**Genes and Protein and the Genetic Code**

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| 1 | Gene | Section of DNA on a chromosome that controls a feature by coding for formation of one or more specific polypeptides or a functional RNA (including rRNA and tRNA). |
| 2 | Chromosome | A thread like structure made of protein and DNA by which hereditary information is physically passed from one generation to the next. |
| 3 | Chromatin | The material that makes up chromosomes. It consists of DNA and the protein histone. |
| 4 | Autosome | A chromosome which is not a sex chromosome |
| 5 | Genetic code | The sequence of triplets of nucleotides (codons) in DNA which determines the sequence of amino acids in an organism’s proteins. It is degenerate; non-overlapping; universal ; has start and stop codons |
| 6 | Degenerate | A single amino acid may be coded for by more than one triplet code. |
| 7 | Non-overlapping | Each base appears in only one triplet – each base is only read once. |
| 8 | Universal | The genetic code is the same in all organisms – this is indirect evidence for evolution. |
| 9 | Histones | Proteins, which together with DNA, make up the chromosomes of eukaryotic cells. |
| 10 | Chromatid | Each of the two thread-like strands into which a chromosome divides that are joined together by a single centromere prior to cell division |
| 11 | Locus | The specific linear position of a particular gene on a certain chromosome |
| 12 | Alleles | Alternative forms of a particular gene with different base sequences, and therefore different codes |
| 13 | Protein synthesis | The process by which the genetic code codes for proteins in the cell. The template strand of DNA codes for mRNA in transcription, which is then translated into an amino acid sequence at the ribosomes. |
| 14 | Genome | The complete set of genetic material present in a cell or an organism. |
| 15 | Human Genome | The complete set of genes in a cell, including those in mitochondria and/or chloroplasts |
| 16 | Proteome | The full range of proteins produced by the genome. This is sometimes called the complete proteome, in which case the term proteome refers to the proteins produced by a given type of cell under a certain set of conditions. |
| 17 | Transcription | Formation of messenger RNA molecules from the DNA that makes up a particular gene. It is the first stage of protein synthesis. |
| 18 | RNA Polymerase | Enzyme that joins together nucleotides to form messenger RNA during transcription |
| 19 | nucleotides | Complex chemicals made up of an organic base, a sugar and a phosphate. They are the basic units of which the nucleic acids DNA and RNA are made. |
| 20 | mRNA | The type of RNA that is a long strand arranged in a single helix and its base sequence is determined by the sequence of bases on a length of DNA |
| 21 | Triplet | A sequence of three bases in DNA. |
| 22 | Template strand | The strand of DNA which is used during transcription to make mRNA. It runs in a 3’ to 5’ direction so the mRNA is built in a 5’ to 3’ direction. |
| 23 | Codon | A sequence of three adjacent nucleotides in mRNA that codes for one amino acid |
| 24 | Intron | Portions of DNA within a gene that do not code for a polypeptide. They are removed from pre-messenger RNA after transcription. |
| 25 | Exon | Portions of DNA within a gene that codes for proteins. They are joined together during splicing. |
| 26 | Splicing | The process by which base sequences corresponding to the introns are removed and the functional exons are joined together. |
| 27 | Translation | The latter part of protein synthesis when the mRNA is used as template to which complementary tRNA molecules attach and the amino acids link to form a polypeptide. |
| 28 | tRNA | The type of RNA made of around 80 nucleotides and has an anticodon, which is complementary to a section of mRNA. Each molecule is specific to one amino acid. |
| 29 | Anti-codon | A sequence of three adjacent nucleotides on a molecule of transfer RNA that is complementary to a particular codon on a messenger RNA molecule. |
| 30 | Ribosome | An organelle consisting of rRNA and proteins found in large numbers in the cytoplasm and on the RER of living cells. They bind to mRNA and use tRNA to synthesise polypeptides. |
| 31 | Polypeptide | A polymer consisting of a large chain of amino acids bonded together by peptide bonds. |
| 32 | Gene Mutation | A change to one or more nucleotide bases in DNA that could result in a change in genotype which may be inherited |
| 33 | Substitution mutation | If a nucleotide is changed in the DNA sequence |
| 34 | Nonsense mutation | If the base change results in the formation of a stop codon |
| 35 | Mis-sense mutation | If the base change results in a code for a different amino acid completely |
| 36 | Silent mutation | If the base change still codes for the same amino acid as before (as code is degenerate) |
| 37 | Deletion mutation | If a nucleotide is lost from the DNA sequence, resulting in a ‘frame shift’ in translation |
| 38 | Mutagen (mutagenic agent) | A material or other factor which increases the normal mutation rate eg high energy radiation, chemicals |
| 39 | Chromosome mutation | A change that occurs in a chromosome. These changes are most often brought on by problems that occur during meiosis and can result in changes in the number of chromosomes in a cell or changes in the structure of a chromosome. |
| 40 | Polyploidy | The process of the genome doubling that gives rise to organisms with multiple sets of chromosomes. |
| 41 | Non-disjunction | The failure of one or more pairs of homologous chromosomes or sister chromatids to separate normally during nuclear division, usually resulting in an abnormal distribution of chromosomes in the daughter nuclei. |

**Meiosis**

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| 42 | Meiosis | The type of nuclear division in which the number of chromosomes is halved. |
| 43 | Gamete | Reproductive (sex) cell that fuses with another gamete during fertilisation |
| 44 | Diploid | Cell or nucleus containing pairs of homologous chromosomes (two sets of chromosomes) |
| 45 | Haploid | Cell or nucleus containing single, unpaired chromosomes (a single copy of each chromosome) |
| 46 | Homologous chromosomes | A pair of chromosomes, one maternal and one paternal, that have the same gene loci and therefore determine the same features. They are not necessarily identical as may have different alleles. They are capable of pairing during meiosis. |
| 47 | Crossing over | The process whereby a chromatid breaks during meiosis and rejoins to the chromatid of its homologous chromosome so that their alleles are exchanged |
| 48 | Chiasmata | A point at which paired chromosomes remain in contact during the first metaphase of meiosis and at which crossing over and exchange of genetic material occur between the strands. |
| 49 | Recombination | The rearrangement of genetic material, especially by crossing over in chromosomes. |
| 50 | Independent assortment | The alleles of two (or more) different genes get sorted into gametes independently of one another. The allele a gamete receives for one gene does not influence the allele received for another gene. This is because homologous chromosomes line up in random orientations at the middle of the cell at metaphase as they prepare to separate, meaning that the same parent cell can produce different combinations of chromosomes in the daughter cells. |
| 51 | Independent segregation | During the formation of gametes, each gamete receives just one gene copy, which is selected randomly. Each pair of alleles segregates independently of the other pairs and all possible combinations of alleles can occur in the resulting gametes. |
| 52 | Variation | Differences between individuals. It can be interspecific (between different species) or intraspecific variation (between individuals of the same species). |

**Diversity and Adaptation**

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| 53 | Genetic Diversity | The greater the number of different alleles that all members of a species possess, the greater the genetic diversity of that species. |
| 54 | Allele frequency | the number of times an allele occurs within the gene pool in a population, relative to all others at same locus |
| 55 | Gene pool | all the different alleles of all the genes of all the individuals in a population at any one time |
| 56 | Natural Selection | Natural Selection is Darwin’s theory to explain the mechanism of evolution. The process by which organisms better adapted to their environment survive and reproduce and pass on their advantageous alleles to the their offspring, whilst those less well adapted fail to do so. |
| 57 | Directional selection | Favours one extreme of the range of characteristics and the other extreme is selected against – shift in population curve |
| 58 | Stabilising selection | Favours the mean of the distribution because the extremes are at a selective disadvantage – frequency of mean phenotype increases |
| 59 | Polygenes | Group of genes that are responsible for controlling a characteristic. |
| 60 | Normal distribution curve | A bell-shaped curve produced when a certain distribution is plotted on a graph |
| 61 | Biodiversity | The range and variety of genes, species and habitats within a particular region. Made up of three components: genetic diversity, species diversity and ecosystem diversity. |
| 62 | Species | A group of organisms that have a common ancestry and so share the same genes and are capable of breeding together to produce fertile offspring - are reproductively separated from other species. |
| 63 | Binomial naming system | Linnaeus’ system to name species. 1st: Generic name (genus). 2nd: Specific name (species) E.g. Felix tigris |
| 64 | Hierarchy | Groups within larger groups; with no overlap between groups at each rank |
| 65 | Artificial Classification | Process of classifying organisms based on differences useful at time e.g. colour, size, number of legs |
| 66 | Phylogenetic Classification | Process of classifying organisms based upon evolutionary relationships between organisms and ancestors |
| 67 | Analogous Characteristics | Characteristics with the same function not the same evolutionary origins. e.g. wings of butterflies and birds used for flight but originated in different ways. |
| 68 | Homologous Characteristics | Characteristics with similar evolutionary origins regardless of their functions in the adult of a species e.g. wing of a bird, arm of a human and front leg of a horse |
| 69 | Taxon | Each group within a phylogenetic biological classification (pl. taxa) |
| 70 | Courtship behaviour | A specialised behaviour that precedes the fertilisation of eggs by a male to ensure successful reproduction. |
| 71 | Classification | Organisation of living organisms into groups |
| 72 | Taxonomy | The practice of biological classification |
| 73 | Domain | Largest taxon either bacteria, archaea and eukarya |
| 74 | Kingdom | Second largest taxon of classification. Eukarya domain divides into Protoctista, Fungi, Plantae and Animalia. |
| 75 | Community | The organisms of all species that live in the same area |
| 76 | Population | A group of organisms of the same species occupying a particular space at a particular time that can potentially interbreed. |
| 77 | Species diversity | Number of different species and number of individuals of each species within any one community |
| 78 | Ecosystem Diversity | Range of different habitats within a particular area |
| 79 | Genetic diversity | Variety of genes possessed by individuals that make up any one species |
| 80 | Species richness | The number of different species represented in an ecological community. It does not take account the abundances of species or their relative abundance distributions. |
| 81 | Index of diversity | A formula is used to quantify the biodiversity of a habitat. It takes into account the number of species present as well as the abundance of each species. |
| 82 | Biomass | The total mass of living material, normally measured in a specific area over a given period of time |
| 83 | Conservation | Management of the Earth’s natural resources in such a way that maximum use can be made of them in the future |
| 84 | Intercropping | The practice of growing two or more crops in close proximity usually to produce a greater yield on a piece of land. |
| 85 | Habitat | The place where an organism normally lives |
| 86 | Random sampling | Sampling a population to eliminate bias e.g. grid square and co-ordinates |
| 87 | Sampling bias | When a sample is collected in such a way that some members of the intended population are more or less likely to be included than others. The data you collect may therefore not be accurate or represent the group. |
| 88 | Sample size | The number of observations in a sample. |
| 89 | Mean | A type of average where you add up all of the numbers then divide by how many numbers there are. |
| 90 | Median | A type of average where you place the numbers you are given in value order and find the middle number. |
| 91 | Mode | A type of average that is the number that occurs the most often. |
| 92 | Standard deviation | A measure of how spread out about the mean your values are. The more spread out the data the higher it will be. |