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F

Tuesday 17 May 2022 – Morning

GCSE (9–1) Biology A (Gateway Science)

J247/01 Paper 1 (Foundation Tier)

Time allowed: 1 hour 45 minutes

You must have:
- a ruler (cm/mm)

You can use:
- a scientific or graphical calculator
- an HB pencil

Please write clearly in black ink. **Do not write in the barcodes.**

Centre number | | | | | | Candidate number | | | | |

First name(s) _____

Last name _____

INSTRUCTIONS
- Use black ink. You can use an HB pencil, but only for graphs and diagrams.
- Write your answer to each question in the space provided. If you need extra space use the lined pages at the end of this booklet. The question numbers must be clearly shown.
- Answer **all** the questions.
- Where appropriate, your answer should be supported with working. Marks might be given for using a correct method, even if your answer is wrong.

INFORMATION
- The total mark for this paper is **90**.
- The marks for each question are shown in brackets **[ ]**.
- Quality of extended response will be assessed in questions marked with an asterisk (*).
- This document has **28** pages.

ADVICE
- Read each question carefully before you start your answer.

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SECTION A

Answer **all** the questions.

You should spend a maximum of 30 minutes on this section.

Write your answer to each question in the box provided.

1 What does one DNA nucleotide consist of?

A A phosphate and sugar backbone

B A sugar, a phosphate and a base

C Four bases, A, C, T and G

D Two different sugars and a base

Your answer ☐ **[1]**

2 Which molecule is produced in **both** aerobic and anaerobic respiration in animals?

A ATP

B Glucose

C Lactic acid

D Oxygen

Your answer ☐ **[1]**

3 What do electron microscopes have that allow scientists to see cells in greater detail?

A A high magnification and a high resolution

B A high magnification and a low resolution

C A low magnification and a high resolution

D A low magnification and a low resolution

Your answer ☐ **[1]**

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4 Which blood vessels have valves along their length?

A Arteries and capillaries

B Arteries, veins and capillaries

C Capillaries

D Veins

Your answer ☐ **[1]**

5 When one cell divides by mitosis, how many new cells are produced?

A 1

B 2

C 4

D 8

Your answer ☐ **[1]**

6 What word describes the amino acids that join to make a protein molecule?

A Enzymes

B Monomers

C Nucleotides

D Polymers

Your answer ☐ **[1]**

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7 A student investigates the effect of light intensity on the rate of photosynthesis.

They count the number of gas bubbles released by a plant under water.
The table shows their results.

Light intensity	Number of gas bubbles		
	Repeat 1	**Repeat 2**	**Repeat 3**
Low	6	7	8
Medium	10	10	11
High	13	19	14

Which number could be classed as anomalous (an outlier)?

A 6

B 8

C 11

D 19

Your answer ☐ **[1]**

8 DNA consists of two strands.
This is the base sequence found in one strand:

ATT

Which is the complementary base sequence of the second strand?

A ATT

B CAG

C CGG

D TAA

Your answer ☐ **[1]**

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9 One symptom of diabetes is glucose in the urine.
Which biochemical test is used to confirm the presence of glucose in the urine?

A Benedict's

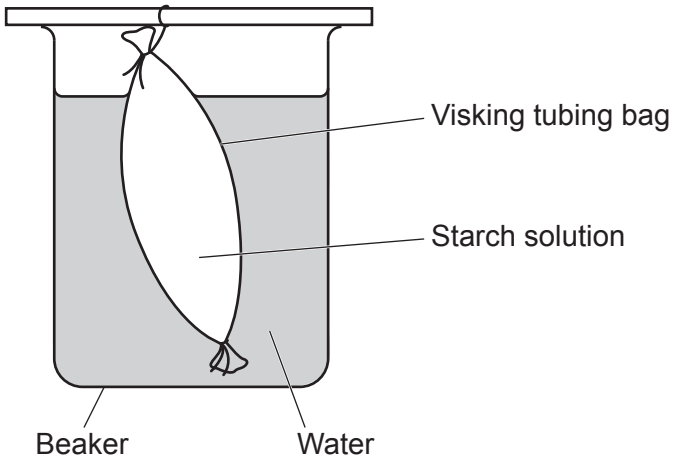
B Biuret

C Ethanol (emulsion)

D Iodine

Your answer ☐ **[1]**

10 Visking tubing is made of a selectively permeable membrane.
A visking tubing bag containing starch solution is placed in a beaker of water.



What will happen?

A Nothing will happen.

B Starch will leave the visking tubing bag.

C Water will enter the visking tubing bag.

D Water will leave the visking tubing bag.

Your answer ☐ **[1]**

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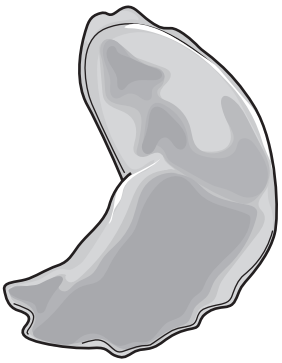
11 The diagram shows a red blood cell from a person who has sickle cell anaemia.
This condition results in red blood cells that are sickle shaped.



People with sickle cell anaemia can feel tired.
Which statement about sickle cells explains why?

A They contain a nucleus.

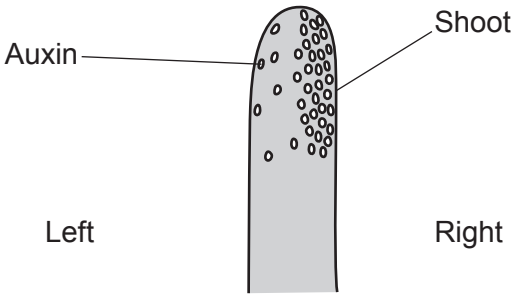
B They have a smaller surface area.

C They have more haemoglobin.

D They leave capillaries and enter tissues.

Your answer ☐ **[1]**

12 The diagram below shows the distribution of auxin in a shoot.



What will happen to the shoot?

A The shoot will bend to the left.

B The shoot will bend to the right.

C The shoot will grow upwards and will not bend.

D The shoot will not grow.

Your answer ☐ **[1]**

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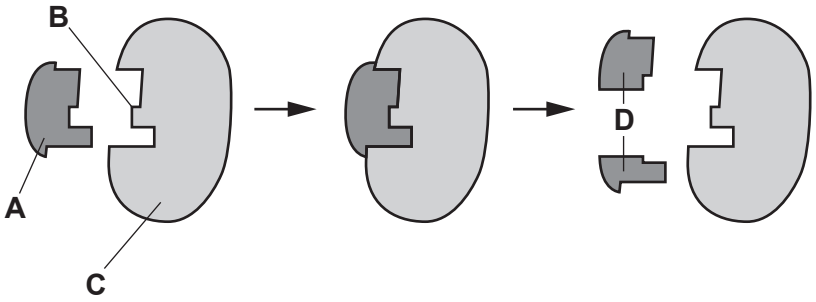
13 The diagram shows the lock and key hypothesis of how enzymes work.



Which letter, **A**, **B**, **C** or **D** represents the active site of the enzyme?

Your answer ☐ **[1]**

14 Which row shows the correct type of reaction for photosynthesis and for respiration?

		Photosynthesis	**Respiration**
Type of Reaction	**A**	endothermic	endothermic
	B	exothermic	exothermic
	C	endothermic	exothermic
	D	exothermic	endothermic

Your answer ☐ **[1]**

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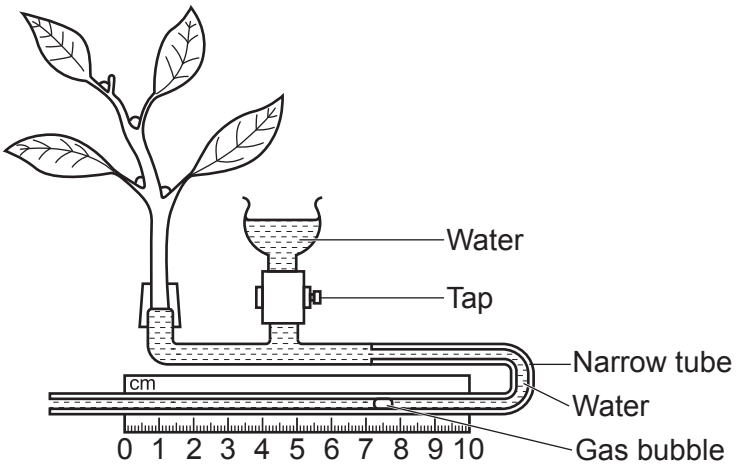
15 The diagram shows a potometer.



A student wants to test the hypothesis that the number of stomata on a plant affects water loss.

They first record the distance the gas bubble moves in 10 minutes.

What should the student do next before taking a second reading to test this hypothesis?

A Cover the plant with a black plastic bag.

B Remove some of the leaves.

C Repeat the test in a warmer room.

D Use an electric fan to move the air.

Your answer ☐ **[1]**

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SECTION B

Answer **all** the questions.

16 A student observes the stages of cell division in cells taken from the root tips of garlic.

They cut a small amount of root tip and squash it onto a microscope slide.

(a) Complete each sentence to describe what they do next. Use words from the list.

coverslip	**eyepiece**	**focus**	**light**
objective	**stage**	**stain**	**water**

To make the chromosomes more visible, the student adds a few drops of ..... .

The slide is then placed on the microscope ..... .

The student first chooses the low power ..... lens.

The student twists a knob on the side of the microscope to bring the image into ..... .

[4]

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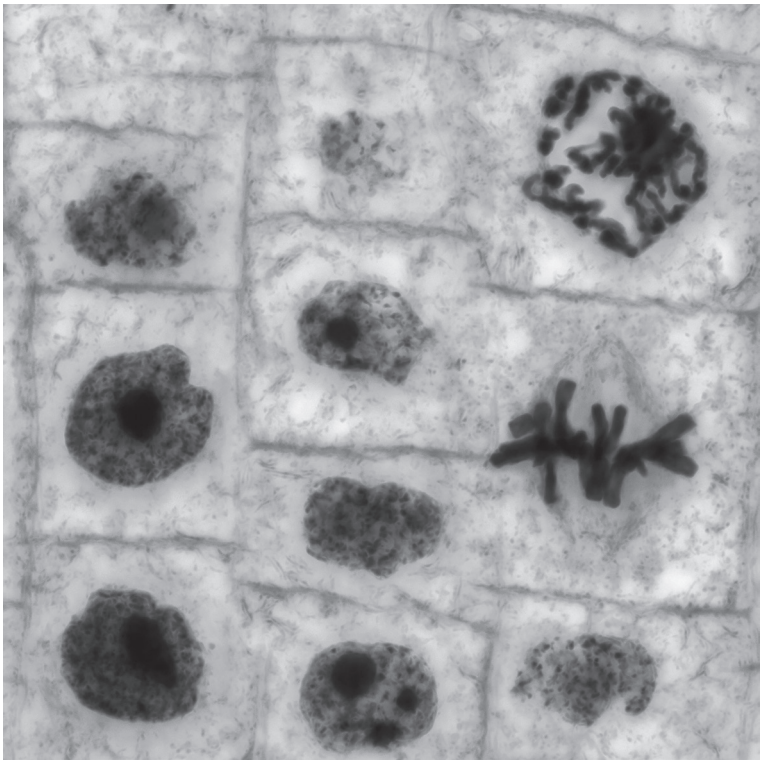
(b) The image shows some of the cells observed by the student.



(i) Identify one cell in the image that shows the chromosomes starting to move apart.

Draw an arrow to this cell on the image. Label the arrow **A**. **[1]**

(ii) Draw a second arrow to identify one nucleus in the image. Label this arrow **N**. **[1]**

(c) Give **one** reason why the tissue for the sample was taken from root tips.

.....

..... **[1]**

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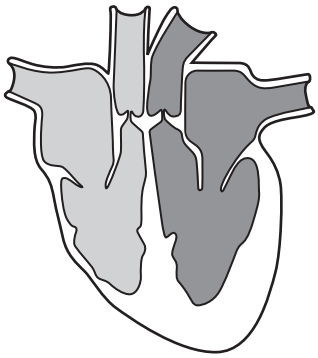
17 **(a)** **Fig. 17.1** shows a section through a human heart.

Fig. 17.1



(i) On **Fig. 17.1** draw an arrow to identify one valve. Label the arrow **V**. **[1]**

(ii) On **Fig. 17.1** draw a second arrow to identify one atrium. Label this arrow **A**. **[1]**

(iii) The left ventricle has more muscle than the right ventricle.

Explain why.

.....

.....

.....

..... **[2]**

(b) The heart circulates blood around the body three times every minute.

Calculate how many times blood will circulate around the body in **one** hour.

Number of times ..... **[2]**

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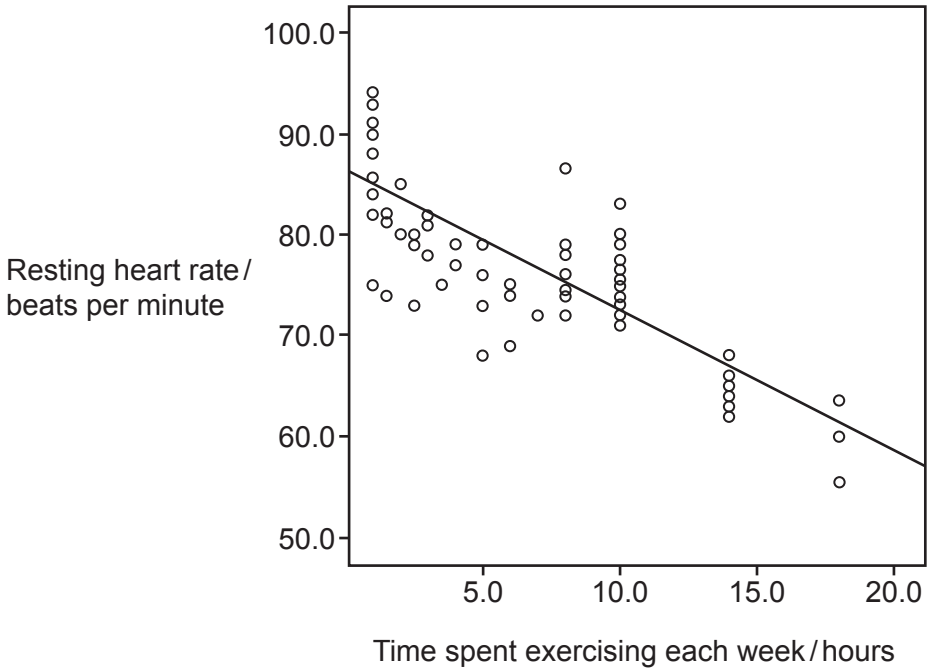
(c) A scientist compares the time spent exercising each week with the resting heart rates of a number of individuals.

Fig. 17.2 shows their results.

Fig. 17.2



Write down **one** conclusion the scientist can make from the data.

.....

..... **[1]**

(d) A student writes some notes about veins:

Veins are large blood vessels that carry blood towards the heart.
They have a smooth lining and a narrow lumen.

The student has made **one** mistake in their notes.
Identify the mistake they have made.

.....

..... **[1]**

(e) The human circulatory system is described as a double circulatory system.
Explain why.

.....

.....

..... **[2]**

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18 Photosynthesis, transpiration and translocation are three processes occurring in plants.

(a) Draw **three** lines to connect each **description** to its correct **process**.

Then draw **three** lines to connect each **process** to the **structure** where that process takes place.

Description	Process	Structure
sunlight is used to make food for the plant	photosynthesis	xylem and stomata
the method of moving sugars around the plant	transpiration	phloem
the loss of water from the leaves of a plant	translocation	chloroplasts

[4]

(b) Complete the word equation for photosynthesis.

carbon dioxide + ... ⟶ glucose + ... **[2]**

(c) Plant cells are eukaryotic cells and bacteria are prokaryotic cells.

Plant cells and bacterial cells have similarities and differences between their structures.

Give **one** similarity and **one** difference.

Similarity .....

Difference .....

[2]

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19 A boat with ten people onboard capsizes and all ten people are found in the sea.

The first aiders at the scene take the body temperature of each of the ten people.

Rescued person	Body temperature after rescue (°C)
1	35.2
2	35.0
3	34.9
4	34.8
5	35.1
6	35.1
7	34.8
8	34.9
9	35.0
10	34.9

(a) **(i)** Calculate the mean temperature of the ten people rescued.

Give your answer to **1** decimal place.

Mean temperature = ... °C **[2]**

(ii) If a person's body temperature is below 35 °C, they are classed as hypothermic.

What percentage of those rescued would be classed as hypothermic?

Percentage hypothermic = ... % **[2]**

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(iii) Describe how the body responds to hypothermia.

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.....

..... **[3]**

(iv) The body needs to maintain a constant body temperature.

Write down **one** other feature of the internal environment of the body that should be kept constant.

..... **[1]**

(b) A study in the British Medical Journal looked at 35 488 people to see if there were differences in individuals' normal body temperatures.

They found the following:

- the mean body temperature was 36.6 °C
- 95% of the population had a body temperature between 35.7 °C and 37.3 °C.

The study did **not** include people with infections or severe illnesses.

(i) The British Medical Journal is a peer-reviewed journal.
Explain why scientists publish their results in peer-reviewed journals.

.....

.....

.....

..... **[2]**

(ii) Explain why the study did **not** include people with infections or severe illnesses.

.....

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..... **[2]**

(iii) Give **one** reason why a study such as this should have a large sample size.

.....

..... **[1]**

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20 **(a)** A person is finding it difficult to read road signs at a distance whilst driving.

(i) Describe the eye defect this person could have.

.....

.....

..... **[2]**

(ii) Suggest how this eye defect can be corrected.

.....

.....

..... **[1]**

(b) Write down the role of the ciliary body in the eye.

.....

..... **[1]**

(c) A condition called dry eye can be caused by damage to the corneal cells in the eye.

- Dry eye can now be treated using stem cells.
- The stem cells are taken from the patient's own tissues and not from a donor.

Suggest why the stem cells used in this treatment are taken from the patient's own tissues.

.....

..... **[1]**

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21* When a fly lands on a horse, the horse's skin shivers.

This response to the fly is a reflex action.

Describe the sequence of events that occurs in the body of the horse to produce this response.

Use ideas about reflex arcs in your answer.

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..... **[6]**

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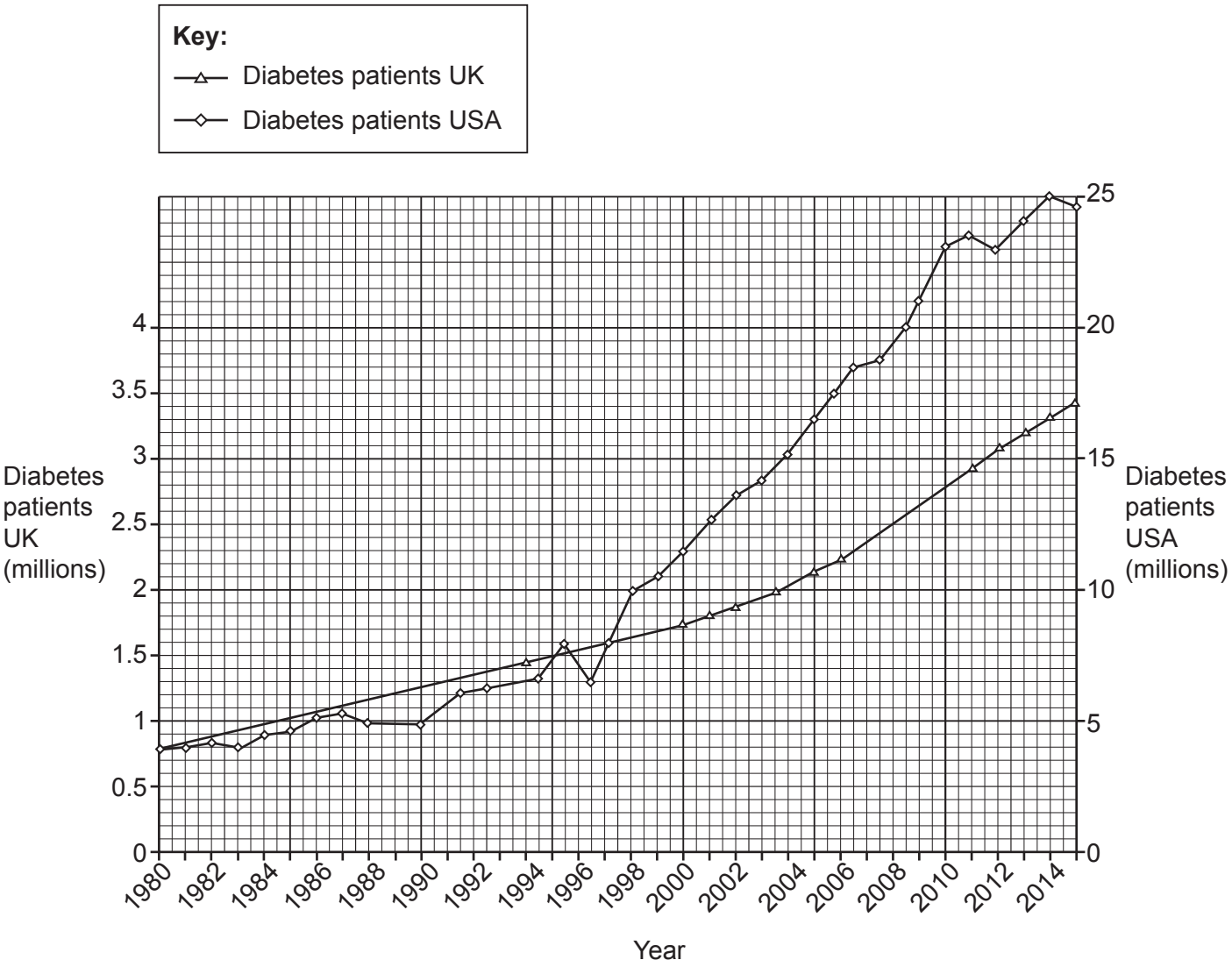
22 The graph shows the number of patients with diabetes in the UK and the USA from 1980 to 2015.



(a) How many patients had diabetes in the UK in the year 2000?

Number = ... million **[1]**

(b) Calculate the difference between the number of patients with diabetes in the UK and the number with diabetes in USA for the year 2000.

Number = ... million **[2]**

(c) Describe how the number of patients with diabetes has changed in **both** countries from 1980 to 2015.

.....

.....

.....

..... **[2]**

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(d) The numbers presented in this graph may not be accurate.

Suggest why.

..... **[1]**

(e) Diabetes can be Type 1 or Type 2.

Describe **two** differences between the treatments for Type 1 and Type 2 diabetes.

1 .....

.....

2 .....

.....
[2]

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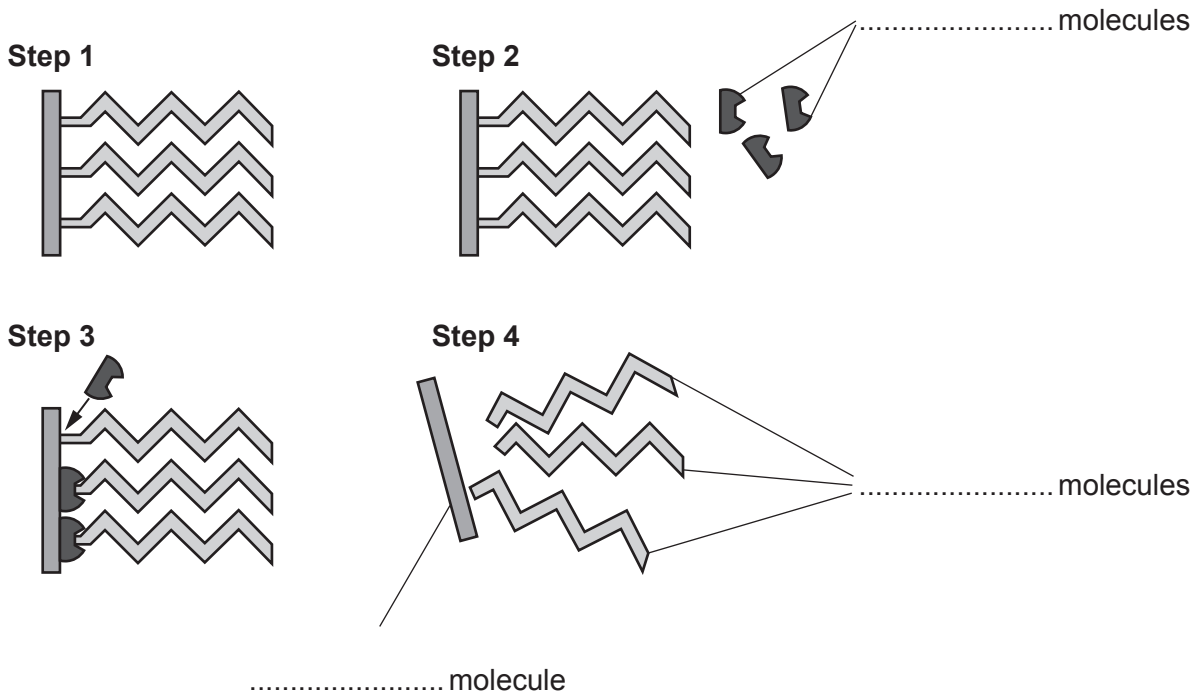
23 Lipase is an enzyme produced in the human digestive system. It breaks down lipids.

(a) **Fig. 23.1** shows the steps in lipid digestion.

Fig. 23.1

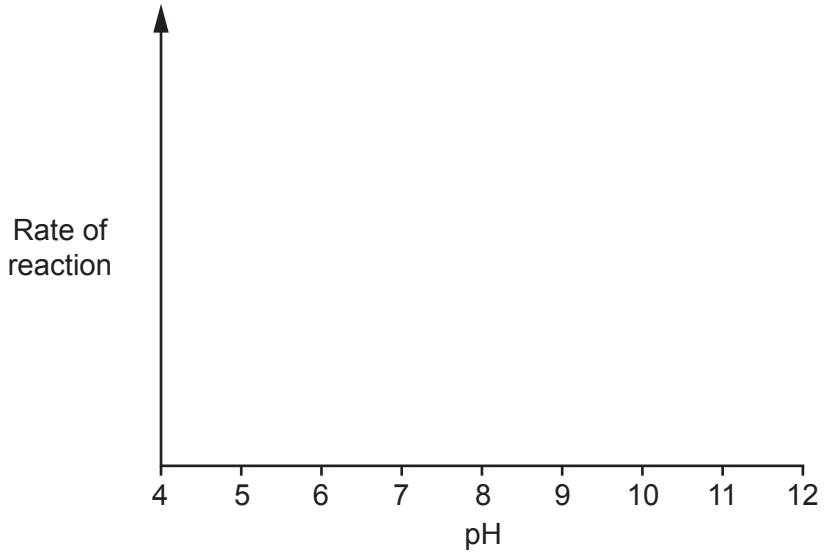


(i) Complete the labels in **Fig. 23.1**. **[3]**

(ii) Lipase is found in the small intestine where the pH is alkaline.

Draw a curve on **Fig. 23.2** to show the effect the pH will have on the rate of reaction for the digestion of lipids by lipase.

Fig. 23.2



[2]

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(b) Phenolphthalein is an indicator that turns pink in an alkaline solution of pH 10.

When lipase breaks down lipids, the indicator goes colourless.

A group of students investigate how temperature affects the enzymes that break down lipids found in milk.

Describe an experiment that the students could use to investigate the effect of temperature on the breakdown of the lipids found in milk.

In your description include:

- how the independent variable could be changed
- the observations that should be made
- **two** variables that need to be controlled.

To change the independent variable, I will .....

.....

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The observations I make will be to .....

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I will need to control .....

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[5]

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24 The female menstrual cycle is regulated by hormones.
As women get older, they go through a stage called menopause when their periods stop.

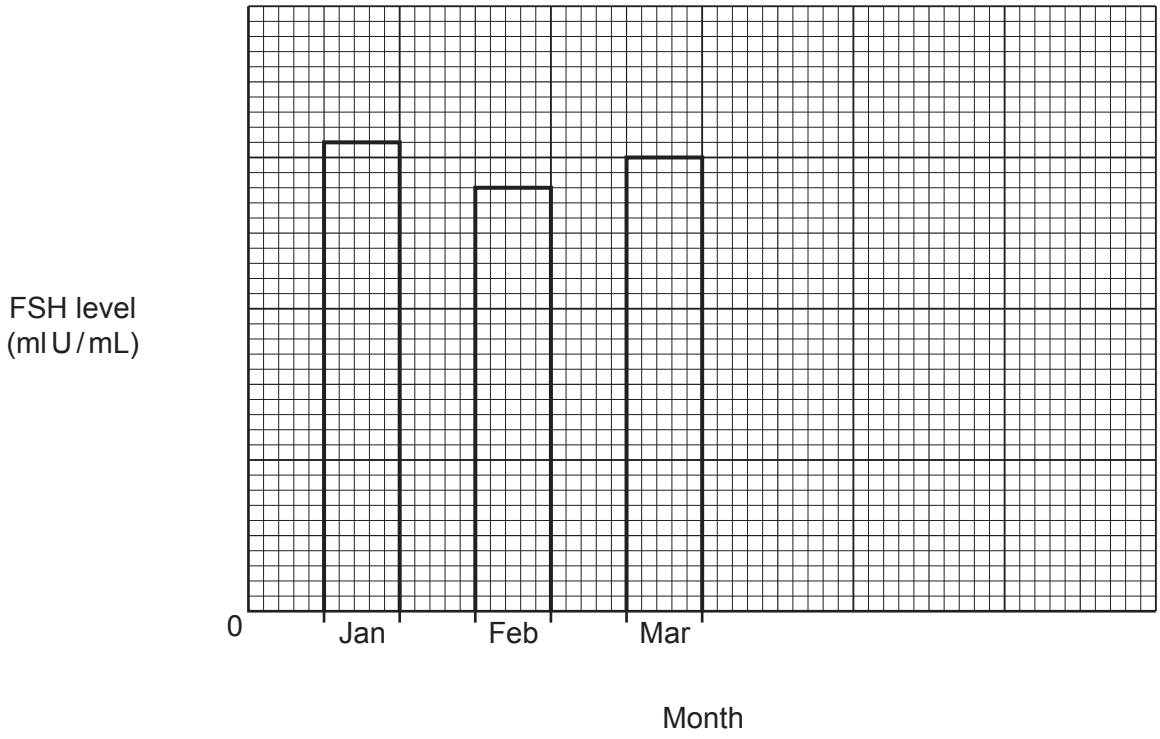
- Doctors can determine if a woman is going through menopause by measuring the level of FSH in their blood.
- If the FSH level goes above 30 mIU / mL, this indicates that menopause may have started.

A patient has her FSH levels measured each month for six months as shown in the table.

Month	FSH level (mIU / mL)
January	31
February	28
March	30
April	32
May	30
June	33

(a) (i) Complete the bar chart for the remaining values from the table.

Finish the scales for both axes.



[2]

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(ii) What evidence is there to suggest this patient **may** have started menopause?

.....

..... **[1]**

(iii) The doctor decides they need more evidence to confirm if the patient has started menopause.

Suggest what further evidence the doctor should collect.

.....

.....

..... **[2]**

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(b) The doctor discusses a treatment called hormone replacement therapy (HRT) with the patient.

The doctor gives the patient a leaflet about HRT.

Information about HRT

HRT usually contains the hormones oestrogen and progesterone.

Benefits of HRT

When some women reach the menopause, it can affect their health.

They can get hot flushes, mood swings and it can weaken their bones.

These symptoms can be reduced by taking HRT.

Risks of HRT

HRT increases the risk of blood clots and, if you are overweight, this risk is increased further.

HRT increases the risk of heart disease in people over the age of 60.

Taking HRT for more than a year can increase the risk of breast cancer.

A 56-year-old patient is deciding if she should take HRT. She is overweight.

Discuss what factors the patient should consider when trying to decide whether to take HRT.

.....

.....

.....

.....

..... **[3]**

END OF QUESTION PAPER

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ADDITIONAL ANSWER SPACE

If additional space is required, you should use the following lined page(s). The question number(s) must be clearly shown in the margin(s).

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