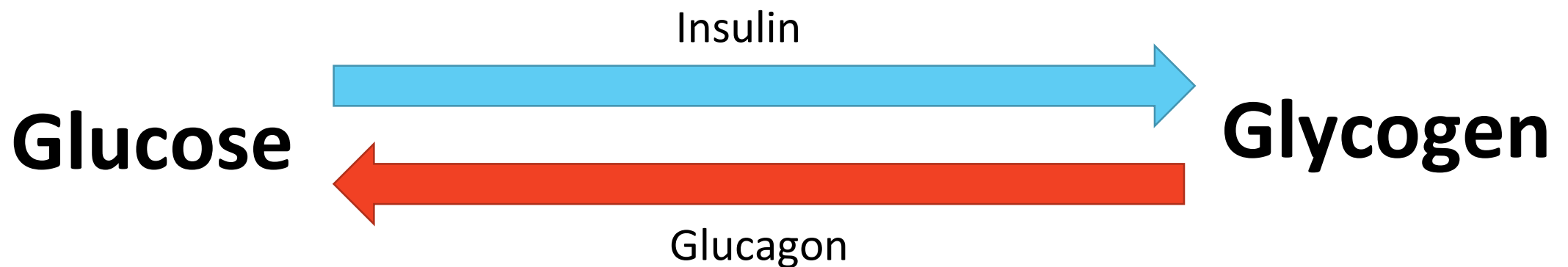
- **Homeostatic control** of blood sugar is controlled by die **endocrine pancreas**
- **Homeostasis** is the maintenance of a constant internal environment

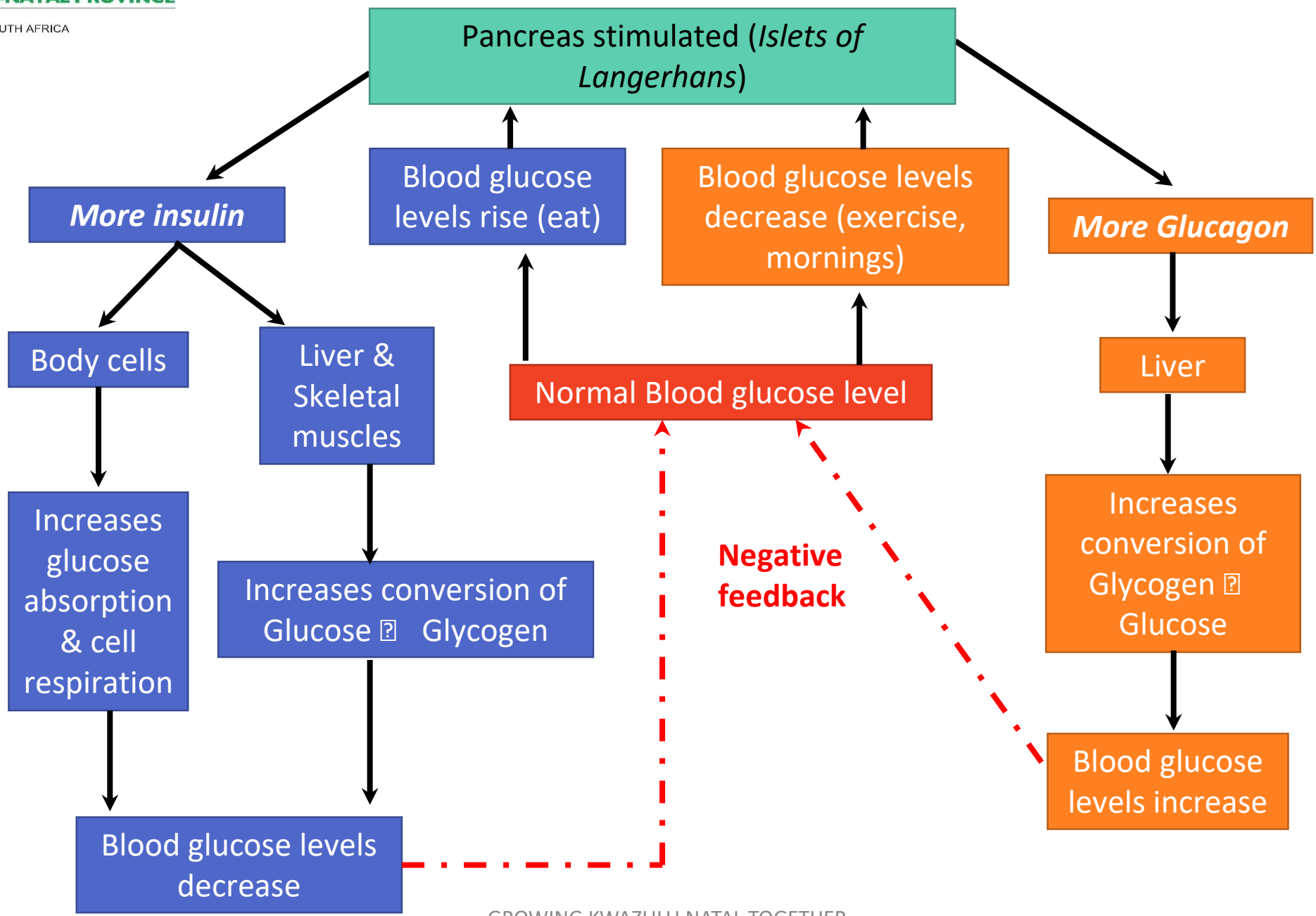




- **The Islets of Langerhans can release two different hormones depending on the concentration of sugar in the blood**
- **High blood sugar levels trigger the release of Insulin**
- **Low blood sugar levels trigger the release of Glucagon**

<https://youtu.be/BJDY0AXjroo>







Study the diagram below and answer the questions that follow.

1. Identify this structure and state where it can be located in the human body. (2)

Villi✓ found in the small intestine✓

2. Identify the parts marked **A** to **D**. (4)

A – Columnar epithelial cell✓

B – Capillary network✓

C – Lacteal ✓

D – Lymph vessel

3. Glucose is absorbed by part B where it is transported to the liver.

- (a) What will happen to excess glucose in the liver?

It will be stored as glycogen✓

- (b) Name the hormone that is involved in the function in **QUESTION 4.3 (b)**. (1)

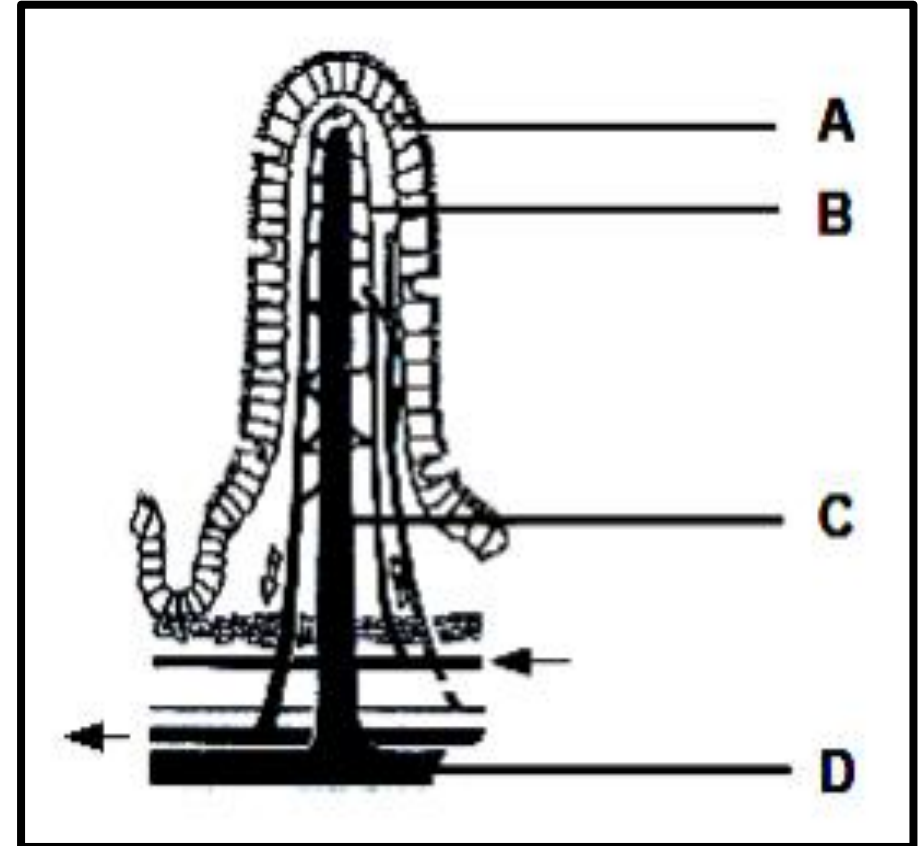
Insulin✓

4. Name **ONE** substance that is transported in **D**. (1)

Fats / fatty acids✓

(1)

(1)



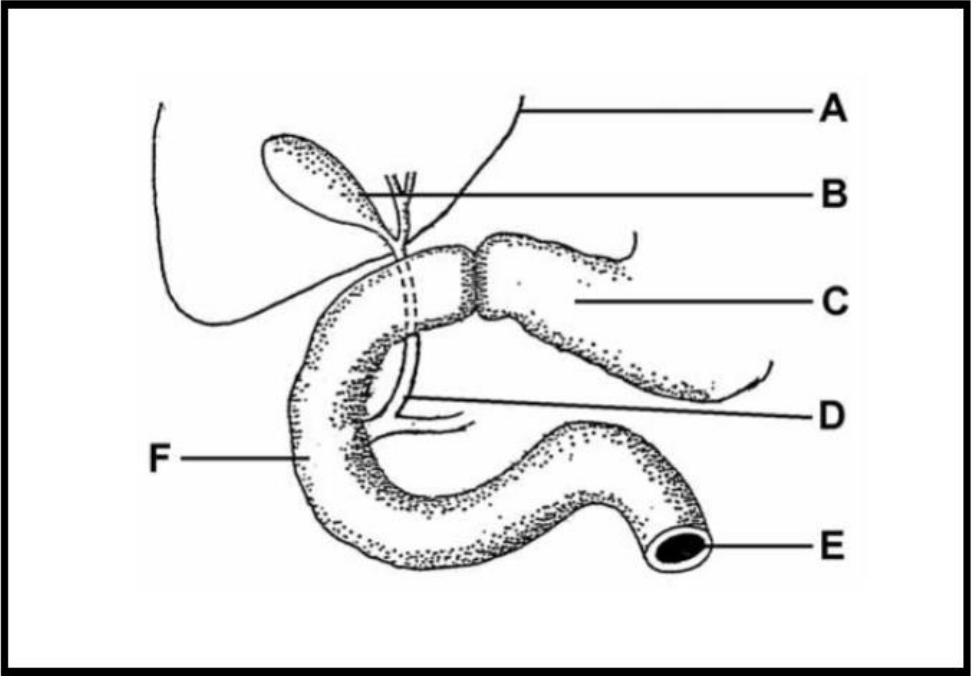


Two patients of similar age and mass were confined to their beds. They ate the same amounts of the following food types at the same time.

Carbohydrates	200 g
Proteins	50 g
Fats	20 g

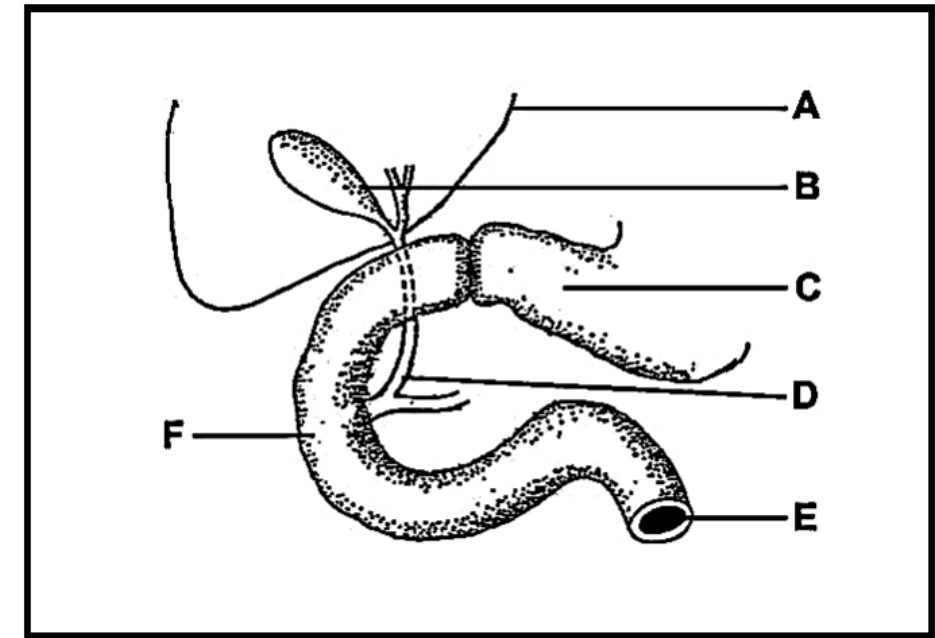
Part D of one patient was blocked, while 4,5 metres of part E of the other patient was removed surgically. The content of each of their colons was analysed after some time and the results are shown in the following table.

Substances	Content of colon	
	Patient X	Patient Y
Carbohydrates	125,0 g	120,0 g
Proteins	12,5 g	6,0 g
Fats	12,0 g	19,0 g
Intestinal gas	10,0 ml	28,0 ml



(a) Which patient had 4,5 metres of part E removed? Explain your choice. (4)

- Patient X✓*
- very little digestion and absorption has occurred✓
- because the small intestine was too short / shortened
- There is less surface area✓
- less time✓ for adequate digestion and absorption of nutrients



(b) Which patient had a blockage in part D? Explain your choice. (4)

- Patient Y✓*
- very little digestion and absorption of fat✓ occurred
- because bile duct was blocked
- Bile could not reach the small intestine✓
- no emulsification✓ occurred

Carbohydrates	200 g
Proteins	50 g
Fats	20 g

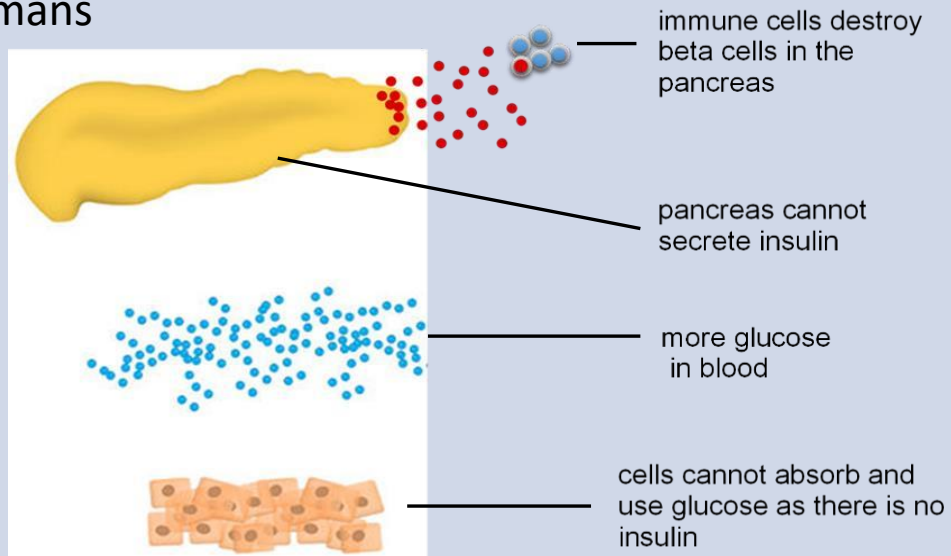
Substances	Content of colon	
	Patient X	Patient Y
Carbohydrates	125,0 g	120,0 g
Proteins	12,5 g	6,0 g
Fats	12,0 g	19,0 g
Intestinal gas	10,0 ml	28,0 ml

Diabetes mellitus

- Diabetes mellitus is a disease associated with high blood glucose levels.

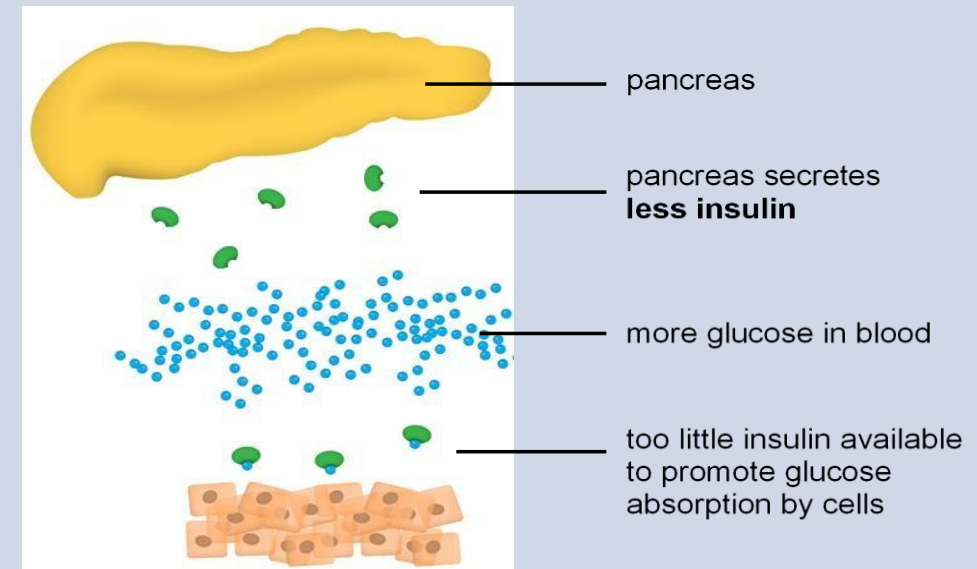
Type 1 Diabetic

When the pancreas is **not producing** the hormone, **insulin**, necessary for controlling the glucose levels in humans



Type 2 Diabetic

When there is insufficient insulin produced by the pancreas or does not work properly.



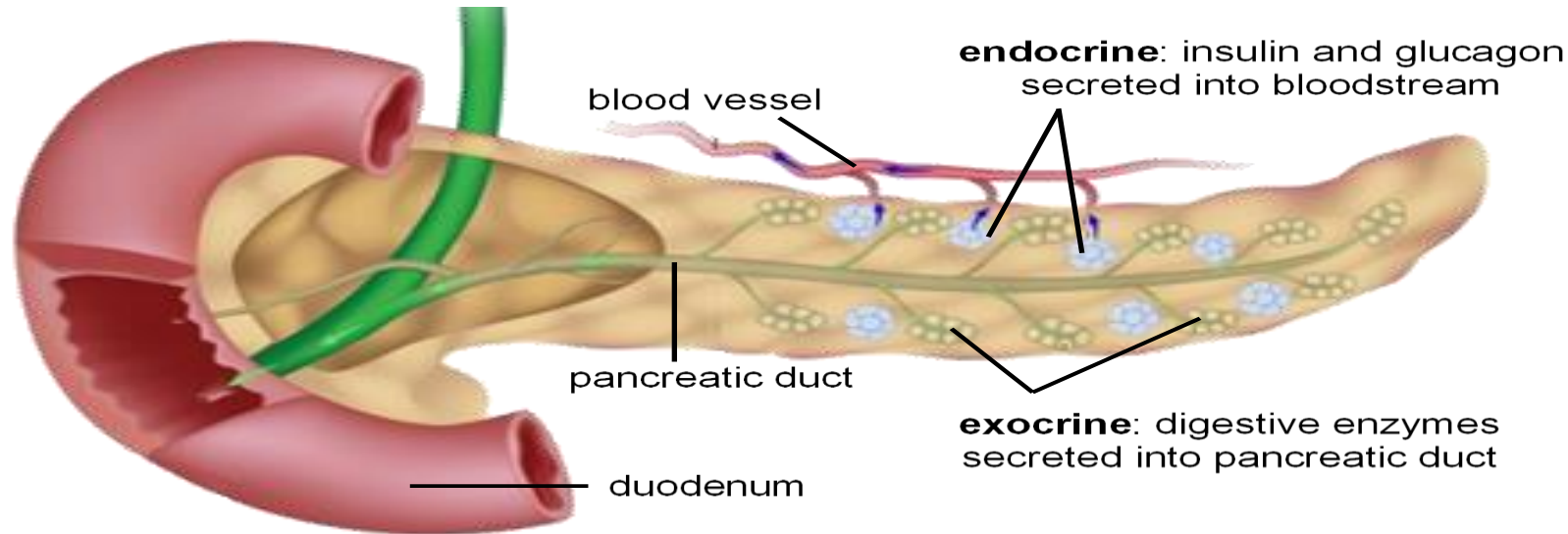


Example 2: Insulin and Glucagon

A – HIGH BLOOD GLUCOSE	B – LOW BLOOD GLUCOSE
• When the blood glucose level is higher than normal. • the Islets of Langerhans in the pancreas secrete insulin into the bloodstream. • Insulin reduces blood glucose level by: - Stimulating the conversion of excess glucose into glycogen. - Glycogen is stored in the liver and muscles - Increasing the absorption of glucose cells of the liver and muscles. - Glucose levels in the blood return to normal.	• When the glucose level is lower than normal • Islets of Langerhans in the pancreas secrete Glucagon into the blood-stream. • Glucagon increases the blood glucose level by: - Stimulating the conversion of glycogen to glucose. - Glucose is released into the bloodstream. - Glucose levels are increased to normal levels.

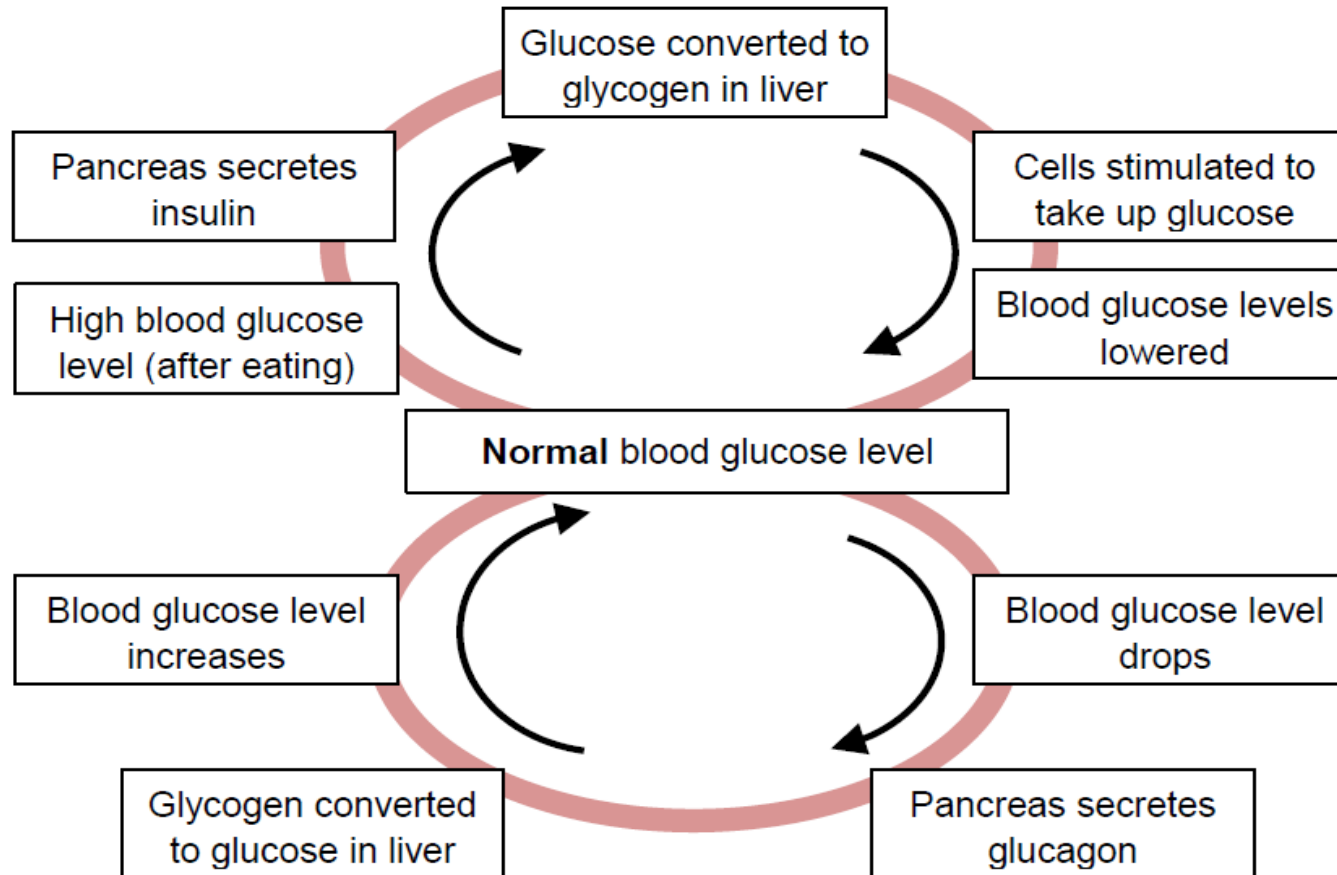
Pancreas

- **Note:** The pancreas is both an endocrine and an exocrine gland. As an exocrine gland it secretes digestive enzymes into the small intestine. As an endocrine gland it secretes insulin and glucagon into the bloodstream.





Insulin and Glucagon



THANK YOU

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