

Human Nutrition

IGCSE Biology ■ Topic 7

IGCSE Biology



Human Nutrition

What we will cover

- 1 A balanced diet
- 2 The digestive system
- 3 Teeth & physical digestion
- 4 Enzymes & chemical digestion
- 5 Stomach acid & bile
- 6 Absorption & villi



1 Diet

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└ Diet

A balanced diet



- too little vitamin C → **scurvy** 坏血病 (bleeding gums, slow healing).
- too little vitamin D → **rickets** 佝偻病 (soft, bent bones), because the body cannot take in enough calcium.

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└ Diet

Vitamins and deficiency

vitamin C

fruit & veg; short-age → **scurvy** 坏血病

vitamin D

helps absorb calcium; short-age → **rickets** 佝偻病

2 Digestion

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Digestion

The digestive system

salivary glands

mouth

oesophagus

stomach

small intestine

large intestine

anus

pancreas

liver (makes bile)

gall bladder (stores bile)

Food travels the **alimentary canal** 消化道: mouth → **oesophagus** 食道 → **stomach** 胃 → **small intestine** 小肠 → **large intestine** 大肠. The **liver** 肝脏, **pancreas** 胰腺 & glands add juices.

→ food's path - - juices added

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Digestion

Five processes

ingestion

digestion

absorption

assimilation

egestion

Take in → break down → into blood → used by cells → waste out. **Egestion** (faeces) is **not** excretion.

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Digestion

Teeth and physical digestion

Molar

Pie-Molar

Canine

Incisor

enamel

dentine

pulp (nerves + blood vessels)

gum

cement

jaw bone

Incisors 门齿 cut, **canines** 犬齿 tear, **premolars** 前臼齿 & **molars** 臼齿 grind. A tooth: hard **enamel** 牙釉质 over **dentine** 牙本质, a soft **pulp** 牙髓. Chewing makes more surface for enzymes.

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Digestion

Enzymes and chemical digestion

starch

amylase

simple sugars

protein

protease

amino acids

fats

lipase

fatty acids + glycerol

Enzymes break big **insoluble** 不溶性 molecules into small **soluble** 可溶性 ones:

- **amylase** 淀粉酶: starch → sugars
- **protease** 蛋白酶: protein → amino acids
- **lipase** 脂肪酶: fat → fatty acids + glycerol

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Digestion

Stomach acid and bile

stomach acid

hydrochloric acid 盐酸

kills microbes & sets a low pH for **pepsin** 胃蛋白酶

bile 胆汁

emulsifies 乳化 fat (more surface) & neutralises the acid

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Digestion

Absorption and villi

microvilli

epithelium (wall one cell thick)

capillary (glucose + amino acids)

lacteal (fatty acids + glycerol)

a villus (huge surface area for absorption)

Millions of **villi** 绒毛 line the small intestine.

- huge **surface area**; wall one cell thick
- **capillaries** 毛细血管 take glucose & amino acids
- a **lacteal** 乳糜管 takes fats

3 Recap

Worked example – matching enzyme to food

A person's pancreas makes no lipase.
Which food is affected, and what is seen?

- Lipase digests **fats**: fat → **fatty acids** + **glycerol**.
- No lipase ⇒ fat is not broken into small enough molecules to **absorb**.
- Undigested fat stays in the gut and passes out in the faeces.
- Starch and protein are unaffected – **amylase** and **protease** still work.

Three to know: **amylase** starch → maltose; **protease** protein → amino acids; **lipase** fat → fatty acids + glycerol.

Topic 7 – key takeaways

1 Diet

vitamin C → scurvy; vitamin D → rickets

2 Processes

ingest, digest, absorb, assimilate, egest

3 Enzymes

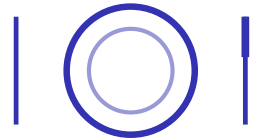
amylase, protease & lipase make it soluble

4 Villi

big surface, thin wall – fast absorption

Check yourself

- 1 Which deficiency causes scurvy?
- 2 Which process is NOT excretion: egestion or sweating?
- 3 What does lipase break fat into?
- 4 Why do villi have a thin wall?



Answers 1. too little vitamin C 2. egestion 3. fatty acids & glycerol 4. a short distance for fast absorption