

# Transfer of Genetic Variation

## Question Paper 1

|            |                               |
|------------|-------------------------------|
| Level      | A Level                       |
| Subject    | Biology                       |
| Exam Board | Edexcel                       |
| Topic      | Origins of Genetic variation  |
| Sub Topic  | Transfer of Genetic variation |
| Booklet    | Question Paper 1              |

Time Allowed: 57 minutes

Score: /47

Percentage: /100

Grade Boundaries:

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

(a) Inherited factors may contribute to the development of moyamoya.

**Key:**

- = unaffected male
- = unaffected female
- = affected male
- = affected female

(3)

[illegible]

(ii) Using a genetic diagram, find the probability that the next child born to parents 3 and 4 would be affected by moyamoya.

(3)

Probability.....

(b) One way of treating moyamoya is to transplant an artery from a suitable donor to bypass the affected arteries supplying the brain.

Explain how the structure of an artery is adapted for its function.

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- 2 The pigment melanin affects fur colour in mammals, such as rabbits.

As a result of polygenic inheritance, some breeds of rabbit may have fur that ranges in colour from light brown to black.

- (a) Explain what is meant by the term **polygenic inheritance**.

(2)

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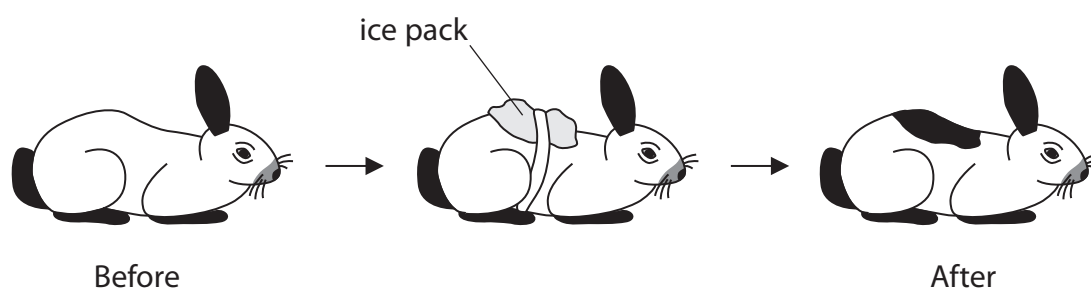
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- (b) Himalayan rabbits are white with black fur on their ears, tails and feet.

An experiment was carried out to investigate the effect of temperature on the fur colour in Himalayan rabbits. An area of fur was shaved from the back of a rabbit and an ice pack taped to the area until the fur grew back.

The fur that grew back was black.



- (i) Suggest a control for this experiment.

(1)

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- (ii) It is thought that the expression of the gene for fur colour in Himalayan rabbits is affected by the environment.

Explain how this experiment provides evidence to support this hypothesis.

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- (c) The production of melanin is controlled by an enzyme called tyrosinase.

Further investigations suggested that in Himalayan rabbits the enzyme tyrosinase is inactive at temperatures above 25°C.

Suggest how the results of this investigation support this hypothesis.

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- 3 A number of investigations have been carried out to study the effect of nature and nurture on human development.
- (a) Explain how twin studies could be used to compare the effects of nature and nurture on human development.

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- (b) (i) Facial expressions can show different emotions.
- Explain how a cross-cultural study could be used to investigate whether recognising different emotions through facial expression is due to nature or nurture.

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(ii) Suggest how this cross-cultural study could be carried out to make sure that the results are valid.

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(Total for Question 3 = 8 marks)

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- 4 The photograph below shows a cleft iris, a rare condition in humans. Cleft iris may be due to the inheritance of recessive alleles.



Magnification  $\times 1$

- (a) Explain the meaning of the term **recessive allele**.

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- (b) (i) In the space below, draw a genetic diagram to show the genotypes and phenotypes of a man with cleft iris and a woman who is heterozygous for this condition, and all their possible children.

(4)

- (ii) State the probability that the first child of these parents will have a cleft iris.

(1)

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**(Total for Question 4 = 8 marks)**

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(a) Read through the following passage about cystic fibrosis then write on the dotted lines the most appropriate word or words to complete the sentences.

Cystic fibrosis is a disorder caused by one of a number of gene mutations.

..... for the recessive allele. The gene codes for

a ..... protein called CFTR. This protein is responsible for the movement of ..... ions across the cell membranes. Cystic fibrosis impairs the functions of the gaseous exchange, digestive and ..... systems in the body.

(b) Explain why people with cystic fibrosis can have breathing difficulties.

(4)

- (c) Cystic fibrosis can be detected using prenatal genetic testing.
- (i) Describe how **one** named method of **prenatal** genetic testing can be carried out.

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- (ii) Explain **either** one ethical issue **or** one social issue relating to the use of prenatal genetic testing.

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