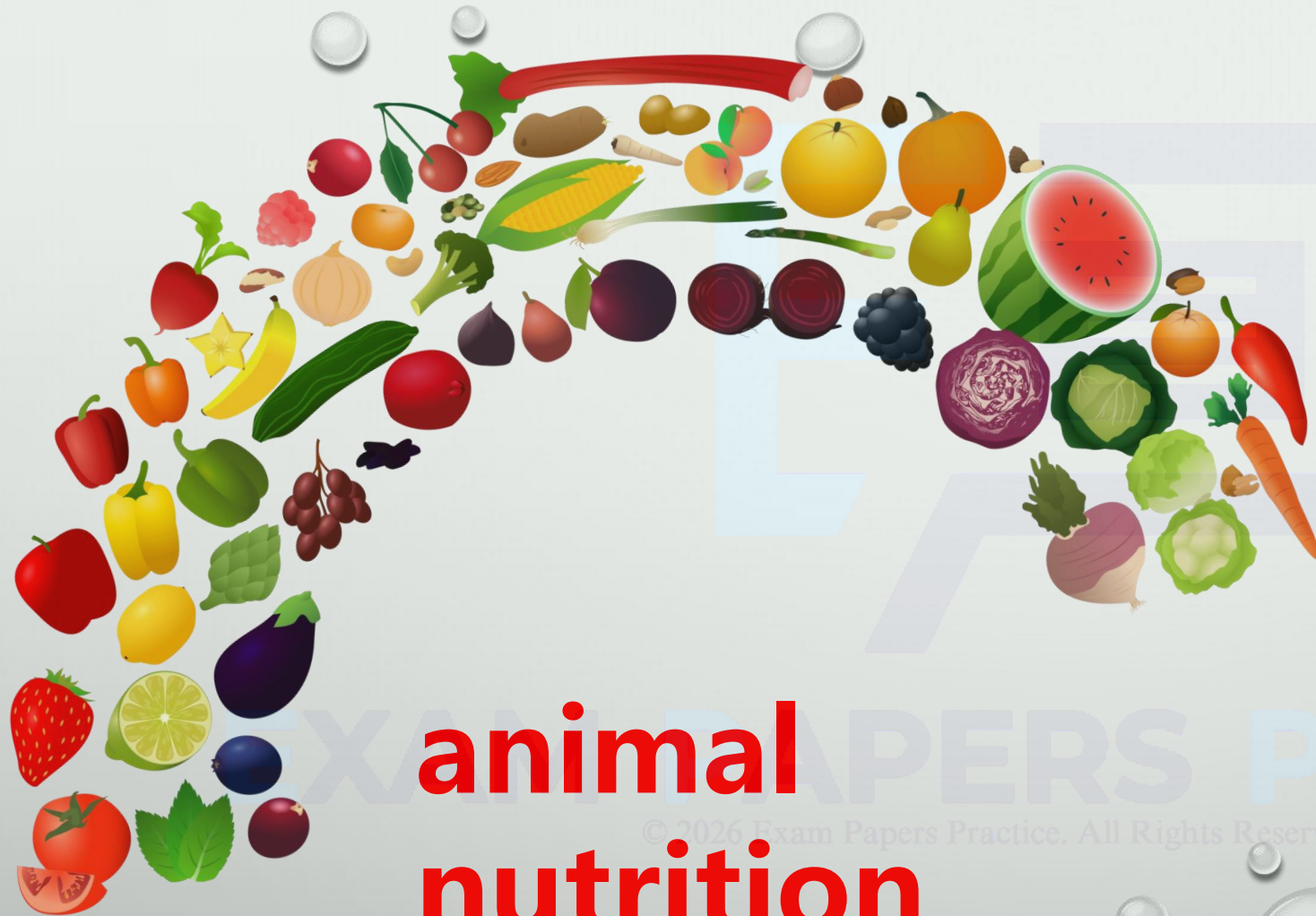
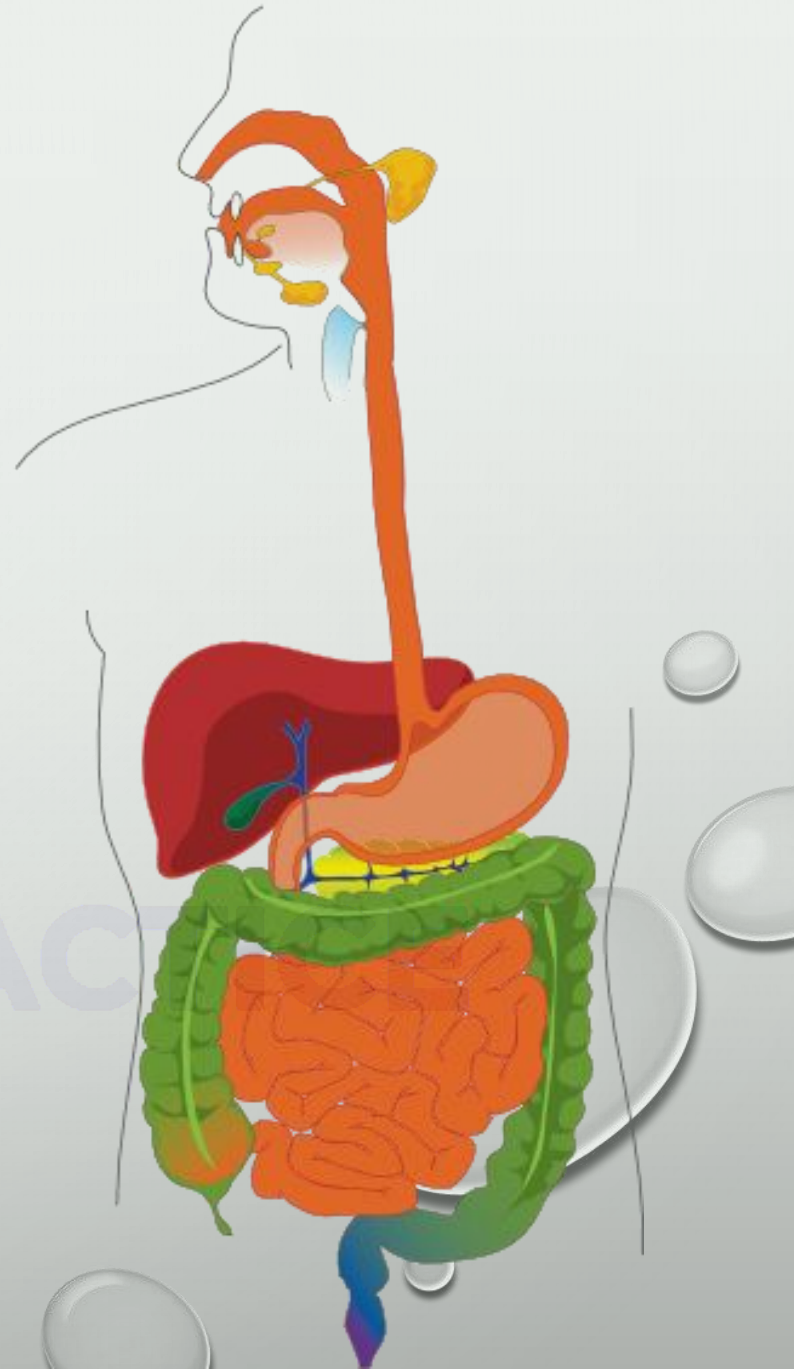




animal nutrition

© 2026 Exam Papers Practice. All Rights Reserved



Seven types of nutrient of most animals

- ♣ carbohydrate
- ♣ proteins
- ♣ fats
- ♣ vitamins
- ♣ water
- ♣ fibre



Balanced diet

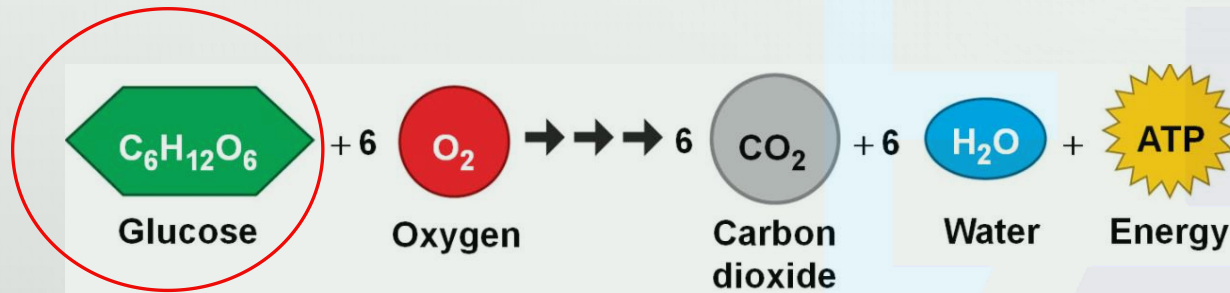
A diet which contain all of these things, in correct amounts and proportions.

Balanced diet 均衡的饮食

animal nutrition

Diet

Why do we need nutrients? $\Rightarrow$ Need energy



Carbohydrate, fat and protein all can provide energy.

One gram of fat contains about twice as much energy as one gram of protein or carbohydrate.

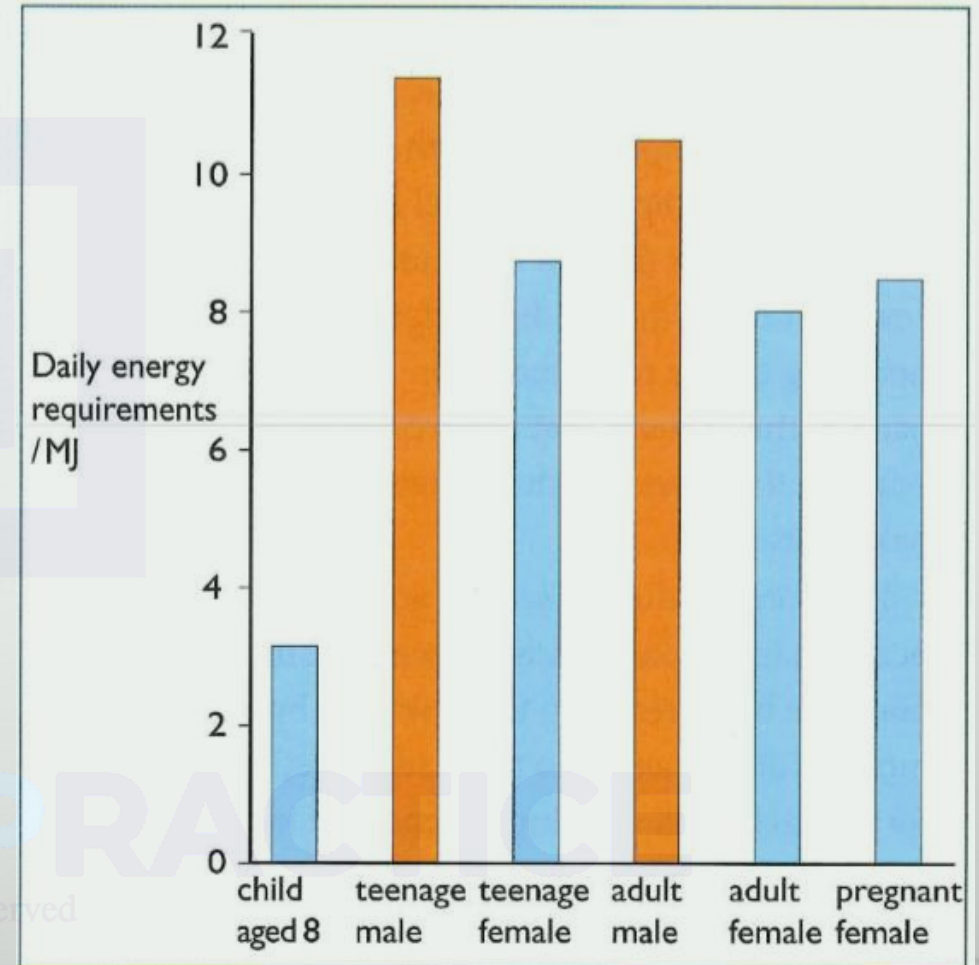


Figure 7.2 Daily energy requirements.

A person's diet may need to change at different times of their life.

Vitamins

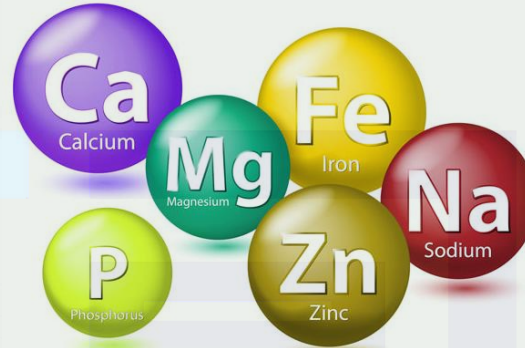
- ♣ organic substance
- ♣ only need in tiny amounts.
- ♣ If do not have enough → deficiency disease

Vitamin	Foods that contain it	Why it is needed	Deficiency disease
C	citrus fruits (such as oranges, limes), raw vegetables	to make the stretchy protein collagen, found in skin and other tissues; keeps tissues in good repair	scurvy, which causes pain in joints and muscles, and bleeding from gums and other places; this used to be a common disease of sailors, who had no fresh vegetables during long voyages
D	butter, egg yolk (and can be made by the skin when sunlight falls on it)	helps calcium to be absorbed, for making bones and teeth	S rickets, in which the bones become soft and deformed; this disease was common in young children in industrial areas, who rarely got out into the sunshine

deficiency disease 缺乏症 citrus 柑橘类 collagen 胶原
scurvy 坏血症 egg yolk 卵黄 rickets 佝偻病 deform 变形

Minerals

- ♣ inorganic substance
- ♣ only small amounts needed



Mineral element	Foods that contain it	Why it is needed	Deficiency disease
calcium, Ca	milk and other dairy products, bread	for bones and teeth; for blood clotting	brittle bones and teeth; poor blood clotting
iron, Fe	liver, red meat, egg yolk, dark green vegetables	for making haemoglobin, the red pigment in blood which carries oxygen	 anaemia, in which there are not enough red blood cells so the tissues do not get enough oxygen delivered to them

brittle bone 脆的
blood clotting 血液凝固
anaemia 贫血
haemoglobin 血红蛋白

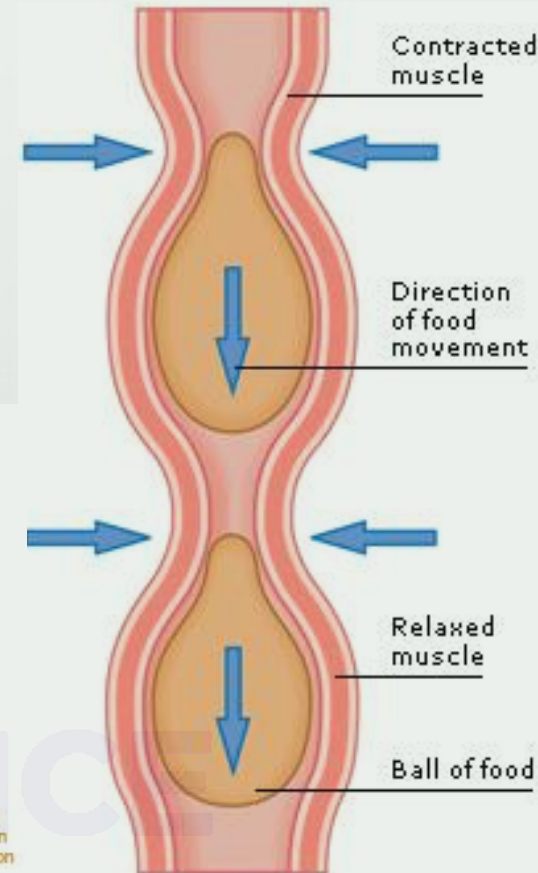
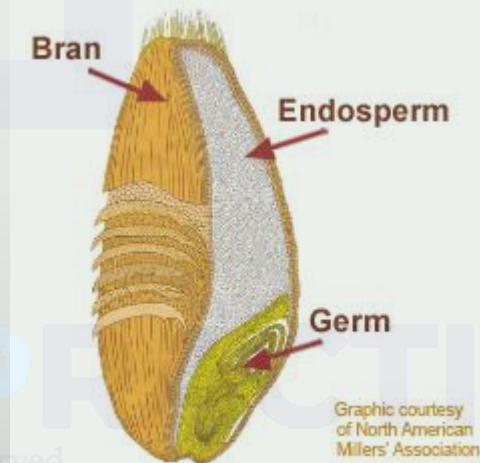
Fibre → cellulose

♣ stimulate alimentary canal work harder —— peristalsis
keep the digestive system in good working order, and helps
to prevent constipation.

One common form of fibre is the outer husk
of cereal grains, such as oats, wheat and
barley. This is called bran.

wholemeal bread / brown or unpolished rice

peristalsis 蠕动 constipation 便秘
husk 外壳 oat 燕麦
barley 大麦 bran 麸
wholemeal 全麦 brown or unpolished rice 糙米



peristalsis

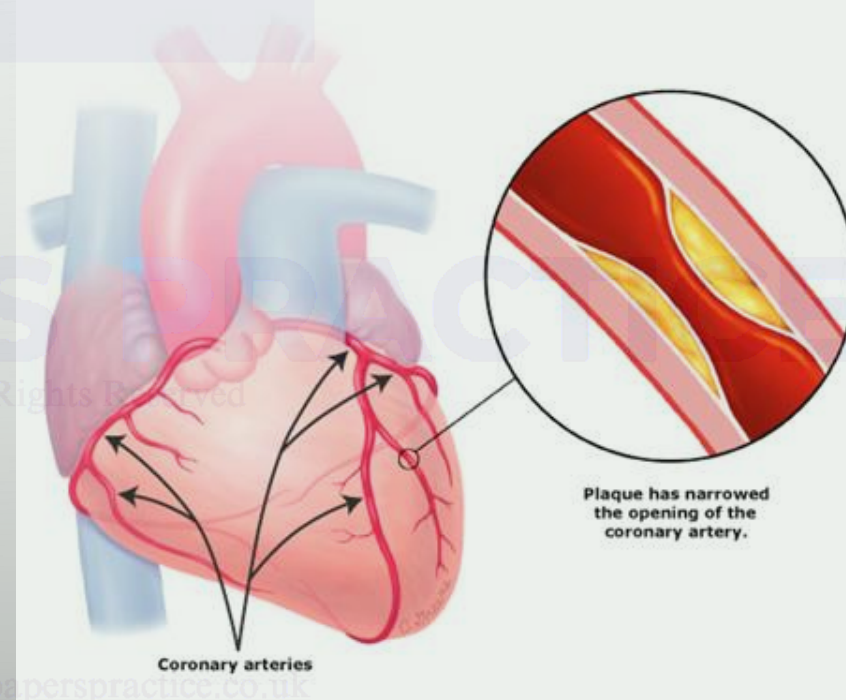
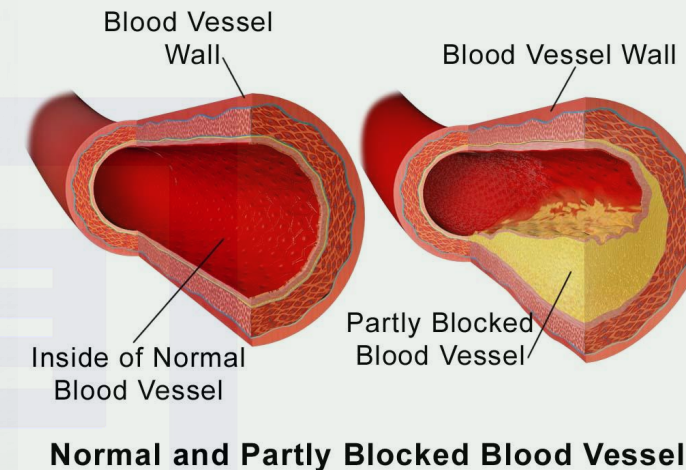
Fat

animal food: saturated fat + cholesterol
—— they can deposit in the arteries and make arteries stiffer and narrower.

Coronary heart disease

Coronary arteries can not supply the heart muscle with blood.

coronary heart disease 冠心病
saturated fat 饱和脂肪
cholesterol 胆固醇



Fat

unsaturated fat (vegetable oil/ fish oil)
→ do not increase the risk of heart disease

Fish and white meat do not contain much saturated fat.



GOOD FATS

© www.thousandwishes.net

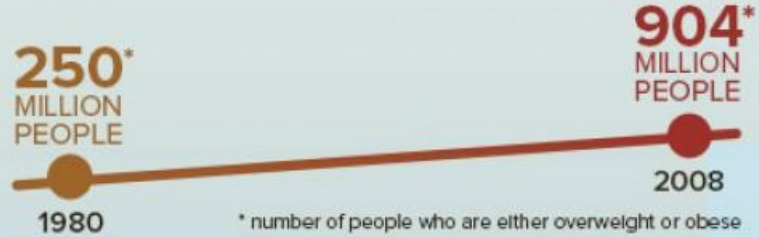
VS.

BAD FATS



unsaturated fat 不饱和脂肪

THE WORLD IS GETTING FATTER



HOW DO I KNOW WHETHER I AM OVERWEIGHT?

Calculate your body mass index (BMI) using this formula

$$\text{BMI} = \frac{\text{weight (kg)}}{\text{height}^2 \text{ (m}^2\text{)}}$$


OBESITY KILLS!

7 common diseases due to obesity:

- Arthritis
- Cancer
- Infertility
- Heart Diseases
- Back Pain
- Diabetes
- Stroke

OBESITY IS
KILLING
PREVENTABLE
THE WORLD

ABC TO OBESITY PREVENTION

SIMPLE RULES TO STAY IN SHAPE

A dopt New Healthy Habits



B alance Your Calorie Intake



C ontrol Your Weight Gain



Fat ——obesity

Obese people are more likely to get heart disease, strokes and diabetes.

Ways of control weight

- ♣ eating normal, well-balanced meals
- ♣ taking regular exercise

...

obesity 肥胖

obese 肥胖的

Coronary heart disease 冠心病

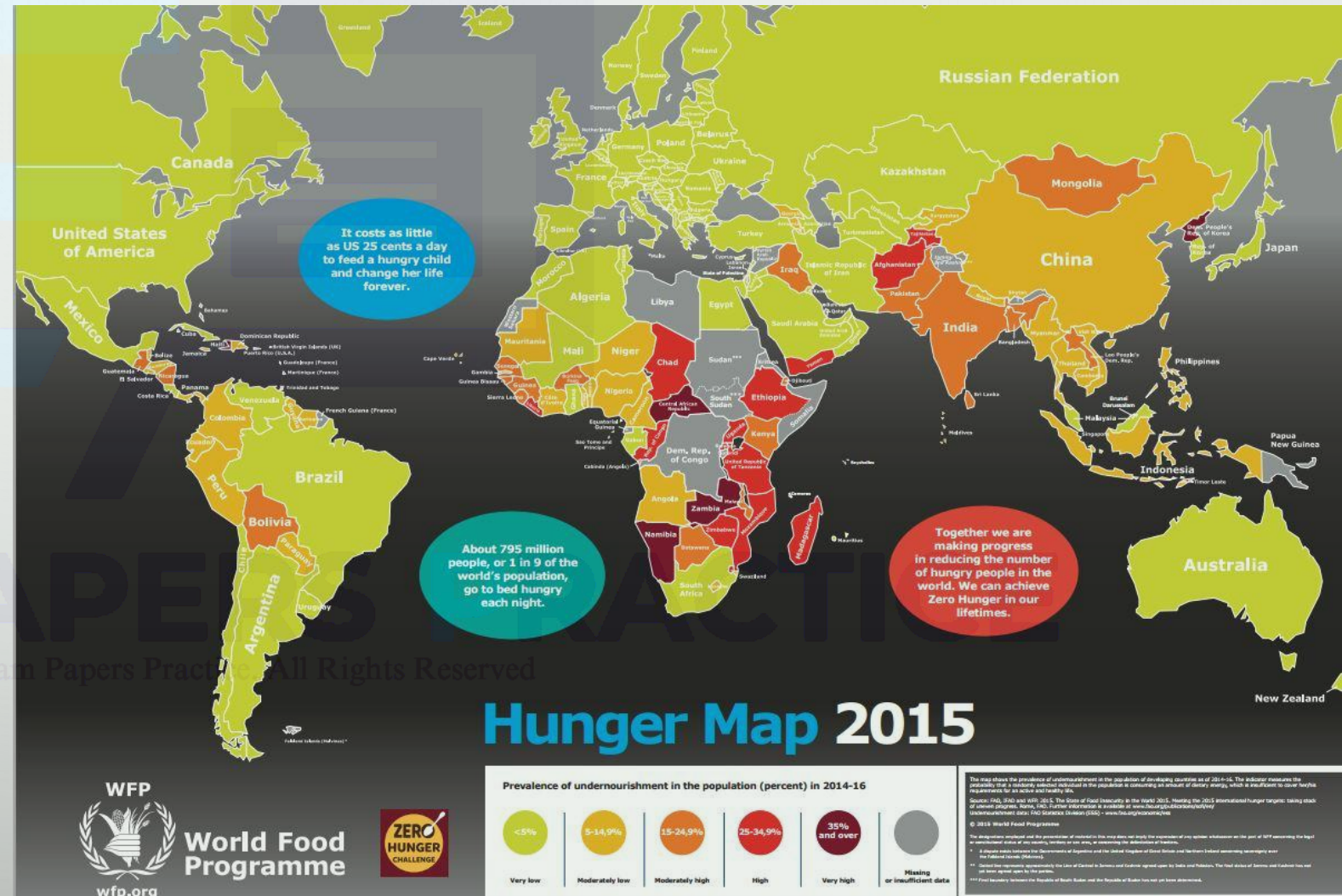
animal nutrition

Diet

Starvation and malnutrition



starvation 饥饿
malnutrition 营养不良



Starvation and malnutrition

Starvation is caused by **not eating enough food**.

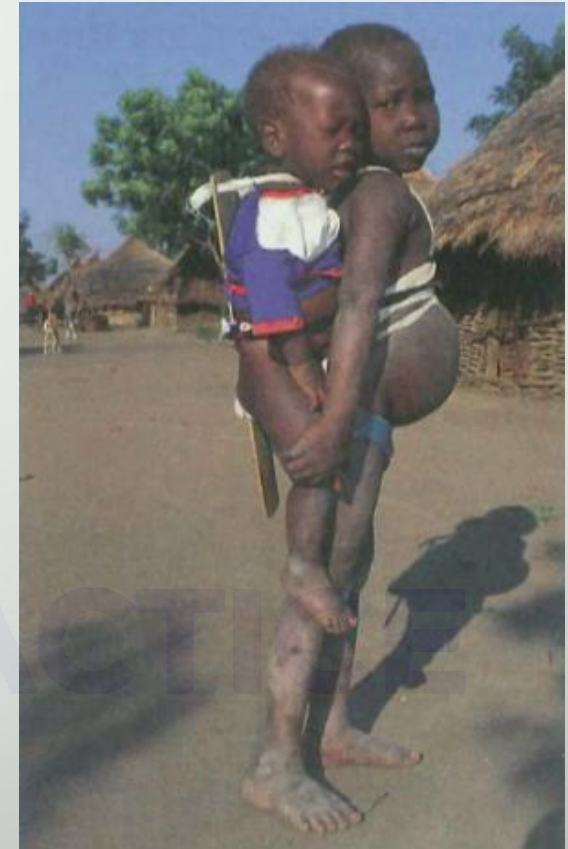
Malnutrition is caused by **not eating a balanced diet**.

e.g. **kwashiorkor**— lack of protein in diet

marasmus — severe shortage of energy in diet

Causes of starvation and malnutrition:

- ♣ poverty
- ♣ lack of knowledge about the right kinds of food



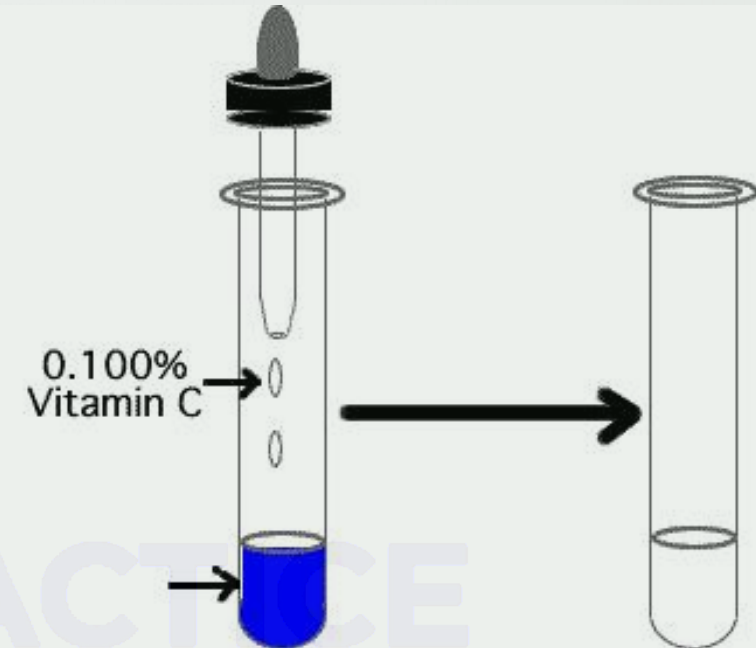
kwashiorkor 恶性营养不良症
marasmus 衰弱, 消瘦

Testing foods for vitamin C

DCPIP(blue)

Add vitamin C, DCPIP will lose colour

1. Test presence of vitamin C
2. Compare concentration of vitamin C in different liquid (the time of losing colour)

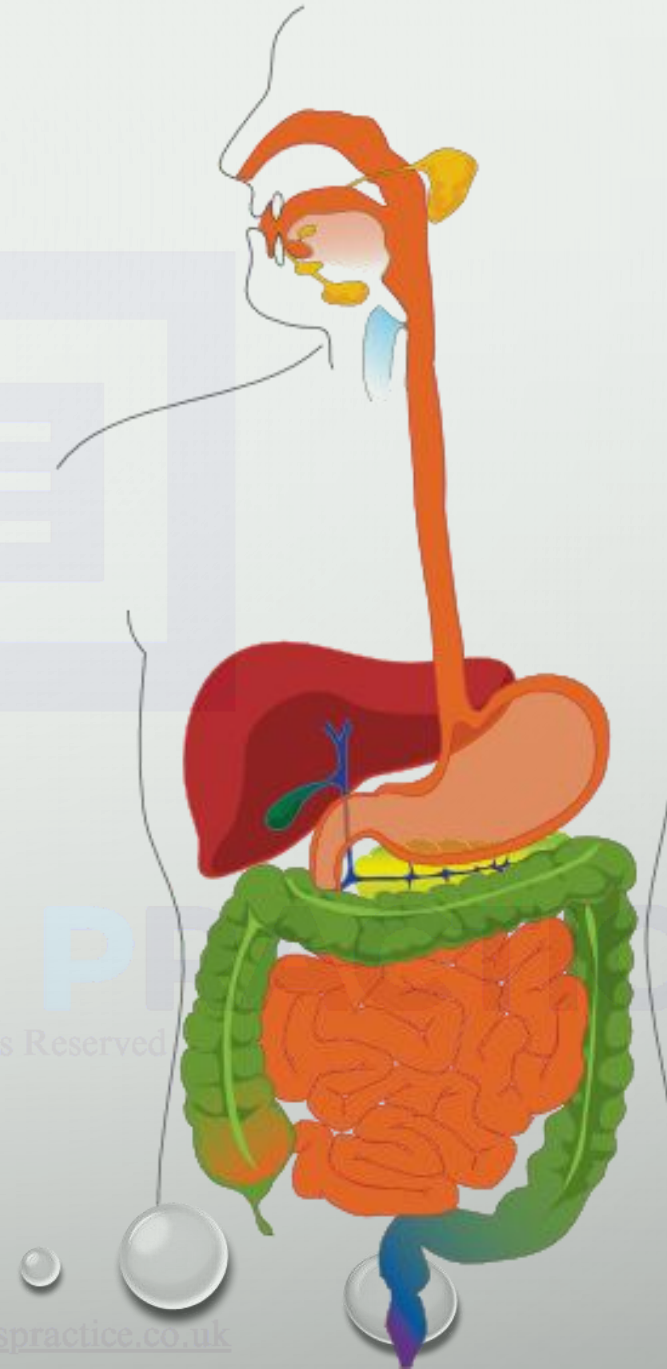


© 2026 Exam Papers Practice. All Rights Reserved

- 1 a balanced diet contains these nutrients:
carbohydrates fats proteins vitamins minerals water
 - a which of these nutrients are organic, and which are inorganic?
 - b which of these nutrients can provide energy?
 - c what is the role of fibre in the diet?
- 2 List three health problems associated obesity.
- 3 What is coronary heart disease?
- 4 What is the difference between starvation and malnutrition?
- 5 What is meant by a deficiency disease?
- 5 Give two examples of deficiency diseases?

digestion

digestion 消化
digestive canal 消化道
digestive gland 消化腺



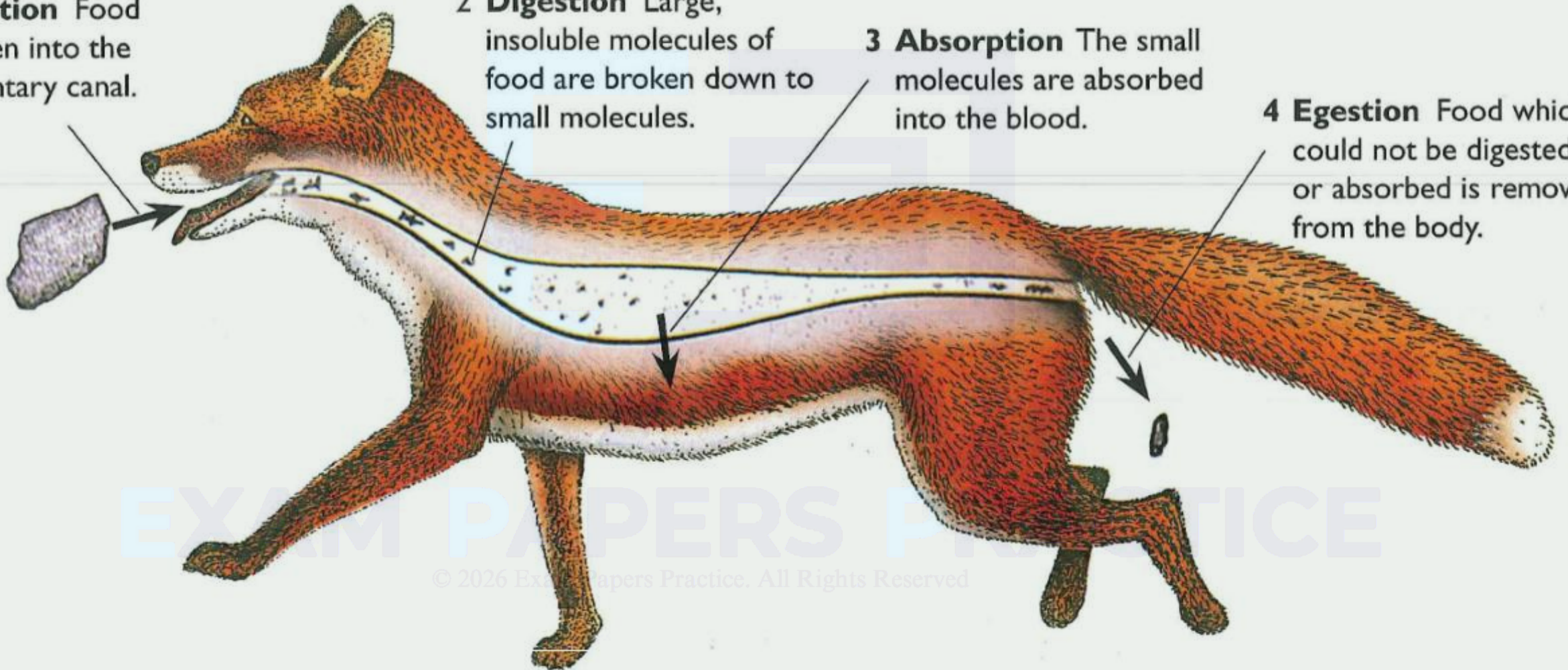
© 2026 Exam Papers Practice. All Rights Reserved

1 Ingestion Food is taken into the alimentary canal.

2 Digestion Large, insoluble molecules of food are broken down to small molecules.

3 Absorption The small molecules are absorbed into the blood.

4 Egestion Food which could not be digested or absorbed is removed from the body.



© 2026 Exam Papers Practice. All Rights Reserved

ingestion 摄食

absorption 吸收

egestion 排遗

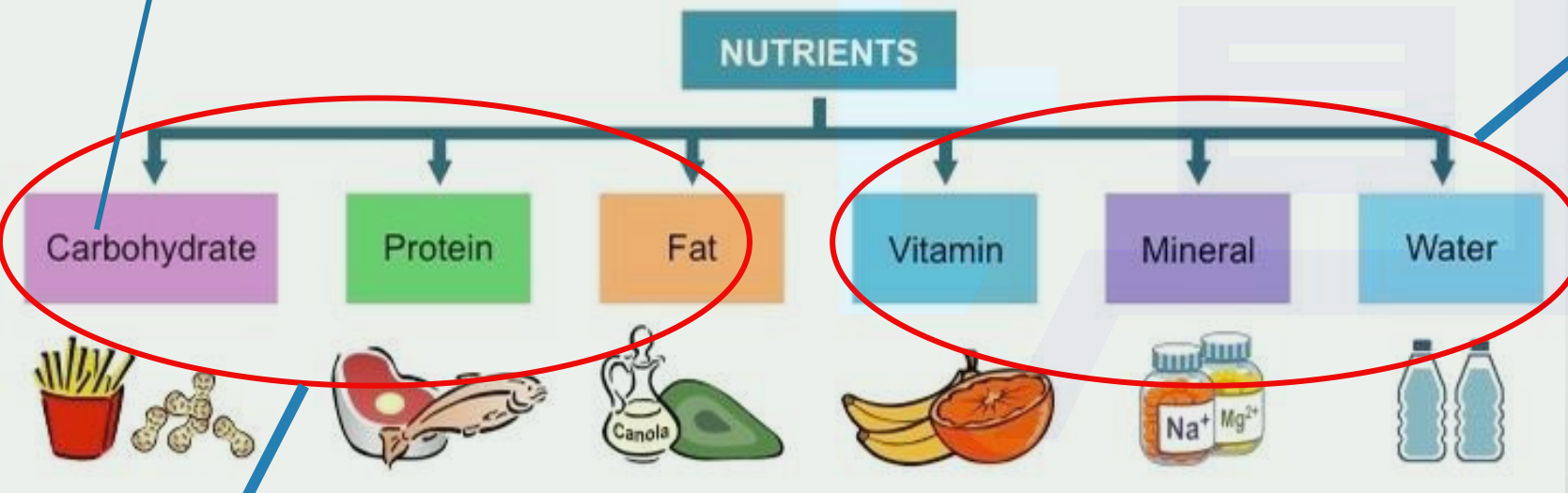
excretion 排泄

animal nutrition

Digestion

Polysaccharides and disaccharides need to be digested. Simple sugars do not need to be digested

do not need to be digested



need to be digested

Nutrient	Enzyme that breaks it down	Small molecules produced
starch	amylase	simple sugars
protein	protease	amino acids
fat	lipase	fatty acids and glycerol

Mechanical digestion

Large pieces → small pieces

- ◆ broken up by teeth, and by churning movements of alimentary canal

The breakdown of food into small pieces without chemical change to the food molecules

chemical digestion

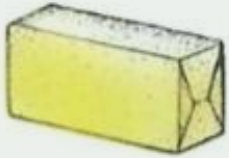
Large molecule → small molecule

- ◆ digestive enzymes

The breakdown of large **insoluble** molecules into small **soluble** molecules

Mechanical digestion 机械性消化
Chemical digestion 化学性消化

Fats



Teeth break down large pieces of food into smaller ones.



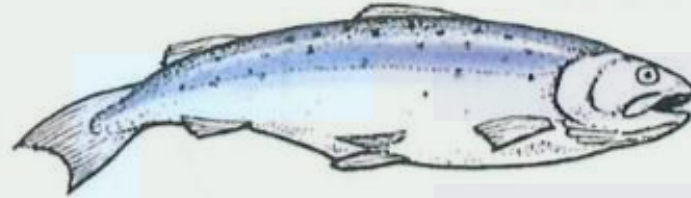
Bile salts break down large drops of fat into smaller ones.



fat droplets



Proteins



Teeth break down large pieces of food into smaller ones.



Water in digestive juices dissolves some food.



small pieces of food and some food in solution



Carbohydrates



Teeth break down large pieces of food into smaller ones.

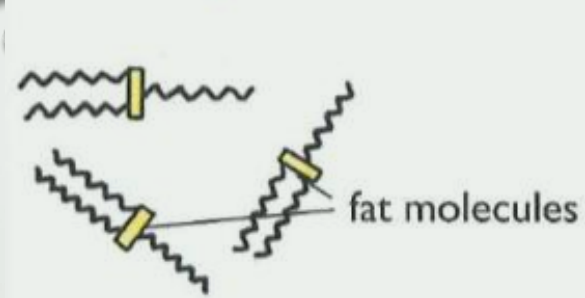


Water in digestive juices dissolves some food.

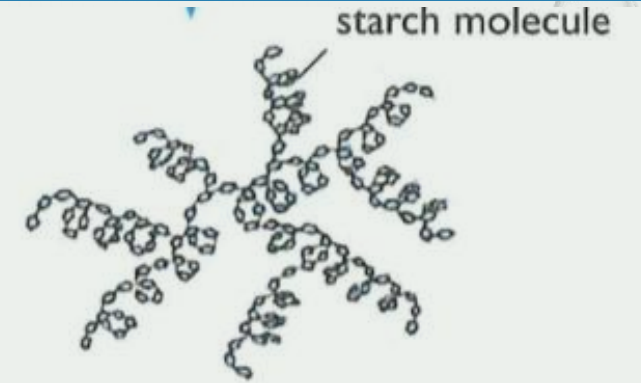
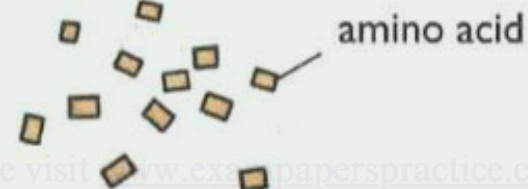
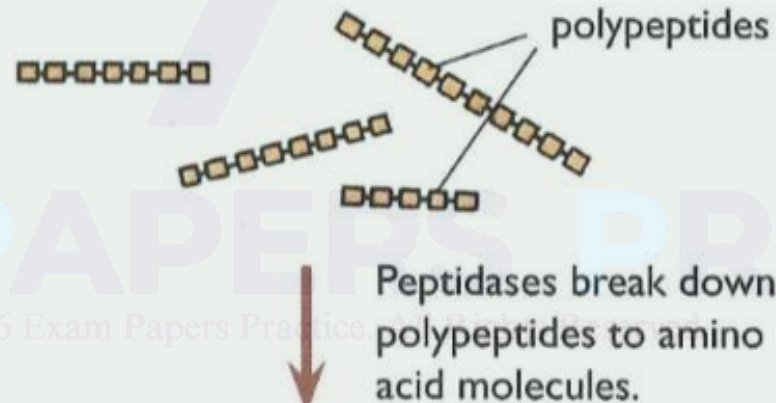
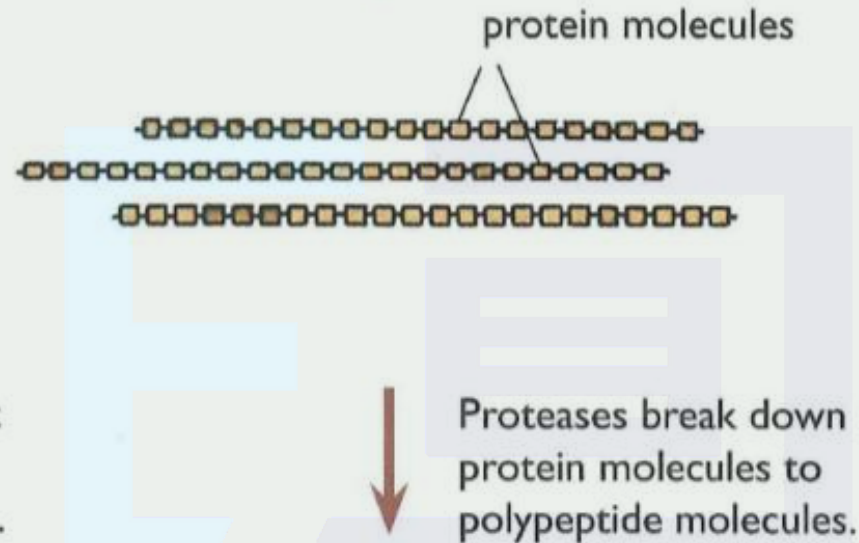
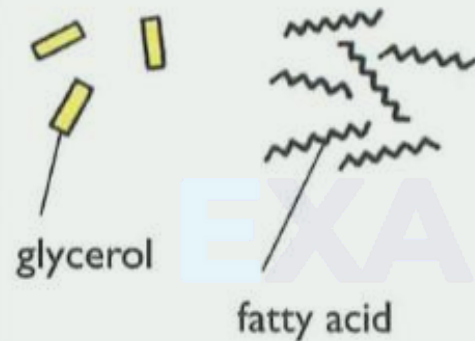


small pieces of food and some food in solution

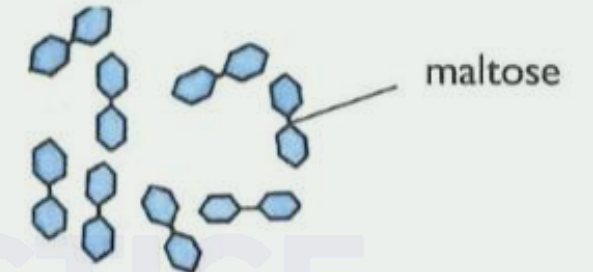




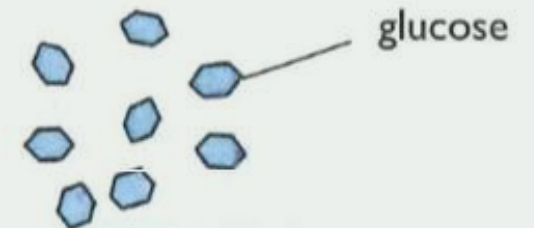
Lipase breaks down fat molecules to fatty acid and glycerol molecules.



Amylase breaks starch molecules down to maltose molecules.



Maltase breaks maltose down to glucose molecules.





EXAM PAPERS PRACTICE

© 2026 Exam Papers Practice. All Rights Reserved

Teeth

chop, crush or grind

large pieces → → → → → smaller pieces →



♣ This gives the food a larger surface area, which makes it easier for enzymes to work on the food in the digestive system.

♣ It also helps soluble parts of the food to dissolve.

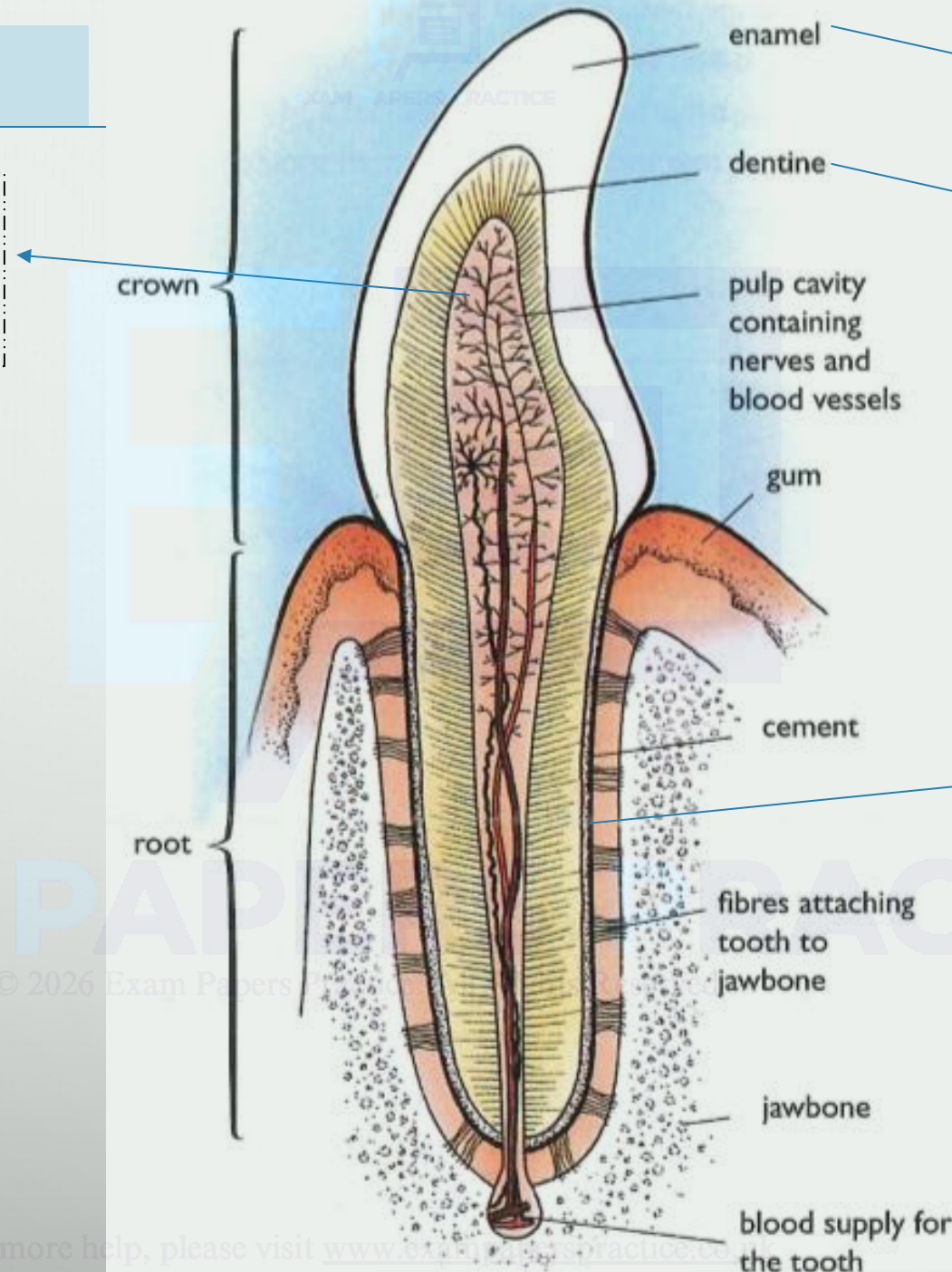
chop 剝, 砍
crush 磨碎
grind 磨碎

© 2026 Exam Papers Practice. All Rights Reserved

animal nutrition

contain nerves and blood vessels.
These supply the cytoplasm in
the dentine with food and oxygen.

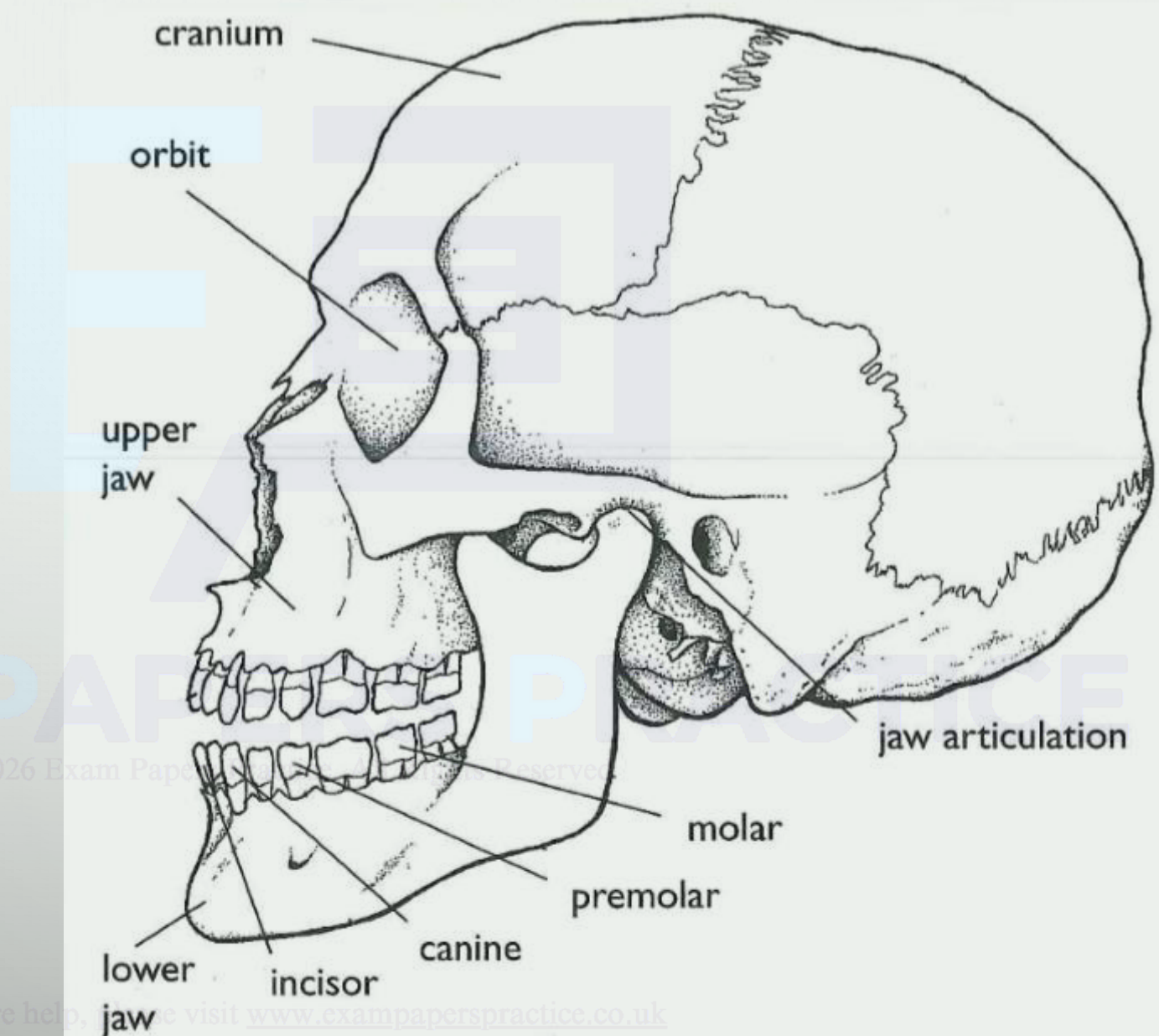
crown 牙冠
root 牙根
enamel 牙釉质
channel 通道
dentine 牙骨质
Cement 水泥, 接合剂
jawbone 颌骨
chew 咀嚼
pulp cavity 牙髓腔
gum 牙龈



Hardest substance.
Can be dissolved by acids

rather like bone
not as hard as enamel
Have channels in it which
contain living cytoplasm

The root of the tooth is
covered with cement. This
has fibres growing out of it.
These attach the tooth to
the jawbone, but allow it to
move slightly when biting
or chewing.



incisor 门齿
canine 犬齿
premolar 前臼齿
Molar 臼齿

Shape: sharp-edged, chisel-shaped teeth

Purpose: bite off piece of food

Shape: more pointed teeth at either side

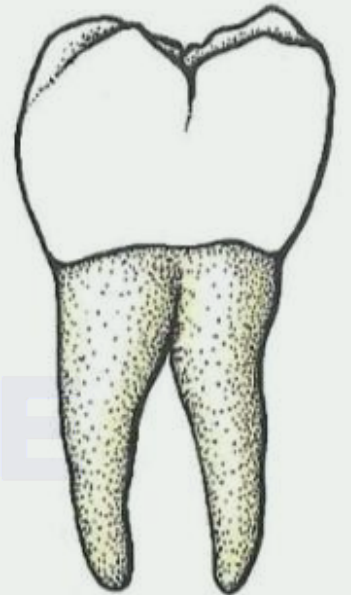
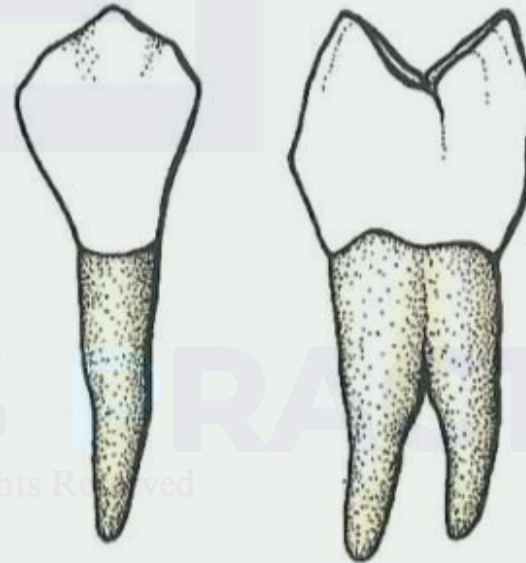
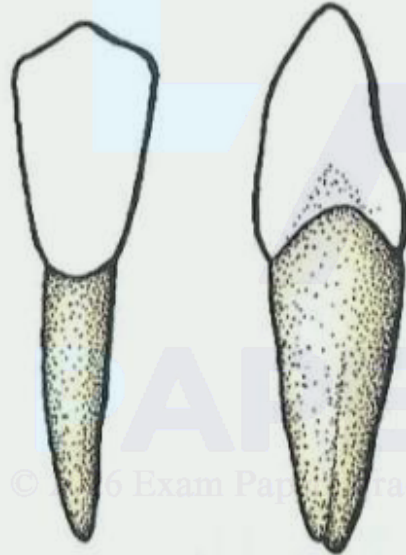
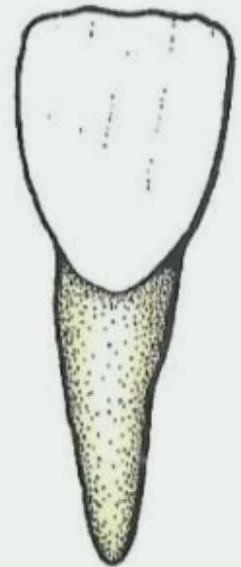
Purpose: tear down food

Shape: like millstone

Purpose: chew and grind food

front view

side view



Incisors are chisel shaped, for biting off pieces of food.

Canines are very similar to incisors in humans.

Premolars have wide surfaces, for grinding food.

Molars, like premolars, are used for grinding.

sharp-edged 边缘锋利的 chisel-shaped 凿子状的 millstone 磨盘 grind 磨碎

animal nutrition

Teeth

Tooth development

Mammals have two sets of teeth.

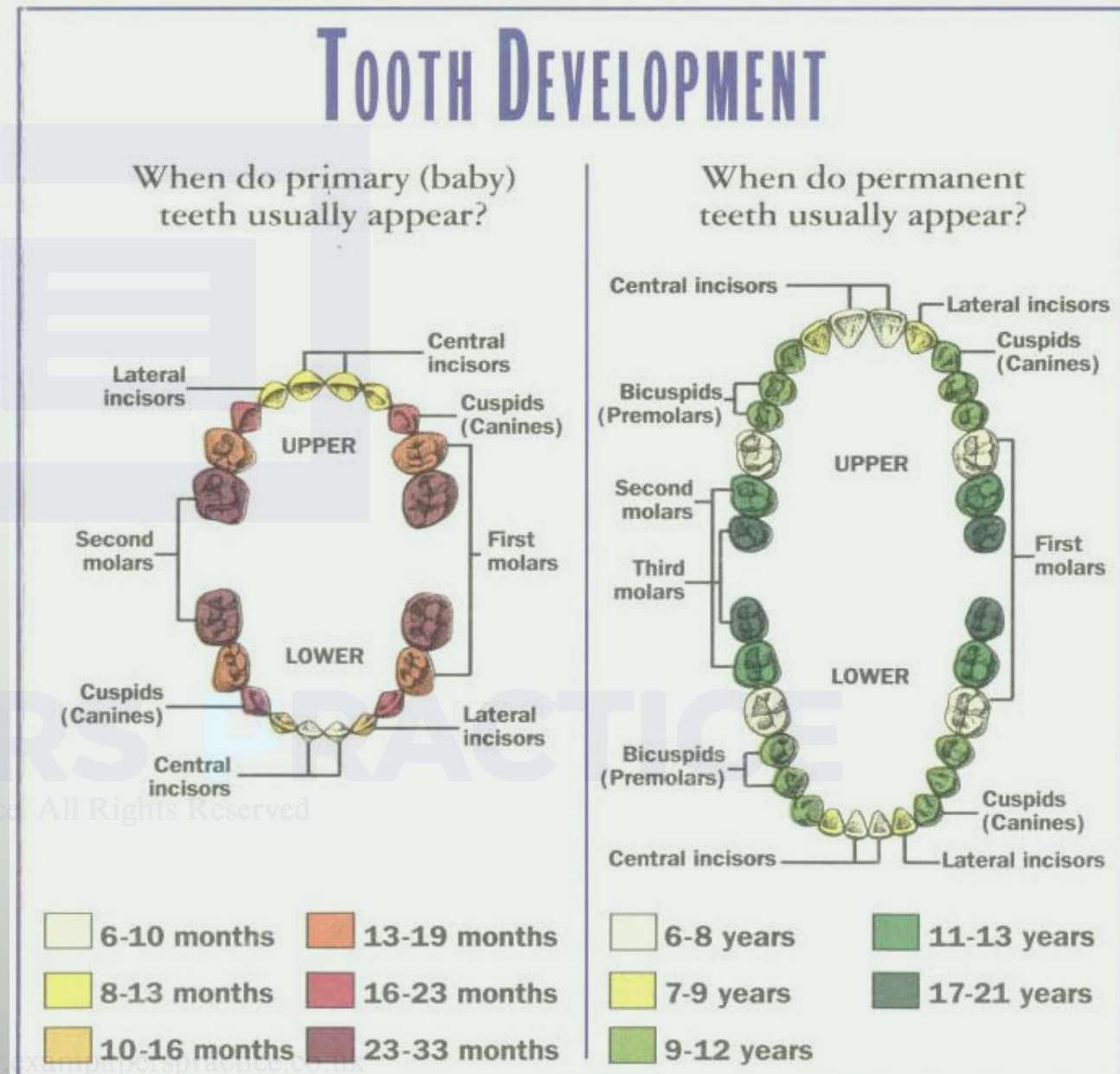
First set :

- milk teeth or deciduous teeth
- start about 5 months old, by the age of 24-30 months, most children have a set of 20 teeth

Second set:

- permanent teeth
- 32 teeth

milk teeth 乳齿
deciduous teeth 乳齿





© 2026 Exam Papers Practice. All Rights Reserved

dental decay 龋齿

Some bacteria in mouth, together with substances from saliva, form a sticky film over teeth, especially next to the gums and in between the teeth. This is called **plaque** → **gum disease** (swell, inflame, bleed, loose, have to be removed)



1 Plaque builds up around the edges of teeth and gums.

2 If the plaque is not removed, the bacteria may work down around the roots of the tooth.

3 The tooth is loosened and may fall out or have to be removed.

plaque 牙菌斑 **swell** 肿 **inflame** 发炎

Tooth decay

Sugar + bacteria → acid

Ways of keeping teeth and gums healthy

- don't eat too much sugar
- use a fluoride toothpaste regularly
- make a regular visits to a dentist.

fluoride toothpaste 含氟牙膏



1 Particles of sugary foods get trapped in cracks in the teeth.



2 Bacteria feeding on the sugar form acids, which dissolve a hole in the enamel and dentine.



3 There are nerves in the pulp cavity, so the tooth becomes very painful if the infection gets this far.



4 The infection can spread rapidly through the pulp cavity, and may form an abscess at the root of the tooth.

animal nutrition

Digestive system

alimentary canal + digestive glands

tongue 舌头

salivary gland 唾液腺

epiglottis 会厌

oesophagus 食道

trachea 气管

sphincter muscle 括约肌

stomach 胃

pancreas 胰腺

liver 肝脏

gall bladder 胆囊

bile duct 胆管

pancreatic duct 胰腺管

duodenum 十二指肠

ileum 回肠

colon 结肠

rectum 直肠

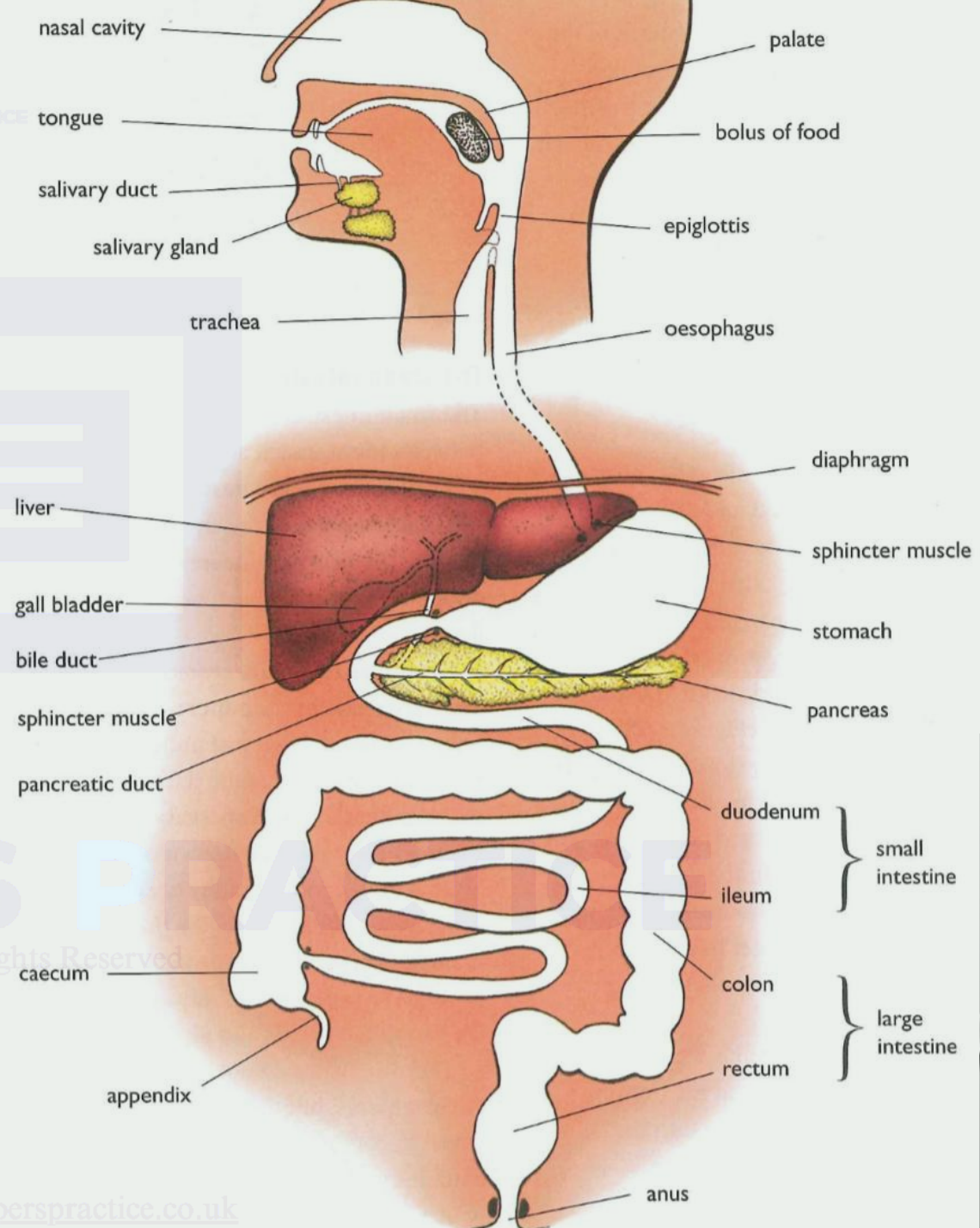
caecum 盲肠

appendix 阑尾

anus 肛门

small intestine

large intestine



animal nutrition

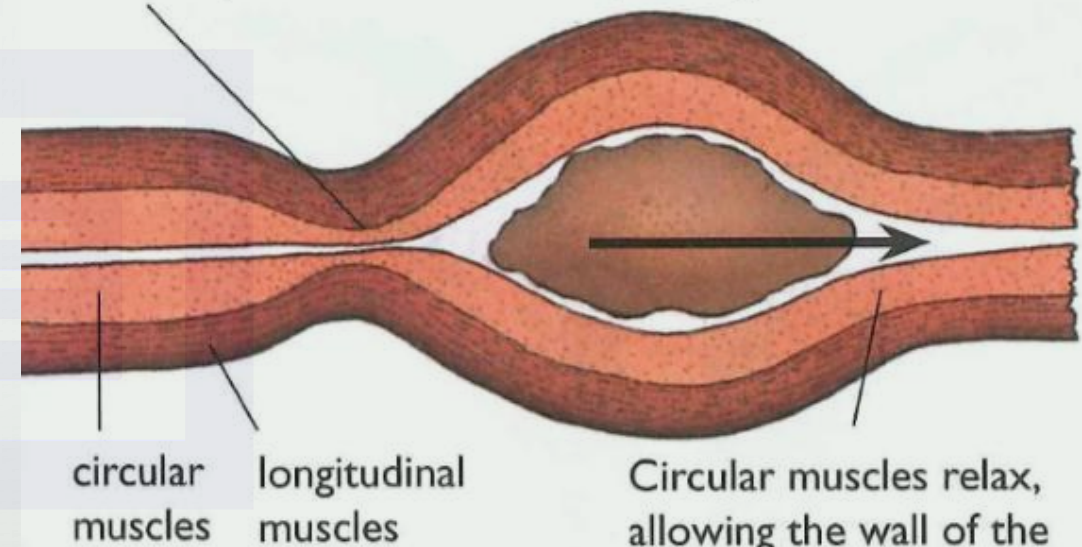
peristalsis

Muscles in the wall of the alimentary canal contract and relax to make food move along. This movement is called peristalsis

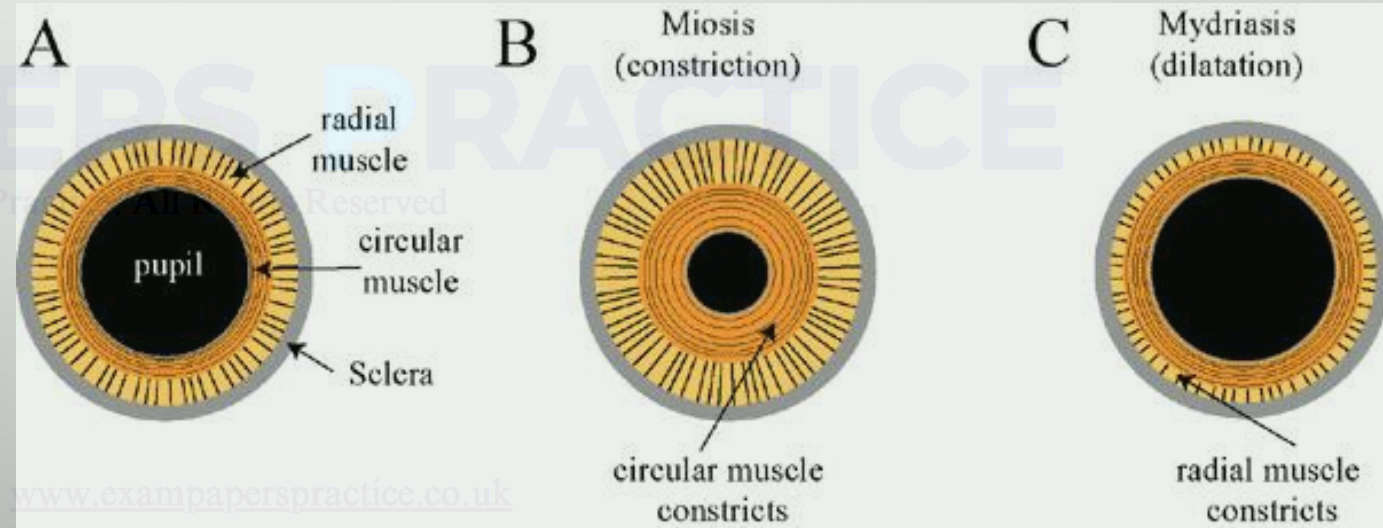
peristalsis 蠕动
squeeze 挤压
circular muscle 环形肌肉

alimentary canal

Circular muscles contract, making the lumen of the alimentary canal smaller and squeezing food forwards.



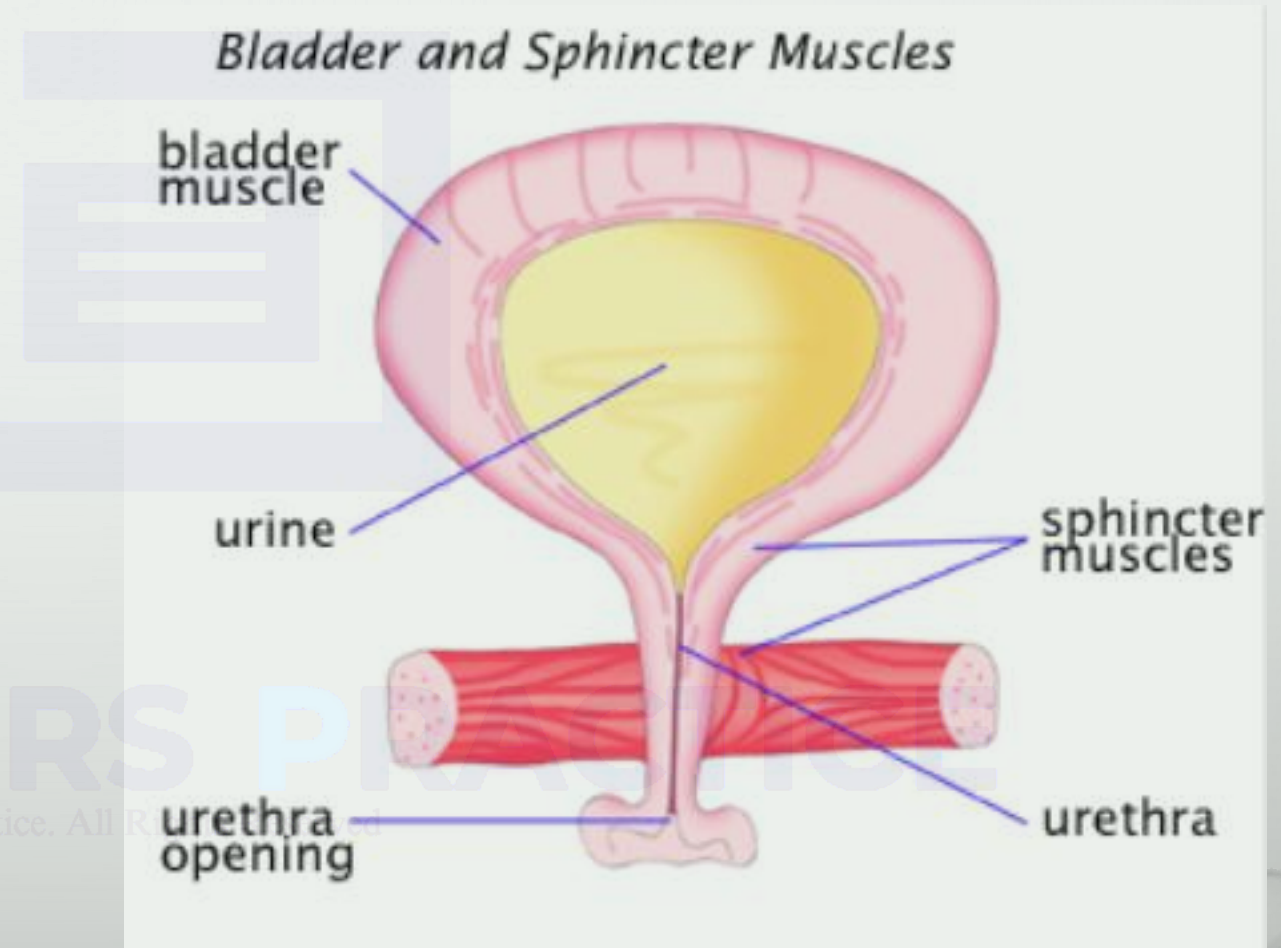
Circular muscles relax, allowing the wall of the alimentary canal to expand.



sphincter muscles

It can close the tube completely and can keep the food in one part of the alimentary canal for a while.

sphincter muscle 括约肌



Mucus (goblet cell)

goblet cells in alimentary canal

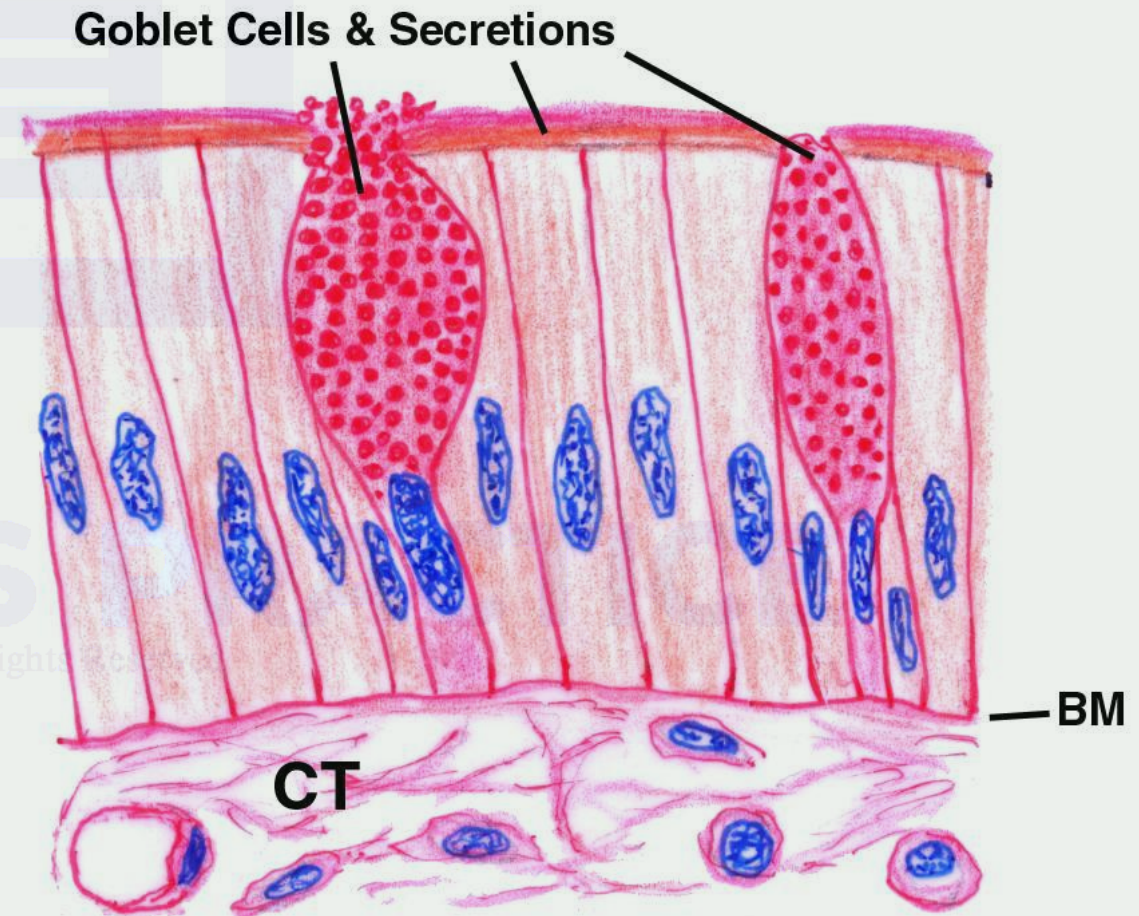
→ mucus

→ lubricate

goblet cell 杯状细胞

mucus 粘液

lubricate 润滑



Mouth

◆ Ingestion

teeth chop and grind

- ◆ large pieces of food → → → → small pieces
(increase surface area)

tongue mix

- ◆ food + saliva → → → → bolus

amylase

- ◆ a part of starch → → → → maltose

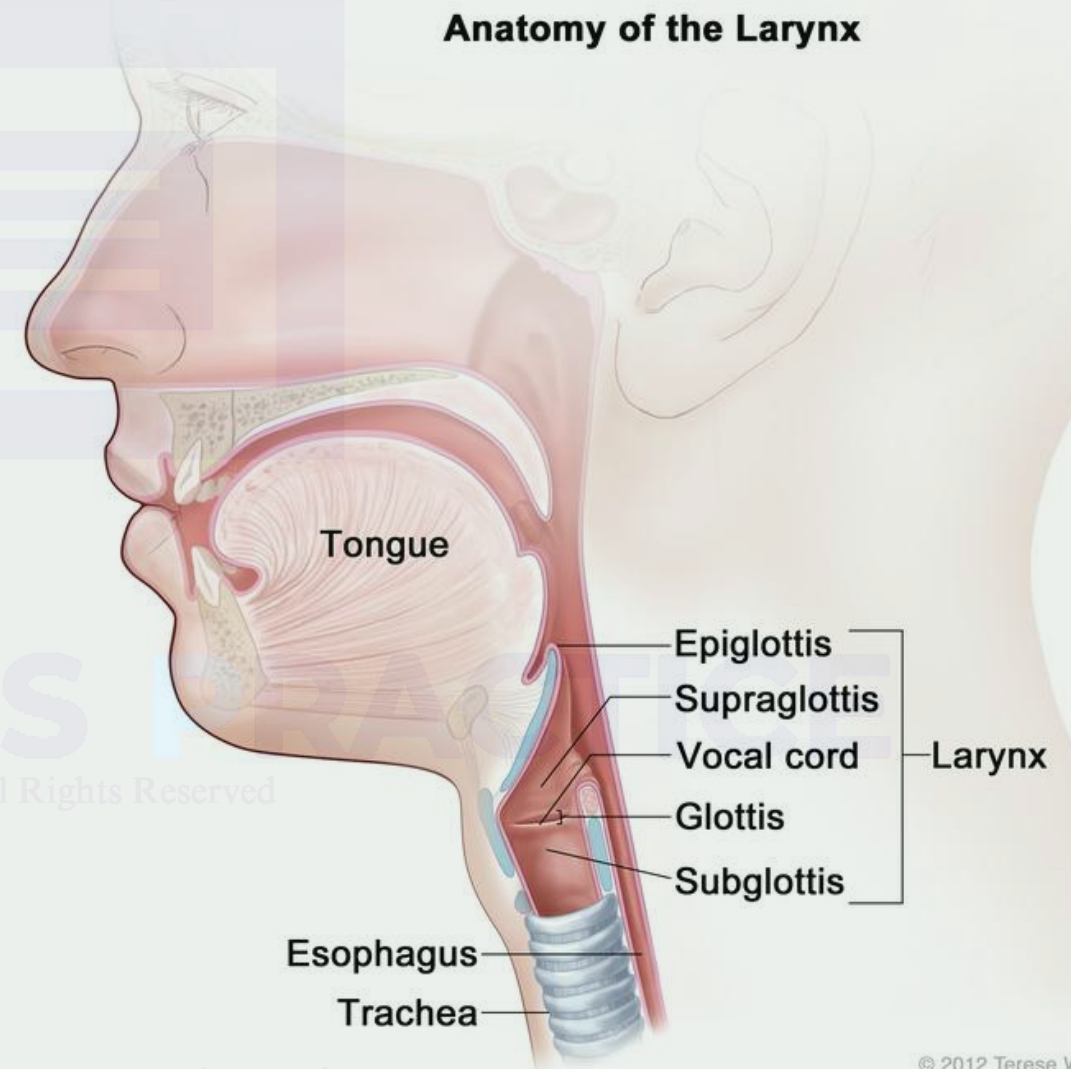
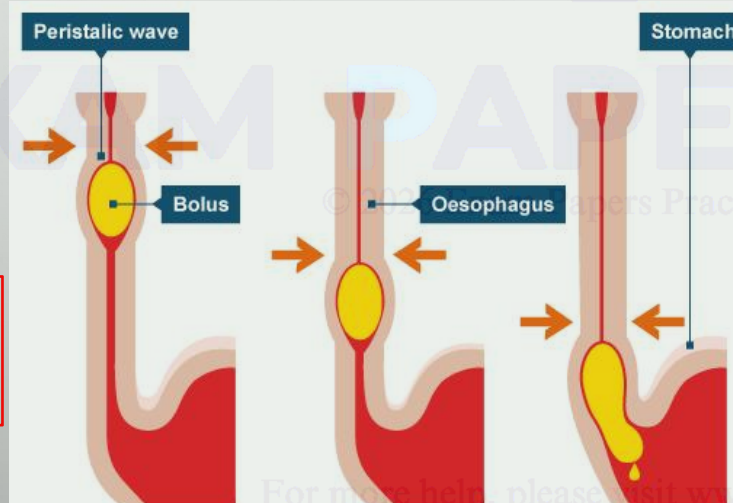
saliva 唾液
amylase 淀粉酶
maltose 麦芽糖



oesophagus

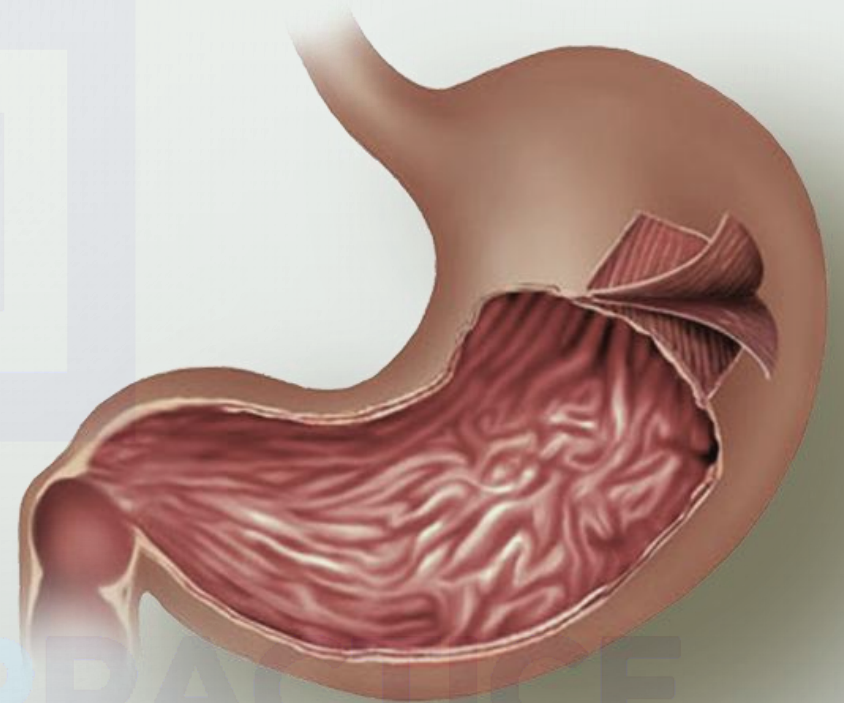
- ◆ take food down to the stomach
- ◆ **epiglottis** (**cartilage**) stops food from going down into lungs
- ◆ **sphincter** at entrance to the stomach

epiglottis 会厌
cartilage 软骨



stomach

- ◆ has strong, muscular walls.
chyme (food + enzymes + mucus)



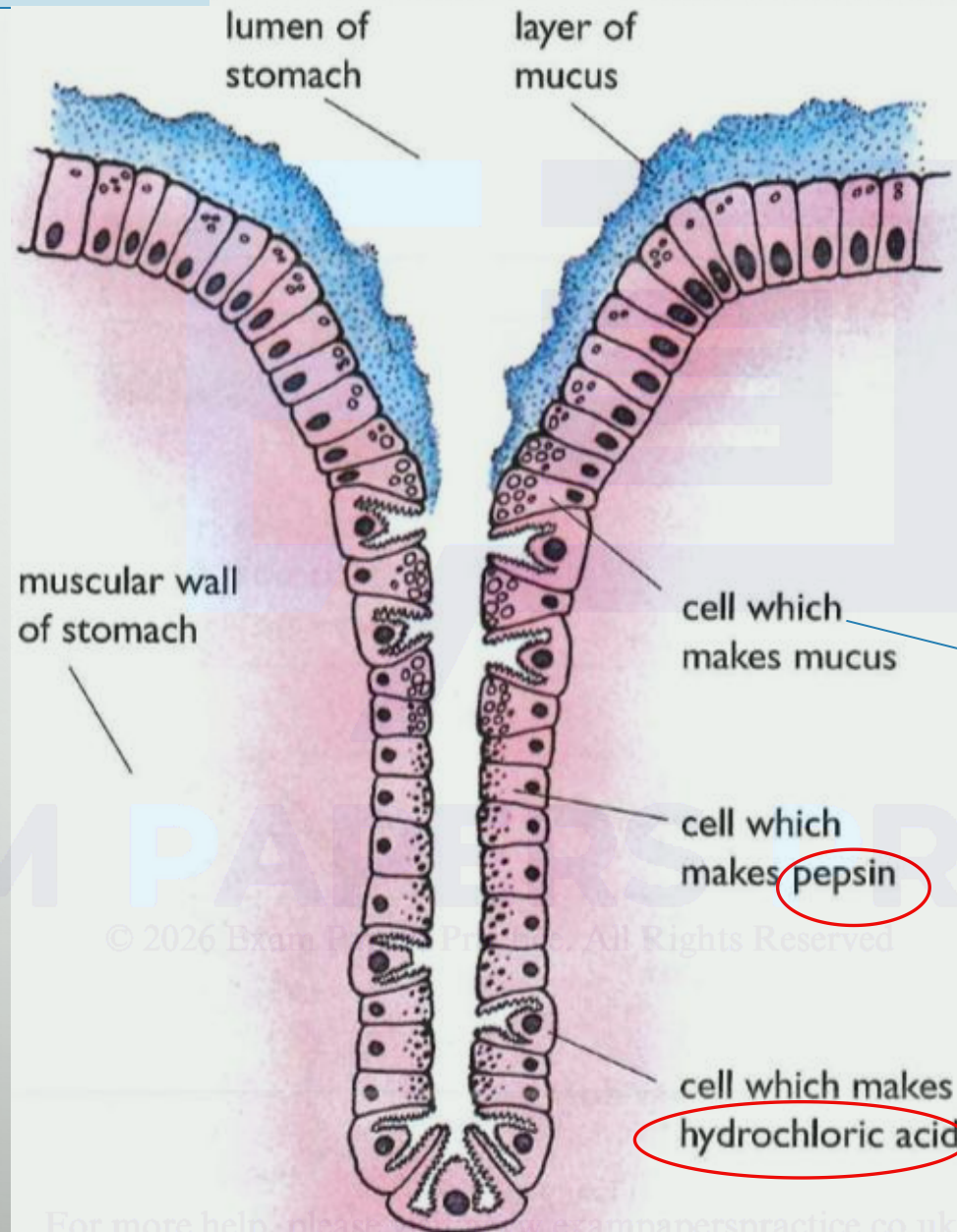
chyme 食糜

© 2026 Exam Papers Practice. All Rights Reserved

animal nutrition

stomach

clot 凝固
pepsin 胃蛋白酶
rennin 凝乳酶
gastric juice 胃液



alimentary canal

rennin

- ◆ produced in stomach of **young mammals**
- ◆ cause milk to **clot**

goblet cells
Make **mucus**

Hydrochloric acid

& **pepsin** work best in acid conditions (optimum PH)
Protein → polypeptide
& kill any **bacteria** in food

Small intestine — digest food

- ◆ duodenum + ileum
- ◆ pancreas → pancreatic juice
(amylase, protease(**trypsin**) and lipase)
(sodium hydrogen carbonate → neutralise acid)
- ◆ liver → bile → flow into duodenum by bile duct
yellowish green, alkaline (neutralize), watery liquid
- ◆ bile (not enzyme — not digest fats, emulsify)

bile salt

Large drops of fat → → → small drops

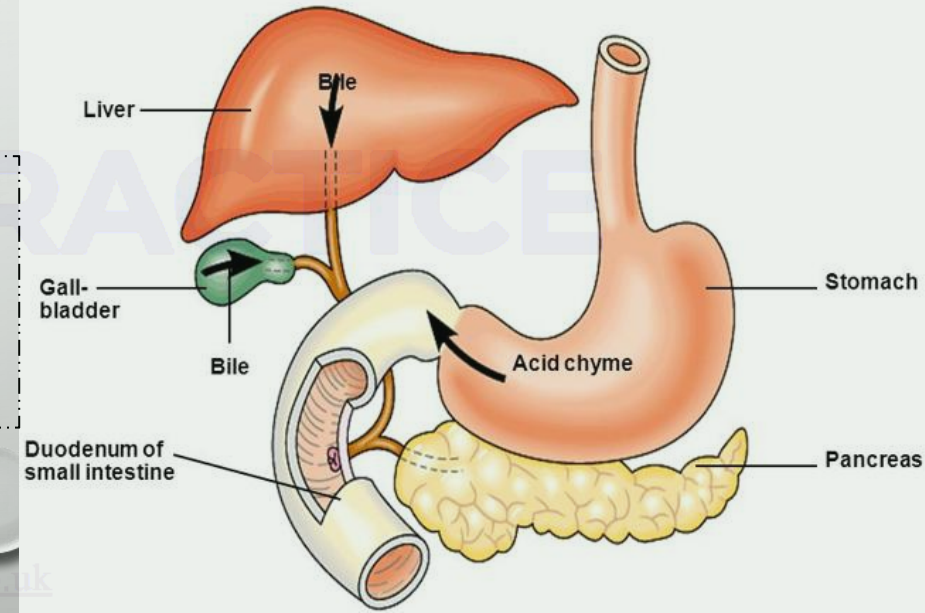
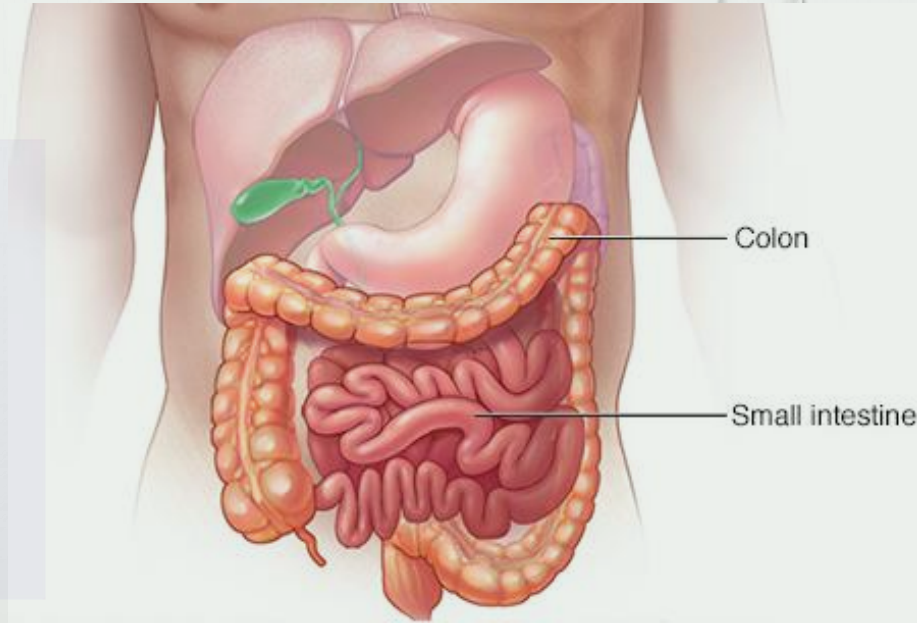
old red blood cell → →
bile contain yellowish bile pigment

Emulsification

Increase the surface
area for the chemical
digestion

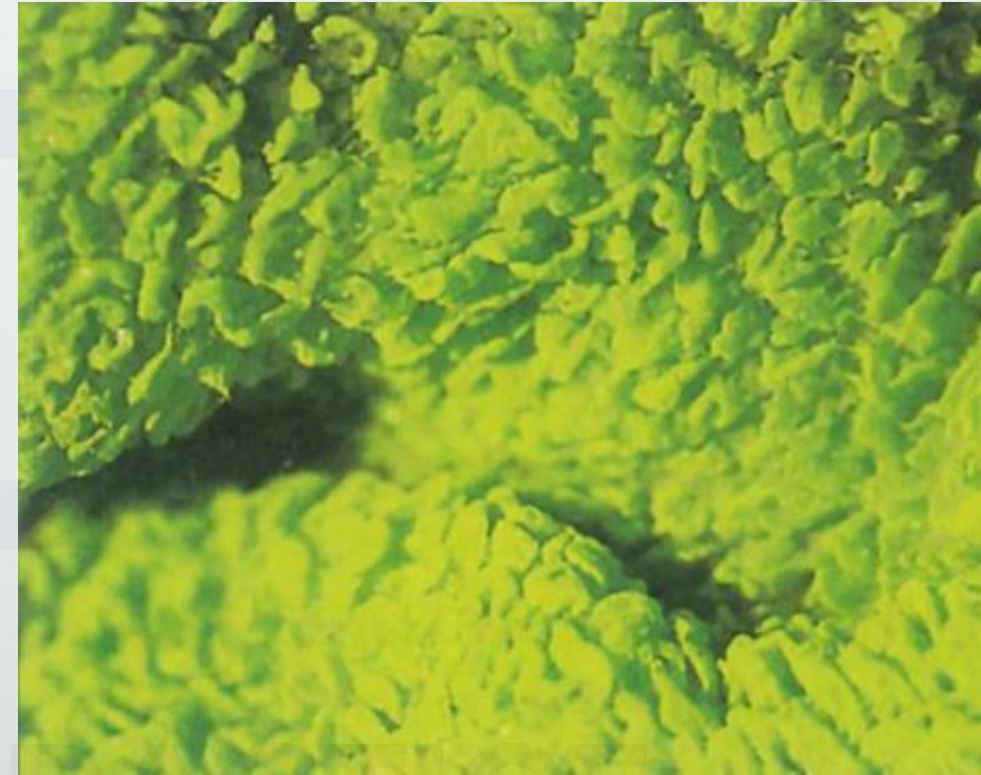
lipase in pancreatic juice

fatty acid + glycerol

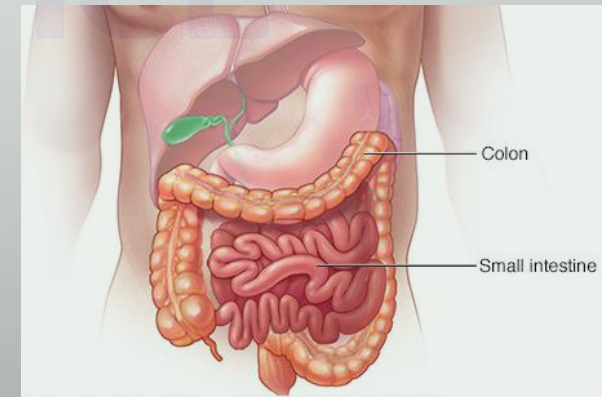


Small intestine

- ◆ make some enzymes itself
- ◆ villi (singular: villus)
cells covering the villi make enzymes (maltase, protease, lipase), stay close to the cells which make them.
→ complete the digestion of food



villi/ villus 绒毛
lumen 内腔



Small intestine — absorb nutrients

Absorption: small nutrient molecules pass through the wall of small intestine and into the blood.

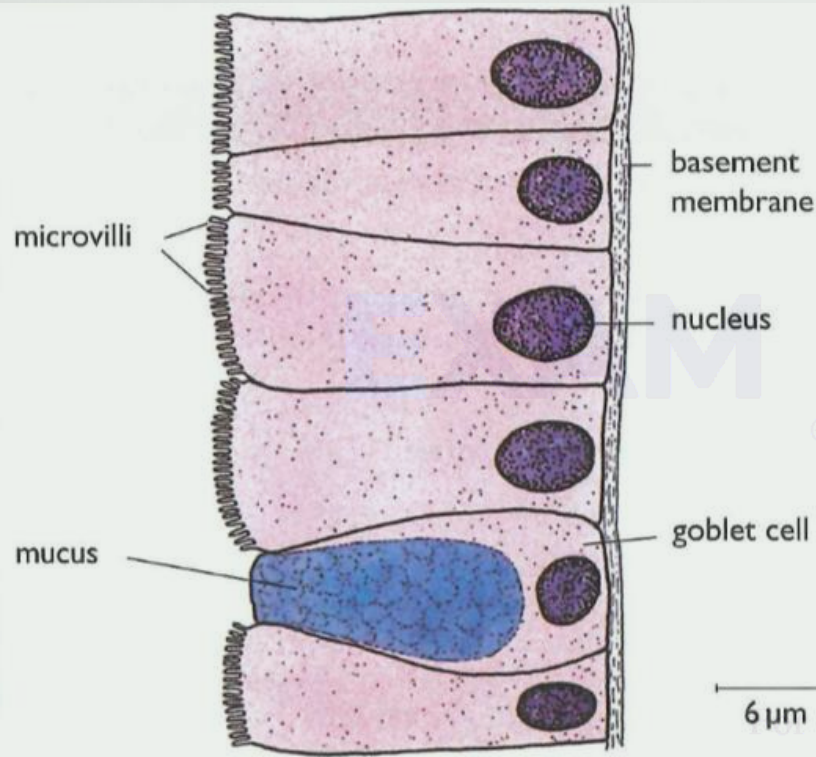
- . water
- . mineral salts
- . vitamins

amino acid
fatty acid + glycerol
simple sugar

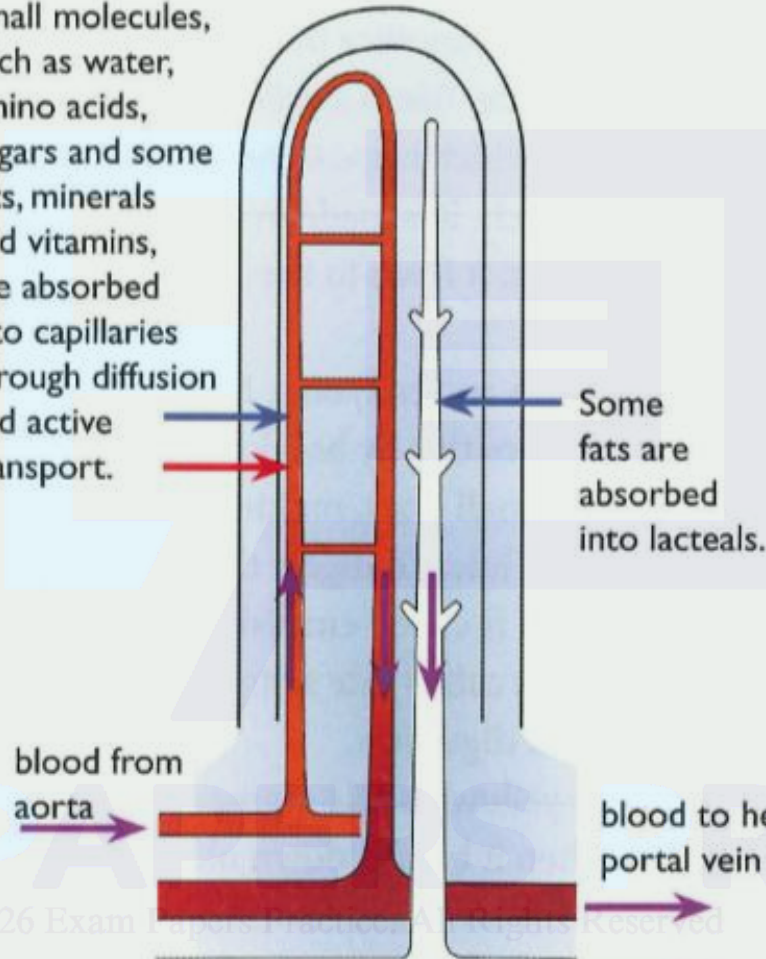
animal nutrition

How to make absorption take place efficiently ?

blood capillary 毛细血管
lacteal 乳糜管
lymph vessel 淋巴管
microvilli 微绒毛

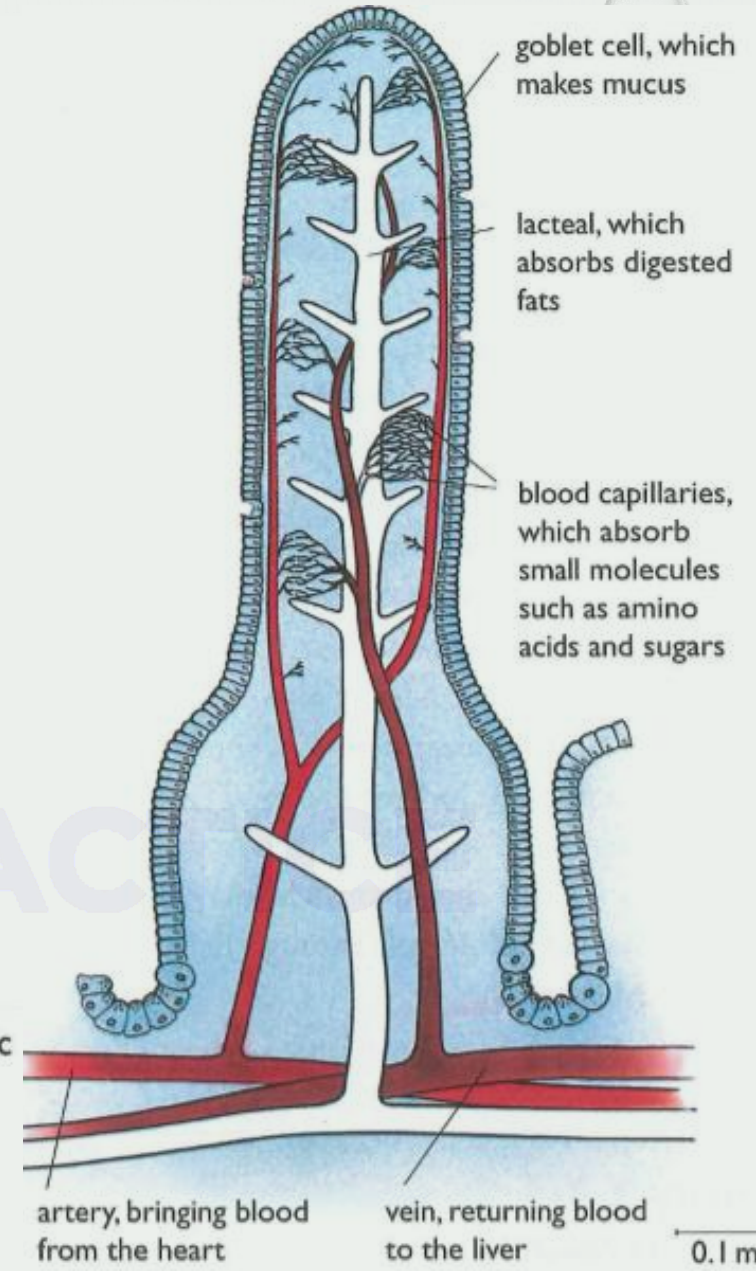


Small molecules, such as water, amino acids, sugars and some fats, minerals and vitamins, are absorbed into capillaries through diffusion and active transport.



Key

- mass flow
- diffusion down a concentration gradient
- active transport



Feature	How this helps absorption take place
It is very long, about 5 m in an adult human.	This gives plenty of time for digestion to be completed, and for digested food to be absorbed as it slowly passes through.
It has villi. Each villus is covered with cells which have even smaller projections on them, called microvilli.	This gives the inner surface of the small intestine a very large surface area. The larger the surface area, the faster nutrients can be absorbed.
Villi contain blood capillaries.	Monosaccharides, amino acids, water, minerals and vitamins, and some fats, pass into the blood, to be taken to the liver and then round the body.
Villi contain lacteals, which are part of the lymphatic system.	Fats are absorbed into lacteals.
Villi have walls only one cell thick.	The digested nutrients can easily cross the wall to reach the blood capillaries and lacteals.

Part of the canal	Juices secreted	Where made	Enzymes in juice	Substrate	Product	Other substances in juice	Functions of other substances
mouth	saliva	salivary glands	amylase	starch	maltose		
oesophagus	none						
stomach	gastric juice	in pits in wall of stomach	pepsin	proteins	polypeptides	hydrochloric acid	acid environment for pepsin; kills bacteria in food
			rennin (only in young mammals)	milk protein	curdled milk protein		

duodenum	pancreatic juice	pancreas	amylase	starch	maltose	sodium hydrogencarbonate	reduces acidity of chyme
			trypsin	proteins	polypeptides		
			lipase	fats	fatty acids and glycerol		
	bile	liver, stored in gall bladder	none			bile salts	emulsify fats
						bile pigments	excretory products
ileum	no juice secreted; enzymes remain in or on the cells covering the villi	by cells covering the villi	maltase	maltose	glucose		
			sucrase	sucrose	glucose and fructose		
			lactase	lactose	glucose and galactose		
			peptidase	polypeptides	amino acids		
			lipase	fats	fatty acids and glycerol		

All of the digestive juices contain water and mucus. The water is used for the digestion of large molecules to small ones. It is also a solvent for the nutrients and enzymes. Mucus acts as a lubricant. It also forms a covering over the inner surface of the alimentary canal, preventing enzymes from digesting the cells.

All of the digestive juices contain water and mucus. The water is used for the digestion of large molecules to small ones. It is also a solvent for the nutrients and enzymes. Mucus acts as a lubricant. It also forms a covering over the inner surface of the alimentary canal, preventing enzymes from digesting the cells.

animal nutrition

alimentary canal

Large intestine

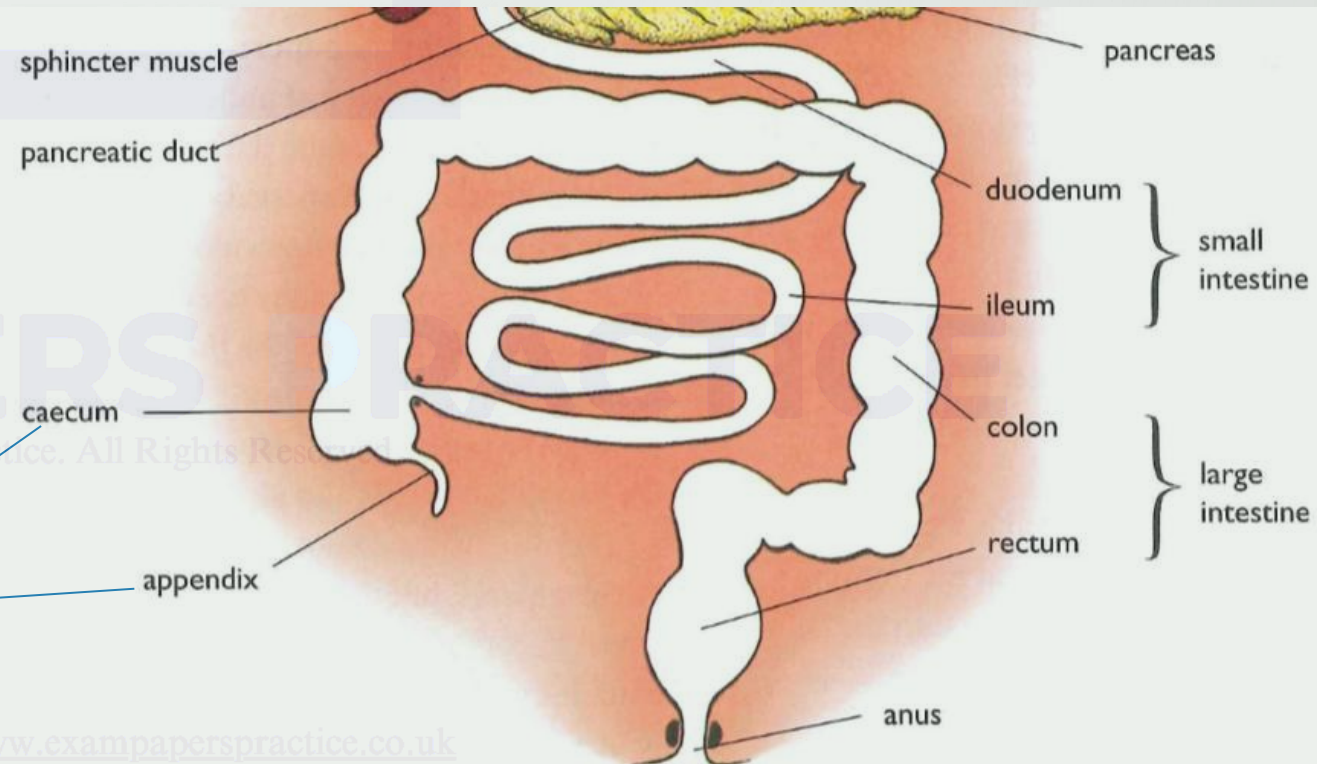
- ◆ colon + rectum
- ◆ undigested food
- ◆ absorb **little** water and salt (in the colon)
- ◆ **faeces**
indigestible food (fibre), bacteria, some dead cells

colon 回肠
rectum 直肠
faeces 粪便
anus 肛门

Egestion

The passing out of food that has not been digested or absorbed, as faeces, through the anus

caecum and appendix
have **no function**

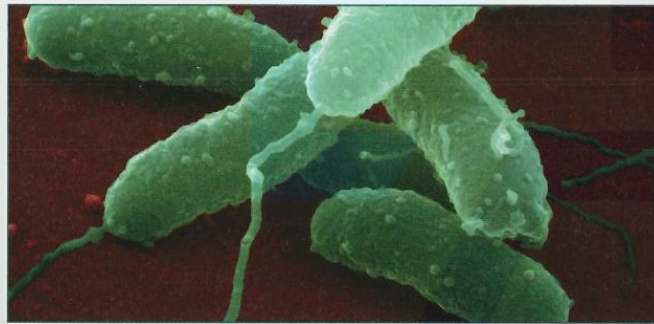


animal nutrition

alimentary canal

diarrhoea — is the loss of watery faeces

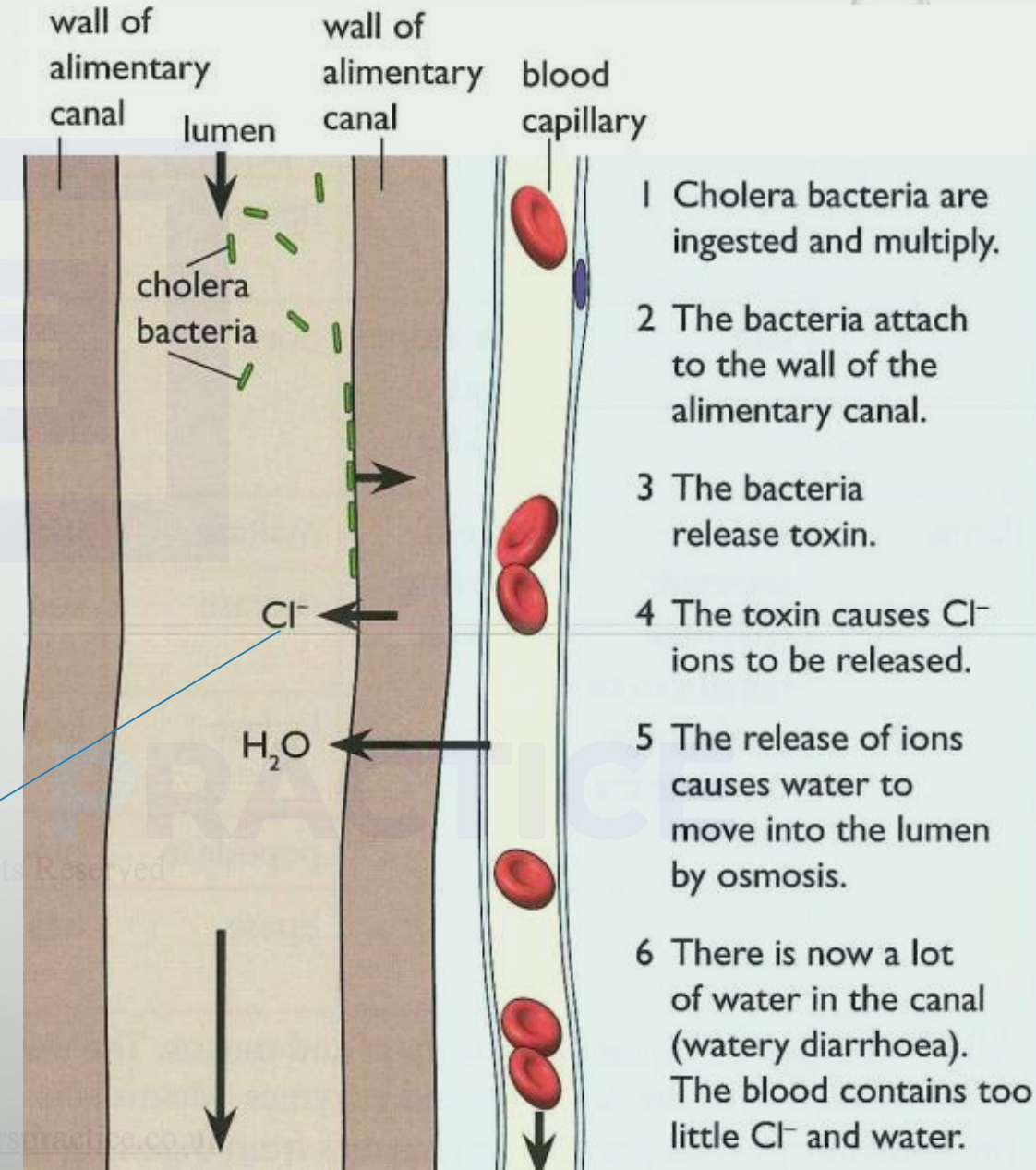
◆ **therapy**: give oral rehydration (contain water with a small amount of salt and sugar)



◆ **cause**: cholera

diarrhoea 腹泻
cholera 霍乱
rehydration 补水

increase the concentration of
the fluid in the lumen



animal nutrition

alimentary canal

ingestion



digestion

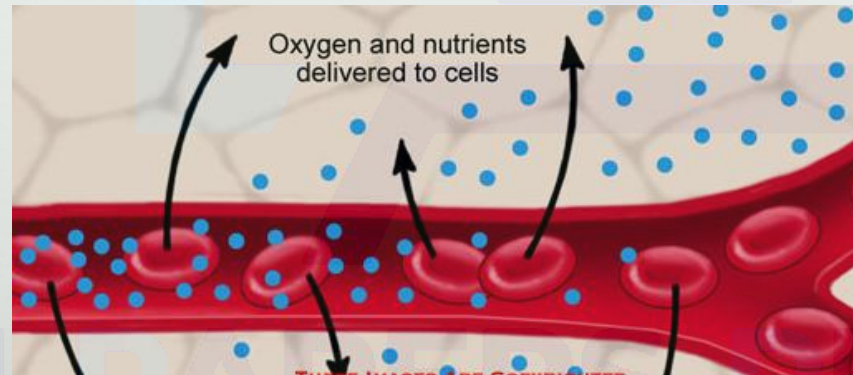


absorption



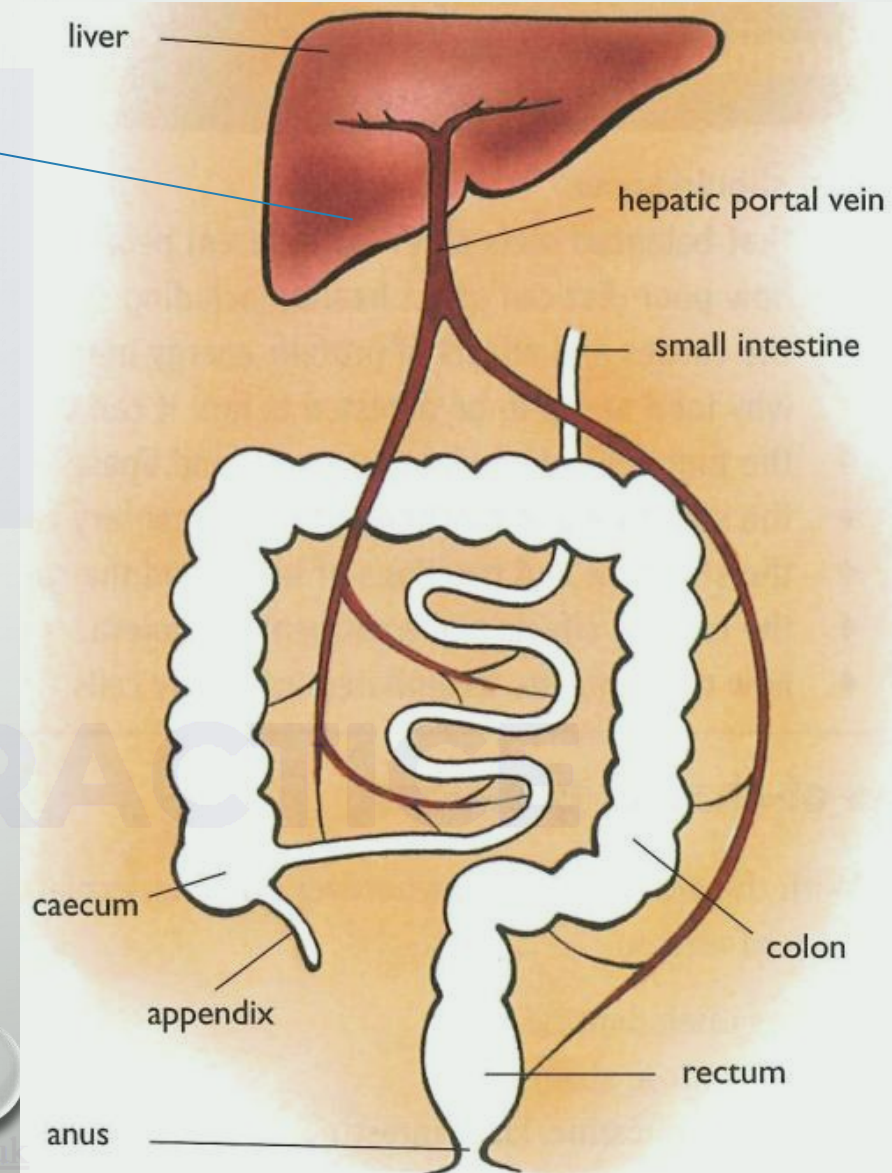
assimilation

glucose(blood) →
glycogen(liver)



Assimilation

The movement of **digested food molecules** **into the cells** of the body where they are used, **becoming part of the cells**.





EXAM PAPERS PRACTICE

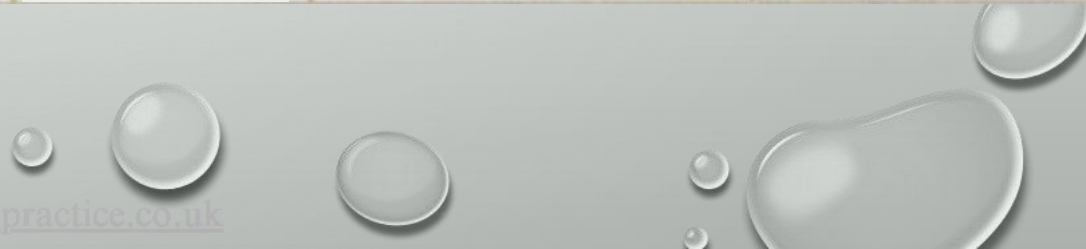
© 2026 Exam Papers Practice. All Rights Reserved

For more help, please visit www.exampaperspractice.co.uk

Feature	How this helps absorption take place
It is very long, about 5 m in an adult human.	
It has villi. Each villus is covered with cells which have even smaller projections on them, called microvilli.	
Villi contain blood capillaries.	
Villi contain lacteals, which are part of the lymphatic system.	
Villi have walls only one cell thick.	

© 2026 Exam Papers Practice. All Rights Reserved

EXAM PAPERS PRACTICE



Part of the canal	Juices secreted	Where made	Enzymes in juice	Substrate	Product	Other substances in juice	Functions of other substances
duodenum							

Part of the canal	Juices secreted	Where made	Enzymes in juice	Substrate	Product	Other substances in juice	Functions of other substances
ileum							

© 2026 Exam Papers Practice. All Rights Reserved

All of the digestive juices contain water and mucus. The water is used for the digestion of large molecules to small ones. It is also a solvent for the nutrients and enzymes. Mucus acts as a lubricant. It also forms a covering over the inner surface of the alimentary canal, preventing enzymes from digesting the cells.