AQA

Please write clearly in block capitals.

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

Surname _____

Forename(s) _____

Candidate signature _____

I declare this is my own work.

GCSE
COMBINED SCIENCE: TRILOGY

H

Higher Tier
Biology Paper 1H

Time allowed: 1 hour 15 minutes

Materials

For this paper you must have:
- a ruler
- a scientific calculator.

Instructions
- Use black ink or black ball-point pen.
- Pencil should only be used for drawing.
- Fill in the boxes at the top of this page.
- Answer **all** questions in the spaces provided.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- Do all rough work in this book. Cross through any work you do not want to be marked.
- In all calculations, show clearly how you work out your answer.

For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
TOTAL	

Information
- The maximum mark for this paper is 70.
- The marks for questions are shown in brackets.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.

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ANSWER IN THE SPACES PROVIDED

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0 1 Bacteria can cause a variety of diseases in humans.

0 1 . 1 What are **two** similarities between a bacterial cell and an animal cell?

[2 marks]

Tick (✓) **two** boxes.

- Both have a cell membrane. ☑
- Both have a cell wall. ☐
- Both have a nucleus. ☐
- Both have cytoplasm. ☑
- Both have plasmids. ☐

0 1 . 2 Salmonella food poisoning is caused by bacteria in food.

Give **one** symptom of salmonella food poisoning.

Do **not** refer to vomiting or diarrhoea in your answer.

[1 mark]

Fever

Question 1 continues on the next page

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0 1 . 3 What is the name of the first antibiotic developed?

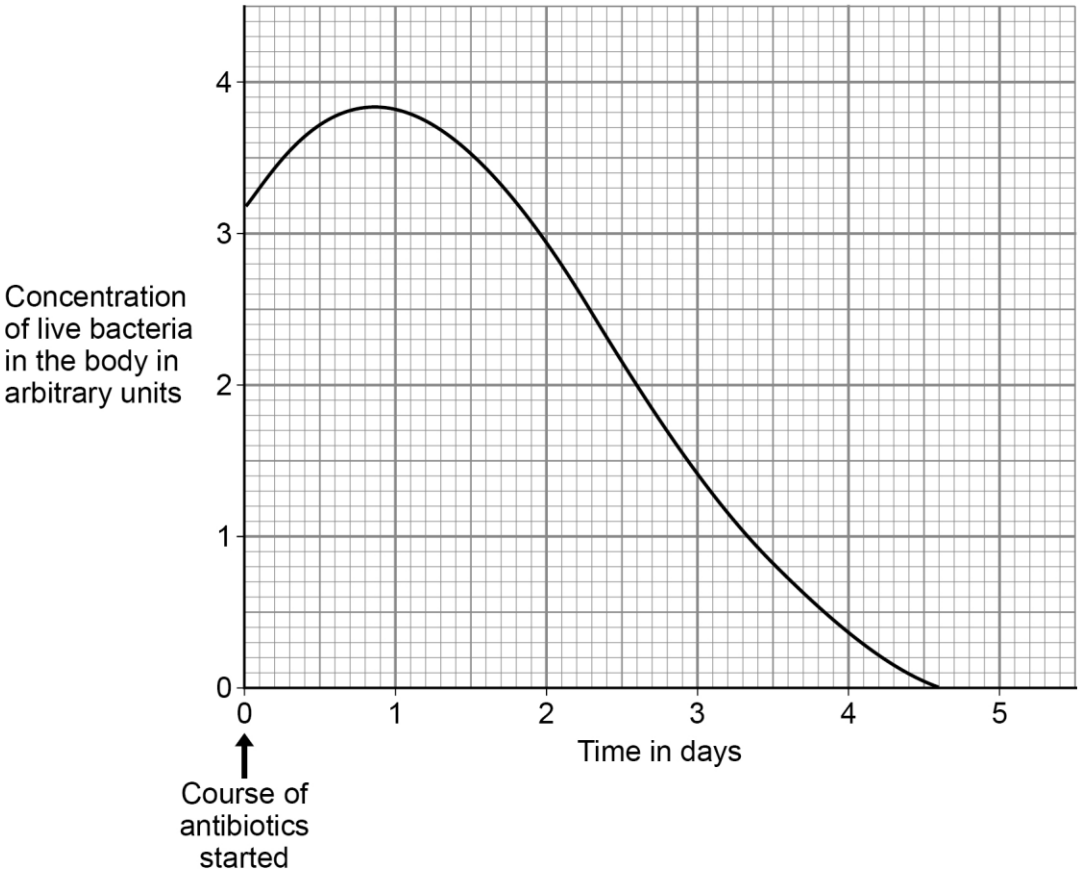
[1 mark]

penicillin

A child with a severe bacterial infection was given a course of antibiotics.

Figure 1 shows how the concentration of live bacteria in the child's body changed when taking the course of antibiotics.

Figure 1



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0 1 . 4 The concentration of live bacteria in the body continued to increase after starting the course of antibiotics.

Suggest **one** reason why.

[1 mark]

Time delay before antibiotic could kill bacteria

0 1 . 5 After 3 days of taking the antibiotic:

- the child felt better
- there were still bacteria in the child's body.

Why did the child feel better?

[1 mark]

Tick (✓) **one** box.

Bacteria had become immune to the antibiotic. ☐

The child had become resistant to the bacteria. ☐

There were fewer toxins in the body than at day 0 ☑

0 1 . 6 Suggest why doctors do **not** give antibiotics to patients with minor infections.

[1 mark]

to reduce / prevent resistant strains / bacteria developing

Question 1 continues on the next page

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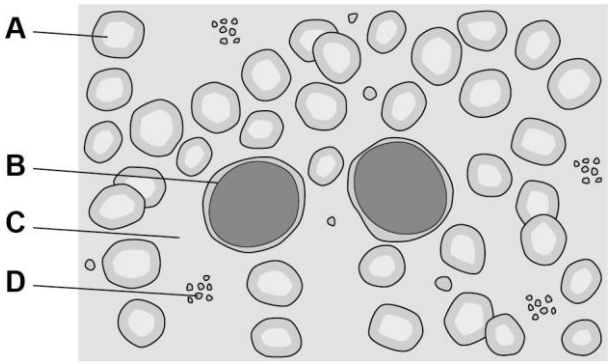
Figure 2 shows blood viewed using a microscope.

Figure 2



0 1 . 7 A vaccine will stimulate the production of antibodies.

Which part of the blood in **Figure 2** produces antibodies?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☑ **C** ☐ **D** ☐

0 1 . 8 Which part of the blood in **Figure 2** starts the clotting process?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☑

9

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0 2 This question is about cell division.

0 2 . 1 Write the biological structures from the box in the correct order of size.

[1 mark]

cell	**chromosome**	**gene**	**nucleus**

Smallest ↓ Largest

gene
chromosome
Nucleus
cell

Question 2 continues on the next page

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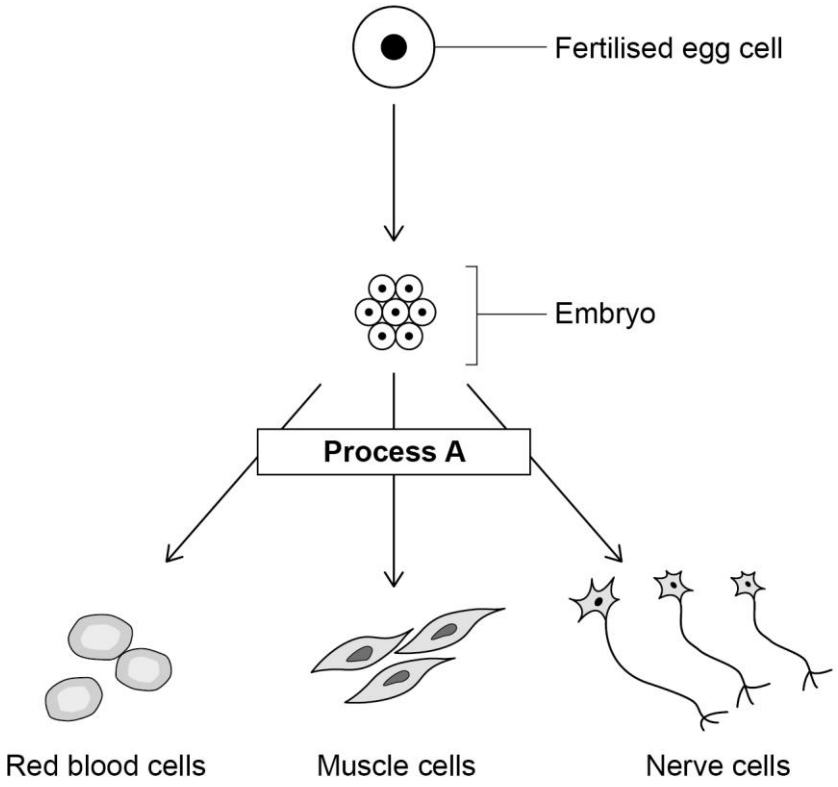
Figure 3 shows how a fertilised egg cell can produce specialised cells.

Figure 3



0 2 . 2 Name **Process A**.

[1 mark]

Differentiation

0 2 . 3 How many cell divisions are needed to form a 16-cell embryo from the original fertilised egg cell?

[1 mark]

Number of cell divisions = 4

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0 2 . 4 In humans a fertilised egg cell contains 23 pairs of chromosomes.

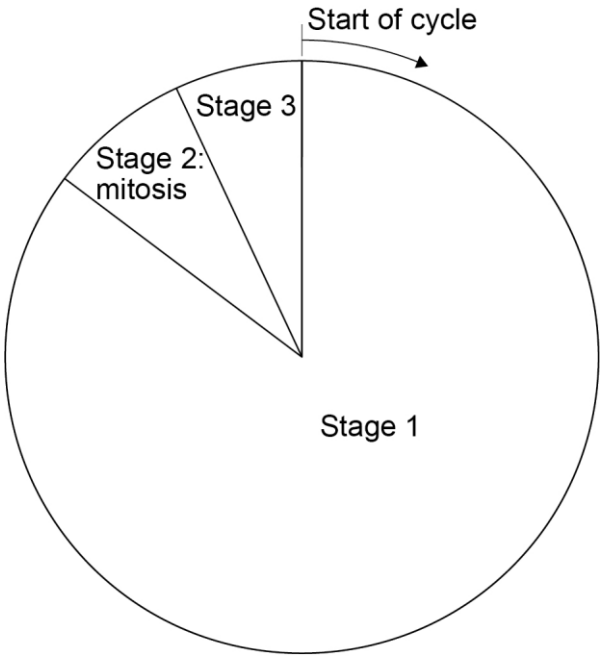
How many chromosomes will there be in each of the embryo cells?

[1 mark]

46

0 2 . 5 **Figure 4** represents a cell cycle for a human embryonic cell.

Figure 4



Describe **one** change in the cell that occurs during **each** of the stages of the cell cycle.

[3 marks]

Stage 1 DNA Replicates

Stage 2 Two nuclei Form

Stage 3 Two identical cells formed

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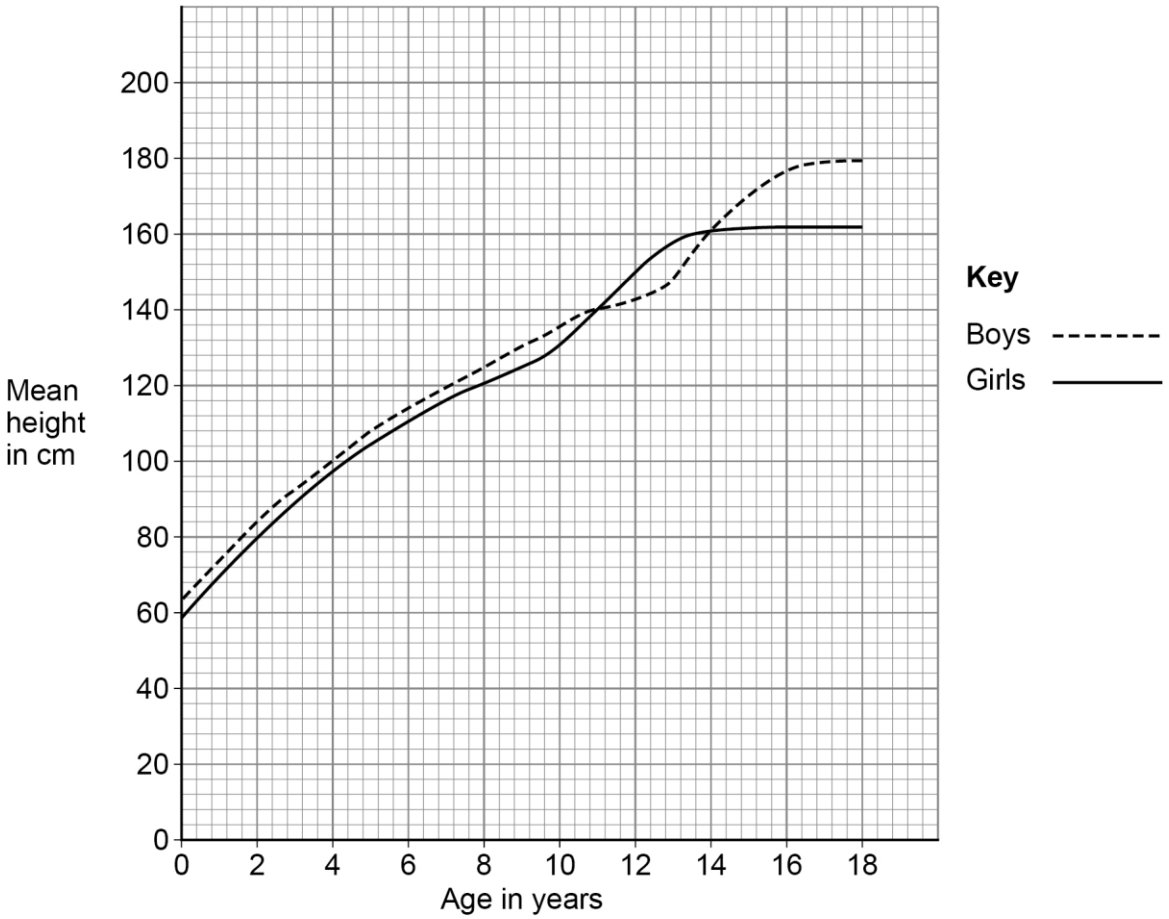
Cell division is important in the growth of multicellular organisms.

0 2 . 6 **Figure 5** shows the mean height of boys and of girls from birth to age 18 years.

Figure 5



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Compare the growth of boys with the growth of girls.

Use data from **Figure 5** in your answer.

[6 marks]

General comparisons:

• boys height at birth (slightly) greater than girls height • boys are (slightly) taller than girls up to age 11 • correct height comparisons eg boys are approximately 4 / 5 cm taller than girls up to age 11 • girls and boys are the same height at age 11 • girls are taller than boys between age 11 and age 14 • girls and boys are the same height at age 14 • boys are taller than girls above age 14 • correct height comparisons eg boys are 5 to 18 cm taller than girls above age 14 • boys (eventually) grow taller than girls • boys carry on growing for a longer time than girls • girls stop growing age 13 / 14 / 15 and boys stop growing age 17 / 18

Rate comparisons:

• rate of growth similar up to age 10 / 11 • girls grow faster than boys between 10 / 11 and 14 allow girls have a greater increase in height between 11 and 14 • growth spurt occurs at a younger age in girls • growth spurt starts age 10 / 11 in girls and age 13 / 14 in boys • increased rate of growth in girls aged 10 to 13 /14 and in boys aged 13 to 17 / 18

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Compare the growth of boys with the growth of girls.

0 2 . 7 Give **one** way that cell division by mitosis is important in **fully grown** animals.

Repair of tissues

[1 mark]

14

Turn over ►

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0 3 Amylase is an enzyme that digests starch.

0 3 . 1 Which organs in the human digestive system produce amylase?

[1 mark]

Tick (✓) **one** box.

- Liver, small intestine and large intestine ☐
- Salivary glands, stomach and liver ☐
- Salivary glands, pancreas and small intestine ☑
- Stomach, pancreas and large intestine ☐

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

This is the method used.

1. Prepare amylase solution at pH 5
2. Mix the amylase solution with starch in a boiling tube.
3. Remove a drop of the amylase-starch mixture every 30 seconds and test it for the presence of starch.
4. Record the time when all the starch has been digested.
5. Repeat steps 1 to 4 using amylase solution prepared at pH 6, then at pH 7 and then at pH 8

0 3 . 2 What was the independent variable in this investigation?

[1 mark]

PH of Amylase

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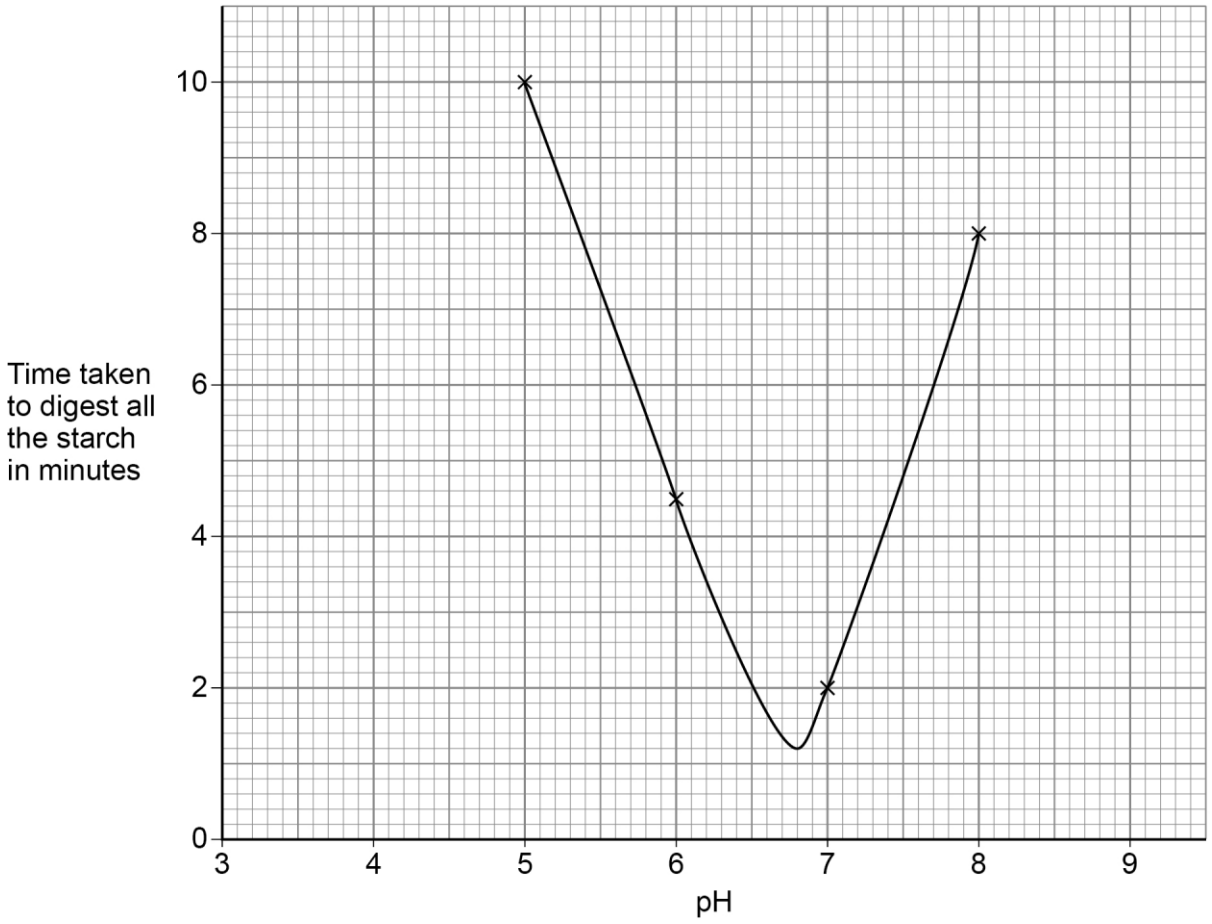
0 3 . 3 Describe how the student would know when all the starch had been digested.

[1 mark]

Iodine solution would stay orange

0 3 . 4 **Figure 6** shows the student's results.

Figure 6



What was the optimum pH for the amylase?

Use **Figure 6**.

[1 mark]

Optimum pH = 6.8

Turn over ►

A scientist did a different investigation.

This is the method used.

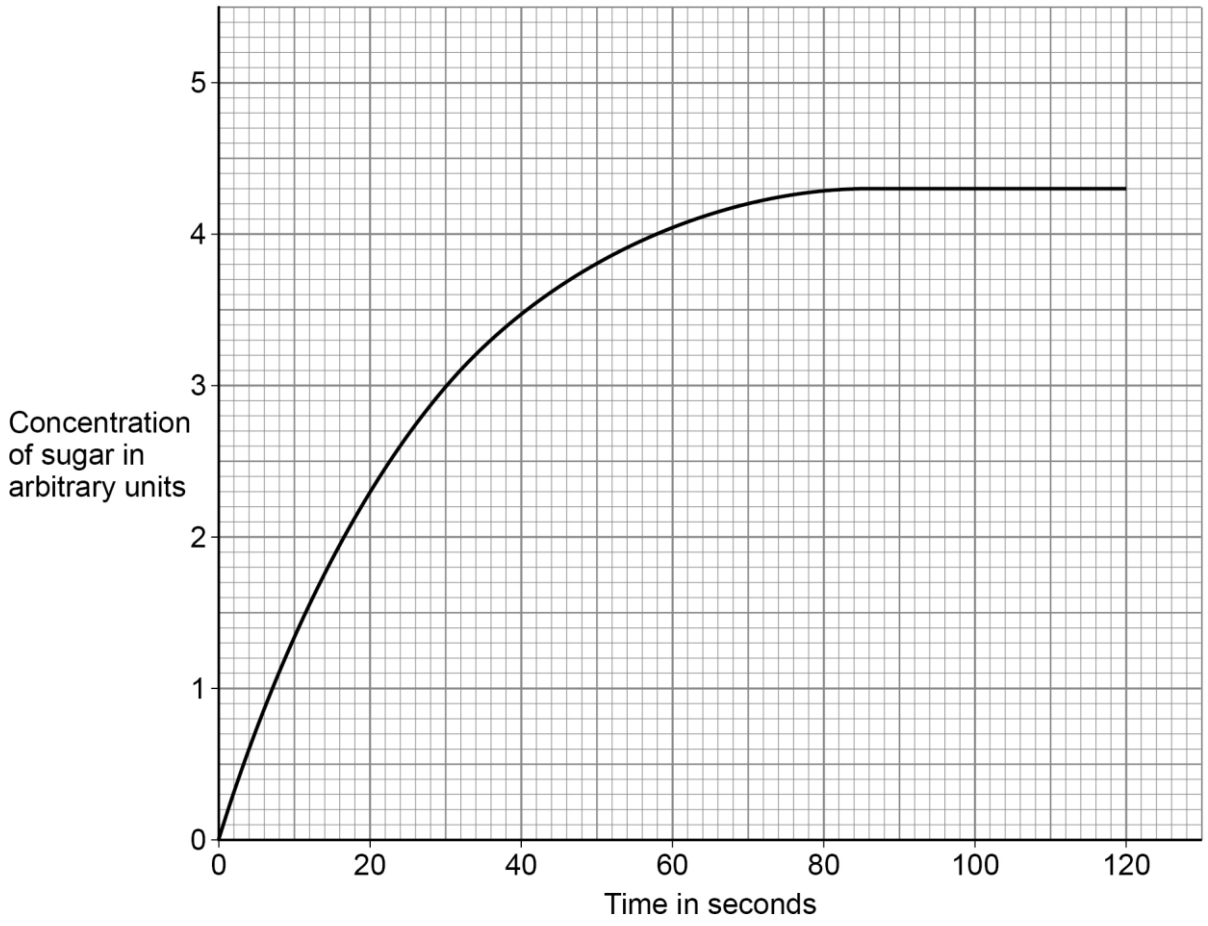
1. Prepare amylase solution at the optimum pH.

2. Mix the amylase solution with starch in a boiling tube.

3. Measure the concentration of sugar every 10 seconds for 2 minutes.

Figure 7 shows the scientist's results.

Figure 7



0 3 . 5 How much time did it take for the amylase to digest all the starch?

Use **Figure 7**.

[1 mark]

Time to digest all the starch = 82 seconds

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0 3 . 6 Determine the rate of sugar production per minute at 40 seconds.

[4 marks]

Tangent drawn at 40 seconds

rate = value For dy / value For dx

calculation of rate at 40 sec

Rate = 2.25 arbitrary units per minute

0 3 . 7 Explain how the structure of enzyme molecules is related to the effect of pH on the activity of amylase.

[6 marks]

• enzymes are protein molecules • (so) have a 3D structure • lock and key theory • have an active site • (which) has a specific shape • shape of active site will only match shape of substrate • starch is substrate for amylase • at pH values above or below the optimum the shape of active site is changed (in some molecules) • (so) substrate can no longer fit the active site • at extreme pH values enzyme is denatured • (so) shape of active site is changed • (so) amylase can no longer digest starch • (so) rate of digestion decreases

15

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0 4 Photosynthesis is an important chemical reaction in plants.

0 4 . 1 Why is light needed for photosynthesis?

[1 mark]

To transfer energy

0 4 . 2 What is the equation for photosynthesis?

[1 mark]

Tick (✓) **one** box.

$C_6H_{12}O_6 + CO_2 \rightarrow 6\,O_2 + 6\,H_2O$ ☐

$CO_2 + H_2O \rightarrow CH_2O + O_2$ ☐

$6\,CO_2 + 6\,H_2O \rightarrow C_6H_{12}O_6 + 6\,O_2$ ✓

$6\,O_2 + 6\,H_2O \rightarrow C_6H_{12}O_6 + 6\,CO_2$ ☐

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0 4 . 3 A student investigated the effect of different colours of light on the rate of photosynthesis at room temperature.

The student used pondweed in water.

A piece of pondweed was placed in red light, then in blue light and then in green light.

Each colour of light was the same intensity.

Describe how the student should make accurate measurements to obtain valid results for the rate of photosynthesis.

[4 marks]

allow the pondweed to equilibrate in the light use a gas syringe or use a (measuring) cylinder to measure / collect the oxygen / gas produced measure time oxygen / gas is collected for using a timer / stopwatch / stopclock repeat the measurements and calculate a mean

Question 4 continues on the next page

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Turn over ►

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A scientist investigated the effect of different wavelengths of light on the rate of photosynthesis.

The wavelength of light determines the colour of the light.

Figure 8 shows the student's results.

Figure 9 shows the scientist's results.

Figure 8

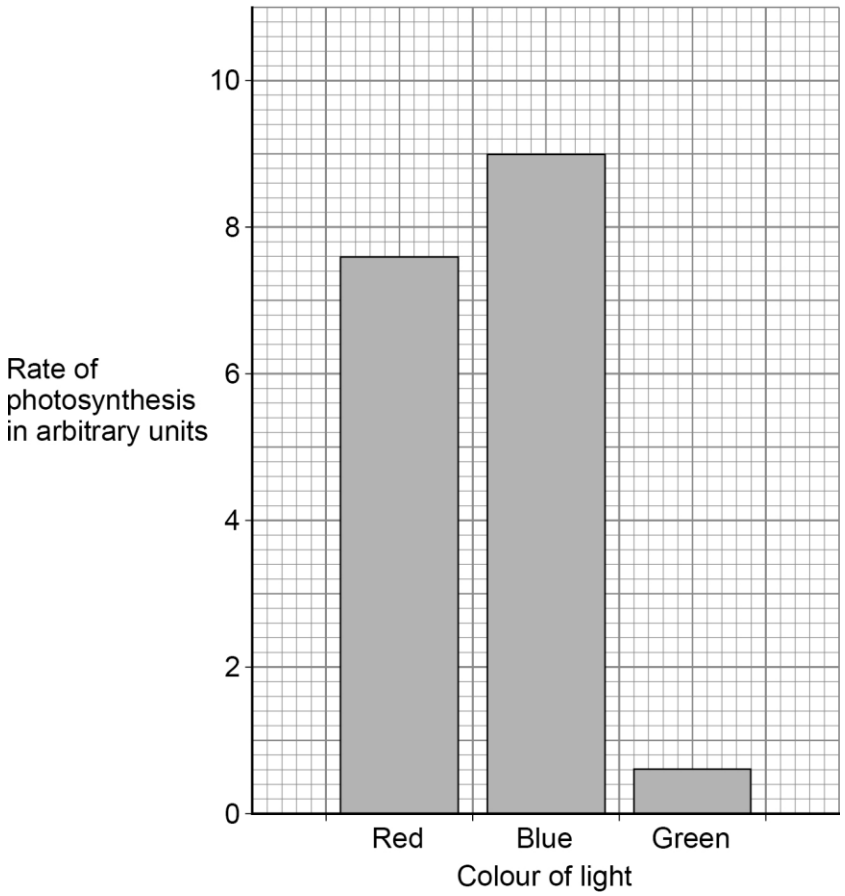

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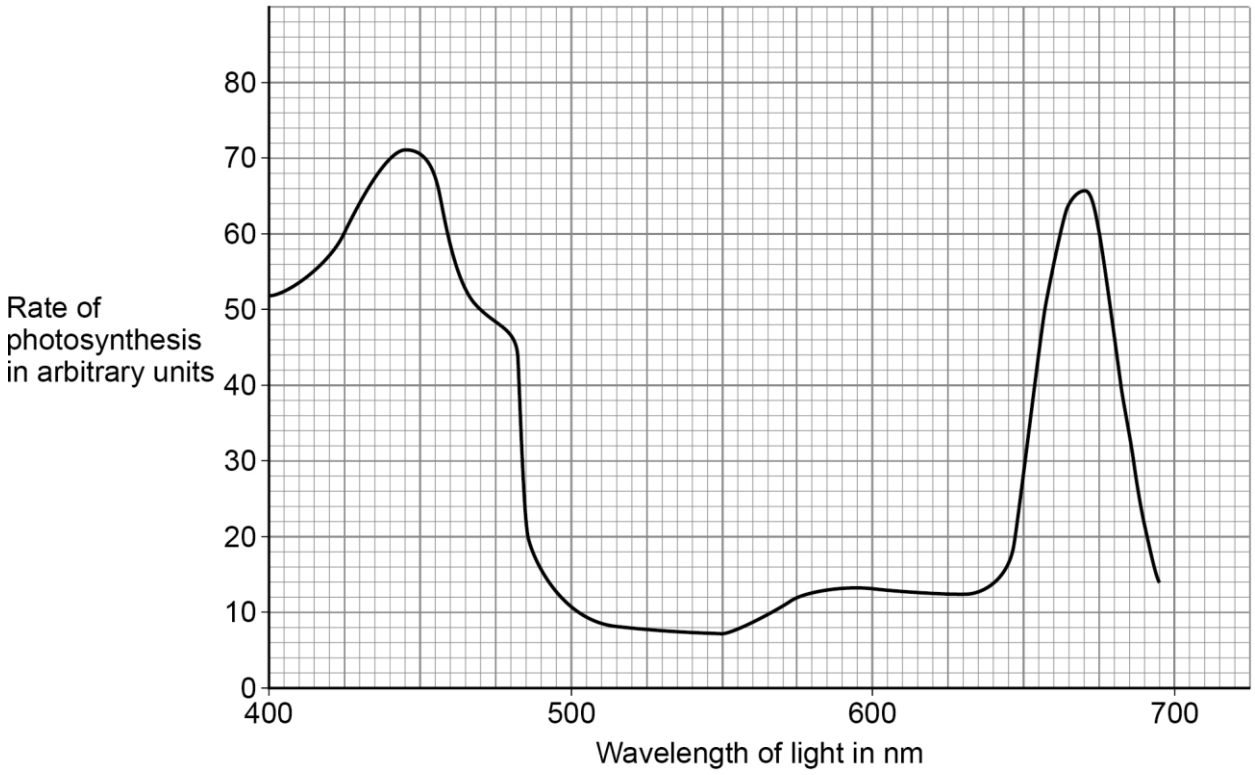
Figure 9



0 4 . 4 Why are the results for the two investigations presented differently?

[2 marks]

independent variable in student's investigation is categoric / discrete

independent variable in scientist's investigation is continuous

0 4 . 5 Suggest the range in wavelength of green light.

Use **Figure 8** and **Figure 9**.

[1 mark]

Range in wavelength of green light = from 492 nm to 577 nm

9

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Figure 9

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0 5 This question is about tumours.

0 5 . 1 Describe the similarities and differences between benign tumours and malignant tumours.

[4 marks]

Similarities:
• result from changes in the cell / DNA / genes • uncontrolled cell growth / division • can form a lump of cells • made up of abnormal cells

Differences: Malignant tumours: • are made of cancer cells, benign tumours are not or benign tumours are made up of cells that are more similar to normal cells • (usually) grow faster than benign tumours • invade neighbouring tissues, but benign tumours do not • can spread (to other parts of the body) but benign tumours stay in one place or cells can travel in the blood, but benign tumours do not • can form secondary tumours, benign tumours do not

Question 5 continues on the next page

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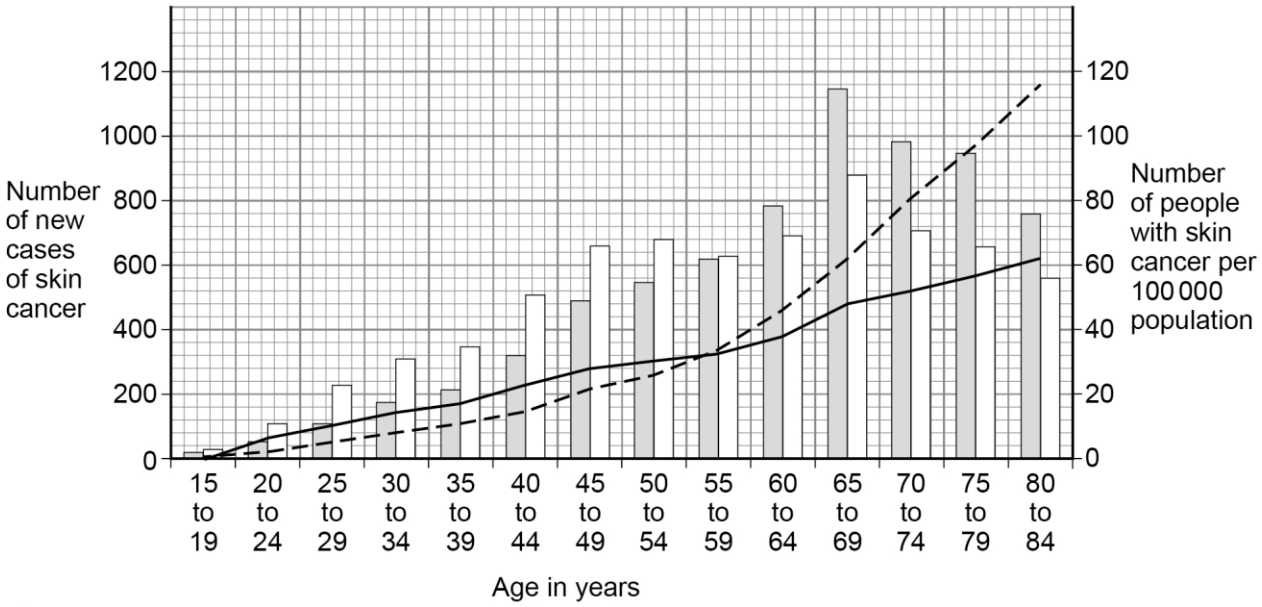
Figure 10 shows data about skin cancer in males and females for different age groups in the UK.

It shows:

- the number of new cases of skin cancer in 1 year
- the number of people with skin cancer per 100 000 population in 1 year.

Figure 10



Key

New male cases

New female cases

– – – Number of males with skin cancer per 100 000

—— Number of females with skin cancer per 100 000

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0 5 . 2 There are no new cases of skin cancer diagnosed in people younger than 15 years of age.

Explain why.

[2 marks]

little exposure to carcinogens (so) less cell / DNA / gene damage

0 5 . 3 Give **two** conclusions about the number of **new cases** of skin cancer.

Use **Figure 10**.

[2 marks]

1 more females than males diagnosed each year up to age 59 (years)

2 more new cases in males than in females from 60 (years)

0 5 . 4 The data for the number of people with skin cancer is given per 100 000 population.

Suggest why the data is **not** given as the total number of people.

[1 mark]

To account for the different group sizes

Question 5 continues on the next page

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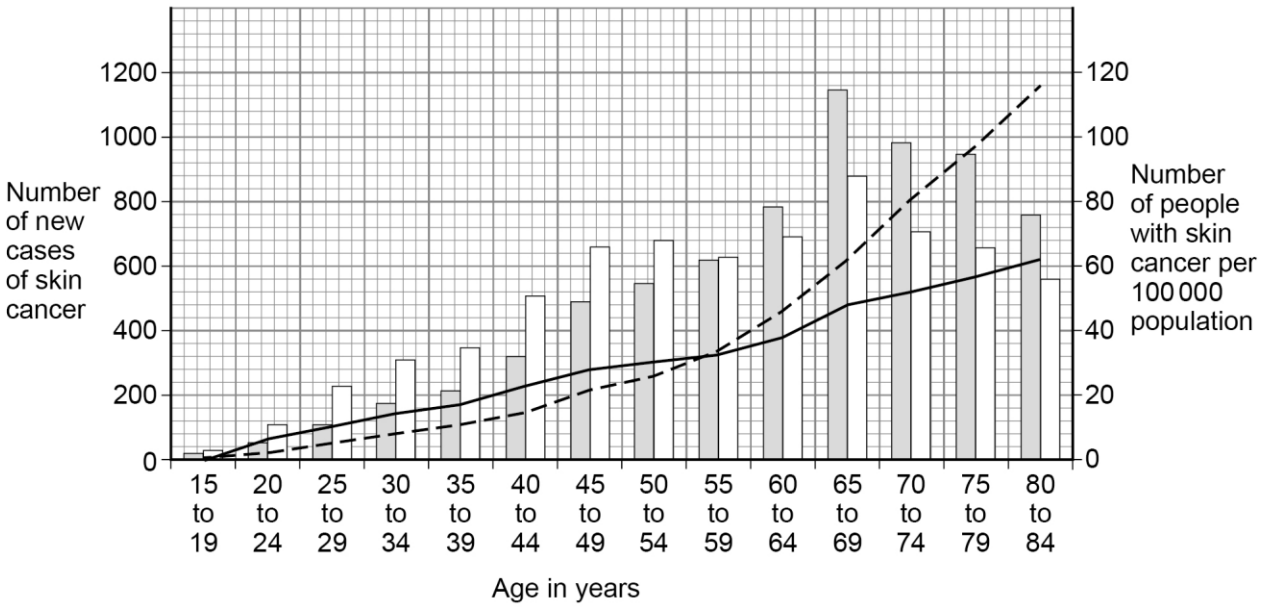
Figure 10 is repeated below.

Figure 10



0 5 . 5 Describe **two** trends shown in **Figure 10**.

Use **only** the data for the number of people with skin cancer per 100 000 population.

[2 marks]

• number (of males / female per 100 000 population) increases with age

• in females the number (per 100 000 population) increases at a steady rate

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0 5 . 6 The estimated population of males aged 80 to 84 years was 694 000

Calculate the number of males aged 80 to 84 years with skin cancer in that year.

Use **Figure 10**.

Give your answer to 3 significant figures.

[3 marks]

= 116 x 694000 / 100000

= 805.04

Number of males with skin cancer (3 significant figures) = 805

14

Turn over for the next question

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0 6 This question is about the heart.

0 6 . 1 Why is the heart described as an organ?

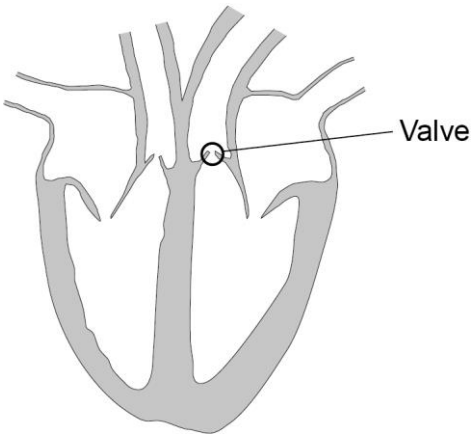
[1 mark]

it is made up of (different) tissues (that perform specific functions)

0 6 . 2 Valves in the heart keep the blood flowing through the heart in one direction.

Figure 11 shows the heart with one of the valves labelled.

Figure 11



Explain the effects on a person if the valve labelled in **Figure 11** developed a leak.

[4 marks]

some blood would flow back into the ventricle / heart (so) less oxygenated blood would be pumped to the body cells require oxygen for respiration or less aerobic respiration (so) person would become out of breath

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0 6 . 3 Faulty heart valves can be replaced using biological or mechanical valves.

The faulty valve is replaced during an operation.

Biological valves:

- are from animals or human donors
- allow blood to flow through them normally
- wear out and stiffen over time, so may need to be replaced.

Mechanical valves:

- are made from synthetic materials
- may cause blood clots on the surface of the valve
- require anti-clotting drugs to be taken for the rest of the patient's life
- can last for a very long time in ideal conditions.

A young woman enjoys extreme sports and would like to start a family.

The woman needs a heart valve replacing.

Describe the advantages and disadvantages for this young woman of having a biological heart valve instead of a mechanical heart valve.

[4 marks]

reduced risk of blood clots which could cause heart attack or stroke • reduced risk of blood clots during pregnancy / birth • reduced risk of bleeding during pregnancy / birth • do not need to take anti (blood) clotting drugs

9

END OF QUESTIONS

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