

Chapter 14: Variation and evolution

Knowledge organiser

Variation in populations

Differences in the characteristics of individuals in a _____ are called **variation**.

Variation may be due to differences in

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-
-

Mutation

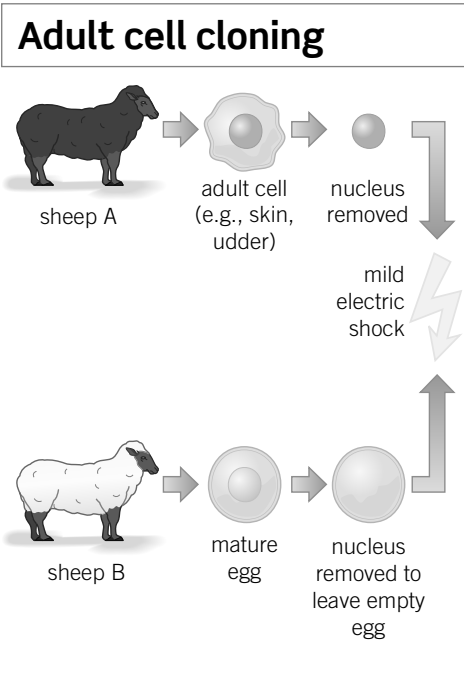
There is usually a lot of _____ variation within a population of a species – this variation arises from _____.

A mutation is a change in a DNA _____:

- mutations occur _____
- very rarely a mutation will lead to a new _____, but some may change an existing phenotype and most have no effect.
- if a new phenotype is suited to an environmental change, it can lead to a relatively rapid change in the _____.

Cloning

A **clone** is an individual that has been produced _____ and is genetically identical to its _____.



Selective breeding

Selective breeding (artificial selection) is the process by which humans _____ plants and animals for particular genetic _____.

Process of selective breeding:

- 1.
- 2.
- 3.
- 4.

The characteristic targeted in selective breeding can be chosen for usefulness or appearance, for example:

-
-
-
-

Disadvantages of selective breeding:

-
-

Genetic engineering (HT only)

Genetic engineering is a process that involves changing the _____ of an organism by introducing a gene from another organism, to produce a desired characteristic.

- Bacterial cells have been _____ to produce useful substances, such as human insulin to treat _____.
- Plant crops have been genetically engineered to be resistant to diseases, insects, or herbicides, or to produce bigger and better fruits and higher _____. Crops that have undergone genetic engineering are called _____ (GM).

The diagram shows the steps of genetic engineering: 1. A 'cell from organism with desired gene' provides a 'desired gene'. 2. 'enzymes used to cut out the desired gene' are applied. 3. A 'vector taken out of cell and split open' is prepared. 4. The 'gene is inserted into the vector'. 5. The 'vector used to insert gene into required cell at an early stage in development (may be bacteria, animal, fungi, or plant)'. 6. 'as the organism grows, it develops with the desired characteristics from the other organism'.

Benefits	Risks
•	•
•	•
•	•
•	•

Methods of cloning – name methods, benefits, and risks

	Benefits	Risks
Small groups of cells from part of a plant are used to grow identical new plants. This is important for preserving rare plant species and growing plants commercially in nurseries.	•	•
An older, simple method used by gardeners to produce many identical plants from a parent plant.	•	•
Cells are split apart from a developing animal embryo before they become specialised, then the identical embryos are transplanted into host mothers.	•	•

Key terms

Make sure you can write a definition for these key terms.

asexual	clone	cutting	embryo transplant	genetically modified	genetic engineering
	inbreeding	mutation	selective breeding	tissue culture	variation

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Retrieval questions

Answer the following questions using the information from the knowledge organiser.

B14 questions		Answers
1	What is variation?	
2	What can cause variation?	
3	How do new phenotype variants occur?	
4	What is selective breeding?	
5	Describe the process of selective breeding.	1 2 3 4
6	What are the consequences of inbreeding?	
7	What is genetic engineering?	
8	How have plant crops been genetically engineered?	
9	How have bacteria been genetically engineered?	
10	What are enzymes used for in genetic engineering?	
11	What is used to transfer the required gene into the new cell in genetic engineering?	
12	Describe the steps involved in adult cell cloning.	1 2 3 4
13	What is tissue culture cloning?	
14	Why is tissue culture cloning of plants important?	
15	What is cutting as a cloning method?	
16	Describe cloning through using embryo transplants.	