ST EDWARD'S

OXFORD

Lower Sixth Entrance Assessment
November 2013
Biology
1 hour

Candidate Name:

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INSTRUCTIONS TO CANDIDATES
Attempt **all** questions.

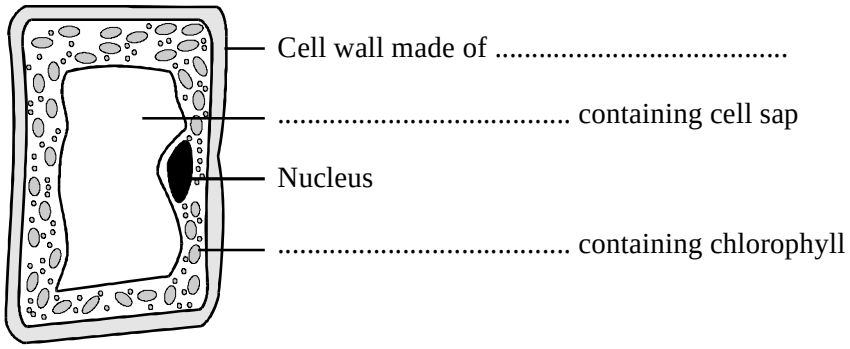
Write your answers in the spaces provided on the question paper

INFORMATION FOR CANDIDATES
The number of marks is given in brackets () at the end of each question or part question. The marks allocated and the spaces provided for your answers are a good indication of the length of answers required.

For Examiners' Use		
Question	Max	Mark
1	10	
2	10	
3	10	
4	5	
5	7	
6	10	
7	8	
Total -		/60

1. (a) The diagram shows a typical plant cell.

Complete the **three** spaces.



(3)

(b) Organisms have cells which produce enzymes.

(i) Name the single-celled organisms which produce the enzymes for bread making.

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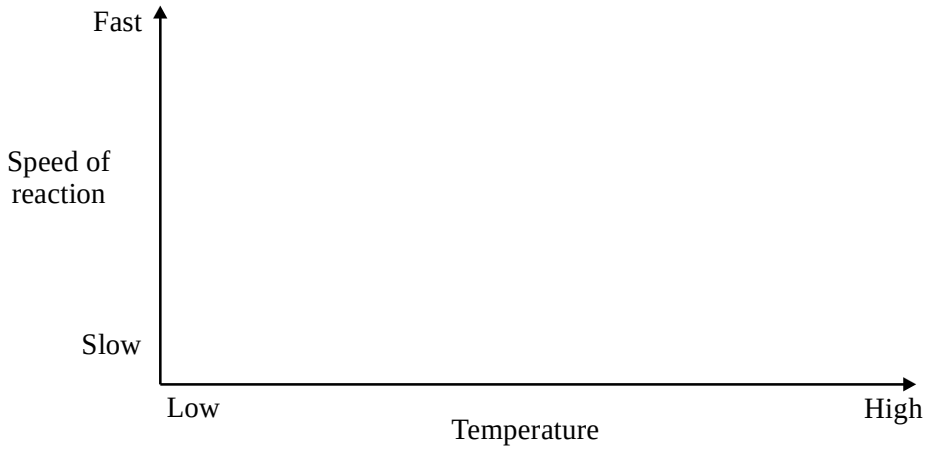
(1)

(ii) On the axes sketch a graph to show how the speed of an enzyme reaction changes with temperature.

Mark, with an **X** on the temperature axis, the *optimum temperature* for the action of the enzyme.



(2)

(iii) In the box, ring the temperature which is the optimum temperature for an enzyme which acts inside the human body.

23 °C	29 °C	31 °C	37 °C	41 °C	43 °C	47 °C	53 °C

(1)

(iv) Complete the sentence.

At temperatures much higher than its optimum temperature an enzyme is

..... .

(1)

(c) Enzymes affect certain chemical reactions in living things.

(i) What effect do enzymes have on these reactions?

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(1)

(ii) Complete the sentence.

When an enzyme affects a chemical reaction it is acting as a biological

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(1)
(Total 10 marks)

2. (a) Respiration is a process which takes place in living cells. What is the purpose of *respiration*?

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(1)

(b) (i) Balance the equation for the process of respiration when oxygen is available.

$C_6H_{12}O_6$ + O_2 → CO_2 + H_2O

(1)

(ii) What is the name of the substance in the equation with the formula $C_6H_{12}O_6$?

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(1)

(c) Oxygen is absorbed through the alveoli in the lungs.

(i) How are the alveoli adapted for this function?

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(2)

(ii) Name the gas which is excreted through the alveoli.

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(1)

(d) (i) What is the name of the process of respiration when oxygen is **not** available?

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(1)

(ii) Describe the process of respiration which takes place in human beings when oxygen is **not** available and give an effect.

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(3)

(Total 10 marks)

3. Sickle cell anaemia is an example of a disease caused by a *mutation* affecting one of the genes involved in the production of haemoglobin.

- Hb is a gene that determines haemoglobin.
- Hb^A causes normal haemoglobin and is *dominant.*
- Hb^S causes defective haemoglobin and is *recessive.*
- In the *homozygous* recessive condition the person suffers acute anaemia and has a low life expectancy.
- In the *heterozygous* condition individuals suffer from the sickle cell trait but have increased resistance to malaria.

(a) What is the role of haemoglobin in the body?

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(1)

(b) What is a *mutation*?

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(1)

(c) Use the information above to explain what is meant by the terms *homozygous* and *heterozygous*.

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(2)

(d) Use the information above to explain what is meant by the terms *dominant* and *recessive*.

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(2)

(e)

Father

Mother	Hb^A	Hb^S
Hb^A	**Child 1** Hb^AHb^A	**Child 2** Hb^AHb^S
Hb^S	**Child 3** Hb^AHb^S	**Child 4** Hb^SHb^S

(i) Which child will have sickle cell anaemia?

Child .....

(ii) Which child will have sickle cell trait?

Child .....

(iii) Which child will not carry any sickle cell genes?

Child .....

(iv) Which child will be more resistant to malaria?

Child .....

(4)
(Total 10 marks)

4. Penicillin is an antibiotic which stops bacteria from reproducing. It was used a lot in the past to treat bacterial infections in humans and other animals. In many hospitals there are now strains of penicillin resistant bacteria.

Explain how natural selection could have produced these strains of penicillin resistant bacteria.

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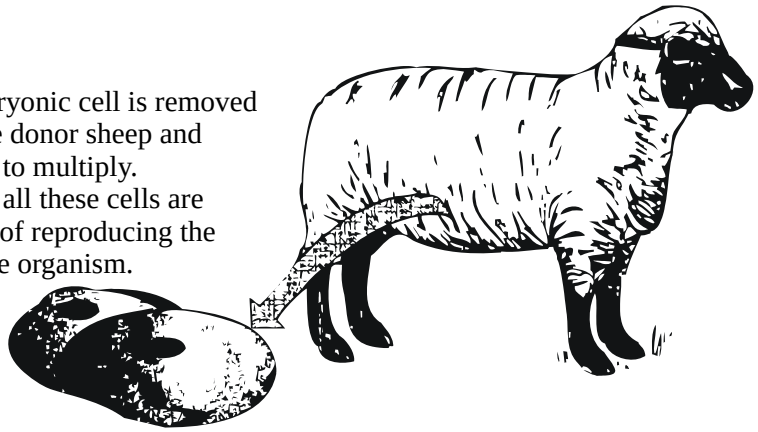
(Total 5 marks)

5. The diagram shows one method of cloning sheep.

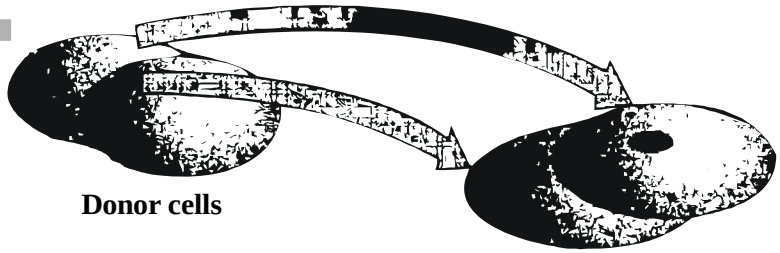
1

An embryonic cell is removed from the donor sheep and allowed to multiply. Initially all these cells are capable of reproducing the complete organism.



2

The nuclei are taken from the donor cells and imported into 'foster eggs' (nuclei-less ova from other sheep). They are allowed to develop.

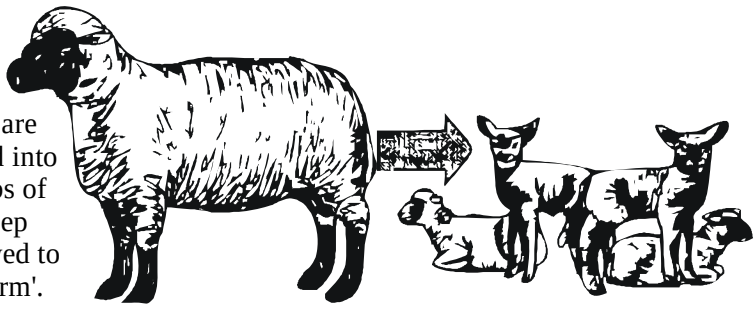


Donor cells

'Foster' eggs

3

The eggs are implanted into the wombs of foster sheep and allowed to 'go full term'.



(a) Explain why the lambs produced by this technique are identical to each other.

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(2)

(b) Explain why the lambs are **not** genetically identical to the sheep which produced the 'foster' eggs.

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(2)

(c) Explain the drawback of widespread use of just a few clones of sheep.

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(3)

(Total 7 marks)

6. The information in the table compares two farms. Both are the same size, on similar land, close to one another and both are equally well managed.

Name of farm	Activity	Energy value of food for humans produced in one year	Number of people whose energy requirements can be met by this food
Greenbank Farm	Grows food for humans	3285 million kJ	720
Oaktree Farm	Grows food for animals on the farm which become food for humans	365 million kJ	80

(a) Use this information to work out the average daily human energy requirement in kilojoules (kJ) per day.

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Energy requirement = ... kJ/day

(2)

(b) The figures show that farms like Greenbank Farm can be nine times more efficient at meeting human food energy requirements than farms such as Oaktree Farm.

(i) The food chain for Greenbank Farm is:

vegetation → humans

What is the food chain for Oaktree Farm?

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(1)

(ii) Explain why Greenbank Farm is much more efficient at meeting human food energy requirements.

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(3)

(c) The human population has been increasing rapidly throughout this century. It is now about 6 billion and is still growing. What does the information in this question suggest about likely changes in the human diet which may need to occur during the coming century? Explain your answer.

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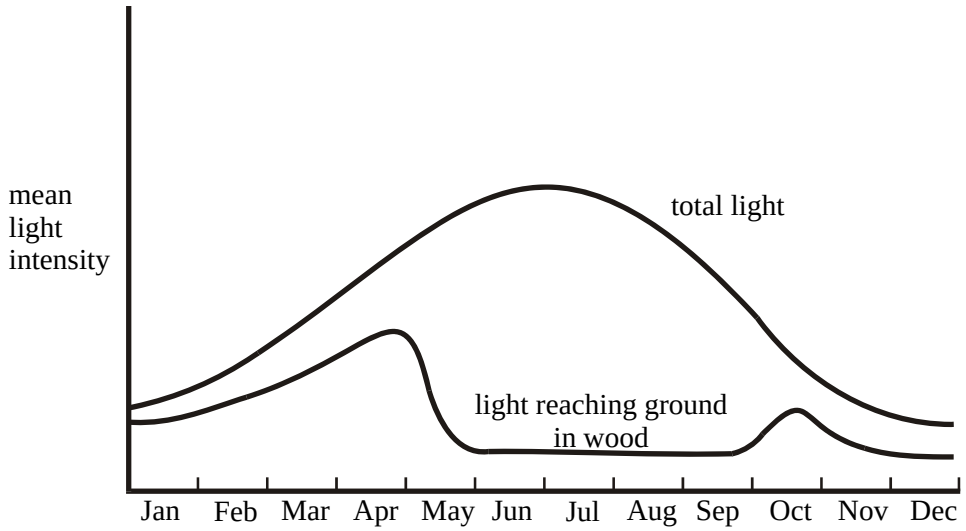
(4)
(Total 10 marks)

7. The graph shows the mean light intensity at different times of the year in an oak wood.



(a) (i) In which month would you expect the rate of photosynthesis in the oak trees to be greatest?

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(1)

(ii) There are plants living on the ground in the wood. In which month would you expect their rate of growth to be fastest?

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Explain your answer.

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(3)

(b) Name **two** factors, other than light intensity, that would affect the rate of photosynthesis in the oak trees.

1 .....

2 .....

(2)

(c) An oak wood contained the following:

200	oak trees
150 000	primary consumers
120 000	secondary consumers

Draw and label the following a pyramid of biomass for this wood. (Your pyramid does not have to be drawn to scale).

(2)
(Total 8 marks)