Exercise walk-through

2.1 Principles of organisation and digestion (4.2.1–4.2.2.1, RP4)

AQA · GCSE · Biology

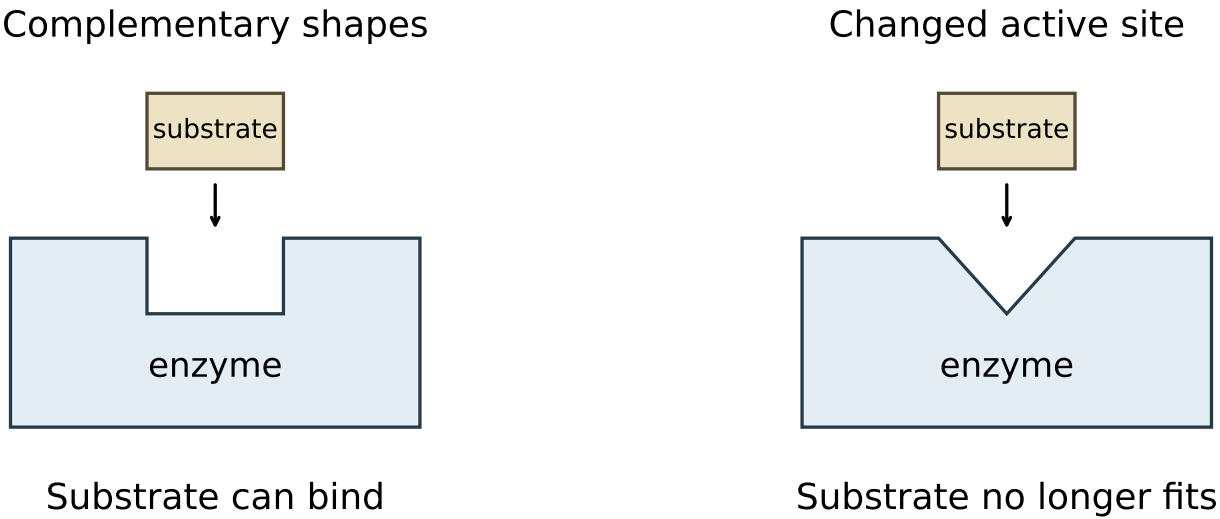
Levels of organisation

- a **tissue** is a group of cells with a similar structure and function, such as muscle **tissue**;
- an **organ** is a group of different tissues working together, such as the stomach;
- an **organ system** is a group of organs working together, such as the digestive system.

Enzymes and digestion

- it is alkaline, so it neutralises the hydrochloric acid from the stomach, giving the alkaline conditions that enzymes in the small intestine work best in;
- it **emulsifies** fat, breaking large drops into many small droplets. This gives a larger surface area for **lipase** to act on, so fat is digested faster.

Figure: Enzymes and digestion



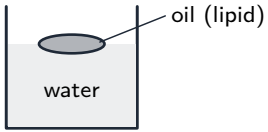
- Lock and key: the **substrate** fits the **active site**; after **denaturation** the changed active site no longer fits
- Match each part of the diagram to the text.

Exercises 2.1·2.2

2.1 Write these in order from smallest to largest. [2]

organ | cell | organ system | tissue

2.2 Name the enzyme that digests lipids. Name the products. [2]



Exercises 2.1·2.2

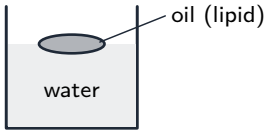
2.1 Write these in order from smallest to largest. [2]

organ | cell | organ system | tissue

2.1

- cell → tissue; → organ → organ system

2.2 Name the enzyme that digests lipids. Name the products. [2]



2.2

- **lipase**; fatty acids and glycerol

Exercise 2.3

2.3 A student tests a food. Tube A has iodine solution. Tube B has biuret solution. Give the result in each tube if the food contains starch but no protein. [2]



Exercise 2.3

2.3 A student tests a food. Tube A has iodine solution. Tube B has biuret solution. Give the result in each tube if the food contains starch but no protein. [2]

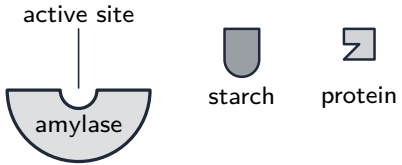


2.3

- A: turns **blue-black**; B: stays **blue**

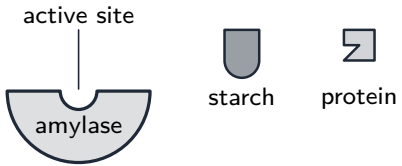
Exercise 3.1

3.1 The diagram shows amylase and two molecules. Use the lock and key model to explain why amylase breaks down starch but not protein. [3]



Exercise 3.1

3.1 The diagram shows amylase and two molecules. Use the lock and key model to explain why amylase breaks down starch but not protein. [3]

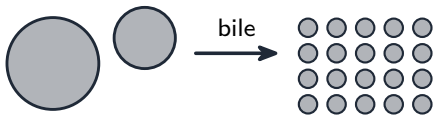


3.1

- the active site has a particular shape
- only starch fits (is complementary to) the active site
- protein is a different shape, so it does not fit and is not broken down

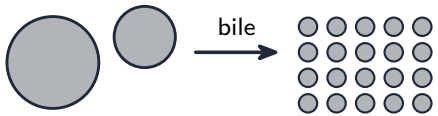
Exercise 3.2

3.2 Bile is released into the small intestine. Explain **two** ways that bile helps the digestion of fats. [3]



Exercise 3.2

3.2 Bile is released into the small intestine. Explain **two** ways that bile helps the digestion of fats. [3]



3.2

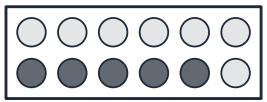
- bile emulsifies fats into small droplets
- this gives a larger surface area for lipase to act on, so fats are digested faster
- bile is alkaline and neutralises stomach acid, so the pH is right for lipase in the small intestine

Exercise 3.3 (a)

3.3 A student investigates how pH affects amylase. Every 10 s she puts a drop of the mixture of starch and amylase onto iodine in a spotting tile. She records the time until the starch has gone.

pH	**4**	**5**	**6**	**7**	**8**
time until starch has gone / s	300	90	40	30	70

(a) How does the student know when all the starch has gone? [2]

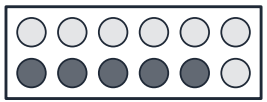


Exercise 3.3 (a)

3.3 A student investigates how pH affects amylase. Every 10 s she puts a drop of the mixture of starch and amylase onto iodine in a spotting tile. She records the time until the starch has gone.

pH	**4**	**5**	**6**	**7**	**8**
time until starch has gone / s	300	90	40	30	70

(a) How does the student know when all the starch has gone? [2]



(a) the iodine stays orange-brown; it no longer turns blue-black

Exercise 3.3 (b)

3.3 A student investigates how pH affects amylase. Every 10 s she puts a drop of the mixture of starch and amylase onto iodine in a spotting tile. She records the time until the starch has gone.

pH	**4**	**5**	**6**	**7**	**8**
time until starch has gone / s	300	90	40	30	70

(b) Calculate the rate of reaction at pH 6 and at pH 8. Use rate $= \frac{1000}{\text{time}}$. [3]

Exercise 3.3 (b)

3.3 A student investigates how pH affects amylase. Every 10 s she puts a drop of the mixture of starch and amylase onto iodine in a spotting tile. She records the time until the starch has gone.

pH	**4**	**5**	**6**	**7**	**8**
time until starch has gone / s	300	90	40	30	70

(b) Calculate the rate of reaction at pH 6 and at pH 8. Use rate $= \frac{1000}{\text{time}}$. [3]

(b) pH 6: $1000 \div 40 = \mathbf{25}$; pH 8: $1000 \div 70 = \mathbf{14}$ s^{-1}

Exercise 3.3 (c)

3.3 A student investigates how pH affects amylase. Every 10 s she puts a drop of the mixture of starch and amylase onto iodine in a spotting tile. She records the time until the starch has gone.

pH	**4**	**5**	**6**	**7**	**8**
time until starch has gone / s	300	90	40	30	70

(c) Explain why the reaction is very slow at pH 4. [2]

Exercise 3.3 (c)

3.3 A student investigates how pH affects amylase. Every 10 s she puts a drop of the mixture of starch and amylase onto iodine in a spotting tile. She records the time until the starch has gone.

pH	**4**	**5**	**6**	**7**	**8**
time until starch has gone / s	300	90	40	30	70

(c) Explain why the reaction is very slow at pH 4. [2]

(c) the pH changes the shape of the active site (the enzyme is denatured); so starch no longer fits and fewer substrate molecules are broken down

Exercise 3.3 (d)

3.3 A student investigates how pH affects amylase. Every 10 s she puts a drop of the mixture of starch and amylase onto iodine in a spotting tile. She records the time until the starch has gone.

pH	**4**	**5**	**6**	**7**	**8**
time until starch has gone / s	300	90	40	30	70

(d) A person eats a cheese sandwich. Explain how the starch, protein and fat are digested and absorbed in the digestive system. [6]

Exercise 3.3 (d)

3.3 A student investigates how pH affects amylase. Every 10 s she puts a drop of the mixture of starch and amylase onto iodine in a spotting tile. She records the time until the starch has gone.

pH	**4**	**5**	**6**	**7**	**8**
time until starch has gone / s	300	90	40	30	70

(d) A person eats a cheese sandwich. Explain how the starch, protein and fat are digested and absorbed in the digestive system. [6]

(d) points to include:

- amylase from the salivary glands starts to break starch into sugars in the mouth
- in the stomach, protease and hydrochloric acid start to break proteins into amino acids
- the pancreas releases amylase, protease and lipase into the small intestine
- bile from the liver (stored in the gall bladder) neutralises acid and emulsifies the fat; lipase makes fatty acids and glycerol
- the small molecules are absorbed through the villi of the small intestine into the blood
- villi give a large surface area, a thin wall and a good blood supply

Levels: **5–6** a full, logical answer with correct biology and correct terms; **3–4** several correct points, partly linked; **1–2** one or two relevant points.