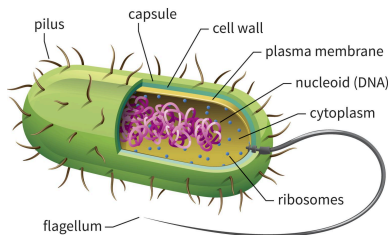


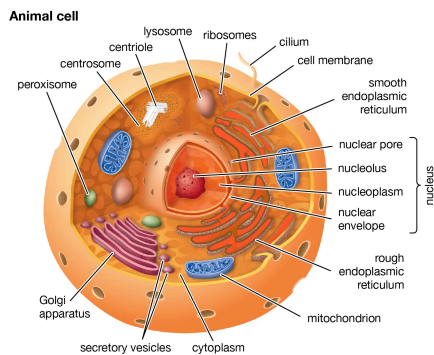
BIOLOGY NOTES

Cells:

- Cell theory =
 - All living organisms are made out of cells.
 - The cell is the basic structural and functional unit of life in all living things
 - All cells come from pre-existing cells
- Characteristics of living organisms (MRS GREN)=
 - M = Movement
 - R = Respiration
 - S = Sensitivity
 - G = Growth
 - R = Reproduction
 - E = Excretion
 - N = Nutrition
- 2 types of cells = Prokaryotic and Eukaryotic
- Prokaryotic = Do not have membrane bound organelles
- Eukaryotic = Have membrane bound organelles
- PROKARYOTIC CELL



- EUKARYOTIC CELL



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- NUCLEUS =
 - Structure = Sphere with another sphere (nucleolus)
 - Function = Stores cell DNA and manages cell functions
- CELL WALL =
 - Structure = Rigid wall made out of cellulose, proteins and carbohydrates
 - Function = Protects and supports the cell
 - * only found in plant cells

- CYTOPLASM =
Structure = Gelatin like fluid inside cell-membrane
Function = Contains salts, minerals and organic molecules. Site where metabolic reactions occur
- RIBOSOMES =
Structure = Consists of 2 subunits made of protein and RNA
Function = Site of protein synthesis.
- ENDOPLASMIC RETICULUM (ER) =
Structure = A system of membrane tubules and sacs
Function = Intracellular highway (transport)
 - Smooth ER = Do not have ribosomes on their surface
 - Rough ER = Have ribosomes on their surface
- GOLGI APPARATUS =
Structure = Stacked, flat sacs
Function = Receives proteins from ER and transports them to other organelles
- MITOCHONDRIA =
Structure = Folded membrane within an outer membrane
Function = Converts energy in food to usage energy (cellular respiration)
- LYSOSOMES =
Structure = Spherical organelles that contain hydrolytic enzymes
Functions = Breaks down food particles, foreign invaders or worn out cell parts
- CILIA AND FLAGELLA =
Structure = Hair like organelles that extend from surface of cells
Function = Cell mortality
- VACUOLES =
Structure = A sac of fluid surrounded by a membrane
Function = Temporary storage of wastes, water and nutrients
- CHLOROPLASTS =
Structure = Stacked sacs (thylakoid) that contain chlorophyll
Function = Photosynthesis
* only found in plant cells
- DIFFERENCE BETWEEN PLANT AND ANIMAL CELLS
 - Animal cells do not contain chloroplasts
 - Animal cells do not contain a cell wall
 - Plant cells have a much larger vacuole than animal cells
- DIFFERENCE BETWEEN PROKARYOTES AND EUKARYOTES

PROKARYOTES	EUKARYOTES
No membrane bound nucleus	Membrane bound nucleus
No membrane bound organelles	Membrane bound organelles
Have pili, fimbriae and flagella	Cilia or flagella

Movement in and out of Cells:

- DIFFUSION = Molecules move from an area of higher concentration to an area of lower concentration. They move down the concentration gradient
- Diffusion is passive (no energy required)
- Molecules diffuse until equilibrium is reached
- The main way through which substances move over short distances in organisms
- EXAMPLES OF DIFFUSION = Refer page 46 of Kashvi's notes
- OSMOSIS = The process through which molecules move from an area of higher water potential to an area of lower water potential. They move down the concentration gradient
- In plant cells = When there is higher concentration (of molecules) outside the cell, water moves out, causing the cell to become plasmolysed (very flaccid)
When there is higher concentration inside the cell, water comes inside, causing cell to become turgid (swollen)
- In animal cells = When concentration is higher outside the cell, water molecules cause crenation (shrinkage)
When concentration is higher inside the cell, water molecules cause lysis (bursting)
- ACTIVE TRANSPORT = When molecules move from an area of lower concentration to an area of higher concentration. They move against the concentration gradient.
- Requires energy from the cell
- SPECIALISED CELLS =
- Root Hair cells =
 - Function = To absorb water and minerals from the soil
 - Adaptations = Long root hair shape to reach water
Large surface area for higher diffusion of water and minerals
No chloroplasts due to being underground
- Palisade Cells =
 - Function = To carry out photosynthesis and make food
 - Adaptations = Lots of chloroplast to absorb light and provide energy
Tall, long and high surface area to maximise absorption of sunlight
- Muscle cells =
 - Function = To help in movement
 - Adaptation = Contains proteins that change shape to contract and relax
Lots of mitochondria to provide energy for muscle contraction
- Nerve cells =
 - Function = To carry nerve impulses around the body
 - Adaptation = Long fibres allowing it to carry electric impulses
Branching dendrites at each end to connect other nerves and muscles
- Ciliated cells =
 - Function = To move mucus away from the lungs with trapped dust

- Adaptation = Tiny hairs called cilia help in wafting mucus along airway
Lots of mitochondria to release energy for cilia to move
- Red Blood Cells (Erythrocytes) =
 - Function = Transportation of oxygen in the body
 - Adaptation = Biconcave shapes increases SA for diffusion of oxygen
No nucleus to provide more room for haemoglobin
- White blood cells (Leukocytes) =
 - Function = Help maintain immunity
 - Phagocytes = have specialised WBC's that destroy pathogens by engulfing
 - Lymphocytes = destroy pathogens by producing antibodies
- Sperm cell =
 - Function = Travel and fuse with the egg cell for fertilisation
 - Adaptation = Long tail for movement to the egg
Lots of mitochondria to release energy to allow sperm to move their tail
Enzymes on the head help to break jelly layer of egg cell
- Egg cell =
 - Function = To get fertilised by the sperm cell
 - Adaptation = Cytoplasm contains nutrients for developing embryo
 - Membrane changes after fertilisation to prevent more sperms to get in

Plants, respiration and enzymes:

- Tropism = Growth or movement of plants towards (positive) or away (negative) from an environmental stimulus.
- A stimulus is any event that causes reaction
- Types of tropisms = Thigmotropism (touch), Phototropism (Light), Hydrotropism (Water), Geotropism (Gravity)
- Auxins are hormones that help with cell growth and elongation
 - They accumulate in the shadier part/ away from light
 - They gather towards the direction of gravity
- More auxins on one side makes it longer, causing the plant to bend towards the light source

Plant Hormones:

- Abscisic Acid: Closes stomata, seed dormancy
- Auxin: Cell elongation and differentiation between shoots and roots
- Cytokinins: Promote cell division, delay ageing of leaves and open stomata
- Ethylene: Ripening of fruit
- Gibberellin: Germination of seeds, elongation of stems and fruit bearing

Enzymes:

- Catalysts that help to speed up chemical reactions without being used up.
- They are basically proteins folded into complex shapes, so that smaller proteins can fit inside

- As temperature increases, enzyme activity also increases because kinetic energy is produced. This is only until optimum (30°) because once temperature increases beyond this point, enzymes tend to get denatured.
- HUMAN ENZYMES =
- Amylase = breaks down starches to form simple sugars (ie. glucose) produced in salivary glands & pancreas and is important in digestion
- Protease = breaks down proteins into amino acids. Produced in stomach, pancreas and small intestine
- Lipase = breaks down lipids/fats into fatty acids and glycerol
- Pepsin = Another type of protease. Breaks down proteins into peptides

Respiration:

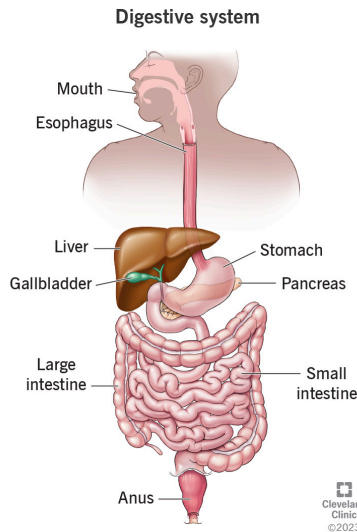
- USES IN HUMANS:
Muscle contraction
Making protein (linking amino acids)
Cell division
Active transport
Growth
Transmitting nerve impulses
Maintaining body temperature
- Aerobic Respiration (including O₂) =
 $C_6H_{12}O_6 + 6O_2 \rightarrow 6H_2O + 6CO_2 + ATP$
glucose + oxygen → water + carbon dioxide + energy
- Anaerobic Respiration (without O₂) =
- $C_6H_{12}O_6 \rightarrow 2C_3H_6O_3 + ATP$ } in
glucose → lactic acid + energy } muscles
- $C_6H_{12}O_6 \rightarrow 2C_2H_5OH + 2CO_2 + ATP$ } in
glucose → ethanol + carbon dioxide + energy } yeast
- The presence of CO₂ tends to make limewater cloudy

Food/Biochemical tests:

- Sugars/Glucose = Benedict's test
Add Benedict's (blue) and then heat, if changes to g/o/r/y then +ve
- Proteins = Biuret
Add Biuret (blue) if it changes to purple/mauve, then +ve
- Starch = Iodine test
Add Iodine (brownish) and if it changes to bluish black, the +ve
- Lipids/Fats = Ethanol test
Add ethanol and H₂O, if the reaction gives white emulsion, then +ve
- Vitamin C = DCPIP test
Add DCPIP (blue) and if the solution becomes colourless, then +ve
- CO₂
- Calcium Hydroxide + CO₂ → Calcium Carbonate + H₂O

Digestion:

- Breaking down of large food particles



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- Saliva in mouth contains amylase which helps in starting the breakdown
- PROCESS =
- (1) Ingestion = Food is taken in through the mouth (gastrointestinal tract) and the amylase in saliva begins the chemical breakdown of food particles
- (2) Digestion = Ingested food is broken down
 Mechanical = chewing, grinding, churning, mixing
 Chemical = Enzymes, HCl, Bile
- (3) Absorption = Uptake of useful nutrients from small intestine to the bloodstream and then to the cells
- (4) Assimilation = Movement of digested food molecules from small intestine to the cells of the body where they will be used
- (5) Egestion = Removal/ Passing of unwanted/undigested material as faeces
- FUNCTIONS =

Mouth	Breaks down food
Salivary Gland	Produces saliva which helps in lubricating and moisturising
Pharynx	Swallows food
Oesophagus	Transports food
Stomach	Stores and churns food, HCl activates enzymes, breaks down food, kills germs, mucus protects stomach wall, pepsin digests proteins
Liver	Breaks down and builds up many biological molecules, stores vitamins and irons, destroys poisons and old blood cells, produces bile which aids in digestion
Gallbladder	Stores and concentrates bile

Pancreas	Hormones regulate blood glucose levels, Bicarbonates neutralise acid, Trypsin and chymotrypsin digest proteins
Small Intestine	Completes digestion, mucus protects gut wall, absorbs nutrients and water, contains villi to maximise absorption, contains enzymes such as peptidase, sucrase and amylase
Large intestine	Reabsorbs some water and ions, forms and stores faeces
Rectum	Stores and expels faeces
Anus	Opening for elimination of faeces.

- Villi = structures that help in increasing the surface area of the small intestine to increase absorption.

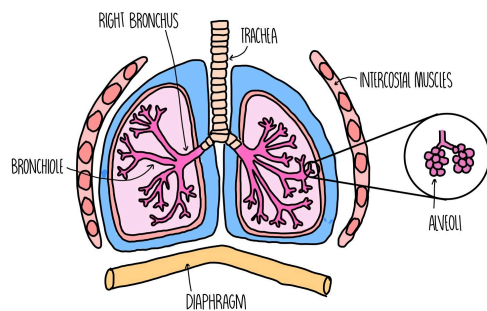
They contain blood capillaries that absorb glucose and amino acids

They contain lacteal that absorb fatty acids

They contain epithelium which are one cell thick to increase diffusion rate

- REFER TO PROCESS WRITTEN IN BOOK AS WELL

Gas Exchange:



- Nasal Cavity → trachea → bronchus → bronchiole → alveoli

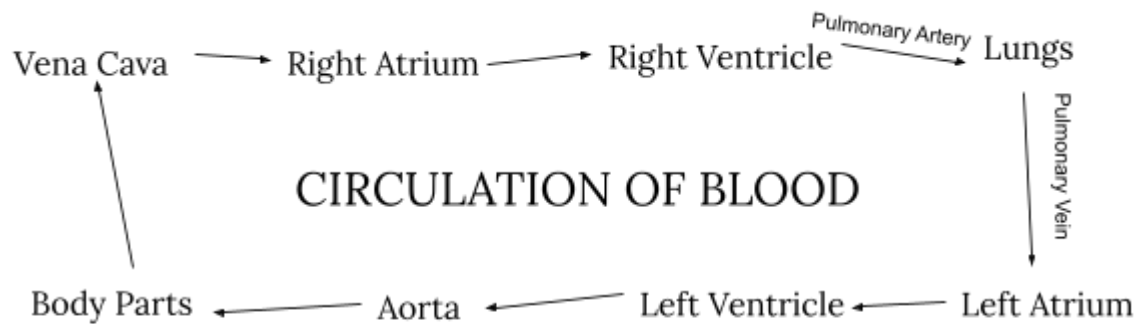
- FEATURES OF ALVEOLI

- Thin walls = The alveoli (air sac) walls are very thin so that gases can quickly diffuse through them
- Moist so that gases can dissolve before diffusion
- Large surface area for gas diffusion
- Large capillary network so that large volume of gas is exchanged

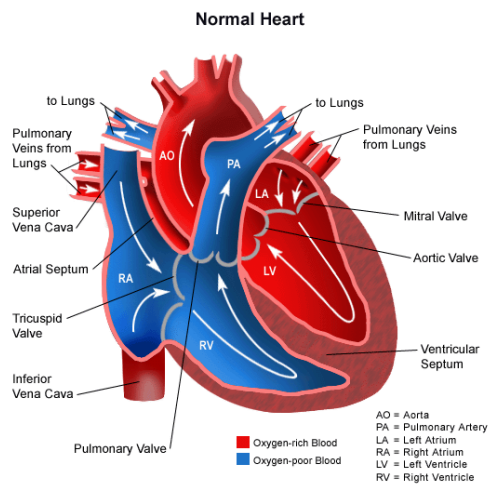
Feature	Inspiration	Expiration
Intercostal Muscles	External muscles contract	Internal muscles contract
Ribcage	Moves upward	Moves downward
Diaphragm muscles	Contract	Relax

Diaphragm	Moves down	Moves up
Thorax volume	Increases	Decreases
Air pressure in thorax cavity	Lower than outside	Higher than outside
Air rushes	Into the lungs	Out the lungs

Circulatory system:



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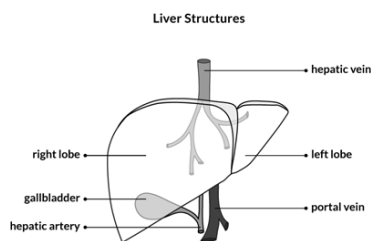


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- Aorta carries oxygenated blood from the heart to the body parts through arteries
- Vena Cava carries deoxygenated blood from body parts to heart through veins
- Pulmonary arteries carry deoxygenated blood from the heart to the lungs
- Pulmonary veins carry oxygenated blood from the lungs to the heart
- Right side → Deoxygenated blood
- Left side → Oxygenated blood
- DOUBLE CIRCULATION
- Pulmonary circulation = to and from lungs
- Systematic circulation = to and from all the other organs
- Right side pumps deoxygenated blood to the lungs via pulmonary artery
- Oxygenated blood returns to the left side via the pulmonary vein

- Left side pumps oxygenated blood to all the organs via the aorta
- Deoxygenated blood returns to the right side via the Vena Cava
- Coronary heart diseases: Plaque builds up in coronary arteries
Coronary arteries = that supply the heart muscles with blood
- Atherosclerosis = Plaque builds up in arteries and leads to the narrowing of arteries making it hard for blood to pass.
Plaque is made up of fats and lipids
- Heart attack = blood flow to a part of the heart is blocked by a clot
- Cardiac arrest = Sudden cessation of the functioning of the heart
- Arrhythmia = Abnormal heart rhythm

Liver:



- The liver has over 500 functions
- Receives $\frac{1}{4}$ of the blood supply from the heart.
- Contains hepatic veins and arteries
- Portal vein carries blood from the gastrointestinal tract, gallbladder and pancreas to the liver
- DETOXIFICATION
Amino Acids \rightarrow Ammonia \rightarrow Urea = Deamination



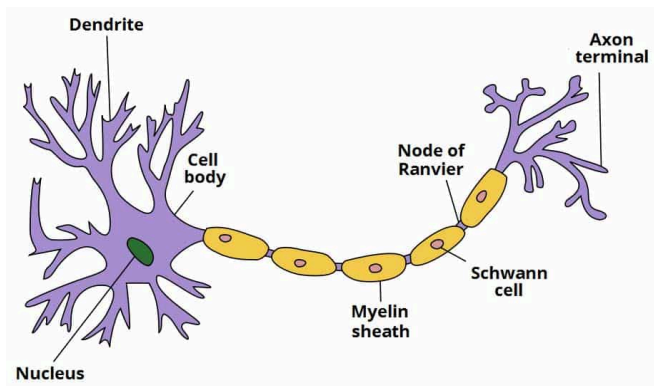
Kidneys:

- Helps in filtering blood
- As blood passes through, it removes most urea and excess H_2O and salts + glucose but not protein
- As the liquid moves through the kidneys, some parts are reabsorbed (selective reabsorption)
- The final liquid (urine), is a solution of urea, salts and water

Nervous System:

- Central (CNS) = Brain, Spinal Cord
- Peripheral = cranial nerves, spinal nerves
- Stimulus = what is being detected by the receptor
- Receptor = detects stimulus

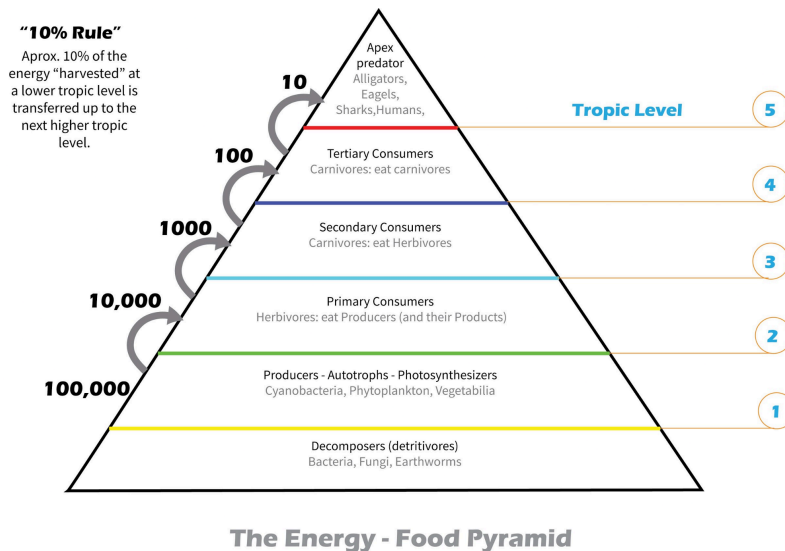
- Effector = what produces the response



- Dendrite = receives signals
- Cell body = organelles, produces protein
- Axon = main conducting unit
- Myelin sheath = insulating layer
- Node of Ranvier = Gap in myelin sheath
- Axon terminal = forms junctions with other cells
- HOMEOSTASIS = refer notes PAGE 64

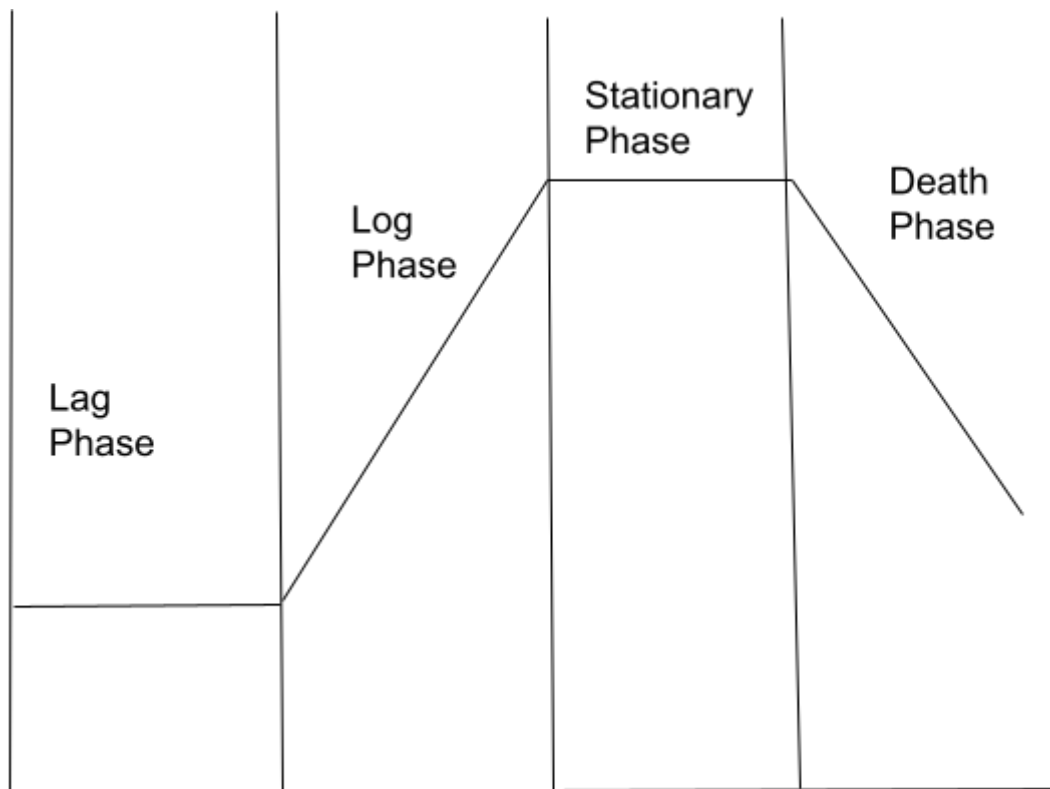
Ecosystems:

- A setting where interactions between biotic and abiotic organisms take place
- The sun is the principle source of energy input to biological systems



- REASONS WHY ENERGY IS LOST
- Respiration
- Movement
- Warm Blood
- Faeces and Urine
- Some material being eaten is not used or digested

- POPULATION GROWTH



- Lag = new population takes time to settle and mature before reproduction
Doubling of small numbers doesn't have a huge impact on the population
Hence, slow increase
- Log = no limiting factors
Rapid population growth due to increased reproduction rates
Steady doubling and increased population
- Stationary = limiting factors (ie. shortage of food etc.) cause reproduction to slow down and lead to more deaths
Hence, DR = BR
- Death = Food runs out
More death than those born
Number and population drops

Nitrogen Cycle:

- N₂ Fixation = Lightning breaks the bond between N-N and bonds as N-O, then it rains and falls into the soil. The plants absorb it through the soil. The bonds dissolve in rain, forming nitrates & getting carried to the Earth
- Biological Fixation = Bacteria have the nitrogenase enzyme that combines gaseous nitrogen with hydrogen to produce ammonia, which is converted by the bacteria into other organic compounds.
- Nitrification = A process by which ammonia is nitrified by bacteria. Converts to nitrites and then nitrates

- Denitrification = Reduction of nitrates to gaseous nitrogen. This occurs most rapidly in warm, wet soils with an abundance of nitrate(s) back into the largest inert nitrogen gas completing the nitrogen cycle

Body defence against diseases:

- Skin: The dead outer layer of the skin, known as the epidermis forms a shield against invaders and secretes chemicals such as sweat.
- Hair in nose: Defence against airborne invaders. Tiny hairs called cilia in the nose move around and trap particles in mucus coated hairs
- Mucus and cilia: Foreign particles stick to mucus and cilia waft these into the throat for swallowing and coughing.
- Stomach acid: Bacterias are broken down by stomach acid
- White blood cells: these cells attack when invaders get into the bloodstream. They normally circulate in the blood, but enter tissues in case invaders are detected. Phagocytes ingest the particles and break them down by lysosomes
- ANTIBODY PRODUCTION
- Exposure to antigen activates lymphocyte
- Antibody is produced
- The antibody binds to the specific antigen
- Active lymphocyte divides by mitosis to produce a clone of many identical cells
- The clone cell that does not secrete antibodies is called memory cells
- Memory cell = identifies antigen and produces antibodies based on them

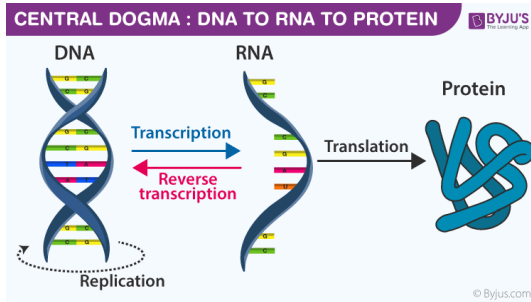
Vaccinations:

- Prepare an immune system in advance for viral or bacterial infections
- Contain antigens that trigger memory cells but do not cause the disease
- Usually administered through an injection but can be through oral or nasal
- Contain a live attenuated (weakened) or killed version of the pathogen or its toxins
- Help stimulate a primary immune response

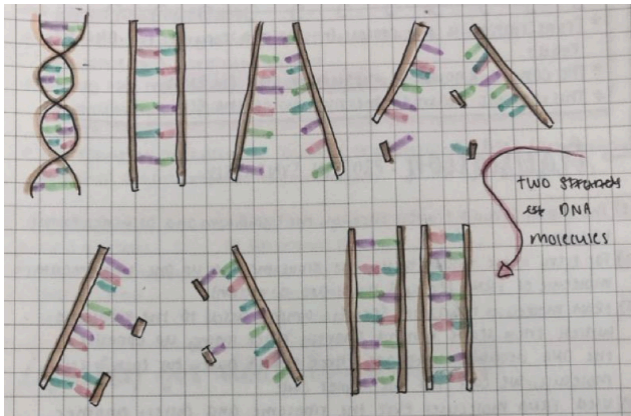
DNA and RNA:

- Chromosomes and their genes are made from molecules called DNA
- Each chromosome is a very long molecule of tightly coiled DNA
- The DNA molecule looks like a twisted ladder called a double helix
- It is composed for 4 different nucleotides, and the specific sequence in which these occurs forms the basis of new genetic information coded
- DNA controls cell functions
- A nucleotide is made up of three parts: a phosphate group, a 5-carbon sugar and a nitrogenous base
- 4 nitrogenous bases (A C T G)
- RNA is a polynucleotide
- Similar to DNA, one of its functions is protein synthesis

- RNA is single stranded
- It contains the nitrogenous base uracil instead of thymine
- Its nucleotides contain ribose sugar

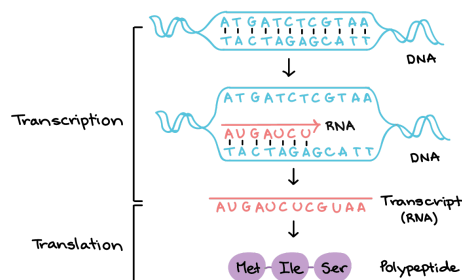


- DNA REPLICATION



- An enzyme called Helicase unwinds the double stranded DNA and H bonds break
- DNA polymerase brings in nucleotides complementary to the 2 strands
- Ligase seals all the nucleotides into double helices
- Two new DNA molecules are formed

- TRANSCRIPTION

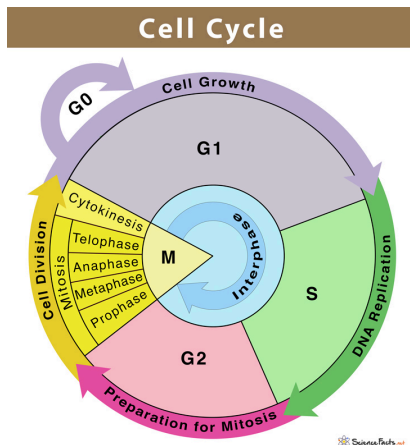


- RNA Polymerase binds to the DNA strand and the DNA unwinds
- RNA Polymerase synthesises a complementary RNA strand using one of the strands as a template
- RNA Polymerase moves along the strand until it gets a termination signal
- It detaches from the template
- Newly synthesised RNA strand (mRNA) is released
- TRANSLATION
- The mRNA binds to the ribosome in the cytoplasm
- The initiator tRNA carrying methionine binds to the start codon

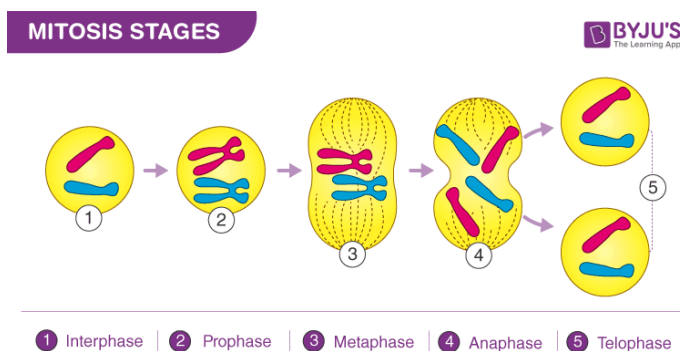
- A second tRNA carrying amino acids specified to the next codon binds
 - Peptide bonds form between the amino acids carried by the 2 tRNA
 - A new tRNA binds & the process continues
 - The ribosome then encounters a stop codon
 - The newly synthesised protein is released
- BIOTECHNOLOGY READ NOTES PAGE 18

Cell Division:

- Mitosis = occurs in somatic cells (all body cells)
- The daughter cells are exactly duplicated from the parent cells
- Both daughter and parent cells have 46 chromosomes
- Meiosis = occurs in sex cells (sperm and egg cells)
- The daughter cells have half the chromosomes of parent cells
- If the parent has 46, the daughters will have 23 each
- CELL CYCLE



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- MITOSIS

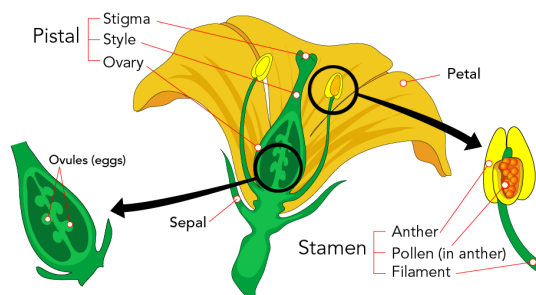


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- Interphase =
Cell prepares to divide
Genetic material doubles
- Prophase =
Chromosomes pair up and become visible
Nuclear membrane disappears

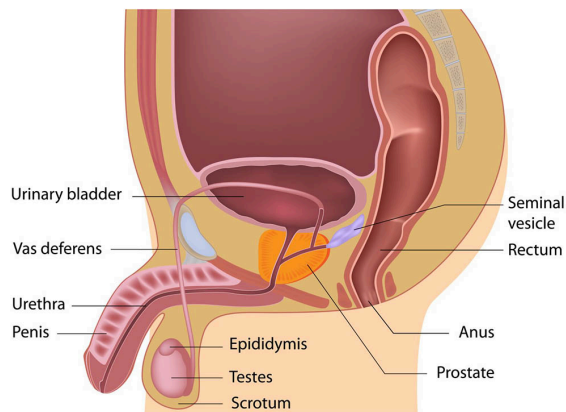
- Centrioles divide and move to opposite poles
- Spindle forms
- Metaphase=
 - Chromosomes line up along the middle of the cell
 - Spindle fibres attach to each chromatid of each chromosome
- Anaphase =
 - Centromeres split and chromosomes get pulled apart
 - Spindle fibres contract, pulling sister chromatids to opposite ends of the cell
- Telophase =
 - Chromosomes uncoil and spindle disintegrates
 - Nuclear membrane reforms
 - Chromosomes become less visible
 - Cytokinesis begins
- Homologous chromosomes = chromosomes with same sizes, same gene location and same centromere position

Reproduction:

- Sexual = the fusion of two haploid gametes resulting in a zygote
- Zygote can then divide by mitosis to form a developing embryo
- Plants = anther and filament, called the stamen form male reproductive system
- Ovule, ovary, style & stigma called carpel forms the female reproductive system
- Pollen = Male Gamete
- The stigma is very sticky

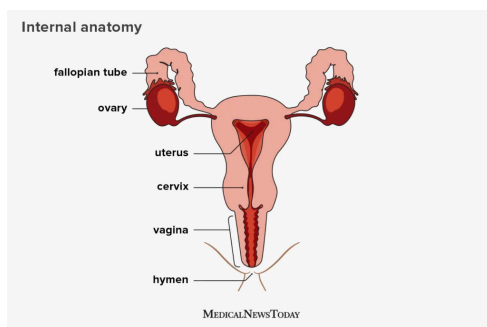


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- Pollination = transfer of pollen to the stigma
- FERTILISATION =
 - Pollen grains land on stigma - sugar solution on stigma provides nutrition for pollen
 - Each pollen grain grows a pollen tube with 2 nuclei
 - One responsible for the growth of the tube
 - One male nucleus
 - Strongest pollen grain creates a tube that reaches the ovary, releases the nucleus and fuses with the egg.
 - Ovary then becomes a fruit
- HUMAN REPRODUCTION
- MALE REPRODUCTIVE SYSTEM



- Testes =
 - Sexual organ that produces sperms
 - Releases male sex hormones, androgen and testosterone
 - They cause physical and physiological changes in males
- Scrotum =
 - A sac which covers the testes and holds them from the outside (protects)
- Epididymis =
 - Stores sperm until ejaculation
- Seminal Vesicle =
 - Secretes fluid into the sperm duct
 - The fluid provides nutrients to the sperms and makes it easier for them to move. It also prevents the sperms from sticking to each other
- Prostate gland =
 - Secretes fluid into the semen
 - The fluid activates the sperms
- Sperm ducts (vas deferens)=
 - Carry sperms from testes to the urethra
- Urethra =
 - A tube which carries urine from the urinary bladder
 - Also carries sperms from the sperm duct to outside body
 - Semen and urine pass through urethra at different times
- Penis =
 - Organ from which semen (mixture of sperm and fluid) leaves the body and is deposited into the female reproductive system

- FEMALE REPRODUCTIVE SYSTEM



- Ovaries =
 - Female sex organ
 - Produces female gamete, ova (single ovum)
 - Produces female sex hormone, oestrogen
- Oviducts (fallopian tube) =
 - Site of fertilisation
 - Carry egg (ovum) or fertilised ovum (zygote) to the uterus
- Uterus =
 - Site of development of the embryo
 - Made up of muscle tissues
 - Protects and nourishes the embryo
- Cervix =
 - Neck of the uterus, producing mucus which prevents entry of bacteria into the uterus
- Vagina =
 - Receives penis during copulation (sex)
 - Sperms are deposited into the vagina during ejaculation

Homeostasis:

- Maintenance of constant temperature in body
- TEMPERATURE
 - High body temperature: sweat and vasodilation
 - Sweat glands release more sweat. It evaporates, removing heat energy from the body.
 - Skin arterioles increase in diameter so that more blood flows to the skin and this heat is lost to the external environment
 - Low body temperature: shivering and vasoconstriction
 - Skeletal muscles do many rapid contractions to generate heat
 - Skin arterioles decrease in diameter so that less blood flows to the skin and less heat is lost to the external environment
- BLOOD SUGAR/GLUCOSE LEVELS
 - When there is high blood glucose = insulin production
 - Insulin is produced from pancreatic β cells
 - This stimulates the liver
 - Which then converts glucose to glycogen
 - When there is low blood glucose = glucagon production
 - Glucagon is produced from pancreatic α cells
 - This helps in stimulating the liver
 - Which then converts glycogen to glucose

Menstruation:

- Hormones involved and where they are produced
-

Name of hormone	Produced by
FSH (follicle stimulating hormone)	Pituitary gland
Progesterone	Corpus Luteum
Oestrogen	Follicle (ovary)
Luteinizing hormone (LH)	Pituitary gland

- FUNCTIONS:
- FSH (FOLLICLE STIMULATING HORMONE)
 - Follicle = cell-like structure that has an egg in it
 - Helps in the development and growth of the follicle
 - Helps in stimulating production of oestrogen
- OESTROGEN
 - Produced from the ovaries
 - Rises at the end of the follicular phase
 - Repairs and thickens endometrium
 - When it reaches high levels in blood, it inhibits production of FSH
 - Inhibits so that too many follicles are not developed
 - Stimulates production of Luteinizing hormone (LH)
- LUTEINIZING HORMONE (LH)
 - Produced from pituitary gland
 - Peaks at the end of the follicular phase
 - Helps in ovulation (release of egg from follicle)
 - Helps in development of Corpus Luteum
 - Corpus luteum = a follicle after release of egg
 - Corpus luteum starts to secrete more oestrogen and more progesterone
- PROGESTERONE
 - Secreted from the ovary
 - Rises at the start of the luteal phase
 - Promotes thickening and maintenance of the endometrium
 - Stimulates pituitary gland to stop production of FSH and LH
- Corpus Luteum only stays for a few days, which leads to it degenerating. This stops production of progesterone, LH etc. This leads to the endometrium breaking, thus causing bleeding and MENSTRUATION

Contraception:

- NATURAL METHODS
 - Withdrawal of penis (not very reliable)
 - No sexual intercourse (most reliable)

- Intercourse avoided during intercourse (cannot be predicted)
- CHEMICAL METHODS
 - Contraception pill = contains progesterone and oestrogen which prevents ovulation
 - Spermicidal (killing sperm in vagina) = should only be used with condom / diaphragm
- MECHANICAL METHODS
 - Condom = prevents STDs
 - Femidom = Plastic sheath placed in vagina (also prevents STDs)
 - Diaphragm = Dome-shaped rubber barrier in cervix
 - IUD
- SURGICAL METHODS
 - Vasectomy = Sperm ducts tied or cut
 - Laparotomy/Tubectomy = oviducts tied or cut

Eutrophication:

- The process when excess nutrients leach into water bodies, frequently due to runoff causing the bountiful growth of plant life within the water body. This could lead to the growth of algal blooms causing the blockage of sunlight and making it hard for sunlight to penetrate leading to the death of fish life.
- Excessive growth of plankton decreases O₂ levels causing death of fish etc.
- Lack of sunlight causes the death of plants
- CAUSES =
 - Excessive nutrient runoff from agriculture and urban areas containing high levels of nitrogen and phosphorus
 - Discharge of untreated sewage and industrial effluents into water bodies
 - Deforestation, leading to increased soil erosion and nutrient runoff
- PROCESS =
 - Nutrient enrichment = agricultural land owners and other plants use excess nutrients to enrich their products
 - Nutrient runoff = These excess nutrients make their way into water bodies through sewage
 - Rapid growth of plants = Water distributes nutrients and plankton and algae absorb these nutrients
 - O₂ concentration depletion = due to algal bloom, the O₂ concentration in the water gets depleted, by respiration of plankton
 - Toxic gases = excess CO₂

Magnification:

- Magnification = image size / actual size
- Magnification = the number of times larger an image appears, compared to its real/actual size

- Image size can be measured using a ruler and should then be converted to the unit of micrometre
 - 1 centimetre = 10,000 micrometres
 - 1 millimetre = 1000 micrometres
 - 1 nanometre = 0.001 micrometres

Classification of organisms:

- Taxonomy = the process of grouping an organism
- Nomenclature = Naming of organism
 - Written as *Genus,Species*
- GROUPS
 - Kingdom = Plants, animals, bacteria, fungi, protista
 - Phylum
 - Class
 - Order
 - Family
 - Genus
 - Species
- DOMAINS
 - Prokaryotes
 - Eukaryotes
 - Archaea

Invertebrates:

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Porifera (sponges)	<ul style="list-style-type: none"> - No body openings - No muscles, nerves or organs - Live in water
Cnidaria (Stinging cells)	<ul style="list-style-type: none"> - Tentacles with stinging cells - One body opening - Live in water
Annelida (worms)	<ul style="list-style-type: none"> - Have body openings - Simple nervous system
Platyhelminthes	<ul style="list-style-type: none"> - Soft coverings/without cilia - Dorsoventrally flattened body without segments
Mollusca (soft-bodied)	<ul style="list-style-type: none"> - Soft bodied with internal or external shells - Have a foot or tentacles - Most have shells

Echinodermata (spiny skinned)	<ul style="list-style-type: none"> - Bodies in 5 parts - Covered in spikes or external skeletons - External skeletons made out of lime
Arthropods (jointed legs)	<ul style="list-style-type: none"> - Jointed legs - More than one body section - Exoskeleton

Vertebrates:

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Fish	<ul style="list-style-type: none"> - Cold blooded - Gills - Lay eggs or live birth in water - Scales and fins
Amphibians	<ul style="list-style-type: none"> - Cold blooded - Thin moist skin - Gills and lungs - Lay jelly-like eggs in water
Reptiles	<ul style="list-style-type: none"> - Cold blooded - Lungs - Scales - Lay leathery eggs / live birth on land
Birds	<ul style="list-style-type: none"> - Warm blooded - Feathers - Lungs - Lay hard eggs on land
Mammals	<ul style="list-style-type: none"> - Warm blooded - Lungs - Hair - Live birth and feed young with milk

Biotechnology:

- GENETIC MODIFICATION:
 - Manipulation of genes for a particular purpose
 - Involves the transfer of specific traits, or genes from one organism to into a plant or animal of a different species
 - The resulting organism is called a GMO
- Cloning

- A process by which a similar population is produced with genetically identical individuals
- Genome Mapping
 - Process of locating and identifying genes to create a genetic map
 - Graphical representation of the order of genes
- 3-D Bio Printing
 - Three-dimensional printing of biological tissue and organs through the layering of living cells
- EVOLUTION
- Natural Selection
 - The process by which plants and animals that can adapt to changes in the environment can survive and reproduce. While those who cannot adapt do not survive.
- ARTIFICIAL SELECTION
 - Humans among plants and animals for economic benefits
 - Selective breeding is used to produce desirable traits among species
 - Faster than natural selection