# End of topic quiz

# Topic B5: Genes, inheritance and selection

## Learner Activity

### Topic: B5 of J250

**Total marks: 40**

1. Which of the following shows continuous variation? **[1 mark]**

|  |  |  |
| --- | --- | --- |
| **A** | Ability to roll tongue |  |
| **B** | Blood group |  |
| **C** | Eye colour |  |
| **D** | Weight |  |

Your answer

1. If a haploid cell has 20 chromosomes.

How many chromosomes will a diploid cell of the same species have? **[1 mark]**

|  |  |  |
| --- | --- | --- |
| **A** | 10 |  |
| **B** | 20 |  |
| **C** | 40 |  |
| **D** | 46 |  |

1. What is the genome? **[1 mark]**

|  |  |  |
| --- | --- | --- |
| **A** | The dominant genes which are expressed. |  |
| **B** | The entire genetic material of an organism. |  |
| **C** | The genes in an organism. |  |
| **D** | The length of DNA which codes for the making of a protein. |  |

Your answer

1. Which column in the table correctly describes the cells involved in meiosis?

| Type of cell | **1** | **2** | **3** | **4** |
| --- | --- | --- | --- | --- |
| body cell | diploid | diploid | haploid | diploid |
| egg cell | diploid | haploid | haploid | haploid |
| sperm cell | haploid | haploid | haploid | haploid |
| zygote cell | diploid | diploid | diploid | haploid |

|  |  |  |
| --- | --- | --- |
| **A** | 1 |  |
| **B** | 2 |  |
| **C** | 3 |  |
| **D** | 4 |  |

Your answer

1. Which of the following does **not** occur as part of evolution?

|  |  |  |
| --- | --- | --- |
| **A** | A change in inherited characteristics of a population over time. |  |
| **B** | The inheritance of acquired characteristics. |  |
| **C** | The process of natural selection. |  |
| **D** | The formation of a new species. |  |

Your answer

1. A homozygous black-haired guinea pig was bred with a homozygous brown-haired guinea pig.

All the offspring had black hair.

Assume hair colour is controlled by a single gene.

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| **(a)** | **(i)** | What is meant by the term homozygous? **[1 mark]** | |
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|  | **(ii)** | Which is the dominant hair colour in mice and why? **[1 mark]** | |
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| **(b)** | **(i)** | One of the heterozygous black-haired mice was bred with a homozygous brown-haired mouse.  Use a genetic diagram to show the outcome of this cross.  Use the symbols B and b to represent the alleles. **[3 marks]** | |
|  |  | black mouse brown mouse  genotype ..................... ....................  gametes ..................... ....................  offspring genotypes ............................... | |
|  |  |  |  |
|  | **(ii)** | What is the ratio of phenotypes in the offspring? **[1 mark]** | |
|  |  |  | |
|  |  |  |  |
| **(c)** |  | Single gene inheritance was assumed in this example.  Single gene inheritance allows predications based on simple genetic crosses.  Why are most phenotypic features more difficult to predict? **[1 mark]** | |
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1. There are many possible ways of classifying organisms.

The first person to suggest a classification system was a biologist called Linnaeus in 1735.

He grouped organisms by looking at similarities in their structures, like wings, which were shared by large groups.

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| **(a)** |  | What type of classification system is this and why? **[2 marks]** | |
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| **(b)** |  | How has classification changed since the use of DNA sequencing? **[3 marks]** | |
|  |  |  | |

1. In humans sex is determined by a person’s chromosomes.

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| **(a)** |  | What is a chromosome? **[2 marks]** | |
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| **(b)** |  | A couple are expecting a baby.  Use a genetic cross to show that the probability of having a female child. **[4 marks]** | |
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|  |  |  |  |
| **(c)** | **(i)** | Sometimes offspring can have multiple copies of sex chromosomes due to problems in meiosis.  An individual with XXY chromosomes has a male phenotype. This is called Klinefelter syndrome.  What is meant by the term phenotype? **[1 mark]** | |
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|  | **(ii)** | A normal human gamete has 23 chromosomes.  How many chromosomes could be in the gamete which causes Klinefelter syndrome? **[1 mark]** | |
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|  | **(iii)** | Why could this be a problem? **[1 mark]** | |
|  |  |  | |

1. The peppered moth is a possible example of natural selection.

Read the article about the peppered moth.

“Scientists have discovered the specific mutation that turned moths black during the industrial revolution.

A black form of the peppered moth became common during the 1800s. At this time soot blackened the tree trunks and walls of the moth’s habitat. The peppered moth normally has a pale colouring.

The mutation is in a gene called *cortex*. A ‘jumping’ piece of DNA had inserted itself into the gene, causing a change in the order of nucleotides. This change caused the moth to be black.”

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| **(a)** |  | “The mutation is in a gene called *cortex*.”  What is a gene? **[2 marks]** | |
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| **(b)** |  | Why is the mutation in the *cortex* gene unusual? **[1 mark]** | |
|  |  |  | |
|  |  |  |  |
| **(c)** |  | How has the genome and/or environment influenced the phenotype? **[2 marks]** | |
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| **(d)** |  | How has natural selection caused an increase in the number of black moths during the 1800s? **[4 marks]** | |
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|  |  |  |  |
| **(e)** |  | Clean air laws came into effect in the 1960s.  Since this time more pale moths have been seen.  Why could this be? **[2 marks]** | |
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| **(f)** |  | Another example of natural selection leading to evolution is antibiotic resistance in bacteria.  How has antibiotic resistance in bacteria provides evidence for evolution? **[3 marks]** | |
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