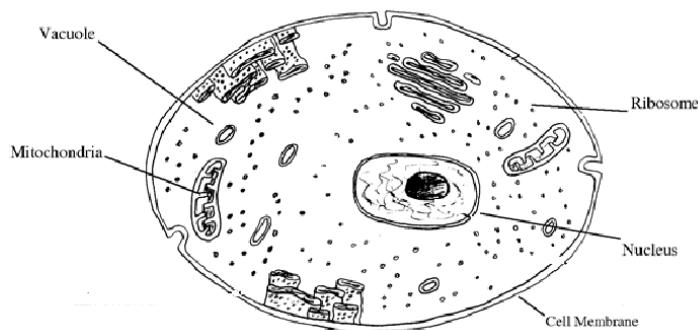


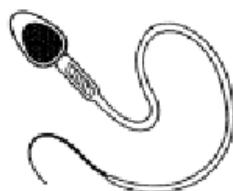
NATIONAL 5 BIOLOGY - Multicellular Organisms SUMMARY

Cells, tissues and Organs

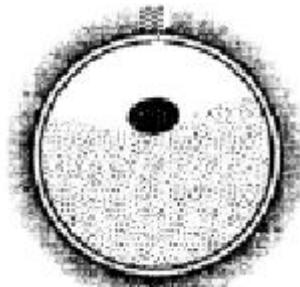
- Identify some of the specialised cells found in the body of a multicellular animal
- Explain how the structure of these cells relate to their function.
- Understand that this specialisation allows each type of cell to carry out its function more efficiently.
 - All living things are made from cells, they are the basic units of all living organisms. Cells can be viewed using a microscope and stains like iodine are used to make cell structures more visible.



The animal cell

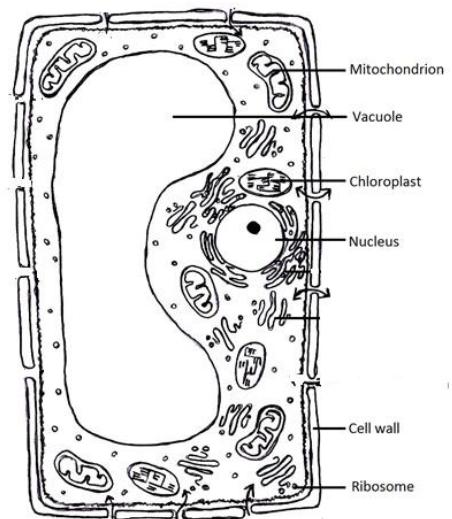


A sperm cell is a type of animal cell it also has a tail to allow it to swim.



An egg cell is another type of animal cell, it is produced by the ovaries.

St

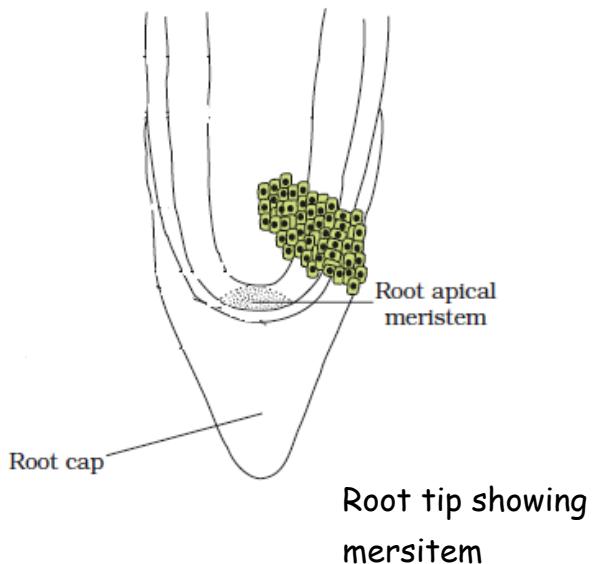
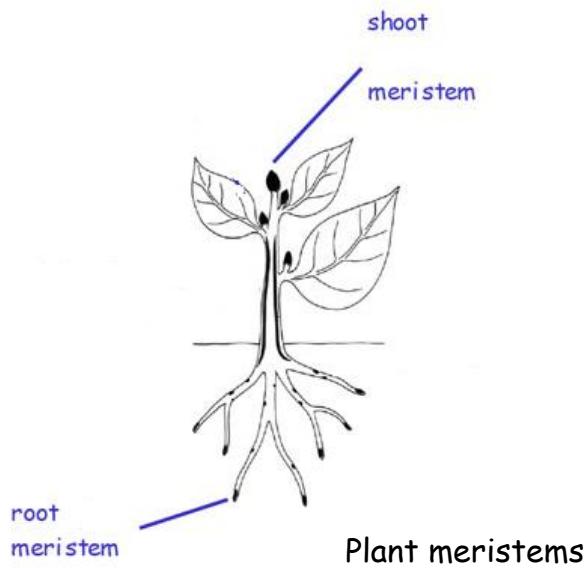


The plant cell

Onion epidermal and root cells are types of plant cell

- Explain what a stem cell is*
 - Identify some of the sites in an animal's body where stem cells are made*
 - Understand that stem cells are involved in growth and repair of body tissues and organs*
 - Identify some of the different types of cell that stem cells can become.*
 - Name some of the diseases which could be cured by the use of stem cells*
 - Discuss some of the ethical issues associated with the use of stem cells in medical research.*
 - Explain what a meristem is*
 - Identify sites in the plant's body where meristems are found.*
 - Know that non-specialised cells produced in the meristem can become specialised into any type of plant cell.*
 - Understand that cells produced in the meristem contribute to the growth of the plant.*
-
- Stem cells are unspecialised cells that divide to produce a wide range of cells. They can either produce Stem cells or specialised cells e.g. red blood cells.
 - They are involved in the growth and repair of body tissues and organs.
 - Stem cells could be used to repair a damaged heart, treat Type 1 diabetes or cure Alzheimer's disease.
 - At present Stem cells are taken from a human embryo of no more than 14 days. Some people consider this unethical because it results in the destruction of the embryo.

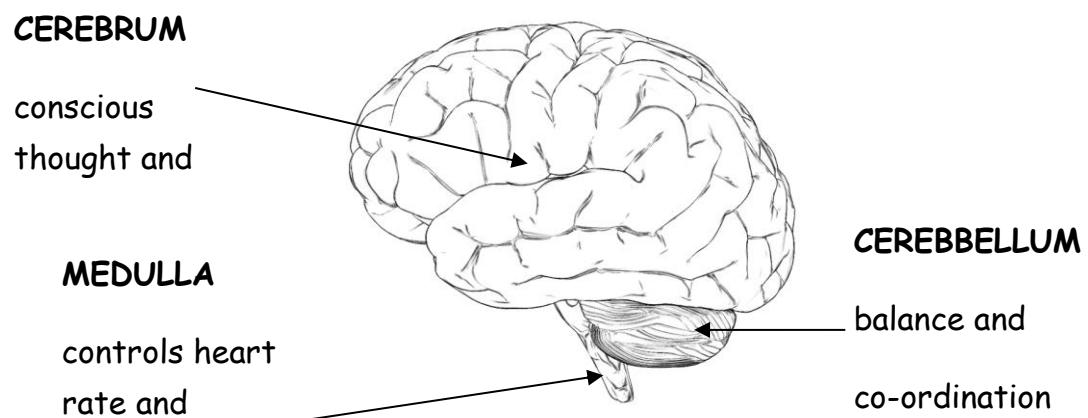
- In plants new cells are only produced in certain areas. These are called meristems. In a plant they are found at the root and shoot tips.



Control and communication

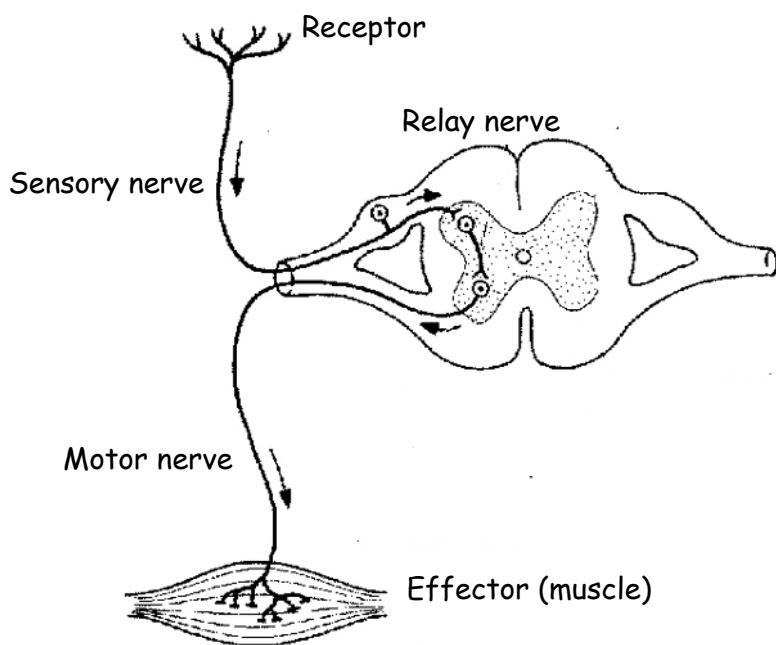
- Identify the cerebrum, cerebellum and the medulla and state their function
- State that the nervous system is composed of the brain, spinal cord and nerves
- State that nerves carry information from the senses to the CNS and from the CNS to the brain.
- State that the CNS sorts out information from the senses and sends messages to those muscles which make the appropriate response.
- Describe how a reflex action works, using a simple model of a reflex arc.
- Name two hormones that are involved in controlling blood sugar levels
- Know which hormone works when there is too much sugar and too little sugar

The human brain



The reflex arc

A reflex action is an automatic reaction that occurs to protect the body.



Endocrine glands

Endocrine glands release hormones. Hormones are chemical messengers that travel in the bloodstream to their target tissues where they bring about a response.

Hormone	Site of production	Target tissue	Function of hormone
ADH	Pituitary gland	Kidney	Increase permeability
Adrenaline	Adrenal glands	Pancreas	Stops insulin secretion
Glucagon	Pancreas	Liver	Promotes conversion of glycogen to glucose
Human growth hormone (somatotrophin)	Pituitary gland	Long bones	Increases growth of long bones
Thyroxine	Pituitary gland	Thyroid gland	Increase protein synthesis

Insulin

Insulin is a hormone produced by the pancreas. Insulin promotes the conversion of glucose to glycogen. Glycogen is then stored in the liver. This removes any excess glucose from the bloodstream. The glycogen is then stored in the liver. When the body needs to reverse this process (when blood sugar levels fall) the hormone glucagon converts the glycogen back into glucose.

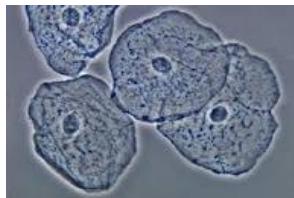
Diabetes

This is the name of the condition that people suffer from when their bodies are unable to control their blood sugar levels. Symptoms include being very thirsty and very hungry, needing to urinate more often, tiredness, sudden weight loss, having a dry mouth and blurred vision.

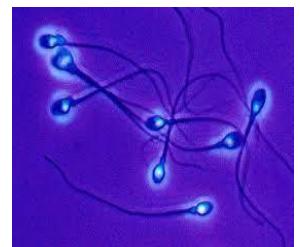
Reproduction

- Identify the number of chromosomes in a cell, gametes and fertilised ova.
- Identify gonads in animals and plants
- Identify gonads in animals
- Compare male and female gametes
- Identify the areas that produce pollen and ovules in flowers (the gonads)

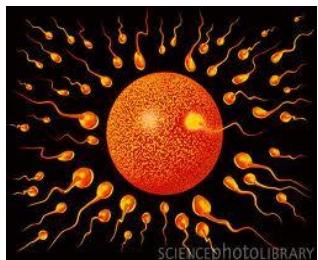
Diploid body cells - nucleus has 23 pairs/46 chromosomes



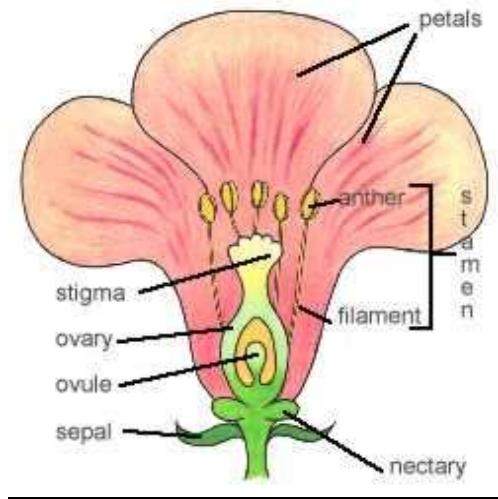
Haploid Gametes - nucleus of the ova and sperm have 23 chromosomes



- Female gonads are ovaries - ova are produced there. Ovaries produce a few (or even just one) ova at a time. Ova are larger cells than sperm and contain a food store.
- Male gonads are testes - sperm are produced here. Testes continually produce millions of sperm cells. Sperm are much smaller cells than ova and swim using a tail structure.



Fertilisation - nuclei from both gametes join to make a fertilised egg containing the **diploid** 23 pairs/46 chromosomes



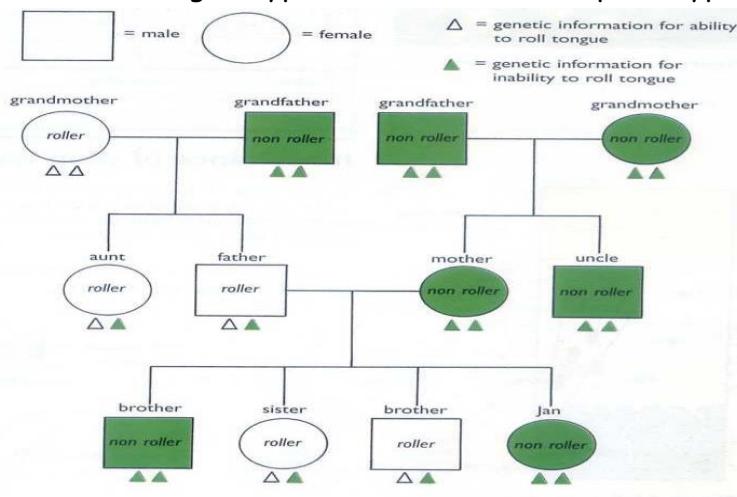
The female gonad in a flower is the ovary. It can contain just one ovule or many ovules for fertilisation

The male gonads in flowers are the stamen. Pollen grains containing the gamete are produced in the anther at the end of the stamen.

Variation and Inheritance

- Identify features of discrete and continuous variation and give examples of both.
- Follow the pattern of inheritance using family trees
- Identify dominant form of a gene
- Identify homozygous and heterozygous genotypes.
- Follow the inheritance of a characteristic through two generations and use a punnet square to predict the outcome of a cross.
- Know what polygenic inheritance is and I am able to give examples of characteristics controlled in this way.
- Identify individuals and give their possible genotypes using family trees
- Identify medical traits that may receive medical counselling
- Have considered the ethics and dilemmas with designer babies.

- Variations are differences that occur within any population. Variations can be discrete or continuous.
- Discrete variations: these differences are clear cut groups or categories and can be seen or observed e.g. tongue rolling, hair colour
- Continuous variations: these differences cover a wide range of values and can be measured e.g. hand span, height, leaf size
- A diagram showing the inheritance of a characteristic is a **family tree**.
- The **Phenotype** of a characteristic is how the organism **appears** as a result of inheriting genetic information.
- The **Genotype** of the characteristic shows the set of genes (usually 2) inherited from either parent and it is usually written as letters.
- Gregor Mendel** was the scientist who worked out phenotypes and genotypes of pea plants.
- Pea plant phenotypes for height can either be tall or dwarf.
- Mendel used the letter T to represent the tall gene and t to represent the dwarf gene.
- A plant with the genotype TT will have a tall phenotype.
- A plant with the genotype tt will have a dwarf phenotype



- Some forms of genes are **dominant** and always show (are expressed) in the phenotype.
- Other forms of genes are **recessive** and show in the phenotype if only those recessive genes for the characteristic are inherited
- In a homozygous genotype the 2 forms of the gene are the same. E.g. TT tall plants.
- In a heterozygous genotype the 2 forms of the gene are different. E.g. Tt Tall

plants.

<u>The cross is written</u>			
P Phenotypes	Tall		Dwarf
P Genotypes	TT	X	tt
Gametes	T		t
F ₁ Genotypes		Tt	
F ₁ Phenotype Ratio	All Tall		
<u>Cross the F₁ generation</u>			
P Phenotypes	Tall	X	Tall
P Genotypes	Tt	X	Tt
Gametes	T t		T t
Punnett Square to show combination of gametes			
		Gametes	
	T	t	
Gametes	T	TT	Tt
	t	Tt	tt
			Offspring
F ₂ Genotypes	TT	Tt	Tt
F ₂ Phenotype Ratio	3 Tall : 1 Dwarf		

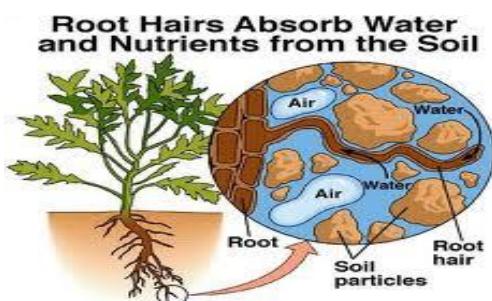
- Polygenic inheritance is when characteristics are controlled by the alleles (forms) of several genes

The need for transport

Plant Transport

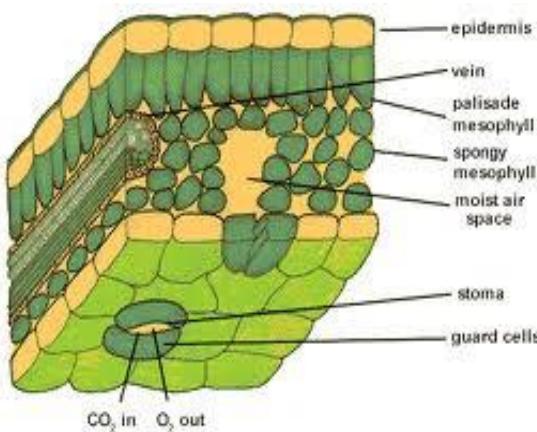
- Understand that multi-cellular organisms need transport systems to carry substances to all parts of their bodies because their surface area to volume is low.
- Describe the movement of water through a plant
- Understand that transpiration is the evaporation of water from the leaves and this causes the upward movement of water in a plant.
- Recognise and describe the main features of phloem and xylem vessels
- Carry out simple procedures to view the parts of a plant that are involved in water transport.
- Carry out an experiment to measure transpiration rate.

- In order to make energy for growth, repair etc. animals and plants need food and oxygen to enter their cells and need waste products to be removed.
- In unicellular organisms that have only one cell e.g. Amoeba and Euglena, these substances enter and leave the cell by the processes of diffusion and osmosis.
- A plant obtains water and nutrients from the soil. These enter a plant at the roots where special root hair cells increase the surface area of the root and increase water absorption. The water enters by osmosis, from a region of high water concentration in the soil to a region of low water concentration in the cells.



- Water moves out of the xylem (in the vein) into the mesophyll cells of the leaf.

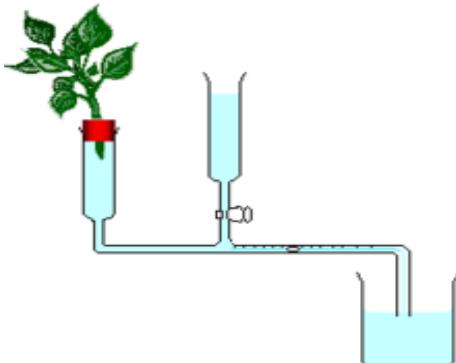
Here some of the water is used in the palisade and spongy mesophyll cells for photosynthesis.



- Sugar made in photosynthesis is transported around the plant in living vessels called phloem. Phloem cells are living cells. They have sieve tubes where soluble sugar moves from cell to cell.
- However, most of the water a plant takes up evaporates out of the mesophyll cells of the leaf and into the air spaces. The water vapour then diffuses out of the stomata that are in the lower epidermis of the leaf. This evaporation of

water out of the stomata is called **transpiration**.

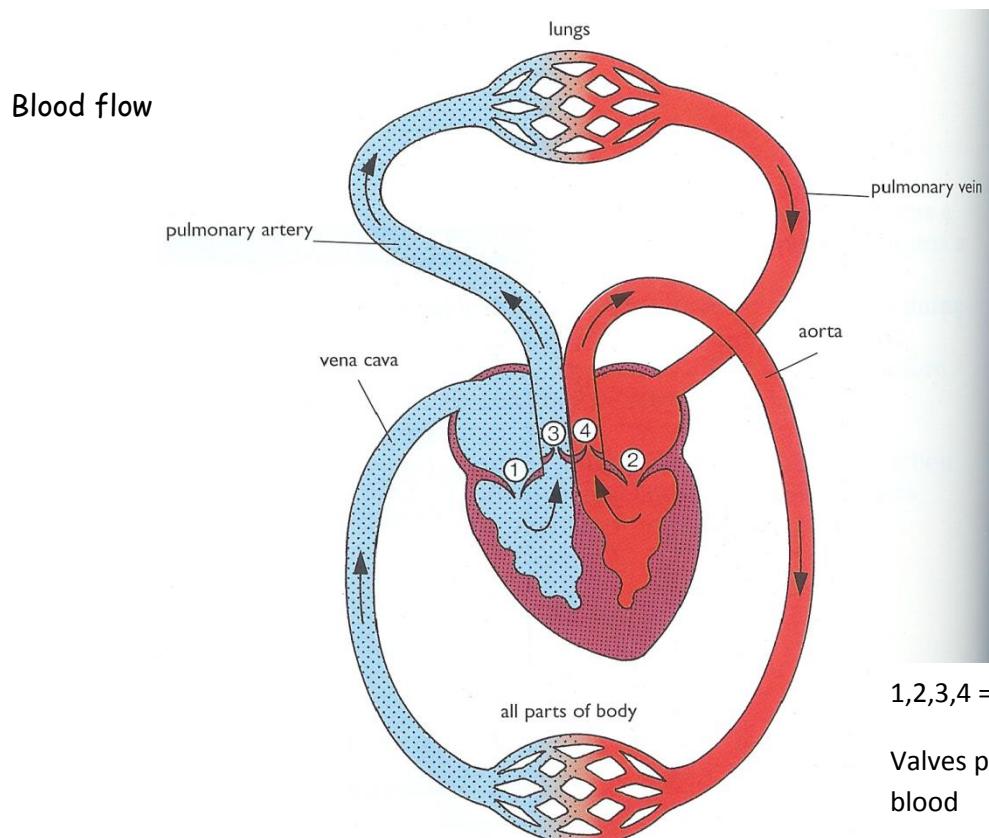
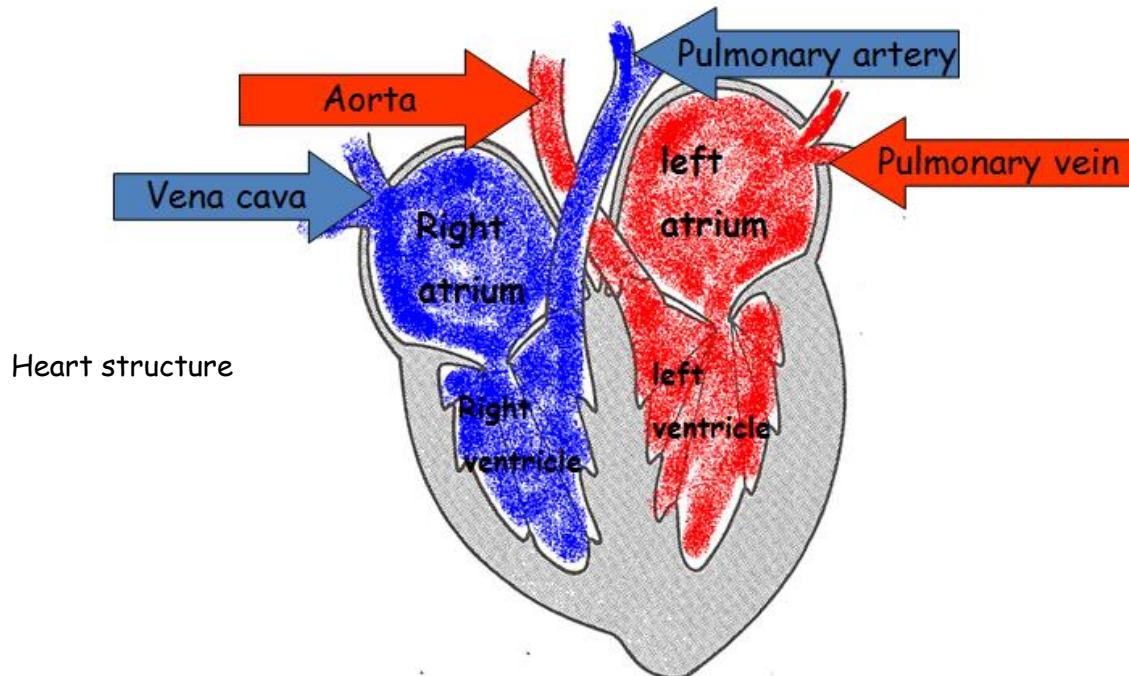
- The **potometer** is an instrument that measures the rate of transpiration in a plant.



Animal Transport

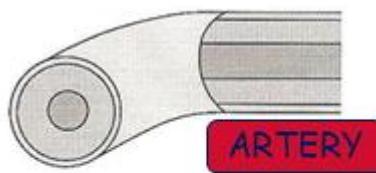
- State that oxygen, nutrients and waste products are transported to and from cells of the body in the blood.
- Describe the pathway of deoxygenated and oxygenated blood through the heart, lungs and body
- Describe the structure of the heart and blood vessels
- Describe how RBCs are able to deliver oxygen from the lungs to body cells and the role of haemoglobin
- Describe the structure and function of the lungs mentioning cartilage and the role of the alveoli
- List the structures and functions of the parts of the digestive system.
- Understand the role of peristalsis

- Know that food enters the blood at the small intestine through villi and how they are suited to their function.

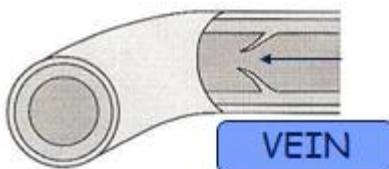


Blood vessels

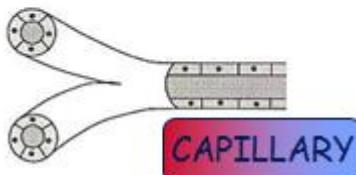
Thick elastic wall containing muscle to cope with high pressure of blood coming from the heart (can constrict or relax)



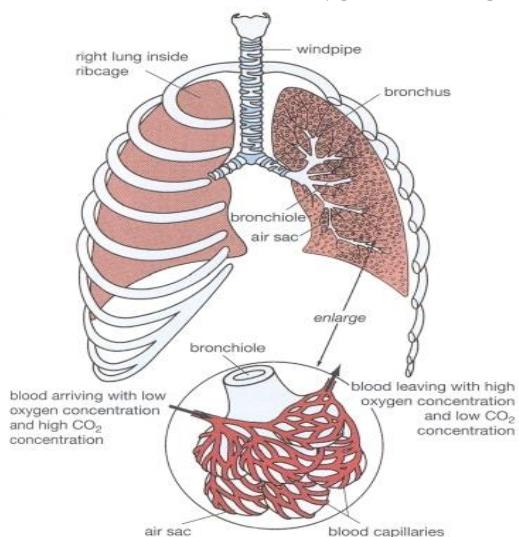
Thin wall, blood at low pressure. Contain valves to prevent backflow



Permeable walls are one cell thick, allows exchange of materials



- Red blood cells transport the oxygen in the blood and deliver it to cells in the body. They have a biconcave shape that ensures that the cell has a large surface area for the absorption of oxygen. Red blood cells contain the pigment haemoglobin which combines with oxygen at high concentrations (at the alveoli) to form oxy-haemoglobin. At low concentrations (in the cells) the haemoglobin dissociates from the oxygen allowing it to be released.



The alveoli/ air sacs are where oxygen passes from the lungs to the blood and carbon dioxide passes from the blood back to the lungs

- The digestive system...digestion of food as it moves from mouth to anus.
Transport of food through the muscular gut is carried out by a process called peristalsis.
- When partially digested food reaches the small intestine, digestion continues. Then, the products of digestion are absorbed into the blood through thousands of villi (singular, villus) that line the intestinal walls.
Villi are well-designed for transporting digested food from the gut into the bloodstream:
 1. Villi have very thin walls to allow molecules to pass through easily.
 2. They also have a very good blood supply so that food moves out of the intestine straight into the blood.
 3. In addition, because there are so many of villi, they form a huge surface area for maximum absorption of food.

Effects of lifestyle choices on transport and exchange systems

- Know the difference between physical and mental health*
- Identify some healthier lifestyle choices that will improve the physical and mental health of an individual*
- Take physiological measurements such as blood pressure, pulse rate and reaction time and describe the effect of moderate exercise on these measurements.*
- Debate whether all illness should be treated free under the NHS in the UK*
 - Lifestyle is the typical way of life of an individual, group or culture.
 - Lifestyle choices can affect the physical and mental health of the individual
 - Mental health refers to a person's state of mind or emotional wellbeing.
 - Physical health means good body health, because of regular physical activity (exercise), good nutrition and adequate rest.
 - A diet deficient in iron can lead to anaemia. Iron is needed to make haemoglobin.
 - Physical health is affected by diet, drug abuse and too much alcohol, as well as not enough sleep. Poor physical health affects parts of the body such as the heart, lungs, skin, teeth and hair.

- Physiological measurements include measuring - **BLOOD PRESSURE, PULSE RATE, RECOVERY TIME, REACTION TIME.** These can provide information about physical health.
- Moderate exercise can affect physiological measurements in particular, heart rate and blood pressure
- The adverse effects of poor lifestyle choices can include:
 - Fatty deposits in blood vessels
 - Blood clots
 - Diabetes
 - Heart attacks
 - Strokes
 - Unhealthy levels of stress that increase the risk of obesity and heart disease