

TOPIC ONE

Keywords	Definition
Base	<ol style="list-style-type: none"> 1. The nonacid part of a salt, a substance that combines with acids to form salts 2. A substance that dissociates to give hydroxide ions in aqueous solutions 3. A substance whose molecule or ion can combine with a proton (hydrogen ion) 4. A substance capable of donating a pair of electrons (to an acid) for the formation of a coordinate covalent bond 5. An N-base can be classified as either a pyrimidine or a purine 6. consists of adenine, guanine, cytosine, thymine and uracil
c-banding	<ol style="list-style-type: none"> 1. Take the chromosome out and stain it to reveal the centromeres 2. chromosome banding technique where chromosome preparations from mice were heat denatured and then treated with Giemsa stain. 3. Only the centromeres took the stain. 4. Used to identify a specific heterochromatic region of chromosomes (the centromere)
Centromere	<ol style="list-style-type: none"> 1. A region of DNA typically found near the middle of a chromosome where two identical sister chromatids come closest in contact 2. It is involved in cell division as the point of mitotic spindle attachment (happens during anaphase) > aka primary constriction 3. The sister chromatids are attached all along their length, but they are closest at the centromere 4. In prokaryotes, a DNA molecule containing the organisms genome in eukaryotes a DNA molecule complexes with RNA and proteins to form a threadlike structures containing genetic information arranged in a linear sequence
Chromatin	<ol style="list-style-type: none"> 1. The combination of DNA and proteins that make up the contents of the nucleus of a cell 2. Primary functions of chromatin are <ol style="list-style-type: none"> a. To package DNA into a smaller volume to fit in the cell b. To strengthen the DNA to allow mitosis and meiosis and prevent DNA damage c. To control gene expression and DNA replication 3. The primary protein components of chromatin are histones that compact the DNA 4. Chromatin is only found in eukaryotic cells 5. In prokaryotes, a DNA molecule contain the organisms genome in eukaryotes, a DNA molecule complexes with RNA and proteins to form a threadlike structure contain genetic information.

Deoxyribose	<ol style="list-style-type: none"> 1. A monosaccharide with idealized formula $H-(C=O)-(CH_2)-(CHOH)_3-H$ 2. Its name indicates that it is a deoxy sugar, meaning that it is derived from the sugar ribose by loss of an oxygen atom 3. the 5 carbon sugar associated with deoxyribonucleotides in DNA
Diphosphate	<ol style="list-style-type: none"> 1. A nucleoside diphosphate 2. An ester of pyrophosphoric acid with the nucleoside adenosine 3. ADP consists of the pyrophosphate group, the pentose sugar ribose, and the nucleobase adenine
DNA	<ol style="list-style-type: none"> 1. A nucleic acid containing the genetic instructions used in the development and functioning of all known living organisms (with the exception of RNA viruses) 2. The DNA segments carrying this genetic information are called genes 3. Other DNA sequences have structural purposes, or are involved in regulating the use of this genetic information 4. A macromolecule usually consisting of a nucleotide polymers consisting of antiparallel chains in which the sugar residues are deoxyribose, which are held together by hydrogen bonds. The primary carrier of genetic information
Double Stranded	<ol style="list-style-type: none"> 1. Most DNA molecules are actually two polymer strands, bound together in a helical fashion by noncovalent bonds 2. This double stranded structure (dsDNA) is maintained largely by the intrastrand base stacking interactions, which are strongest for G,C stacks 3. Parts of the DNA double helix that need to separate easily, such as the TATAAT Pribnow box in some promoters, tend to have a high AT content, making the strands easier to pull apart <ol style="list-style-type: none"> a. This is required for DNA replication or transcription 4. DNA is double stranded, runs antiparallel directions
Duplicated Chromosome	<ol style="list-style-type: none"> 1. Contain two identical copies (called chromatids) joined by a centromere 2. Compaction of the duplicated chromosomes during mitosis and meiosis results in the classic four-arm structure <ol style="list-style-type: none"> a. Chromosomal recombination plays a vital role in genetic diversity
Euchromatin	<ol style="list-style-type: none"> 1. A lightly packed form of chromatin (DNA, RNA and protein) that is rich in gene concentration 2. Unlike heterochromatin, it is found in both cells with nuclei (eukaryotes) and cells without nuclei (prokaryotes) 3. Euchromatin comprises the most active portion of the genome within the cell nucleus. <ol style="list-style-type: none"> a. Often under active transcription 4. chromatin or chromosomal regions that are lightly staining and are relatively uncoiled during interphase portion of the cell cycle.

	Euchromatin regions contain most of the structural genes
Exon	<ol style="list-style-type: none"> 1. A nucleic acid sequence that is represented in the mature form of an RNA molecule 2. The mature RNA molecule can be a messenger RNA or a functional form of a non-coding RNA such as rRNA or tRNA 3. Exon can refer to the sequence in the DNA or its RNA transcript
G-banding	<ol style="list-style-type: none"> 1. Giemsa banding (gbanding) of the whole chromosome gives higher resolution 2. involves digestion of mitotic chromosomes with the proteolytic enzyme trypsin followed by giemsa staining
Heterochromatin	<ol style="list-style-type: none"> 1. Tightly packed form of DNA 2. Comes in different varieties. These varieties lie on a continuum between the two extremes <ol style="list-style-type: none"> a. Constitutive Constitutive heterochromatin is usually repetitive and forms structural functions such as centromeres or telomeres, in addition to acting as an attractor for other gene-expression or repression signals b. Facultative heterochromatin Facultative heterochromatin is not repetitive and although it shares the compact structure of constitutive heterochromatin, facultative heterochromatin can, under specific developmental or environmental signalling cues, lose its condensed structure and become transcriptionally active 3. the heavily staining late- replicated regions of chromosomes that are prematurely condensed in interphase
Intron	<ol style="list-style-type: none"> 1. Any nucleotide sequence within a gene that is removed by RNA splicing to generate the final mature RNA product of a gene
Lampbrush Chromosome	<ol style="list-style-type: none"> 1. Special form of chromosomes that are found in the growing oocytes (immature eggs) of most animals, except mammals 2. Chromosomes transform into the lampbrush form during the diplotene stage of meiotic prophase I due to an active transcription of many genes 3. Are highly extended meiotic half-bivalents, each consisting of 2 sister chromatids 4. meiotic chromosomes characterized by extended lateral loops that reach max extension during diplotene. Occurs in meiotic cells of organisms ranging from insects to humans
LINES	<ol style="list-style-type: none"> 1. Long INterspersed Element are a group of genetic elements that are found in large numbers in eukaryotic genomes 2. They are transcribed (or are the evolutionary remains of what was once transcribed) to an RNA using an RNA polymerase II promoter that resides inside the LINE

	<ol style="list-style-type: none"> 3. LINEs code for the enzyme reverse transcriptase, and many LINEs also code for an endonuclease 4. represent a category of repetitive transposable DNA sequence these are 6KB in length and in the genome 850,000 times. The most known family is L1 family
mRNA	<ol style="list-style-type: none"> 1. A molecule of RNA that encodes a chemical "blueprint" for a protein product 2. mRNA is transcribed from a DNA template, and carries coding information to the sites of protein synthesis: the ribosomes 3. The nucleic acid polymer is translated into a polymer of amino acids: a protein, at Ribosomes 4. An RNA molecule transcribed from DNA and translated into the amino acid sequence of a polypeptide
Nucleic Acid	<ol style="list-style-type: none"> 1. Biological molecules essential for life 2. Together with proteins, nucleic acids make up the most important macromolecules 3. They function in encoding, transmitting and expressing genetic information 4. Biological molecules essential for life and include DNA and RNA, consists of many nucleotides linked in a long chain
Nucleoside	<ol style="list-style-type: none"> 1. Glycosylamines consisting of a nucleobase (often referred to as simply <i>base</i>) bound to a ribose or deoxyribose sugar via a beta-glycosidic linkage 2. Nucleoside triphosphates play central roles in metabolism, in which capacity they serve as sources of chemical energy (ATP and GTP) 3. Are nucleotide derivatives 4. in nucleic acid chemical nomenclature a purine or pyrimidine base covalently linked to a ribose or deoxyribose sugar molecule
Nucleoside diphosphate	<ol style="list-style-type: none"> 1. same thing as nucleotide, except contains 2 phosphate groups on the 5 C of the ribose or deoxyribose sugar.
Nucleosome	<ol style="list-style-type: none"> 1. The basic unit of DNA packaging in eukaryotes, consisting of a segment of DNA wound around a histone protein core 2. Form the fundamental repeating units of eukaryotic chromatin, which is used to pack the large eukaryotic genomes into the nucleus while still ensuring appropriate access to it 3. Are folded through a series of successively higher order structures to eventually form a chromosome; this both compacts DNA and creates an added layer of regulatory control, which ensures correct gene expression 4. in eukaryotes a nuclear complex consisting of 4 pairs of histone molecules wrapped by 1.7 turns of DNA molecule. Major structure associated with organization of chromatin in the nucleus.
Nucleotide	<ol style="list-style-type: none"> 1. Molecules that, when joined together, make up the structural units

	<p>of RNA and DNA</p> <ol style="list-style-type: none"> Nucleotides participate in cellular signalling (cGMP and cAMP), and are incorporated into important cofactors of enzymatic reactions (coenzyme A, FAD, FMN, and NADP⁺) in nucleic acid chemical nomenclature, a nucleoside covalently linked to one or more phosphate groups. Nucleotides containing a single phosphate linked to the 5 prime C of the ribose or deoxyribose are the building blocks of nucleic acids.
Polyadenylation Site	<ol style="list-style-type: none"> The addition of a poly(A) tail to an RNA molecule Poly(A) tail consists of multiple adenosine monophosphates; in other words, it is a stretch of RNA that has only adenine bases In eukaryotes, polyadenylation is part of the process that produces mature messenger RNA (mRNA) for translation. It, therefore, forms part of the larger process of gene expression <p>Polyadenylation is a process that takes place after transcription termination. It involves cleavage of the new transcript (mRNA), followed by the addition of adenines at its newly synthesized 3' end. The cleavage site is called the polyadenylation site or, in short, poly(A) site.</p> <ul style="list-style-type: none"> The purpose of the polyA tail is to protect the mRNA from digestive enzymes in order for it to reach intact the protein synthesis site .
Polynucleotide	<ol style="list-style-type: none"> A biopolymer composed of 13 or more nucleotide monomers covalently bonded in a chain. DNA (deoxyribonucleic acid) and RNA (ribonucleic acid) are examples of polynucleotides with distinct biological function A molecular chain of nucleotides chemically bonded by a series of ester linkages between phosphoryl group of one nucleotide and the OH group of the sufar in the adjacent molecule
Polytene Chromosome	<ol style="list-style-type: none"> Form when multiple rounds of replication produce many sister chromatids that remain synapsed together To increase cell volume, some specialized cells undergo repeated rounds of DNA replication without cell division (endomitosis) found in various somatic tissues that can be seen in the nuclei of interphase cells. It is around 200-600 micrometres long. Contain a series of bands and interbands that contains replicated DNA sequences that do not undergo cytoplasm mitosis.
Promoter	<ol style="list-style-type: none"> Is a region of DNA that facilitates the transcription of a particular gene Located near the genes they regulate, on the same strand and typicallyupstream (towards the 5' region of the sense strand)
Purine	<ol style="list-style-type: none"> Purines have 2 rings Make up one of the two groups of nitrogenous bases, including the two groups of nucleotide bases.

	<ol style="list-style-type: none"> Two of the four deoxyribonucleotides and two of the four ribonucleotides, the respective building-blocks of DNA and RNA, are purines group of organic compounds containing 2 fused rings of C and N atoms. One ring has 6 members in the ring while the other has 5 members. Purines include adenine and guanine
Pyrimidine	<ol style="list-style-type: none"> Pyrimidines have 1 ring Make up one of the two groups of nitrogenous bases, including the two groups of nucleotide bases. Two of the four deoxyribonucleotides and two of the four ribonucleotides, the respective building-blocks of DNA and RNA, are pyrimidines group of organic molecules that have a 6 membered ring in which the first and third atoms are N and the rest are C. pyrimidines include the basis cytosine, thymine, and uracil
Repetitive DNA	<ol style="list-style-type: none"> DNA sequences that are repeated in the genome These sequences do not code for protein One class termed highly repetitive DNA consists of short sequences, 5-100 nucleotides, repeated thousands of times in a single stretch and includes satellite DNA Another class termed moderately repetitive DNA consists of longer sequences, about 150-300 nucleotides, dispersed evenly throughout the genome, and includes what are called Alu sequences and transposons
Ribose	<ol style="list-style-type: none"> Constitutes the backbone of RNA, a biopolymer that is the basis of genetic transcription. It is related to deoxyribose, as found in DNA. Once phosphorylated, ribose can become a subunit of ATP, NADH, and several other compounds that are critical to metabolism like the secondary messengers cAMP and cGMP a 5 carbon sugar associated with ribonucleosides and ribonucleotides associated with RNA
RNA	<ol style="list-style-type: none"> Is one of the three major macromolecules (along with DNA and proteins) that are essential for all known forms of life Like DNA, RNA is made up of a long chain of components called nucleotides. Each nucleotide consists of a nucleobase a ribose sugar, and a phosphate group The sequence of nucleotides allows RNA to encode genetic information A nucleic acid similar to DNA but characterized by the pentose sugar ribose, the pyrimidine uracil, and the single stranded nature of the polynucleotide chain. Several forms are recognized
rRNA	<ol style="list-style-type: none"> The RNA component of the ribosome, the enzyme that is the site of

	<p>protein synthesis in all living cells</p> <ol style="list-style-type: none"> Ribosomal RNA provides a mechanism for decoding mRNA into amino acids and interacts with tRNAs during translation by providing peptidyl transferase activity The RNA molecule that are the structural components of the ribosomal subunits. In prokaryotes, there are 16S, 23S, 5S molecules, In eukaryotes there are 18S, 28S and 5.8S molecules
Satellite DNA	<ol style="list-style-type: none"> Consists of very large arrays of tandemly repeating, non-coding DNA Is the main component of functional centromeres, and form the main structural constituent of heterochromatin Dna that forms a minor band when genomic DNA is centrifuged in a Cs salt gradient. DNA usually consist of short sequences repeated many times I the genome.
SINEs	<ol style="list-style-type: none"> Short INterspersed Elements are short DNA sequences (<500 bases) that represent reverse-transcribed RNA molecules originally transcribed by RNA polymerase III into tRNA, rRNA, and other small nuclear RNAs SINEs do not encode a functional reverse transcriptase protein and rely on other mobile elements for transposition While historically viewed as "junk DNA", recent research suggests that in some rare cases both LINEs and SINEs were incorporated into novel genes, so as to evolve new functionality
Single stranded	<ol style="list-style-type: none"> RNA is a single stranded molecule RNA is single stranded, not antiparallel
STRs	<ol style="list-style-type: none"> A short tandem repeat (STR) in DNA occurs when a pattern of two or more nucleotides are repeated and the repeated sequences are directly adjacent to each other The pattern can range in length from 2 to 5 base pairs (bp) (for example (CATG)_n in a genomic region) and is typically in the non-coding intron region short tandem repeats 2-9 base pairs long found within minisatallites, used to prepare DNA profiles in forensics
telomere	<ol style="list-style-type: none"> Is a region of repetitive DNA sequences at the end of a chromosome, which protects the end of the chromosome from deterioration or from fusion with neighbouring chromosomes Telomere regions deter the degradation of genes near the ends of chromosomes by allowing chromosome ends to shorten, which necessarily occurs during chromosome replication. Over time, due to each cell division, the telomere ends do become shorter the heterochromatic terminal region of a chromosome
Transcription Regulatory Element	<ol style="list-style-type: none"> Is the change in gene expression levels by altering transcription rates Regulation of transcription controls when transcription occurs and how much RNA is created

	<ol style="list-style-type: none"> 3. E.g. Controlling how much of a protein is ultimately produced, saves the body from needlessly creating more than needed
Translation Initiation Site	<ol style="list-style-type: none"> 1. The mRNA codon at which the ribosome initiates the process of translation of the sequence into an amino acid sequence 2. The start codon is usually AUG (coding for methionine) 3. GUG and UUG sometimes are used as start codons, but this rarely happens in organisms other than bacteria
Translation Termination Site	<ol style="list-style-type: none"> 1. The mRNA codon at which the ribosome stops the process of translation of the sequence into an amino acid sequence 2. A stop codon in the mRNA moves onto the ribosomal binding site 3. Three stop codons encoding the termination of translation: UAG, UAA and UGA
tRNA	<ol style="list-style-type: none"> 1. An adaptor molecule composed of RNA, typically 73 to 93 nucleotides in length, that is used in biology to bridge the four-letter genetic code(ATCG) in messenger RNA (mRNA) with the twenty-letter code of amino acids in proteins 2. The role of tRNA as an adaptor is best understood by considering its three-dimensional structure 3. One end of the tRNA carries the genetic code in a three-nucleotide sequence called the anticodon. The anticodon forms three base pairs with a codon in mRNA during protein biosynthesis 4. small ribonucleic acid molecule with an essential role in translation. tRNA contains : <ul style="list-style-type: none"> - 3 base segment (anticodon) that recognizes a codon in mRNA - A binding site for the specific amino acid corresponding to the anticodon and - Recognition site for te interaction with ribosomes and with the enzymes that links the tRNA to its specific amino acid
VNTRs	<ol style="list-style-type: none"> 1. A Variable Number Tandem Repeat (or VNTR) is a location in a genome where a short nucleotide sequence is organized as a tandem repeat 2. These can be found on many chromosomes, and often show variations in length between individuals 3. Each variant acts as an inherited allele, allowing them to be used for personal or parental identification 4. short repeated DNA sequence present as a tandem repeats between 2 restriction enzymes sites. Variation in the number of repeats creates DNA fragments of differing lengths following restriction enzyme digestion

TOPIC 2

Anticodon	<ol style="list-style-type: none"> 1. A sequence of three adjacent nucleotides located on one end of transfer RNA 2. It bounds to the complementary coding triplet of nucleotides in messenger RNA during translation phase of protein synthesis
Codons	<ol style="list-style-type: none"> 1. A set of three adjacent nucleotides 2. Also called triplet in mRNA that base-pair with the corresponding anticodon of tRNA molecule that carries a particular amino acid 3. This specifies the type and sequence of amino acids for protein synthesis
Frameshift mutations	<ol style="list-style-type: none"> 1. Is a genetic mutation caused by indels (insertions or deletions) of a number of nucleotides that is not evenly divisible by three from a DNA sequence 2. Due to the triplet nature of gene expression by codons, the insertion or deletion can change the reading frame (the grouping of the codons), resulting in a completely different translation from the original 3. The earlier in the sequence the deletion or insertion occurs, the more altered the protein produced
Genetic code	<ol style="list-style-type: none"> 1. The set of rules by which information encoded in genetic material (DNA or mRNA sequences) is translated into proteins (amino acid sequences) by living cells 2. Code defines how sequences of three nucleotides, called codons, specify which amino acid will be added next during protein synthesis
Induced mutations	<ol style="list-style-type: none"> 1. A mutation that is produced by treatment with a physical or chemical agent that affects the deoxyribonucleic acid molecules of a living organism.
Missense mutations	<ol style="list-style-type: none"> 1. A point mutation in which a single nucleotide is changed, resulting in a codon that codes for a different amino acid 2. This can render the resulting protein nonfunctional 3. Such mutations are responsible for diseases such as Epidermolysis bullosa, sickle-cell disease
mRNA	<ol style="list-style-type: none"> 5. A molecule of RNA that encodes a chemical "blueprint" for a protein product 6. mRNA is transcribed from a DNA template, and carries coding information to the sites of protein synthesis: the ribosomes 7. The nucleic acid polymer is translated into a polymer of amino acids: a protein, at Ribosomes

Mutations	<ol style="list-style-type: none"> 1. Changes in a genomic sequence: the DNA sequence of a cell's genome or the DNA or RNA sequence of a virus 2. They can be defined as sudden and spontaneous changes in the cell 3. Mutations are caused by radiation, viruses, transposons and mutagenic chemicals, as well as errors that occur during meiosis or DNA replication
Nonsense mutation	<ol style="list-style-type: none"> 1. A point mutation in a sequence of DNA that results in a premature stop codon, or a nonsense codon in the transcribed mRNA, and in a truncated, incomplete, and usually nonfunctional protein product
Point mutation	<ol style="list-style-type: none"> 1. A point mutation, or single base substitution, is a type of mutation that causes the replacement of a single base nucleotide with another nucleotide of the genetic material, DNA or RNA 2. The term point mutation also includes insertions or deletions of a single base pair
Polyadenylation site	<ol style="list-style-type: none"> 4. The addition of a poly(A) tail to an RNA molecule 5. Poly(A) tail consists of multiple adenosine monophosphates; in other words, it is a stretch of RNA that has only adenine bases 6. In eukaryotes, polyadenylation is part of the process that produces mature messenger RNA (mRNA) for translation. It, therefore, forms part of the larger process of gene expression
Post Transcriptional modification	<ol style="list-style-type: none"> 1. A process in cell biology by which, in eukaryotic cells, primary transcript RNA is converted into mature RNA 2. A notable example is the conversion of precursor messenger RNA into mature messenger RNA (mRNA), which includes splicing and occurs prior to protein synthesis 3. This process is vital for the correct translation of the genomes of eukaryotes as the human primary RNA transcript that is produced as a result of transcription contains both exons, which are coding sections of the primary RNA transcript and introns, which are the non coding sections of the primary RNA transcript
Post Translational modification	<ol style="list-style-type: none"> 1. Is the chemical modification of a protein after its translation. It is one of the later steps in protein biosynthesis, and thus gene expression, for many proteins 2. After translation, the posttranslational modification of amino acids extends the range of functions of the protein by attaching it to other biochemical functional groups (such as acetate, phosphate, various lipids and carbohydrates), changing the chemical nature of an amino acid (e.g.citrullination), or making structural changes (e.g. formation of disulfide bridges)
Promoter	<ol style="list-style-type: none"> 3. Is a region of DNA that facilitates the transcription of a particular gene

	<ol style="list-style-type: none"> 4. Located near the genes they regulate, on the same strand and typically upstream (towards the 5' region of the sense strand)
Ribosomes	<ol style="list-style-type: none"> 1. A component of cells that synthesizes protein chains 2. It assembles the twenty specific amino acid molecules to form the particular protein molecule determined by the nucleotide sequence of an RNA molecule
RNA polymerase	<ol style="list-style-type: none"> 1. Is an enzyme that produces RNA 2. RNAP is necessary for constructing RNA chains using DNA genes as templates, a process called transcription 3. RNA polymerase enzymes are essential to life and are found in all organisms and many viruses
rRNA	<ol style="list-style-type: none"> 5. Is one of the three major macromolecules (along with DNA and proteins) that are essential for all known forms of life 6. Like DNA, RNA is made up of a long chain of components called nucleotides. Each nucleotide consists of a nucleobase a ribose sugar, and a phosphate group 7. The sequence of nucleotides allows RNA to encode genetic information
Splicing	<ol style="list-style-type: none"> 1. A modification of an RNA after transcription, in which introns are removed and exons are joined 2. This is needed for the typical eukaryotic messenger RNA before it can be used to produce a correct protein through translation 3. For many eukaryotic introns, splicing is done in a series of reactions which are catalyzed by the spliceosome, a complex of small nuclear ribonucleoproteins (snRNPs), but there are also self-splicing introns
Spontaneous mutations	<ol style="list-style-type: none"> 1. A mutation that arises naturally and not as a result of exposure to mutagens 2. Also called natural mutation
Synonymous mutation	<ol style="list-style-type: none"> 1. The evolutionary substitution of one base for another in an exon of a gene coding for a protein, such that the produced amino acid sequence is not modified 2. Synonymous substitutions and mutations affecting noncoding DNA are collectively known as silent mutations
Transcription	<ol style="list-style-type: none"> 1. The process of creating a complementary RNA copy of a sequence of DNA 2. During transcription, a DNA sequence is read by RNA polymerase, which produces a complementary, antiparallel RNA strand 3. As opposed to DNA replication, transcription results in an RNA complement that includes uracil (U) in all instances where thymine (T) would have occurred in a DNA complement
Transcription regulatory element	<ol style="list-style-type: none"> 4. Is the change in gene expression levels by altering transcription rates 5. Regulation of transcription controls when transcription occurs and how much RNA is created

Translation	<ol style="list-style-type: none"> 1. The third stage of protein biosynthesis (part of the overall process of gene expression) 2. In translation, messenger RNA (mRNA) produced by transcription is decoded by the ribosome to produce a specific amino acid chain, or polypeptide, that will later fold into an active protein 3. The ribosome facilitates decoding by inducing the binding of tRNAs with complementary anticodon sequences to that of the mRNA 4. The tRNAs carry specific amino acids that are chained together into a polypeptide as the mRNA passes through and is "read" by the ribosome
Translation initiation site	<ol style="list-style-type: none"> 4. The mRNA codon at which the ribosome initiates the process of translation of the sequence into an amino acid sequence 5. The start codon is usually AUG (coding for methionine); in prokaryotes it may also be GUG (leucine)
Translation termination site	<ol style="list-style-type: none"> 4. The mRNA codon at which the ribosome stops the process of translation of the sequence into an amino acid sequence 5. A stop codon in the mRNA moves onto the ribosomal binding site
tRNA	<ol style="list-style-type: none"> 5. An adaptor molecule composed of RNA, typically 73 to 93 nucleotides in length, that is used in biology to bridge the four-letter genetic code(ATCG) in messenger RNA (mRNA) with the twenty-letter code of amino acids in proteins 6. The role of tRNA as an adaptor is best understood by considering its three-dimensional structure 7. One end of the tRNA carries the genetic code in a three-nucleotide sequence called the anticodon. The anticodon forms three base pairs with a codon in mRNA during protein biosynthesis
Mutagens	<ol style="list-style-type: none"> 1. A physical or chemical agent that changes the genetic material, usually DNA, of an organism and thus increases the frequency of mutations above the natural background level 2. Not all mutations are caused by mutagens: so-called "spontaneous mutations" occur due to spontaneous hydrolysis, errors in DNA replication, repair and recombination 3. As many mutations cause cancer, mutagens are therefore also likely to be carcinogens

TOPIC 3 – Meiosis and Sex

Chromosome	<ul style="list-style-type: none"> -Organized DNA sequence contained in the cells. -Contain DNA that is wrapped into compact forms around histone proteins to allow the massive amount of information contained to be condensed. -This formation is such that the chromosome can be unwound and the DNA can be accessed for replication.
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X & Y Chromosome	<ul style="list-style-type: none"> -Sex chromosomes determine gender of zygote -Female (XX), male (XY)... found in gonads -mutations or crossing over on these chromosomes can cause gender confusion (inactivated SRY gene in males creates ovaries) -also, sex chromosomes not present as a homologous pair.
Autosomal Chromosome	<ul style="list-style-type: none"> -any chromosome except for sex chromosome -made of pairs of homologous chromosomes -there are 22 pairs of homologous autosomal chromosomes in the human body.
Chromatid	<ul style="list-style-type: none"> -1 of 2 identical copies of DNA -make up a duplicated chromosome -basically $\frac{1}{2}$ of a duplicated chromosome. Two identical chromatids joined together at the centromeres form the sister chromatids.
Sister Chromatids	<ul style="list-style-type: none"> -2 matching chromatids that join and are bound together at the centromere -analogous to homologous chromosomes -found in diploid cells/organisms -contain same genes and alleles
DNA Replication	<ul style="list-style-type: none"> -the process where the DNA helix is split into strands and the strands are duplicated -creates 2 identical copies of the DNA (daughter strands) via semi-conservative replication. -process is initiated by DNA polymerase, which creates a replication fork, which is where the DNA is duplicated and then the process is terminated
Karyotype	<ul style="list-style-type: none"> -describes the number and appearance of chromosomes -homologous chromosomes arranged together and arranged by size -illustrates differences in chromosomes of organism and individuals - in humans, the karyotype consists of 46 chromosomes of which 22 are autosomal homologous pairs and 2 belong to the sex chromosomes.
Diploid	<ul style="list-style-type: none"> -cells that contain 2 identical haploid sets of information -follows a $2n$ pattern (n being the number of chromosomes in gametes). $2n$ for somatic cells. -ie human cells (except gonads)
Haploid	<ul style="list-style-type: none"> -cells that contain 1 haploid set of information -follows a $1n$ pattern (n being the number of chromosomes in gametes) -ie sperm cells or egg cells in humans have 23

	chromosomes
Meiosis	<ul style="list-style-type: none"> -the replication of genetic material that ends with 4 independent daughter cells - Two step process: Meiosis I and Meiosis II -turns a diploid cell into 4 haploid gametes -second division (meiosis II) follows mitosis to produce 4 daughter cells - in humans, 4 spermatozoa are made from one cell in males, while one ovum is made from one cell in females.
Homologous chromosomes	<ul style="list-style-type: none"> -a set of nearly identical chromosomes -1 from mother, 1 from father -both carry genes in the same order for the same biological feature (eye colour) but can either contain the same or different alleles
Gametes	<ul style="list-style-type: none"> -cells contained in the gonads -are the product of meiosis -are haploid and fuse with another gamete (from another sex parent) to form a diploid set of DNA -sperm and egg cells
Zygote	<ul style="list-style-type: none"> - Initial cell formed by the fusion of two gametes during reproduction. -Divides to form the embryo and ultimately the organism. -Diploid cell formed by two haploid sex cells. The zygote contains DNA from both father and mother and forms the DNA that makes up the organism.

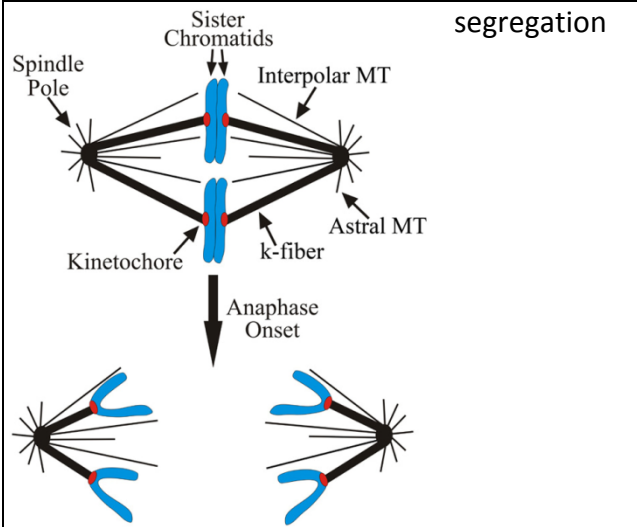
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X & Y Chromosome	<ul style="list-style-type: none"> -Sex chromosomes determine gender of zygote -Female (XX), male (XY)... found in gonads -mutations or crossing over on these chromosomes can cause gender confusion (inactivated SRY gene in males creates ovaries) -also, sex chromosomes not present as a homologous pair.
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Chromatid	<ul style="list-style-type: none"> -1 of 2 identical copies of DNA -make up a duplicated chromosome -basically $\frac{1}{2}$ of a duplicated chromosome. Two identical chromatids joined together at the centromeres form the sister chromatids.
Sister Chromatids	<ul style="list-style-type: none"> -2 matching chromatids that join and are bound together at the centromere -analogous to homologous chromosomes -found in diploid cells/organisms -contain same genes and alleles
DNA Replication	<ul style="list-style-type: none"> -the process where the DNA helix is split into strands and the strands are duplicated -creates 2 identical copies of the DNA (daughter strands) via semi-conservative replication. -process is initiated by DNA polymerase, which creates a replication fork, which is where the DNA is duplicated and then the process is terminated
Karyotype	<ul style="list-style-type: none"> -describes the number and appearance of chromosomes -homologous chromosomes arranged together and arranged by size -illustrates differences in chromosomes of organism and individuals - in humans, the karyotype consists of 46 chromosomes of which 22 are autosomal homologous pairs and 2 belong to the sex chromosomes.
Diploid	<ul style="list-style-type: none"> -cells that contain 2 identical haploid sets of information -follows a $2n$ pattern (n being the number of chromosomes in gametes). $2n$ for somatic cells. -ie human cells (except gonads)
Haploid	<ul style="list-style-type: none"> -cells that contain 1 haploid set of information -follows a $1n$ pattern (n being the number of chromosomes in gametes) -ie sperm cells or egg cells in humans have 23 chromosomes
Meiosis	<ul style="list-style-type: none"> -the replication of genetic material that ends with 4 independent daughter cells - Two step process: Meiosis I and Meiosis II -turns a diploid cell into 4 haploid gametes -second division (meiosis II) follows mitosis to produce 4 daughter cells - in humans, 4 spermatozoa are made from one cell in males, while one ovum is made from one cell in females.

Homologous chromosomes	<ul style="list-style-type: none"> -a set of nearly identical chromosomes -1 from mother, 1 from father -both carry genes in the same order for the same biological feature (eye colour) but can either contain the same or different alleles
Gametes	<ul style="list-style-type: none"> -cells contained in the gonads -are the product of meiosis -are haploid and fuse with another gamete (from another sex parent) to form a diploid set of DNA -sperm and egg cells
Zygote	<ul style="list-style-type: none"> - Initial cell formed by the fusion of two gametes during reproduction. -Divides to form the embryo and ultimately the organism. -Diploid cell formed by two haploid sex cells. The zygote contains DNA from both father and mother and forms the DNA that makes up the organism.

<p>Meiosis I</p> <p>The diagram illustrates the two stages of meiosis. It begins with a pair of homologous chromosomes, one purple and one orange, each with two sister chromatids. Meiosis I shows these chromosomes crossing over and then separating into two daughter cells. Meiosis II shows the sister chromatids separating, resulting in four haploid daughter cells, each with one purple and one orange chromosome.</p>	<p>→A form of mitosis in which the chromosomes complement of the nuclei is reduced from the diploid (2n) number to the haploid (n).</p> <p>→Prophase, metaphase, anaphase, telophase form the main stages of meiosis I</p> <p>→ Prophase: Homologous chromosomes come together in pairs, chromatids separate and remain adhered along a longitudinal plane, and shortening & thickening of the chromosomes occurs.</p> <p>Metaphase: Thickened chromosomes arrange in an equatorial plane.</p> <p>Anaphase: Centromeres repel each other forcing the chromosomes apart, but chromatids remain attached. One pair of chromatids moves towards each pole.</p> <p>Telophase: Chromosomes surrounded by a nuclear membrane; interphase (resting stage) may follow.</p>
Meiosis II	<p>→A normal mitosis – process is the same, results are different.</p> <p>→Forms four haploid cells from two haploid</p>

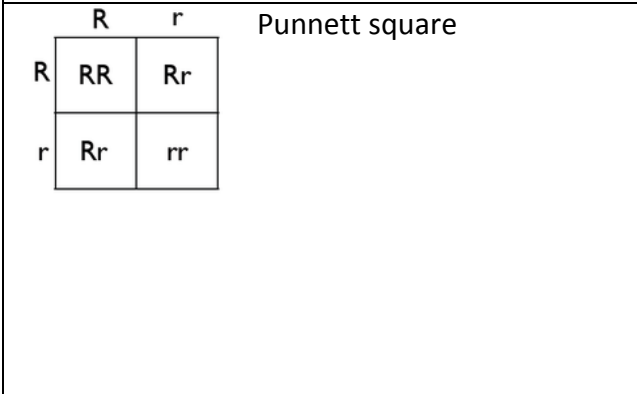
cells resulting from meiosis I
 → There is no prophase unless an interphase follows telophase.



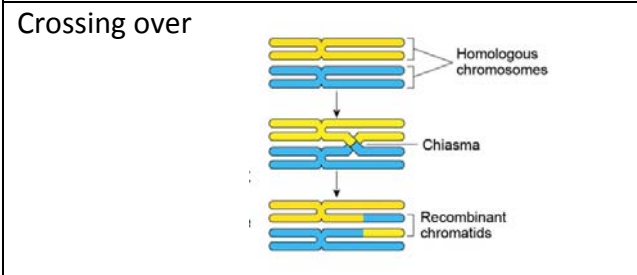
→ Segregation is a process that occurs during meiosis
 → It is the process of the separation of the maternal and paternal homologs of each homologous chromosome pair into gametes.
 → The formation of unique gametes from the genotype of the parents

Independent assortment
 (Mendel's law of independent assortment)

→ Independent assortment occurs during the segregation in meiosis I.
 → It is the random distribution of maternal and paternal homologs into gametes.
 → It is the independent behaviour of each pair of homologous chromosomes during their segregation process.



→ It is method (diagram) used to derive / determine a specific outcome of a cross or breeding process.
 → It shows the probability of inheriting a specific trait(s) -a pair of alleles- from the parents.
 → Punnett squares give direct probabilities for the genotypes; from there you can deduce the probabilities of the possible phenotypes.



→ Crossing over is the exchange of genetic information between homologous chromosomes.
 → During crossing over homologous chromosomes come together in late prophase I of meiosis (called synapsis) and form a tetrad (4 chromosomes).

	<p>→ It is exchange of material between non-sister chromatids during meiosis is the basis of this genetic recombination.</p> <p>→ It is the basis for genetic variation and can occur anywhere along the autosomes</p>
Chiasma	<p>→ The crossed strands of non-sister chromatids seen in diplotene of the first meiotic division. → It is the point of overlap of the paired chromatid at which fusion and exchange of genetic material take place during prophase of meiosis.</p> <p>→ It is regarded as the cytological evidence for exchange of chromosomal material, or crossing over.</p>
Recombinant chromatid	<p>→ They are formed due to meiotic recombination which involves the physical interchange of DNA molecules between the two homologous chromosomes, thus allowing the creation of new combinations of alleles for genes located on that pair of chromosomes.</p> <p>→ Each recombinant chromatid carries information from both of the original homologs.</p> <p>→ Genetic recombination that occurs to form the chromatids only occurs in the gene-rich euchromatin that makes up most of the chromosome arms, never in the heterochromatin that surrounds the centromeres.</p>
SRY gene	<p>→ The formal name for SRY gene is “sex-determining region Y.”</p> <p>→ The SRY gene produces a protein called SRY sex-determining region Y protein, which binds to specific regions of the DNA and ultimately controls whether a fetus develops into a male or a female.</p> <p>→ The SRY gene is located on the short (p arm) of the Y chromosome.</p> <p>→ It is possible to have karyotypes with XX (SRY+) that are male and XY (SRY-) that are female.</p>