Exercise walk-through

6.3

Variation, selective breeding, genetic engineering and cloning (4.6.2)

AQA · GCSE · Biology

Reproduction and meiosis

- **Sexual reproduction** involves the joining of male and female sex cells, each called a **gamete** : sperm and egg cells in animals, pollen and egg cells in flowering plants.
- It mixes genetic information from two parents, so the offspring vary. **Asexual reproduction** involves only one parent and no gametes.
- Its offspring are genetically identical to the parent, a **clone** (apart from any mutations).
- In plants and animals it uses cell division by **mitosis** .

Variation and evolution

- **Variation** is the difference between individuals of the same **species**.
- It can be caused by the genes they inherit (genetic), by the conditions in which they develop (environmental), or, most often, by both.
- All genetic variation comes from mutations.
- Most mutations have no effect on the **phenotype**, some change it slightly, and very few decide it completely.

Selective breeding, genetic engineering and cloning (2)

- **Embryo transplants** : cells are split apart from a young animal embryo before they specialise, and each one grows into an identical embryo, which is placed in a host mother.
- **Adult cell cloning** : the nucleus is removed from an unfertilised egg; the nucleus from an adult body cell is put in its place; an electric shock makes the egg divide into an embryo; the embryo is placed in the uterus of a host mother. Dolly the sheep, born in 1996, was cloned in this way.

Exercises 2.1·2.3

2.1 Give the three causes of variation in a population. [3]



2.2 Order the steps of selective breeding. [1]



2.3 *(HT)* In genetic engineering, what is the vector, and name two kinds used? [3]



Exercises 2.1·2.3

2.1 Give the three causes of variation in a population. [3]



2.1 Genes inherited; conditions in which the individuals developed; a combination of genes and environment.

2.2 Order the steps of selective breeding. [1]



2.2 Choose parents with the desired characteristic, breed them, select the best offspring and breed those – repeated over many generations.

2.3 *(HT)* In genetic engineering, what is the vector, and name two kinds used? [3]



2.3 The carrier that transfers the gene into the cells; a bacterial plasmid; a virus.

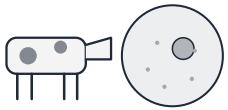
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Exercises 3.1·3.2

3.1 Explain how evolution occurs by natural selection, using a population of rabbits in a cold winter. [4]



3.2 *(Bio)* Describe how adult cell cloning produces an animal, in order. [5]



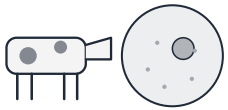
Exercises 3.1·3.2

3.1 Explain how evolution occurs by natural selection, using a population of rabbits in a cold winter. [4]



3.1 The rabbit population shows variation in fur thickness – a genetic variant; in the cold winter, rabbits with thicker fur are better suited to the environment and are more likely to survive to breed; they pass on the alleles for thicker fur; over generations the population's inherited characteristics change – evolution by natural selection.

3.2 *(Bio)* Describe how adult cell cloning produces an animal, in order. [5]



3.2 The nucleus is removed from an unfertilised egg cell; the nucleus from an adult body cell (e.g. skin cell) is inserted into the egg cell; an electric shock stimulates the cell to divide and form an embryo; the embryo cells contain the same genetic information as the adult skin cell; once a ball of cells, the embryo is inserted into the womb of an adult female to develop.

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Exercise 3.3

3.3 *(HT)* Insulin for diabetes used to come from pigs. Describe how human insulin is now produced by genetic engineering of bacteria, and give one benefit and one concern. [6]



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3.3 The human insulin gene is cut out using enzymes; it is inserted into a vector – a bacterial plasmid or virus; the vector transfers the gene into bacterial cells; the bacteria are grown in large fermenters and produce human insulin, which is harvested and purified. Benefit – an exact match to human insulin, so it works better/no rejection, unlimited supply, no pigs needed. Concern – ethical objections to transferring genes between species; possible effects if engineered genes spread – accept a justified risk or objection.