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Student number

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Name _____

Date _____

Attempt/Time taken _____

GCSE BIOLOGY

Topic Paper: 6.2 Variation and evolution: Section 1
Part 1

Time allowed: 35 minutes

Materials

For this paper you must have:

- the Periodic Table/Data Sheet, provided as an insert (enclosed)
- a ruler with millimetre measurements
- a calculator, which you are expected to use where appropriate.

Instructions

- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- All working must be shown.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information

- The Periodic Table/Data Sheet is provided as in insert.
- You are reminded of the need for good English and clear presentation in your answers.
- When answering questions you need to make sure that your answer:
 - is clear, logical, sensibly structured
 - fully meets the requirements of the question
 - shows that each separate point or step supports the overall answer.



28 Marks



Q1. Read the information.

Insects can be both useful and harmful to crop plants.
Insects such as bees pollinate the flowers of some crop plants. Pollination is needed for successful sexual reproduction of crop plants.
Some insects eat crops and other insects eat the insects that eat crops.

Corn borers are insects that eat maize plants.
A toxin produced by the bacterium *Bacillus thuringiensis* kills insects.
Scientists grow *Bacillus thuringiensis* in large containers. The toxin is collected from the containers and is sprayed over maize crops to kill corn borers.

A company has developed genetically modified (GM) maize plants. GM maize plants contain a gene from *Bacillus thuringiensis*. This gene changes the GM maize plants so that they produce the toxin.

(a) Describe how scientists can transfer the gene from *Bacillus thuringiensis* to maize plants.

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(3)



(b) Would you advise farmers to grow GM maize plants?

Justify your answer by giving advantages and disadvantages of growing GM maize plants.

Use the information from the box and your own knowledge to help you.

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(4)
(Total 7 marks)



Q2. Scientists have brought an extinct species of mountain goat, the Pyrenean ibex, 'back to life'. These scientists used skin cells from preserved Pyrenean ibex in cloning experiments.

The Scientists:

removed the nuclei from domestic goat egg cells

transferred cell nuclei from the skin cells of the Pyrenean ibex into domestic goat egg cells

used the domestic goats as surrogate mothers for the embryos that developed.

The scientists made 439 cloned embryos, but only 57 were suitable for transfer into the surrogate goat mothers. Only seven of the goats got pregnant and only one live offspring was born.

Some biologists are very worried about using cloning to preserve endangered animals, because cloned animals often have developmental problems. Some endangered animals are difficult to breed in captivity. For these animals cloning is another way to continue the genetic line.

The biggest threats to endangered animals today are habitat loss, illegal hunting, pollution and climate change. Many scientists say that cloning is not as important as trying to preserve the wild places on Earth. The wild places are being lost very quickly and the animals and plants living in the wild places are dying out.

(a) The Pyrenean ibex was 'brought back to life'.

How is this process different from using adult cell cloning to clone a pet animal?

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(1)



- (a) The fusion of the body cell from the male sheep and the egg from the female sheep is an example of asexual reproduction.

Explain why.

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(2)

- (b) (i) Give the gender and face colour of the cloned lamb.

Gender

Face colour

(1)

- (ii) Give the reasons for your choice.

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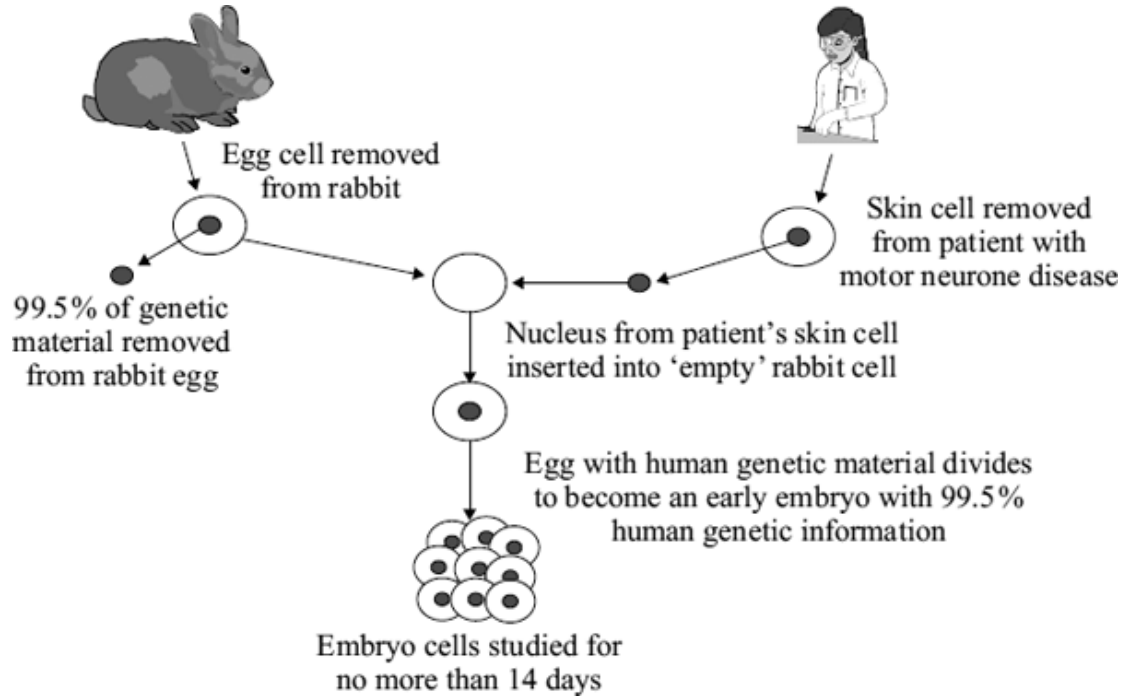
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(Total 5 marks)



Q4. Scientists in Korea have discovered a method of producing rabbit–human embryos. Rabbit–human embryos could provide cells for research into human diseases such as motor neurone disease. Rabbits produce large numbers of eggs. Rabbit–human embryos could overcome a shortage of human embryo cells for research.

The diagram shows how rabbit–human embryos are produced.



(a) Which structures in the nucleus contain 99.5% of a cell's genetic information?

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(1)



- (b) Use the above information and your own knowledge and understanding to evaluate how the production of rabbit–human embryos may help research into human diseases.

Remember to give a conclusion as part of your evaluation.

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(4)
(Total 5 marks)

Q5. Scientists have recently cloned a mouse that had died and been frozen for 16 years.

- (a) Explain what is meant by a clone.

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(2)



- (b) The scientists used an egg cell from a living mouse and the genetic material from a brain cell of the frozen mouse.

Describe how the process of adult cell cloning could be used to clone the frozen mouse.

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(3)

- (c) People could ask scientists to use this technique to clone long-dead relatives, whose bodies have been deep-frozen.

Most people would be opposed to cloning a human from a deep-frozen, long-dead relative.

Give **one** reason why.

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(1)

(Total 6 marks)