1. Division and Differentiation in Human Cells

- **Somatic cells:** Any cell in the body that is not involved in reproduction.
- **Germline cells:** Cells that include gametes (sperm and ova) and the stem cells that divide to form gametes.
- **Mitosis:** A type of cell division that results in two daughter cells, each with the same number and kind of chromosomes as the parent nucleus.
- **Meiosis:** A type of cell division that reduces the chromosome number by half, resulting in four haploid cells (gametes).
- **Diploid:** A cell that contains two sets of chromosomes (23 pairs in humans).
- **Haploid:** A cell that contains a single set of chromosomes (23 in humans).
- **Pluripotent:** Cells that can differentiate into any type of cell in the body.
- **Multipotent:** Cells that can differentiate into all types of cells within a particular tissue.
- **Tumour:** A mass of abnormal cells that divide excessively due to a failure to respond to regulatory signals.

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2. Structure and Replication of DNA

- **DNA (Deoxyribonucleic Acid):** A molecule that carries genetic information and consists of nucleotides.
- **Nucleotide:** The basic unit of DNA, consisting of a sugar, phosphate, and a nitrogenous base.
- **Base Pairing:** Adenine (A) pairs with thymine (T), and cytosine (C) pairs with guanine (G) in DNA.
- **Double Helix:** The shape of the DNA molecule, consisting of two strands wound around each other.
- **Hydrogen Bond:** A weak bond that forms between nitrogenous bases in DNA.
- **DNA Polymerase:** An enzyme involved in DNA replication that adds nucleotides to form new DNA strands.

- **Primer:** A short strand of nucleotides that serves as a starting point for DNA synthesis.
- **Ligase:** An enzyme that joins DNA fragments together.
- **PCR (Polymerase Chain Reaction):** A technique used to amplify a segment of DNA.

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3. Gene Expression

- **Gene Expression:** The process by which a gene is used to produce a functional product, such as a protein.
- **Transcription:** The process of copying a gene's DNA sequence into a complementary RNA sequence.
- **Translation:** The process of synthesising proteins from an mRNA template.
- **mRNA (Messenger RNA):** RNA that carries the genetic code from DNA to the ribosome for protein synthesis.
- **tRNA (Transfer RNA):** RNA that carries specific amino acids to the ribosome during protein synthesis.
- **rRNA (Ribosomal RNA):** RNA that, along with proteins, forms the structure of the ribosome.
- **Codon:** A triplet of nucleotides on mRNA that specifies a particular amino acid.
- **Anticodon:** A triplet of nucleotides on tRNA that is complementary to a codon on mRNA.
- **Intron:** A non-coding region of a gene that is removed during RNA splicing.
- **Exon:** A coding region of a gene that is expressed in the final mRNA.
- **RNA Splicing:** The process by which introns are removed, and exons are joined to form a mature mRNA transcript.

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4. Mutations

- **Mutation:** A change in the DNA sequence that may affect the structure and function of proteins.

- **Missense Mutation:** A mutation that results in the substitution of one amino acid for another in a protein.
- **Nonsense Mutation:** A mutation that introduces a premature stop codon, leading to a truncated protein.
- **Splice-Site Mutation:** A mutation that affects the splicing of exons and introns in mRNA.
- **Frame-Shift Mutation:** A mutation caused by the insertion or deletion of nucleotides, which shifts the reading frame of the gene.
- **Duplication:** A chromosome mutation in which a section of a chromosome is duplicated.
- **Deletion:** A chromosome mutation in which a section of a chromosome is removed.
- **Inversion:** A chromosome mutation in which a section of a chromosome is reversed.
- **Translocation:** A chromosome mutation in which a section of one chromosome is added to another chromosome.

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5. Human Genomics

- **Genome:** The complete set of genetic information in an organism.
- **Genomic Sequencing:** The process of determining the sequence of nucleotides in an individual's DNA.
- **Bioinformatics:** The use of computer tools to analyse and interpret large sets of biological data, such as genomic sequences.
- **Pharmacogenetics:** The study of how genetic variation affects an individual's response to drugs.
- **Personalised Medicine:** Medical treatment tailored to an individual's genetic makeup.

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6. Metabolic Pathways

- **Metabolic Pathways:** A series of enzyme-controlled reactions within a cell that lead to the production or breakdown of substances.

- **Anabolic Reaction:** A metabolic reaction that builds larger molecules from smaller ones, requiring energy.
- **Catabolic Reaction:** A metabolic reaction that breaks down larger molecules into smaller ones, releasing energy.
- **Enzyme:** A protein that speeds up chemical reactions by lowering activation energy.
- **Induced Fit:** A change in the shape of an enzyme's active site to better fit the substrate.
- **Competitive Inhibition:** Inhibition in which an inhibitor binds to the enzyme's active site, preventing the substrate from binding.
- **Non-Competitive Inhibition:** Inhibition in which an inhibitor binds to a different part of the enzyme, changing the enzyme's shape.
- **Feedback Inhibition:** The regulation of a metabolic pathway by the end-product of the pathway, which inhibits an earlier enzyme.

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7. Cellular Respiration

- **Cellular Respiration:** The process by which cells produce energy (ATP) from glucose and oxygen.
- **Glycolysis:** The breakdown of glucose into pyruvate, producing a small amount of ATP.
- **Citric Acid Cycle:** A series of reactions that generate ATP, carbon dioxide, and high-energy electron carriers.
- **Electron Transport Chain:** A series of protein complexes that transfer electrons and pump protons to generate ATP.
- **ATP (Adenosine Triphosphate):** The molecule that stores and transfers energy within cells.
- **Acetyl Coenzyme A:** A molecule that conveys carbon atoms into the citric acid cycle.
- **Dehydrogenase:** An enzyme that removes hydrogen atoms during respiration.

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8. Energy Systems in Muscle Cells

- **Lactate Metabolism:** The process by which pyruvate is converted to lactate during anaerobic respiration.
- **Oxygen Debt:** The extra oxygen required after exercise to metabolise accumulated lactate and restore muscle energy stores.
- **Slow-Twitch Muscle Fibres:** Muscle fibres that contract slowly, are resistant to fatigue, and rely on aerobic respiration.
- **Fast-Twitch Muscle Fibres:** Muscle fibres that contract quickly, fatigue rapidly, and rely on anaerobic respiration.
- **Myoglobin:** An oxygen-binding protein in muscle cells, especially abundant in slow-twitch fibres.
- **Glycogen:** A stored form of glucose, used as fuel by fast-twitch muscle fibres.
