

Chapter 10 – Cell Growth, Mitosis & Regulating the Cell Cycle

- Cell growth: surface to volume ratio
- Cell cycle:
 - G₁, S, G₂ and M phases
 - M phase: Prophase, Metaphase, Anaphase, Telophase, Cytokinesis
- Mitosis: asexual reproduction, resulting in the production of 2 diploid daughter cells
- Cell division regulators (internal and external)
- Uncontrolled cell growth → cancer
- Significance of gene p53

Chapter 11 – Mendelian Genetics & Meiosis; Chapter 14-1, 14-2 Human Inheritance

- Chromosomes – half from each parent (homologous chromosomes)
- Gregor Mendel: principle of dominance and the principle of segregation
- Punnett squares: monohybrid and dihybrid crosses and probabilities
- Dominant vs. Recessive alleles
- Genotypes vs. Phenotypes
- Homozygous vs. Heterozygous
- Principle of independent assortment
- Types of dominance: Incomplete, co-dominance, polygenic traits, multiple alleles
- Meiosis – produces 4 genetically different haploid cells
- Importance of crossing over in prophase 1
- Pedigree charts: Used to trace a trait over several generations of a family
- Sex-linked genes: How do they affect inheritance patterns?
- Sex-linked chromosomal disorders: colour-blindness, hemophilia, muscular dystrophy
- Non-disjunction, trisomy (21, 13, 18)
- Disorders of the sex chromosomes

Chapter 12 DNA & RNA

- Griffith's experiments (mice and pneumonia; transformation of R → S type)
- Avery's experiments (enzymes; transformation occurs only if DNA is present)
- Hershey-Chase experiment (radioactive isotopes & bacteriophage; DNA is hereditary molecule)
- Contributions of Rosalind Franklin (x-ray diffraction) and Erwin Chargaff (Chargaff's rule)
- Discovery of structure of DNA by Watson and Crick
- DNA: made up of nucleotides (know basic structure - deoxyribose sugar, phosphate group and nitrogenous base)
- Nucleotides: 4 types (ACTG)
- DNA replication (steps); role of DNA polymerase
- Genes: code for a sequence of amino acids called a polypeptide,
- RNA: 3 types, purpose – create proteins! (new nucleotide: U instead of T)
- Be able to transcribe DNA → RNA and translate RNA → protein
- Gene mutations are the result of point mutations (substitution / insertion / deletion)
- Chromosomal mutations: deletion / duplication / inversion / translocation

Chapter 13 Genetic Engineering, Chapter 14-3 Human Molecular Genetics

- Types of transgenic organisms (GMOs – bacteria, plants, animals) and their uses.
- DNA analysis techniques: DNA extraction, DNA probes, DNA fingerprinting, gel electrophoresis and polymerase chain reactions
- Gene therapy: Why? Dangers?
- Cloning: basics of process; advantages, disadvantages?

Chapter 15 Darwin's Theory of Evolution, Chapter 16-1 Genes & Variation

- Charles Darwin: Epic voyage on the *HMS Beagle*, famous stop at Galapagos Islands (tortoises and finches)
- Scientists who influenced Darwin (Hutton, Lyell, Malthus, Lamarck)
- Adaptation; survival of the fittest
- Natural vs. Artificial Selection).
- Natural competition among organisms leads to a struggle for survival
- Organisms best adapted to their environments have better fitness, survive longer and have better fitness.
- Descent with modification (Darwin's description of evolution)
- Supporting evidence: fossil record, geographical distribution of organisms, homologous body structures (also, vestigial organs), embryology
- Gene pool
- Causes of genetic variety: mutations and gene shuffling
- Hardy-Weinberg principle and the factors required to stay in genetic equilibrium

Chapter 39 Endocrine & Reproductive Systems

- Endocrine system: creates hormones for a body-wide communication system
- Homeostasis
- Endocrine & exocrine glands
- Steroid & Non-steroid hormone action
- Negative feedback control system
- Prostaglandins: local hormones
- Major parts of the male reproductive system (scrotum, penis, testes, seminiferous tubules, epididymis, vas deferens, bulbourethral gland, prostate, seminal vesicle)
- Sperm production and structure of a sperm cell
- Major parts of the female reproductive system (ovaries, uterus, vagina, fallopian tubes, cervix)
- Menstrual cycle (FSH and LH, follicle cells, corpus luteum, follicular phase, ovulation, luteal phase)
- Fertilization and Embryonic Development (implantation, differentiation of cells, blastula, embryo, gastrulation, fetus)
- Development of the fetus, role of the placenta and childbirth

Chapter 35 Nervous System

- Organization within the human body: cells – tissues – organs – organ systems
- Nervous system: receives, processes and responds to both internal and external stimuli
- 3 types of neurons (sensory, motor and interneurons)
- Diagram of a neuron (dendrite, axon, myelin sheath, cell body)
- Central nervous system (brain & spinal cord) and peripheral nervous system
- Disorders of the nervous system
- The Eye – major parts and functions
- The Ear – major parts and functions
- Other senses – Taste, Touch, Smell