

# Gene Technology

## Question Paper 1

<b>Level</b>	International A Level
<b>Subject</b>	Biology
<b>Exam Board</b>	Edexcel
<b>Topic</b>	Coordination, Response, Gene Technology
<b>Sub-Topic</b>	Gene technology
<b>Booklet</b>	Question paper 1

**Time Allowed:** 47 minutes

**Score:** /39

**Percentage:** /100

**Grade Boundaries:**

A*	A	B	C	D	E	U
>85%	77.5%	70%	62.5%	57.5%	45%	<45%

1 The scientific article you have studied has been adapted from a Royal Society publication. Use the information in the article and your own knowledge to answer the following questions.

(a) Scientists are encouraged to use non-animal alternatives in their research (paragraphs 3 and 5).

Name **one** non-animal alternative that can be used in research and give an advantage of this alternative method.

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(b) Explain why new medicines are tested on animals before they are tested on humans (paragraph 7).

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(e) Suggest how the experimental design for the testing of thalidomide could have been improved (paragraph 13).

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(f) State what is meant by the term **mouse genome** (paragraph 15).

(1)

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(g) Explain why animals had to be used to test the polio vaccine (paragraphs 17 and 18).

(2)

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- (j) The article states that there is an “alternative to such absolutism” (paragraph 29). People who believe in this alternative ethical position are called relativists.

Suggest the opinion a relativist would have with regard to using animals in research.

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- (k) The article states that scientists who use animals for testing are expected “to reduce the number of animals used in research to the minimum required for meaningful results” (paragraph 37).

Explain why reducing numbers below the minimum required could produce results that are not meaningful.

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(l) Suggest how gene therapy for “motor neuron degeneration diseases” such as ALS might be carried out (paragraph 42).

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\*(m) An investigation that used animals was carried out by Hubel and Weisel. These scientists used kittens to investigate brain development.

Explain how this work helped to develop explanations of human brain development.

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**(Total for Question 1 = 30 marks)**



- 2 The zebrafish is a tropical freshwater fish that has been genetically modified.  
The photograph below shows a zebrafish.



Magnification  $\times 1$

- (a) The transcription factor known as Sp2 has been studied. In this study, a gene from red coral cells was added to the genome of the zebrafish.

The gene from red coral cells produces a red protein when the synthesis of Sp2 also occurs.

- (i) Explain what is meant by the term **transcription factor**.

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(ii) Suggest how this gene is removed from the red coral cells and then added to the zebrafish genome.

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(b) Genetically modified zebrafish, in a variety of bright colours, can be bought from some pet shops.

The colour of the zebrafish depends on which gene has been added to its genome.

Suggest **one** potential risk to other organisms in a river ecosystem if a genetically modified zebrafish escaped into this river.

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(c) The optimum temperature range for zebrafish to survive is 17–29°C.

An investigation was carried out to study the effect of water temperature on the survival of both genetically modified zebrafish and non-genetically modified zebrafish.

The results are shown in the table below.

Type of zebrafish	Lowest temperature for survival / °C	
	Mean	Standard deviation
Non-genetically modified	5.3	1.3
With gene for red protein	9.2	1.9
With gene for green protein	6.4	1.3

(i) These results suggest that there would be less risk to the environment if zebrafish with the gene for the red protein escaped into a cold water river compared with non-genetically modified zebrafish.

Using the information in the table, give the evidence for this.

(1)

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(ii) These results also suggest that there may be no difference in the lowest temperature for survival of the zebrafish with the gene for the green protein and the non-genetically modified zebrafish.

Using the information in the table, give the evidence for this.

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