St Mary's School
CAMBRIDGE

Year 10 Biology

Sample Entrance Examination

Time allowed: 30 minutes

Name: _____

Total : 46 marks

INSTRUCTIONS :

- **Spend 30 minutes on this section.**
- **You may use a calculator.**
- **You will need a pencil and ruler.**
- **Work through as many questions as you can, showing all relevant workings.**
- **If you do not understand a question, miss it out and go on to the next one.**
- **When you have done all you can, return to any questions that you may have missed.**
- **When you have finished check your answers**

1. The table shows the number of chromosomes in the body cells of five different animals.

animal	number of chromosomes in a body cell
starfish	36
fruitfly	8
goldfish	94
chimpanzee	48
alligator	32

(a) (i) Which animal in the table has the smallest number of chromosomes in a body cell?

.....

(1)

(ii) Which animals have **more** chromosomes in their body cells than a human?

.....

(1)

(iii) How many chromosomes are there in a sperm cell from a chimpanzee?

.....

(1)

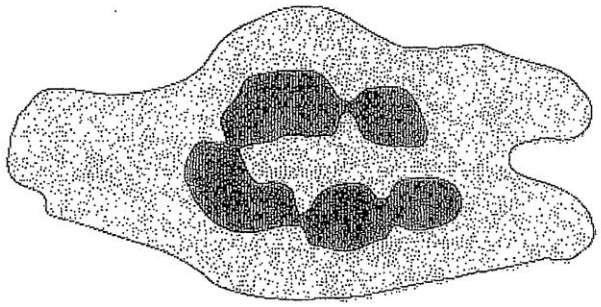
(b) Where are chromosomes found in a cell?

.....

(1)

(Total 4 marks)

2 The diagram shows a white blood cell.



(a) (i) Use your ruler to measure the maximum length of the cell in the diagram in mm.

..... mm

(1)

(ii) The magnification is × 100,000.

Calculate the actual length of the white blood cell using the formula:

$$\text{actual length} = \frac{\text{length of cell in the diagram}}{\text{magnification}}$$

.....

.....

actual length ..... mm

(1)

(b) White blood cells ingest bacteria.
Give **one** other way that white blood cells help in the defence against infection.

.....

.....

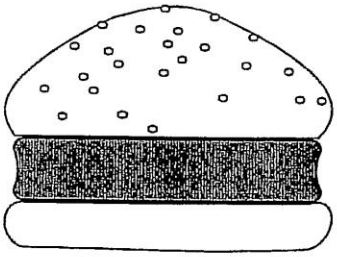
(1)

(Total 3 marks)

3 Jack's mum is having a barbecue. She has bought some Quorn™ burgers, which are made of mycoprotein, and some pork sausages.

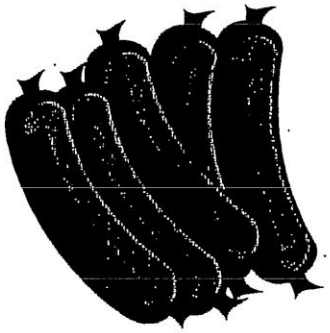
Jack read the labels on the packets.

Quorn™ burgers



Nutritional information (per 100 g)	
protein	10.7 g
carbohydrate	12.3 g
fat	9.8 g
dietary fibre	3.1 g
sodium	0.6 g

Pork sausages



Nutritional information (per 100 g)	
protein	13.3 g
carbohydrate	5.8 g
fat	23.0 g
dietary fibre	2.0 g
sodium	0.7 g

(a) (i) Which of the two foods contains more fat?

.....

(1)

(ii) How much **more** protein per 100 g do the sausages contain compared with the burgers?

.....

.....

.....

Answer ..... g

(2)

(b) Jack's mum thought that the Quorn burger was a healthier food.

What evidence from the packet labels supports her choice?

.....

.....

.....

.....

(2)

(c) Some people would choose to eat the Quorn burger instead of the sausages for reasons other than health. Suggest **one** reason they might give.

.....

(1)

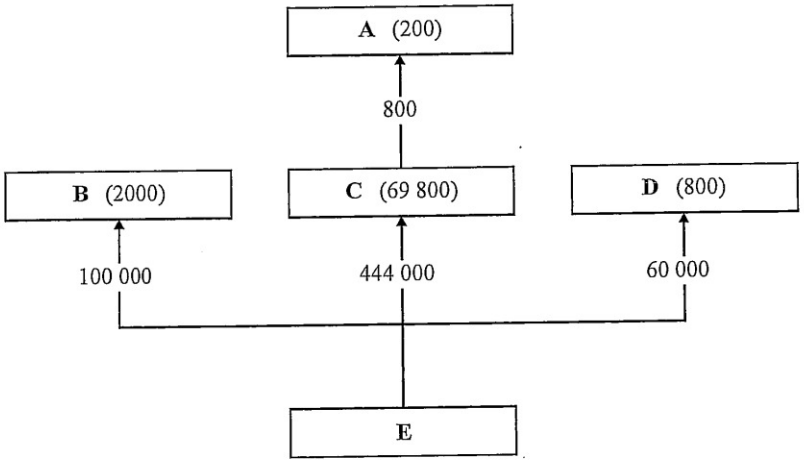
† Below are some words about cells. Draw **one** straight line from each word to its description.

One has been done for you

word	**description**
ribosome	a protein that speeds up a biological reaction
enzyme	where proteins are made in a cell
stem cell	where chromosomes are found in a cell
nucleus	a cell that can divide to make other types of cells

(Total 3 marks)

5



The energy efficiency of an organism is a measure of how much of the energy available to the organism becomes part of its biomass.

The equation below shows how to calculate energy efficiency.

$$\text{Energy efficiency} = \frac{\text{energy that become part of biomass}}{\text{energy available}} \times 100\%$$

(a) Calculate the energy efficiency of organism **B**.

Put your answer in the table below.

Organism	Energy efficiency (%)
A	25.0
B	
C	15.7
D	1.3

(1)

(b) Suggest **two** reasons why organism **D** has a low energy efficiency.

1. .....

.....

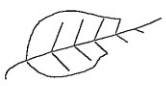
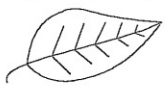
2. .....

.....

(2)

(Total 3 marks)

6 Some students investigated the decay of leaves in soil.
They kept four identical leaves (**A**, **B**, **C** and **D**) in different soil conditions.
Their results are shown in the table.

Leaf	Soil Conditions	Appearance of leaf	
		at start	after one month
A	moist 2 °C with bacteria		
B	moist 10 °C with bacteria		
C	moist 20 °C with bacteria		
D	moist 20 °C no bacteria		

Use this information to answer these questions.

(a) (i) Which leaf (**A**, **B**, **C** or **D**) had the best conditions for rapid decay?

.....

(1)

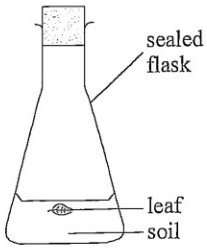
(ii) Apart from moisture, what TWO conditions are needed for rapid decay?

1. .....

2. .....

(2)

(b) The diagram shows the apparatus used for leaf **D**.



soil conditions

moist
20 °C
no bacteria

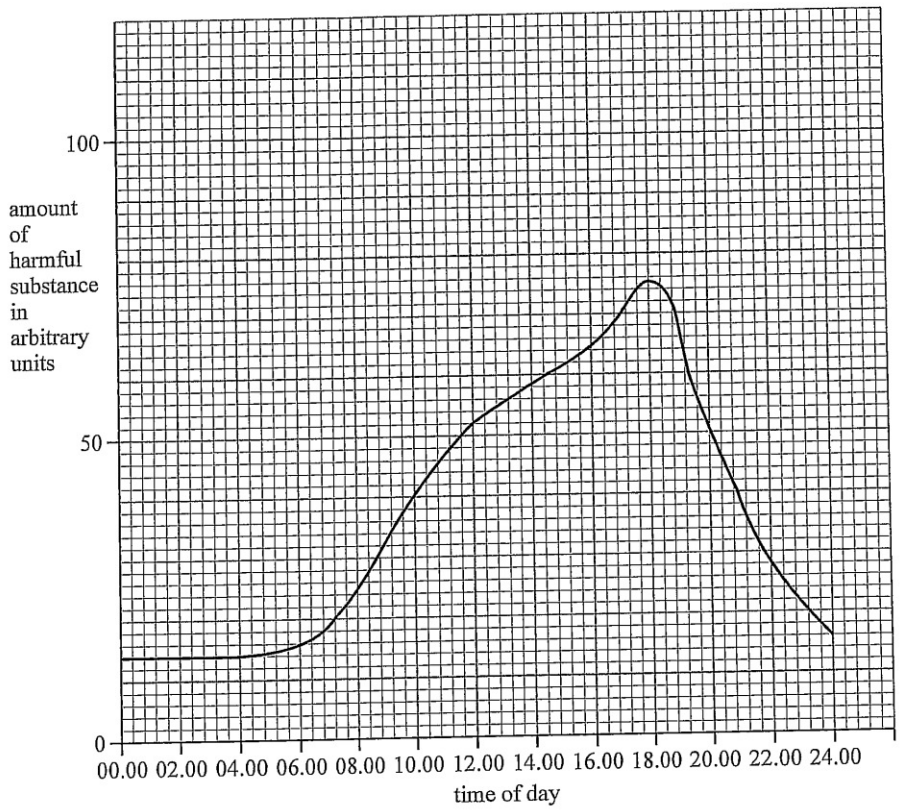
Suggest why the flask is sealed.

.....

(1)

(Total 4 marks)

7 Vehicle exhaust gases contain harmful substances. The amount of one harmful substance was measured in a city centre during one day.
The results are shown on the graph.



(a) Describe the results shown on the graph.

.....

.....

.....

.....

(1)

(b) Suggest **two** ways in which harmful substances from vehicle exhaust gases in the air in city centres could be reduced.

1 .....

.....

2 .....

.....

(2)

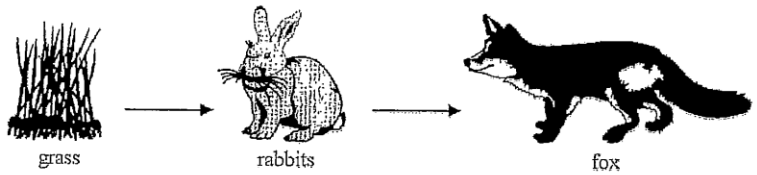
(c) Give the name of **one** harmful substance found in vehicle exhaust gases.

.....

(1)

(Total 4 marks)

8 The diagram shows a food chain in a field.



(a) In the space below, draw and label a pyramid of biomass for this food chain. (2)

(b) There are plans to build a factory on the field.

(i) What will happen to the number of rabbits and foxes if the factory is built?

.....

.....

(1)

(ii) Give reasons for your answer.

.....

.....

.....

(2)

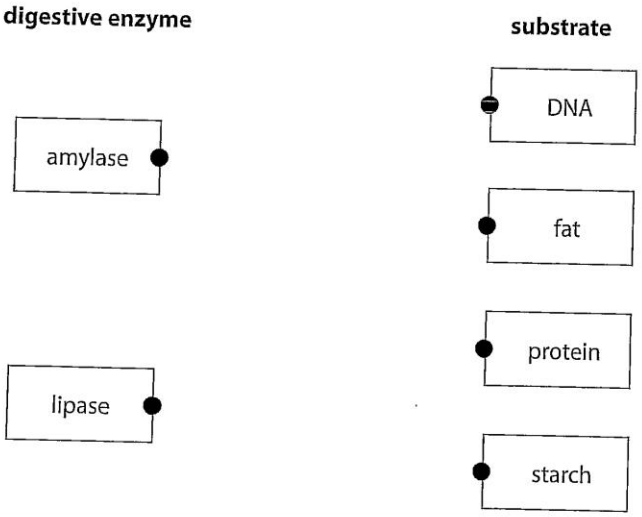
(Total 5 marks)

9 .

Digestive enzymes

(a) Draw **one** straight line from each digestive enzyme to its substrate.

(2)



(b) (i) Complete the sentence by putting a cross (☒) in the box next to your answer.

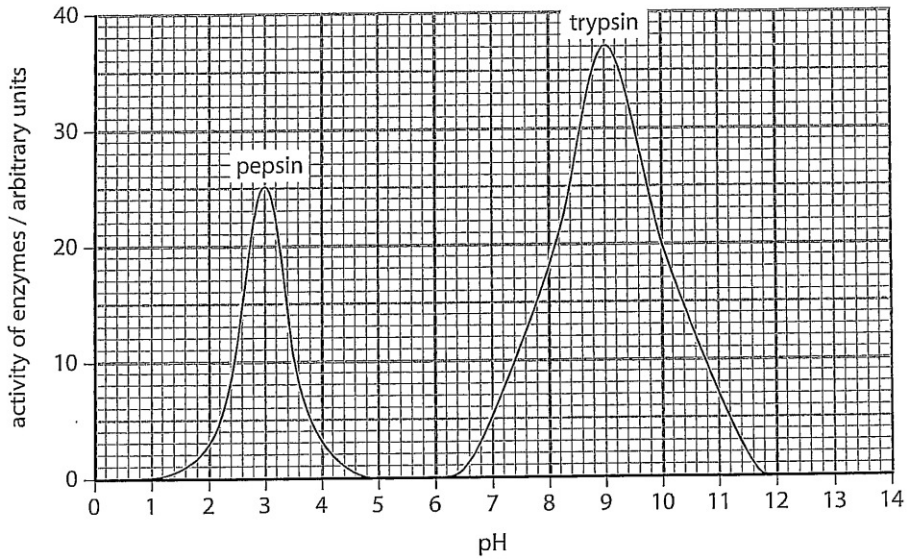
Pepsin is an enzyme that digests protein into

(1)

- ☐ **A** amino acids
- ☐ **B** fatty acids
- ☐ **C** glucose
- ☐ **D** glycerol

(ii) An experiment was carried out to investigate the effect of pH on the activity of pepsin and another enzyme called trypsin.

The graph shows the results of the experiment.



Complete the sentence by putting a cross (☒) in the box next to your answer.

The graph shows that

(1)

- ☐ **A** pepsin only works at a pH of 3
- ☐ **B** pepsin has an optimum pH of 3
- ☐ **C** trypsin only works at a pH of 3
- ☐ **D** trypsin has an optimum pH of 3

(iii) Using the graph, describe **two** ways in which the activity of pepsin is different to the activity of trypsin.

(2)

1 .....

.....

2 .....

.....

(iv) Explain why the activity of trypsin is different at pH 11 compared to pH 9.

(2)

.....

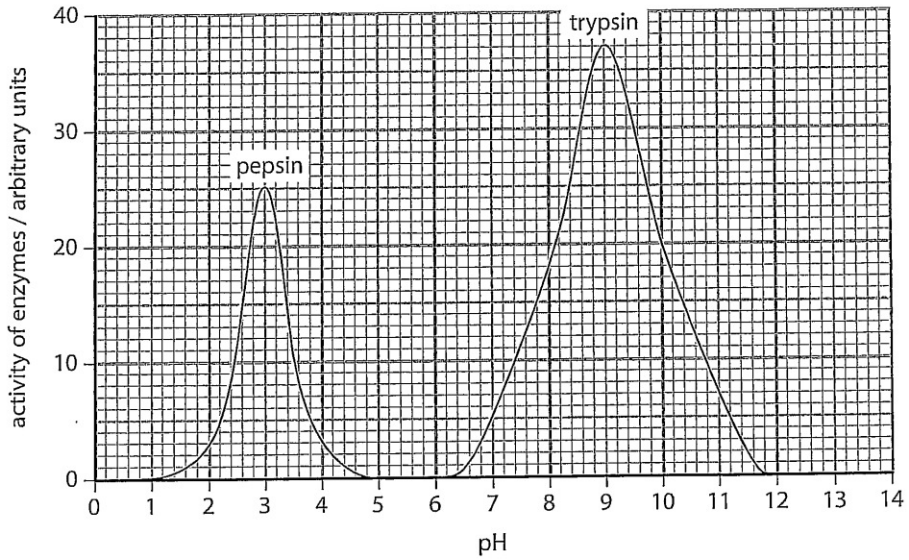
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.....

.....

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.....

2 .....

.....

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(2)

.....

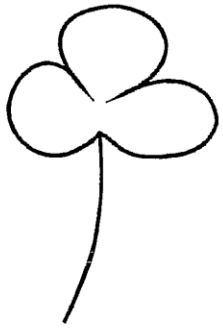
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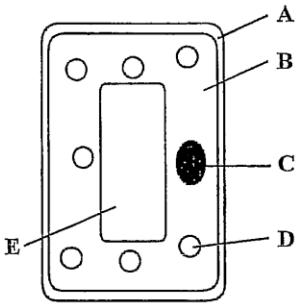
10

The diagrams show a clover leaf and one of its cells.



leaf

Not to scale



cell

The table lists parts of the clover cell.
Complete the table by writing one letter (**A, B, C, D** or **E**) in each box.
One has been done for you.

cell part	letter
cell wall	
chloroplast	
cytoplasm	**B**
nucleus	
vacuole	

(Total 4 marks)