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| **Variation** |
| Variation | Differences between individuals. |
| Genetic variation | Differences due to genotype. |
| Environmental variation | Differences caused by the conditions in which an organism lives. |
| Species | A group of similar organisms that can breed and produce fertile offspring. |
| Mutation | A rare, random change in an organism's DNA that can be inherited. |
| Effect of mutations | Mutations may cause a gene to be altered. As genes code for amino acids that make up proteins, this can lead to a change in the protein. |

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| **Evolution** |
| Evolution | The gradual change in a species over time. |
| Charles Darwin | English natural scientist who formulated a theory of evolution by natural selection. |
| Problems with Darwin's theory | Darwin couldn't explain why new characteristics appeared or exactly how beneficial adaptations were passed on to offspring. |
| Speciation | The development of a new species. |
| Extinction | When no individuals of a species remain. |
| Causes of extinction | The environment changes too quickly. A new predator kills them all.A new disease kills them all.They can't compete with another (new) species for food.A catastrophic event kills them all. |
| Natural selection | The organisms that are best adapted to the environment will survive to pass those traits on. |
| Stages in natural selection | There is variation in a population.A change in the environment means that some individuals have an advantage.They are able to survive and reproduce.The useful adaptation is passed on. |
| Fossils | The preserved remains or traces of organisms that once lived on Earth. |

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| **Selective breeding** |
| Selective breeding | The human practice of breeding animals or plants that have certain desired traits |
| Problems with selective breeding | Reduction in the gene pool. This leads to inbreeding which means that there is more chance of inheriting harmful genetic defects. |

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| **Genetic engineering** |
| Genetic engineering | Genes from one organism are transferred into the DNA of another organism |
| Steps in genetic engineering | A useful gene is cut from the genome using enzymes.It is inserted into a vector.The vector is introduced to the target organism and inserted into cells.  |
| Vector | A DNA molecule used as a vehicle to artificially carry foreign genetic material into another cell. Usually a virus or a bacterial plasmid. |
| Plasmid | A circular piece of DNA found in bacterial cells. |

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| **Antibiotic resistance** |
| Antibiotic resistance | The ability of bacteria to withstand the effects of an antibiotic. |
| Why is antibiotic resistance a problem? | Without effective antimicrobials for prevention and treatment of infections, medical procedures such as organ transplantation, cancer chemotherapy, diabetes management and major surgery (for example, caesarean sections or hip replacements) become very high risk. |
| Causes of antibiotic resistance | Overuse and inappropriate use of antibiotics. |