

# Light dependent stage



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? New cells arise by division of existing cells Cell division occurs in the nucleus of eukaryotic cells by mitosis and meiosis Replacement of the entire lining of your small intestine Liver cells only divide for repairing Nerve cells do not divide Chromosomes Long and thin for replication and decoding Become short and fat prior mitosis > easier to separate due to compact form Meiosis (reduction division) During the production of sex cells (gametes) in animals

In spore formation which precedes gamete production in plants Haploid gametes (sperm ovum) - sexual reproduction DNA in a cell replicates only once, but cell divides twice The Cell Cycle Interphase G1: Protein synthesis and growth (10 hours) Preparation for DNA replication (e. g. growths of mitochondria) Differentiation, only selected genes are used to perform different functions in each cell S: DNA Replication (9 hours) G2: short gap before mitosis, organelles and proteins for mitosis are made (4 hours) G0: Resting phase (nerve cells)

M-phase Mitotic division of the nucleus (Prophase, Metaphase, Anaphase, Telophase) Cytokinesis (division of the cytoplasm) Interphase Phase with highest metabolism (mitochondria have a high activity) Muscles never complete the whole cycle Mitosis Process of producing 2 diploid daughter cells with the same DNA by copying their chromosomes (clones) Chromosomes can be grouped into homologous pairs Mitosis occurs in Growth Repair Replacement of cells with limiting life span (red blood, skin cells) Asexual replacement

Controlled process, cancers result from uncontrolled mitosis of abnormal cells Division of the nucleus (karyokinesis) and the cytoplasm (cytokinesis) are two processes of mitosis Division of cytoplasm after nucleus. Delayed if cells have more than one nucleus (muscle) Active process that requires ATP Prophase Chromosomes become shorter and thicker by coiling themselves (condensation) This prevents tangling with other chromosomes Nuclear envelope disappears/breaks down Protein fibres (spindle microtubules) form Centrioles are moving toward opposite poles forming the spindle apparatus of microtubule Metaphase

Centrioles at opposite poles Chromosomes line up on the equator of the spindle Centromeres (kinetochores) attach to spindle fibres Kinetochores consist of microtubules and " motor" proteins which utilise ATP to pull on the spindle Anaphase Spindle fibres pull copies of chromatids to spindle poles to separate them Mitochondria around spindle provide energy for movement Telophase Chromatid at the pole Sets of chromosomes form new nuclei Chromosomes become long and thin, uncoil! Nuclear envelopes form around the nucleus Genes, DNA, RNA

Nucleic acids carry the genetic code that determines the order of amino acids in proteins Genetic material stores information, can be replicated, and undergoes mutations Differs from proteins as it has phosphorus and NO sulphur DNA Deoxyribonucleic Acid Nucleotides are smaller units of long chains of nucleic acids. Each nucleotide has A pentose sugar (deoxyribose in DNA, ribose in RNA) A phosphate group An organic base which fall into 2 groups, Purines (double rings of C and N - bigger) Adenine or Guanine

Pyrimidines (single ring of C and N - smaller) Thymine or Cytosine Base pairing by weak hydrogen bonds

Adenine-Thymine 2 H- bonds Cytosine-Guanine 3 H- bonds Chains are directional according to the attachment between sugars and phosphate group They are antiparallel which is essential for gene coding and replication DNA molecule has 2 separate chains of nucleotides hold together by base pairing / DNA normally twist into a helix (coil) / forms a double helix Ribonucleic Acid (RNA) Ribose instead of deoxyribose Single chain (shorter than DNA - lower molecular mass) Base difference: Uracil instead of Thymine. Adenine, Guanine and Cytosine are the same Ribosomal RNA (rRNA) Located in the cytoplasm - ER

Reads mRNA code and assembles amino acids in their correct sequence to make a functional protein (translation) Messenger RNA (mRNA) Commutes between nucleus and cytoplasm Copies the code for a single protein from DNA (transcription) Carries the code to ribosomes in the cytoplasm Transfer RNA (tRNA) In the cytoplasm Transfer amino acids from the cytoplasm to the ribosomes The Genetic Code DNA codes for assembly of amino acids / forms a polypeptide chain (proteins - enzymes) The code is read in a sequence of three bases called Triplets on DNA e. g. CAC TCA Codons on mRNA e. g. GUG AGU Anticodons on tRNA e. . CAC UCA (must be complementary to the codon of mRNA) Each triplet codes for one amino acid / single amino acid may have up to 6 different triplets for it due to the redundancy of the code / code is degenerate. Some amino acids are coded by more than one codon Same triplet code will give the same amino acid in virtually all organisms, universal code We have 64 possible combinations of <https://assignbuster.com/light-dependent-stage/>

the 4 bases in triplets, 4<sup>3</sup> No base of one triplet contributes to part of the code next to it, non-overlapping Few triplets code for START and STOP sequences for polypeptide chain formation eg START AUG and STOP UAA UAG UGA

DNA Replication (Semi-Conservative Replication) Happens during Interphase 'S' Separate the strands, a little at a time to form a replication fork Events: Unwinding / Enzyme DNA helicase separates 2 strands of DNA by breaking hydrogen bonds Semi-conservative replication / each strand acts as a template for the formation of a new strand Free DNA molecules join up to exposed bases by complementary base pairing Adenine with Thymine (A= T 2 -H bonding) Cytosine with Guanine (C= G 3 -H bonding) For the new 5' to 3' strand the enzyme DNA polymerase catalyses the joining of the separate nucleotides " All in one go" > completed new strand

For the 3' to 5' strand DNA polymerase produces short sections of strand but these sections have to be joined by DNA ligase to make the completed new strand. Specific base pairing ensures that two identical copies of the original DNA have been formed Transcription: DNA to mRNA DNA in nucleus unzips - bonds break Single template strand of DNA used for mRNA (triplet on DNA = codon for amino acid on mRNA) Enzyme RNA polymerase joins nucleotides together Free RNA nucleotides are assembled according to the DNA triplets (A-U / C-G / T-A) mRNA bases are equivalent to the non-template DNA strand Start and stop codons are included Introns (Non-coding) and exons (coding) DNA sequences are present in the primary mRNA transcript. Introns are removed before the mRNA is translated so that exons are only present in the

mature mRNA transcript mRNA moves into cytoplasm and becomes associated with ribosomes Translation: mRNA to Protein via tRNA Translation is the synthesis of a polypeptide chain from amino acids by using codon sequences on mRNA tRNA with anticodon carries amino acid to mRNA associated with ribosome " Anticodon - codon" complementary base pairing occurs

Peptide chain is transferred from resident tRNA to incoming tRNA tRNA departs and will soon pick up another amino acid Requirement for Translation Pool of amino acids / building blocks from which the polypeptides are constructed ATP and enzymes are needed Complementary bases are hydrogen-bonded to one another Structure involved in translation Messenger RNA (mRNA) Carries the code from the DNA that will be translated into an amino acid sequence Transfer RNA (tRNA) Transfer amino acids to their correct position on mRNA strand Ribosomes Provide the environment for tRNA attachment and amino acid linkage DNA and Inheritance

Reactions in cells is referred to as cell metabolism A sequence of chemical reactions is called a metabolic pathway Different forms of the same gene are alleles A gene is the length of DNA that carries the code for a protein (enzyme) Enzyme effect the cell's metabolism Visible changes are described with the phenotype The phenotype is influenced by the metabolic pathway Therefore DNA controls enzyme production Enzymes control metabolic pathways Metabolic pathways influence the phenotype of an organism Gene Mutations Deletion, reading frame shifts Substitution, one base replaced by another

Duplication, repetition of part of the sequence Addition, Addition extra base  
Change in one or more nucleotide bases in the DNA Change in the genotype  
(may be inherited) Cystic Fibrosis - Defective Gene Mutation causes the  
deletion of 3 bases in DNA. One amino acid (phenylalanine) is not coded for  
in the Cystic Fibrosis Transmembrane Regulator CFTR protein Faulty CFTR  
protein cannot control the opening of chloride channels in the cell membrane  
Results in production of thick sticky mucus, especially in lungs, pancreas and  
liver Organs cannot function normally and infection rate increases

Phenylketonuria (PKU) - Defective Gene

Gene mutation in DNA coding for the enzyme phenylalanine hydroxylase  
Phenylalanine hydroxylase not produced Amino acid phenylalanine cannot  
be converted to the amino acid tyrosine Tyrosine is necessary to produce the  
pigment melanin Phenylalanine collects in the blood and causes retardation  
in young children Managed by controlling diet to eliminate proteins  
containing phenylalanine Disease is tested by drops of blood taken from the  
baby