BENENDEN

SIXTH FORM BIOLOGY ENTRANCE 2023

100 MARKS – 1 hour 30 minutes

Full Name:

Current school:

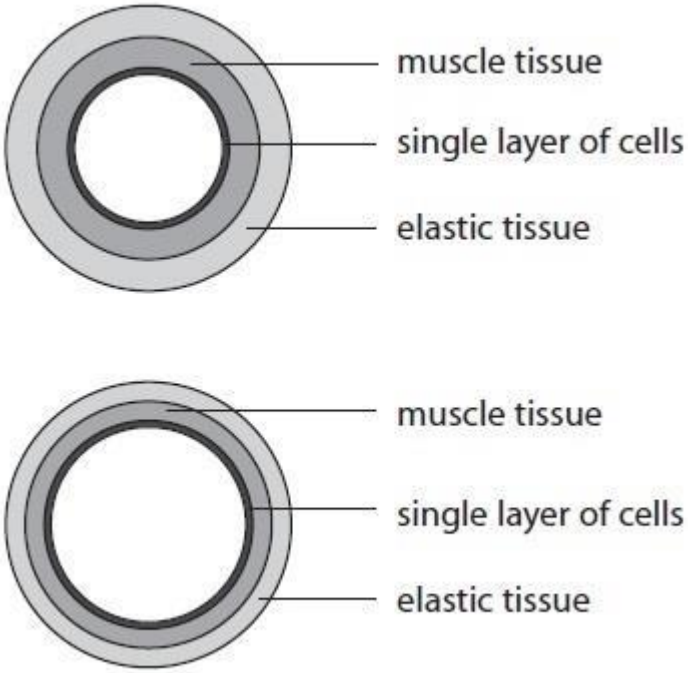
Date:

Instructions to Candidates:

- Write your answers in the space provided in this booklet.
- (total mark of paper 100)
- Marks available are indicated in brackets **Equipment needed:**
- Calculators are allowed
- Make sure you have ruler and a sharp pencil

Q1.

The diagrams show sections through an artery and a vein.



(a) Use the information in the diagrams and your own knowledge to give three ways in which the structure of an artery differs from the structure of a vein.

(3)

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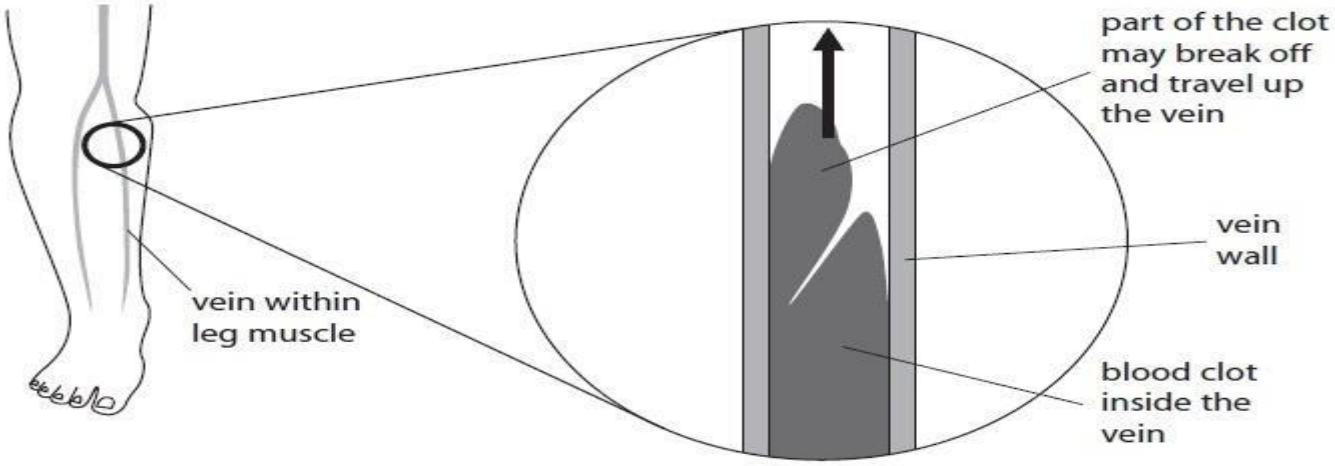
(b) Lack of movement by sitting still for long periods of time makes blood flow very slowly in a vein. Blood that flows slowly is more likely to clot than blood that flows normally. This problem is known as deep vein thrombosis (DVT). In DVT, the clot usually occurs in a leg vein as shown in the diagram.



DVT is dangerous because sometimes part of the clot breaks off and travels to the lung, blocking small blood vessels and causing death.

(i) Suggest why blood flow in a leg vein is slow when there is lack of movement.

(2)

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(ii) Name the blood cells responsible for transporting oxygen.

(1)

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(iii) Suggest why a clot that blocks the small blood vessels in the lungs can cause death.

(2)

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(Total for question = 8 marks)

Q2.

One of the characteristics of living organisms is the ability to respond to a change in their surroundings.

In mammals, such as humans, responses are controlled by nervous or hormonal communication.

(a) ADH is an example of a hormone.

(i) Where is ADH produced?

(1)

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(ii) Describe the effects of ADH in the body.

(3)

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(b) Describe **two** ways in which nervous communication differs from hormonal communication.

(2)

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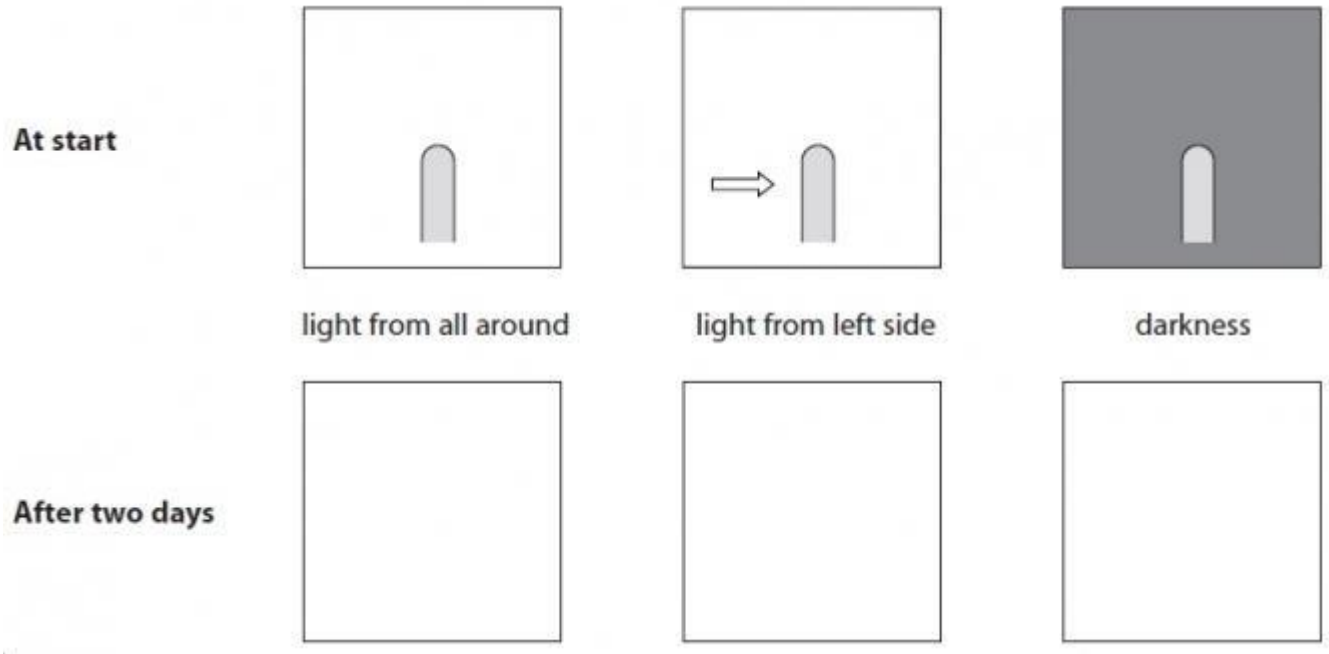
(c) Plants are also able to respond to their surroundings. The diagram shows young cereal shoots (coleoptiles) which are placed in different light conditions.

Complete the diagram to suggest how each of the shoots would appear after two days.

(3)



(d) Plant roots also respond to external stimuli.
Describe the response of roots to gravity and explain how this response benefits the plant.

(3)

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(Total for question = 12 marks)

Q3.

The photograph shows a cow with her calf.

(a) Scientists investigated the success of transferring cloned embryos into surrogate cows.

In total, 2170 cloned embryos were transferred resulting in 535 pregnancies.
From these pregnancies, 103 calves were born.
Calculate the percentage of embryos that successfully developed into newborn calves.
Show your working.

(2)

percentage of embryos = ...

(b) The formation of a placenta is needed for the successful development of an embryo into a fetus.

(i) Name the part of the female reproductive system where the placenta forms.

(1)

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(ii) Suggest how the structure of the placenta is adapted to allow the exchange of substances between the mother and the fetus.

(4)

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(c) Calves feed on milk from their mothers.

Suggest how the components of milk help calves to develop.

(3)

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(Total for question = 10 marks)

Q4.

Listeriosis is an illness caused by eating food containing the bacterium *Listeria*.

(a) The diagram shows the cell wall of one of these bacteria. Other structures found in the bacterium are not shown.

Draw and label three other structures that would be found in the bacterium.

(3)

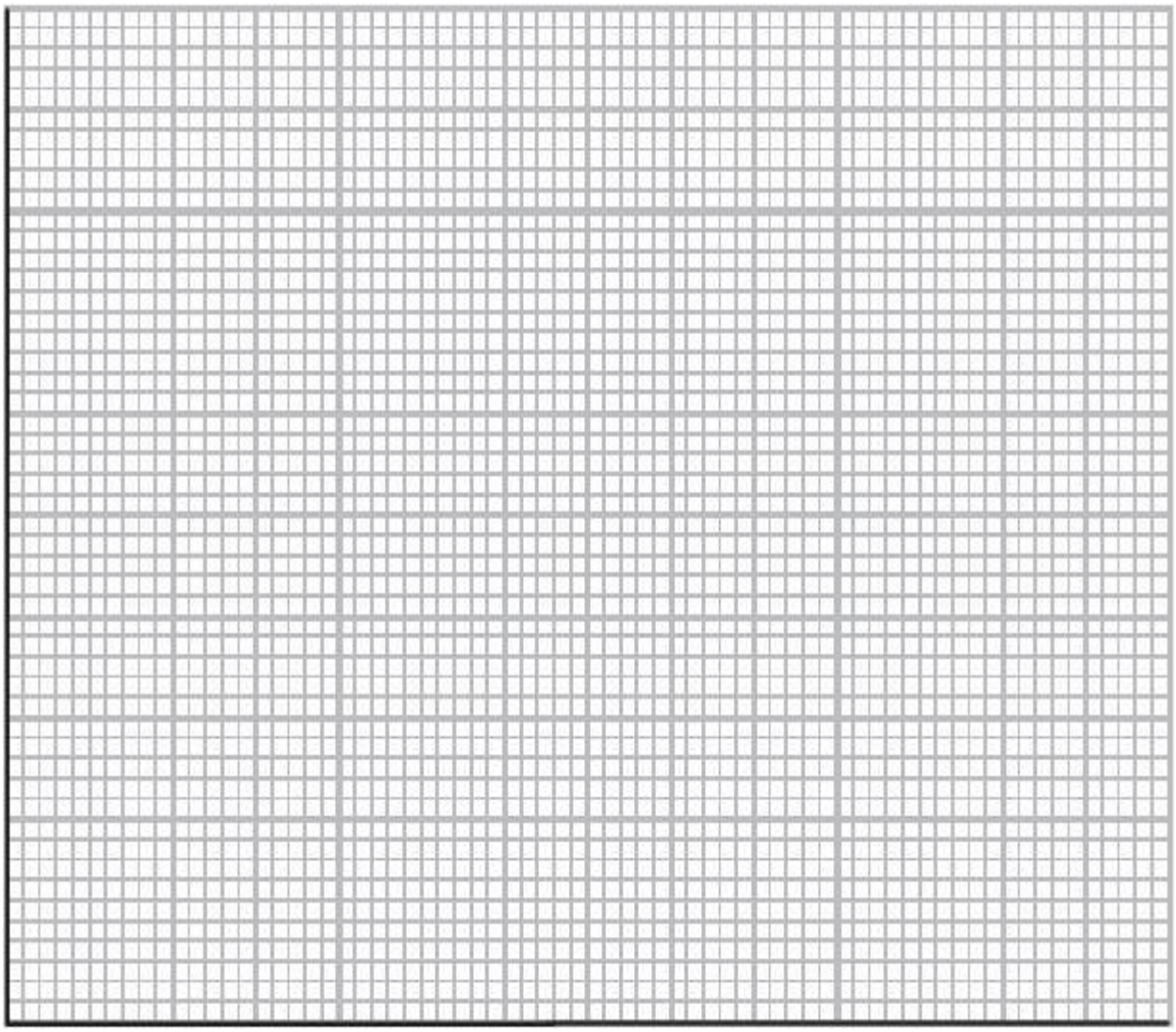
(b) Many different foods have been found to contain *Listeria*.

A study was carried out in the USA over a two-year period. The table shows the number of people who became ill with listeriosis after eating different types of food. It also shows the number of people who died as a result of becoming ill with listeriosis.

Type of food eaten	Number of people who became ill	Number of people who died
coleslaw	52	11
milk	105	5
cheese	364	80
processed meat	458	98
fresh meat	494	96

(i) Plot a bar graph to show the number of people who became ill and the number of people who died from listeriosis after eating the different types of food.

(5)



(ii) The likelihood of a person dying from listeriosis depends on which food the bacterium came from. Use the information in the table to determine which type of food is most likely to cause a bacterial infection that leads to death.
Show your working.

(2)

type of food .....

(c) Explain how the immune system protects most people from becoming ill with listeriosis.

(5)

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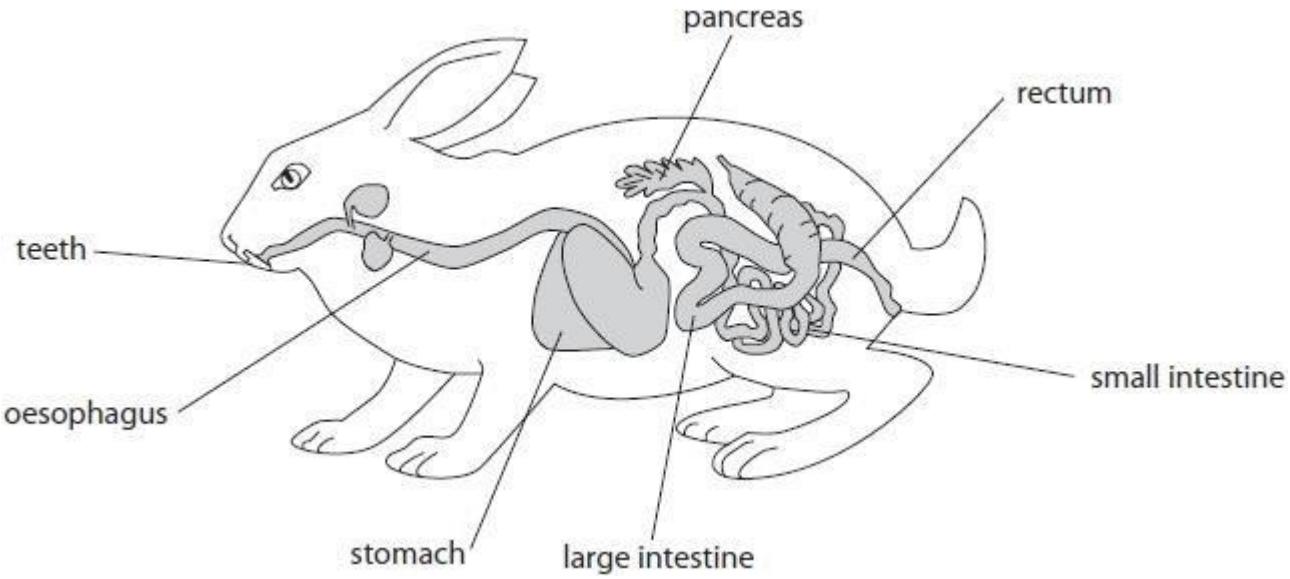
(Total for question = 15 marks)

Q5.

The diagram shows the alimentary canal of a rabbit with some parts labelled.



(a) The table lists descriptions of some parts of the alimentary canal.

Complete the table by giving the correct part from the diagram to match each description. One has been done for you.

(3)

Description	Part
used to chew food	teeth
has most villi for absorption	
produces hydrochloric acid	
stores faeces	

(b) Explain how the liver helps digestion in the alimentary canal.

(3)

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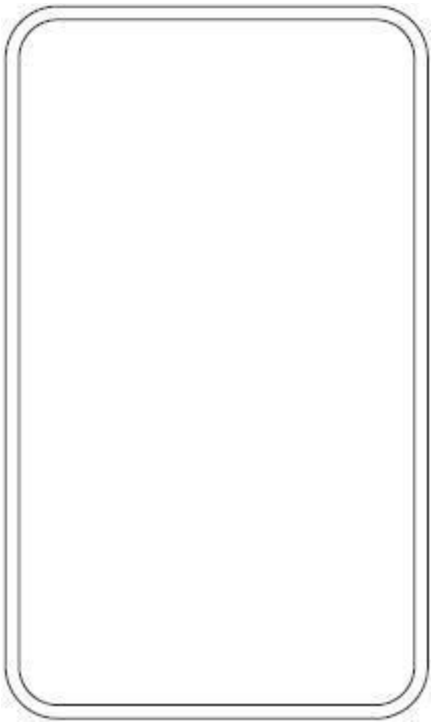
(c) Rabbits eat grass.

The diagram shows the cell wall of a leaf cell from a grass plant.
Complete the diagram by drawing and labelling other structures in this leaf cell.

(3)



(d) Grass cell walls are made of cellulose.

Rabbits cannot digest cellulose.
Bacteria living in the large intestine of rabbits can digest cellulose into glucose.
Rabbits eat their own faeces to obtain this glucose.

(i) Give two differences between the structure of bacterial cells and the structure of plant cells.

(2)

1 .....

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2 .....

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(ii) Describe a test to show that rabbit faeces contain glucose.

(3)

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(Total for question = 14 marks)

Q6.

(a) Diagram 1 shows a section through an eye with parts labelled A to F.

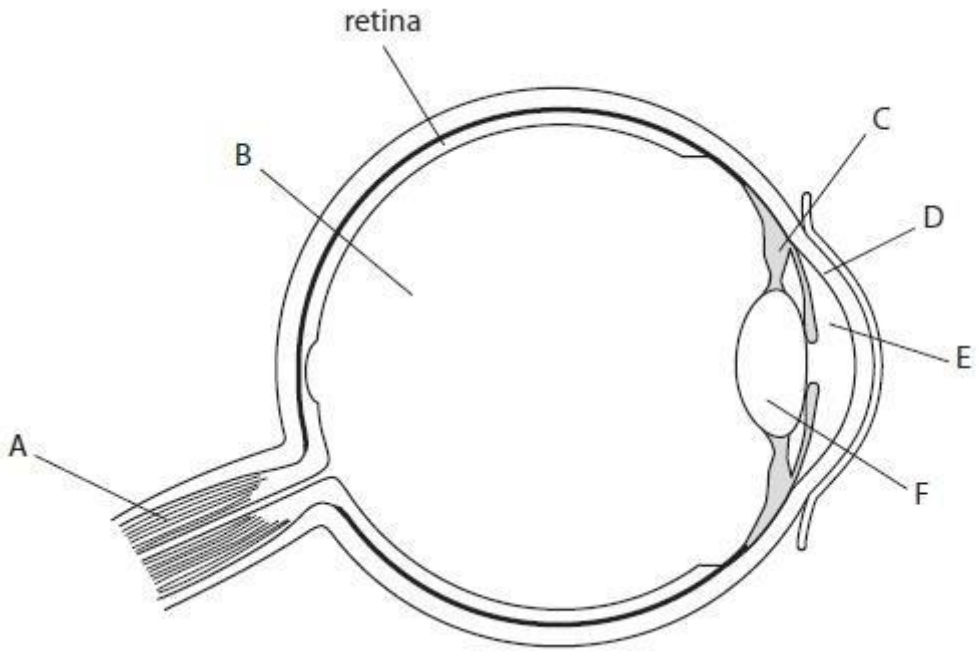

Diagram 1

(i) Give the letter that labels the cornea.

(1)

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(ii) Give the letter that labels a jelly-like fluid.

(1)

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(iii) Give the function of part A.

(1)

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(b) Diagram 2 shows a section through the eye of a person with a detached retina.

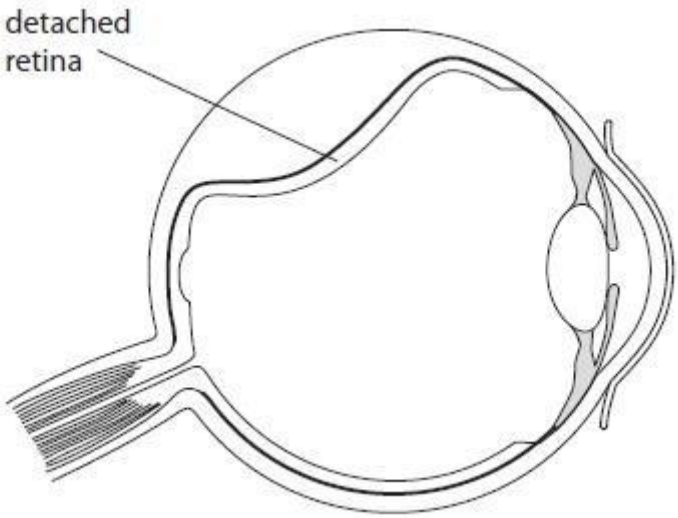

Diagram 2

Suggest how a detached retina could affect vision.

(2)

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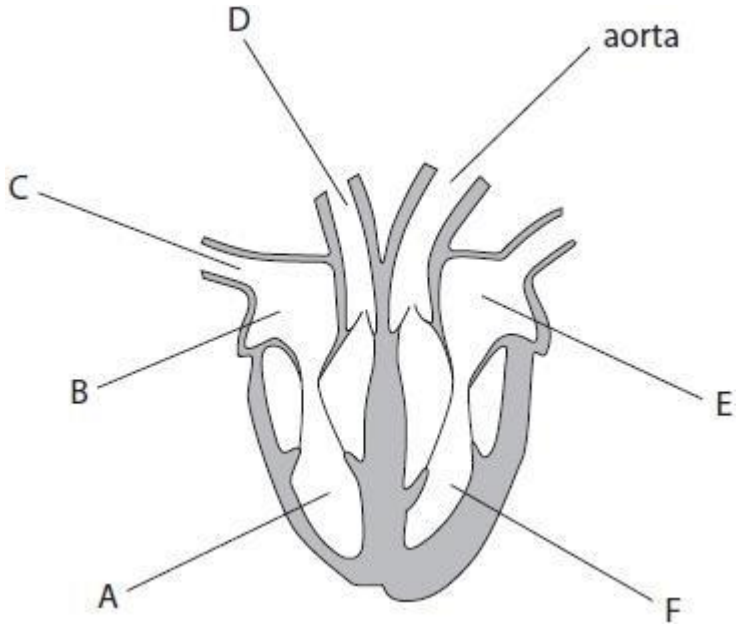
(Total for question = 5 marks)

Q7.

The diagram shows a section through the human heart.



(a) (i) Give the letter of the part known as the vena cava.

(1)

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(ii) Give the letters of the chambers where oxygenated blood is found.

(1)

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(b) Describe how the structure of the aorta is adapted for its role.

(2)

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(c) The table shows the speed of blood flow in three blood vessels.

Blood vessel	Speed of blood flow in cm per second
aorta	40.00
lung capillary	0.03
vena cava	15.00

(i) Blood has to travel 20 cm from a person's heart to their renal artery.
Calculate the time taken for blood to flow from this person's heart to their renal artery.
Show your working.

(2)

time ..... s

(ii) Explain how the speed of blood flow in the lung capillary affects gas exchange.

(2)

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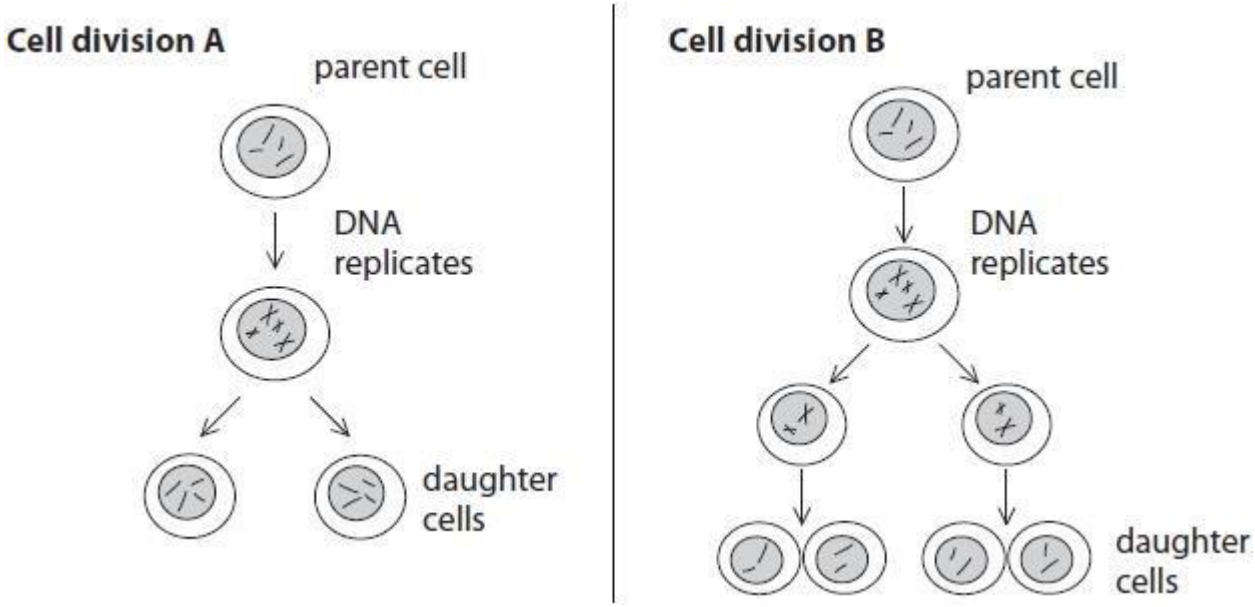
(Total for question = 8 marks)

Q8.

The diagram shows two types of cell division.



(a) Give the name of cell division A.

(1)

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(b) Using the information in the diagram, give two differences between cell division A and cell division B.

(2)

1 .....

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2 .....

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(c) Name a part of a flowering plant where cell division A occurs and a part where cell division B occurs.

(2)

A ..... B

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(Total for question = 5 marks)

Q9.

Two different varieties of yeast, A and B, are used to produce beers that contain different concentrations of alcohol.

Design an investigation to determine which variety of yeast is best for producing low alcohol beer.

Your answer should include experimental details and be written in full sentences.

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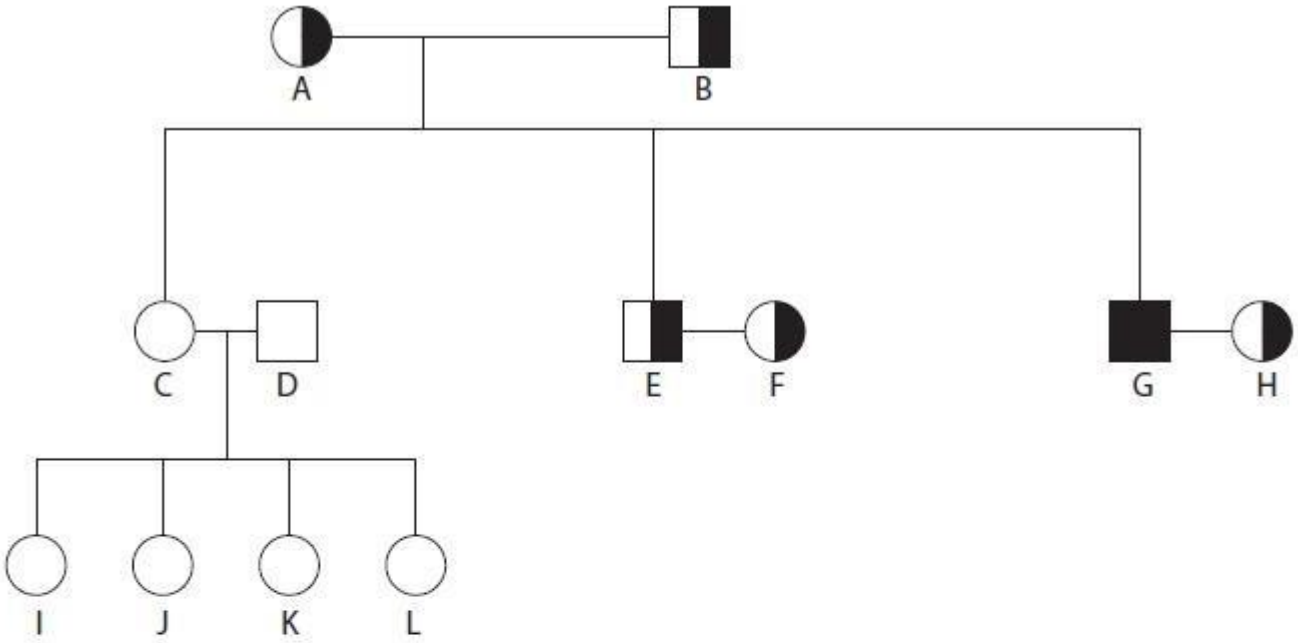
(Total for question = 6 marks)

Q10.

Cystic fibrosis is an inherited condition. It is caused by a recessive allele (d).

The non-cystic fibrosis allele is dominant (D).

The diagram shows how cystic fibrosis was inherited in a family.



key

	homozygous dominant female
	heterozygous female
	homozygous recessive female
	homozygous dominant male
	heterozygous male
	homozygous recessive male

(a) Use letters D and d to give the genotype of person A and person L in the table.

(2)

Person	Genotype
A	
L	

(b) How many people in this family do **not** have cystic fibrosis?

(1)

.....

(c) (i) Complete the table to show the probability of each set of people having a child with cystic fibrosis. One has been done for you.

(2)

People	Probability as a %
C and D	
E and F	25
G and H	

(ii) Parents E and F have four children. None of them have cystic fibrosis although the probability shown in the table is 25%.
Suggest why they did not have a child with cystic fibrosis.

(1)

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(Total for question = 6 marks)

Q11.

(a) What is meant by the term **gene**?

(2)

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(b) A gene is made from 1000 base pairs. The table shows the percentage of each base found in the gene.

(i) Complete the table by giving the name of the missing base.

(1)

Percentage of base	Name of base
29	adenine
21	
29	thymine
21	cytosine

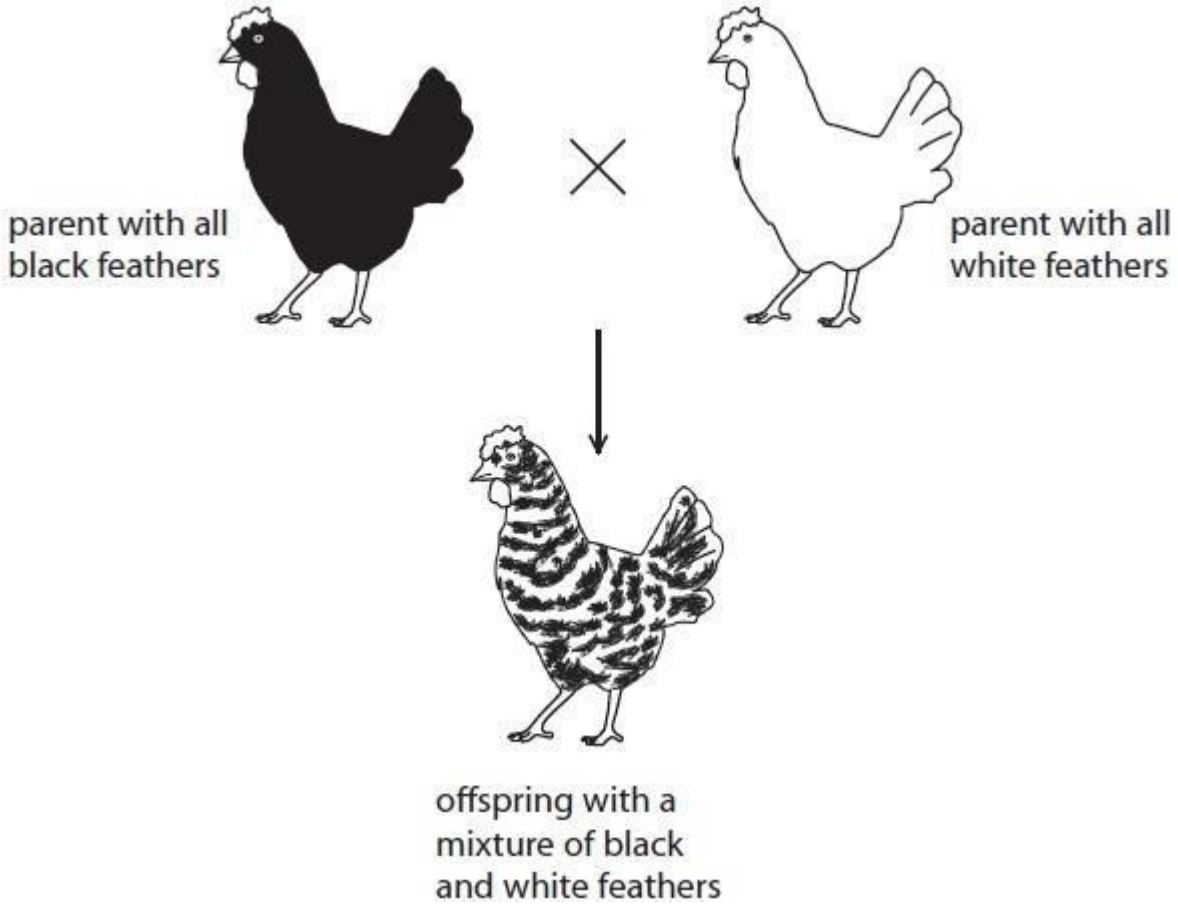
(ii) Calculate how many cytosine bases you would expect to find in this gene.

(1)

Answer .....

(c) The photograph shows a chicken with a mixture of black feathers and white feathers.

In chickens the inheritance of feather colour is controlled by codominant alleles. The allele for black feathers is C^B, and the allele for white feathers is C^W. The diagram shows a parent with all black feathers and a parent with all white feathers. It also shows one of their offspring with a mixture of black and white feathers.



(i) Complete the table by writing the genotype of the chickens shown in the diagram.

(1)

Chicken	Genotype
parent with all black feathers	
parent with all white feathers	
offspring with a mixture of black and white feathers	

(ii) Two of the offspring with a mixture of black and white feathers mated. What is the probability that their offspring would also have a mixture of black and white feathers?

(1)

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(Total for question = 6 marks)

Q12.

The use of a pesticide may result in an increase in the number of pest organisms that are resistant to the pesticide.

Use your knowledge of natural selection to explain the increase in the number of pest organisms that are resistant to the pesticide.

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(Total for question = 5 marks)

END OF PAPER