

Week 8

IGCSE Biology

Homework bundle for this week

本周作业合集

exercises.lol

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7. Human nutrition

Starter Quiz · 课前小测

IGCSE Biology

Name: _____ Score: _____

- Which nutrient is mainly needed for growth and repair?
 - ☐ protein
 - ☐ carbohydrate
 - ☐ fat
 - ☐ water
- Food is moved along the gut by waves of muscle contraction called:
 - ☐ peristalsis
 - ☐ digestion
 - ☐ absorption
 - ☐ diffusion
- Which teeth are used for cutting?
 - ☐ incisors
 - ☐ molars
 - ☐ premolars
 - ☐ canines
- Amylase digests:
 - ☐ starch into sugars
 - ☐ protein into amino acids
 - ☐ fat into fatty acids
 - ☐ sugar into starch
- Most absorption of digested food happens in the:
 - ☐ small intestine
 - ☐ stomach
 - ☐ mouth
 - ☐ large intestine
- Which nutrients are major energy sources? (Select all that apply.)
 - ☐ carbohydrates
 - ☐ fats

- ☐ vitamins
- ☐ minerals

Tick every correct option.

7. Egestion is the removal of undigested food (faeces).

- ☐ True ☐ False

8. Bile neutralises stomach acid so enzymes in the small intestine work at their optimum pH.

- ☐ True ☐ False

9. Which adaptations of a villus speed up absorption? (Select all that apply.)

- ☐ a thin (one-cell) wall
- ☐ a rich blood supply
- ☐ a large surface area
- ☐ a thick, waxy coating

Tick every correct option.

10. The organ that produces bile is the _____.

7. Human nutrition

Answers · 答案

IGCSE Biology

1. **protein**

Protein builds and repairs tissues.

2. **peristalsis**

Peristalsis squeezes food along the gut.

3. **incisors**

Incisors cut; canines tear; molars and premolars grind.

4. **starch into sugars**

Amylase is a carbohydrase acting on starch.

5. **small intestine**

The small intestine, lined with villi, absorbs digested food.

6. **carbohydrates; fats**

Carbohydrates and fats provide energy; vitamins and minerals do not.

7. **True**

Egestion removes the waste food that was never absorbed.

8. **True**

The small intestine is alkaline; bile raises the pH.

9. **a thin (one-cell) wall; a rich blood supply; a large surface area**

A thick coating would slow absorption; the others speed it up.

10. **liver**

The liver makes bile; the gall bladder stores it.

7.1 Diet

Name: _____ Class: _____ Date: _____ Total: 7 marks

KEY WORDS diet 饮食 • vitamin 维生素 • iron 铁 • calcium 钙 • balanced diet 均衡饮食

Objective

Build the skills to answer exam questions on **diet** 饮食 — a **balanced diet** 均衡饮食, food sources and uses, and deficiency diseases.

You must be able to:

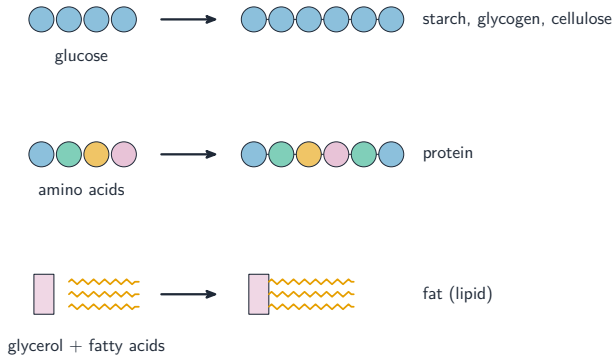
- name the parts of a balanced diet, with a source and a use
- give the role of calcium, iron, fibre and water
- link vitamin C/D deficiency to scurvy/rickets

1 Worked examples

■ A balanced diet



A balanced diet supplies all the substances you need, in the right amounts



A balanced diet supplies carbohydrates, proteins and fats

- **carbohydrates:** energy; **proteins:** growth and repair; **fats:** energy store.
- **calcium:** bones/teeth; **iron:** red blood cells; **fibre:** keeps food moving.
- vit C deficiency → **scurvy**; vit D deficiency → **rickets**.

2 Practice

2.1 State the main use of carbohydrates in the diet. [1]

2.2 State why iron is needed in the diet. [1]

3 Exam-style questions

3.1 A lack of vitamin D causes: [1]

- A scurvy
- B rickets
- C anaemia
- D obesity

3.2 Proteins and fats are both parts of a balanced diet.

(a) State the use of protein in the body.

[1]

(b) State the role of fibre (roughage).

[1]

3.3 Explain why a person who eats too little vitamin C may develop scurvy.

[2]

Solutions

2.1 the main source of energy.

2.2 to make red blood cells (haemoglobin) that carry oxygen.

3.1 B. Lack of vitamin D causes rickets.

3.2 (a) growth and repair of cells.

(b) it keeps food moving through the gut.

3.3 vitamin C is needed to keep skin and gums healthy; without it the gums bleed and wounds heal slowly (scurvy).

9 The table shows the recommended daily allowance (RDA) of some nutrients for young children.

The table also shows the masses of these nutrients eaten by a child in one day.

	mass of vitamin C /mg	mass of vitamin D /µg	mass of iron /mg	mass of calcium /mg
RDA	50	10	11	260
mass eaten in one day	54	5	11	150

Which conditions will the child be at risk of developing if they consume the same diet for a long period of time?

- 1 anaemia (**not** having enough red blood cells)
- 2 rickets
- 3 scurvy

A 1, 2 and 3 B 1 and 2 only C 1 and 3 only D 2 only

10 Which term is used for the uptake and use of nutrients by cells?

- A absorption
B assimilation
C egestion
D ingestion

11 What is the function of trypsin in digestion?

- A It catalyses the breakdown of maltose in the mouth.
B It catalyses the breakdown of maltose in the small intestine.
C It catalyses the breakdown of protein in the small intestine.
D It catalyses the breakdown of protein in the stomach.

10 A person has swollen, bleeding gums and slow wound healing.

This could be caused by a lack of which nutrient in a diet?

- A calcium
B fibre
C iron
D vitamin C

12 A student is told that their diet is **not** balanced and they may be at risk of developing scurvy.

What should the student do to reduce their risk of scurvy?

- A The student should drink more milk which will provide more calcium.
B The student should drink more milk which will provide more vitamin C.
C The student should eat more citrus fruits which will provide more calcium.
D The student should eat more citrus fruits which will provide more vitamin C.

7.2 Digestive system

Name: _____ Class: _____ Date: _____

Total: 20 marks

KEY WORDS small intestine 小肠 • digestion 消化 • alimentary canal 消化道
• digestive system 消化系统 • gall bladder 胆囊

Objective

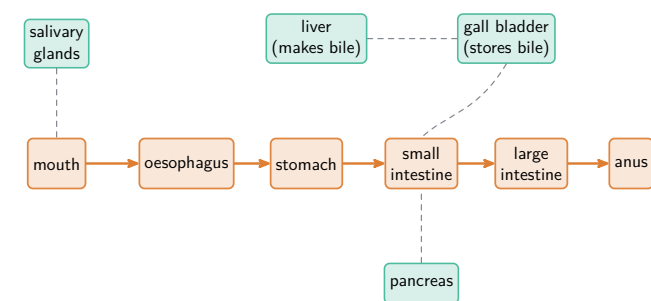
Build the skills to answer exam questions on the **digestive system** 消化系统 — the **alimentary canal** 消化道, the helper organs, and the five processes.

You must be able to:

- name the parts of the alimentary canal in order
- name the organs that add digestive juices
- define ingestion, digestion, absorption, assimilation and egestion

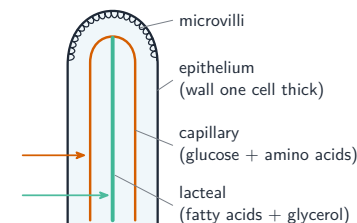
1 Worked examples

■ The alimentary canal



→ food's path - - juices added

Food passes: mouth → oesophagus → stomach → small intestine → large intestine → anus



a villus (huge surface area for absorption)

Digested food is absorbed at the villi

- **helper organs** (food doesn't pass through): salivary glands, pancreas, liver, gall bladder.
- **processes:** ingestion → digestion → absorption → assimilation → egestion.

2 Practice

2.1 Name the parts of the alimentary canal that food passes through, in order. [3]

2.2 Define egestion. [1]

3 Exam-style questions

3.1 Which organ adds digestive juice but food does **not** pass through it? [1]

- A stomach
- B small intestine
- C pancreas
- D oesophagus

3.2 Food is taken in and later leaves the body.

(a) Name the process of taking food into the body. [1]

(b) Explain the difference between egestion and excretion. [2]

3.3 Food passes along the alimentary canal: mouth → oesophagus → stomach → small intestine → large intestine → rectum → anus. The liver and pancreas are helper organs.

(a) Name the five processes of the digestive system and state briefly what each means.[5]

(b) State where in the canal each of these mainly happens: chemical digestion; absorption of digested food; absorption of water. [3]

(c) The liver and the pancreas are not part of the canal. State what each adds to it, and where. [2]

(d) Explain how peristalsis moves food along the canal. [2]

Solutions

2.1 mouth → oesophagus → stomach → small intestine → large intestine → anus.

2.2 undigested food leaving the body as faeces.

3.1 C. The pancreas adds juice; food does not pass through it.

3.2 (a) ingestion.

(b) egestion removes undigested food (faeces), which was never absorbed; excretion removes the waste products of metabolism made inside cells.

3.3 (a) **Ingestion** — taking food into the body through the mouth. **Digestion** — breaking large insoluble molecules into small soluble ones. **Absorption** — the small molecules passing through the gut wall into the blood. **Assimilation** — the absorbed molecules being taken into cells and used. **Egestion** — undigested food leaving the body through the anus.

(b) Chemical digestion — mainly the **small intestine**; absorption of digested food — the **small intestine**, at the villi; absorption of water — the **large intestine**.

(c) The liver makes **bile**, which is stored in the gall bladder and released into the small intestine; the pancreas makes **pancreatic juice** containing digestive enzymes, released into the small intestine.

(d) The circular and longitudinal muscles in the gut wall contract and relax in turn; a wave of contraction squeezes behind the food and pushes it forward along the canal.

1 (a) Describe what is meant by the term physical digestion.

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..... [2]

(b) Fig. 1.1 is a diagram of the human digestive system.

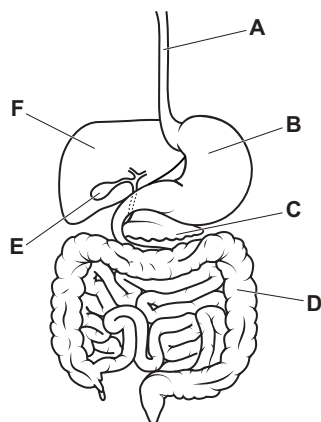


Fig. 1.1

State the letter from Fig. 1.1 that shows one part where:

physical digestion occurs

glucagon is produced

bile is produced.

[3]

(c) Explain the role of bile in physical digestion.

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..... [3]

(d) Physical digestion also occurs in the mouth.

State the names **and** functions of **two** types of human teeth.

1

.....

2

..... [2]

This electron micrograph shows a longitudinal section of a plant stem. A rectangular box labeled 'X' highlights a specific cell wall structure, and a line labeled 'Y' points to the central vascular bundle.

Fig. 1.2

[4]

⑬

A line drawing of the human digestive system. The diagram shows the mouth, pharynx, esophagus, stomach, liver, gallbladder, pancreas, small intestine, large intestine, and rectum. Labels A through M point to various parts: A points to the mouth, B to the esophagus, C to the stomach, D to the liver, E to the small intestine, F to the large intestine, G to the rectum, H to the cecum, I to the appendix, J to the gallbladder, K to the pancreas, L to the duodenum, and M to the pharynx.

Fig. 1.1

Complete Table 1.1, using Fig. 1.1.

Table 1.1

name of the structure	function	letter in Fig. 1.1
		G
	produces amylase	
gall bladder		
	transports food to the stomach	

[4]

(b) (i) Describe the role of chemical digestion.

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..... [3]

(ii) Maltose is digested by maltase.

State the name of the product of this reaction.

..... [1]

(iii) Describe where maltose is digested in the small intestine.

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..... [1]

(iv) Explain why amylase digests starch in the small intestine but does **not** digest starch in the stomach.

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[Total: 15]

7.3 Physical digestion

Name: _____ Class: _____ Date: _____

Total: 19 marks

KEY WORDS teeth 牙齿 • physical digestion 物理消化 • bile 胆汁 • surface area 表面积
• molars 白齿

Objective

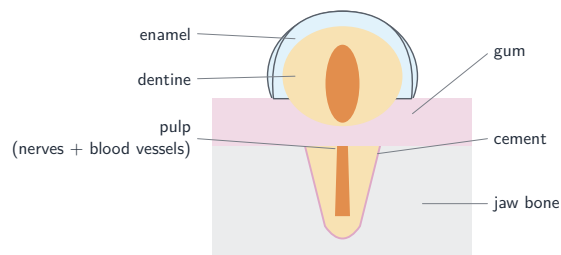
Build the skills to answer exam questions on **physical digestion** 物理消化 — the **teeth** 牙齿, the **stomach**, and **bile** 胆汁.

You must be able to:

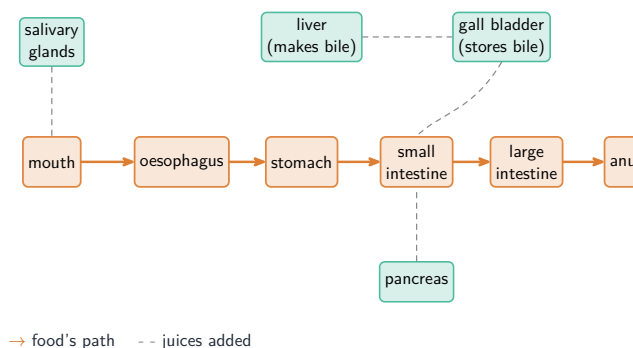
- name the four types of tooth and their jobs
- describe physical digestion (smaller pieces, larger surface area)
- explain how bile emulsifies fats

1 Worked examples

■ Teeth and bile



Physical digestion breaks food into smaller pieces — a larger surface area for enzymes



Teeth begin mechanical digestion in the gut

- **teeth:** incisors (bite), canines (tear), premolars/molars (chew/grind).
- **bile** (from liver, stored in gall bladder) emulsifies fats → larger surface area for lipase. Bile has no enzymes.

2 Practice

2.1 Name the type of tooth used for biting and cutting. [1]

2.2 State why physical digestion is useful for later (enzyme) digestion. [1]

3 Exam-style questions

3.1 Bile emulsifies fats, which means it: [1]

- **A** digests fat into fatty acids
- **B** breaks large fat drops into small droplets
- **C** neutralises acid
- **D** absorbs fat

3.2 Bile is made in the liver.

(a) State where bile is stored. [1]

(b) Explain why emulsifying fat speeds up its digestion. [2]

3.3 State the job of the molars and premolars. [1]

3.4 Physical digestion happens in the mouth, the stomach and the small intestine.

(a) Name the four types of tooth and state the job of each. [4]

(b) Explain what physical digestion is, and why it is needed before chemical digestion can work well. [3]

(c) Bile is made in the liver and stored in the gall bladder. Describe its **two** jobs in the small intestine. [3]

(d) The stomach churns food, and stomach acid helps break down protein. Explain which of these is physical digestion and which is not. [2]

Solutions

2.1 incisors.

2.2 it makes the pieces smaller, giving a larger surface area for enzymes to act on.

3.1 B. Emulsifying breaks large fat drops into many small droplets.

3.2 (a) the gall bladder.

(b) small droplets give a much larger surface area; so lipase can digest the fat faster.

3.3 chewing and grinding food.

3.4 (a) **Incisors** — chisel-shaped, for biting and cutting. **Canines** — pointed, for tearing. **Premolars** — for grinding and chewing. **Molars** — broad and ridged, for grinding food to a paste.

(b) Physical digestion breaks food into smaller **pieces** without changing the molecules themselves; it greatly increases the surface area of the food; enzymes can then act on far more of it at once, so chemical digestion is much faster.

(c) Bile is alkaline, so it **neutralises** the acid arriving from the stomach and gives the intestinal enzymes the pH they work best at. It also **emulsifies** fat — breaking large drops into many tiny ones, which raises the surface area for lipase to act on.

(d) The churning is physical digestion — it breaks the food into smaller pieces but the molecules are unchanged. The acid helping break down protein is **chemical** digestion, because the protein molecules themselves are broken into smaller ones.

1 (a) Describe what is meant by the term physical digestion.

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..... [2]

(b) Fig. 1.1 is a diagram of the human digestive system.

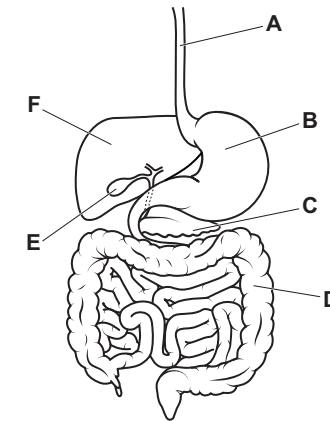


Fig. 1.1

State the letter from Fig. 1.1 that shows one part where:

physical digestion occurs

glucagon is produced

bile is produced.

[3]

(c) Explain the role of bile in physical digestion.

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[3]

(d) Physical digestion also occurs in the mouth.

State the names **and** functions of **two** types of human teeth.

1

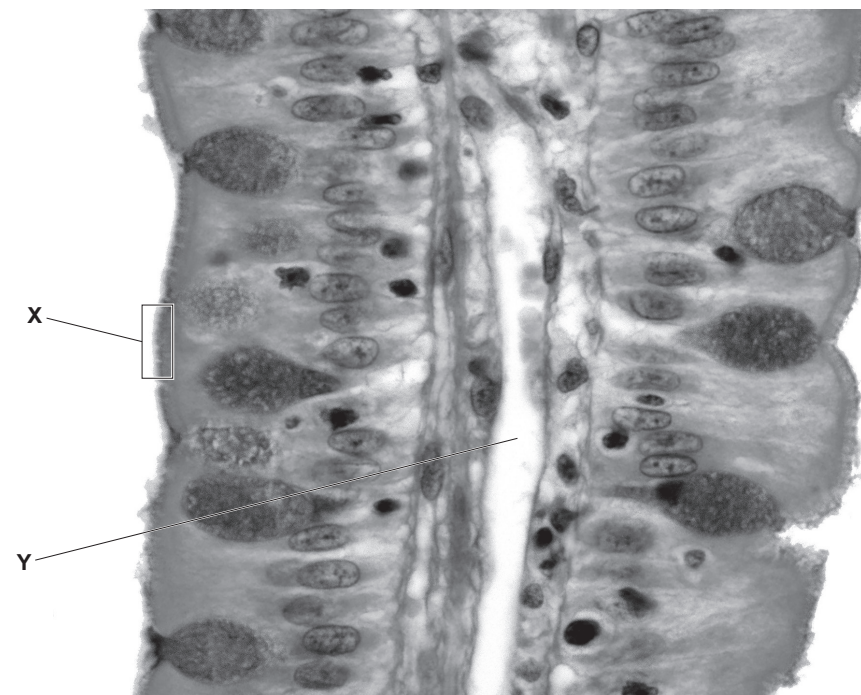
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2

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[2]

(e) Fig. 1.2 is a photomicrograph of part of one villus in the small intestine.



magnification $\times 800$

Fig. 1.2

Identify **and** explain the roles of the parts labelled **X** and **Y** in Fig. 1.2.

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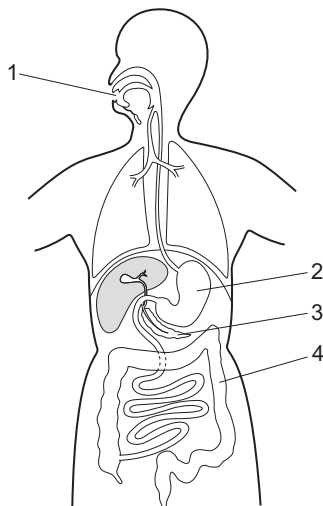
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[4]

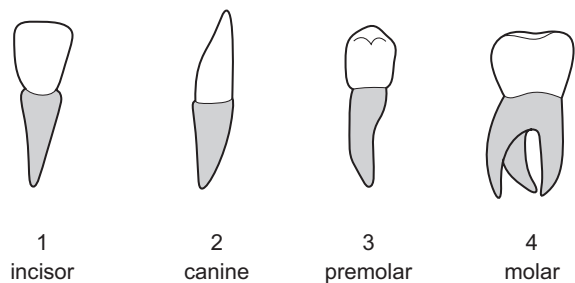
[Total: 14]

11 In which parts of the digestive system does physical digestion occur?



- A** 1, 2 and 3 **B** 1 and 2 only **C** 2 and 3 only **D** 4 only

13 The diagram shows the four types of human tooth.



Which teeth are used for grinding food?

- A** 1 and 2 **B** 1 and 4 **C** 2 and 3 **D** 3 and 4

7.4 Chemical digestion

Name: _____ Class: _____ Date: _____ **Total: 9 marks**

KEY WORDS amylase 淀粉酶 • starch 淀粉 • enzymes 酶 • chemical digestion 化学消化
• fatty acids 脂肪酸

Objective

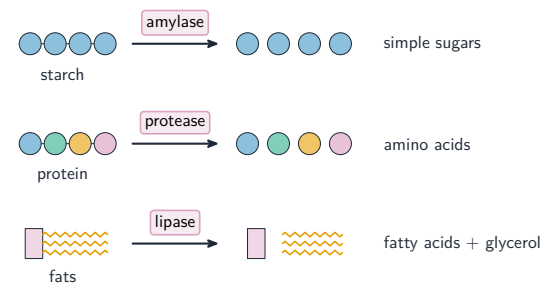
Build the skills to answer exam questions on **chemical digestion** 化学消化 — the digestive **enzymes** 酶, the role of stomach acid, and digesting starch and protein.

You must be able to:

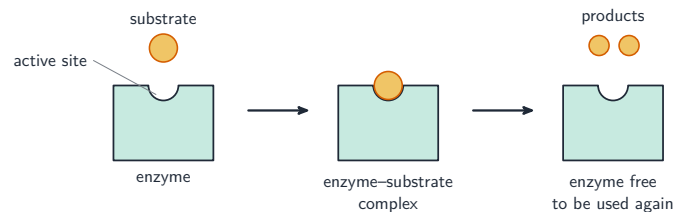
- give the substrate and products of amylase, protease and lipase
- explain the role of hydrochloric acid in the stomach
- describe the two-step digestion of starch and the two proteases

1 Worked examples

■ Digestive enzymes



Chemical digestion breaks large insoluble molecules into small soluble ones



Digestive enzymes work by a lock-and-key fit

Enzyme	Breaks down → into
amylase	starch → reducing sugars
protease	protein → amino acids
lipase	fats → fatty acids + glycerol

- stomach acid kills microorganisms and gives the best pH for stomach protease (pepsin).

2 Practice

2.1 State the products formed when lipase digests fat. [2]

2.2 Name the enzyme that digests protein. [1]

3 Exam-style questions

3.1 Amylase digests starch into: [1]

- A amino acids
- B reducing sugars
- C fatty acids
- D glycerol

3.2 The stomach produces hydrochloric acid.

(a) State two functions of this acid. [2]

(b) Name the protease that works in the acidic stomach. [1]

3.3 Explain why food molecules must be made small and soluble before they can be used. [2]

Solutions

2.1 fatty acids; glycerol.

2.2 protease.

3.1 B. Amylase digests starch into reducing sugars.

3.2 (a) it kills harmful microorganisms in the food; it gives an acidic pH suited to the stomach's protease.

(b) pepsin.

3.3 large molecules are insoluble and cannot be absorbed; small soluble molecules can pass into the blood.

Name: _____

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10 What is a role of bile?

- A It contains enzymes that digest starch.
- B It emulsifies fats, increasing their surface area.
- C It kills bacteria in food.
- D It provides the optimum pH for pepsin activity.

11 Where in the alimentary canal is the enzyme trypsin found and what are the products of the reaction trypsin catalyses?

	where trypsin is found	products
A	duodenum	amino acids
B	duodenum	fatty acids
C	ileum	proteins
D	stomach	amino acids

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7 Which function is performed in the duodenum?

- A assimilation
- B digestion
- C egestion
- D ingestion

9 Which row names a small molecule and where that molecule is absorbed in the digestive system?

	name of the small molecule	small intestine	colon
A	amino acid	X	✓
B	glucose	X	✓
C	maltose	✓	X
D	water	✓	✓

key

✓ = molecule is absorbed

X = molecule is **not** absorbed

- 11 What is an example of chemical digestion?
- A breaking down starch into reducing sugars
 - B churning of food by muscular contractions of the stomach wall
 - C grinding of food by teeth
 - D mixing of food with bile

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- 12 The table shows the substrates and end products in four enzyme-controlled chemical reactions.

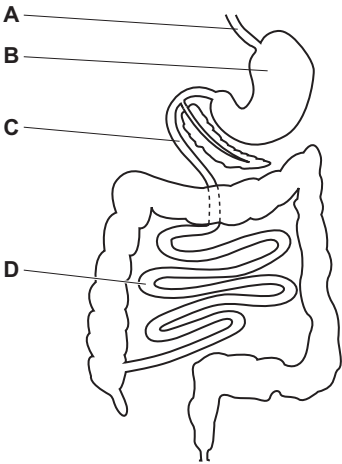
Which reaction was controlled by lipase?

	substrate	end product
A	maltose	starch
B	oil	fatty acids and glycerol
C	protein	amino acids
D	starch	maltose

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- 12 The diagram shows part of the human digestive system.

In which part does protein digestion **begin**?



- 1 (a) Fig. 1.1 is a diagram of the human digestive system.

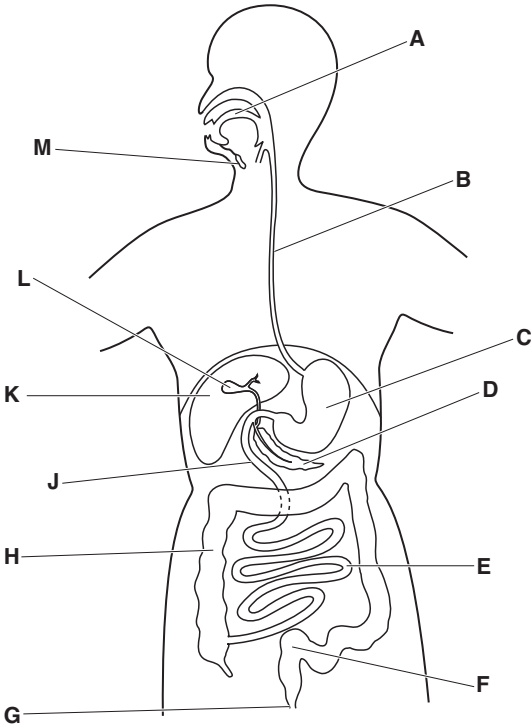


Fig. 1.1

Table 1.1 shows information about some of the structures shown in Fig. 1.1.

Complete Table 1.1, using Fig. 1.1.

Table 1.1

name of the structure	function	letter in Fig. 1.1
		G
	produces amylase	
gall bladder		
	transports food to the stomach	

(b) (i) Describe the role of chemical digestion.

[3]

(ii) Maltose is digested by maltase.

State the name of the product of this reaction.

..... [1]

(iii) Describe where maltose is digested in the small intestine.

..... [1]

(iv) Explain why amylase digests starch in the small intestine but does **not** digest starch in the stomach.

[6]

[Total: 15]

14 Which substance causes the change in pH when food enters the small intestine?

- A** amylase
B bile
C gastric juice
D trypsin

7.5 Absorption

Name: _____ Class: _____ Date: _____

Total: 8 marks

KEY WORDS villi 绒毛 • lacteal 乳糜管 • microvilli 微绒毛 • absorption 吸收
• capillaries 毛细血管

Objective

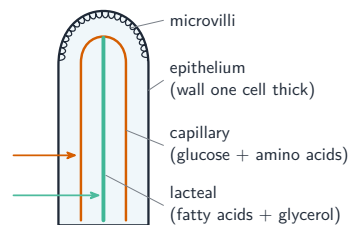
Build the skills to answer exam questions on **absorption** 吸收 — where nutrients are absorbed and how the **villi** 绒毛 are adapted.

You must be able to:

- state where digested food and water are absorbed
- describe how a villus is adapted for fast absorption
- name what the capillaries and lacteal absorb

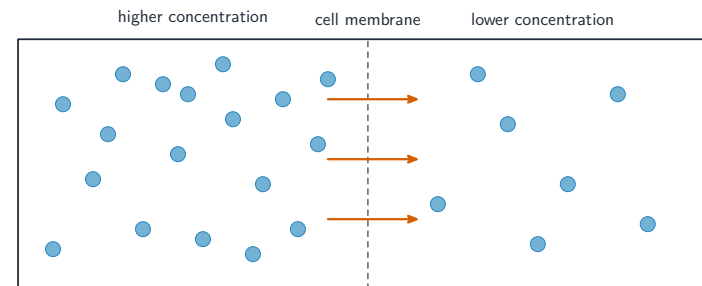
1 Worked examples

■ The villus



a villus (huge surface area for absorption)

Villi (and microvilli) give a large surface area; a thin wall gives a short distance



net movement of particles down the concentration gradient

Absorption at the villus is by diffusion and active transport

- absorbed in the **small intestine**; most water there, the rest in the colon.
- **capillaries**: take up glucose and amino acids; **lacteal**: takes up fatty acids and glycerol.

2 Practice

2.1 Name the organ where most digested food is absorbed. [1]

2.2 State what the lacteal absorbs. [1]

3 Exam-style questions

3.1 The small intestine is lined with villi mainly to: [1]

- **A** make enzymes
- **B** increase the surface area for absorption
- **C** kill microorganisms
- **D** store food

3.2 A villus has a thin wall and a good blood supply.

(a) Explain how a thin wall helps absorption. [1]

(b) Explain how the capillary network helps absorption. [2]

3.3 State two features of the small intestine that increase the surface area for absorption.[2]

Solutions

2.1 the small intestine.

2.2 fatty acids and glycerol.

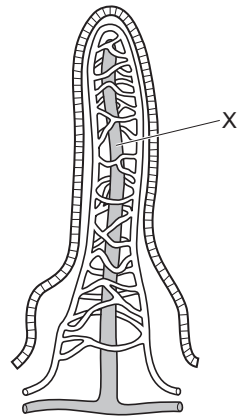
3.1 B. Villi increase the surface area for absorption.

3.2 (a) molecules have only a short distance to diffuse across.

(b) the capillaries carry away the absorbed glucose/amino acids; this keeps a steep concentration gradient for fast absorption.

3.3 the many villi; and the microvilli on each villus.

12 The diagram shows a villus.

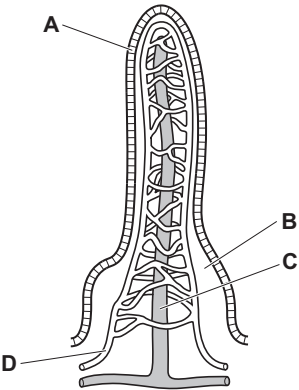


Which row shows the name and function of the part labelled X?

	name	function
A	capillary	absorption of amino acids and glucose
B	capillary	absorption of fatty acids and glycerol
C	lacteal	absorption of amino acids and glucose
D	lacteal	absorption of fatty acids and glycerol

12 The diagram shows the structure of a villus.

Which label shows a lacteal?



13 What is the function of microvilli in the small intestine?

- A** conduction of electrical impulses
- B** increasing surface area for absorption
- C** movement of food particles
- D** movement of mucus

11 Digested food molecules move into the cells of the body where they are used and become part of the cells.

What is this a definition of?

- A** absorption
- B** assimilation
- C** digestion
- D** ingestion