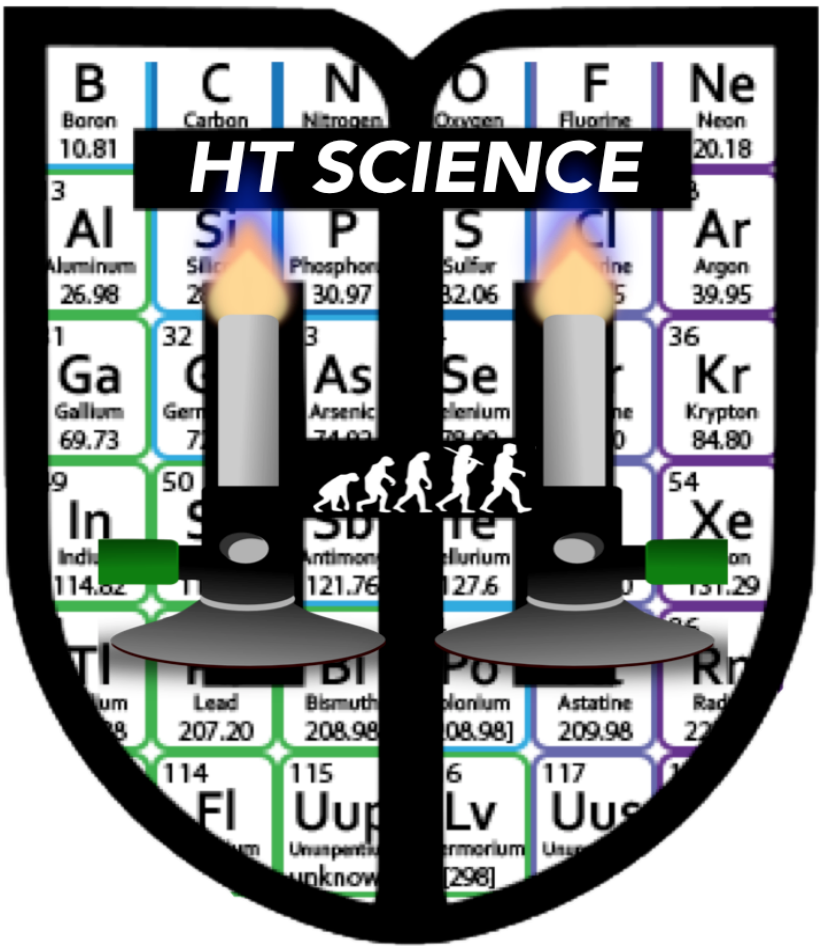
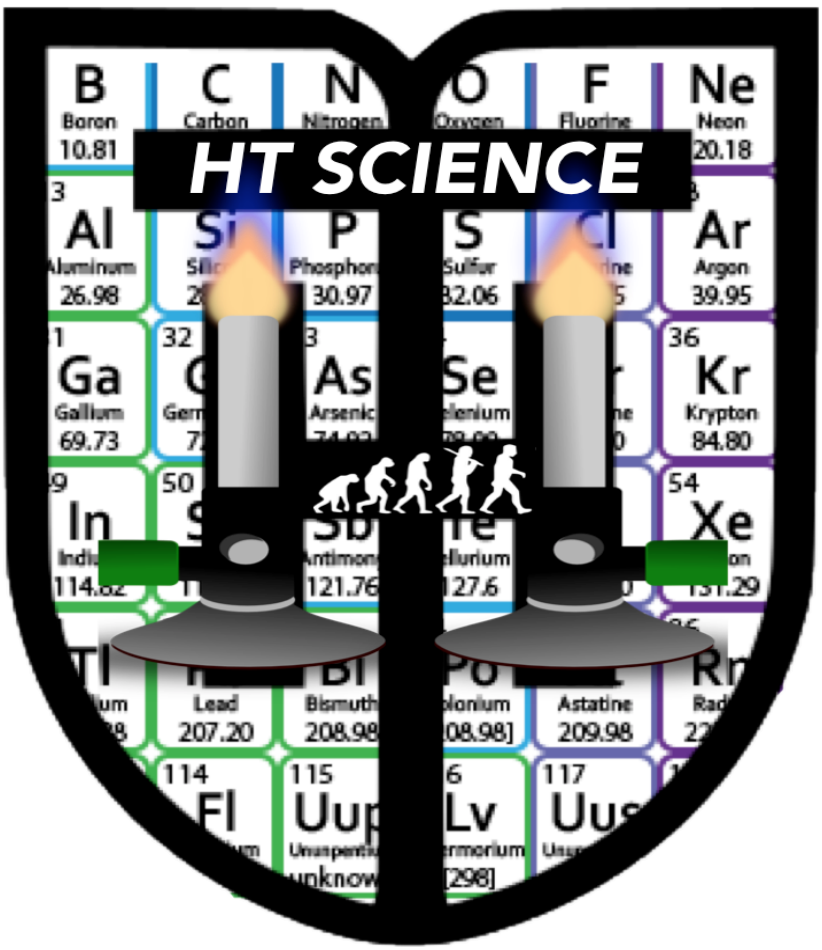
KS3 SCIENCE WORKBOOK



- You may need access to a computer or text book to complete some tasks.

BIOLOGY

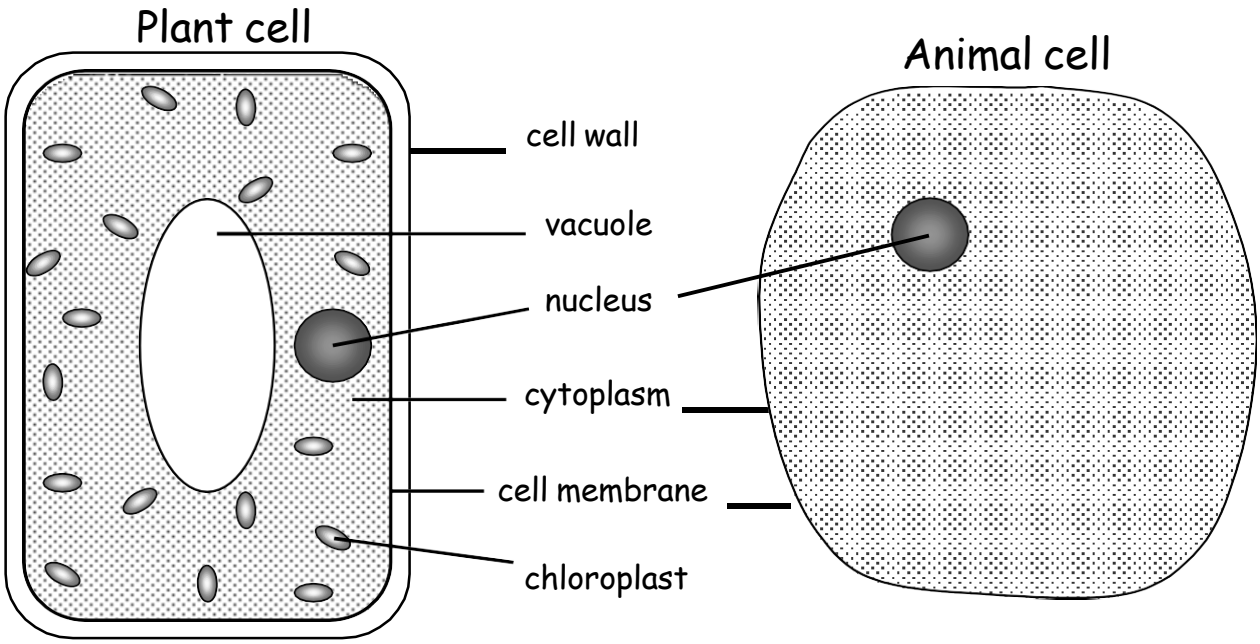


W.S.3. **Animal and plant cells.** Name ……

Exercise 1 – Fill in the missing words in the passage below.

The bodies of all plants and …… are made up of tiny living units called …… Some microscopic organisms consist of only a …… cell but the bodies of most plants and animals are made up of …… of cells. There are many different …… of plant and animal cells. The diagrams below show the …… that they usually contain.

parts **animals** **cells** **types** **millions** **single**



Exercise 2 – Join up the cell parts below to their correct jobs.

Cell part	Job
Nucleus	covers the membrane and gives strength to a plant cell.
Cytoplasm	controls what the cell does.
Cell wall	jelly that fills the cell, chemical reactions happen here.
Chloroplast	stores water in a plant cell.
Vacuole	absorbs light energy to make food for the plant.

W.S.4. Different cells for different jobs.

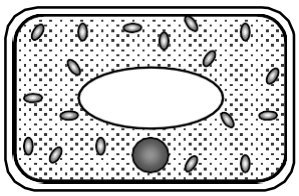
Name ……

Exercise 1 – Fill in the missing words in the passage below.

Nearly all cells contain a membrane, …… and cytoplasm. There are many …… types of cells. They vary in their shape and …… depending on their functions (jobs). Each type of cell is well …… (suited) to its function. In the human …… there are about twenty different types of cell, each has a certain …… to do. This makes the body work much …… than if each cell was trying to do everything.

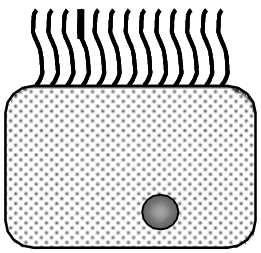
better different nucleus size body adapted job

Exercise 2 – Join up the cells below to their correct descriptions.



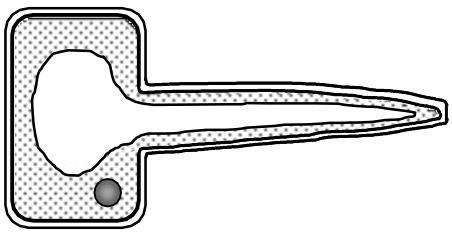
Ciliated cell

This cell is found lining the windpipe. Its surface is covered with tiny hairs called cilia. These waft dirt and germs up to the throat.



Palisade cell

This cell is found on the top side of a leaf. It contains tiny green discs called chloroplasts. These absorb sunlight in order to make food.



Sperm cell

It uses its tail to swim to the ovum. The head contains the nucleus which enters the ovum during fertilisation.

Root Hair cell

This is found on the surface of a root. Its job is to absorb water from the soil. It is long and thin with a big surface area to absorb water.

W.S.5. **A balanced diet.** Name ……

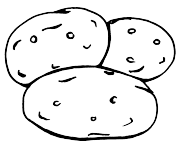
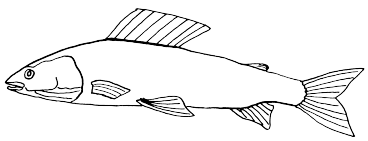
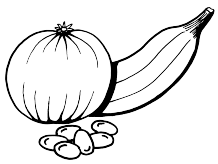
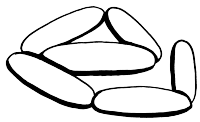
Exercise 1 - Fill in the missing words in the passage below.

In order to stay ..... the body needs seven main chemicals which are called food ..... These are carbohydrates, proteins, ..., minerals, vitamins, fibre and water. A balanced diet contains the ..... amounts of all seven food types. Carbohydrates are sugars and ..... Carbohydrates give us energy quickly. Fats also give us ..... but they release it much more slowly. Stored fat under the skin also helps us to keep ..... We need ..... to help us grow and to repair damaged parts. Minerals and ..... are needed in smaller amounts to keep the body healthy. Fibre helps to keep the food moving along the .....

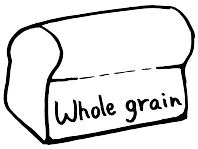
intestines types fats warm correct protein starch healthy energy vitamins

Food type	Foods rich in this
Carbohydrate	Starchy and sugary foods, e.g. potato, bread, cereals and cakes.
Protein	Meat, fish, eggs, cheese, milk and nuts.
Fat	Vegetable oils, butter, lard, cream, cheese and some meats.
Vitamins	Fresh fruit and vegetables.
Minerals	A wide range of foods, e.g. iron from meat and calcium from milk.
Fibre	Cereals, fruit and vegetables.

Exercise 2 – Write down the main FOOD TYPES that each of the foods below contain.

_____ _____ _____ _____




_____ _____ _____ _____

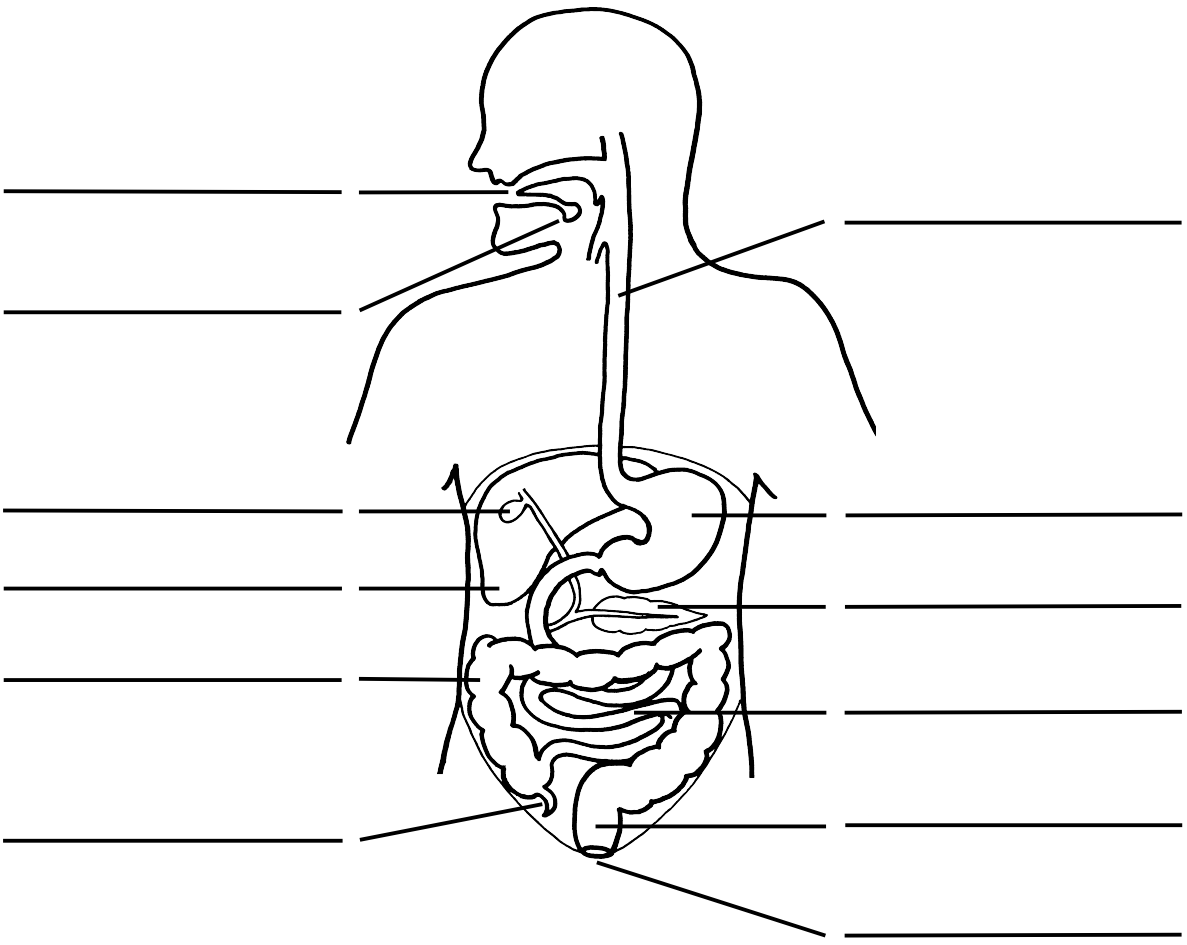
W.S.6. **Food and digestion.** Name ……

Exercise 1 - Fill in the missing words in the passage below.

The body needs food for a number of reasons. We need food for growth and to …… worn out or damaged parts. We also get …… from food. Energy is used for movement, producing …… and to keep all of the parts working properly. Before the body …… can use the food we eat it must pass into the blood. The food is broken down into very small soluble molecules by the …… system. These molecules then pass through the walls of the …… and into the blood.

intestines **heat** **repair** **cells** **digestive** **energy**

Exercise 2 - Study the diagram below of the human digestive system and then carefully add the labels by choosing from the list at the bottom of this page



tongue **salivary gland** **liver** **gall bladder** **small intestine** **gullet**
pancreas **stomach** **large intestine** **appendix** **rectum** **anus**

W.S.7. Stages of digestion.

Name ……

Food is slowly broken down by our digestive system. It is broken up by chewing in the mouth and by churning of the stomach muscles. Special chemicals called ENZYMES break up large food molecules into smaller ones. These molecules then slowly seep out into the blood through tiny pores in the walls of the small intestines. Any undigested food enters the large intestine where water is absorbed back into the blood. The solid waste is then passed out of the body.

What to do

This table gives descriptions of organs in the human digestive system. Read each description and then write down the name of each organ in the left hand column. Use the words at the bottom of this page.

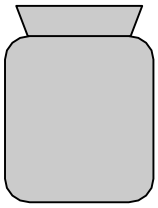
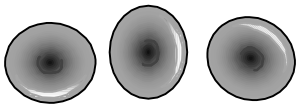
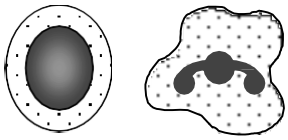
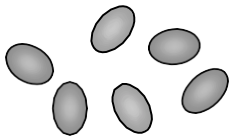
Organ	Description
	Here the food is chewed and moistened with saliva. The food is shaped into a round ball before it is swallowed.
	This is a tube that squeezes the food down to the stomach.
	This is a bag that churns up the food. It contains gastric juice and hydrochloric acid. Gastric juice contains an enzyme that digests protein. The acid kills germs.
	This is a very long tube that the food passes into after it leaves the stomach. Here the food is completely digested and then it is absorbed through the walls and into the blood stream.
	This is a small leaf-shaped organ. It makes pancreatic juice which passes into the small intestine. This juice contains an alkali that helps to neutralise the acid from the stomach. It also contains several enzymes.
	This organ makes a chemical called BILE which is stored in a small bag called the GALL BLADDER. The bile is squeezed into the small intestine where it helps to break up large pieces of fat.
	This is a wide tube that the undigested food passes through. Water is absorbed from this back into the body.
	This organ has no function in humans but it helps with digestion of plant material in herbivores such as sheep. It sometimes becomes infected in humans and then it must be removed.
	The dried out waste food material is stored here until it is ready to be passed out of the body through the anus.

Organs.

liver small intestine gullet pancreas stomach large intestine appendix mouth rectum.

W.S.8. **Blood.** Name ……

The blood transports (carries) substances around the body. The table below shows what the blood is made of and what each part does.

Part of blood	*What it does*
PLASMA 	This is a pale yellow liquid in which the blood cells float. It carries: • waste carbon dioxide from the cells to the lungs; • dissolved food to the cells; • waste urea from the liver to the kidneys; • hormones from one part of the body to another.
RED CELLS 	They do not have a nucleus and there are lots of them. They carry oxygen from the lungs to the cells.
WHITE CELLS 	They do have a nucleus. They fight against germs that enter the blood.
PLATELETS 	These are small pieces of cells. They do not have a nucleus. They help blood to clot if the skin is cut.

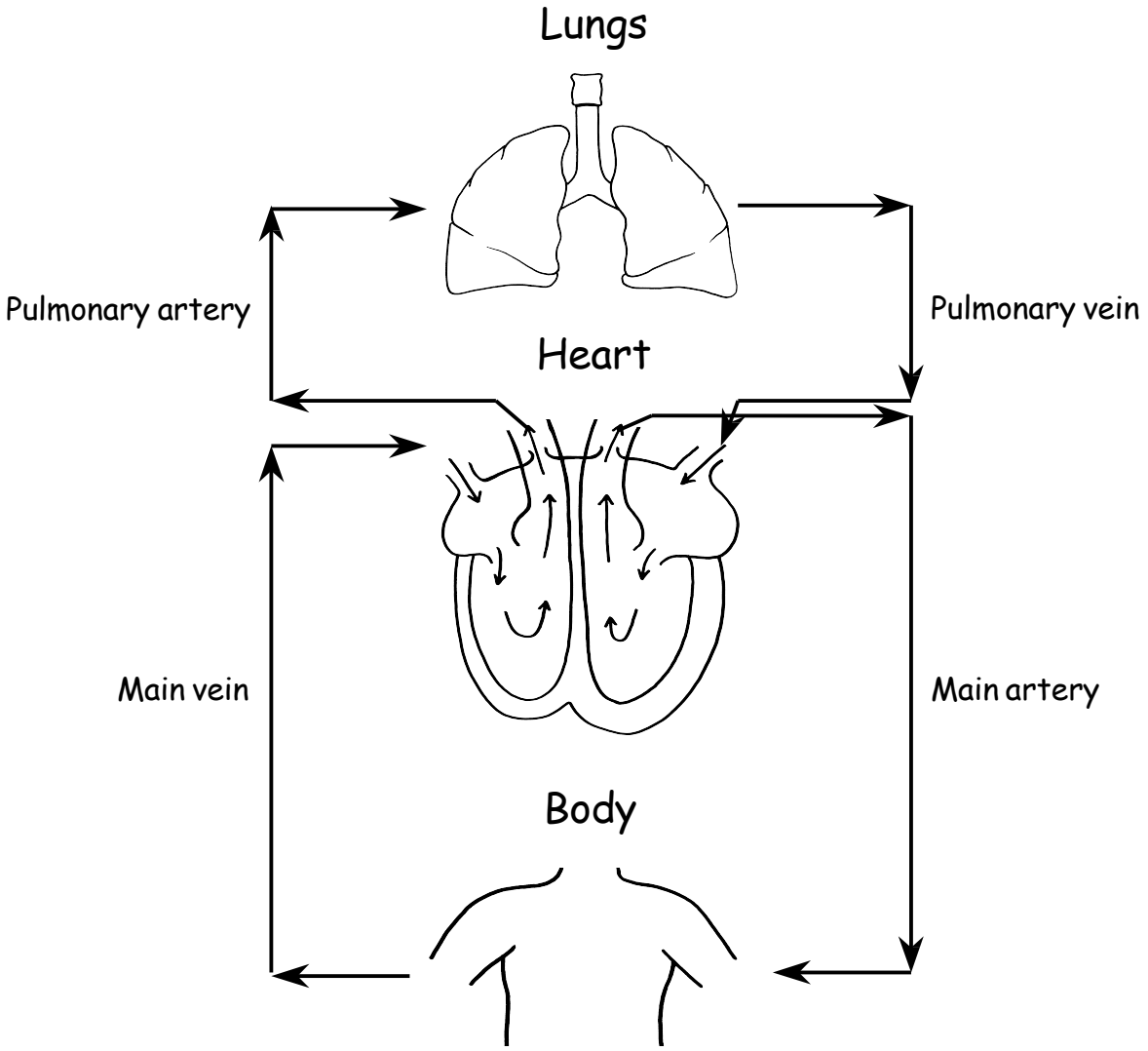
Exercise - Fill in the missing words in the passage below.

Blood is made of a pale yellow liquid called ..... and two different types of blood cell, white blood cells and ..... blood cells. Most of the chemicals in the blood are ..... in the plasma. ..... is carried by the red blood cells. The white blood cells help to destroy any ..... (bacteria and viruses) which may enter the body. There are also tiny pieces of cells in the blood called ..... These help to clot the blood if the skin is ..... If we could not make ..... we would be in danger of bleeding to death from even the smallest of cuts.

plasma cut scabs red dissolved germs oxygen platelets

W.S.9. **The blood system.** Name ……

The heart pumps the blood around the body. It travels inside tubes called blood vessels. Look at the diagram below and then try to complete the sentences at the bottom of this page.



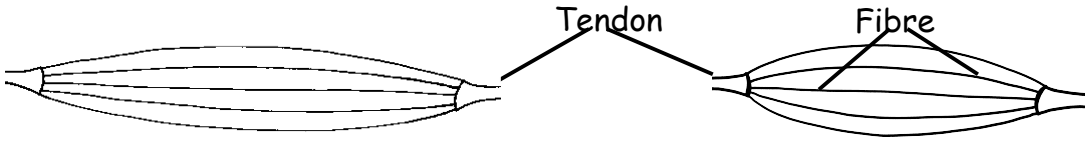
Exercise - Complete the sentences below.

1) The blood travels around the body inside tubes called blood ……..
2) The three types of blood vessel are arteries, …….. and capillaries.
3) The heart is a …….. that squeezes blood into the arteries.
4) The veins carry the blood back to the ……..
5) The capillaries have very thin ……..
6) The capillaries give useful chemicals to the body ……..
7) The capillaries take …….. chemicals away from the body cells.

vessels **pump** **heart** **waste** **veins** **walls** **cells**

W.S.10. **Moving the body.** Name ……

In order to move the skeleton has JOINTS in between many of its parts. The movements are made by muscles which pull on the bones. Muscles CONTRACT (shorten) in order to pull. A muscle is made up of many thin fibres. Each fibre shortens when the muscle contracts.

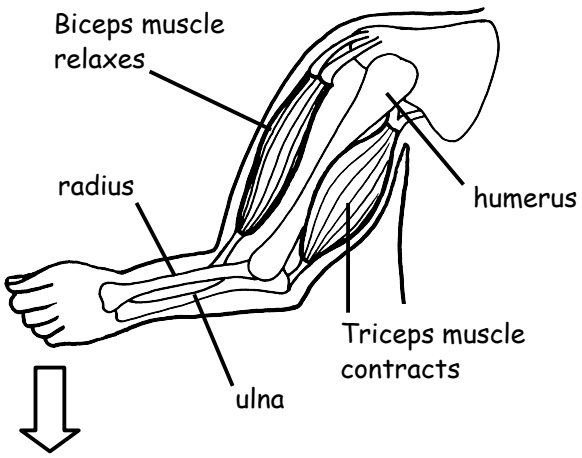


Relaxed muscle
Muscle fibres are resting and appear long and thin.

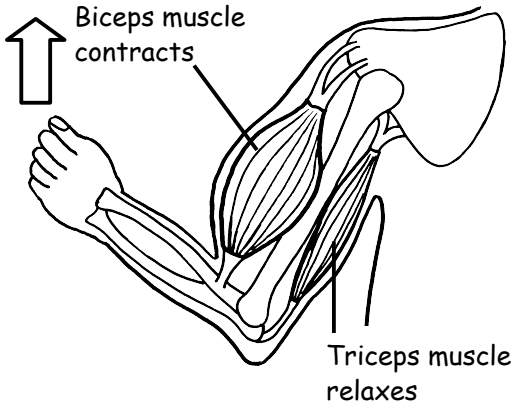
Contracted muscle
Each muscle fibre has shortened and thickened.

A muscle cannot push, it can only pull. This is why a pair of muscles are needed at a joint. One muscle pulls the joint in one direction and the other pulls the joint back.

Lowering arm



Raising arm



Exercise - Complete the sentences below.

1) A muscle is made up of many thin strands called ……
2) When a muscle contracts each fibre ……
3) Muscles are attached to bones by tough cords called ……
4) Muscles can only pull they cannot ……
5) Muscles work in …… to move a joint in both directions.
6) If we wish to lift a weight our …… contracts.
7) To lower the arm the biceps relaxes and the …… contracts.

triceps shortens biceps fibres tendons push pairs

W.S.11. Growing up. Name ……

Puberty is the time when a child begins to change into an adult. In boys it begins between the ages of about 12-14 years. In girls it begins between the ages of about 11-13 years. Special chemicals called SEX HORMONES are released into the blood. These chemicals cause many of the changes that happen in the body. Emotional changes also happen at this time.

Changes in boys at puberty	Changes in girls at puberty
1) The testes begin to make sperms. 2) A hormone called TESTOSTERONE is produced by the testes. 3) The voice becomes deeper. 4) Hair grows on the face and body. 5) The body becomes more muscular. 6) Changes in attitude and behaviour.	1) The ovaries begin to produce ova. 2) A hormone called OESTROGEN is produced by the ovaries. 3) The monthly menstrual cycle starts. 4) Hair grows on parts of the body. 5) The hips widen. 6) The breasts begin to develop.

Exercise 1 - Fill in the missing words in the passage below.

All …… eventually grow up to be men and women. The time when the body is changing is called …… Changes happen all over the …… Emotional changes also happen at puberty and we feel …… to the opposite sex. A …… called testosterone is made by the testes in a boy and this causes some of the …… in his body. In a girl the ovaries make a hormone called …… which causes many of the changes in her body.

body changes oestrogen hormone puberty children attracted

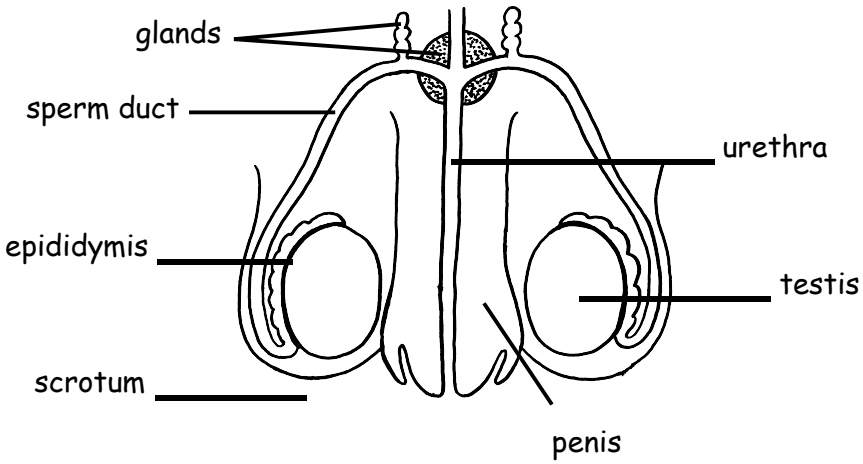
Exercise 2 - In the table below there is a list of changes which happen at puberty. Tick the right hand columns to show which changes happen to boys, girls or both.

Changes at puberty	Boys	Girls
The breasts grow larger.		
The body becomes more muscular.		
The monthly periods start.		
The voice becomes deeper.		
Hair grows around the sex organs.		
The hair and skin become more greasy.		
Sperms are produced.		
Ova are produced.		
Feel attracted to the opposite sex.		

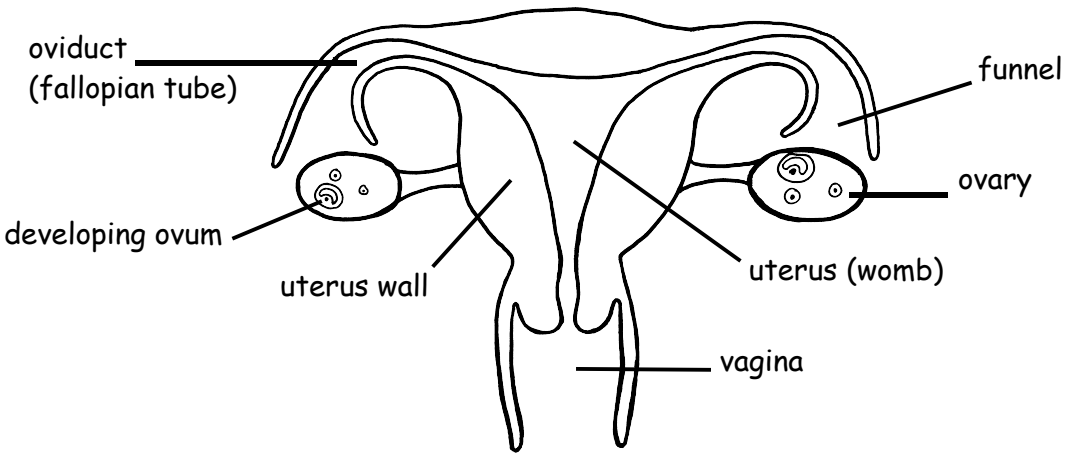
W.S.12. **The human reproductive system.** Name ……

The diagrams below show the male and female reproductive systems.

The male reproductive system



The female reproductive system



Exercise - fill in the missing words in the passage below.

In the man the testes make the …… cells. The sperms are stored in a coiled …… called the epididymis. The …… becomes erect during sexual intercourse. The sperms are carried through a long tube called the sperm …… to the top of the penis. Here glands make fluids that help the sperms to …… The urethra is a tube that carries sperms and …… out of the body.

In the woman the ovaries make the …… (egg cells). One ovum is produced every …… The ovum is carried along the …… (fallopian tubes) down to the uterus (womb). The placenta grows in the uterus wall during pregnancy. This gives the developing baby …… and oxygen.

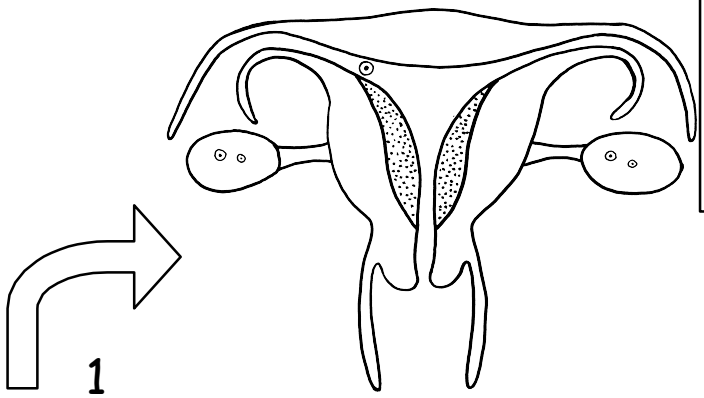
duct urine ova food sperm tube month swim oviducts penis

W.S.13. **The menstrual cycle.** Name ……

Once every month a woman's body releases an ovum (egg cell) into the oviduct (fallopian tubes). Usually the ovum is not fertilised and it dies. The woman has her period when the lining of the uterus breaks down and blood and dead cells pass out through the vagina. The diagram below shows what happens during a woman's monthly cycle.

2

During the week after ovulation the lining of the uterus becomes thicker as many blood capillaries grow in it. This prepares the uterus to feed the fertilised ovum.

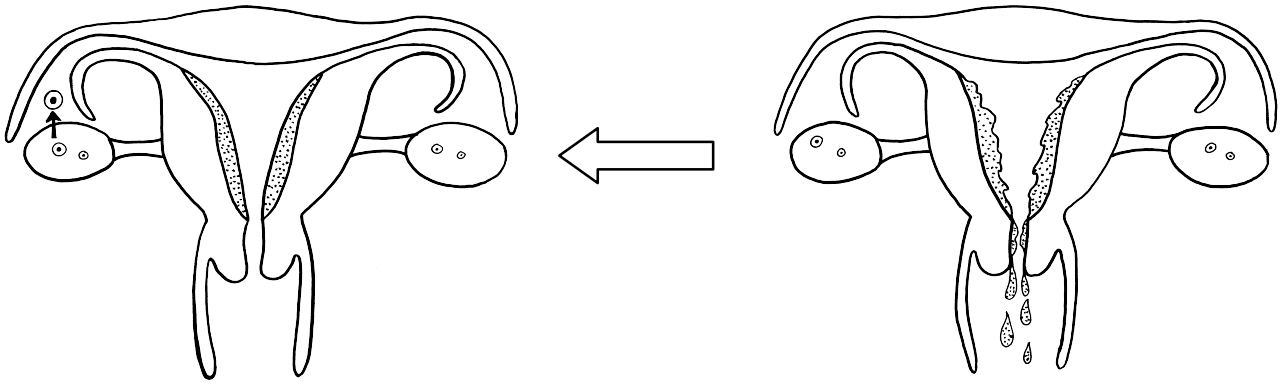


1

During the first 2 weeks the ovum develops inside the ovary and the uterus lining repairs itself. On about day 14 OVULATION happens.

3

If the ovum is not fertilised the thick uterus lining breaks down about 14 days after ovulation. Blood and dead cells pass out through the vagina.



Exercise - Complete the sentences below.

1) Only one ovum is released every _ _ _ _ _

2) The release of an ovum from the ovary is called _ _ _ _ _ _ _ _ _ _

3) Ovulation happens after about_____days.

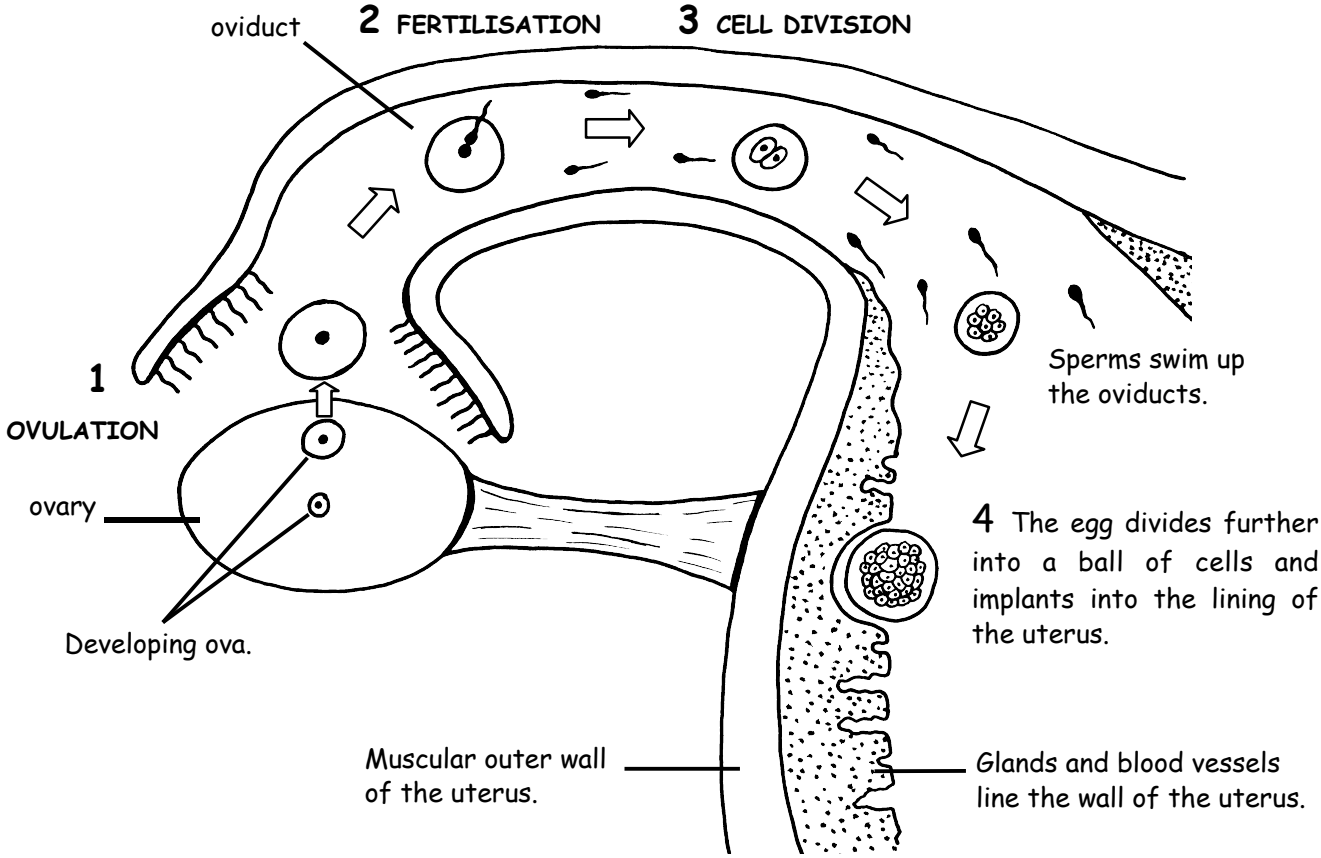
4) The uterus lining _ _ _ _ _ the fertilised ovum.

5) If the ovum is not fertilised it will _ _ _

6) A woman has her period when the _ _ _ _ _ _ lining breaks down.

W.S.14. **<u>Ovulation and fertilisation.</u>** Name ……

Every month an ovum (egg cell) is released from an ovary into the oviduct. This is called OVULATION. If there are sperm cells in the oviduct the ovum may join with one of them. This is called FERTILISATION. The fertilised ovum then travels down to the uterus where it grows into a baby. The diagram below shows what happens to the ovum after it is released from the ovary if it is fertilised.



<u>Exercise</u> – Complete the sentences below.

1) O _ _ _ _ _ _ _ _ means when the ovum is released from the ovary.

2) The joining of the ovum and sperm is called F _ _ _ _ _ _ _ _ _ _ _ _ _

3) Fertilisation usually happens in the O _ _ _ _ _ _

4) After fertilisation the egg begins to D _ _ _ _ _

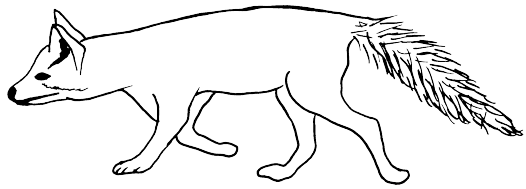
5) The egg develops into a ball of C _ _ _ _

6) The baby develops in the U _ _ _ _ _

W.S.34. **Food chains.** Name ……

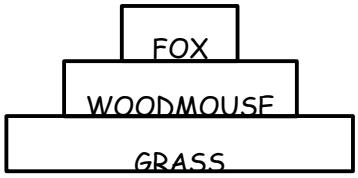
Green plants make food by PHOTOSYNTHESIS. Animals must feed on plants or other animals. The food is passed along a FOOD CHAIN.



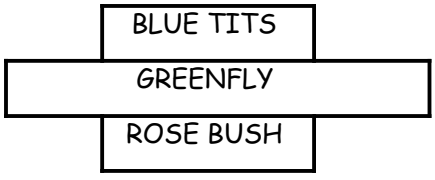


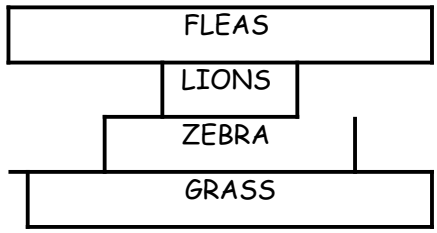
grass ⟶ woodmouse ⟶ fox

Food chains always begin with plants. Animals that eat plants are called HERBIVORES. Animals that eat other animals are called CARNIVORES. Carnivores are also called PREDATORS and the animals that they hunt are called the PREY. In most habitats there are more plants than herbivores and more herbivores than carnivores. This can be shown with a PYRAMID OF NUMBERS.



Pyramids of numbers are usually large at the bottom and small at the top. Sometimes they have a different shape because of the different sizes of the organisms in them. Two examples of this are shown below.





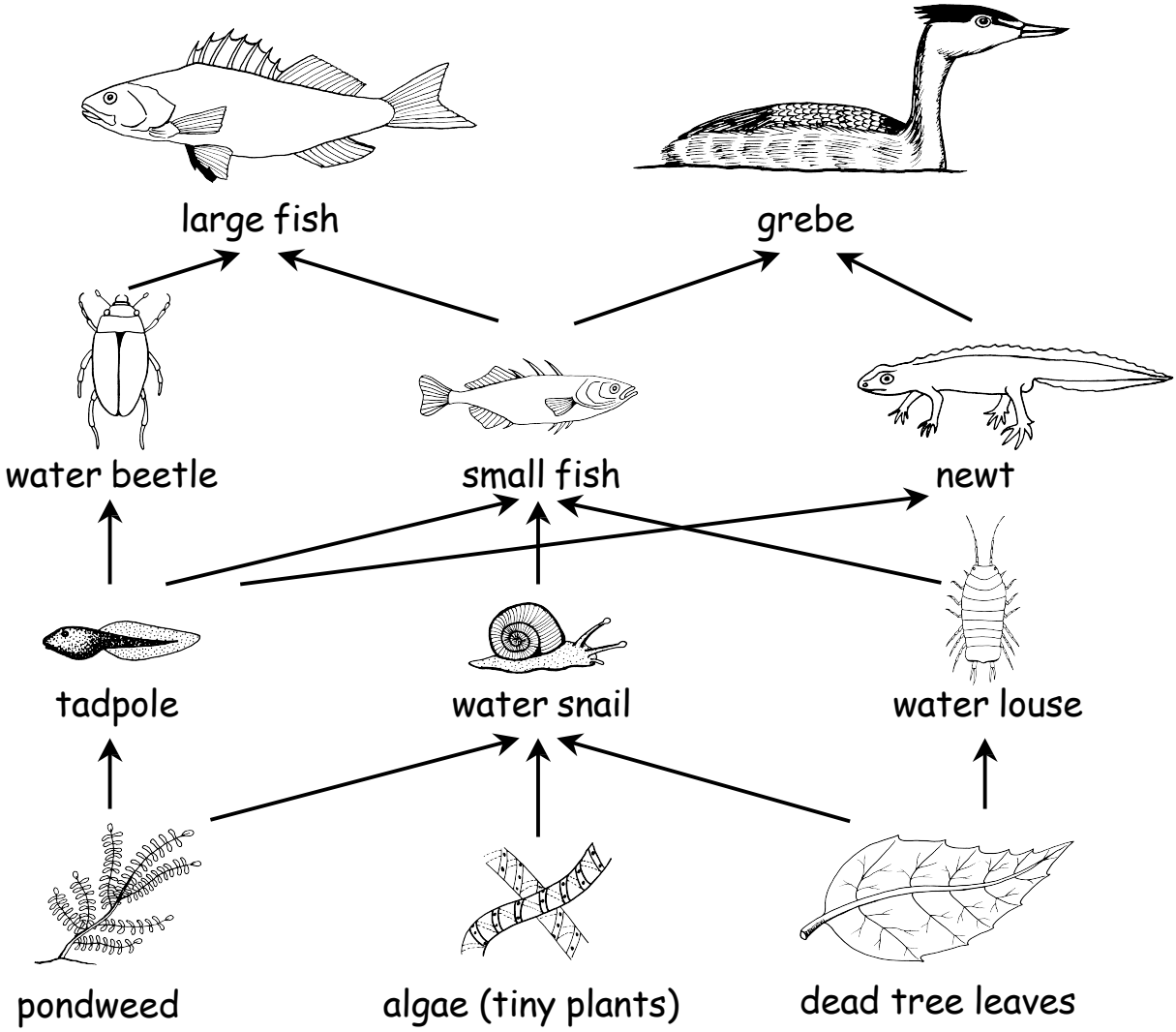
Exercise - Fill in the missing words in the passage below.

In habitats there is a mixture of ..... herbivores and carnivores. Carnivores are animals that eat other ..... Herbivores eat plants and are ..... by carnivores. Another name for carnivores is ..... and the animals that they hunt are called the ..... The amount of plants in a habitat must be ..... than the amount of herbivores or else the herbivores would run out of ..... In the same way there must be ..... carnivores than herbivores.

predators animals food fewer eaten plants prey greater

W.S.35. Food webs. Name ……

Food chains can be connected together to make FOOD WEBS. The diagram below shows a food web in a lake.



Exercise - Complete the food chains and sentences below.

PONDWEED ⟶ …… ⟶ WATER BEETLE ⟶ LARGE FISH

LEAF ⟶ WATER LOUSE ⟶ …… ⟶ GREBE

1) The predators of small fish are_____and _____

2) The prey of water beetles are _____

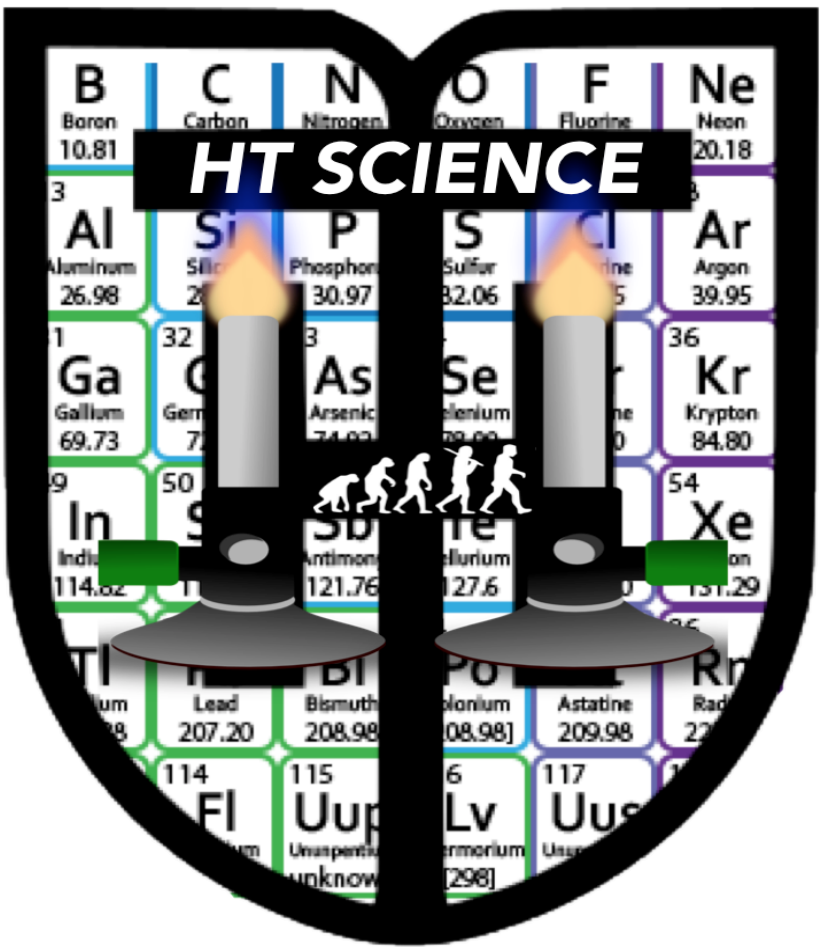
3) The prey of grebes are_____and _____

4) The animal that **only** eats dead tree leaves is the _____

5) The 3 **herbivores** are_____and _____

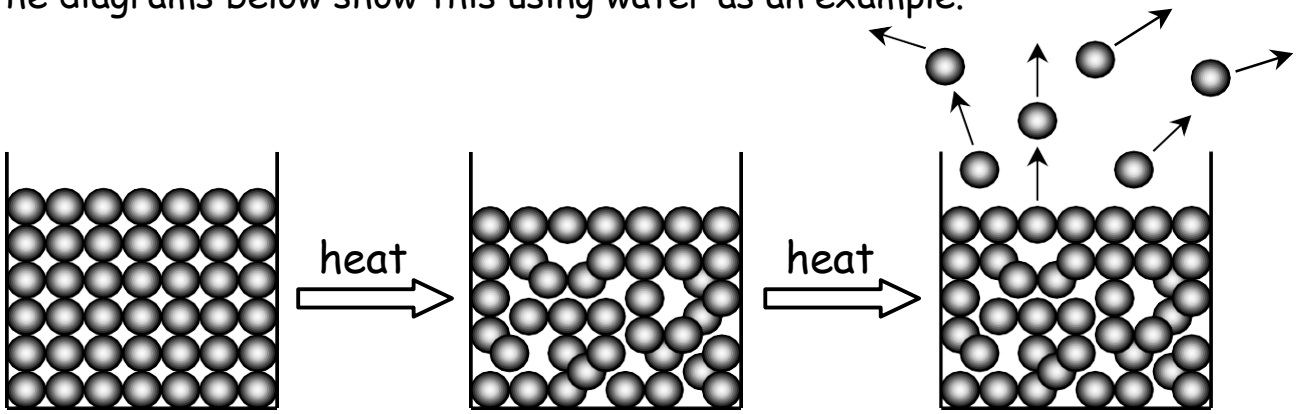
6) The 2 top **predators** are the_____and _____

CHEMISTRY



W.S.39. **Changes of state.** Name ……

When a solid is heated it changes into a liquid state and then a gas state. When a gas is cooled it changes back into a liquid and then into a solid. The diagrams below show this using water as an example.



Solid – ice.
The particles are held firmly in place but they vibrate.

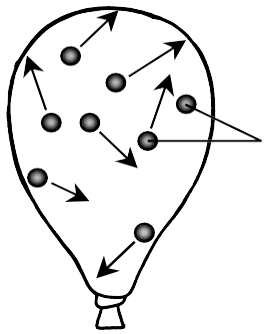
Liquid – water.
The particles gain more energy. The vibrations become stronger until they break apart.

Gas – steam.
The particles have gained enough energy to break free. They are moving very quickly.

Gas pressure and diffusion.

If a gas is squeezed into a small space e.g. when air is pumped into a balloon, the particles bump against the walls. This causes a PRESSURE.

A gas will DIFFUSE (spread out) until it fills up any area that it is contained in. The gas particles diffuse until they are EVENLY SPREAD OUT.



Air particles move around quickly and bump against the inside of the balloon.

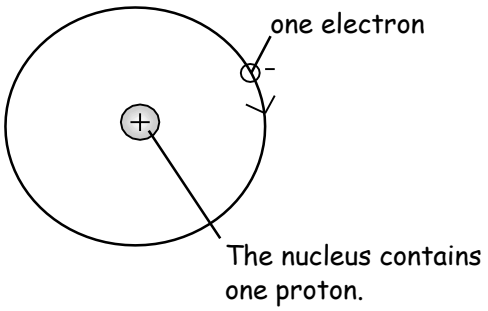
Exercise – Join up the words in the left-hand column with their meanings in the right-hand column.

DIFFUSION	A solid changing to a liquid.
ICE	The spreading out of particles.
MELTING	The solid state of water.
STATE OF MATTER	A solid, liquid or gas.
EVAPORATION	A gas changing to a liquid.
CONDENSING	A liquid changing to a gas.

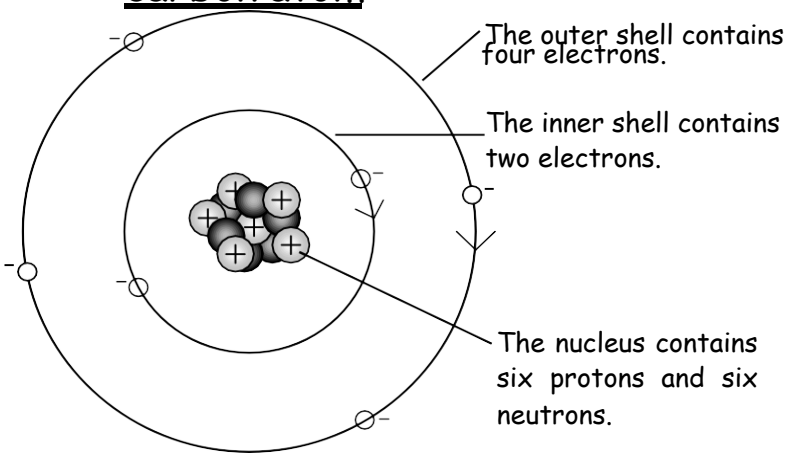
W.S.40. **Elements.** Name ……

An element is a pure substance that cannot be broken down into anything simpler. Everything on Earth is made from about one hundred different elements. An ATOM is the smallest particle of an element. They are much too small to be seen even with the most powerful microscope. Each element contains only one type of atom. Atoms have a NUCLEUS in the centre with ELECTRONS moving around it.

hydrogen atom



carbon atom



= positively charged proton

= neutron (no charge)

= negatively charged electron

Atoms always have the same number of electrons and protons so that their overall charge is neutral (no charge).

Different elements have different numbers of protons in their atoms. The ATOMIC NUMBER is the number of protons that an atom contains. The smallest atom is hydrogen with an atomic number of one. Lead is one of the largest atoms with an atomic number of eighty two.

Exercise - Complete the missing words in the sentences below.

1) An _ _ _ _ _ _ _ cannot be broken down into anything simpler.

2) The smallest particle of an element is called an _ _ _ _

3) The _ _ _ _ _ _ _ is in the centre of an atom.

4) Electrons have a _ _ _ _ _ _ _ _ charge.

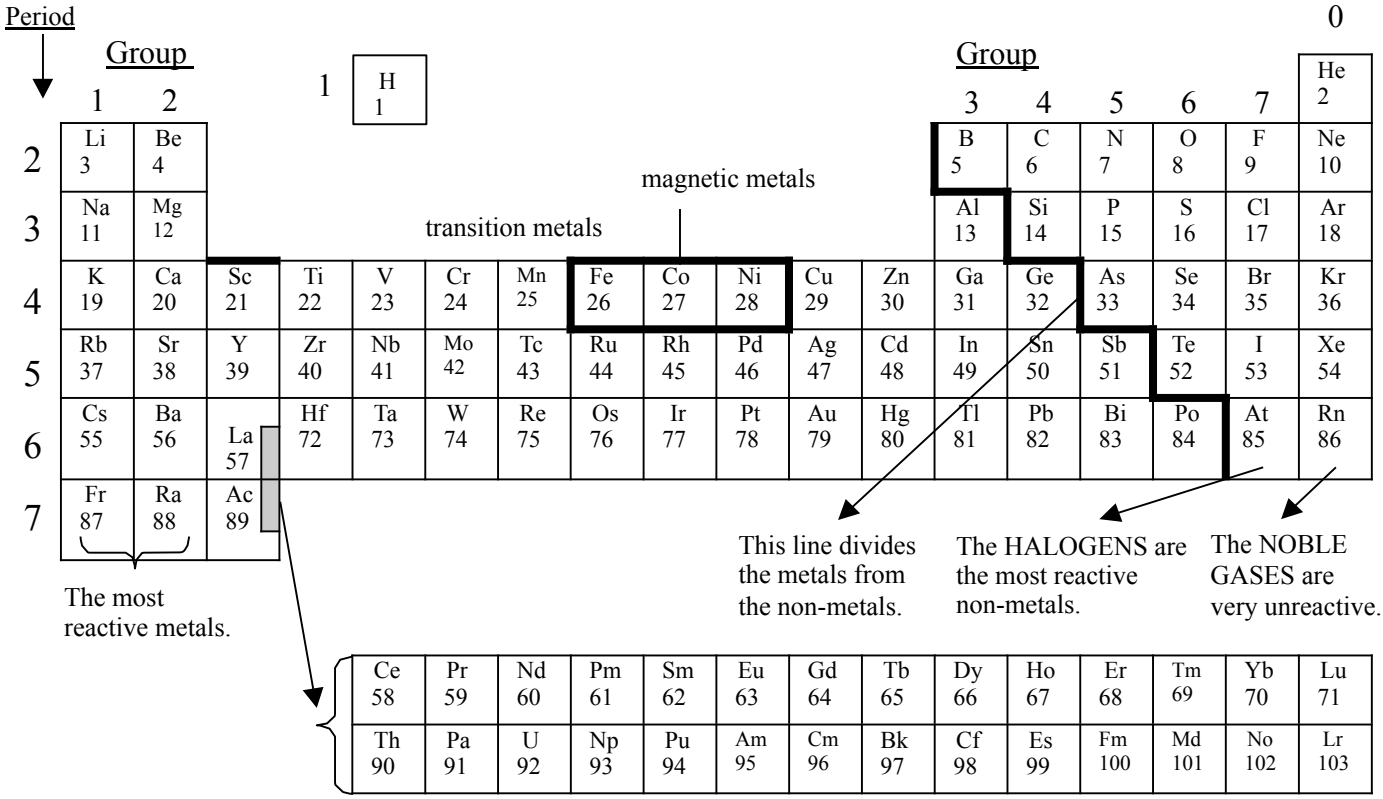
5) Protons have a _ _ _ _ _ _ _ _ charge.

6) The atomic number is the number of _ _ _ _ _ _ _ in an atom.

W.S.41. The periodic table.

Name ……

All of the elements have been arranged into the PERIODIC TABLE. This contains seven rows of elements called PERIODS. These are arranged so that each column contains elements with similar properties. The table shows the symbol and ATOMIC NUMBER (number of protons) for every element.



Exercise - Complete the missing words in the passage below.

Each group in the periodic table contains elements that have similar …… The atomic number gives the number of …… that an element contains. The lightest element is …… (H) which has an atomic number of one. The atomic number of …… is eight. Sodium (Na) and potassium (K) are two very …… metals. Iron (Fe) and nickel (Ni) are two of the …… metals. The most reactive non-metals are called the …… The …… gases are very unreactive. Magnesium (Mg) and calcium (Ca) are both in group …… of the periodic table. Nitrogen (N) and phosphorus (P) are both in group …… of the periodic table.

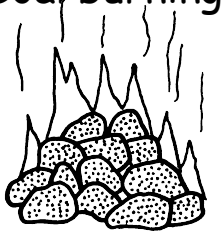
magnetic noble two hydrogen reactive five halogens properties oxygen protons

W.S.42. **Compounds.** Name ……

Elements join together by chemical reactions to form compounds. Compounds have different properties to the elements that formed them. In a chemical reaction new substances are formed and energy is taken in or given out. It is also difficult to make a reaction go backwards.

Exercise 1 – Fill in the missing words or symbols for the chemical reactions below.

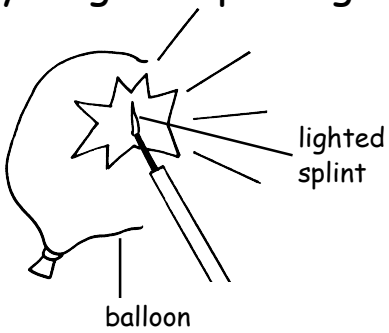
Coal burning



CARBON + OXYGEN ⇨ CARBON DIOXIDE + HEAT

…… + O_2 ⇨ CO_2 + HEAT

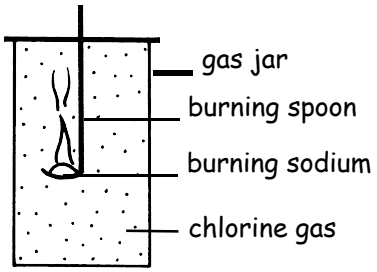
Hydrogen exploding



HYDROGEN + …… ⇨ WATER + HEAT

$2H_2$ + O_2 ⇨ $2H_2O$ + HEAT

Making salt



SODIUM + CHLORINE ⇨ SODIUM CHLORIDE (salt)

Na + Cl ⇨ ……

Exercise 2 – For each of the changes below write down if it is a physical or chemical change.

When a firework explodes it is a_____change.

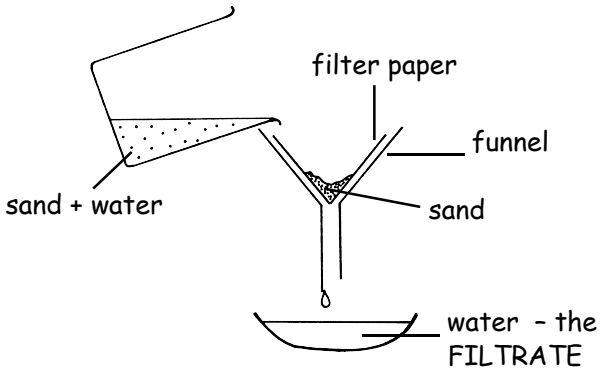
When salt dissolves in water it is a_____change.

When a cake is baked in an oven it is a_____change.

When ice melts it is a_____change.

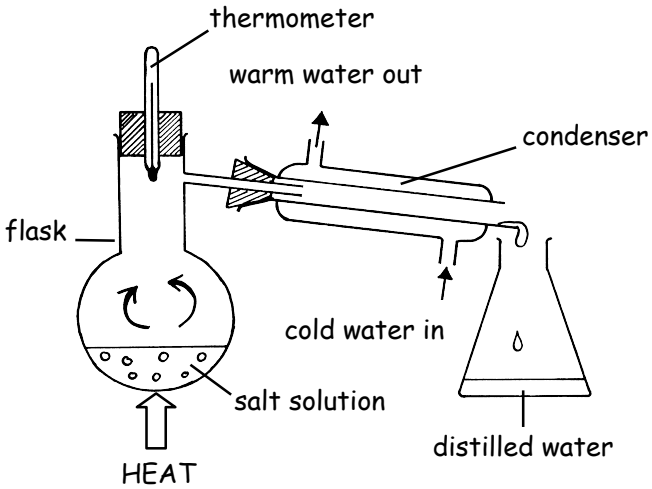
W.S.43. **Separating mixtures.** Name ……

A mixture contains a number of substances that are not chemically joined. The diagrams below show different ways of separating mixtures. Fill in the missing words in the paragraphs beside each method.



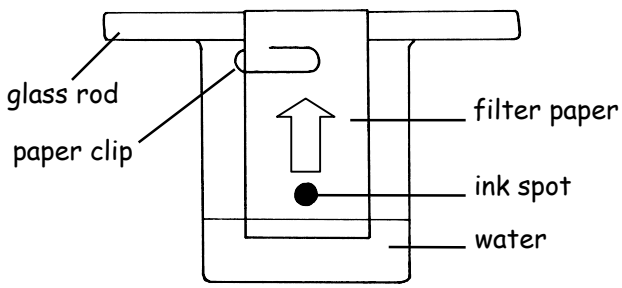
Filtration.

This method separates small, solid particles from liquids. In the diagram a mixture of sand and water is being filtered. The …… passes through the filter paper and the …… is held back. The sand particles are too big to pass through the pores in the ……



Distillation.

This method separates dissolved chemicals (SOLUTES) from the liquids that they are dissolved in (SOLVENTS). In the diagram salt solution is being separated into salt and …… The water evaporates from the boiling solution and then condenses as it is …… in the condenser. The salt is left behind in the ……



Chromatography.

In the diagram the colours in pen ink are being separated. As water rises up the …… it takes the colours with it. Different colours travel at different …… If the ink contains more than one colour they will separate out along the paper.

Exercise 2 – Join up each mixture below with the correct method for separating it.

muddy water	distillation
copper sulphate solution	filtration
peas and sand	magnetic attraction
iron filings and sawdust	sieving

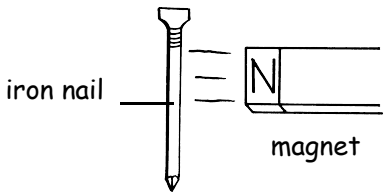
W.S.44. Metals and non-metals.

Name ……

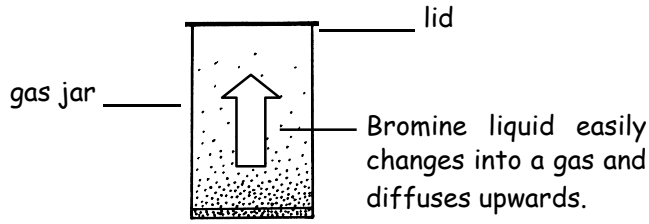
The elements can be divided into two main groups which are NON-METALS and METALS. The table below shows the properties of each group.

Metals	Non-metals
Most are shiny solids at room temperature although mercury is a liquid. They usually have high melting points.	They vary in their properties. They usually have low melting points and many are gases at room temperature.
Good conductors of heat.	Most are poor conductors of heat.
Good conductors of electricity.	Poor conductors of electricity except for graphite which is a form of carbon.
A few are magnetic (iron, cobalt and nickel).	None are magnetic.
They are often flexible (bendy) and can be hammered into shape.	They are often brittle (hard but break easily).

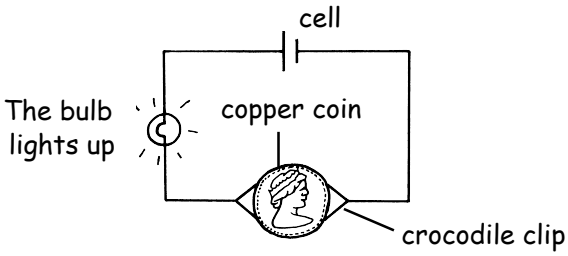
Exercise 1 – For each diagram below write down if the element is a metal or a non-metal.



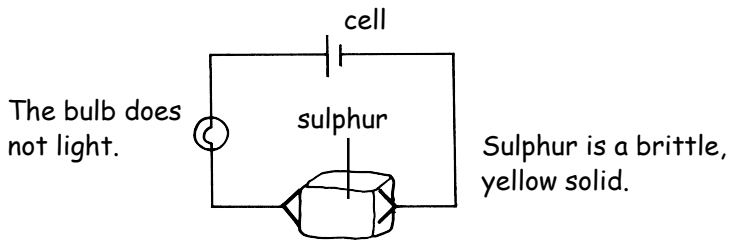
Iron is a _____



Bromine is a _____



Copper is a _____



Sulphur is a _____

Exercise 2 – Complete the sentences below.

1) M _ _ _ _ _ _ is the only metal that is a liquid at room temperature.

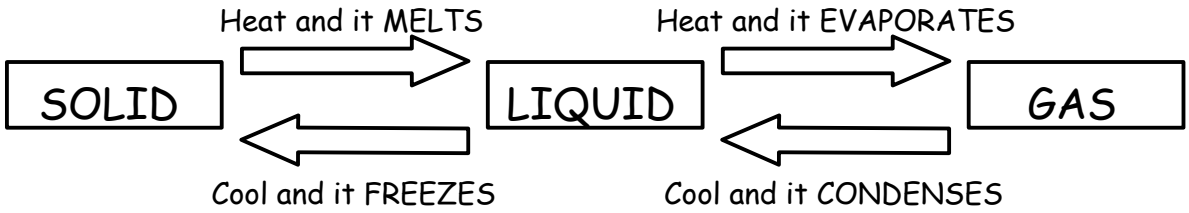
2) G _ _ _ _ _ _ _ is the only non-metal that is a good conductor of electricity.

3) The M _ _ _ _ _ _ _ metals are iron, cobalt and nickel.

4) M _ _ _ _ _ can be hammered into shape.

W.S.45. **Changes of state.** Name ……

The three states of matter are SOLID, LIQUID and GAS. One state can change into another. The diagram below shows this.



When a solid changes to a liquid, or a liquid changes to a gas, heat is absorbed. This is because the particles that make up the substance need more energy to move faster and overcome the forces that hold them together. When a gas changes to a liquid, or a liquid changes to a solid, heat is given out. This is because the particles lose energy as they slow down. The substance still keeps the SAME MASS because it still contains the SAME NUMBER OF PARTICLES.

Exercise – Use the information in the table below to help you complete the sentences at the bottom of this page.

Substance	Melting point (°C)	Boiling point (°C)
Oxygen	-219	-183
Ethanol	-15	78
Water	0	100
Sulphur	119	445
Iron	1,540	2,900

1) Oxygen is a _ _ _ at room temperature.

2) Water and _ _ _ _ _ _ _ are liquids at room temperature.

3) _ _ _ _ _ _ _ and iron are solids at room temperature.

4) Sulphur melts at a temperature of_____°C

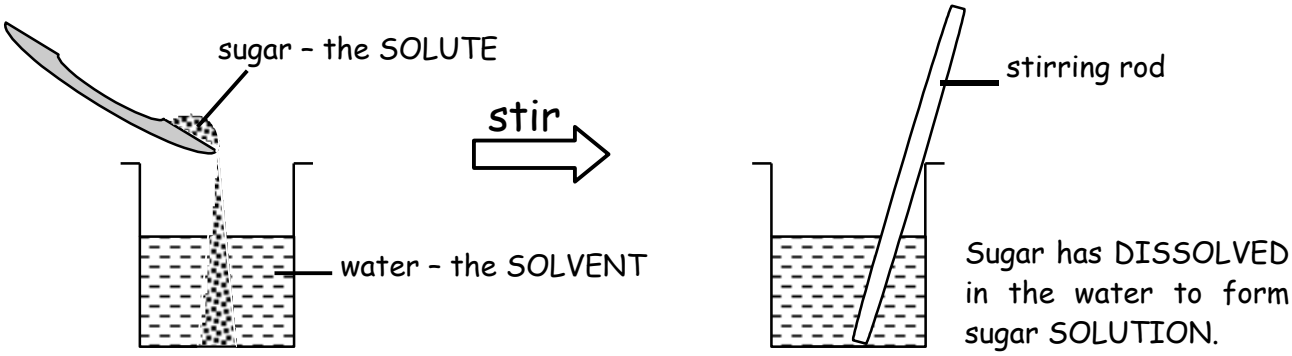
5) Iron melts at a temperature of_____°C

6) The substance with the lowest melting point in the table is _ _ _ _ _ _

7) Ethanol has a _ _ _ _ _ boiling point than water.

W.S.46. Solubility. Name ……

The diagrams below show how sugar can be dissolved in water.

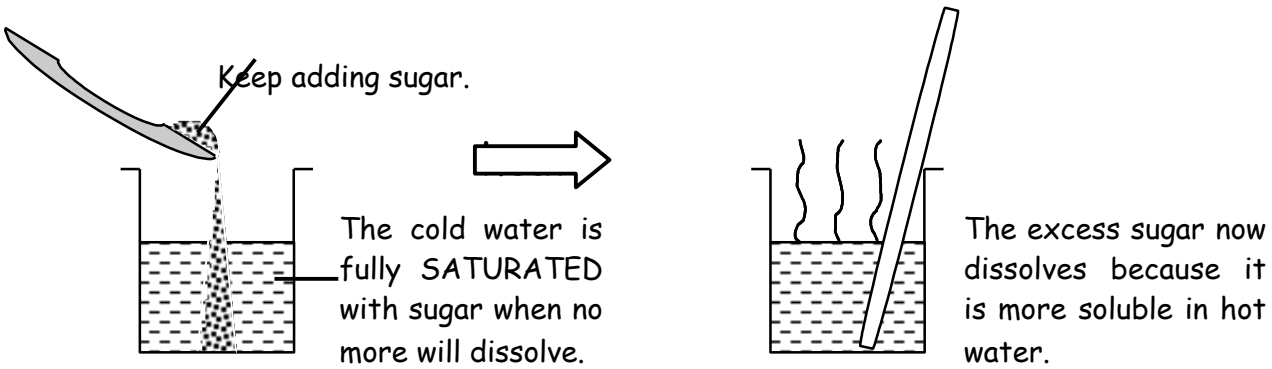


Exercise 1 – Fill in the missing words in the passage below.

If a solid …… in water we say that it is SOLUBLE. The substance that dissolves is called the SOLUTE and the liquid that it dissolves in is called the SOLVENT. Water is a good …… because many substances will dissolve in it. If you have been using …… paint you can not wash your brush in …… because the paint will not dissolve. The correct solvent for gloss paint is white ……

spirit **solvent** **dissolves** **gloss** **water**

The effect of temperature on solubility.



Exercise 2 – Complete the sentences below.

1)If you keep adding sugar to cold water you reach a point where no more sugar will _ _ _ _ _ _ _ _

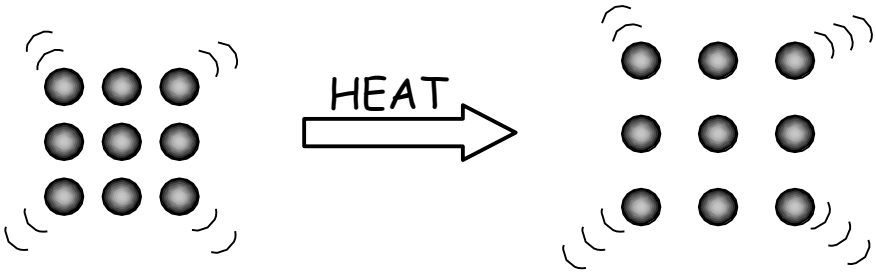
2) A solution that cannot dissolve any more solute is fully _ _ _ _ _ _ _ _ _

3) Solids are _ _ _ _ soluble in water as the temperature rises.

W.S.47. Expansion.

Name ……

If a metal bar is heated up it EXPANDS (gets bigger) slightly. This happens because the metal particles gain more energy and vibrate more.

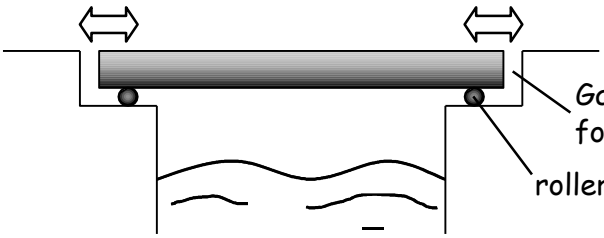


The particles vibrate more and so they move further apart.

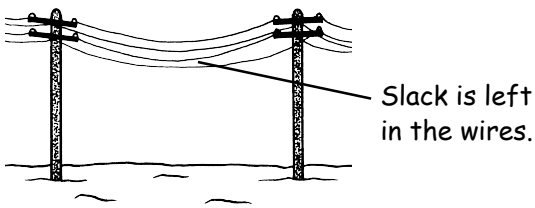
Most materials expand slightly when they are heated.

Problems caused by expansion.

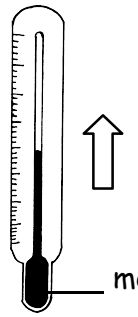
In hot weather a bridge could expand and buckle.



Overhead wires shorten in cold weather and could snap.

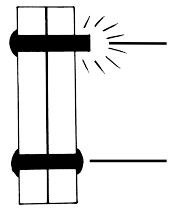


Uses of expansion.



As the mercury warms up it expands and moves up the thermometer scale.

Rivets hold metal plates tightly together.



Exercise – Fill in the missing words in the passage below.

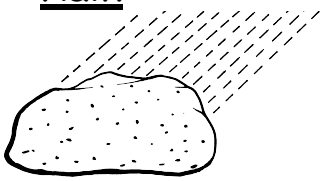
Most materials …… when they are heated and …… when they are cooled. This is because their particles …… more when hot and so move further …… In hot weather a metal bridge could expand and …… To stop this from happening it is held on rollers. Overhead wires could contract and …… in cold weather. To stop this from happening they are given slack when they are put up. Mercury is a liquid metal that is used inside a …… When it is put in a warmer place the mercury expands and moves up the ……

vibrate apart snap thermometer contract buckle expand scale

W.S.48. **Rocks and weathering.** Name ……

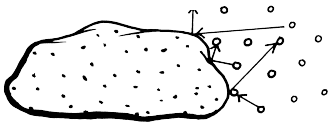
Rocks can be slowly broken up by the weather. This is called WEATHERING. The diagrams below show how this can happen.

Rain



Rainwater is slightly acidic. This makes certain rocks e.g. limestone slowly dissolve away.

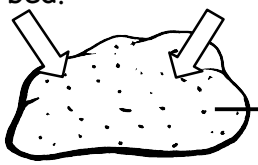
Wind



Wind carries sand particles which blast against the surface of rocks and produce more sand.

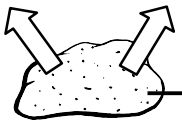
Expansion and contraction.

Heat is absorbed. DAY



Rock expands.

NIGHT Heat is lost.

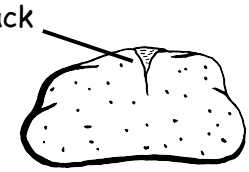


Rock contracts.

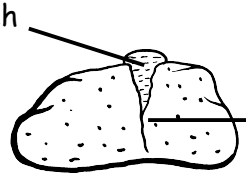
In a desert it is very hot during the day and very cold at night.
Constant expansion and contraction of rocks causes them to break up.

Freezing of water.

Water fills a crack in the rock.



Ice forms which expands.



The rock is forced apart and the crack gets bigger.

Exercise – Complete the sentences below.

1) The slow wearing away of rocks is called _ _ _ _ _ _ _ _ _ _ _

2) _ _ _ _ can make limestone rocks slowly dissolve away.

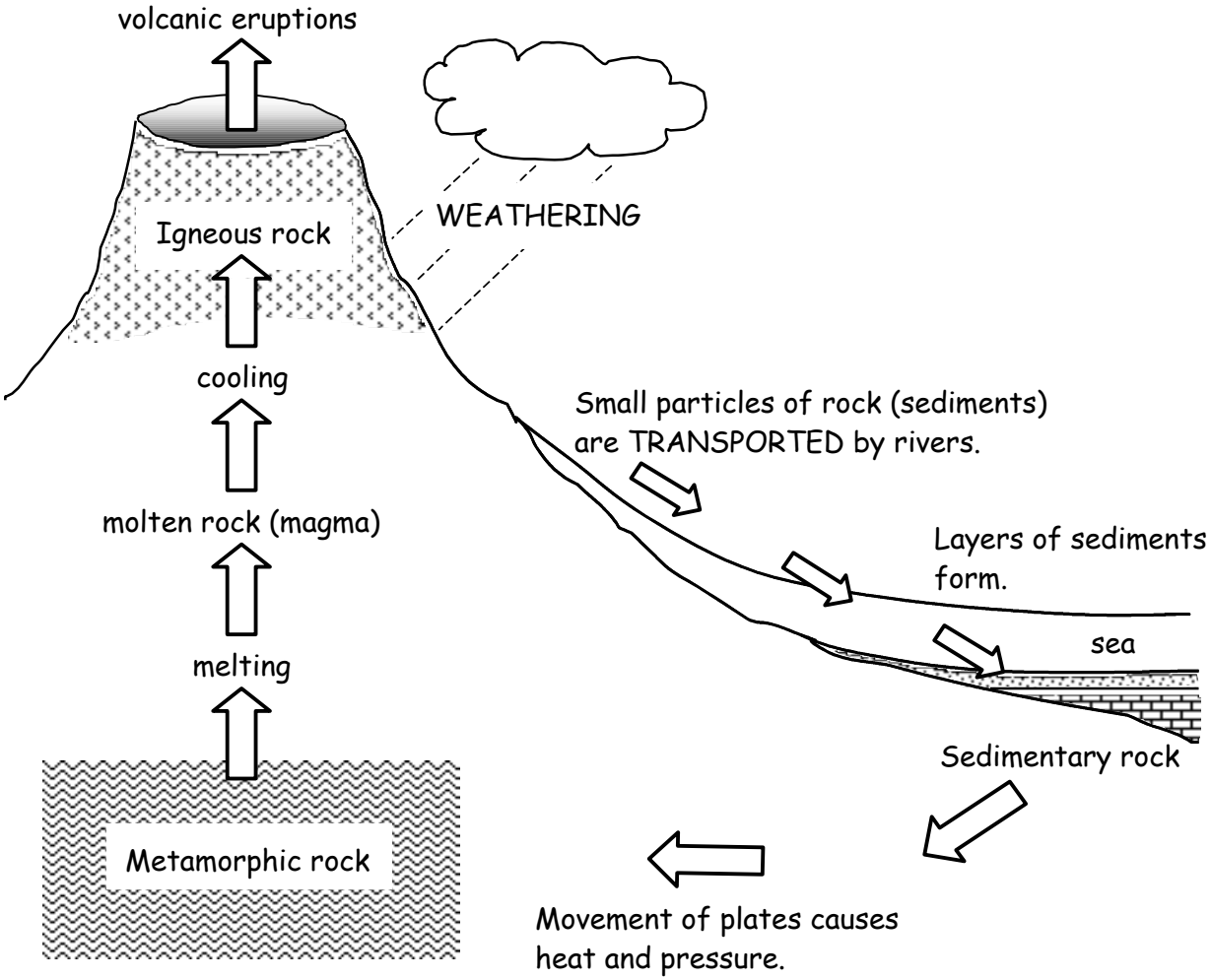
3) In deserts rocks can be weathered by _ _ _ _ carried in the wind.

4) Expansion and _ _ _ _ _ _ _ _ _ _ _ _ can cause rocks to crumble.

5) When water freezes it _ _ _ _ _ _ _ This can break rocks apart.

W.S.49. **The rock cycle.** Name ……

Over millions of years rocks slowly change from one type into another. This is called the ROCK CYCLE. The diagram below shows how it happens.



Exercise - Fill in the missing words in the passage below.

Weathering of rocks causes small particles called …… to form. The sediments are …… by rivers to seas. Over many years …… of sediments build up on the sea bed. The sediments are squashed together so that they form …… rocks. Sandstone and …… are two examples of sedimentary rocks. Heat and pressure deep inside the Earth may change sedimentary rock into …… rock. Rocks inside the Earth may melt to form …… Sometimes magma returns to the surface during volcanic …… It then cools down to form solid …… rock.

mudstone **magma** **igneous** **sediments** **metamorphic**

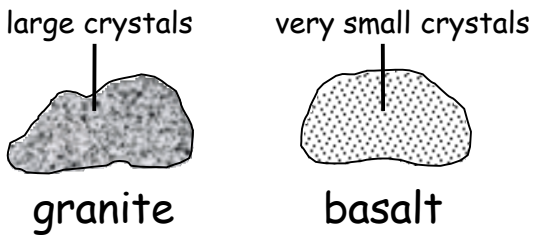
transported **eruptions** **layers** **sedimentary**

W.S.50. **Types of rock.** Name ……

Rocks can be divided into three main types depending on how they were formed. Read the information below about the three types of rock.

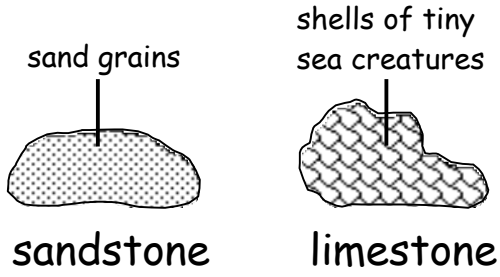
Igneous rocks.

These are formed when molten magma cools down and becomes solid. They are made of tiny crystals. If the magma cools quickly on the surface of the Earth then the crystals are small. If the magma cools slowly, deeper in the Earth's crust, then the crystals are larger. Igneous rocks are very hard.



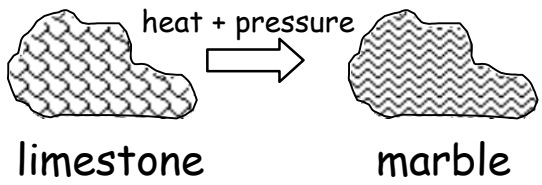
Sedimentary rocks.

These are made from layers of SEDIMENT (small particles) on the bottom of rivers or seas. The sediments are compressed as more layers build up on top of them. The particles then become cemented together to form solid rocks. The layers of rock are called STRATA. Sedimentary rocks have a grainy structure and they easily crumble.



Metamorphic (changed) rocks.

These are formed from igneous or sedimentary rocks which are changed by heat or pressure deep underground. They are usually harder than the rocks that formed them.



Exercise - Complete the sentences below.

1) Igneous rocks form when M _ _ _ _ cools down.

2) Granite contains L _ _ _ _ crystals because the magma cooled slowly.

3) Sedimentary rocks are made from particles called S _ _ _ _ _ _ _ _

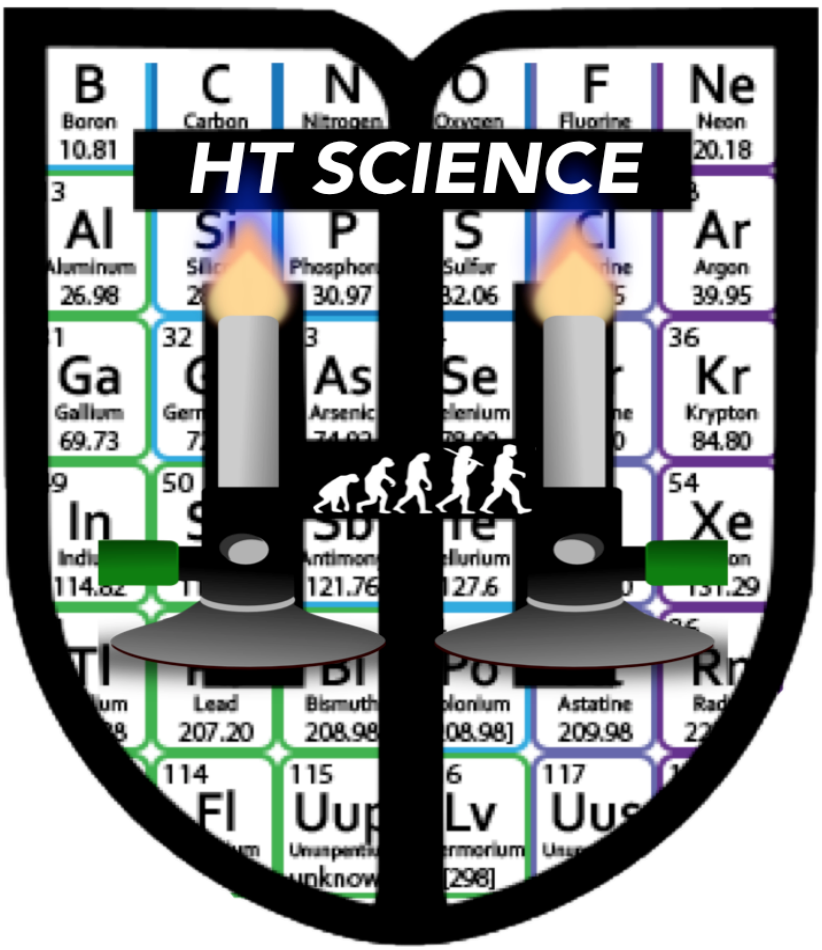
4) Layers of rock are called S _ _ _ _ _

5) Sedimentary rocks easily C _ _ _ _ _ _

6) Metamorphic rocks have been changed by H _ _ _ or pressure.

7) Heat and pressure changes limestone into M _ _ _ _ _

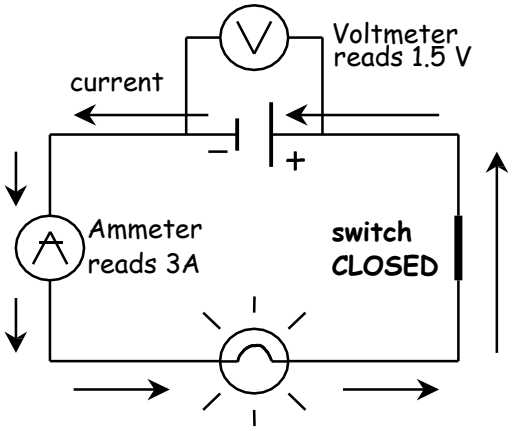
PHYSICS



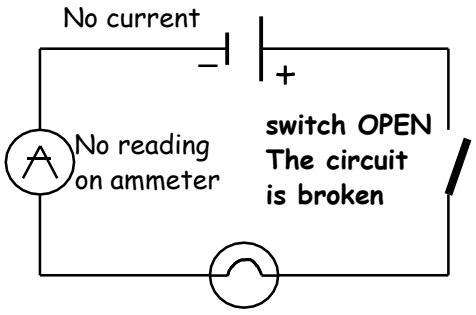
W.S.64. Electric current and voltage.

Name ……

Metals are good CONDUCTORS (carriers) of electricity. Most non-metals do not conduct electricity and we call them INSULATORS. An electric current will only flow through a COMPLETE circuit. A chemical reaction inside the battery pushes the current from the negative terminal to the positive terminal.



The bulb uses the electrical energy and lights up.



The bulb does not light up

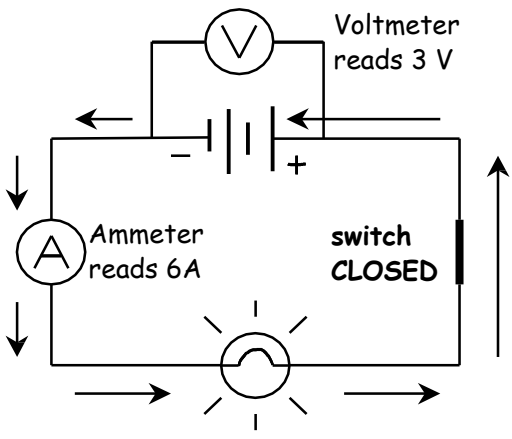
Symbols

- A cell (battery).
- A switch. This connects two leads.
- A voltmeter. This measures the voltage across the battery terminals.
- An ammeter. This measures the size of the electric current in AMPS (A).
- A bulb. The brightness gives some idea of how much electricity is flowing.

The effect of increasing the voltage.

The diagram opposite shows what happens if two batteries are put into the circuit. Carefully compare it to the first diagram at the top of this page and then try to complete the missing words in the passage below.

A battery pushes out the C _ _ _ _ _ _ _ The voltage across both batteries can be measured using a V _ _ _ _ _ _ _ _ _ With two batteries there is T _ _ _ _ as much voltage. This produces twice the current and so the bulb is much B _ _ _ _ _ _ _ _ The negative end of one battery must be connected to the P _ _ _ _ _ _ _ _ end of the other battery. If they are connected the wrong way round the current will not F _ _ _



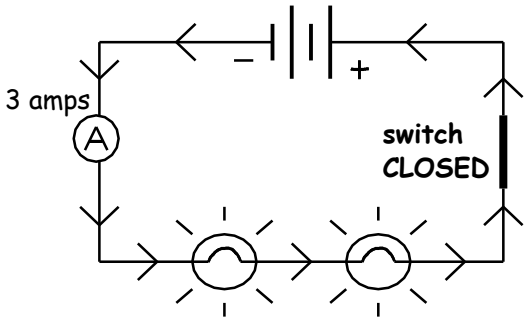
The bulb is much brighter.

W.S.65. Series and parallel circuits. Name ……

Exercise 1

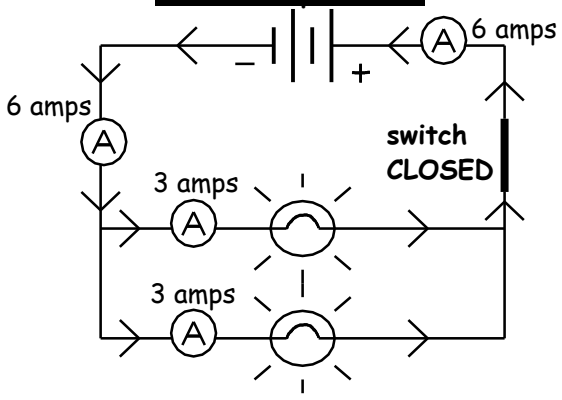
The diagrams below show the two ways of adding two bulbs to a circuit. Study them carefully and then try to fill in the missing words in the passages underneath. Choose from the list of words at the bottom.

Bulbs in series



The bulbs are dim.

Bulbs in parallel



The bulbs are much brighter.

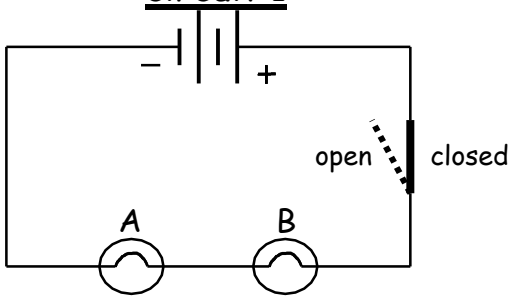
The current is …… because it is harder for it to travel through both bulbs. We say that there is a high …… The current does not get used up as it travels around the circuit. The …… gives the same reading anywhere in the circuit.

Both bulbs are connected directly across the two batteries therefore they are given the full …… The current is …… because it is easier for it to flow around the circuit. If another bulb was connected in parallel they would still be as ……

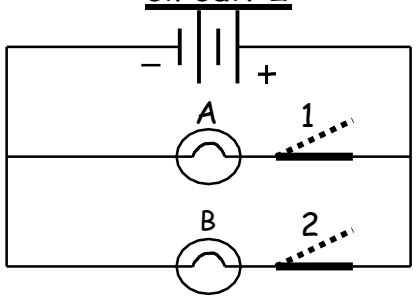
voltage **small** **bright** **resistance** **larger** **ammeter**

Exercise 2 - Study the two circuit diagrams below and then try to complete the sentences.

circuit 1



circuit 2



1) If the switch is opened in circuit 1 both bulbs would _____

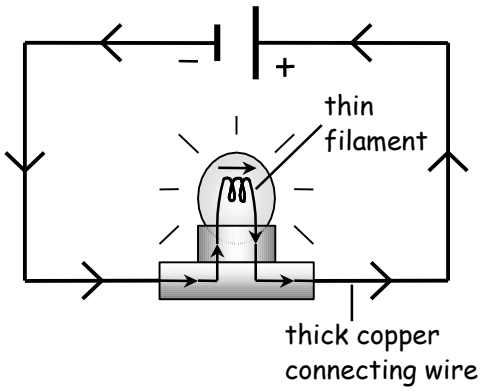
2) If bulb A is removed from circuit 1 bulb B would get _____

3) If switch 1 is opened in circuit 2 only bulb_____would light up.

W.S.66. Electrical resistance.

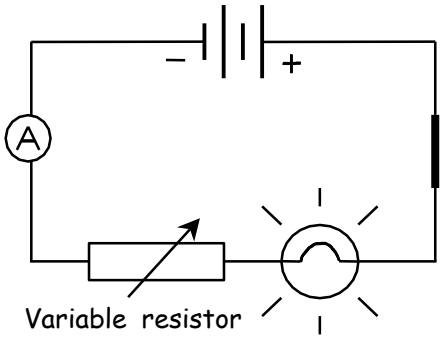
Name ……

When a bulb is connected into an electrical circuit the current passes from the thick copper connecting wires, into the thin filament wire of the bulb. The filament does not let the current pass through as easily. It has a bigger RESISTANCE than the connecting wires. This causes the filament to heat up and electrical energy is changed into heat and light energy.



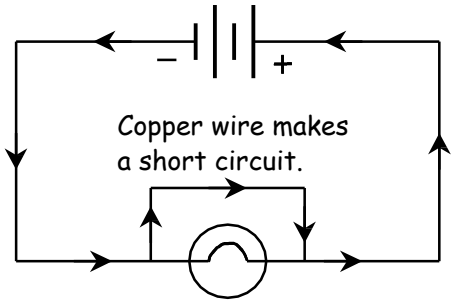
Using resistors.

The resistance of a wire increases if it is made thinner or longer. RESISTORS are lengths of wire that are used in circuits to reduce the current. They are used in electrical devices such as radios and televisions to keep the currents at the correct levels. A VARIABLE RESISTOR is a long coil of nichrome resistance wire. It has a sliding contact that can be moved along the coil to change the resistance. The bulb in the circuit diagram opposite can be gradually made dimmer or brighter by sliding the control on the resistor.



Short circuits.

An electric current always takes the easiest route around a circuit. In the diagram opposite the bulb does not light up because it is easier for the current to pass through the copper wire than through the bulb. The bulb has a bigger resistance than the wire. This is called a SHORT CIRCUIT.



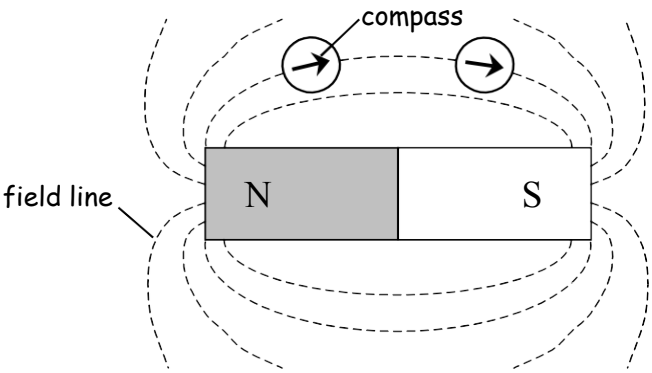
Exercise – Complete the missing words in the passage below.

The thin wire inside a light bulb is called a F _ _ _ _ _ _ _ This does not let the C _ _ _ _ _ _ pass through it easily because it has a high electrical R _ _ _ _ _ _ _ _ _ _ When a bulb lights, electrical energy is being changed into H _ _ _ and light energy. C _ _ _ _ _ is a metal with a very low resistance which is why it is used for electric wires.

The thinner a wire is the M _ _ _ resistance it has. Resistors are used in electrical devices to stop currents getting too H _ _ _ A variable resistor is used to change the S _ _ _ of the current in a circuit. They are used as dimmer switches in household L _ _ _ _ _ Variable resistors are also used as V _ _ _ _ _ controls in televisions and radios.

W.S.67. Magnets. Name ……

The magnetic metals are iron, steel, cobalt and nickel. They are attracted to magnets and can become magnetized themselves. There are invisible magnetic forces around a magnet. This is called a MAGNETIC FIELD. The forces are strongest around the ends, which are called the NORTH (N) POLE and the SOUTH (S) POLE.



The field lines can be shown by placing a piece of paper over the magnet and then sprinkling iron filings on top. The iron filings follow the pattern of the field lines.

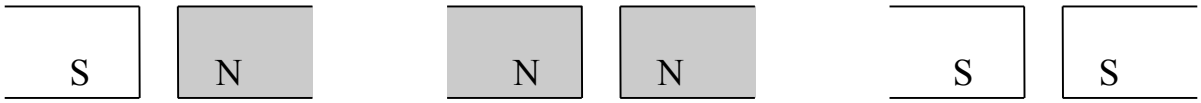
A compass always points from north to south along the field lines.

Forces between magnets.

If the poles of two bar magnets are brought close together they will exert a force on each other. They will either ATTRACT (pull together) or REPEL (push away from each other). This depends on what type of poles are brought together :

The rule is : LIKE POLES REPEL AND UNLIKE POLES ATTRACT.

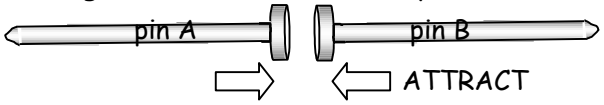
Exercise 1 - Underneath each diagram write down whether the magnets will attract or repel.

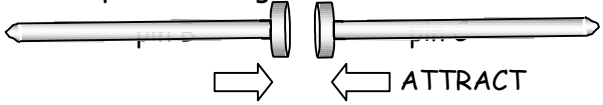


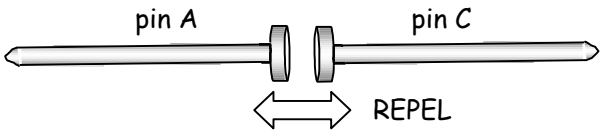
1) …… 2) …… 3) ……

Exercise 2

The diagrams below show three steel pins. Two of them are magnetized (have become magnets) and one is not. Try to work out which of the pins are magnets.



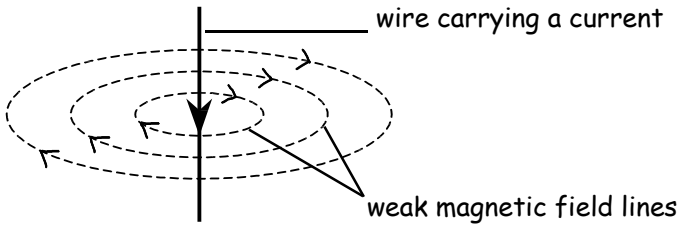




Therefore the magnetic pins are _____

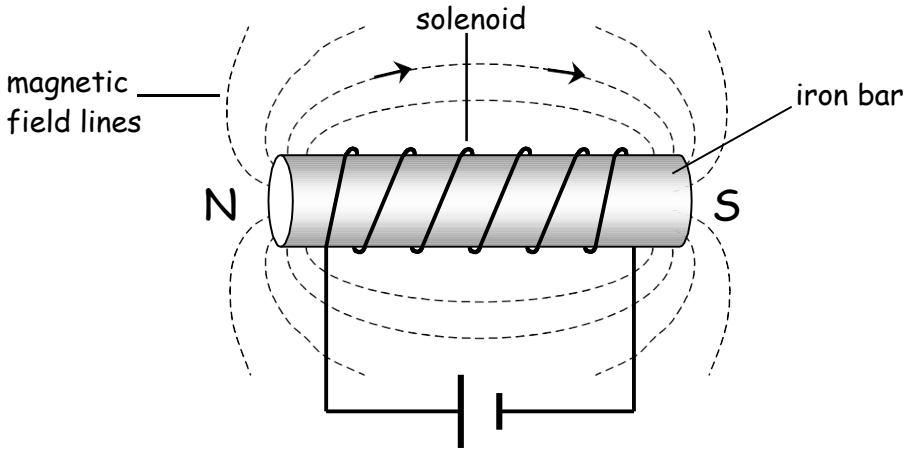
W.S.68. **Electromagnets.** Name ……

When a wire carries an electric current it produces a weak magnetic field around it. The field can be made **stronger** by increasing the **current** passing through the wire.



The magnetic field can also be made **stronger** by winding the wire into a **coil** called a SOLENOID. The magnetic field that is produced is like the one around a bar magnet. The greater the **number of turns** on the coil the **stronger** the magnetic field becomes.

If an **iron bar** is placed inside the solenoid the magnetic field becomes **much stronger**. This is called an ELECTROMAGNET and it can be used in many devices, e.g. electric bells. The diagram below shows how an electromagnet is made.



When the current is switched off the iron bar loses its magnetism. If a **steel** bar is put into the solenoid it stays a permanent magnet after the current is switched off.

Exercise - Complete the sentences below.

1) If a wire carries an electric current it produces a magnetic _ _ _ _ _

2) If the current is increased the magnetic field gets _ _ _ _ _ _ _ _

3) A coil of wire is called a _ _ _ _ _ _ _ _

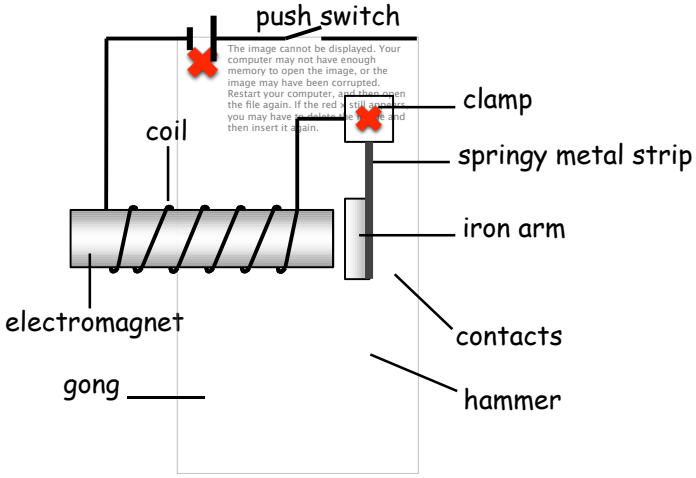
4) The _ _ _ _ turns of wire on the coil the stronger the magnetic field.

5) An iron bar inside a solenoid makes an _ _ _ _ _ _ _ _ _ _ _ _ _

W.S.69. Uses of electromagnets.

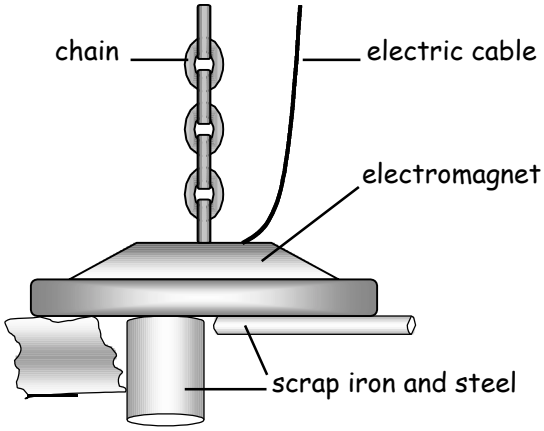
Name ……

The diagrams below show how electromagnets are used in various devices. Try to complete the missing words in the passages underneath each one.



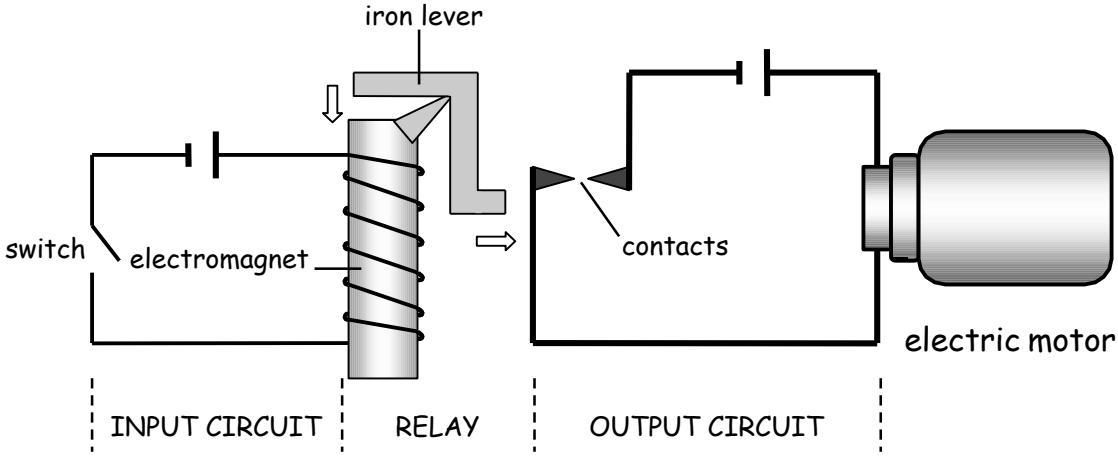
An electric bell.

When the push switch is closed the current flows through the _ _ _ _ The electromagnet then attracts the iron _ _ _ The hammer moves and strikes the _ _ _ _ As this happens the contacts separate and the circuit is broken. The electromagnet is switched _ _ _ and the hammer springs back.



Sorting scrap metal.

In a scrap yard electromagnets can be used to separate iron and _ _ _ _ _ _ objects from other materials. A thick _ _ _ _ _ supplies electricity to the magnet. The electricity is switched on to pick the metals up and then switched _ _ _ to put them down.



Electromagnetic switches – RELAYS.

Sometimes it is dangerous to switch on a circuit directly. For example, a car starting motor needs a current of over 100 amps. An electromagnetic switch called a _ _ _ _ _ can be used to switch the circuit on safely. When the switch in the _ _ _ _ _ circuit is closed the magnet is switched on. This pulls the iron _ _ _ _ _ towards it and the _ _ _ _ _ _ _ _ are closed. The motor in the _ _ _ _ _ _ circuit is now switched on.

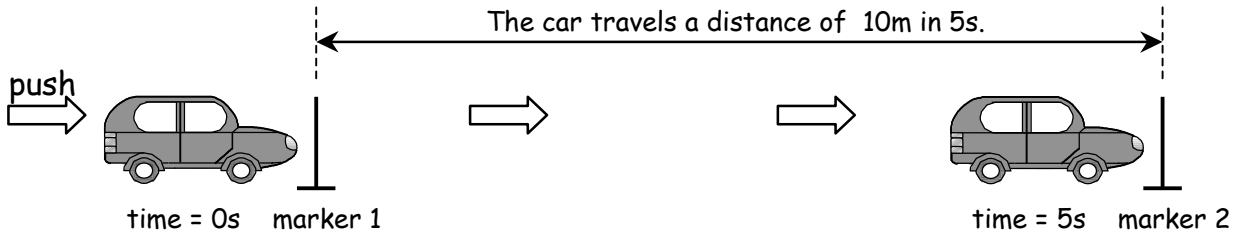
W.S.70. Speed. Name ……

The SPEED of a moving object is the DISTANCE it travels divided by the TIME that it takes.

SPEED = DISTANCE ÷ TIME or $\frac{\text{DISTANCE}}{\text{TIME}}$

Units for speed
metres per second (m/s)
miles per hour (mph)
kilometres per hour (km/h)

The example below shows how to work out the speed of a toy car.



The average speed of the car = $\frac{\text{distance}}{\text{time}}$ = $\frac{10\text{m}}{5\text{s}}$ = 2m/s

Exercise 1 – Work out the answers to the problems below. REMEMBER UNITS.

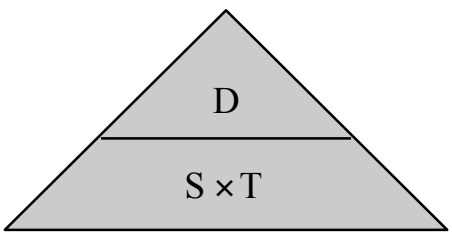
1) A sprinter runs 100m in 10 s. His average speed = $\frac{100\text{m}}{10\text{s}}$ = _____m/s

2) A train travels 600km in 5 hours. Its average speed = $\frac{600\text{km}}{5\text{h}}$ = _____

3) A boy cycles 20 miles in 2 hours. His average speed = _____ = _____mph

Working out distance and time.

You can use the formula triangle on the right to work out speed, distance or time. For example, if you wish to work out distance then place your finger over the distance part (D) and you will see that distance is speed × time (S × T).



Exercise 2 – Use the formula triangle to help you work out the problems below.

1) A car travels at 40 mph. What distance will it travel in 3 hours?

distance = _____ × _____ = 40 mph × 3 hours = _____

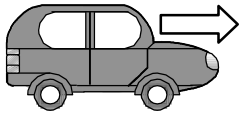
2) An athlete sprints at 10m/s. How long does it take him to complete a 200m race? time = DISTANCE ÷ SPEED = _____ = _____

W.S.71. Force and movement.

Name ……

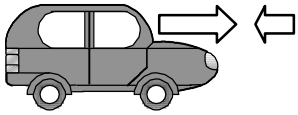
A FORCE is a PUSH or PULL. Force is measured in NEWTONS (N). Forces can speed up or slow down objects. The diagrams below show how different forces can affect the movement of a car.

1. Force from the engine makes the car begin to move.



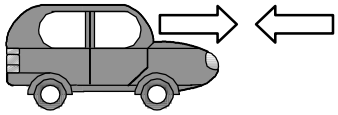
unbalanced force

2. As the car speeds up the force of air resistance gets bigger.



unbalanced force

3. The car reaches a steady speed when the two forces are equal.

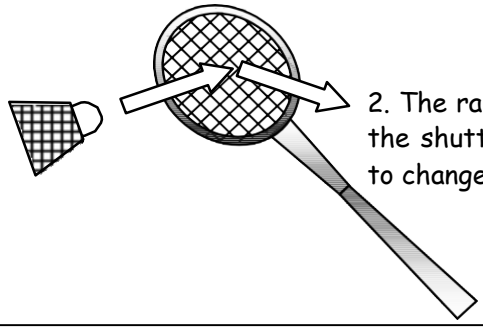


balanced force

When the force pushing against the car is the same size as the force from the engine the car stops accelerating and travels at a steady speed.

Forces can also make objects change direction. The diagram below shows this.

1. Shuttlecock moving in one direction hits the racket with a force.



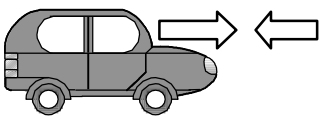
2. The racket gives a force to the shuttlecock and causes it to change direction.

The important rules from this are :

1. Unbalanced forces change the speed and/or direction of moving objects.
2. Balanced forces produce no change in the movement of an object.

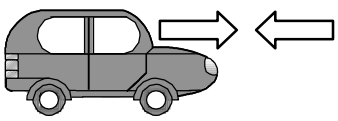
Exercise – Complete the sentences underneath each of the diagrams below.

Force from engine is 500N. Force of air resistance is 300N.



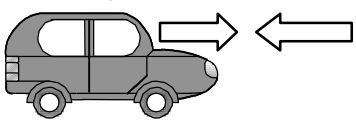
1) The car will _____

Force from engine is 500N. Force of air resistance is 500N.

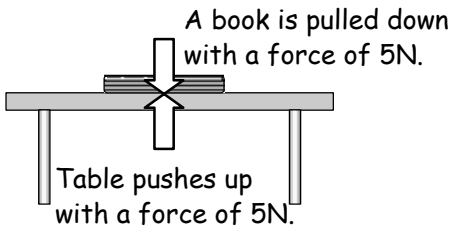


2) The car will _____

Force from engine is 500N. Force of air resistance is 700N



3) The car will _____



4) The book will not _____

W.S.72. Friction.

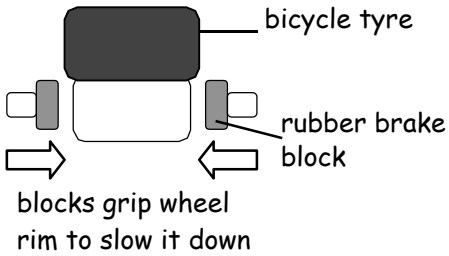
Name ……

Friction is a force that stops two surfaces sliding past each other. It is caused by tiny bumps on the surfaces which catch together.

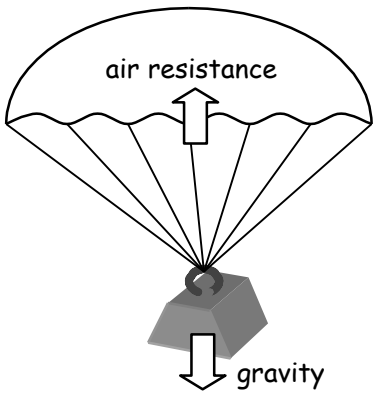
Uses of friction.

1. Friction gives grip for shoes and tyres. We could not move over the ground without friction.

2. Brakes on bicycles and cars use friction to slow down the wheels.



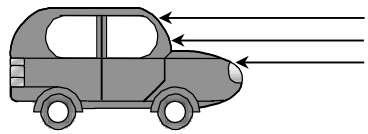
3. Air resistance is a type of friction that slows down parachutes.



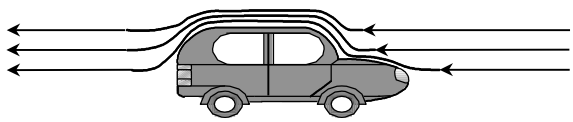
Problems caused by friction.

1. Friction slows down moving machinery. It can also make machinery over heat. Grease and oil must be used to reduce friction.

2. Air resistance is a type of friction that slows down vehicles. The faster the vehicle travels the greater the air resistance becomes. Car bodies are designed so that the air slips smoothly over the bonnet.



Poor design – air hits against bonnet and slows the car down. The engine must work hard to keep at a high speed.



Good design – air slips smoothly over the bonnet. The air resistance is low and the car travels at high speed easily.

Exercise – Complete the missing words in the passage below.

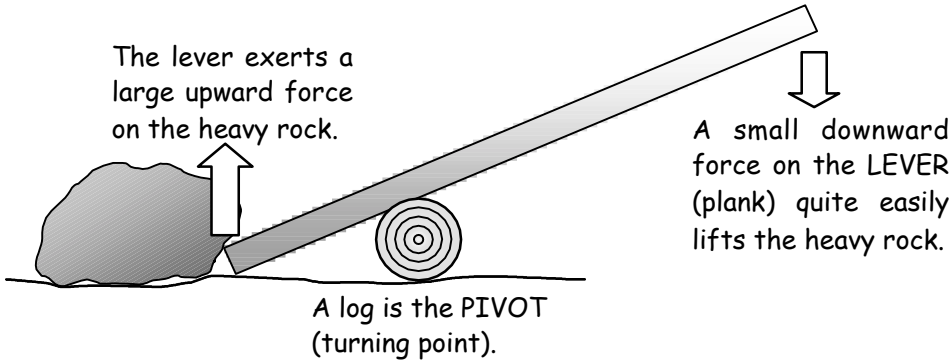
The force that stops two surfaces sliding past each other is called …… If there was no friction between our shoes and the ground our feet would …… when we tried to walk. Rubber brake blocks grip against the …… of a bicycle wheel in order to slow it down. A parachute reaches a steady speed when the force of …… pulling it down is balanced by the air resistance pushing …… Friction between the moving parts of machinery can cause it to over …… The friction can be …… by using oil or …… The …… a car moves the greater the air resistance is that pushes against it.

slip reduced friction faster heat rims gravity grease upwards

W.S.73. Turning forces.

Name ……

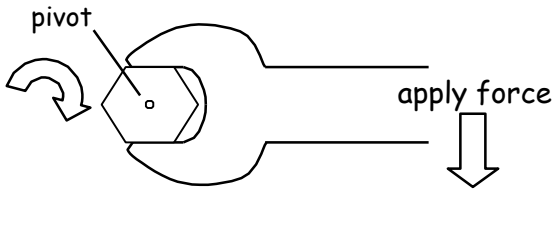
Forces can cause objects to turn around a pivot.



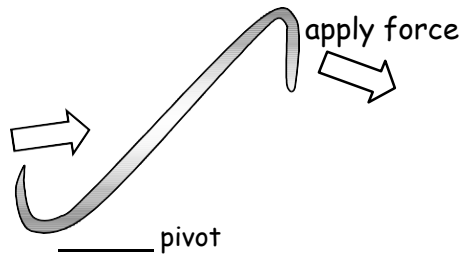
The important rule from this is :

The size of the turning force can be increased by increasing the length of the lever.

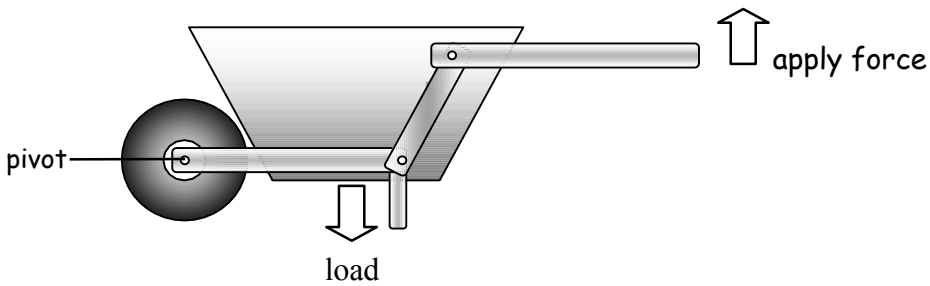
Some examples of how we use turning forces.



Using a spanner to loosen a nut.



Using a crowbar to force objects apart.



Using a wheelbarrow to carry heavy loads.

Exercise – Complete the sentences below.

1) A _ _ _ _ _ is a turning point.

2) A long _ _ _ _ _ makes it easy to move a heavy object.

3) The longer the lever the greater the _ _ _ _ _ _ _ _ _ _ _ _ _

4) A _ _ _ _ _ _ _ can be used to lever open a locked door.

5) A tight nut can be loosened easily if a _ _ _ _ spanner is used.