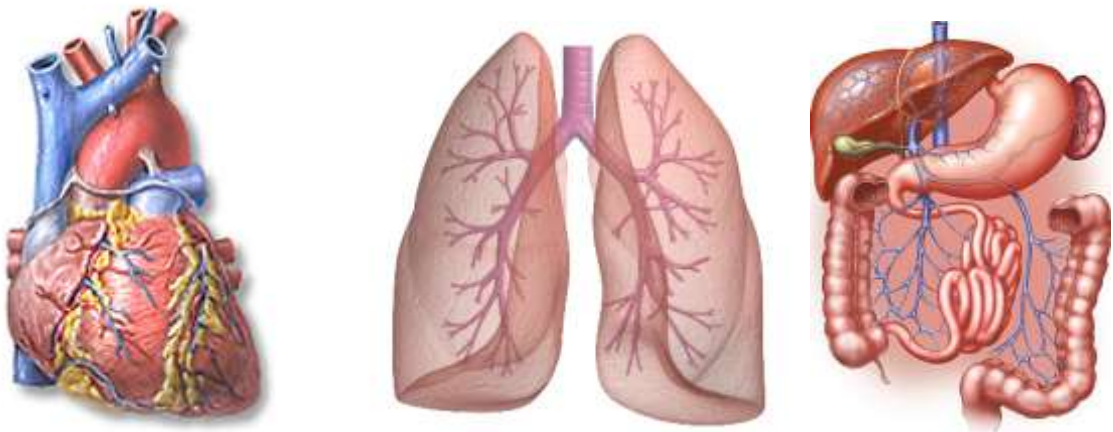


MULTICELLULAR ORGANISMS

NATIONAL 5



PUPIL WORKBOOK.



Cells, tissues and organs

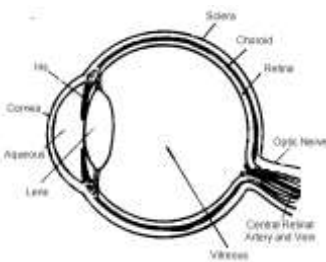
LEARNING OUTCOMES:

- To identify some of the specialised cells found in the bodies of multicellular animals and plants
- To demonstrate that this specialisation of cells leads to the formation of a variety of tissues and organs in the body of the organism
- To understand that the structure of a cell is related to its function
- To understand that cell specialisation makes the cell more efficient at performing that function

COPY into your jotter:

The bodies of multicellular organisms contain a variety of different cell types. Each type of cell is specialized to make it more efficient at carrying out a particular function.

Cells that carry out the same function are arranged into **TISSUES**. Structures in the body that have several tissues working together are called **ORGANS**



TISSUE or ORGAN?



ANIMAL CELLS, TISSUES and ORGANS

Working in pairs:

- Write down the names of some tissues and organs found in the human body
- Discuss your ideas with the rest of your class
- Make a table in your jotter naming some of the tissues and organs which were discussed

Human Body Tissues	Human Body Organs

COLLECT A DIAGRAM of cells from **ANIMAL TISSUES** and **GLUE** it into your jotter.

Using class resources:

- Name the different types of cell shown in the diagrams
- **COPY** and **COMPLETE** the following table to explain how these cells are specialized to carry out their different functions.

Tissue	Cell type	Specialized structural features	Function

Practical work:

You may be able to view prepared slides of these cells under a microscope, or using a bioviewer.

Extension work: If time allows, you can squash a thin piece of muscle tissue between two slides and look at it under the microscope. The stripes (or striations) you can see are **PROTEINS** which can shorten causing the muscle to contract. This shows how muscle tissue is specialized to bring about movement.

Revision of Animal Cell Ultrastructure

WATCH the video clip on *Animal Cells* and answer the following questions.

1. List the structures normally found in animal cells.
2. Which of these structures are not found in red blood cells?
3. Can you think of any advantage this may give to these cells?

PLANT CELLS, TISSUES and ORGANS

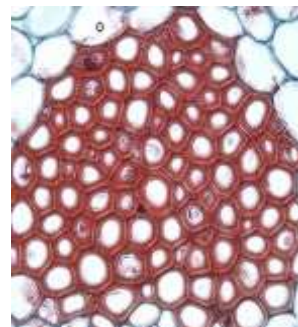
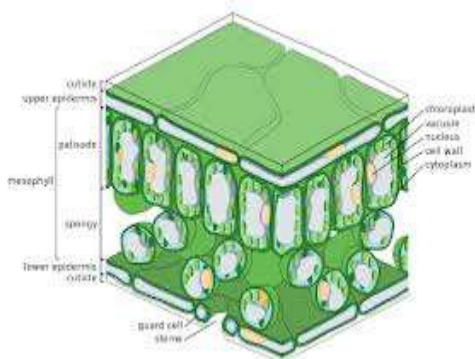
Collect: Two different types of plant, for example a geranium and a spider plant

In your group:

Looking at the plants, and using a suitable class resource;

- Write down the names of some tissues and organs found in plants
- Make a table in your jotter naming some of the tissues and organs which were discussed

Plant tissues	Plant organs



TISSUE or ORGAN?

COLLECT A DIAGRAM of cells from PLANT TISSUES and **GLUE** it into your jotter.

Using class resources:

- Name the different types of cells and tissues shown in the diagrams
- **COPY** and **COMPLETE** the following table to explain how these cells and tissues are specialized to carry out their different functions

Tissue	Cell type	Specialized structural features	Function

Using the information in the table and a suitable class resource, **answer the following questions.**

1. Which plant tissues are made up of more than one type of cell?
2. What is a STOMA?
3. Which of the cells listed in the table would be able to carry out photosynthesis?

Practical work:

You may be able to view prepared slides of these plant tissues under a microscope, or using a bioviewer.

Extension work: Using clear nail varnish, make a leaf print from the lower epidermis of a plant leaf. Look at it under the microscope. Can you see the stomata and leaf epidermal cells?

Revision of Plant Cell Ultrastructure

1. List the structures normally found in plant cells.
2. Which of these structures are not found in?
 - Xylem vessels
 - Phloem sieve tube cells?
3. Can you explain why these cells do not have the structures you have named?

Success Criteria:

- I can identify some of the specialised cells found in the body of a multicellular animal.
- I can identify some of the specialised cells found in the body of a multicellular plant.
- I can explain how the structure of these cells relate to their function
- I understand that this specialisation allows each type of cell to carry out its function more efficiently.

STEM CELLS

LEARNING OUTCOMES:

- To understand that stem cells are animal cells that have the potential to become different types of cell
- To understand that stem cells are involved in the growth and repair of body tissues and organs
- To investigate the potential uses of stem cells in new medical treatments
- To discuss the ethical issues associated with their use

COPY the following note into your jotter:

Stem cells are unspecialized animal cells that have the potential to become different types of cell.

Stem cells are involved in the growth and repair of body tissues and organs.

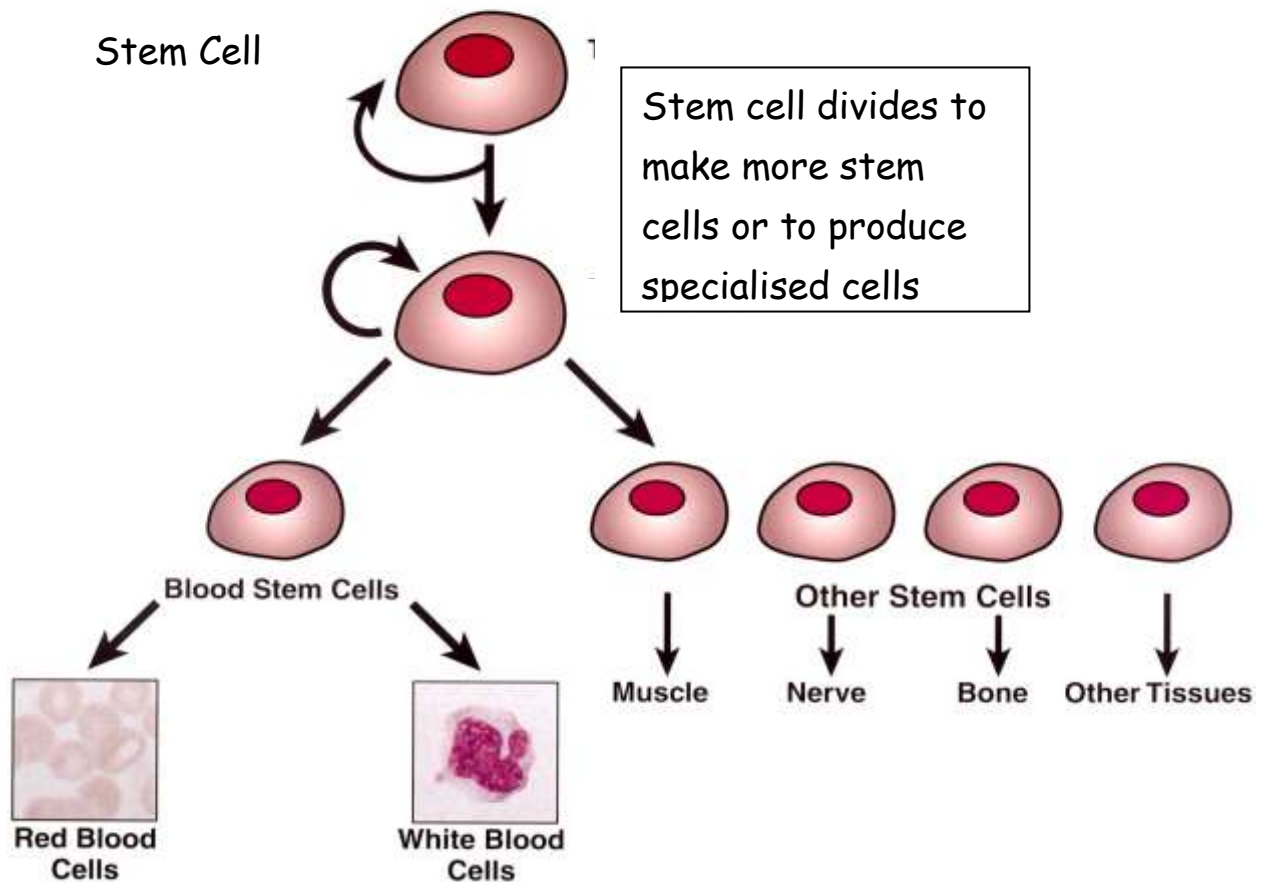
In some organs, such as the gut and bone marrow, stem cells regularly divide to repair and replace worn out or damaged tissues. Cells in the bone marrow divide to replace worn out blood cells.

In other organs, such as the pancreas and heart, stem cells only divide under certain conditions.

When a stem cell divides, each new cell has the potential either to remain a stem cell or become another type of cell with a more specialized function, such as a muscle cell, a red blood cell or a brain cell.

COLLECT A DIAGRAM of STEM CELLS and **GLUE** it into your jotter.

Hierarchy of Stem Cells



READ the following information, then **WATCH** the **STEM CELL** video clip.

EMBRYONIC STEM CELLS

Stem cells are also present in human embryo tissues.

Recently researchers have been able to isolate these stem cells and grow them in laboratory cultures.

It is hoped that these embryonic stem cells may provide an effective treatment to regenerate or repair diseased or damaged tissues in people, as well as increase our understanding of how these diseases occur in the first place. For example, stem cell treatment could be used to repair a damaged heart, treat Type 1 Diabetes or cure Alzheimer's.

As you watch the video clip you may wish to make some notes. Afterwards you will be asked to get into groups where you will discuss the ethical issues associated with the use of stem cells in this way.

Group work: *Ethical Issues Associated with the Use of Stem Cells*

Researchers believe stem cells offer great promise for new medical treatments. The stem cells used for these treatments are likely to come from embryos.

Do you agree with the use of stem cells in this way?

In your group:

- READ the document on stem cells provided
- Use this document and the following web sites to produce a POSTER or POWERPOINT presentation on how stem cells are used
- In your presentation you should name some of the diseases which might be cured by the use of stem cells, as well as identifying any ethical issues associated with their use

Each group will be asked to present their poster or power point to the rest of the class for discussion.

Web sites:

<http://stemcells.nih.gov/info/basics/pages/basics6.aspx>

<http://www.loc.gov/rr/scitech/mysteries/stemcells.html>

<http://www.eurostemcell.org/factsheet/embryonic-stem-cell-research-ethical-dilemma><http://science.howstuffworks.com/life/genetic/ethical-to-use-stem-cells.htm>

http://www.academickids.com/encyclopedia/index.php/Stem_cell

Success Criteria:

- I can explain what a stem cell is.
- I can identify some of the sites in an animal's body where stem cells are made.
- I understand that stem cells are involved in growth and repair of body tissues and organs.
- I can identify some of the different types of cell that stem cells can become.
- I can name some of the diseases which could be cured by the use of stem cells.
- I can discuss some of the ethical issues associated with the use of stem cells in medical research.

MERISTEMS

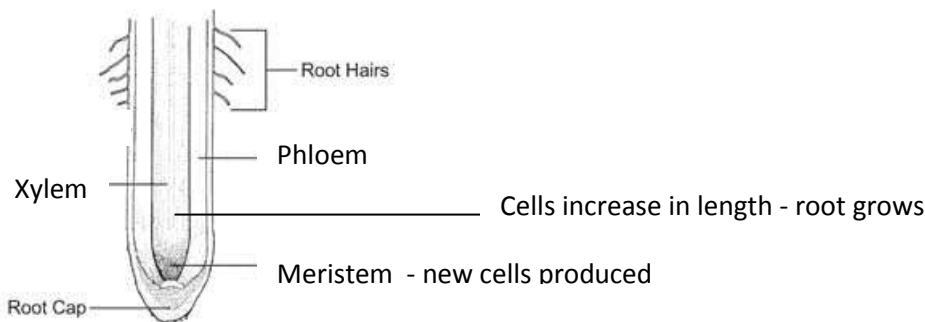
LEARNING OUTCOMES:

- To understand that in plants cell division can only take place at special sites called meristems.
- To show that meristems are found in the root tip and shoot tip of the plant.
- To understand that the non-specialised cells produced in these meristems have the potential to become any type of plant cell, and that they also contribute to plant growth.

COPY the following note and diagram into your jotter.

Meristems are found in the root tips and shoot tips of plants.

Meristems are the only areas in a plant where cell division can take place. The non-specialized cells in these sites divide to produce more non-specialized cells. As these new cells increase in length they contribute to plant growth, and the root or shoot gets longer. They can then become specialized into any type of plant cell, such as xylem vessels, phloem sieve tube cells or root hair cells.



Practical work:

Experiment 1: To demonstrate the site of growth in a Broad Bean root

Collect the following apparatus and materials:

A germinating broad bean with a root about 2cm long

A piece of thread

An ink pad (or some ink and a paint brush)

A piece of filter paper

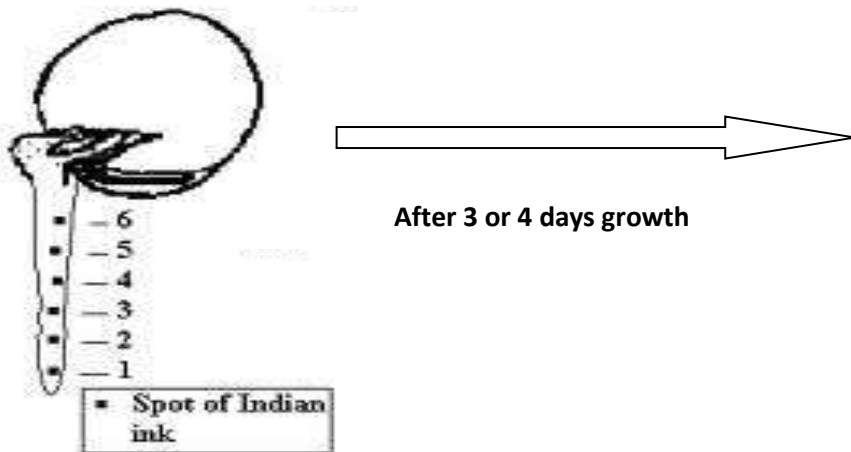
A gas jar to grow your bean in

Procedure

1. Place the broad bean seed on the filter paper and blot it with a paper towel to remove any moisture from its surface.
2. Add ink to the thread, taking care not to make it too wet.
3. Mark the root at regular intervals (every 2mm) with the ink from the thread.
4. Place the seed in the gas jar with some damp paper towels. The root should be pointing downwards.
5. Leave the seed to grow for another 3 to 4 days.
6. Look at the ink markings on the root. Are they still all equal distances apart?

RESULTS – COPY and COMPLETE the following diagram

Broad bean root with ink marks 2 mm apart



From your results **WRITE** a **CONCLUSION** to explain where growth takes place in the broad bean root.

Experiment 2: To show that the root tip contains a meristem where new cells are produced.

Collect the following apparatus and materials:

- | | | |
|---------------------------------|-------------------------|---------------------------|
| <i>A germinating broad bean</i> | <i>Scalpel</i> | <i>Watch glass</i> |
| <i>Alcohol</i> | <i>Stopwatch</i> | <i>Test tube and rack</i> |
| <i>Hydrochloric Acid</i> | <i>Microscope slide</i> | <i>Filter paper</i> |
| <i>Stain (Orcein)</i> | <i>Glass rod</i> | <i>Cover slip</i> |

You will also need access to a water bath at 60° C and a microscope.

Procedure

1. Use the scalpel to cut off the last 1cm of the root tip and place it in the watch glass.

2. Cover the root with alcohol and leave it for 5 minutes

The alcohol is a fixative - it kills the cells and preserves their structure.

3. Transfer the root tip to a test tube and cover it with Hydrochloric acid. Place the test tube in the water bath at 60°C for 5 minutes.

This treatment macerates the tissue, making it easier to separate the cells.

4. Pour off the acid and add water to the test tube to rinse all the acid from the root tip.

5. Place the root tip on the microscope slide. Cut off the bottom 1mm and discard the rest of the root tip.

The final 1mm of the root tip should contain the meristem tissue.

6. Drain off any water from the root tip using a small piece of filter paper and add one drop of Orcein stain.

Orcein stains the chromosomes.

7. Tap the root tip with a glass rod to break up the tissue. Remove any large pieces which remain.

8. Add a further drop of stain and lower a cover slip into place. Then leave for 5 minutes to allow the stain to penetrate the cells.

9. Press vertically on the cover slip through two layers of blotting or filter paper, to further squash the tissue and separate the cells.

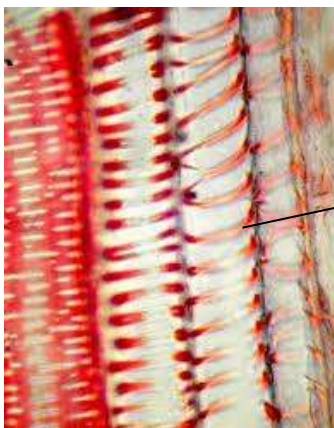
10. Examine the tissue under Low Power (x40) and then High Power (x400) of the microscope

Meristem cells will appear small with large nuclei. You may even see some cells in the various stages of mitosis and cell division (REVISE work on MITOSIS).



Cells from a plant meristem site

Depending on how you cut the root tip at stage 5 you may also see specialized cells such as xylem vessels with their rings of lignin.



Lignin

COLLECT a MERISTEMS DIAGRAM and GLUE it into your jotter.

LABEL both the ROOT TIP and SHOOT TIP diagram to show the position of the MERISTEM (ZONE of CELL DIVISION) and the ZONE of ELONGATION. The ZONE of ELONGATION is the name given to the area just behind the meristem where the new cells increase in length causing the root or shoot to grow.

PROBLEM SOLVING

In an experiment, a young root was inked at 2mm intervals.

After 5 days of further growth, the spaces between the marks were measured and recorded in a table which is shown below.

Space between:	Distance (mm)
Root tip and mark 1	2.0
Marks 1 and 2	5.0
2 and 3	6.0
3 and 4	5.5
4 and 5	2.0
5 and 6	2.0
6 and 7	2.0
7 and 8	2.0

- (i) Present these results as a bar graph.
- (ii) Draw TWO conclusions from the data.
- (iii) Which TWO processes produced growth in the root.

Meristems

Success Criteria:

- I can explain what a meristem is.
- I can identify sites in the plant's body where meristems are found
- I know that the non-specialised cells produced in the meristem can become specialised into any type of plant cell.
- I understand that the cells produced in the meristem contribute to the growth of the plant.

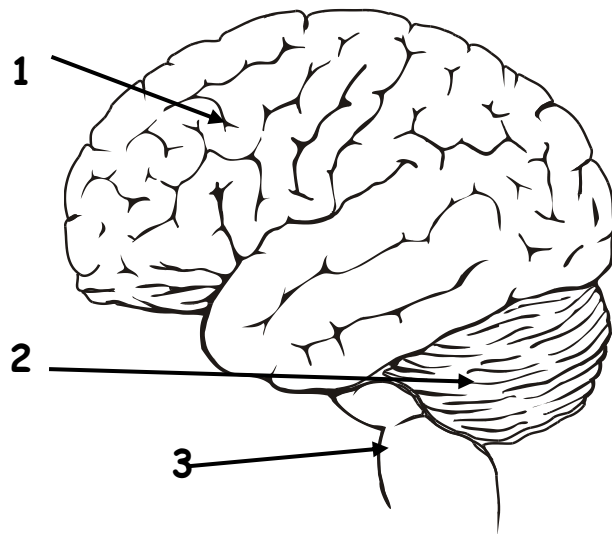
The Brain

Learning Outcome:

- To find out about the structure and function of the brain.

The brain is made up of three main parts:

- Cerebrum (1)
- Cerebellum (2)
- Medulla (3)



1. COLLECT a diagram of the brain and label the 3 main parts.
2. Complete the table to show the function of the 3 main parts of the brain.

PART OF BRAIN	FUNCTION

Success Criteria:

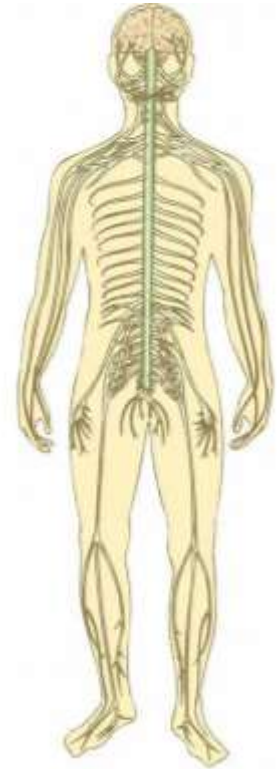
- I can identify the cerebrum, cerebellum and the medulla and state their functions.

The Nervous System

Learning Outcome:

- To find out about the structure of the nervous system.

The brain, spinal cord and nerves make up the nervous system. The central nervous system (CNS) consists of the brain and the spinal cord. Nerves connect the CNS to organs and muscles.



1. Complete the passage using the following words:

SENSORY NEURONES BRAIN
SPINAL CORD NERVES MOTOR
CENTRAL NERVOUS SYSTEM ELECTRICAL

The nervous system is made up of the _____, the _____ and the _____. The brain and spinal cord make up the _____. Information is passed along nerves to and from the CNS in the form of _____ impulses. Nerves are called _____.

_____ nerves carry information to the CNS and _____ nerves carry information from the CNS to the muscles.

Success Criteria:

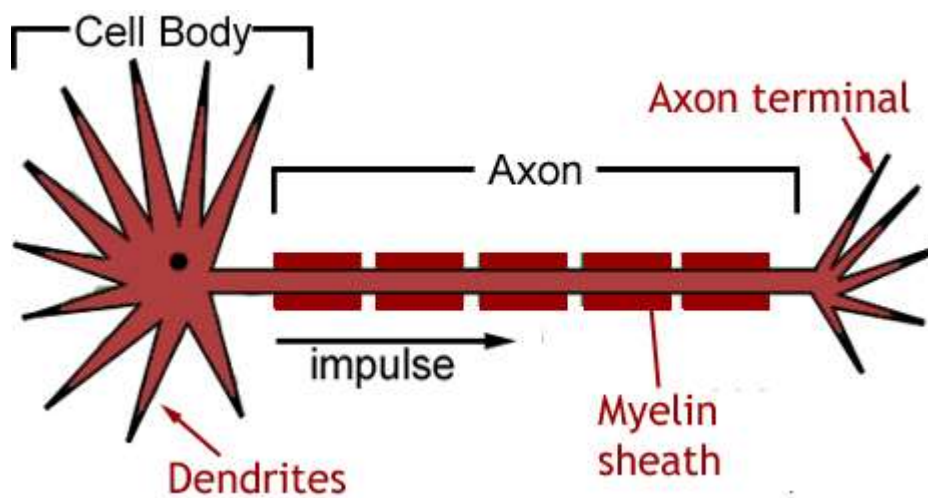
- I can state that the nervous system is composed of the brain, spinal cord and nerves.

The Flow of Information in the Nervous System

Learning Outcome:

- To find out about how information is passed through the nervous system.

Copy the following picture of a neurone into your jotter and label it using the words below:



WORD BANK:

Cell Body

Axon

Dendrites

Myelin Sheath

Impulse

What is the gap between two neurones called? _____

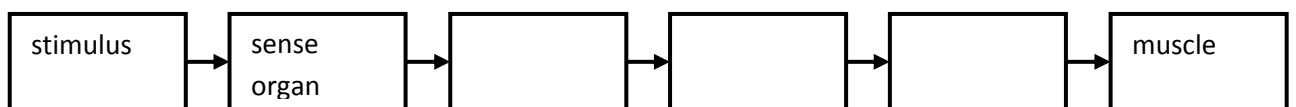
What do we call the chemical that is produced at the axon terminals and crosses the gap? _____

The Flow of Information in the Nervous System cntd.

Learning Outcome:

- To find out about how information is passed through the nervous system.

Complete the flow chart to show the flow of information in the nervous system.



Success Criteria:

- I can state that the nerves carry information from the senses to the CNS and from the CNS to the muscles.
- I can state that the central nervous system sorts out information from the senses and sends messages to those muscles which make the appropriate response.

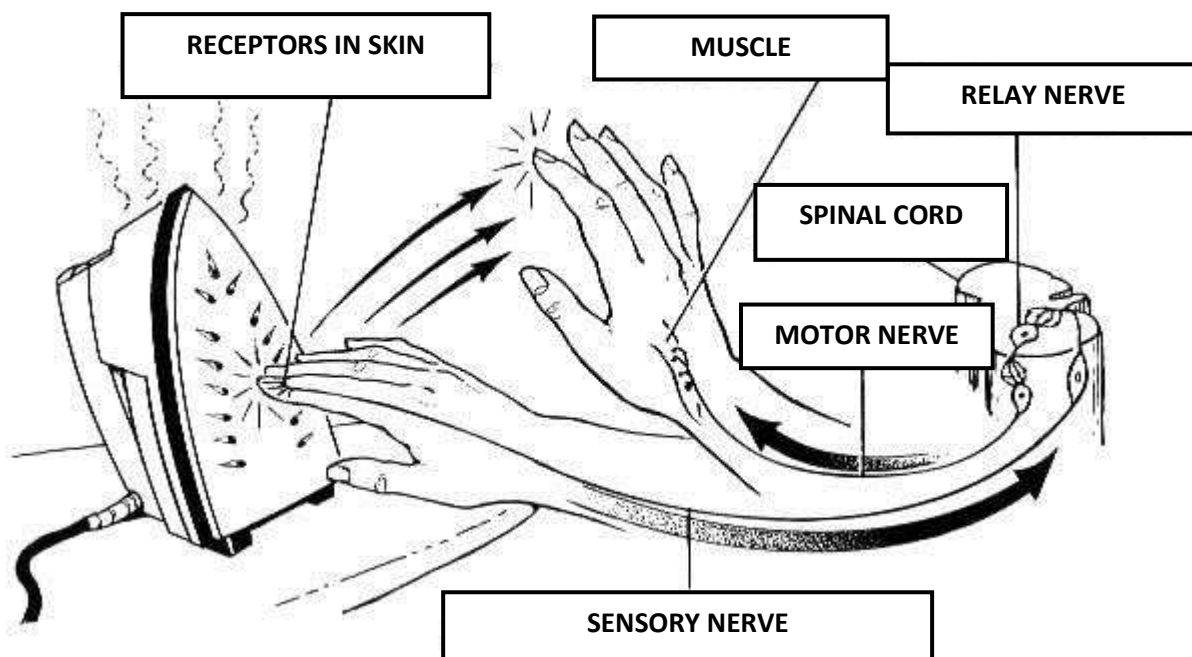
Reflex Actions

Learning Outcome:

- To find out about how a reflex action works.

A reflex action is a rapid, automatic response to a stimulus. They protect the body from damage. For example, you would pull your hand away from a hot flame without thinking about it.

A reflex action does not involve the brain, only the spinal cord and is therefore very fast. They are quick because there is a direct link, a relay nerve, in the CNS between the sensory nerves and the motor nerves for the correct response. This is known as a reflex arc.



In the above diagram the stages of a reflex reaction are shown.

1. COPY the sentence in **bold** into your jotter.
2. Blinking in response to a speck of dust landing on the surface of the eye is an example of a reflex action. Describe how it works.
3. COLLECT a diagram of the reflex arc and label using the following words: SPINAL CORD, RELAY NERVE, SENSORY NERVE, MOTOR NERVE

Success Criteria:

- I can describe how a reflex action works, using a simple model of a reflex arc.

Hormone Research Task.

Learning Outcome:

- To understand the function of a hormone.
- To name some examples of hormones and what they do.

Use the website below to answer the following questions:

<http://www.ftmguide.org/hormonebasics.html>

What is a hormone?

What is endocrinology?

Where do hormones come from and what do they do?

How many hormones have been identified so far in the human body?

List some functions of hormones in our bodies.

How do hormones cause their effects?

How are hormones regulated in the body?

Your teacher will now check that you have answered the questions correctly.

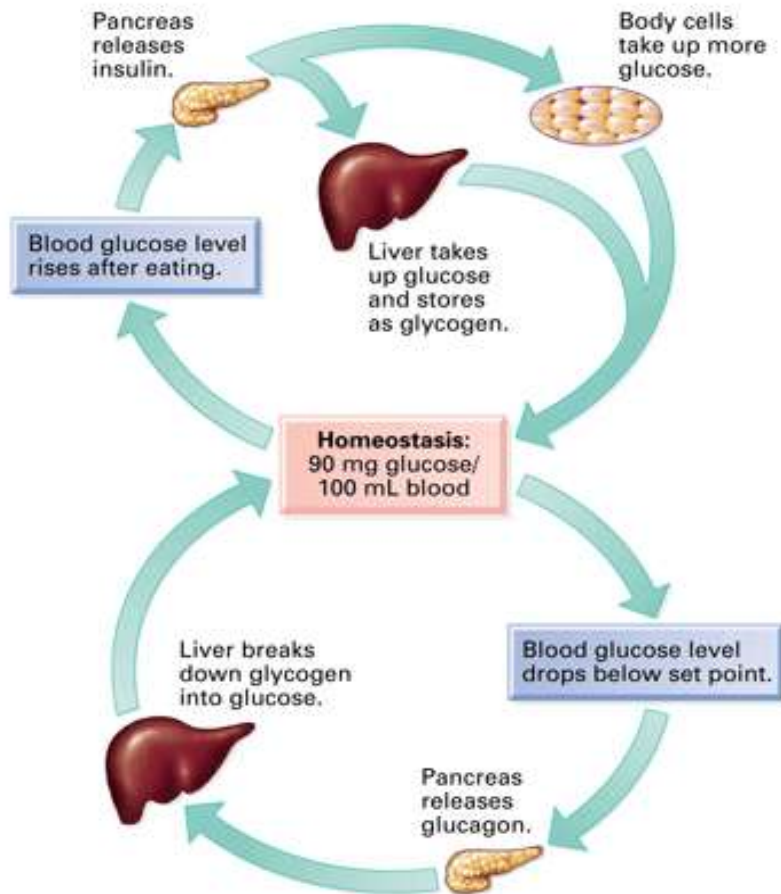
Carry out an internet search of your own on a human hormone of your choice. You must include:

- the name of the hormone,
- where it is produced?
- where it works?
- and what it does?

Controlling blood sugar levels

Learning Outcome:

You will learn about the hormones involved in controlling blood sugar levels.



Copy the passage below into your jotter and fill in the missing words using the word bank below.

BLOODSTREAM LIVER SUGAR
GLUCOSE GLYCOGEN GLUCAGON
INSULIN LOW PANCREAS

When the _____ levels in the blood get too high, the pancreas produces the hormone _____. This travels in the _____ to the _____ where it helps to convert glucose to _____ (the storage carbohydrate in animals).

When the sugar levels in the blood get too _____, the _____ produces the hormone _____. This also travels in the blood to the liver where it helps to convert glycogen to _____.

Success Criteria:

I can name the two hormones that are involved in controlling blood sugar levels.

I know which hormone works when there is too much sugar and too little sugar.

Diabetes

Learning Outcome:

- to study the different types of diabetes and know the differences
- To learn the symptoms of diabetes.
- To know how diabetes is treated.

Copy the following sentence into your notes.

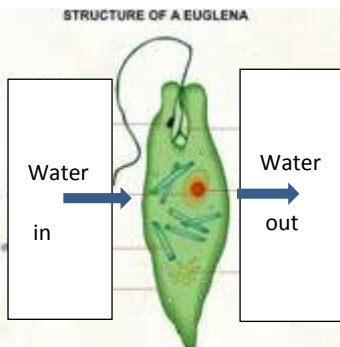
Diabetes is a communication pathway that has failed due to a fault in the release of or a failure to respond to the hormone insulin.

The need for transport

Learning Outcomes;

- To understand that multicellular plants and animals need transport systems to carry essential substances to all parts of the organism, because they have a low surface area to volume ratio.

After looking at the power point and listening to your teacher, copy and complete the following statements correctly.



In _____ animals and plants, water, gases, sugars and other substances can move directly into or out of the cell by the processes of osmosis and diffusion.

However, _____ organisms require more complex transport systems to carry substances to all parts of this much larger organism.

This is because a multicellular organism has a small _____ to volume ratio.

Watch the video that explains surface area to volume.

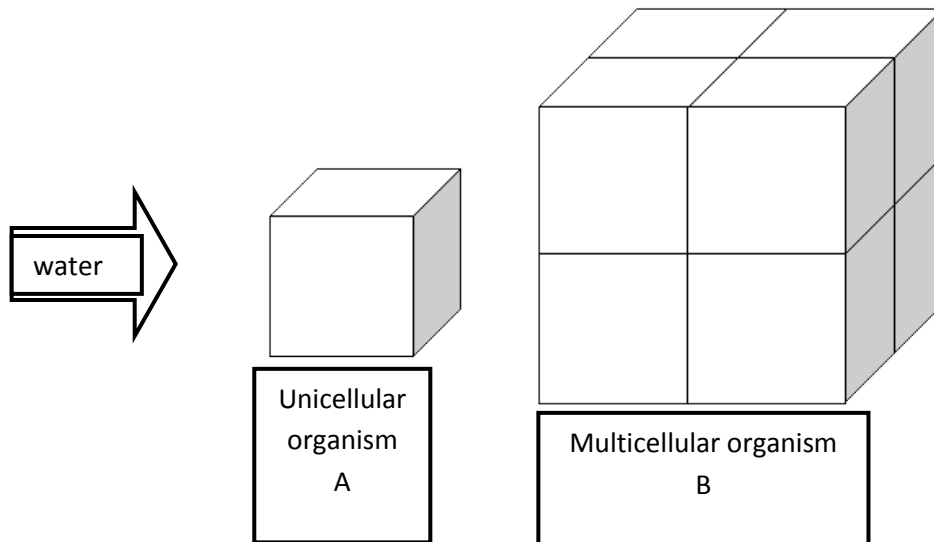
Complete the table showing the surface area and volume of the 'animals' in the power point then calculate their surface area to volume ratio.

Size of 'animal'	Surface area (cm ²)	Volume (cm ³)	Surface area/volume ratio
small			
medium			
large			

Copy and complete the following:

Conclusion: As an organism increases in size, its surface area to volume ratio _____.

Compare the two 'organisms' below, draw them and answer the questions that follow:



Q1. Which 'organism' would allow water from outside to reach all parts of the cell quickly?

Q2. Which would require a special water transport system to carry water to all parts?

Q3. Explain your answer in terms of surface area to volume ratio.

Success Criteria:

I understand that multicellular organisms need transport systems to carry substances to all parts of their bodies because their surface area to volume is low.

Lesson 2+3 Plant transport systems

Learning Outcomes:

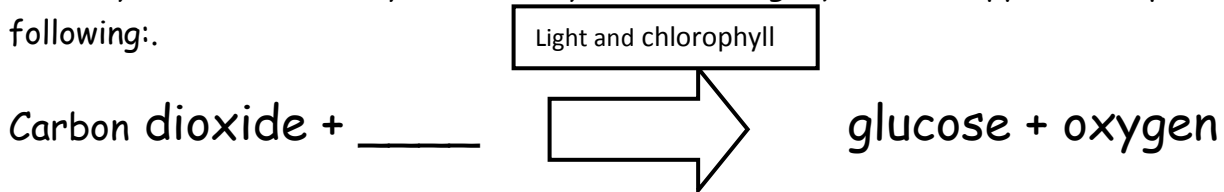
- Know the main structures concerned with water movement through a plant.
- Know the functions of these structures

Copy and complete the following:

Plants

Green plants are the producers in every food chain. They produce sugar in a process called Photosynthesis using _____ energy from the sun. They store this food in their leaves as _____. Apart from light energy, plants also require water and the gas _____ to carry out photosynthesis. _____ is produced as a 'by-product'

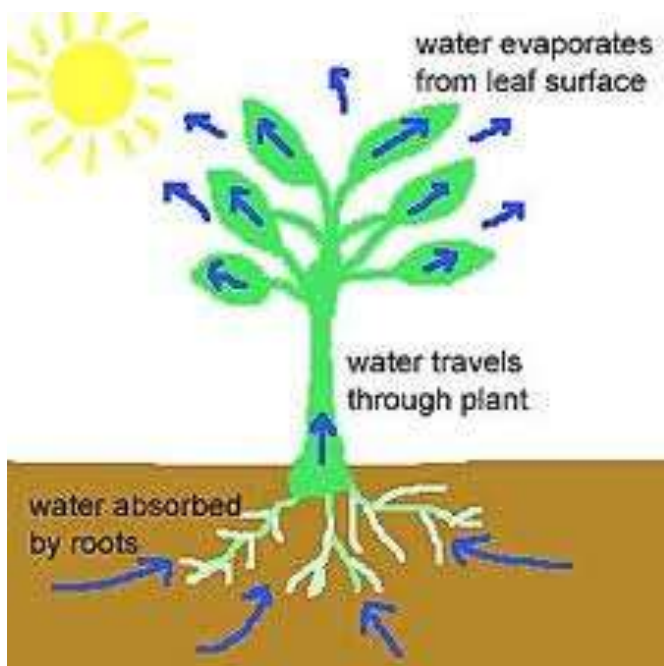
Photosynthesis can be represented by the following equation: copy and complete the following:



Since most plants are multicellular, they require a special transport system to carry this water from the soil to the leaves of the plant.

The water transported also carries dissolved _____ that are important for the growth of the plant.

Water moves through the plant as shown in the diagram. Write the heading then draw and label the diagram.



The main **structures** involved in water transport in a plant are:

1. Root hairs
2. Guard cells
3. Stomata
4. Xylem
5. Epidermis
6. Mesophyll cells

Look at the power point slides that explain water transport in a plant. After this, complete the following using class resources.

To do:

1. Collect diagrams of the cross section of a leaf and the xylem vessels and label the parts.
2. Now make a table to show the **structure and function** of each of the 6 structures involved in water transport (previous page).

Following the power point slides, copy and complete the following with the help of the word bank:

The root hair cells provide a _____ surface area for water and mineral uptake. The water enters by a process called _____.

The water continues to move by osmosis across the _____ of the root and into the _____.

The water is then carried up to the leaf cells where some of it is used for photosynthesis. The rest of the water passes out of the leaf through the _____. This evaporation of water from the leaf is called _____. Transpiration is important to pull water up from the roots to the leaves of a plant.

Transpiration osmosis stomata cortex large xylem
--

Collect a diagram of stomata , glue it in your jotter and answer the questions:

1. Where would you find stomata on a leaf?
2. A what times of the day are they a) open, b) closed?
3. Describe the changes in turgidity that causes them to open and close.

Success Criteria:

- I am able to describe the movement of water through a plant.
- I understand that transpiration is the evaporation of water from the leaves and this causes the upward movement of water in a plant.

Sugar transport in a plant:

Learning Outcome:

To understand that phloem vessels transport soluble sugars around the plant.

To know the difference between phloem and xylem vessels and to be able to describe their main features.

Using class resources:

1. Glue in the diagram of the phloem vessel and the xylem vessel and label them clearly.
2. Glue in the diagram of the cross-section of a stem of a young plant and label the two vessels clearly. Use 'POXI' to describe their position in the stem of a plant.
3. Examine slides of phloem and xylem under the microscope and /or bioviewer then draw and label what you see.
4. Copy and connect the statements to the correct transport vessel:

Xylem

living cells

Have sieve plates

Are lignified

Phloem

transport water

Transport sugars up and down a plant

Dead cells that form a hollow tube

Success Criteria:

- I am able to recognise and describe the main features of phloem and xylem vessels.

Lesson 4 Experimental to view parts of a plant involved in water transport.

Learning Outcome:

- To be able to carry out simple experimental procedures to view the parts of a plant involved in the transport of water and minerals.

Work through the following carefully, answering any questions included using class resources where required.

1. Viewing the root hairs in a germinating seed.

Collect a germinating seed and view it under the microscope to see the root hairs. Draw what you see in your jotter with a description.

Explain why root hair cells increase water uptake from the soil?

2. Viewing the stomata and the guard cells in the leaves of the plant.

Use the plant provided and using your microscope on low power (at first) view the stomata.

Draw the stomata. Are they open or closed? Suggest why at this time of day.

3. Viewing the xylem.

Collect a piece of celery and place it in a beaker containing 10ml of the dye solution. Look at the result after 10 minutes.

Carefully cut the celery lengthways and remove some of a xylem vessel. Examine it under the microscope and look for lignin.

Explain what happened when it was in the dye and explain why xylem is lignified?

4. Transpiration.

View the experimental set up of transpiration.

Draw a diagram of it and label it clearly. Explain how you know that transpiration is occurring. By what process does water leave the leaf?

Success Criteria:

- I am able to carry out simple procedures to view the parts of a plant that are involved in water transport.

Lesson 5 Experiment to measure transpiration rate.

Learning Outcome:

- To be able to measure the transpiration rate in a leafy shoot.

Measuring the transpiration rate.

Transpiration rate is measured using a **potometer**.

Your teacher will explain how a potometer is set up.

- In your group, work together to make a note on how potometers are used to measure transpiration rate.
-
- Now convince your teacher that you are able to carry out a simple experiment to measure the transpiration rate of the leafy shoot.
- Measure the transpiration rate of the shoot over 15 minutes.
- While you are waiting, draw a diagram of your set up and copy the table below.
- After 15 min, put your results into the table and collect results from the other groups.

<i>Leafy shoot</i>	<i>Environmental conditions</i>	<i>Distance bubble moves over 15 min</i>	<i>Rate of transpiration per hour</i>
1			
2			
3			
4			

- Which shoot was used as a control?

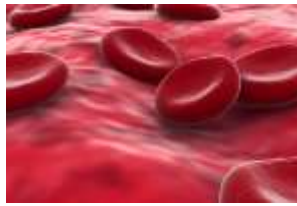
Compare your result with the control experiment.

- Name three environmental factors that alter transpiration rate.
- Now use class resources to list any other environmental factors that also do this.

Success Criteria:

- I can carry out an experiment to measure transpiration rate.

Lesson 6 Animal transport



The blood:

Learning Outcome:

To know the blood transports oxygen, carbon dioxide, waste and nutrients to and from the cells of the body.

1. Copy the heading.
2. Name the process by which cells produce energy.
3. Write the equation for respiration.
4. Copy the diagram
5. Copy and complete the table.

<i>Substance transported</i>	<i>Transported from</i>	<i>Transported to</i>	<i>Method of transport</i>
Digested food (glucose and amino acids)			
Oxygen			
Water			
Carbon dioxide			

Success Criteria:

I am able to state that oxygen, nutrients and waste products are transported to and from cells of the body in the blood.

Lesson 7+8 The heart, circulation and blood vessels.

Learning Outcome:

I will understand:

- The blood is the transport system in the body.
- How the heart pumps blood to major organs in the body.
- The circulation of blood through the heart.
- The structure and function of blood vessels involved in transport of the blood.

Use classroom resources **and the internet** for this lesson.

<http://www.abpishools.org.uk/res/coResourceImport/resources04/heart/heart2.cfm>

1. Collect both diagrams of the heart.
2. Using page 4 of the website, label the diagram of the outside of the heart.
3. Describe the importance of the coronary arteries.
4. Using page 10 of the website, label the diagram of the inside of the heart.
5. Using page 2 of the website, complete the table below describing the blood vessels associated with transport of the blood.

Name of blood vessel?	Direction of blood flow?	Valves present and why? (Your teacher will help here)	Thickness of wall and reason?	In direct contact with cells? Explain.

6. Using page 4 of the website, copy and complete the following:

The heart is made of muscle, is about the size of a fist and its function is to pump blood to the lungs and then around the body.

Deoxygenated blood travels from the body to the heart in a vein called the _____ and enters the _____. The right atrium contracts and blood is forced through a valve into the _____. This contracts and squeezes blood through another _____ and out of the heart through the _____. It is this blood vessel that carries blood to the lungs to be oxygenated.

The oxygenated blood returns to the left side of the heart in the _____. It enters the _____ of the heart. This chamber contracts and forces blood through a valve into the _____. The right ventricle contracts and forces blood through another valve and out through the main artery called the _____.

_____ are present in the heart to stop the blood from flowing backwards.

Success criteria:

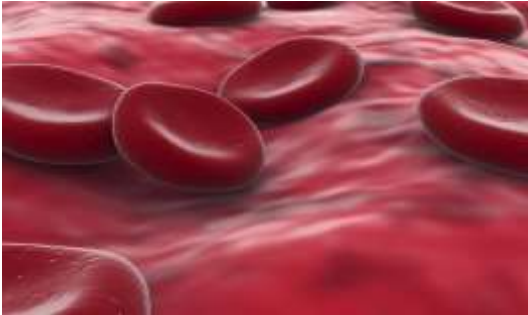
I understand:

- The blood is the transport system in the body.
- The circulation of blood through the heart.
- The structure and function of blood vessels involved in transport of the blood.

Lesson 7+8 (continued) Red blood cells

Learning Outcome:

- To understand the importance of red blood cells.



Answer the following in sentences using information from the powerpoint:

1. What is the function of red blood cells?
2. Why are they so efficient at their job?
- 3 A pigment is a coloured substance, name the pigment that red blood cells contain.
4. Explain what happens to this pigment
 - (i) at the lungs
 - (ii) when it reaches body cells.

Success Criteria:

- I am able to describe how red blood cells are able to deliver oxygen from the lungs to body cells.

Learning Outcomes:

- To understand that the lungs are the organs of gas exchange.
- To know their structure.
- To understand the importance of the alveoli in gas exchange.

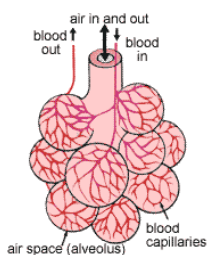
1. **Use class resources** and the sheet provided to create a fully labelled structure of the lungs.

2. Describe the **function** of each of the following parts of the lungs:

- Trachea
- Bronchus (bronchi)
- Bronchioles
- Alveoli (air sacs)
- Rings of cartilage
- diaphragm

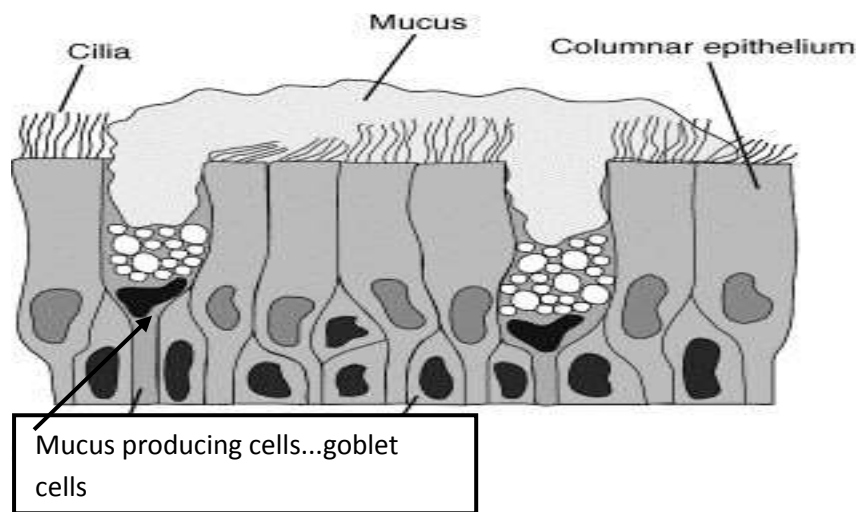
Alveoli and their importance in gas exchange with the blood.

Using the power point, copy the diagram of an alveolus , label it then copy and complete the table below using information.



Part of alveolus	Special design for gas exchange
Thin walls	
	So that gases can dissolve and diffuse easily through the alveolar wall and into the blood.
Large surface area	
	So that gases pass directly into /out of the blood during gas exchange.

How air is cleaned before it enters the lungs.



Complete the following:

1. Copy the heading.
2. Glue in and label the diagram.
3. Use class resources to describe how air is cleaned before it enters the lungs.
4. Try to find out why heavy smokers have a 'smokers' cough'.

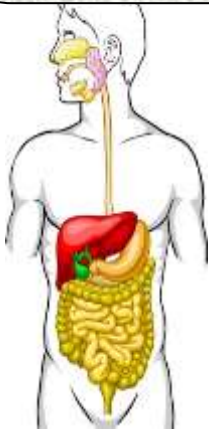
Success Criteria:

- I can describe the structure and function of the lungs, the role of the alveoli.
- I know how air is cleaned before it enters the lungs.

Lesson 10 The digestive system

Success Criteria:

- I understand that the digestive system breaks down large food particles into small molecules that can be absorbed into the blood for transport.
- I can list the parts of the digestive system and understand the role each plays in digesting food.
- I understand what peristalsis is and its importance in moving food through the gut.



Using a suitable website or class resources .

1. label the parts of the digestive system and glue it in your jotter.
2. Copy and arrange the 'heads and tails' linking the structure and function of each part.

Structure	Function.
Oesophagus	Muscular sac that churns food with acid and an enzyme to digest protein.
Stomach	where faeces are stored.
Small intestine	produces bile to help break up fats.
Large intestine	faeces pass out of the body here.
Rectum	stores bile
Anus	where food is transported to the stomach from the mouth
Liver	water is removed from food waste here to form solid faeces
Gall bladder	where digested food passes into the blood from the gut

Peristalsis

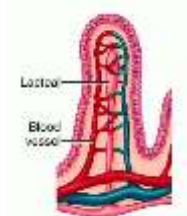
Listen to your teacher describe peristalsis then use class resources to answer the questions below:

1. Of what type of tissue is the gut made if it is able to contract?
2. As food moves through the gut where does contraction take place?
3. Where does the muscle have to be relaxed?
4. What does this do to the food?
5. Name two parts of the digestive system where peristalsis occurs.
6. Glue in your diagram and label it.

Use class resources and the power point slide to complete the following:

Absorption of digested food into the blood.

1. Where does absorption of food into the blood take place in the digestive system?
2. Name the tiny structures where this absorption takes
4. Which soluble foods enters the blood capillary?
5. What is absorbed into lacteal?
4. Give 3 reasons why the structure of the villus is suited to its function.



Success Criteria:

- I can list the structure and function of each part of the digestive system.
- I understand the role of peristalsis.
- I know that food enters the blood at the small intestine through villi and how they are suited to their function.

Reproduction

Learning outcomes:

- To find out about the number of chromosomes in body cells, gametes and fertilised eggs (zygotes)
- Be able to identify gonads as organs which produce gametes

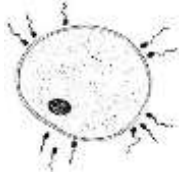
Body Cells are Diploid - they contain the full number of chromosomes in pairs. In humans this is ___ chromosomes found as ___ pairs.

Gametes (sex cells) are Haploid - they contain half number of chromosomes - 1 from each pair. In humans this is ___ chromosomes.

During fertilisation - 2 gametes fuse - the two half numbers are combined to make the full chromosome complement. In humans, a fertilised egg (zygote) will contain:

___ Chromosomes from the egg nucleus and

___ Chromosomes from the sperm nucleus to make the 46 chromosomes in ___ pairs.



Are Zygotes diploid or haploid?

A **gonad** is an organ which produces gametes. Complete the table:

		Gametes	Gonads
Animal	Male		
"	Female		
Plant	Male		
"	Female		

Success Criteria:

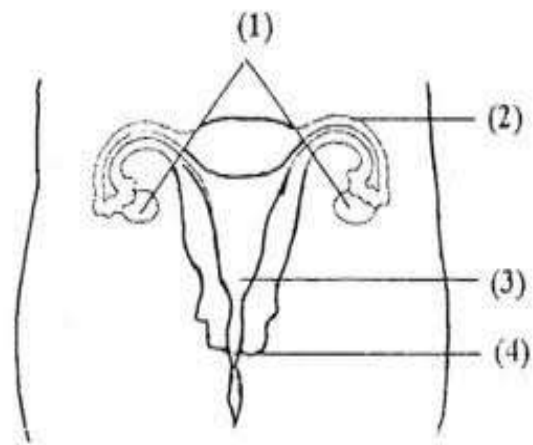
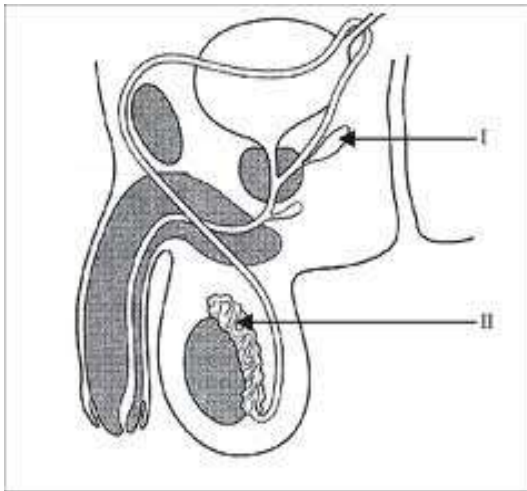
- I can identify the number of chromosomes in cells, gametes and fertilised ova.
- I can identify gonads in animals and plants.

Gamete production in Mammals

Learning outcomes:

- To identify animal gonads as sites of gamete production
- To compare features of male and female gametes

Label the diagrams of the male and female reproductive systems. Use a highlighter on the names of organs which are gonads



Complete the table to compare what we know about animal gametes.

	Ova	Sperm
Relative size		
Able to move?		
Contain food store?		

Success Criteria:

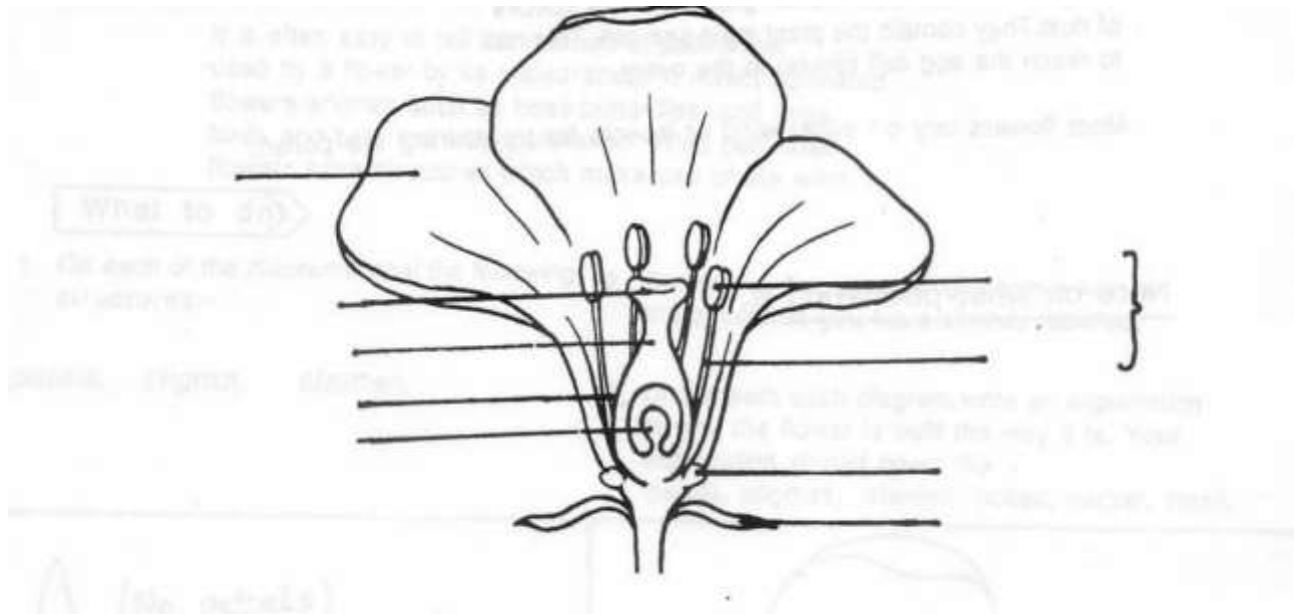
- I can identify gonads in animals
- I can compare male and female gametes

Gamete production in flowering plants

Learning outcomes:

- To identify plant gonads as sites of gamete production

Label the diagram of a typical flower. Use a highlighter on the names of the flower parts that are gonads.



You may be able to dissect a flower now.

Attach onto this page a stamen removed from the flower, clearly labelling where pollen grains are produced. You may be able to also remove the ovary. (Microscopes may be available to view the pollen grains and any ovules present inside the ovary.)

Success Criteria:

- I can identify the areas that produce pollen and ovules in flowers (the gonads)

Variation

Learning Outcomes:

- To identify and give examples of discrete and continuous variation

Within any group of living things there will be naturally occurring differences. We call these differences **Variation**. Variations can be described as discrete or continuous.

Discrete Variation	Continuous Variation
Clear cut, usually seen or _____ e.g. 1. 2. 3.	Wide range of values and can be _____ e.g. 1. 2. 3.

Presenting Information: (Optional activity)

1. Collect data on heights from all the members of your class and arrange their heights into sets. Plot these as a histogram. Note the typical shape showing 'natural distribution'.
2. Collect data from the members of your class about their tongue rolling ability and present your findings as a bar graph or pie chart.
3. Which type of variation may be influenced by environmental factors?

Success Criteria:

- I can identify features of discrete and continuous variation and give examples of both.

Family Trees, Phenotypes and Genotypes

Learning Outcomes:

- To follow family trees that show the inheritance of characteristics
- To use the words phenotype and genotype
- To find out some facts about Mendel

.From the power point, write down the meaning of the following terms:

1. Family Tree
2. Phenotype
3. Genotype
4. The famous scientist who is credited with some of the first work on genetics
5. Use books to look up the word 'allele' - write down what it means.
6. What are the 2 alleles that Mendel described in pea plants?
7. Use the book to follow the family trees showing other characteristics -
 - Red hair in humans
 - Tongue rolling in humans
 - Wing type in fruit flies
8. Extra - try to find out when and where Mendel did his initial work with pea plants. Did he study other characteristics or other organisms?

Success Criteria:

- I can follow the pattern of inheritance using family trees
- I can use the terms phenotype and genotype and have learned about Mendel

Dominant and Recessive Characteristics

Learning Outcome:

- To understand that some genes have a dominant and recessive form.
- To use the terms homozygous and heterozygous when describing genotypes.

From the board give the meanings of dominant and recessive:

Dominant genes _____

Recessive genes _____

Complete the table - one row has been left for your own example.

Characteristic	Genotype	Phenotype
Height in pea plants	TT	
	Tt	
	tt	
Tongue rolling in humans	RR	
	Rr	
	rr	

The above characteristics are examples of _____ variation.

Homozygous and Heterozygous Genotypes

1. Write down the meaning of these terms.
2. Identify homozygous and heterozygous genotypes in the table above. Use a highlighter and make a key.

Success Criteria:

- I can identify dominant forms of genes.
- I can identify homozygous and heterozygous genotypes.

Genetics Crosses

Learning Outcomes:

- To follow the inheritance of a characteristic through two generations
- To use a punnett square to predict the outcome in a genetics cross

In pea plants round seed coat is dominant to wrinkled seed coat.

True breeding plants with round seeds were crossed with true breeding plants with wrinkled seeds. Using a capital letter to represent the dominant allele and the corresponding small letter to represent the recessive allele follow the cross through to the F₂ generation. The framework is set out for you below.

	Round	X	Wrinkled								
P phenotype											
P genotype	_____		_____								
gametes	_____		_____								
F ₁ genotypes	_____										
F ₁ phenotype	_____										
Cross the F₁ generation											
P phenotype	_____		_____								
P genotype	_____		_____								
gametes	_____		_____								
Punnett Square to show combination of gametes	<table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <tr><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td></tr> <tr><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td></tr> </table>										
F ₂ genotypes	_____	_____	_____								
F ₂ phenotype	_____										

Success Criteria:

- I can follow the inheritance of a characteristic through two generations and use a punnett square to predict the outcome of a cross

Polygenetic Inheritance

Learning Outcomes:

- To know what polygenetic Inheritance is and be able to give some examples of characteristics inherited in this way

Use the information on the power point to complete these statements:

- Polygenetic inheritance is when characteristics are controlled by _____.
- These genes interact with each other and - _____
- This results in a _____ of phenotypes which show examples of _____.
- Examples of polygenetic inheritance in humans :
- Examples of polygenetic inheritance in plants or animals:
- Illnesses or diseases where polygenes are thought to be involved:

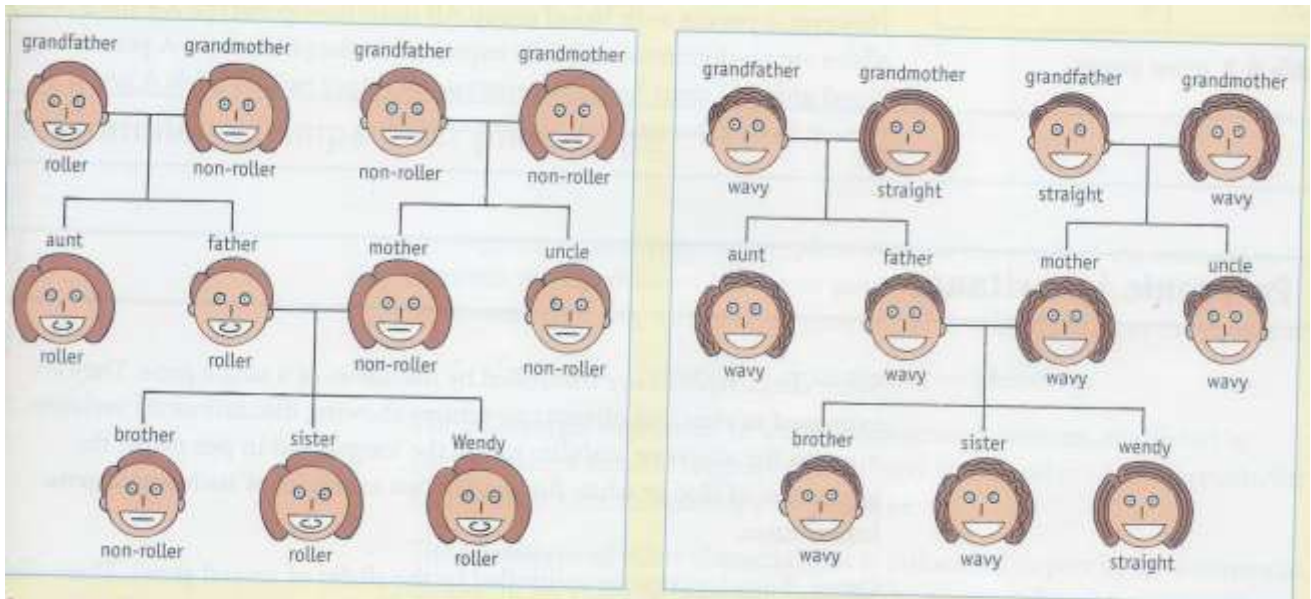
Success Criteria:

- I now know what polygenetic Inheritance is and I am able to give examples of characteristics controlled in this way.

Human Inheritance - Identifying Individuals

Learning Outcomes:

- To follow family tree diagrams to identify individuals and their possible genotypes.
- In humans, the allele (gene) for tongue rolling ability (R) is dominant to that for inability to roll the tongue (r).
- In humans, the allele (gene) for wavy hair (H) is dominant to the allele for straight hair (h).
- Study the family trees and answer the questions that follow.



- From which parent did Wendy inherit her tongue rolling ability?
- From whom did Wendy receive the genetic information that gave her straight hair?
- Identify one other person who will have the same genetic information for tongue rolling as Wendy.
- How many individuals have the genotype rr ? Name them.
- Using the symbols R/r and H/h re-write each family tree giving the genotypes of the individuals.

Success Criteria:

- I can identify individuals and give their possible genotypes using family trees.

Human Genetics and counselling - optional activity

Learning Outcomes:

- To identify some human medical traits that carriers may receive genetic counselling.

Cystic Fibrosis (C.F.) is a condition caused by a recessive gene (c) - a person who has this condition will have the genotype cc and will have inherited a recessive gene from both parents. Carriers of this condition have the genotype Cc and do not suffer the symptoms of the condition.

In Scotland, one in twenty of the population is a carrier for the recessive C.F. gene. What are the chances of two individuals, who are both carriers, having a child affected by C.F.?

Do you know what the symptoms of C.F. are and how these affect the life of the sufferer?

Some health boards have Genetic Counsellors to help couples work out the possible risks and chances of having children affected by such conditions.

Are there other medical traits that can be inherited in this way?

Success Criteria:

- I can identify medical traits that may receive genetic counseling.

Gene Jury Activity

Learning Outcomes:

- To use 'gene jury' to investigate the facts and ethics involved with 'designer babies'.

You will need access to the internet for this activity.

Visit <http://www.genejury.biology.ed.ac.uk>

Go to the PGD - 'Choosing babies' page and follow the links and real life stories.

Note anything that you find out or that you agree with or disagree with here. Your teacher may lead a class discussion on this topic.

Success Criteria:

- I have considered the ethics and dilemmas involved with 'Designer Babies'.

Effects of lifestyle choices on animal transport and exchange systems

LEARNING OUTCOMES:

- To understand what is meant by physical and mental health
- To identify how healthier lifestyle choices can directly and indirectly improve the physical and mental health of an individual
- To take physiological measurements and investigate how moderate exercise affects these measurements
- To debate whether all illnesses should be treated for free under the National Health Service in the UK

What do we mean by lifestyle choices?

COPY the following note into your jotter.

LIFESTYLE CHOICES

Lifestyle is the typical way of life of an individual, group or culture.

A lifestyle usually reflects an individual's attitudes, values or views.

Lifestyle choices can affect the physical and mental health of the individual.

USING the NHS CHOICES WEB SITE -

<http://www.nhs.uk/Pages/HomePage.aspx>, or any other suitable class resource:

COMPLETE YOUR NOTE by writing down in your jotter -

- A description of what is meant by physical health
- A description of what is meant by mental health
- A list of FIVE LIFESTYLE CHOICES which might affect the physical and mental wellbeing of an individual.

CLASS DISCUSSION

You should now discuss the lifestyle choices you have listed with the rest of your class, and then ANSWER the FOLLOWING QUESTIONS.

- 1. Can you decide which of these lifestyle choices could have the greatest impact on the physical and mental health of the individual?*
- 2. Which ones would have the greatest effect on the society in which the individual lives, and why?*

MENTAL HEALTH

Mental health refers to a person's state of mind or emotional wellbeing. The person realizes their own abilities, can cope with the normal stresses of life, can work productively and is able to make a contribution to his or her community.

GROUP WORK

USING the following web site: <http://www.mind.org.uk/>

(Mind Home > How can we help > Information and advice > Mental Health A-Z > Mental Health Problems)

Each person in the group should write down:

- The names of 5 of the most common mental health problems
- A list of 4 common early signs seen in a person who has a mental health problem

Each person in the group should now choose ONE of the mental health problems they have listed, and write a short report of around 100 words.

Each person in the group should choose a different mental health problem, so that the reports can be compared and discussed.

In the report you should:

- State what the mental health problem is
- Explain what the early symptoms of this problem are
- Describe any lifestyle changes the person could make to improve their mental health.

PHYSICAL HEALTH

Physical health means good body health, because of regular physical activity (exercise), good nutrition and adequate rest.

It requires abstaining from drug abuse, avoiding alcohol abuse, good hygiene and getting the right amount of sleep.

Poor physical health will affect parts of the body such as the heart, lungs, skin, teeth and hair.

Physical health can be measured by taking **PHYSIOLOGICAL MEASUREMENTS**.

COPY the following note into your jotter.

Physiology is the study of how the human body works.

Physiological measurements such as measuring blood pressure, pulse rate, recovery time and reaction time can be used to indicate the state of a person's health.

These measurements can be compared with the average values for healthy individuals, and could give an unhealthy person the chance to improve their lifestyle before it is too late.

Practical work: TAKING SOME PHYSIOLOGICAL MEASUREMENTS

You will now carry out some experiments where you will measure some or all of the following:

- **Blood Pressure**

This is the pressure of the blood in your arteries. It can be measured using a digital sphygmomanometer.

- **Pulse rate and Recovery Time**

This is a measure of the number of times the heart beats per minute. Recovery time is the time taken for the pulse rate to return to its normal resting value after exercise. The shorter the recovery time the fitter the person.

- **Reaction Time**

This is the time taken to respond to a stimulus. It can be affected by drugs, alcohol and a person's state of health. A very slow reaction time could indicate that a person is suffering from illnesses such as diabetes or a brain disorder.

A good web site to test your reaction time is:

<http://www.bbc.co.uk/science/humanbody/sleep/sheep/>

- **Peak Flow**

This is the maximum rate at which air can be forced out of the lungs. It depends on level of fitness.

Your teacher will explain how each procedure should be carried out.

Measurements will be taken before and after a period of MODERATE EXERCISE.

This could be:

- *Running on the spot for 3 minutes*
- *Carrying out step exercises for 3 minutes*
- *Running up and down a flight of stairs several times.*

For each physiological measurement that you make, an EXPERIMENTAL REPORT should be written up in your jotter.

Each report should include:

- A title
- An aim
- A description of how the measurement was taken
- A table of results
- A conclusion - what effect did the period of moderate exercise have on the results?



Lifestyle Effects on Health

1. The CARDIOVASCULAR SYSTEM

Cardiovascular disease (CVD) means all the diseases of the heart and circulation. It includes CORONARY HEART DISEASE (Angina and Heart Attacks) and STROKES.

Cardiovascular disease is the biggest killer in the UK, responsible for around one-third of all deaths in 2009.

WATCH the FILM about how your cardiovascular system works:

<http://www.bhf.org.uk>

Using the BRITISH HEART FOUNDATION web site:

<http://www.bhf.org.uk>, and any other suitable class resources find out about CVD and how you can avoid it.

ANSWER the following questions in your jotter.

1. Make a short note on each of the three main types of CVD - Angina, Heart Attacks and Strokes.

2. What is atherosclerosis?

COLLECT a DIAGRAM showing how atherosclerosis occurs and GLUE it into your jotter.

3. Make a LIST of the MAIN FACTORS which INCREASE YOUR RISK of CVD.

DISCUSS your list with others in your group/class. Which ones do you consider to be the most important for your lifestyle?

READ the following passage and answer the questions based on it, in your jotter.

Young at Heart?

New research shows that decades of hard-won progress in reducing the risk of heart disease in America appears to be losing pace. Recent death rates from heart disease remain almost unchanged in men and women under 55 years old.

This trend comes at a time when even young people are increasingly likely to be obese, suffer from diabetes and have high blood pressure. Each of these increases heart attack risk.

Data from 1980 to 2002 showed that the death rate from heart disease had fallen. In the whole population there was a yearly reduction of 2.9 percent during the 1980s, 2.6 percent during the 1990s and 4.4 percent from 2000 to 2002.

However the numbers told a strikingly different story for people aged 35 to 54. The yearly death rate from heart disease fell by 6.2 percent in the 1980s, by only 2.3 percent in the 1990s and showed no reduction at all between 2000 and 2002.

The message is that heart disease has not gone away, and could become an even greater problem if people fail to pay attention to known warning signs. Dr F S Ford, a medical officer for the American government said, "Young adults should take stock of their lifestyles. Don't smoke and take at least 30 minutes of exercise per day. If you need to lose weight, you must burn more energy than you take in. Good habits should start early. Changes that lead to heart disease, for example hardening of the arteries, occur at an early age. Therefore it is especially important that children and young people develop appropriate habits that minimize their risk of heart disease later in life."

(a) From the passage, identify **three** factors which contribute to the risk of heart disease.

1. _____

2. _____

3. _____

(b) Complete the table below to show the changes in death rates for the whole population and for the 35-54 age group.

	<i>Average yearly reduction in death rate from heart disease</i>		
	<i>(%)</i>		
	1980-1989	1990-1999	2000-2002
Whole population			
35-54 age group			

(C) According to Dr Ford, why is it important that "good habits should start early"?

2. LUNG DISEASES

Lung diseases include CHRONIC BRONCHITIS, EMPHYSEMA, CHRONIC OBSTRUCTIVE AIRWAYS DISEASE and LUNG CANCER.

People with these diseases have trouble breathing in and out because of long-term damage to their lungs, usually caused by smoking.

These diseases affect an estimated 3 million people in the UK.

WATCH the VIDEO on Chronic Obstructive Pulmonary Disease (COPD)

- <http://www.nhs.uk/conditions/chronic-obstructive-pulmonary-disease/Pages/Introduction.aspx>

Then, use the website to ANSWER the following questions in your jotter.

1. Why does COPD happen?
2. Who is affected?
3. How is it diagnosed?
4. How is it treated?
5. How can it be prevented?

LUNG CANCER

Cancer is a loss of normal control over cell growth and division. The uncontrolled cells grow to form a TUMOUR.

Lung cancer is cancer that arises from the cells in the lungs. It can start in the windpipe (trachea), the bronchus or the lung tissue. It can then spread to other body tissues and organs.

WATCH the VIDEO on lung cancer: www.macmillan.org.uk/lungcancer

and then WRITE a SHORT REPORT about lung cancer - listing the symptoms, the risk factors, how it is diagnosed and how it is treated.

3. DRUG MISUSE

Drugs are substances which alter the way the body works. Some drugs are useful, for example antibiotics such as penicillin. However, there are many drugs which are dangerous if misused, and many of them are addictive or "habit-forming".

Alcohol and tobacco are the two main non-medical drugs which are legal in the UK. They can both do you a lot of harm, just like other illegal drugs such as heroin or cocaine.

Group Work

Using class resources produce a POSTER or POWER POINT PRESENTATION on one legal and one illegal drug.

Your group presentation should include:

- **The effects that the drugs have on a person's physical and mental wellbeing**
- **The consequences of the misuse of these drugs by individuals on society**

PRESENT your finding to the class for discussion.



THE BIG DEBATE

Some people believe that individuals who become ill because of their lifestyle choices such as smoking or abusing alcohol or drugs or over-eating should have to pay for treatment under the NHS in the UK, rather than receive treatment for free.



Your class is going to debate this motion.

You will get into groups and do some research.

Each group will then take it in turns to present arguments for or against the right of these individuals to receive free treatment under the NHS for their illness.

After the debate, each person in the class will be asked to VOTE by SECRET BALLOT.

Do you AGREE or DISAGREE with the motion?

The class results will be counted to see if the motion is carried or defeated.

Success criteria:

- I know the difference between physical health and mental health.
- I can identify some healthier lifestyle choices that will improve the physical and mental health of an individual
- I can take physiological measurements such as blood pressure, pulse rate and reaction time and describe the effect of moderate exercise on these measurements.
- I can debate whether all illnesses should be treated free under the National Health Service in the UK.