

## AS91157 Demonstrate understanding of genetic variation and change

### Genetic Variation

**(2016,1 part (d))**

#### INHERITANCE AND MEIOSIS

Roses display complete dominance in both their flower colour and in their susceptibility to some diseases. The allele for red petals (R) is dominant to the allele for white petals (r). In addition, the allele for healthy leaves (H) is dominant to the allele for being susceptible to leaf lesions (h).



Leaf lesions are spots on the leaf that are very prone to disease and injury. The genes for petal colour and healthy leaves are located on different chromosomes.

(d) Discuss the processes that produce genetic variation during meiosis, and how gametes differ from parent cells.

Your answer should include:

- a description of meiosis and the type of cells produced by meiosis
- an explanation of the processes of independent assortment, segregation, and crossing over
- a discussion of how each process contributes to the genetic variation of cells produced. You may use diagrams in your answer

**(2014, 2)**

#### NEW ALLELES

Pumpkins can grow in the wild. Wild pumpkins are usually round and have seeds in the centre. With the seeds being in the centre, when animals take a bite there is a high chance of seeds being eaten and then distributed.

Mutations can occasionally cause pear-shaped pumpkins to form. Pear-shaped pumpkins have seeds at only one end.



(a) Define the term mutation.

(b) Gametic mutation leads to pear-shaped pumpkins. Explain the process of gametic mutation including what it is, and where it occurs.

- (c) Not all gametic mutations may enter the gene pool.

Discuss why the allele for pear-shaped pumpkin has not become established in the wild gene pool.

In your discussion:

- describe what a gene pool is
- explain the process of natural selection
- explain how natural selection influences allele frequencies in a gene pool
- discuss why the pear-shaped pumpkin allele has not become established in the wild gene pool through natural selection.

Justify your answer with reasons.

**(2014, 1(d))**

- (d) Discuss how crossing over and linked genes affect genetic variation in a population.

In your discussion:

- describe what linked genes are
- describe the process of crossing over, including when it occurs
- explain the effect of crossing over on linked genes
- compare and contrast how both linked genes, and crossing over, affect genetic variation in a population.

*You may draw diagrams to support your answer.*

**(2013, 2(b))**

- (b) Sources of variation in a gene pool result from the biological processes such as independent assortment and mutation.

Discuss how independent assortment and mutation lead to variation within a gene pool.

In your answer:

- describe independent assortment and mutation
- explain why mutations are the major source of new alleles in a population AND why independent assortment does not introduce new alleles into a population
- compare and contrast how independent assortment and mutation produce variation within an organism.

**(2012, 1)**

**NEW ALLELES**

Mutations can result in the formation of new alleles, but not all new alleles enter the gene pool of a population.

Discuss this statement, considering the following points in your response:

- what is meant by the terms: mutation and gene pool
- differences between somatic and gametic mutation
- the factors that determine whether an allele enters the gene pool.

*Demonstrate understanding of genetic variation and change.*

The following questions were collated from the expired Level 2 AS 90459 Describe genetic variation and change but are still useful for the new AS91157

**(2011:1)**

Meiosis leads to variation in the offspring of plants and animals.

Discuss the three main processes that occur during meiosis: independent assortment, segregation, and recombination / crossing-over. Your answer should include:

- a description of each process
- an explanation of how each process creates variation
- an evaluation of how each process contributes to the overall level of variation found in the gametes.

You may use diagrams to help with your answer.

**(2010:1)**

Discuss how crossing over (recombination) and mutation can lead to changes of alleles in the offspring of an organism, and the effect this can have over time. In your response you should include:

- how crossing over (recombination) and mutation can lead to changes of alleles in the offspring
- why only some mutations are inherited
- the significance of changes over time.

You may include diagrams to help you answer the question.

**(2009:2)**

Discuss how and why the different processes that can occur during meiosis can lead to genetic variation between individuals.

Take into account the following:

- independent assortment
- segregation
- recombination / crossing over.

**(2008:1)**

During the process of meiosis, independent assortment and crossing over (recombination) can occur. This results in genetic variation in the offspring of sexually-reproducing individuals.

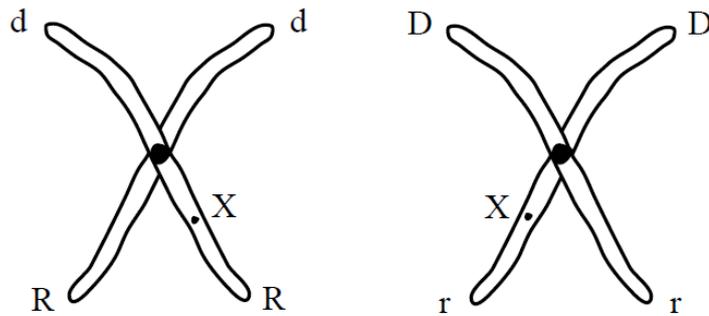
- (a) Describe what happens during independent assortment.
- (b) Explain how crossing over (recombination) can contribute to the genetic variation that results from sexual reproduction. You may use a diagram to help with your answer if you wish.
- (c) Genetic variation can also result from mutation. Explain the result of mutations in somatic and gametic cells.

(2007:1d)

(d) Discuss how the processes involved in meiosis can contribute to genetic variation.

(2006:1)

(a) The diagram below represents a replicated pair of homologous chromosomes, during meiosis.



Draw diagrams to represent the chromosomes in the gametes produced at the end of meiosis when crossing over occurs at point X.

(b) Explain why crossing over can be an advantage to a population.

Answers will be found for Level 2 AS 90459 at

<http://www.nzqa.govt.nz/qualifications-standards/qualifications/ncea/subjects/biology/expired-standards/>