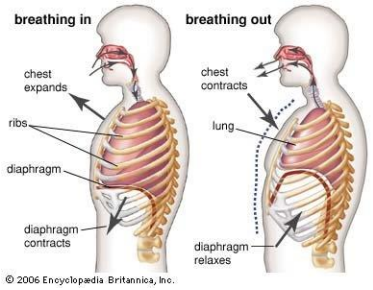
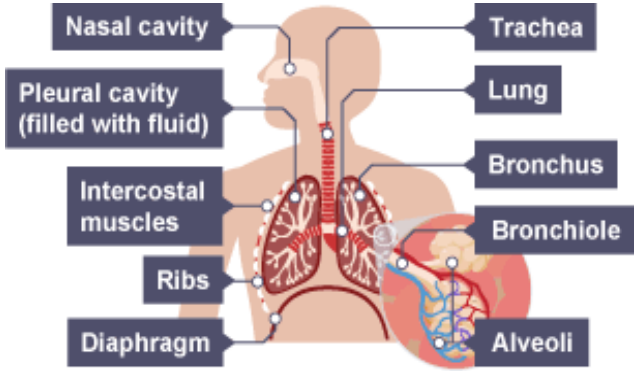
Biology Knowledge Organiser
Exchange and transport

The lungs

The lungs, found in your chest, are protected by your ribcage. The diaphragm is underneath and is a strong sheet of muscle.



Atmospheric gas	% of air breathed in	% of air breathed out
nitrogen	~80	~80
oxygen	~20	~16
carbon dioxide	0.04	~4



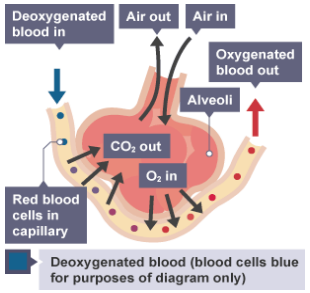
Ventilation

Ventilation - Scientific term for "breathing" – where air is constantly moving in and out of the lungs.
Inspiration - Also known as "inhalation", occurs when air pressure in the atmosphere is greater than that of the lungs; forcing air into the alveoli.
Expiration - Also known as "exhalation", occurs when air pressure in the lungs is greater than that in the atmosphere; forcing air out of the alveoli.

	Inspiration	Expiration
External intercostal muscles	Contract – pulling ribs upwards and outwards.	Relax – permitting rib cage to move downwards and outwards.
Internal intercostal muscles	Are relaxed.	Contract – moving the ribs downwards and decreasing the volume of the thorax.
Diaphragm	Contracts – moves downwards from domed position.	Relaxes – elasticity returns to domed position,
Air pressure in lungs	Decreases	Increases
Air movement along pressure gradient	Into lungs	Out of lungs
Lung volume	Increases	Decreases

Alveoli

Adaptations:
- Thin walls= increases the rate of diffusion as there is a shorter diffusion pathway
- Large surface area= increases the rate of diffusion
- Surrounded by lots of capillaries= good blood supply



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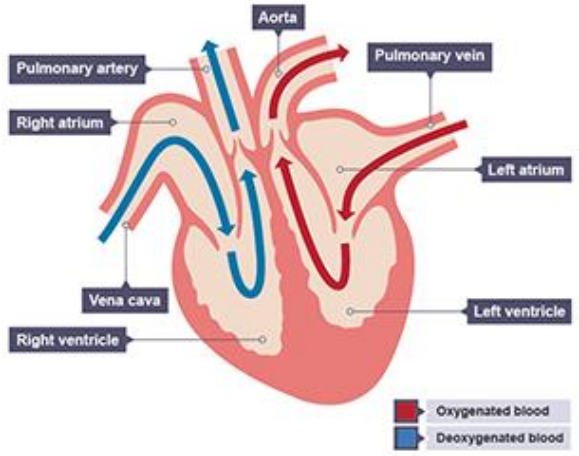
The circulatory system
Made of blood, heart and vessels. The job is to transport blood around the body and carry oxygen and glucose to the cells that need them.

Blood
Red blood cells- carry oxygen, biconcave shape gives an increased surface area. Heamoglobin binds to oxygen.
White blood cells- make up the immune system, they attach invading microorganisms
Platelets- fragments of cells that cause clotting at the site of wounds
Plasma- the bulk of blood, yellow in colour and carries RBC, WBC and platelets

Blood vessels
Arteries- take blood away from the heart. They are strong and are able to stretch because they are under a high amount of pressure. They have thick walls or muscle and elastic tissue.
Veins- have valves to prevent the backflow of blood. They take blood in to the heart.
Capillaries- tiny vessels that connect arteries and veins. They are one cell thick.

The heart
- Double circulatory system- the blood visits the heart twice in its journey around the body.
- The vena cava supplies deoxygenated blood to the right atrium from the body
- The pulmonary vein supplies oxygenated blood to the left atrium from the lungs
- The right ventricle forces deoxygenated blood to the lungs via the pulmonary artery
- The left ventricle pumps oxygenated blood around the body via the aorta
- The atria contract together and force blood down into the ventricles
- Valves close to stop the blood flowing backwards out of the heart.
- The right atrium contains a group of cells that control the resting heartrate. This is where a pacemaker is fitted



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Problems with the heart

Leaky valves= over time they may start to leak and not fully open due to stiffness as they are under a lot of pressure. This makes the heart less efficient and without treatment, may die.

Replacement valves= mechanical- made of polymers and titanium, last a long time however you need to take medication for the rest of your life to prevent blood clots. Biological- taken from animals such as pigs, no need for medication and they last 12-15 years.

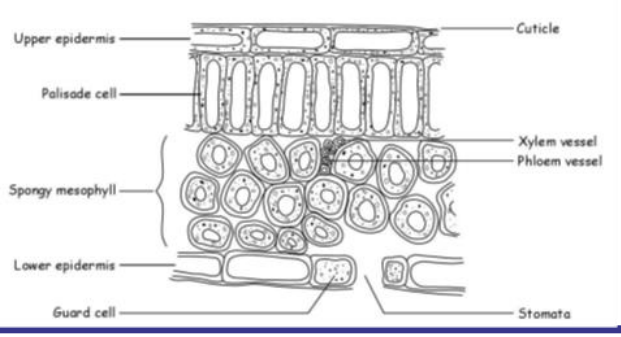
Artificial pacemakers= solves irregularities with the rhythm of the heart. They are very light and are attached to the heart by two wires. Strong signals are sent to the heart that stimulate it to beat properly. You will need regular checkups.

Artificial hearts= used when the heart completely fails. A patient needs to wait for a donor that is a tissue match. This wait can be very long, so scientists have created temporary hearts which requires lots of machinery to keep them working. They can also be used to help the heart recover after disease. Most patients will stay in hospital, but some are able to leave and live a normal life with their artificial heart in a backpack until their actual transplant

Xylem	Phloem
carries water and minerals to the leaves	carries (glucose) to growing parts and storage organs
made of dead cells	made of living cells
cell wall made of lignin	cell wall made of cellulose
no cytoplasm	permeable cell walls
transports water and minerals	transports food
thick cell wall	thin cell wall
flow is upward	flow is up and down

The leaf

Part of leaf	Description	Function
Upper epidermal tissue	Thin and transparent waxy cuticle	Allows light to pass to mesophyll to protect the leaf and stop water loss
Palisade mesophyll	Regular shapes cells Arranged end-on, near upper surface Most chloroplasts at the top of the cells	Absorb the maximum amount of light possible
Spongy mesophyll	Irregular shaped cells Many air spaces	Increase the surface area for CO_2 absorption Allow gases to diffuse
Lower epidermal tissue	Many stomata Surrounded by guard cells	Allow gases to diffuse Guard cells open and close stomata
Vascular bundle	Contain xylem and phloem tubes	Transport substances around the plant



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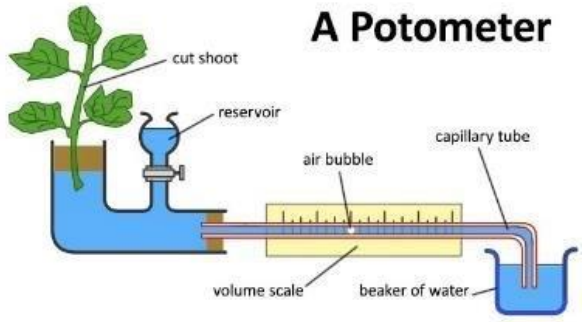
Transpiration

- Cut a shoot underwater- This is done to prevent air from entering the xylem
- Place the shoot in the tube
- Set up the apparatus as shown in the diagram- making sure it is airtight, using vaseline to seal any gaps
- Dry the leaves of the shoot- any moisture present on the leaves will affect the rate of transpiration
- Remove the capillary tube from the beaker of water to allow a single air bubble to form and place the tube back into the water
- Set up the environmental factor you are investigating
- Allow the plant to adapt to the new environment for 5 minutes
- Record the starting location of the air bubble
- Leave for a set period of time
- Record the end location of the air bubble
- Change the light intensity or wind speed or level of humidity or temperature (only one - whichever factor is being investigated)
- Reset the bubble by opening the tap below the reservoir
- Repeat the experiment
- The further the bubble travels in the same time period, the faster transpiration is occurring and vice versa



Factors affecting transpiration

Factor	Affect on transpiration when factor increases	Why does the factor change the rate of transpiration
Light intensity	The rate of transpiration increases as light intensity incr eases.	This happens because more of the stomata open to allow gas exchange for photosynthesis. When the stomata open more water vapour can diffuse out of the stomata. Light also increases temperature.
Air movement	The rate of transpiration increases as air movement in creases.	Air blows away the water vapour which has diffused out of the plant. This means that the concentration gradient will be maintained. Air movement aids evaporation.
Humidity	The rate of transpiration decreases as humidity incr eases.	High humidity means more water vapour in the air. This reduces the water concentration gradient so less water leaves the leaf.
Temperatur e	The rate of transpiration increases as temperature increases.	More kinetic energy results in more water evaporating so more water is lost through transpiration.