

Mutations

Objective : Understand what are mutations .

Resources : Power point

Book page 217

Video <https://www.youtube.com/watch?v=FdrTaOn8BLA> (mutations - recipe)

<https://www.youtube.com/watch?v=1EfgP6Sla6c> (mutations 2)

Mutations

A mutation is a change in a DNA sequence. Mutations can result from DNA copying mistakes made during cell division, exposure to radiation, exposure to chemicals.

In applied genetics, it is usual to speak of mutations as either harmful or beneficial. A harmful mutation decreases the fitness of the organism.

A beneficial mutation increases the fitness of the organism.

A neutral mutation has no harmful or beneficial effect on the organism.

Examples of mutations













Better crops

This is maize – one of our main cereal crops. Evidence from fossils shows that the plant has been selectively bred for at least 10 000 years. Its wild ancestor produced just a few tiny seeds. Modern maize plants produce much bigger seed heads than their distant ancestors did.

Mutations

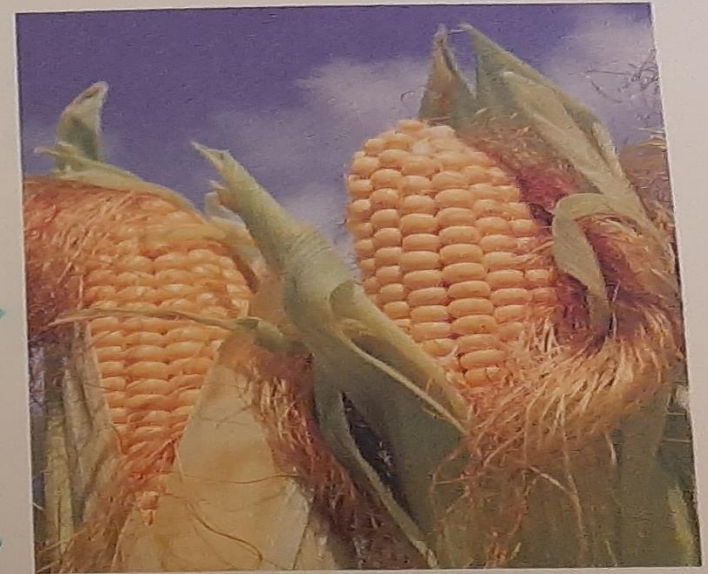
Occasionally mistakes are made when cells copy their genes. These are called **mutations**. Most mutations are harmless, but some mutations stop genes working properly. They cause genetic diseases.

Very occasionally, mutations produce new individuals that look different or have characteristics that make them more useful.

(example)

Sweetcorn is a variety of maize with a mutated gene. The gene makes it store more sugar and less starch in its seeds, so it tastes sweet.

Plant and animal breeders try to pass the most useful genes in a population to the next generation.



↑ Modern maize plants produce much bigger seed heads than their distant ancestors did.

Selective breeding

Objective : DESCRIBE HOW SELECTIVE BREEDING CAN PRODUCE NEW VARIETIES .

Resources : Book pages 216

Workbook page 93

Video <https://www.youtube.com/watch?v=ad4yB63tryI> (selective breeding)

<https://wordwall.net/resource/12578136/selective-breeding>

Selective breeding:

Is when we choose which animals pass their genes to the next generation.

There are 3 steps:

1. Decide what you want , Choose parents that have some of these features then breed them together .
2. Select offspring closest to what you want to be the new parents
3. Repeat the process over many generations .

For example:

If you want a small, black kitten with big ears...

..you could mate a small female with big ears with a black male.

Hopefully you will get some kittens with some of the features you want.

Then you select the offspring closest to what you want to be the next set of parents.



17.5

Selective breeding

Cats

All breeds of cat share one scientific name: *Felis catus*. They are all descended from desert wildcats that lived in the Middle East 10 000 years ago.

How could they end up looking so different?



↑ All these pet cats have inherited different characteristics.

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Objective

- Describe how selective breeding can produce new varieties

Variation

Wild cats show a lot of variation. Each cat inherits a unique combination of genes from its parents, so they all look different and behave differently.

About 10 000 years ago the tamest ones started to live with humans. The pet cats we have now were produced by **selective breeding** from these cats. There are four steps involved:

1. Decide what characteristics you want the next generation to have.
2. Choose parents that have some of these features and breed them together.
3. Select the offspring with the characteristics you prefer, and breed these together.
4. Repeat the process over many generations.

If you want a small, black cat with big ears, you could mate a male black cat with a small female cat that has big ears. Then keep the kittens that are smallest and blackest and have the biggest ears. These will be your next set of parents. Eventually you could produce a new breed with all three features.

example
①

Better farm animals

These Holstein-Friesian cows have been selectively bred to give far more milk than their ancestors would. They will give birth, and start producing milk, before they are 2 years old.

Other breeds produce less milk but are better at resisting disease. If they are crossed with Holstein-Friesians, their offspring may inherit useful characteristics from both breeds.

Other breeds of cow have been selectively bred to be strong enough to pull a cart or a plough.

example
②



Each kitten inherited some genes from each parent.



Holstein-Friesian cows produce a lot of milk.

Questions 2,3 page 217 :

Q2. Selective breeding involves three steps:

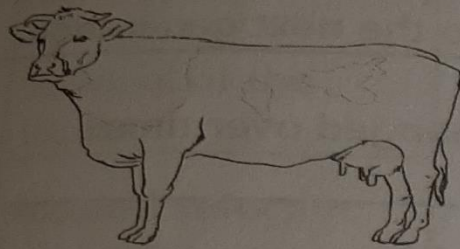
- ✓ Decide what characteristics you want the next generation to have; choose parents that have some of these features and breed them together;
- ✓ Select the offspring with the characteristics you prefer and breed these together.
- ✓ The process needs to be repeated over many generations.

Q3. Selective breeding is useful to farmers because it has produced better farm animals and crops.

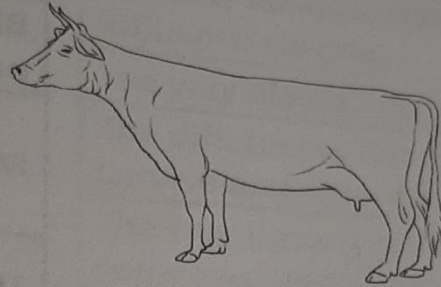
Workbook page 93 :

2 The diagram shows five different cows.

their offspring could inherit them from both parents.



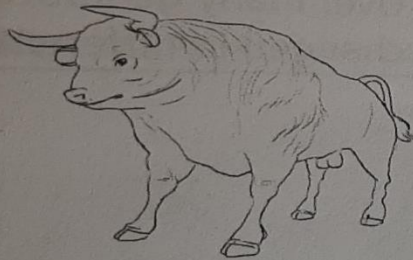
A
high milk yields



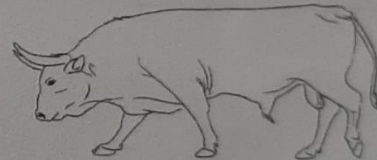
B
strong



C
resists disease



D
large



E
resists disease

Choose which cows to breed to produce each of the following:

- a A healthy cow for milking
- b A cow to pull a plough

..... A & E

..... B & D

Extra question

Review question 6

1. Breed varieties A and C together.
2. Select the offspring with the shortest stems and highest mass of grain, and breed these together.
3. Repeat the process over many generations.

6 A plant breeder wants to produce a new variety of maize. It must have short stems and produce a high mass of grain. None of his existing varieties has both these characteristics.

Variety	Stalk length	Mass of grain
A	short	low
B	long	low
C	long	high

Describe three steps the breeder should take to produce the new variety.

[3]