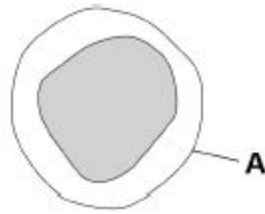


1

Figure 1 shows one type of white blood cell.

Figure 1



(a) What is structure **A**?

Tick **one** box.

Cell membrane

Cell wall

Cytoplasm

Nucleus

(1)

(b) White blood cells help to defend the body against pathogens.

How do the white blood cells do this?

Tick **three** boxes.

Clone pathogens

Engulf pathogens

Produce antibiotics

Produce antibodies

Produce antitoxins

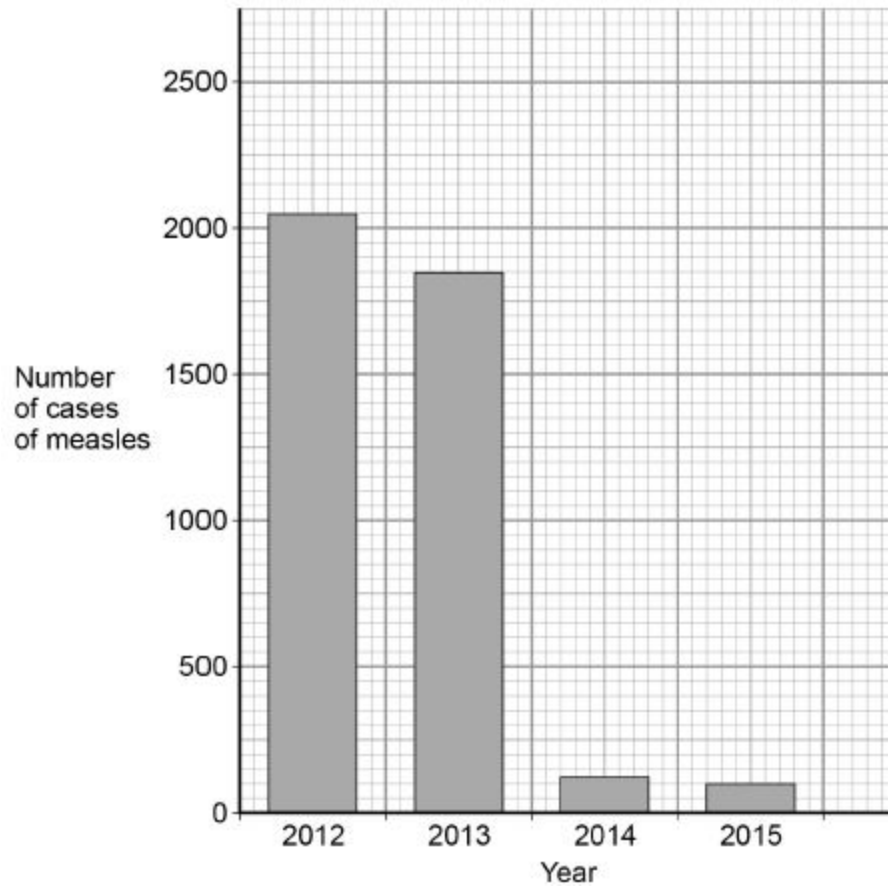
Produce toxins

**(3)**

Measles is a serious disease. A person can die from measles.

**Figure 2** shows the number of cases of measles in England and Wales between 2012 and 2015

**Figure 2**



(c) Use **Figure 2** to calculate the decrease in the number of cases of measles between 2012 and 2015

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Answer = \_\_\_\_\_ cases

(2)

(d) Suggest **one** reason for the decrease in the number of cases of measles between 2012 and 2015

---

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(1)

(e) Antibiotics **cannot** be used to treat measles.

Suggest why.

---

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(1)

(f) Gonorrhoea is a disease caused by a bacterium.

Gonorrhoea **can** be treated with antibiotics.

Give **one** other way to control the spread of gonorrhoea.

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(1)

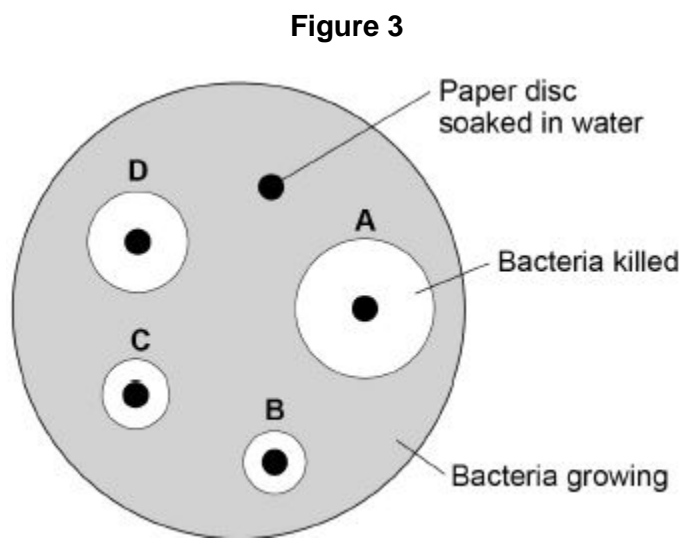
A scientist investigated how effective different antibiotics were at killing gonorrhoea bacteria.

This is the method used.

1. Grow gonorrhoea bacteria on agar in a Petri dish.
2. Place one paper disc soaked in water onto the agar.
3. Place four other paper discs, each soaked in a different antibiotic, **A**, **B**, **C**, and **D**, onto the agar.
4. Use the same sized paper discs and the same concentration of each antibiotic.
5. Incubate the Petri dish for 3 days.

**Figure 3** shows the scientist's results.

A clear area around the disc means the antibiotic has killed the bacteria.



(g) Give **one** control variable the scientist used.

---

---

(1)

(h) Suggest why **one** disc was soaked in water.

---

---

(1)

(i) Which antibiotic in **Figure 3** would be the best to treat gonorrhoea?

Give a reason for your answer.

Antibiotic \_\_\_\_\_

Reason \_\_\_\_\_

---

(2)

(Total 13 marks)

**2**

When an organism grows, new cells are produced by cell division.

(a) What type of cell division happens to produce new body cells?

Tick **one** box.

Differentiation

Meiosis

Mitosis

(1)

(b) Why can cancers grow very large?

Tick **one** box.

Cancer cells are specialised

Cell division is slow

Cell division is uncontrolled

(1)

(c) Give **one** factor which increases the risk of getting cancer.

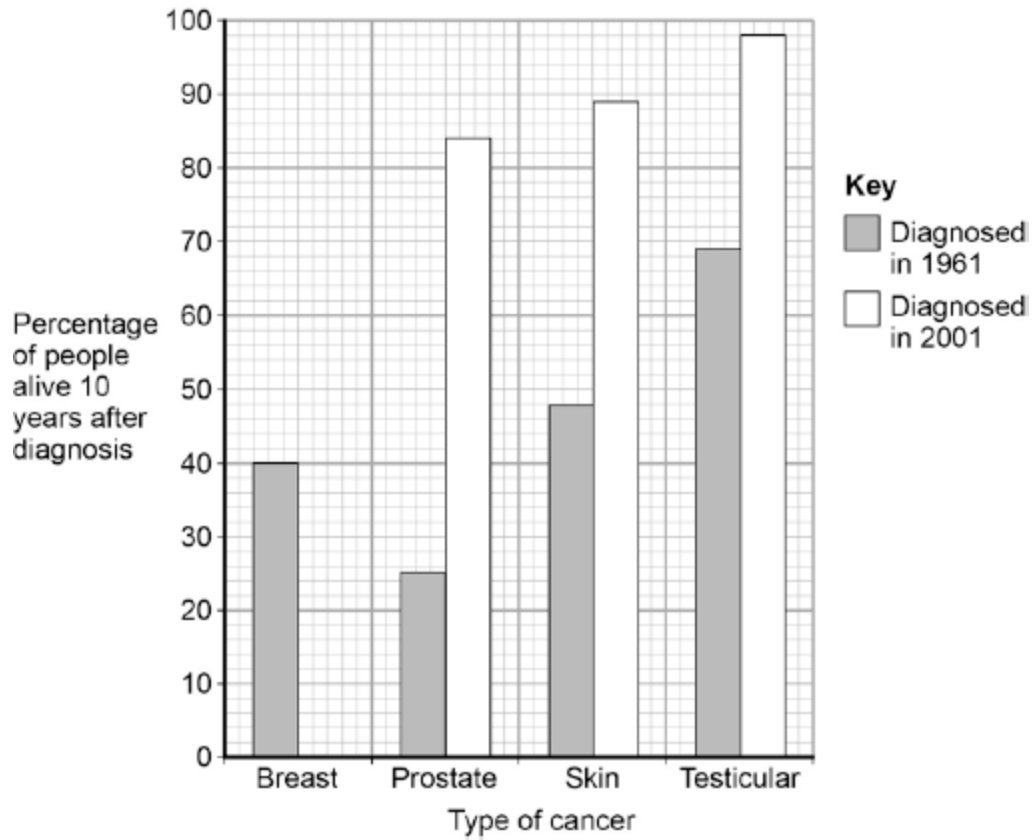
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(1)

(d) Survival rates for people with cancer have improved a lot.

People who are alive 10 years after diagnosis are usually considered to be cured.

The figure below shows data for people diagnosed with cancer in 1961 and 2001.



78% of people diagnosed with breast cancer in 2001 were alive 10 years later.

Complete the figure above to show this information.

(1)

(e) Which type of cancer diagnosed in 1961 had the highest survival rate?

Tick **one** box.

Breast

Prostate

Skin

Testicular

(1)

(f) Which type of cancer shows the biggest improvement in the percentage of people alive after 10 years?

Tick **one** box.

- Breast
- Prostate
- Skin
- Testicular

(1)

(g) Suggest **two** reasons why the survival rates for all cancers have increased.

- 1. \_\_\_\_\_  
\_\_\_\_\_
- 2. \_\_\_\_\_  
\_\_\_\_\_

(2)

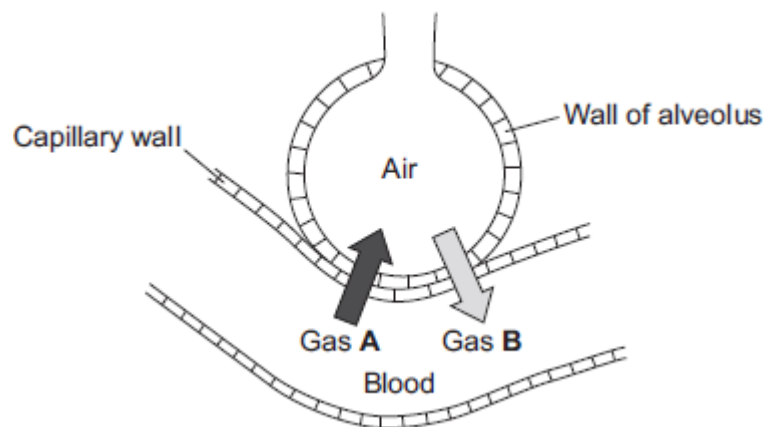
(Total 8 marks)

**3**

Gas exchange takes place in the lungs.

The diagram shows an alveolus next to a blood capillary in a lung.

The arrows show the movement of two gases, **A** and **B**.





(a) (i) Draw a ring around the correct answer to complete the sentence.

Gases **A** and **B** move by

- diffusion.
- osmosis.
- respiration.

(1)

(ii) Gas **A** moves from the blood to the air in the lungs.

Gas **A** is then breathed out.

Name Gas **A**.

\_\_\_\_\_

(1)

(iii) Which cells in the blood carry Gas **B**?

Draw a ring around the correct answer.

**platelets**

**red blood cells**

**white blood cells**

(1)

(b) The average number of alveoli in each human lung is 280 million.

The average surface area of 1 million alveoli is  $0.25 \text{ m}^2$ .

Calculate the total surface area of a human lung.

\_\_\_\_\_

Answer \_\_\_\_\_  $\text{m}^2$

(2)

(c) An athlete trains to run a marathon. The surface area of each of the athlete's lungs has increased to  $80 \text{ m}^2$ .

Give **one** way in which this increase will help the athlete.

\_\_\_\_\_

\_\_\_\_\_

(1)

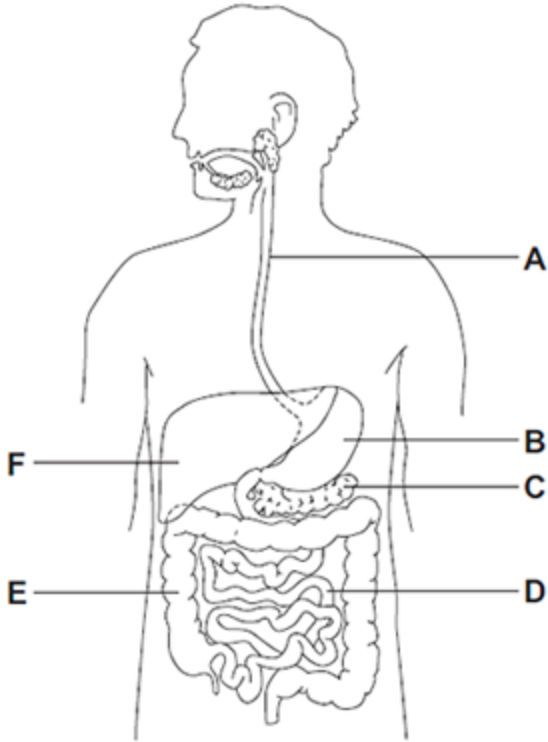
(Total 6 marks)

4

The digestive system breaks down food into small molecules.

The small molecules can be absorbed into the blood.

The diagram below shows the human digestive system.



(a) (i) Which letter, **A**, **B**, **C**, **D**, **E** or **F**, shows each of the following organs?

Write **one** letter in each box.

large intestine

small intestine

stomach

(3)

(ii) Different organs in the digestive system have different functions.

Draw **one** line from each function to the organ with that function.

Function	Organ
Digestion of fat	Large intestine
Absorption of water into the blood	Liver
Production of hydrochloric acid	Small intestine
	Stomach

(3)

(b) Glucose is absorbed into the blood in the small intestine.

Most of the glucose is absorbed by diffusion.

How does the glucose concentration in the blood compare to the glucose concentration in the small intestine?

Tick (✓) **one** box.

The concentration in the blood is higher.

The concentration in the blood is lower.

The concentration in the blood is the same.

(1)

(Total 7 marks)

5

Coronary heart disease (CHD) is a non-communicable disease.

CHD is caused when fatty material builds up in the coronary arteries.

(a) Explain what a non-communicable disease is.

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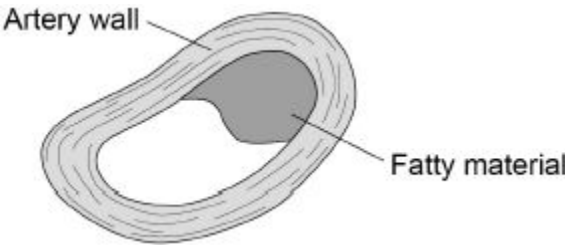
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(2)

The diagram below shows a coronary artery of someone with CHD.



(b) Explain how CHD can cause a heart attack.

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(3)

(c) Explain how lifestyle and medical risk factors increase the chance of developing CHD.

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**(6)**  
**(Total 11 marks)**

6

Amylase is an enzyme that digests starch.

A student investigated the effect of pH on the activity of amylase.

This is the method used.

1. Mix amylase solution and starch suspension in a boiling tube.
2. Put the boiling tube into a water bath at 25 °C.
3. Remove a drop of the mixture every 30 seconds and test it for the presence of starch.
4. Repeat the investigation at different pH values.

The table below shows the students' results.

pH	Time when no starch was detected in minutes
5.0	7.0
5.5	4.5
6.0	3.0
6.5	2.0
7.0	1.5
7.5	1.5
8.0	2.0

- (a) The student concluded pH 7.25 was the optimum pH for the amylase enzyme.

This is **not** a valid conclusion.

Suggest **two** reasons why.

1. \_\_\_\_\_

\_\_\_\_\_

2. \_\_\_\_\_

\_\_\_\_\_

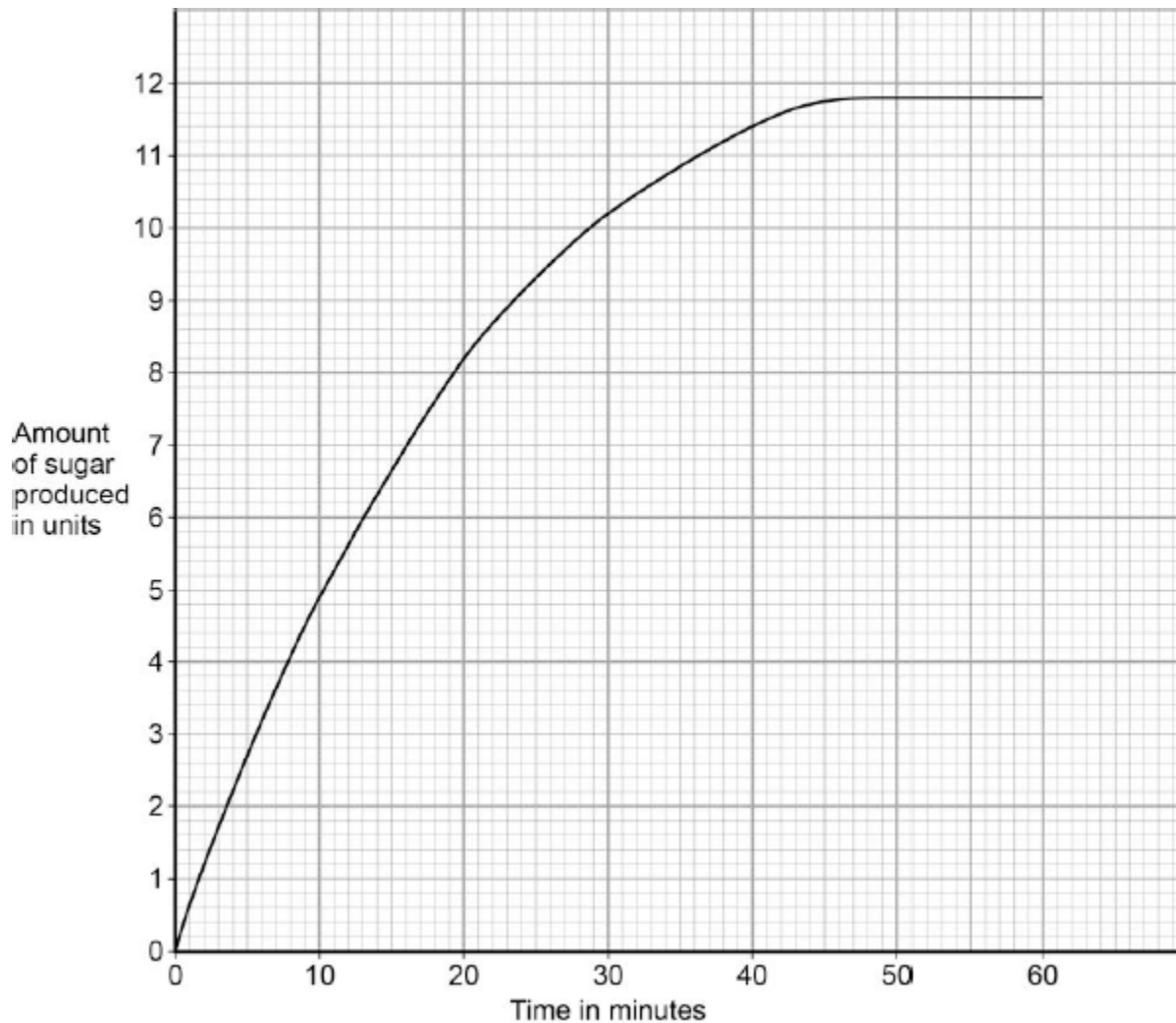
(2)

(b) The student did another investigation.

This is the method used.

1. Put amylase solution and starch suspension into a boiling tube.
2. Make the pH 7.25.
3. Put the boiling tube into a water bath at 25 °C.
4. Measure the amount of sugar produced every 30 seconds.

The results are shown in the figure below.



Calculate the mean rate of sugar produced per minute during the first 5 minutes.

---

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Mean rate = \_\_\_\_\_ units per minute

(2)

- (c) Iodine solution is added to a sample taken from the boiling tube after 10 minutes and 60 minutes.

Suggest what you would see in these samples.

After 10 minutes \_\_\_\_\_

\_\_\_\_\_

.After 60 minutes \_\_\_\_\_

\_\_\_\_\_

**(2)**

- (d) The scientist repeated the investigation at 37 °C.

Draw a line on the figure above to show the predicted results.

**(2)**

**(Total 8 marks)**



## Mark schemes

- 1** (a) cell membrane  
*extra ticks negates marks* 1
- (b) engulf pathogens 1
- produce antibodies 1
- produce antitoxins 1
- extra ticks negates marks*
- (c) 2050 – 100 1
- = 1950
- allow 1 mark for a correct subtraction of incorrect values* 1
- an answer of 1950 scores 2 marks*
- (d) any **one** from:
- (more) people vaccinated  
*ignore injections / treatments / medicines unqualified*  
*allow vaccine produced*  
*allow (more people given) MMR (vaccine)*  
*do **not** allow antibiotics*  
*ignore less people infected*
  - (more) people immune
  - no new measles strain
- 1
- (e) any **one** from:
- measles is (caused by) a virus  
*allow measles is not caused by a bacterium*
  - viruses cannot be killed / destroyed by antibiotics  
*allow antibiotics **only** kill / destroy bacteria*  
*ignore harmed / treated*
- 1

- (f) any **one** from:
- use of a barrier method of contraception  
*ignore use of diaphragm*
  - use of a condom  
*ignore use protection / safe sex*
  - vaccination / immunisation
  - avoid sexual intercourse / contact  
*do **not** accept less sexual intercourse / contact*
- 1
- (g) any **one** from:
- size / shape/ type of paper disc  
*ignore paper disc unqualified*
  - concentration of antibiotic  
*allow strength / dosage of antibiotic*
  - volume / amount of antibiotic
  - (incubation) time  
*allow 3 days*
  - (incubation) temperature  
*ignore size of petri dish*
- 1
- (h) to check that the disc / water did not have an effect  
**or**  
to make sure it was the antibiotic that had an effect  
*allow for comparison with the antibiotics*  
*allow as a (experimental) control*  
*do **not** accept as a control variable*
- 1
- (i) (antibiotic) **A**  
*no marks if wrong antibiotic given*
- 1
- any **one** from:
- (antibiotic **A**) had the **largest** clear area around it
  - (antibiotic **A**) killed the **most** bacteria
- 1
- [13]**
- 2** (a) mitosis  
*extra box ticked negates mark*
- 1
- (b) cell division is uncontrolled  
*extra box ticked negates mark*
- 1

(c) any **one** from:

- smoking / tar
- alcohol
- carcinogens  
*allow named chemical*
- viruses (living in cells)
- (ionising) radiation  
*accept UV / X-rays / gamma waves*

1

(d) bar plotted at 78%

*ignore width of bar*

1

(e) testicular

*extra box ticked negates mark*

1

(f) prostate

*extra box ticked negates mark*

1

(g) any **two** from:

- improved treatment / drugs
- earlier diagnosis
- more cancer screening
- improved patient knowledge (of risk factors)  
*allow improved patient diet / lifestyle*

2

**[8]**

**3**

(a) (i) diffusion

1

(ii) carbon dioxide

*accept CO<sub>2</sub> / CO<sub>2</sub>*

*do **not** accept CO<sup>2</sup>*

1

(iii) red blood cells

1

(b) 70

*if no / incorrect answer then*

*70 000 000*

**or**

*280 x 0.25 gains 1 mark*

*ignore doubling the answer*

2

- (c) allows more gas / oxygen / CO<sub>2</sub>  
(exchange)

*do not accept air*

1

[6]

4

- (a) (i) large intestine = E

small intestine = D

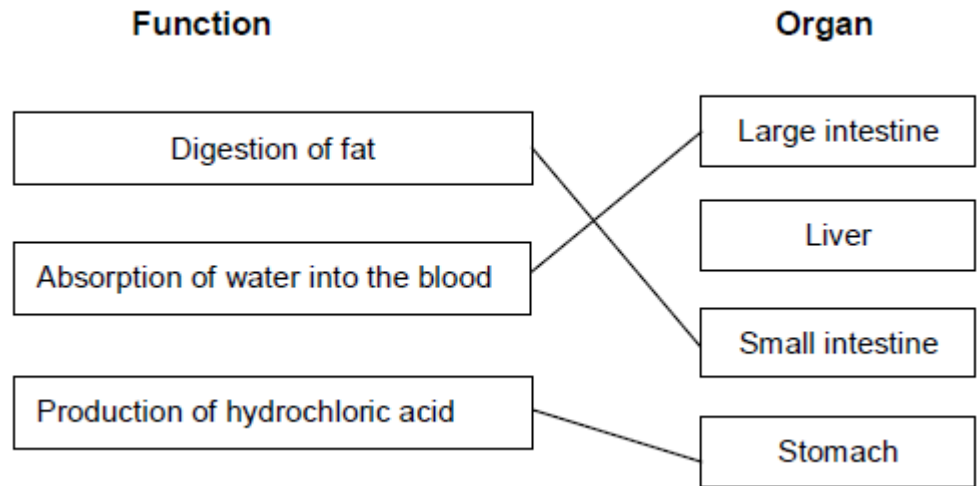
stomach = B

1

1

1

- (ii)



*extra lines cancel*

3

- (b) The concentration in the blood is lower.

1

[7]

5

- (a) is not caused by a pathogen / infective organism

*allow not caused by a microorganism / microbe*

*ignore not caused by infection*

*ignore named pathogen unless bacteria, virus and fungus all mentioned*

1

- (so) is not passed / spread (from person to person)

*allow cannot be spread / caught*

*allow is not infectious / contagious*

1

(b) reduced / restricted / stopped blood flow  
*it does not matter where blood flow is restricted to – heart / body* 1

(so) less oxygen reaches heart (muscle / cells)  
*must reference heart / it*  
*allow no oxygen reaches the heart (muscle / cells)* 1

(so heart muscle / cells) cannot respire (enough)

**or**

(so heart muscle / cells) do not release (enough) energy  
*do **not** accept do not make / produce / create energy*  
*ignore references to breathing / suffocation*  
*ignore blood clots / blockages*  
  
*allow 'it' for heart* 1

(c) **Level 3:** Relevant points (factors / effects) are identified, given in detail and logically linked to form a clear account. 5–6

**Level 2:** Relevant points (factors / effects) are identified and there are attempts at logical linking. The resulting account is not fully clear. 3–4

**Level 1:** Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking. 1–2

**No relevant content** 0

**Indicative content**

**medical risk factors:**

- high blood pressure
- high cholesterol
- diabetes
- genetic factors
- medications

**lifestyle risk factors:**

- smoking
- obesity
- lack of exercise
- high fat / energy diet
- eating insufficient fruit / vegetables
- alcohol
- high salt intake
- exposure to air pollution
- certain drugs / correct named drug

**examples of links:**

- smoking – high bp / cholesterol / fatty deposition
- obesity – lack of exercise / high bp / cholesterol / fatty deposition / diabetes
- exercise – obesity / bp / diabetes
- diet – obesity / cholesterol / diabetes
- alcohol – bp / cholesterol
- high salt intake – high blood pressure
- genetic factors – bp / cholesterol / diabetes / obesity
- medication – can affect blood / blood vessels / metabolism

the main discriminator is the quality of linking  
both lifestyle and medical factors are required for **level 3**

[11]

6

(a) any **two** from:

- same result at pH 7 and 7.5  
**or**  
could be any pH between 7 and 7.5  
**or**  
not tested at pH 7.25  
**or**  
need to test at smaller pH intervals (between 7 and 7.5)
- accuracy of result only to nearest 0.5 minutes
- no repeats
- difficult to determine end point (colour)

2

(b) 2.7 / 5

1

0.54 (units per minute)

*allow 0.52 with no working shown for 2 marks*

1

*allow 1 mark for 0.52 **or** 0.56*

(c) (after 10 minutes) solution goes black

1

(after 60 minutes) solution stays the same

**or**

does not go black

**or**

goes slightly orange

1

(d) steeper curve

1

levels off at 11.8 units **and** before 45 minutes

1

**[8]**