**Reproduction advantages/disadvantages**

<table>
<thead>
<tr>
<th>Sexual</th>
<th>Asexual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Needs two parents.</td>
<td>Only one parent needed (quicker).</td>
</tr>
<tr>
<td>Produces variation in the offspring.</td>
<td>Identical offspring (no variation).</td>
</tr>
<tr>
<td>If the environment changes variation gives a survival advantage by natural selection.</td>
<td>Vulnerable to rapidly changing conditions due to lack of variation.</td>
</tr>
<tr>
<td>Negative mutations are not always inherited.</td>
<td>Negative mutation can affect all offspring.</td>
</tr>
<tr>
<td>Natural selection can be speeded up using selective breeding to increase food production.</td>
<td>Food/medicine production can be extremely quick.</td>
</tr>
</tbody>
</table>

**DNA and the genome**

- Genetic material in the nucleus is composed of a chemical called DNA.

**Sexual and asexual reproduction**

- Meiosis leads to non-identical cells being formed while mitosis leads to identical cells being formed.

**Meiosis**

- Gametes join at fertilisation to restore the number of chromosomes.
- The new cell divides by mitosis. The number of cells increase. As the embryo develops cells differentiate.

**Advantages and disadvantages of sexual and asexual reproduction (Biology only)**

- When the protein chain is complete it folds to form a unique shape. This allows proteins to do their job as enzymes, hormones or new structures such as collagen.
- Advantages of DNA in the nucleus unravels.
- Enzymes make a copy of the DNA strand called mRNA.
- mRNA moves from the nucleus to ribosome in the cytoplasm.
- Ribosomes translate each 3 bases into amino acids according to mRNA template.
- Ribosomes link amino acids brought by carrier proteins.
- A long chain of amino acids form. Their specific order forms a specific protein.

**AQA GCSE INHERITANCE, VARIATION AND EVOLUTION Part 1**

**DNA structure (Biology only)**

- DNA is polymer made from four different nucleotides. Each nucleotides consists of a common sugar, phosphate group and one of 4 different bases A, C, G & T.

**DNA and protein synthesis**

- In DNA the complementarity strands C, A, T, G always link in the same way. C always linked to G on the opposite strand and A to T.

**Mutations occur continuously (HT only)**

- Not all parts code for proteins. Non-coding parts can switch genes on and off. Mutations may affect how genes are expressed.

**Malarial parasites**

- Asexually in the human host but sexually in a mosquito.

**Fungi**

- Asexually by spores, sexually to give variation.
- Produce seeds sexually, asexually by runners in strawberry plants, bulbs division in daffodils.

**Plants**

- Asexualy in the human host but sexually in a mosquito.

**The whole human genome has now been studied.**

- It is of great importance for future medical developments.
- Searching for genes linked to different types of disease.
- Understanding and treatment of inherited disorders.
- Tracing migration patterns from the past.

**Produced by meiosis. There is mixing of genetic information which leads to a variety in the offspring.**

- Only mitosis is involved. There is no mixing of genetic information. This leads to genetically identical clones.

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**Advantages and disadvantages of sexual and asexual reproduction (Biology only)**

- Some change the shape and affect the function of proteins e.g. and enzyme active site will change or a structural protein loses its strength.
- Most do not alter the protein so that its appearance or function is not changed.

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Through natural selection of variants (genotypes) that give rise to phenotypes best suited to their environment or environmental change e.g. stronger, faster. This allows for variants to pass on their genotype to the next generation.

If two populations of one species become so different in phenotype that they can no longer interbreed to produce fertile offspring they have formed two new species.

A change in the inherited characteristics of a population over time through the process of natural selection.

The process by which humans breed plants/animals for particular genetic characteristics

Cloning (Biology only)

Genetic engineering

Selective breeding

Evolution

AQA GCSE INHERITANCE VARIATION AND EVOLUTION PART 3

Classification of living organisms

Evolutionary trees are a method used by scientists to show how organisms are related

Choosing characteristics

Desired characteristics are chosen for usefulness or appearance

Disease resistance in food crops.

Animals which produce more meat or milk.

Domestic dogs with a gentle nature.

Large or unusual flowers.

Concern: effect of GMO on wild populations of flowers and insects.

Genes from the chromosomes of humans or other organisms can be ‘cut out’ and transferred to the cells of other organisms.

Genetically modified crops (GMO)

Crops that have genes from other organisms

To become more resistant to insect attack or herbicides.

To increase the yield of the crop.

Concern: effect of GMO on human health not fully explored

Modern medical is exploring the possibility of GM to over come inherited disorders e.g. cystic fibrosis

Cloning techniques in plants/animals

Tissue culture

Small groups of cells to grow new plants. Important for preservation of rare plants and commercially in nurseries.

Cuttings

Part of a plant is cut off and grown into full plant.

Embryo transplants

Splitting apart cells from animals embryo before they become specialised. New clone embryos are inserted into womb of adult female.

Concern: some people have ethical objections to adult cell cloning e.g. welfare of the animals.

Adult cell cloning

1. Nucleus is removed from an unfertilised egg.
2. Nucleus from body cell is inserted into egg cell.
3. An electric shock stimulates the egg to divide into an embryo
4. Embryo cells are genetically identical to adult cells.
5. When embryo has developed into ball of cells it is inserted into host womb.

Selective breeding

Choosing parents with the desired characteristics from a mixed population

Chosen parents are bred together.

From the offspring those with desired characteristics are bred together.

Repeat over several generations until all the offspring show the desired characteristics.

Concern: effect of GMO on human health not fully explored

Genetic engineering process (HT only)

1. Enzymes are used to isolate the required gene.
2. Gene is inserted into a vector – bacterial plasmid or virus.
3. Vector inserts genes into the required cells.
4. Genes are transferred to plants/animals/microbes at an early stage of development so they develop the required characteristics.

Darwin’s finches

Species of all living things have evolved from simple life forms that first developed 3 billion years ago.

Human have been doing this for thousands of years since they first bred food from crops and domesticated animals.

Changes in the inherited characteristics of a population over time through the process of natural selection.
AF1

Individual organisms within a particular species show a wide range of variation for a characteristic.
Individual most suited to the environment are more likely to breed successfully.
Characteristics enable individuals to survive are then passed on to the next generation.

Evidence from around the world, experimentation, geology, fossils, discussion with other scientists (Alfred Wallace) lead to:

Charles Darwin
Charles Darwin ‘On the Origin of the Species’ (1859)
Published the theory of evolution by natural selection
Slowly accepted; challenged creation theory (God), insufficient evidence at time, mechanism of inheritance not yet known.

Alfred Wallace
Independently proposed the theory of evolution by natural selection
Published joint writings with Darwin in 1858.
Worked worldwide gathering evidence.
Best know for work on warning colouration in animals and his theory of speciation.

AQA GCSE INHERITANCE VARIATION AND EVOLUTION PART 4

The understanding of genetics (biology only)
Gregor Mendel
In the mid 19th century carried out breeding experiments on plants
Inheritance of each characteristic is determined by units that are passed on to descendants unchanged.

Further understanding of genetics
Improving technology allowed new observations.
Late 19th century: behaviour of chromosomes in cell division.
Early 20th century: chromosomes and Mendel’s ‘units’ behave in similar ways. ‘units’ now called genes must be located on chromosomes.
Mid 20th century: structure of DNA determined. Mechanism of gene function worked out.

Classification of living organisms

Kingdom
Animalia

Phylum
Chordata

Class
Mammalia

Order
Primates

Family
Hominidae

Genus
Homo

Species
Sapiens

Fossils and antibiotic resistance in bacteria provide evidence for evolution.

Antibiotic resistant bacteria
Mutations produce antibiotic resistant strains which can spread
Resistant strains are not killed.
Strain survives and reproduces.
People have no immunity to strain and treatment is ineffective.

Extinction
When no members of a species survive
Due to extreme geological events, disease, climate change, habitat destruction, hunting by humans.

Evolution is widely accepted. Evidence is now available as it has been shown that characteristics are passed on to offspring in genes.
I just added a few capital letters and full stops

Amanda Fleck, 01/10/2017