

## Characteristics and classification of living organisms

7 characteristics:

Movement

Respiration

Sensitivity

Growth

Reproduction

Excretion

Nutrition

Five major kingdoms:

Eukaryotes

Animals

Plants

Fungi

Protists

Prokaryotes - bacteria

Binomial naming system

- Largest grouping = Kingdom
- Smallest = species - look alike - breed together
- Phyla / phylum

Genus - Trivial

Binomial system:

- Organisms given scientific names using binomial system.

Plant Kingdom - multicellular, cellulose cell wall

Animal Kingdom - multicellular

Prokaryote Kingdom - plasmids, Flagella, no nucleus

↓  
Bacteria

Protists - Diverse group of organisms cus they don't belong in other four kingdoms.

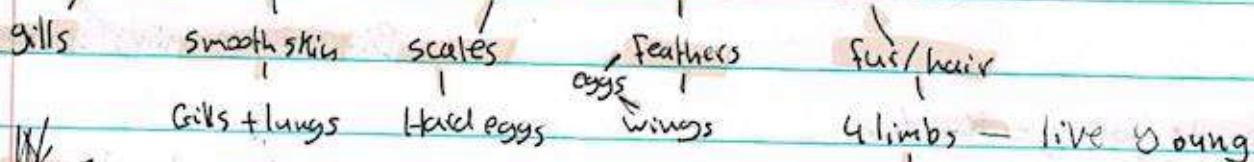
Fungi Kingdom - most are multicellular, chitin cell wall, mycelium - hyphae, Saprotrophs

Viruses - not cells, DNA-RNA.

## Vertebrates:

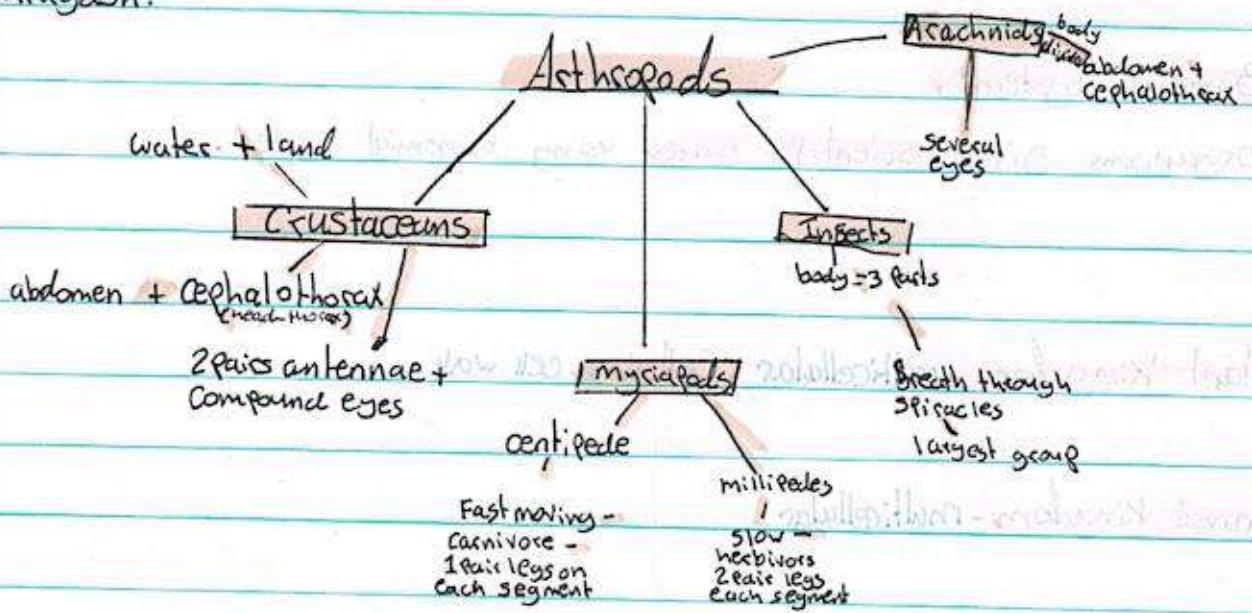
- Have a vertebral column / backbone - internal skeleton bone or cartilage. Phylum chordata

• Fish - Amphibians - Reptiles - Birds - Mammals



## Invertebrates:

- do not have a vertebral column / backbone. Exoskeleton. largest group in Animal Kingdom:

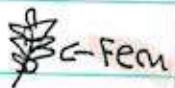


## - Ferns and Flowering Plants:

- multicellular - live on land
- Have transport systems consisting of tiny tubes - xylem vessels - which carry water and mineral salts, and phloem tubes (which transport dissolved substances (sugars)).

### Ferns:

- Have waxy layer - cuticle - to reduce water loss.
- Rhizome - thick underground stem
- Do not produce seeds. They have spores which is carried by the wind to form new plants.



### Flowering plants:

- produce seeds in ovary.

Shoot - part of plant above ground, stem, leaves, buds, flowers.  
+ Apical bud.

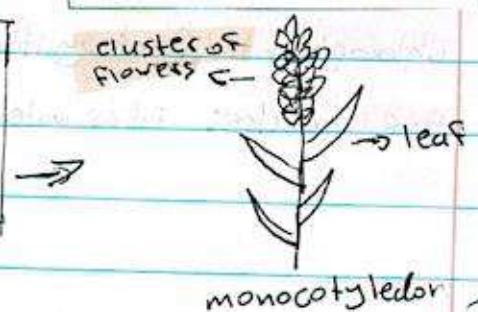
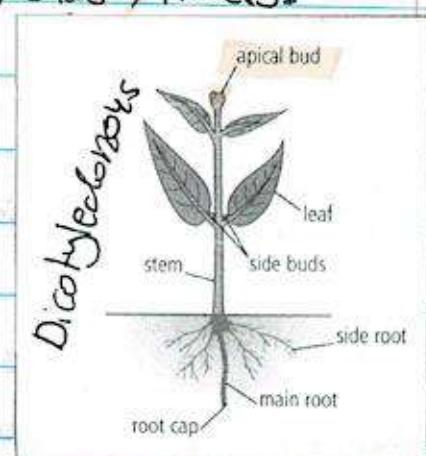
### Roots.

#### Main groups of flowering plants:

##### - Dicotyledons + monocotyledons

Broad leaves with a network of branching veins. Stamens in multiples of 4 or 5. Have 2 cotyledons in each seed.

leaves have parallel veins and can be long and narrow. Parts are in multiples of 3. In one cotyledon.

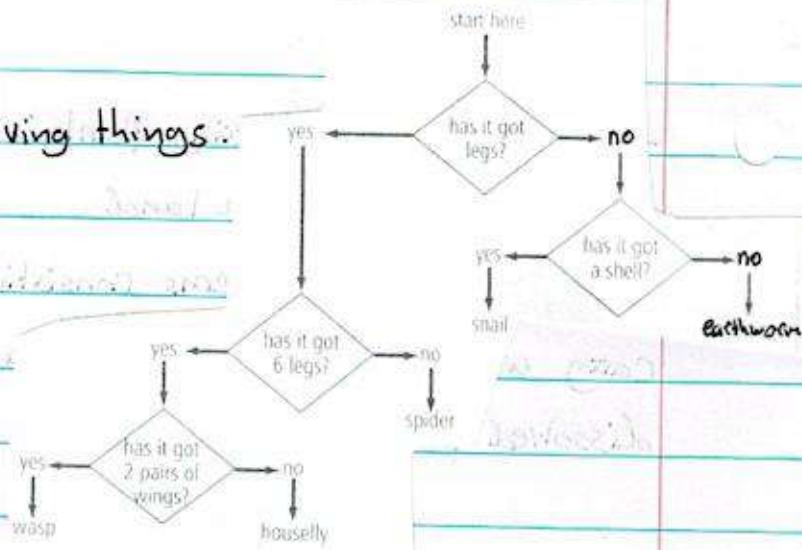


monocotyledon

## Dichotomous Keys - identify living things.

the best method to identify living things

forward thinking method



## Cells

### Animal cell:

- Cell membrane
- no fixed shape
- Small vacuoles - no cell sap
- nucleus
- cytoplasm

### plant cell:

- cell wall
- cell membrane
- Fixed shape defending
- chloroplasts
- vacuole - large - cell sap
- nucleus
- cytoplasm

**Cell membrane:** Barrier, allows stuff to enter or leave, Partially permeable.

**Cell wall:** Gives shape, freely / Fully permeable.

**Nucleus:** Controls development + all activities in cell.

**Cytoplasm:** Chemical reactions take place.

**Chloroplast:** Photosynthesis, stores Starch.

**Sap Vacuole:** Full of water maintain shape + firmness, stores salt + sugars.

## Organelles:

### Rough endoplasmic reticulum -

- double membranes
- Fluid-filled space between membranes.
- Ribosomes present on outer surface.
- Package + transport proteins made by ribosomes.
- Transported in small vesicles.

### Ribosomes -

- about 20nm
- in prokaryotic cells they aren't attached to rough ER
- Synthesise proteins

### Mitochondria - Power plant

- Found in all eukaryotic cells
- about 1 μm wide and 5 μm long
- double membrane / outer = control of entry + exit / inner = chemical reactions



Size of cell %

$$\text{actual size} = \frac{\text{image size}}{\text{magnification}}$$

$$\text{magnification} = \frac{\text{image size}}{\text{actual size}}$$

## Specialised Cells:

- Cells that are specialised to carry out specific functions

### - Ciliated Cells:

- x in the air passages in the lungs - trachea + bronchi. They have small hair like structures called Cilia.

- x Cilia moves back and forth to move the mucus that traps dust from the throat and nose.



### - Root hair cells:

- x absorb water and ions from the soil.



### - Xylem vessels:

- x cylinders + empty. Arranged in columns.

- x cell walls are thick with spirals of cellulose and waterproof lignin.

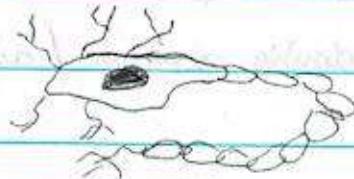
- x Allows the water and ions to move from the roots up the plant.



### - Nerve cells:

- x Have thin extensions of cytoplasm like wires

- x Carry information/impulses throughout the body. communication.



### - Red blood cells:

- x Contain the protein haemoglobin which carries oxygen.



### Palisade mesophyll cells:

- x lots of chloroplasts. photosynthesis.



### - Sperm cell:

X has a tail + adapted for swimming



X Carries genetic information from the male.

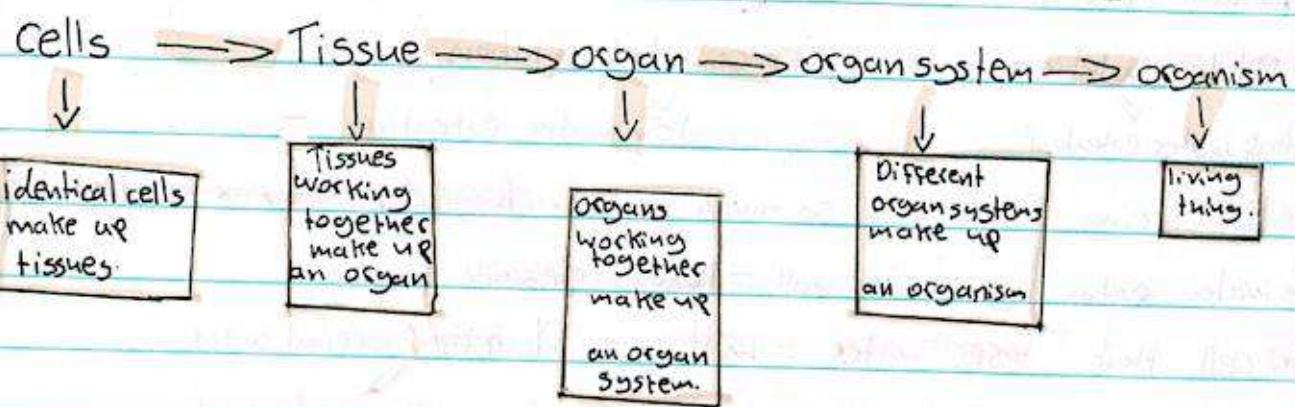
### - Egg cell:

X contain yolk as a store of energy



X Genetic information from the female is found.

## Organisation:



### Plant tissues / organisation:

X Tissue that carries out photosynthesis in the leaves is called mesophyll.

X Palisade cell makes up palisade mesophyll tissue.

X leaf, roots and stems are organs.

Cells → Tissue → organ → organism

## Movement in & out of cells

- Diffusion = high concentrated area to low concentrated ✓ concentration gradient
- Passive movement: no energy needed - movement of molecules across cell membrane
- Diffusion faster in air - plant/leaves - than water - animal -
- Osmosis: water molecules - occurs when two solutions separated by a partially permeable membrane
- Dilute solution into a concentrated solution ✓ High water potential      ↓ Low water potential
- Cell being filled with so much water not bursting because of cell wall = turgid.
- Water pushes against cell wall = turgor pressure
- Cell that lose water = wilt - Flaccid → (plant cells)
- Animal cell = similar to plant cell  
Red Blood cells      ↓ plasmolyzed  
Cell weak, limp
- Active transport: need energy from respiration - opposite of concentration gradient (against).
- Carrier proteins
- Any factors that effects rate of respiration will also affect the rate of active transport.

# Biological molecules

- Biological molecules are complex chemicals. - Carbohydrates, proteins, fats - Needed for metabolism = all the chemical reactions in the cells of the body.
- Plants make complex chemical compounds from raw materials e.g.  $\text{CO}_2 + \text{water}$  for photosynthesis where simple sugars are produced.
- Animals Biological molecules are in their diet.

## \* Carbohydrates:

- Made up of Carbon - hydrogen - oxygen
- Glucose: Simple sugar - Six carbon atoms in ring.
- Sucrose: Complex Sugar - Double sugar made of 2 simple sugars.
- Plants store starch as an energy store. Animals store Glycogen as an energy store. Starch + glycogen are insoluble and aren't sweet.
- Cellulose: made up of thousands of glucose units - molecules linked together to form fibres.

## \* Proteins:

- made up of = Carbon - hydrogen - oxygen - nitrogen - sometimes sulfur.
- long chains made up of amino acids: Diff shapes - about 20 diff types - Sequence on the chain determines type of protein - joined by peptide bond.

## \* Fats:

- made up of = Carbon - hydrogen - oxygen.
- Each molecule made up of one glycerol and attached to three fatty acids.

- Diff types of Fatty acids form diff types of fats.
- Energy store - thermal insulation in body.
- Dissolves in ethanol not water.

### ~~Chemical tests for the bio-molecules:~~

- Carry tests on pure forms of compounds first.

### Test for starch -

- 2-3 drops iodine solution (Colour = yellow or light brown).
- Positive result = iodine solution turns blue-black.

### Test for reducing sugars -

- Same volume Benedict's solution (bright blue)
- Positive result = (Green (only little sugar is present)) - Deep orange (lot of sugar present).
- You can see precipitate if left to cool.

### Test for protein -

- 5-6 drops of Biuret solution (Blue - contains copper sulfate, sodium hydroxide).
- Positive result = Turns purple, lilac, violet.

### Test for fats -

- Add enough ethanol
- Positive result = A white emulsion - cloudy white- or milky colour will appear.

### Test for vitamin C -

- Add DCPIP solution (blue) one drop at a time
- Positive result = DCPIP blue colour disappears

## \* DNA:

- Chromosome is made up of thousands of genes arranged like beads in a necklace. Genes = genetic information.
- Unravel a chromosome = long thread made up of DNA - Deoxyribonucleic Acid -
- Gene = made up of short length of DNA.
- DNA belongs to a bio group called nucleic acids. Each DNA molecule is made up of thousands of units called nucleotide

made up of 3 molecules  
join together and form backbone of DNA strand.  
• Phosphate      • base  
and Sugar              Attached

- DNA is made up of 2 strands of nucleotides forming a ladder like shape. Twisted into a double helix.

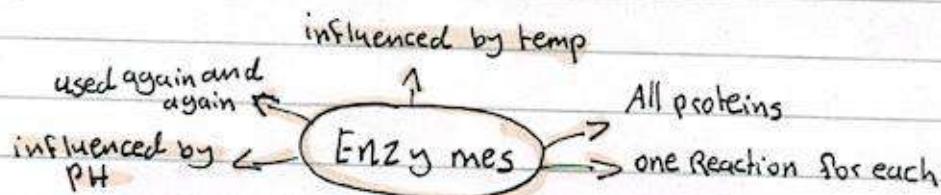
- Each pair of bases is held together by weak bonds, but there are many of them. The four diff bases in DNA:

× Adenine with Thymine =  $A \leftrightarrow T$

× Cytosine with Guanine =  $C \leftrightarrow G$

## Enzymes

- Enzymes - bio catalysts - are proteins that speed up metabolism / chemical reactions.
- Each enzyme has a specific reaction because of its shape.
- Reactions that enzymes catalyse can be divided into 3:
  - × Breaking large molecules into small ones - important in nutrition
  - × Building up large molecules from small ones.
  - × Converting one small molecule into another.



- o Each type of enzyme molecule has a shape that makes it suitable for one type of reaction.
- o Enzymes catalyse reactions where substrates are converted into products.
- o The substrate and enzyme have shapes that are complementary.
- o Reaction takes place in the active site. The way enzymes work is known as the 'lock and key' model. Substrate + enzyme = enzyme-substrate complex.

### \* Factors affecting enzyme action - temp - $^{\circ}\text{C}$

- o Reaction is slow at low temperatures.
- o increases speed until it reaches maximum temp - optimum temperature - best temp for enzyme.

X Fungal + plant enzymes =  $20^{\circ}\text{C}$

X Human enzymes =  $37^{\circ}\text{C}$

o increase in temp = increase in kinetic energy.

o Temperature higher than needed = enzyme molecule breaks down changing its shape - denatured.

### \* Enzymes + pH

- o Rate of enzyme-controlled reaction can be affected by pH in surroundings.
- o Most enzymes work best inside cells where pH is neutral. Some in acidic.
- o optimum pH = best pH for enzyme.
- o Depending on the pH lvl it can denature the enzyme making it unstable too.

- Control experiment**
- used to compare results
  - same experiment
  - Diff control variable

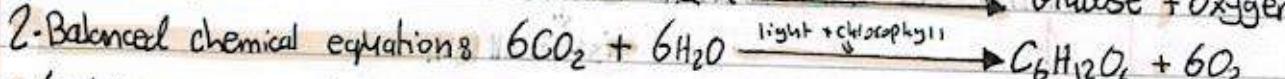
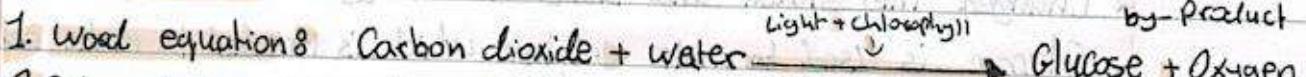
# plant biology in biology

many diff reactions

## plant nutrition

- Photosynthesis provides energy for plants and those who eat plants.  
o Takes place in leaf

o Chloroplasts = Contains chlorophyll which traps/absorbs light energy  
→ o Convert carbon dioxide and water into simple sugars using light energy  
o 2 equations:



o Light energy is absorbed by chlorophyll which gets transferred as chemical energy to drive the reactions that form carbohydrates from  $\text{CO}_2$  and water. During this energy is used to split up water into hydrogen ions and oxygen. The hydrogen is used to reduce  $\text{CO}_2$  to carbohydrate and the light energy becomes a chemical bond in the simple sugars. Glucose can get produced then converted to starch as a store of energy.

- Photo synthesis needs:

• light

• chlorophyll

•  $\text{CO}_2$

• water -

o Used to test for starch

o De-starching = leaving plant in dark - 48 hours - to make sure there's no starch

o Variegated plant = part of leaf is white because there is no chlorophyll there.

Used to test for chlorophyll

o Soda lime absorbs  $\text{CO}_2$

o Covering part of leaf from light → used to test light.

Raw materials

Difficult to show if needed

Used to test

for  $\text{CO}_2$

## Products of photosynthesis

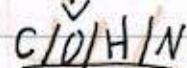
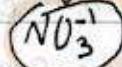
- Oxygen

- Simple sugars = Glucose

Made in leaves

- × Glucose is used for respiration in leaf
- × Converted into starch and stored for energy or use in future
- × Glucose is used to make cellulose which is needed to make cell walls
  - ↓  
is the cell wall
- × Converted to sucrose and transported to other parts in the phloem

- o Plants get nitrogen → absorbing nitrate ions from soil
- o Glucose + nitrate = form amino acids which build up into proteins.



- o protein is needed for growth, cell repair, making enzymes and hormones in plants
  - ↓  
body's chemical messengers.
- × Sugars converted to oils → efficient way to store energy (in seeds).

- A lot of what we eat comes from plants or the meat we eat comes from animals that eat plants. Some products are made from plants.

- Oxygen is a by-product - not main product, more than needed is produced so diffuses into atmosphere.

- Plants provide raw materials for industries  
Timber / cotton / medicine in plants = digitalis - heart drug, anti-cancer drugs

Madagascar, rose periwinkle.

← makes our food +  
can survive in any/most  
conditions

- Plants = Dominant organisms - Provide habitats - microorganisms -
- Concentration of gas in atmosphere are kept constant by photosynthesis.
- without green plants  $\text{CO}_2$  would increase,  $\text{O}_2$  decreases

Counting bubbles  
Volume produced ↑

### - Rate of photosynthesis:

measuring the products that are produced - How much starch or oxygen is made

Finding out the change in dry mass.

Energy available ←

influences activity of enzyme ↑

Raw material ↑

Environmental conditions - light intensity - temperature - carbon dioxide concentration effects photosynthesis rate.

High = fast  
low = slow

Dark = no photosynthesis

low light = increases by a little

Rate of photosynthesis increases as light increases

Adding sodium hydrogen carbonate to the water ensures that plant won't run out of  $\text{CO}_2$

- Increase = Faster (unless optimum temperature is reached)

Decrease = Slower

### Glass house production:

- light intensity, temperature, carbon dioxide are limiting factors.

→ present in environment in short supply which restricts life processes

→ all need to be present and in right amounts for photosynthesis.

- Growers in glasshouses try to improve the ~~yield~~ yield of their crops by giving them the best possible conditions.

- Allows plants to:
- × Grow earlier
- × Grow in places they wouldn't normally.

### Temperatures

- Glass keeps heat inside
- Ventilator flaps opened on really hot days (to keep cool)
- Electric heaters in cold weather

### Light

- Glass lets in sunlight
- Artificial light used when light intensity is low.

### Blinds

### Carbon dioxide

- Pump CO<sub>2</sub> into glass house
- Burn butane or natural gas

### Water

- Automatic watering system + Humidifiers

- All controlled/monitored by staff/computer

sensors

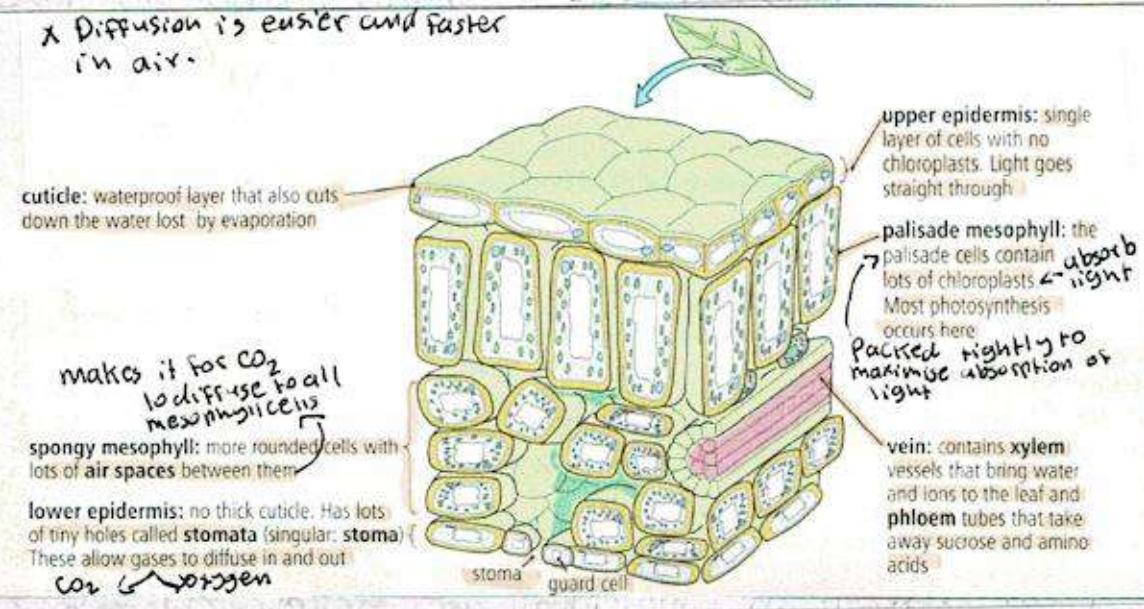
### Leaves

#### Have:

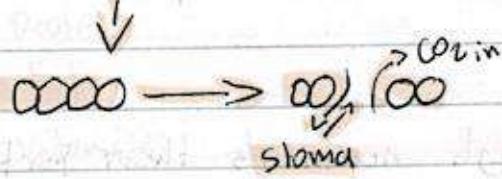
- large surface area to absorb light
- thin shape: gases diffuse in + out easily
- many chloroplasts
- Veins: support leaf surface, carry water + ions to leaf cells, takes glucose +

amino acids away from leaf to other parts.

Diffusion is easier and faster in air.



- Guard cell opens + closes



- magnesium ions needed by cells to make chlorophyll - plants deficient in chlorophyll look yellow. (chlorosis)

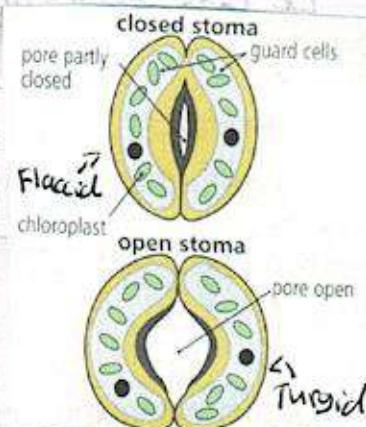
- Stomata:

- small holes in epidermis.

• CO<sub>2</sub> in

• O<sub>2</sub> out

• Water vapour out



- Opening + closing:

• Stomata opened + closed by guard cells.

• Stomata usually ~~open~~ open during day. Water passes in Guard cell by osmosis. Makes them turgid then open.

• Stomata closes at night. Water passes out Guard cell by osmosis. They straighten + more closer closing.

• Closes in hot, dry weather to prevent wilting.

## Mineral requirements

- Plant nutrients needed by plants, absorbed from soil by active transport in roots.

- needed for healthy growth of plant - lacking = no growth + showing deficiency symptoms in plant.

nitrate =  
compound  
ion -  $\text{NO}_3^-$

• plants need nitrate to make amino acids which are used to make proteins which is required for growth. Plants deficient in nitrate show poor growth.

• magnesium ions absorbed then used to make ~~chlorophyll~~ chlorophyll. plant deficient in chlorophyll are yellow. chlorosis

• plants need phosphate for making compounds like DNA and for respiration.  $\text{PO}_4^{3-}$

- Soil doesn't contain enough nutrients then fertiliser is added to replace the missing nutrients.

## Gas exchange in plants

- At night plants exchange these gases (oxygen — carbon dioxide) with their surroundings.

- During the day plants carry out photosynthesis and respiration

- In photosynthesis the oxygen produced is used by the mitochondria for aerobic respiration. The  $\text{CO}_2$  produced by the mitochondria in respiration is used by chloroplasts for photosynthesis.

indicates pH of solution  $\downarrow$  Gas exchange in aquatic is investigated with hydrogen carbonate indicator solution which provides  $\text{CO}_2$  and two pH indicators.

When dissolves in water

= carbonic acid

• If you eat more food than needed  $\rightarrow$  body stores as extra fat

- energy intake = energy you get from food in a day

- energy output: energy body uses in a day

Intake is greater than output may result in sm<sup>1</sup> becoming overweight or obese.

more likely for people with low basal metabolic rate, more fat foods

major causes of obesity:

◦ high intake of fatty foods or foods with added sugar

◦ little exercise

◦ comfort eating!

people with obesity may suffer from problems like heart disease, high blood pressure, diabetes, arthritis.

- Constipation:

indigestion Roughage / Fiber adds bulk to food, important for keeping food moving down alimentary canal.

◦ muscles of gut wall contract to squeeze food along. If food is moving slow = constipation.

Fruit / vegetables help

- Starvation:

◦ people can survive without food if they have water.

◦ During starvation the basal metabolic rate is reduced. Body uses stored fat and breaks down protein <sup>in muscles</sup> for energy which leads muscle wasting

◦ common form of under nutrition worldwide is protein-energy malnutrition (PEM) which is caused by lack of dietary energy and protein.

This PEM can lead to two things/problems

- o children have a greater energy requirement than adults cus they have a higher basal metabolic rate and are still growing.
- o Children need more protein
- o Elderly have a low BMR.
- o Women have a lower energy requirement than men
- o People who do a lot of physical sports require high energy and high protein for muscle development.
- o pregnant women need extra nutrients.

+ o fats provide us with more energy than carbohydrates

    ↓  
    2 types:

o Saturated fats:

    x from animals

    x too much = high concentration of cholesterol (made in liver)

        narrowing of arteries + increase risk of high blood pressure and heart-disease (ability as well)

o Unsaturated fats:

    x monounsaturated

    x polyunsaturated: helps reduce cholesterol concentration

## Source of nutrients:

large food molecules &  
Starch, protein,  
fats.

adults need  
16mg a day.

x Lack of iron can cause anaemia

Reduction in Red blood cells

Tiredness, lack of energy, short breath, pale, heart palpitations.

↗ Digestion & Digestive system = liver, pancreas, gut, alimentary canal.  
Stomach

- o Ingestion - Taking in food or drink into body through mouth
- o Digestion - Breaking down large insoluble molecules into small soluble molecules so they can pass through gut wall into blood
- o Absorption - movement of small food molecules + ions through wall of intestine into blood
- o Assimilation - movement of digestive food molecules into cells becoming part of the cells
- o Egestion - passing out food that hasn't been digested as faeces through anus

Small food molecules are soluble. ↗ When food has been digested, it's absorbed through the small intestine wall into the blood. Large food molecules cannot go through the wall because they're insoluble - won't dissolve.

## 2. Digestion ways:

### 1. Mechanical digestion:

- x Breakdown of large food pieces into small food pieces - chewing - ↗
- x muscular contractions of stomach in small intestines
- x Large globules of fat broken into smaller by emulsification by bile.

### 2. Chemical digestion:

- x Breakdown of large insoluble food molecules to smaller soluble molecules by enzymes - occurs in mouth, stomach, small intestines - ↗ gives large surface area for enzymes to work.
- x The three enzymes in alimentary canal = proteases, carbohydrases, lipases. (Diff enzymes cus diff shapes)

## 1. Kwashiorkor

caused by PEM

x oedema = swelling of abdomen and legs

x Dry hair / Flaky skin

x fat accumulation in liver.

## 2. Marasmus

x low body mass

x thin - SKINNY, little fat or muscle.

x Wizened / old looking face

PEM causes ~~&~~ pancreas Cells and intestine to die, so digestive enzymes are secreted and surface area for absorption of food is reduced.

o Risk of developing infectious diseases due to Starvation.

### - Nutrient needs

x The lack of Vitamin C can cause Scurvy = Bleeding in parts of body mainly Gums.

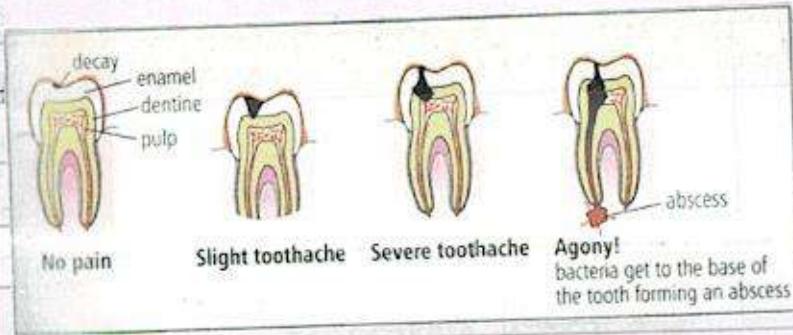
x Vitamin C helps bond cells together and in use of Calcium by bones. Vitamin C is used to form an important protein to make skin, tendons, ligaments, blood vessels, and helps healing wounds and scar tissue formation.

x Vitamin D needed in small intestines to absorb calcium and to regulate deposition of calcium in bone cells.

x Lack of Vitamin D can cause Rickets or in adults osteomalacia = Bones fail to grow properly, Bones are soft.

x Iron is needed for the blood protein haemoglobin (red blood cells).

Combined with iron, needed to carry oxygen around.



- gloss in mouth  
Hence no big teeth



\* Particles of sugary food may be left between teeth, so the bacteria in plaque changes the sugar into acid as they're respiration anaerobically. The acid attacks the tooth/teeth.

## \* mouth, oesophagus, stomach

- Ingestion = Mouth

- Tongue mixes food with saliva then gets collected into ball - bolus.

- Salivary glands make saliva, contains:

- Mucus (lubricates passage)

- Amylase (breakdown of starch → maltose)

- Food goes down oesophagus

has circular + longitudinal muscles in wall

- Movement down occurs by wave of muscular contraction - peristalsis -

- Circular muscles contract - longitudinal relaxes behind to push food along.

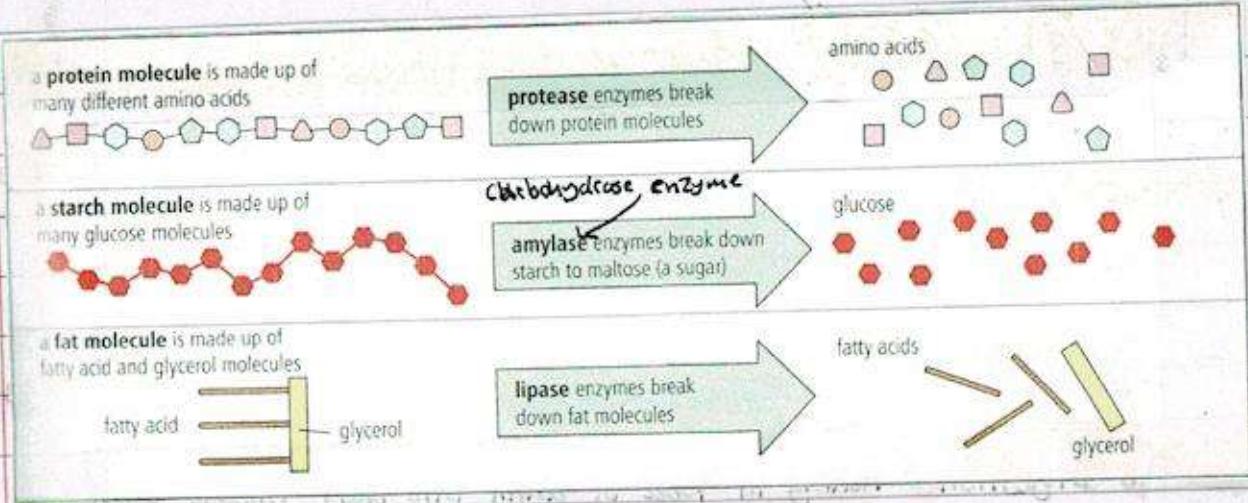
- Circular relaxes - longitudinal contracts in front - widens oesophagus so food can move along

- Muscular bag = stomach (holds about 1 liter but can stretch)

- Walls of stomach make digestive juice known as Gastric juice, contains pepsin (starts digestion of proteins to smaller molecules peptides) , Hydrochloric acid which kills any bacteria in food

- Mixture of food + Gastric juice + hydrochloric acid = Chyme

- Type of action in stomach is mechanical digestion



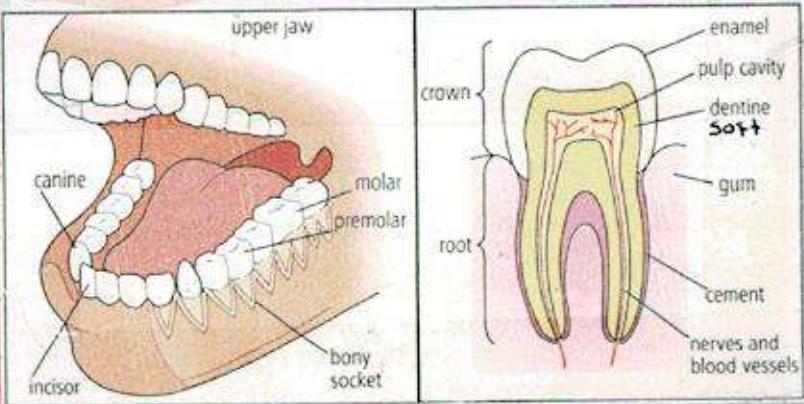
## Teeth

- Carry out mechanical digestion
- Adults = 32 teeth

### Types of teeth

- o incisors - chisel shape for biting + cutting
- o canines - pointer for tearing + Piercing
- o premolars - uneven 'cusps' for grinding + chewing
- o molars - → for chewing
- During life we have 2 sets of teeth
- o milk teeth - 8 molars, small, 6-12 years
- o permanent teeth - last will come at 18 or not at all = buck molars (wisdom teeth)

Replace  
cus milk  
Fall out

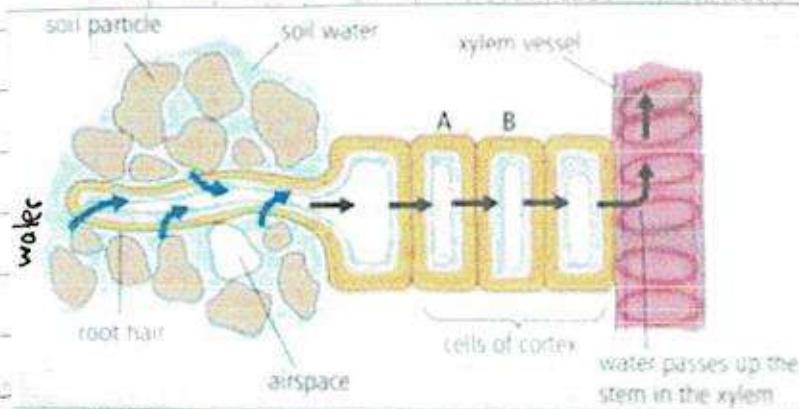


- tooth decay is caused by bacteria in your mouth. It mixes with saliva to form plaque.

L sticks to teeth + gums  
Creamy, white colour

# Transpiration = loss of water

- Roots anchor plant in soil + take up water + mineral ions.
  - ↳ behind root tip are small root hairs.
  - ↳ Water passes in by osmosis
- Soil water = Dilute Solution including mineral ions like nitrate + potassium.



## Root hairs

- Thin permeable cell walls
- large surface area to absorb water
- cell sap more concentrated as has other solutes like sugars
- cell membrane partially permeable

Goes from high water potential in soil to low in root hair cells

and so on...

- Transpiration pulling water is 'pulled' up, like water being sucked up in a straw.

- Transpiration stream: Movement of water up xylem

- Mass flow of water depends on 3

o Cohesion - water molecules attract each other sticking

o Adhesion - water molecules stick to inside of xylem vessel.

- Transpiration loss of water vapour from leaves by evaporation at surface of mesophyll cell, then diffusion through stomata.

↳ takes place during day.

- Wilting - not enough water - flaccid -

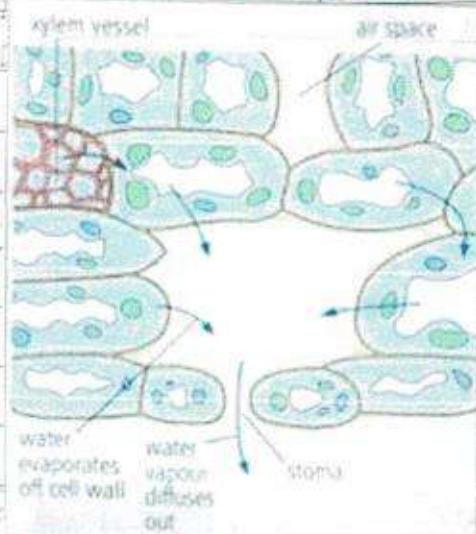
- Light increase = transpiration increase

- high humidity = transpiration is high

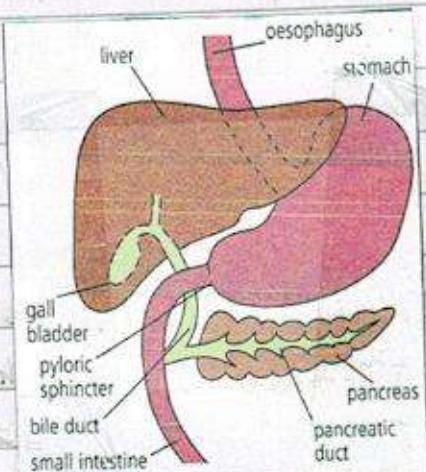
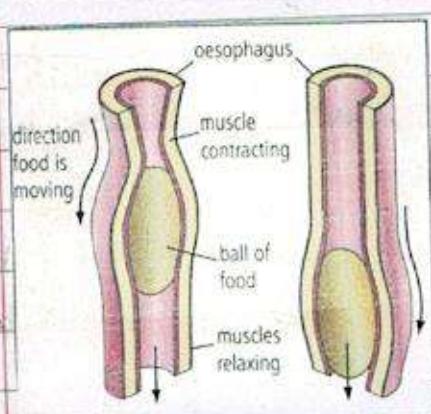
- air temp increases = transpiration increases

- To measure transpiration you can use a

Porometer (measures rate of water uptake)



- Ring of muscle - **pyloric sphincter** - opens to let food pass into **duodenum** (first part of small intestines)



## Small intestine + absorptions

Thin lining  
large surface area

Small intestine = 6m long

- x first part is **duodenum**, which leads to **ileum**
- x Pancrease connected to duodenum by **pancreatic duct**
- x **Pancreatic juice** flows down duct, contains:
  - o Amylase
  - o **Trypsin** (breakdown proteins + Poly peptides to Peptides)
  - o Lipase (fats to fatty acids + Glycerol)
  - o Sodium hydrogencarbonate - alkali -

- Bile enters duodenum along tube **bile duct**

made in liver, yellow-green, stored in gall bladder, Alkaline

- Bile emulsifies fats - breaks down large globules of fats into smaller.

- Cells lining ileum make enzymes:

o Protease (peptides → amino acids)

o Sucrase (sucrose → Glucose + Fructose)

o Maltose (maltase → Glucose on membrane of epithelium)

- molecules pass through intestine wall into blood or lymph by diffusion or active transport = absorption

- Vein is thinner than artery

- o wider space for blood
- o less muscular
- o less elastic walls



- o narrow space

- o thick muscle walls + elastic fibers



- Arteries branch until capillaries is formed



- o narrow - Red blood cell just fits -.

- o made of 1 layer of cells

- Capillaries provide a huge surface area for exchange between blood + cells.

- Arterioles

- o small subdivisions of arteries, carry oxygen blood to capillary net.
- o regulating blood pressure

vessels

- Venules

- o collect blood from capillary beds
- o unite then form veins

Blood

- Shunt vessels

- o link artery to vein
- o control blood flow

- ~~arteries~~

- Coronary heart disease

- o coronary artery gets blocked with cholesterol (narrowing) which slows blood flow. Atherosclerosis

- o walls become rough, cause blood clots. Thrombosis

- o Angina. Not enough oxygen to heart muscle

# Plant Transport

- Mass flow = Fluids move through tubes in order for the fluids to move in the same direction

- Plants have:

Xylem (tissue)

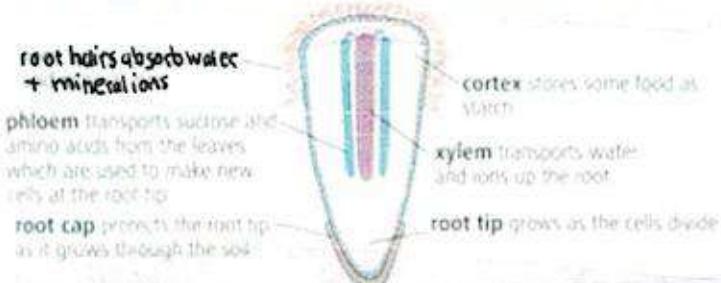
- o Cells that are specialised for transport
- o Transports water + mineral ions only
- o Travels upwards - Roots via stem to leaves -

Phloem (tissue)

- o Transports sucrose, Amino acids and hormones

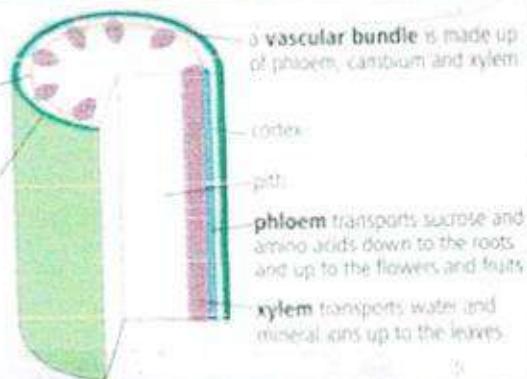
↓  
Soluble, complex sugar, made in leaves

- o Travels downwards - leaves to roots - upwards - leaves to flower -
- o Hormones control cell division for growth



## Internal Structure of Root hair

cambium: cells make new xylem and new phloem as the plant grows  
epidermis: is a single layer of cells on the outside of the stem which protects the stem and reduces water loss



in plants,  
journey      Begin = Source  
                        End = Sink

- The soluble products made by photosynthesis is carried to all parts of the plant in a solution in the phloem. **Translocation** place to place
- Transport of food takes place from areas of production to area of storage or area of respiration + growth
- Simple sugars produced converted to sucrose in leaves.
  - o Broken down by enzyme - used for respiration
  - o changed to starch for storage
  - o Used to make cellulose for new cell walls
- leaves use simple sugars + nitrate ions to make amino acids + to make proteins.

- Aphids - small insects that **Feed** on the sap in the phloem - stylets -  
used to study transport of sugars in phloem

## Transport in animals

### humans

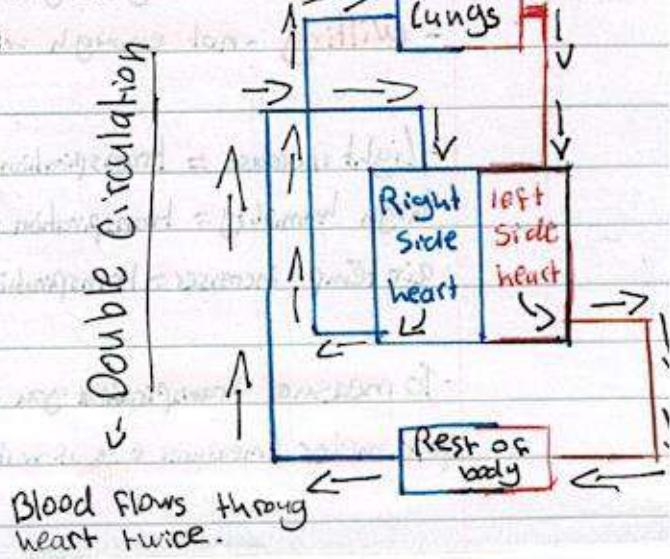
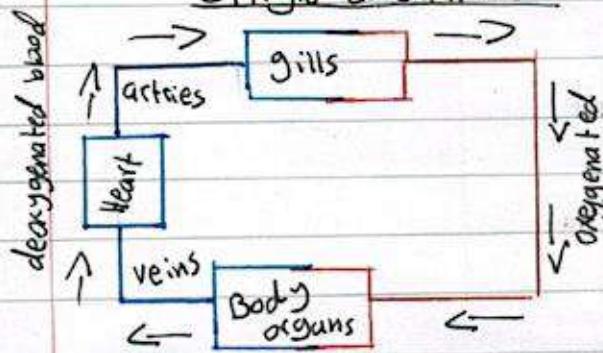
o Circulation

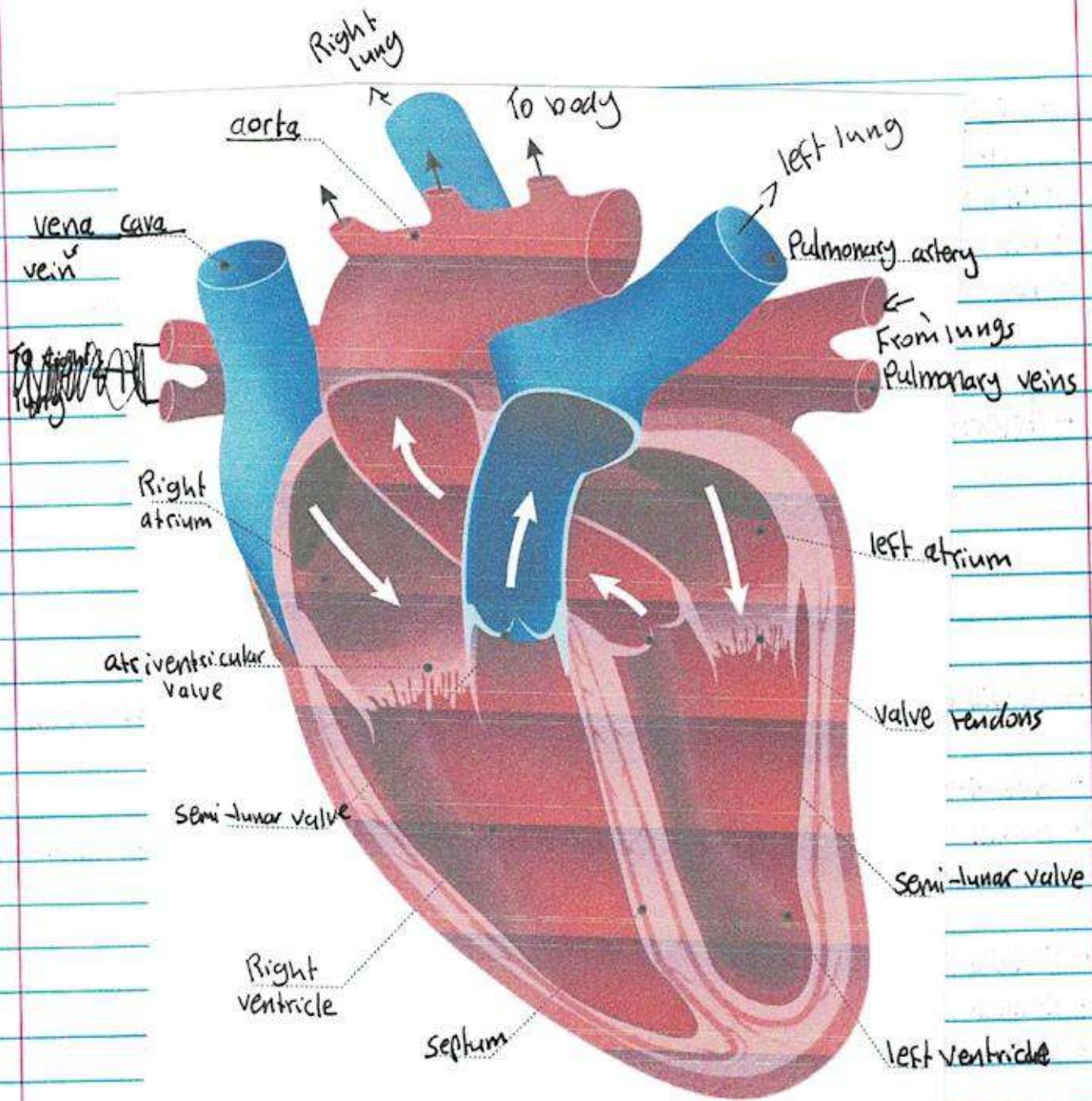
- System = Blood, pump (heart), Blood vessels

Transports = Oxygen, nutrients, waste

- Blood Circulation

#### Single Circulation





- Right ventricle  $\xrightarrow{\text{blood}}$  lungs (pulmonary artery)
- left ventricle  $\xrightarrow{\text{blood}}$  Rest of body (aorta)

- To monitor the activity of the heart we use:

- o Electrocardiograms
- o Pulse rate
- o Sound of heart valves closing.

- Main blood vessels

- o Pulmonary vein/artery
- o hepatic vein/artery
- o Renal vein/artery