GCSE Biology (Separate Science)
Success Criteria: Manipulating genes

Selective breeding

I can...	
Describe selective breeding or artificial selection as the process by which humans breed plants and animals for particular genetic characteristics.	
State that humans have been doing artificial selection for thousands of year since they first bred food crops from wild plats and domesticated animals.	
Describe the steps of selective breeding • Humans select 'parents' that have the desired characteristic from a mixed population • Breed them together • Then from the offspring produced, select the ones with the most desired characteristic and breed these together • Repeat these steps over many generations until all the offspring show the desired characteristic	
Explain the impact of selective breeding of food plants and domesticated animals	
Understand that characteristic can be chosen for usefulness or appearance: • Disease resistance in food crop • Animals which produce more meat or milk • Domestic dogs with a gentle nature • Large or unusual flowers	
Explain the impact of selective breeding of food plants and domesticated animals	
Understand that selective breeding can lead to 'inbreeding' where some breeds are particularly prone to disease or inherited defects due to increased inheritance of faulty genes.	
Explain the benefits and risks of selective breeding given appropriate information and consider related ethical issues.	

Genetic engineering

| I can…	
Describe genetic engineering as a process which involves modifying the genome of an organism by introducing a gene from another organism to give a desired characteristic.	
Describe how genes from the chromosomes of one organism's cell can be 'cut out' and transferred to cells of another organisms using the following steps: • Enzymes are used to isolate (cut out) the required gene • This gene is inserted (pasted) into a vector, usually a bacterial plasmid or a virus • The vector is used to 'carry' the gene into required cells	
Explain that in order to genetically engineer a multicellular organism (animal or plant) the genes must be transferred at an early stage in development so that they develop with desired characteristic	
State that plant crops have been genetically engineered to be resistant to diseases or to produce bigger better fruits. Crops that have had their genes modified in this way are called genetically modified (GM) crops	
Explain that GM crops (such as those that are resistant to insect attack or to herbicides) generally show increased yields.	
Understand that concerns about GM crops include • the effect on populations of wild flowers and insect • cross pollination of GM with non GM could produce 'super weeds' • feeling that the effects of eating GM crops on human health have not been fully explored (potential risks/side effects)	
Describe the example of genetically engineered bacterial cells that produce useful substances such as human insulin to treat diabetes.	
State that modern medical research is exploring the possibility of genetic modification to overcome some inherited disorders.	
Evaluate the potential benefits and risks of genetic engineering in agriculture and in medicine and that some people have objections.	

Cloning

I can…	
Define 'clones' as genetically identical organisms	
State that any variation that exists between clones is due to environment only (genetically identical)	
Identify natural clones – e.g. organisms that reproduce asexually and identical twins (1 embryo that spits to form two genetically identical babies)	
Identify methods of artificially producing plant clones – cuttings and tissue culture	
Describe cuttings as an older, but simple, method used by gardeners to produce many identical new plants from a parent plant.	
Describe tissue culture as a modern, skilled procedure (sterile environment, scraping small groups of cells from part of a plant to grow identical plantlets (in agar) that ultimately grow into new plants. This is important for preserving rare plant species or commercially in nurseries.	
Identify methods of artificially producing animal clones – embryo transplants and adult cell cloning (nuclear transfer)	
Describe embryo transplants as creating animal embryos via IVF, manually splitting apart cells embryo before they become specialised, then transplanting the identical embryos into host mothers (surrogates).	
Describe the steps of adult cell cloning: extract the nucleus from an adult body cell, such as a skin cell insert this nucleus into an 'empty' egg cell (egg cell nucleus removed) an electric shock stimulates the egg cell to divide to form an embryo (ball of cells) When the embryo has developed, it is inserted into the womb of an adult female (host/surrogate) to continue its development.	
Evaluate the potential benefits and risks of cloning in agriculture and in medicine and that some people have ethical objections.	

Additional support:

kerboodle

Access the appropriate textbook on kerboodle.com, create your own revision notes of the key points of the topic and attempt the summary questions.

AQA Biology Third edition
GCSE

Ann Fullick
Andrea Coates
Editor: Lawrie Ryan

OXFORD
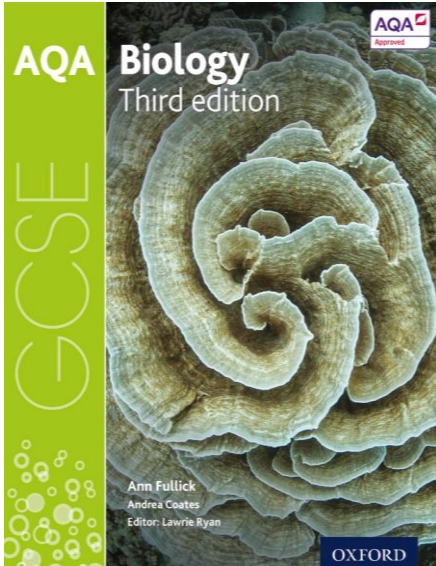
Separate Biology GCSE textbook

Selective breeding
pages 222-223
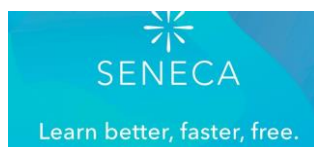**Genetic Engineering**
pages 224-225 and 230-231
Cloning
pages 226-229

Utilise online revision resources to support your class notes, such as…

BBC Bitesize

SENECA Learn better, faster, free.

gcsepod education on demand

▶ YouTube

Attempt past paper questions using www.physicsandmathstutor.com and self-mark your answers using the official exam mark schemes.

PMT resources·tuition·courses

Extension work/extra challenge:

Ask your teacher for extension tasks:
- Selective Breeding: A Canine Catastrophe?
- Genetic Engineering