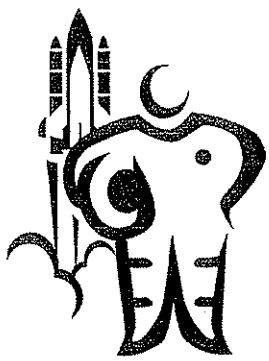
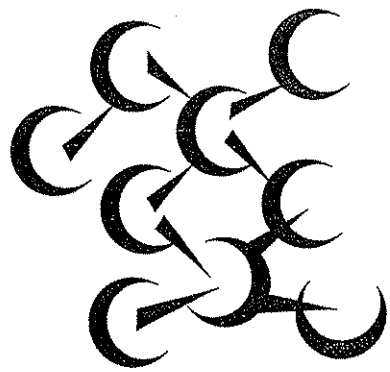


Science

Revision Booklet Hot Tips



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Revision Record

Page	Topic	Date of Revision			
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Revision Record

Page	Topic	Date of Revision			
E.g	Electricity	05/05	23/05	02/06	Etc...
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Revision Tips

You will be tested on the following:

1) Your factual knowledge
2) Your ability to adapt your knowledge to slightly different situations
3) Your ability to read, and take information from graphs and charts.

Science is not just about remembering what you did in lessons. It's about understanding **some of the important ideas and seeing how they apply in different situations. Some questions will test this kind of understanding. To answer these you should be able to** link ideas **and scientific theories while** draw on different sorts of information.

There is no hiding from revision, but you can make it easier on yourself!!! The person sitting the exam is YOU!!!

Revision: When, How, How long

- ❑ Revision should be over a period of months, not the night before.
- ❑ Little but often is the key.
- ❑ Test yourself, **you will only know if you have learnt the topic if you can** remember the facts without the aid of your book. **e.g. close your book and use scrap pieces of paper to draw mind-maps or spider diagrams, linking key words and theories.**
- ❑ Revision/learning is far more affective in the morning – then you can enjoy the rest of the day.
- ❑ **Factual learning** is the foundation of your knowledge. Science researchers have proven that you forget one-third of what you revised a week ago. It is therefore important that you **keep revisiting past topics**.

In the exam room:

- ❑ Be on time, you should not be rushing to get to the exam.
- ❑ Remember a time when you did well.
- ❑ Tell yourself you are going to get an 'A/B/C' grade.
- ❑ Take a few deep breaths to calm your nerves.
- ❑ SLOW DOWN.
- ❑ Be prepared, make sure you have a pencil, ruler, rubber, sharpener, calculator (especially for the physics paper).

Tackling the all important Paper:

- ❑ Read the question from the beginning, don't skim read because you may miss vital information.
- ❑ Read it again, underlining/**highlighting** key words/values/measurements you are likely to miss.
- ❑ What is the question about? E.g. reactivity.
- ❑ Think about that topic.
- ❑ Visualise the experiments done in that topic.
- ❑ Answer the question
- ❑ Look at **how many marks are available for each question** e.g. (3), this indicates the number of valid points you should make.
- ❑ You must include the UNITS!!!
- ❑ You must show your WORKINGS!!!
- ❑ In multiple choice, look at ALL the options; first of all eliminate the obvious wrong answers, then make an educated guess for the best correct answer. Don't leave any multi-choice question/answer blank.
- ❑ If you don't know a word, make a sensible guess.
- ❑ If you can't do the question, don't wait time move on you can always come back to it later.
- ❑ Remember to **look carefully** at any **picture, table, graph or statement**. They are giving you **information** that will help you to answer the questions!
- ❑ Use a **ruler and a pencil for all diagrams** there are some marks available for presentation.
- ❑ **Tackling questions that test your understanding**. Don't be put off if you find a question on something you may not have covered in your science lessons. These sorts of questions are not testing what you can remember but whether you can read and make sense of some new information on a science topic you have studied.
- ❑ Don't be put off if others finish before you. If other around you finish early it's because they have not answered the questions properly. Very, very, very few achieved 100% in an exam, there is always a mistake to be found in your paper somewhere. **Read through your answers** if you have time left at the end of your exam.
- ❑ Blanks = 0 %

Answering the questions properly:

- ❑ What is the question asking? Below are 7 words asking 7 different questions!!!

WHAT, WHERE, WHEN, HOW, EXPLAIN, NAME, DESCRIBE

- ❑ Calculate – make sure your workings are obvious to the examiner!
- ❑ Write down – short answer
- ❑ Describe – give some detail.
- ❑ Write in as must detail as possible however obvious it sounds – if you don't put it down the examiner will assume you don't know!
- ❑ Explain – Why?

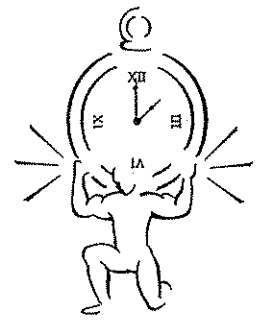
If you can tick all the boxes you are well on your way
to passing the exam!!! – Good Luck

How to Revise:

Be true to yourself. **Factual** learning is the foundation of your knowledge. Science researchers have proven that you forget one-third of what you revised a week ago. It is therefore important that you keep **revisiting past topics** (use the revision record to sheet in this booklet). **Test yourself**, you will only know if you have learnt the topic if you can remember the facts without the aid of your book. e.g. close your book and use scrap pieces of paper to draw mind-maps or spider diagrams, linking key words and theories.

Do the following to aid successful revision:

1. Read/Highlight
2. Summarise
3. Cover (close mindmap revision booklet)
4. Write (without using mindmaps – no cheating)!
5. Check



NEVER JUST READ!

Do not leave revision until "lastminute.com"; revision should be an on going practice leading up to your exams. **Little** but **often** throughout the term is better than a late nights revision session the night before your exam. Try and get all you revision done during the morning/afternoon, that way you can enjoy the rest of the day and not have the thought of revision hanging over you.

There is no hiding from revision, but you can make it easier on yourself!!!
It's hard work – such is life ... get on with it!

BIOLOGY

Check the topic list:

Know the Jargon: -

- ❑ Calculate
- ❑ Describe
- ❑ Explain
- ❑ Name (one word)
- ❑ Suggest (use your imagination)

Label diagrams: -

- ❑ Plant & animal cell (differences)
- ❑ Heart
- ❑ Sex organs
- ❑ Flowering plant

Learn examples: -

- ❑ e.g. of a food chain/web
- ❑ Omnivore, carnivore, producer etc...
- ❑ Bacteria and viruses (symptoms and preventative measures)
- ❑ Food groups and deficiencies
- ❑ Memory tricks for facts e.g. MRS GREN
- ❑ Affects of smoking, drugs, solvents and alcohol

Know your equations: -

- ❑ Photosynthesis
- ❑ Respiration
- ❑ Fermentation

Know the famous experiments: -

- ❑ Photosynthesis (factors affecting P/S)
- ❑ Germination
- ❑ Counting a population
- ❑ Making a slide (cells)

Key facts to learn: -

- ❑ Organs and their role (digestion)
- ❑ Characteristics of vertebrates & invertebrates

CHEMISTRY

Check your topic list:

Know your separation techniques: -

- ❑ Evaporation
- ❑ Filtration
- ❑ Distillation (simple/fractional)
- ❑ Chromatography

Know your types of reactions: -

- ❑ REDOX (Oxidation & Reduction) Extraction of Metals
- ❑ Decomposition (acid & thermal)
- ❑ Neutralisation (exothermic)
- ❑ Combustion (reactants and products – Hydrocarbons) Endothermic
- ❑ Displacement (reactivity series)
- ❑ Reactivity Series

Learn names and equations for: -

- ❑ Common Acids and Alkali/bases
- ❑ Carbonates, salts

Tests: -

- ❑ Gases (hydrogen/carbon dioxide/oxygen)
- ❑ Water (cobalt chloride paper/pH/boil at 100 Celsius)

Know what the key words mean: -

- ❑ e.g. solution, solvent, soluble, saturated etc...

Label and draw equipment/apparatus: -

- ❑ Labels in pen.
- ❑ Diagrams in pencil.

Know the famous experiments: -

- ❑ Making an indicator from red cabbage
- ❑ Separating mixtures
- ❑ Safety / roaring flame Bunsen burner

Key facts and examples to learn: -

- ❑ Chemical and physical reactions
- ❑ Acids and Alkalis
- ❑ Properties & particle arrangement of Solid/Liquid and Gas
- ❑ Properties of metals and non-metals
- ❑ Chemical reaction: change in mass, colour, gas given off etc...
- ❑ Speed up reactions: Catalyst, Temp. Conc. Pressure, Stir, Vol.
- ❑ Global warming & acid rain (problems and solutions)

PHYSICS

Check the topic list:

Calculations: -

- ❑ Always show your working, however obvious (include the calculating triangles).
- ❑ Set your calculator to normal.
- ❑ Two many decimal places.
- ❑ Always put a unit with a number
- ❑ Know your triangles for Density, Pressure, Speed, Moments.
- ❑ Know how to convert: N to g, N to Kg, g to N, Kg to N

Know your diagrams: -

- ❑ PENCIL & RULER
- ❑ Electrical Symbols and circuits
- ❑ Day and night

Graphing: -

- ❑ PENCIL
- ❑ Labelling: title, axes with suitable scale which includes the units
- ❑ Plot with small sharp crosses
- ❑ One line (curve or straight with a ruler – line of best fit).
- ❑ If asked to read off a graph, show the horizontal and vertical line.

Drawing light rays: -

- ❑ PENCIL & RULER.
- ❑ Arrows pointing/reflecting into the eye.
- ❑ Reflection, refraction and light dispersal

Remember the rhymes and acronyms: -

- ❑ **R**ichard **O**f **Y**ork **G**ave **B**attle **I**n **V**ain.
- ❑ **M**y **V**ery **E**asy **M**ethod **J**ust **S**hows **U**s **N**ine **P**lanets

Key experiments: -

- ❑ Magnetic strength
- ❑ Springs (stretch and elastic limit – Hooke's Law)

Key facts to learn:

- ❑ Types of forces and force arrows (including friction)
- ❑ Density (displacement, Eureka beaker, density of water)
- ❑ Sound difference between amplitude and frequency
- ❑ What causes the seasons
- ❑ Ammeters, current and resistance
- ❑ Difference between Conduction, convection and radiation
- ❑ Energy types/Alternative energy

INVESTIGATIONS

- ❑ Be able to label & draw apparatus.
- ❑ Know 5 safety precautions/symbols.
- ❑ What is a fair test / what will you keep the same?
- ❑ What is a control experiment?
- ❑ Plot a graph - look at the graph rules.
- ❑ Interpret a graph.
- ❑ What does a straight line mean? CORRELATION
- ❑ What does a curve mean? INCREASES/DECREASES
- ❑ If they give you a graph to interpret, use your imagination.

Recommended websites to help you with your revision:

1. www.bbc.co.uk/schools/ks3bitesize/science/
2. www.bbc.co.uk/schools/scienceclips/index_flash.shtml
3. www.ex.ac.uk/Mirrors/nineplanets/
4. www.channel4.com/science/index.html
5. www.scienceyear.com/home.html
6. www.eun.org/vs/chemistry/index.htm
7. www.science-active.co.uk/
8. www.bbc.co.uk/schools/ks3bitesize/
9. www.bbc.co.uk/schools/gcsebitesize/
10. http://kids.msfc.nasa.gov
11. www.ncaction.org.uk/

Experiment

Independent Variable

The quantity in the experiment that is **changed** to study its effect.

Fair Test/ Control Variables

The quantity in the experiment that is **kept the same** to make sure that the effect of the independent variable is measured.

Dependent Variable

The quantity in an experiment that is **measured** to see the effect of the independent variable.

Hazards/Safety

Identify the hazards and risks (equipment and chemicals).
What safety precautions will be taken during the experiment.

Equipment

List the equipment and chemicals needed for the experiment.

Continuous/Discontinuous Variables

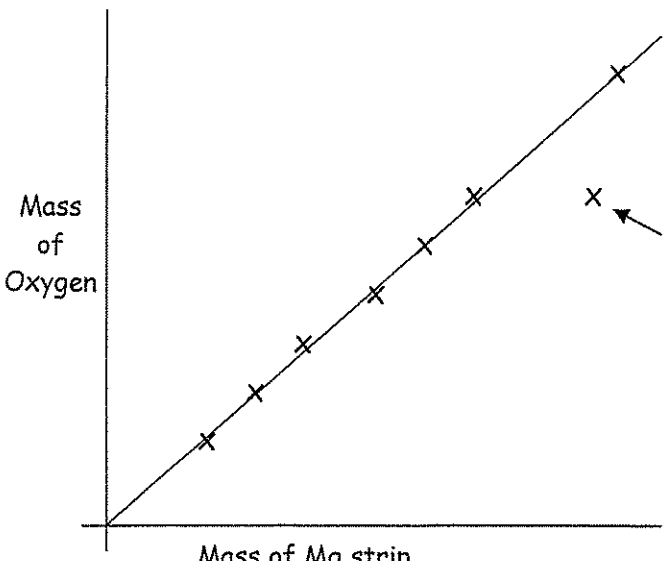
Continuous - can have any value, sometimes within a given range.
e.g. Length of feet
Discontinues - has only certain specific values.
e.g. Size of shoe

Example - Photosynthesis Experiment

Q: Test to prove that CO_2 is needed for Photosynthesis (Starch)
Independent Variable: CO_2 (one plant with CO_2, one plant without CO_2).
Dependant Variable: Presence of starch in leaves/Growth of plant
Control Variables: Destarched plants, same quantity of water & nutrients, same temperature and intensity/exposure to light.

Scatter Graph – two independent variables – two sets of data at the same time – to identify a relationship **(CORRELATION)** between the data.

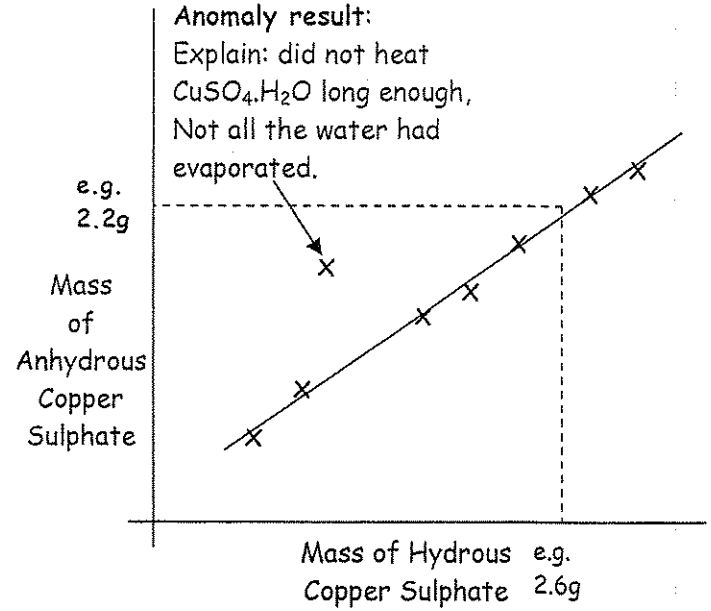
Oxidation – Heating Mg → MgO



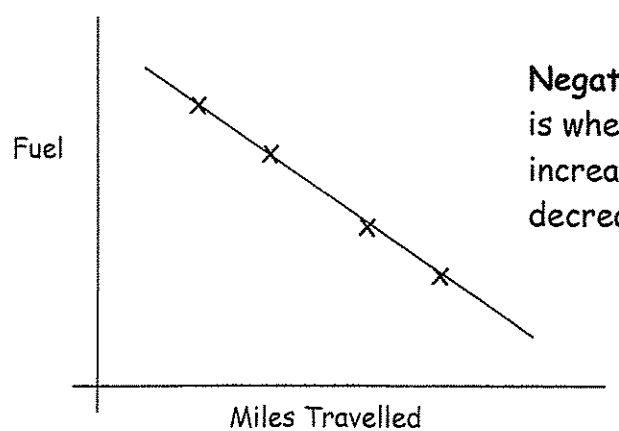
Line of Best Fit: passes through origin. Explain:- no mass of Mg = no oxidation = no gain in oxygen.

Anomaly result:
Explain: did not heat Mg strip long enough, not completely oxidised; therefore has less mass than expected.

Hydrous Copper Sulphate – Heat → Anhydrous Copper Sulphate



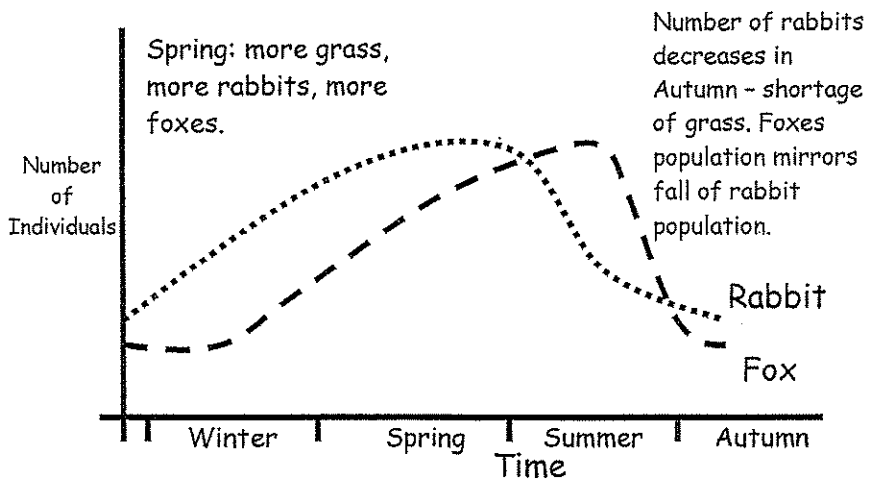
Positive Correlation (relationship) – both variables are increasing.
Explain:- the greater the mass of Mg strip heated the greater the mass of combined oxygen – oxidation.



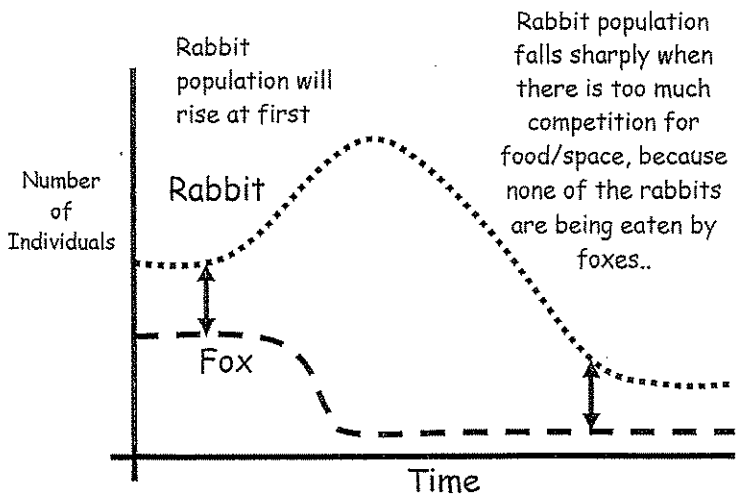
Negative Correlation this is when one variable increases as the other decreases.

Estimating values: using the dotted horizontal and vertical lines along the x/y axis and the line of best fit.
Q: What would be the mass of Anhydrous Copper Sulphate if you were to heat 2.6g of Hydrous Copper Sulphate?
E.g. If you were to heat a mass 2.6g of Hydrous Copper Sulphate, than from the scatter diagram we can estimate the mass of Anhydrous Copper Sulphate (mass of water lost/evaporated). Go to x axis, find the value in question in this case its 2.6g. Then read up to the line of best fit and across to find the corresponding value along the y axis; the value would read 2.2g. NB: d◠y these lines on the graph to show the examiner (these are your workings).

Changes in population: Grass→Rabbit→Fox



Other factors affecting population



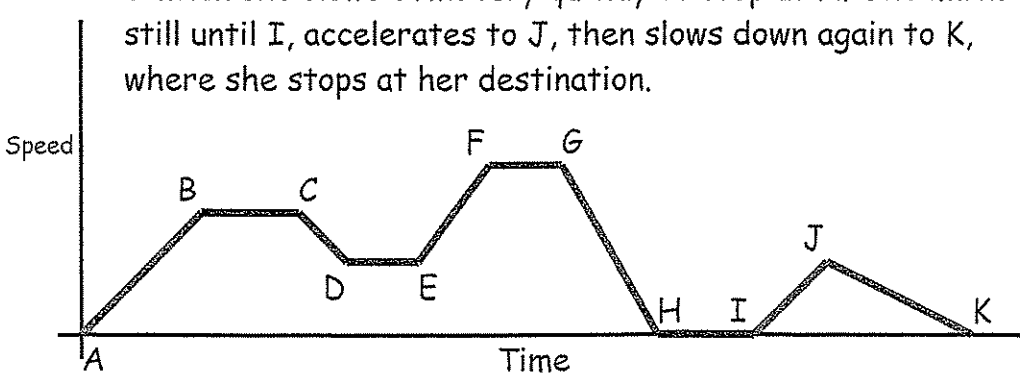
Foxes catch disease – fewer predators – rabbit population increases because there are fewer predators (fewer rabbits are being eaten by fewer foxes). Balance re-established at lower level, similar to before.

Other factors which affect a population:

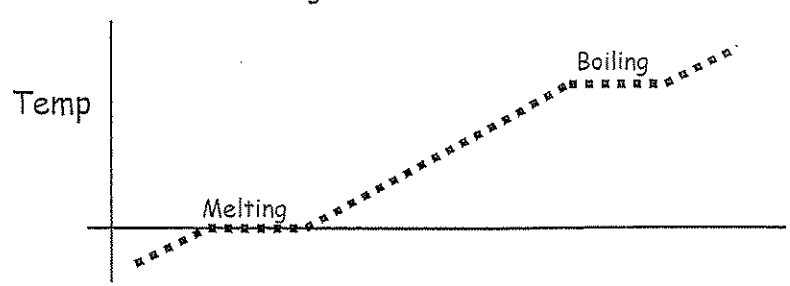
- Food
- Space
- New Predator
- Disease
- Environment change/destroyed
- Climate/season change

Scientific Explanation – Speed and time

The person doing this journey starts to accelerate until a speed is reached at B, which stays steady until C. She then slows down to a new steady speed which is maintained from D to E. At E she starts to accelerate again and reaches the highest speed of the journey at F. She holds this speed until G when she slows down very quickly to stop at H. She mains still until I, accelerates to J, then slows down again to K, where she stops at her destination.



If **the independent variable** is a **continuous variable** then you must plot a line graph. For example, if you heated a beaker containing ice until it became boiling water and took the temperature every minute, then you would have to a graph that looks like the one below.
Usually the **independent variable** goes on the **x-axis** (along the bottom) and the **dependent variable** goes on the **y-axis** (up the side).
In the graph of temperature and time, we see how the temperature of the water changes over time, levelling off when the ice was melting and again when the water was boiling.



Notes

Notes

Leading up to CE

Science Exam Tips / Answering Questions

This revision guide will help you prepare for the Key Stage 3 science tests.

Things to remember when tackling science questions

- Read all of the question carefully or you may miss important information.
- Make sure you understand what the question is asking. Even if a picture or diagram is familiar the question might not be the one you expect.
- You can draw or write on the question paper if this helps. For example, when trying to read a graph it's OK to draw lines from the axis to the point you are trying to read.
- Don't be put off if you find a question on something you may not have covered in your science lessons. These sorts of questions are not testing what you can remember but whether you can read and make sense of some new information on a science topic you have studied.
- You should always try to use scientific words and conventions accurately. It may not be crucial to spell all the words entirely correctly but you should know when to use them. For example, think about words such as 'temperature' and 'heat'. Temperature is a measure of how hot something is; heat is a form of energy.
- Don't forget to include units such as °C, s (seconds), g, N etc. where they are needed. In science numbers without units have no meaning.
- Arrows in food webs or light rays must point in the correct direction. Use a ruler to draw light rays.

Tackling questions about practical work and results

Some questions test how well you can do practical work. Others test your understanding of results and what they might mean. To answer these questions you need to be able to:

1 recognise equipment described in words or from a diagram and explain how to use it correctly and safely;

2 identify important features of an investigation;

3 read results tables, bar charts and line graphs accurately; identify trends or patterns;

4 interpret evidence (in words or numbers) from investigations and draw valid conclusions from it;

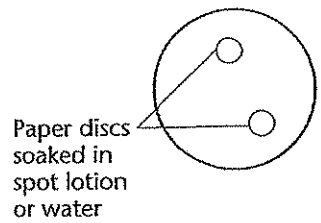
5 suggest reasons or explanations;

6 predict consequences of an action or event (sometimes given some information).

The examples below show how you might tackle these sorts of questions.

1 Recognising and using scientific equipment safely and correctly

Spots may be caused by bacteria in the skin. A researcher investigated the effects of spot lotion on bacteria by growing bacteria on the surface of jelly on a Petri dish. He placed small discs of paper on the surface of the jelly. One disc had been soaked in spot lotion and the other in water.



Give **two** safety precautions the researcher should take to avoid contact with the bacteria.

To answer this question you need to know what a Petri dish is, and what bacteria are and why the researcher needs to avoid contact with them.

You could choose two correct answers from the following:

- keep the Petri dish lid on as much as possible;
- once the discs are on the jelly, tape the lid down to stop it being knocked off;
- use tweezers, not fingers, to put the discs on the jelly;
- wear eye protection and possibly gloves.

2 Identifying important features of an investigation

Sarah added some salt to 100 cm^3 of cold water in a beaker. She stirred the water to dissolve the salt. She added more salt until no more would dissolve.

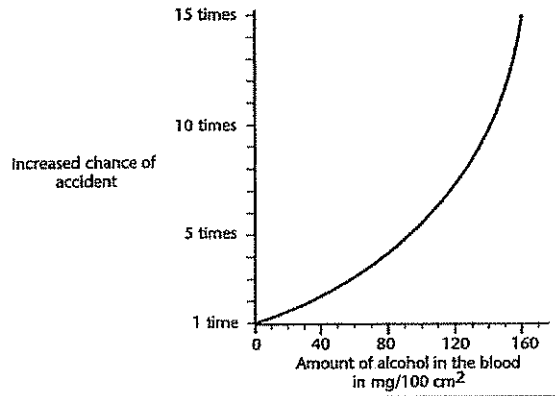
She repeated this experiment with sugar, baking powder and instant coffee powder. Each time she used a different beaker containing 100 cm^3 of cold water.

Describe **two** ways in which Sarah made this experiment a fair test.

In a fair test you need to keep everything the same except the factor being investigated. Sarah is changing the substance she is dissolving. The things she needs to keep the same are the amount (volume) of water, the temperature of water, and the amount of stirring.

3 Reading results and identifying trends or patterns

Using the graph, describe how increasing the amount of alcohol in the blood affects the chance of having an accident.



You need to understand the graph by looking at the labels on the axes and then the shape of the line. Increasing the amount of alcohol in the blood increases the chance of an accident. However, the graph is not a straight line but a curve which gets steeper. So the chances of having an accident increase more quickly as the amount of alcohol goes up.

4 Interpreting evidence and drawing conclusions

Type of road surface	Stopping distance (metres)			
	New tyres on dry road	New tyres on wet road	Old, worn tyres on dry road	Old, worn tyres on wet road
Smooth tarmac	18	19	20	50
Rough tarmac	13	18	17	23
Concrete	12	17	16	21

A question about car tyres and stopping distances included the above table of results.

(a) What happens to the stopping distance when a road gets wet?

(b) Why does the stopping distance change when the road gets wet?

(c) What happens to the stopping distances as tyres get old and worn?

(d) What is the safest type of road surface in the table?

You must read the numbers carefully, paying close attention to the labels for the rows and columns.

(a) Compare wet and dry roads. In every case the stopping distance on a wet road is more than on a dry one.

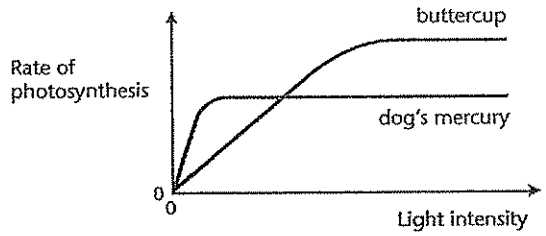
(b) To answer this question you need to remember work on friction.

(c) When comparing old and new tyres, in every case old tyres take longer to stop than new ones.

(d) The surface with the shortest stopping distances will be the safest – this is concrete.

5 Suggesting reasons or explanations

Buttercup plants grow mainly in open fields. Dog's mercury is a plant which grows mainly in woodland. The graph shows how the rate of photosynthesis in these two plants changes as light intensity changes.



Why do dog's mercury plants grow better than buttercups in woodland? Use the graph to help you.

You need to remember that woodland is likely to be quite shady.

The graph for dog's mercury goes up more quickly than that for the buttercup, showing that dog's mercury starts to photosynthesise faster in low light.

The line then levels off, showing that dog's mercury quickly reaches a level when increasing the amount of light makes no difference to the rate of photosynthesis.

Although the line for buttercup is less steep, it gets higher than that for dog's mercury which means that if there is enough light buttercups will photosynthesise more.

6 Predicting consequences

Substance	Melting point (°C)	Density (mass of 1 cm^3, in g)
Water	0	1.0
Paraffin wax	60	0.8
Naphthalene	80	1.2

The table gives some of the properties of three substances: water, paraffin wax and naphthalene.

(a) Draw the shape and position of a small ball of naphthalene which has been placed in a beaker of water at 70 °C for ten minutes.

(b) Draw the shape and position of a ball of paraffin wax which was also placed in a beaker of water at 70 °C for ten minutes.

The table gives you melting points and densities. You need to remember what these mean because this will allow you to work out the correct answers.

At 70 °C naphthalene will not melt so it will still be a ball. It also has a greater density than water so it will sink. Therefore the picture will be a ball at the bottom of the beaker.

At 70 °C paraffin wax will melt and so spread into a layer. Because the density of paraffin wax is less than water the layer will float on the top of the water.

Tackling questions that test your understanding

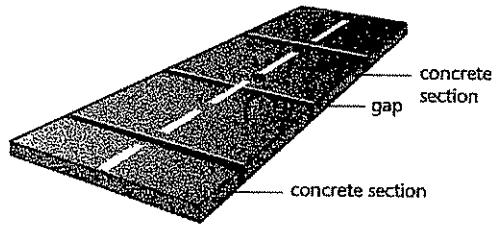
Science is not just about remembering what you did in lessons. It's about understanding some of the important ideas and seeing how they apply in different situations.

Some questions will test this kind of understanding. To answer these you should be able to:

- link ideas, make deductions or draw inferences, sometimes drawing on different sorts of information.

Here's an example. Notes about how you could answer it are below.

Some roads are made of concrete which is laid in sections with small gaps between them.



(a) What happens to the size of most objects when they get hotter?

(b) When the temperature rises, what will happen to the gaps between the concrete sections?

(c) When the temperature rises, what might happen to the sections of concrete if there are no gaps between them?

(d) The gaps between the concrete sections are filled with tar. The tar becomes soft when it is warm. Why is it important that the tar becomes soft?

You may not have studied concrete roads but this does not matter. The question is about expansion.

You will probably remember that most objects expand as they get hotter. You can work out that as the concrete sections get bigger, the gaps between them will get smaller.

If there were no gaps, there would be no room for the concrete sections to expand which might cause them to bend or crack.

Because warm tar becomes soft, it can flow out of the gaps and back in again as the concrete sections expand and contract.

Biology

Cells
Specialised Cells
Muscles and Joints
Disease & Microbes
Health & Balanced Diet
Human Body
Sexual Reproduction
Digestion
Circulation and Respiration
Animal Kingdom
Predator & Prey
Adaptation (Hot & Cold)
Adaptation (Daily & Seasonal)
Ecology
Food Webs
Plants

Cells – Tissue – Organ – Organ System - Organism

To use a microscope you:

i Place the smallest objective lens over the hole in the stage.

ii Turn the focusing wheel to move the objective lens close to the stage.

iii Place the slide on the stage.

iv Adjust the light source or mirror.

v Look into the eyepiece lens

vi Turn the focusing wheel until what you see is clear (**in focus**).

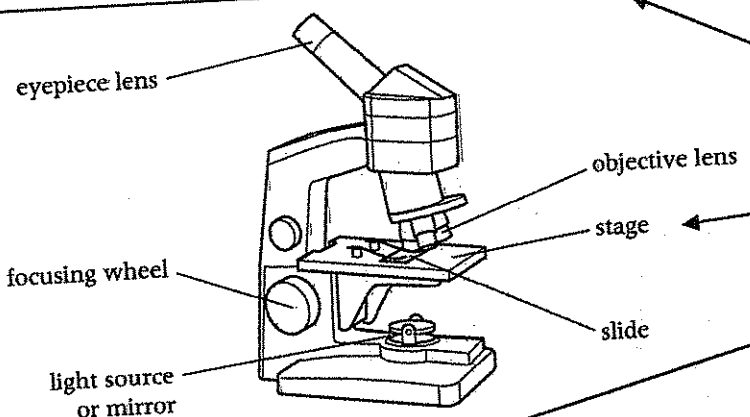
Making a slide

1. Put specimen onto slide
2. Add stain
3. Cover slip
4. View under microscope

Specialised Cells

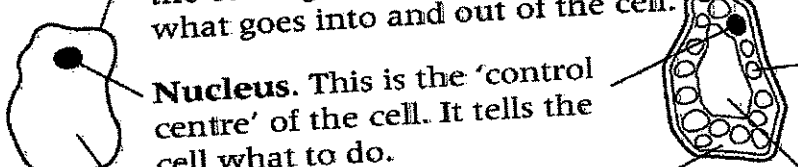
Palisade – photosynthesis
Cilia – trap/remove dirt in throat
RBC – carry oxygen / CO_2
Nerve – transmit messages
Sperm – fertilise egg
Ovum – be fertilised
Root – mineral / water absorption
Guard – control gas / water (P/S)
Muscle – contract / movement

Cells



7 Life Process:
Movement
Reproduction
Sensitivity

Growth
Respiration
Excretion
Nutrition



Cell surface membrane. This is like a very thin bag. It keeps the cell together and controls what goes into and out of the cell.

Nucleus. This is the 'control centre' of the cell. It tells the cell what to do.

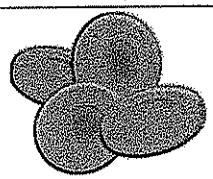
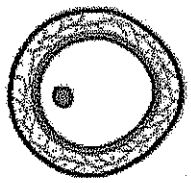
Cytoplasm. This is a jelly-like substance. Many of the cell's activities take place here.

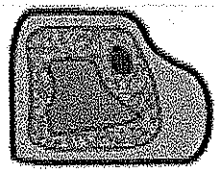
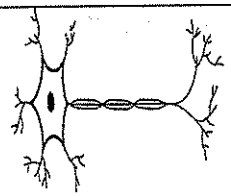
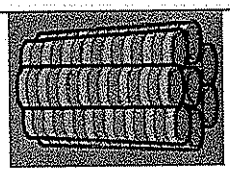
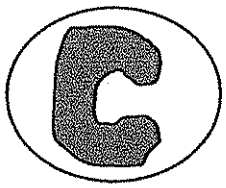
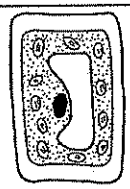
Cell wall. This is like a box with many large holes in it. It supports the cell and is very strong. It is made out of a substance called **cellulose**.

Chloroplasts. These are green discs that allow the plant to make food (by **photosynthesis**). They contain a chemical called **chlorophyll**.

Vacuole. This is a storage space filled with a liquid called **cell sap**.

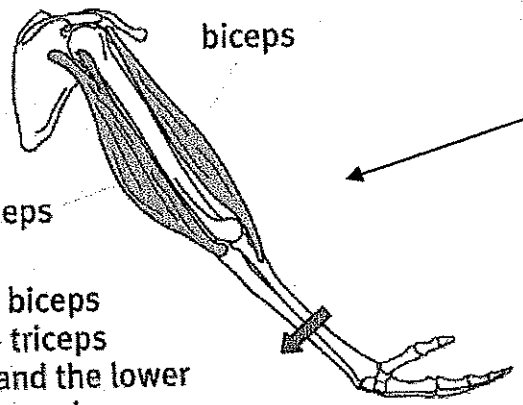
Specialised cells

Name	Diagram	Function
Red Blood Cells (blood)		• Nucleus lost on formation. • Cytoplasm filled with haemoglobin Adapted to carry oxygen. • Flexible when passing through narrow blood vessels.
Root hair cell (roots)		• Very thin walls. • Large cell surface area. • Able to absorb water rapidly.
Ovum (egg) (Ovaries – reproductive cell)		• Female egg - rich in cytoplasm and with a food store. • Both types of reproductive cell contain genetic information.
Sperm cell (Testes – reproductive cell) Produced in serum (sugar/salt liquid).		• Male sperm - mobile tails adapted for swimming. • Both types of reproductive cell contain genetic information (DNA). • Half the number of chromosomes.
Cilia cell (airways)		• Traps foreign particles that enter the airways. • Move bacteria down to the stomach to be destroyed.

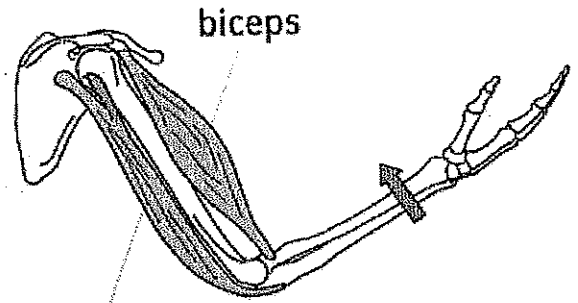
Guard cell (underneath the leaf)		• Open and close stomata (pores) • Control gas exchange in leaf
Nerve cell		• Send electrical impulses • Possess long connecting fibres • Cell membrane very active
Muscle (actin/myosin fibres)		• Able to contract muscle fibres inside cell rapidly • Adapted to respire actively • Absorb sugars and oxygen from the bloodstream rapidly • Able to cope for short periods without oxygen
White Blood Cell (Blood)		• Defend against disease. • Big nucleus. • Produce antibodies to fight bacteria. • Produce antitoxins to neutralise the toxins produced by bacteria
Palisade cell (near top of leaf)		• Contain lots of chloroplasts for photosynthesis • Cells found near the top of the leaf to obtain the most exposure of light.

Movement Antagonistic muscles & Joints

Muscles working in pairs. When one muscle contracts (shortens) the other relaxes (lengthens) and vice versa.



when the biceps relax, the triceps contract and the lower arm is lowered



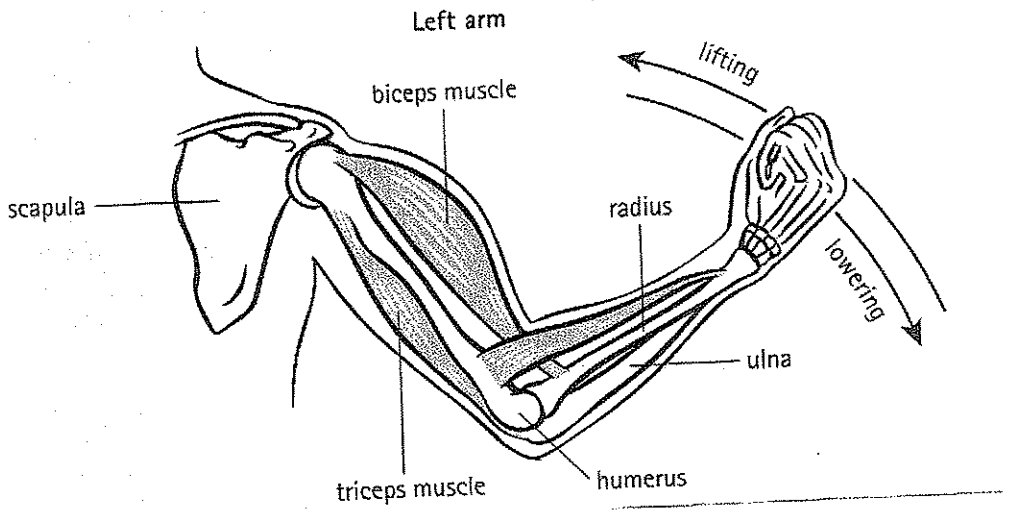
when the biceps contract, the triceps relax and the lower arm is raised

Joints allow movement:

- Immovable – skull
- Slightly (cartilage discs) – spine
- Freely movable – knee, shoulder

Ligaments – attach bones to bones.

Tendons – attach muscles to bones.



Bone Joints:

Ball & socket = shoulder, hip.
Hinge = knee, elbow
Saddle = thumb

Disease & Microbes

Disease	Microbe that causes it	Symptoms	How it is spread
Colds and flu	Virus	Sore throat, running nose, fever	Air (cough/sneezing)
Food poisoning	Bacteria	Vomiting, diarrhoea	Food
Cholera	Bacteria	Vomiting, diarrhoea	Water (spitting)
Athlete's foot	Fungus	Sore cracked skin between the toes	Touch

Disease prevention:

- making sure sewage is treated and disposed of properly
- adding chlorine to water to kill bacteria
- pasteurising milk
- using disinfectants, antiseptics and soaps
- immunising people with vaccines.
- antibiotics which are medicines which kill off some bacteria.

Your body has **natural defences** to stop microbes getting in (eg skin, **mucus** in the windpipe and nose, **ciliated epithelial cells** to sweep mucus along). Your body also has ways of destroying microbes. These include:

- a chemical in tears that kills some bacteria
- acid in the stomach that kills some bacteria
- white blood cells that **engulf** microbes
- other white blood cells that make **antibodies** to help destroy microbes.

A **balanced diet** is essential to health. It is made up of the correct amounts of the following seven food substances: carbohydrates, fats, proteins, vitamins, minerals, water and fibre. A shortage of a particular substance can cause a specific **deficiency disease**.

- Lack of Vitamin C causes Scurvy
- Lack of Calcium causes weak bones
- Lack of Vitamin D causes Rickets
- Iron – RBC – anaemic – tired/weak.

Eating too much of a particular substance can also cause problems. Too much fat can cause **obesity** and **heart disease**.

Microbes (**micro-organisms**): **viruses**, **bacteria** and **fungi**. The most common fungus microbes are **yeasts**.
Virusesare smaller thanbacteria, which are smaller than yeasts.
Bacteria and yeast are important in making foods and drinks. **Yeast** is used to make **bread dough rise**. It uses oxygen, from the air found in pockets in the dough, for **aerobic respiration**. This process produces **carbon dioxide** which makes the **bread rise**.

glucose + oxygen → carbon dioxide + water (+ energy)
(a sugar)

Yeast are also used to make **beer** and **wine**. In this case there is no air and so they **use anaerobic respiration**. When yeast use anaerobic respiration it is called **fermentation**. The ethanol is a waste product of this reaction.

glucose → carbon dioxide + ethanol (+ energy)
(a sugar)

Uses: making medicines, making bre making booze, adding flavour, makes fizzy drinks

Health & Balanced Diet

Drugs

Solvents: paints, aerosols and glues; damage – lungs, kidney, liver, brain.

Alcohol: beers, wines and spirits - legal age 18 yr. Depressant drug, a poison which affects the brain and liver leading to various health problems. Impaired judgement - accidents

Legal Drugs: Cannabis, speed, ecstasy, heroin, LSD

Addictive, stimulants, depressants, hallucinogenic, dehydration, insomnia, degeneration … DEATH

Legal Drugs: aspirin, caffeine, antibiotics

Exercise

Regular exercise:

- Aerobic – with oxygen
- Anaerobic – without oxygen

Tobacco & Smoking

Smoking destroys your lungs with three kinds of chemicals:

1. Nicotine: addictive drug which causes high blood pressure/heart rate and leads to heart disease.
2. Tar: coats the lining of the lungs making them less able to take in oxygen.
3. Carbon Monoxide: poisonous gas which destroys red blood cells.

Causes:

1. Lost sense of smell
2. Stained teeth/ bad breath
3. Mouth/Lung/stomach cancer
4. Heart disease
5. Emphysema
6. Coughs & colds

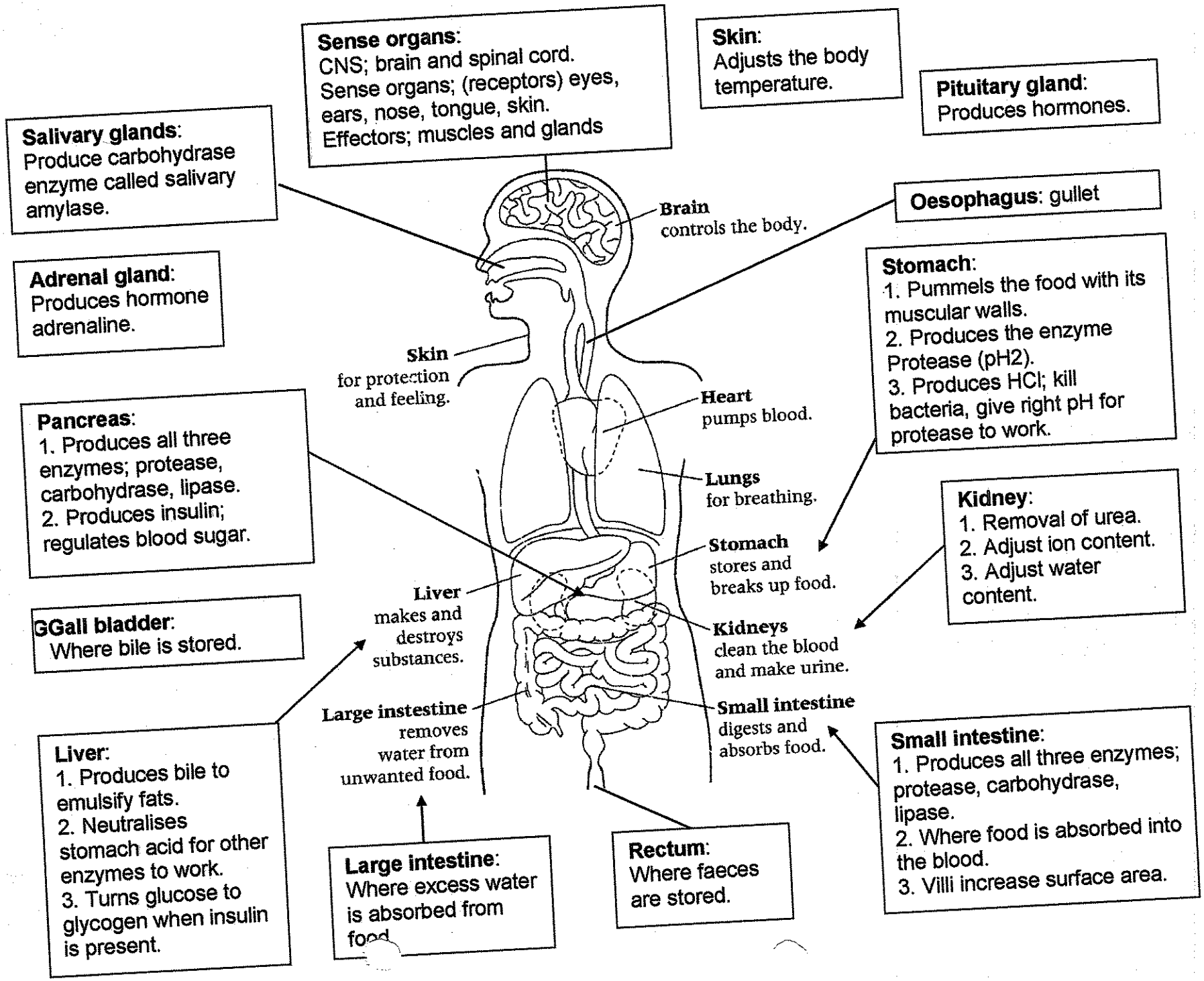
Hygiene

Clean teeth to remove food which bacteria feed on. Toothpaste (alkali) neutralises the acid produced by bacteria, which breaks down the enamel on teeth.

Washing regularly to maintain cleanliness and to avoid infections from bacteria.

Balanced Diet

Carbohydrates (60%): fuel for body/Energy.
E.g. Bread/potatoes/pasta
Protein (15%): Growth & Repair
E.g. Meat/eggs/fish
Fats (10%): store of energy.
E.g. Butter/ cooking oil/cream
Vitamins (4%): keep vital processes happening.
E.g. Veg/ fruit/ cereal
Minerals (1%): Iron (*red meats*) - blood, calcium (*milk*) - bones, Sodium (*salt*) - nerves.
Roughage (10%): Helps with digestion.
E.g. Veg/ fruit/Cereal.
Water: 75% of our body, chemical reactions


Sense organs:
CNS; brain and spinal cord.
Sense organs; (receptors) eyes, ears, nose, tongue, skin.
Effectors; muscles and glands
Skin:
Adjusts the body temperature.
Pituitary gland:
Produces hormones.
Salivary glands:
Produce carbohydrase enzyme called salivary amylase.
Brain
controls the body.
Oesophagus: gullet
Adrenal gland:
Produces hormone adrenaline.
Stomach:
1. Pummels the food with its muscular walls.
2. Produces the enzyme Protease (pH2).
3. Produces HCl; kill bacteria, give right pH for protease to work.
Skin
for protection and feeling.
Heart
pumps blood.
Pancreas:
1. Produces all three enzymes; protease, carbohydrase, lipase.
2. Produces insulin; regulates blood sugar.
Lungs
for breathing.
Kidney:
1. Removal of urea.
2. Adjust ion content.
3. Adjust water content.
Stomach
stores and breaks up food.
GGall bladder:
Where bile is stored.
Liver
makes and destroys substances.
Kidneys
clean the blood and make urine.
Large instestine
removes water from unwanted food.
Small intestine
digests and absorbs food.
Liver:
1. Produces bile to emulsify fats.
2. Neutralises stomach acid for other enzymes to work.
3. Turns glucose to glycogen when insulin is present.
Large intestine:
Where excess water is absorbed from food
Rectum:
Where faeces are stored.
Small intestine:
1. Produces all three enzymes; protease, carbohydrase, lipase.
2. Where food is absorbed into the blood.
3. Villi increase surface area.

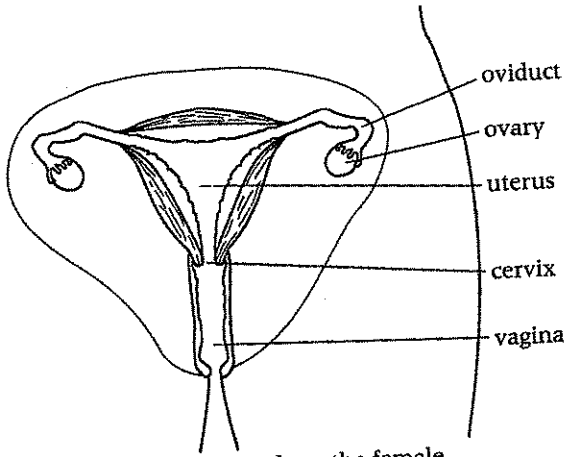
Sexual Reproduction

Puberty Changes and Adolescence

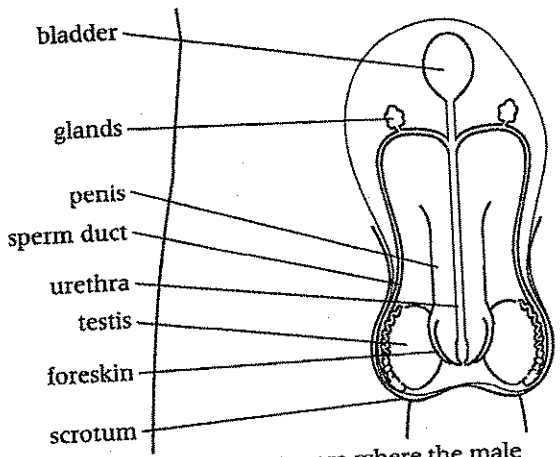
Changes in boys	Changes in girls
• voice deepens ('breaks') • shoulders get wider • hair grows under arms, on face and on chest • pubic hair grows • testes and penis get bigger • testes start to make sperm cells • body smell increases	• underarm hair grows • breasts develop • ovaries start to release egg cells • pubic hair grows • hips get wider • body smell increases

Adolescence is the time when puberty is occurring and emotional changes happen. It starts between the ages of 10–15 and ends at about 18. The changes start sooner in girls. After puberty, men produce sperm cells for the rest of their lives. Women stop releasing egg cells at the age of 45–55. This is called the **menopause**.

Sex Organs



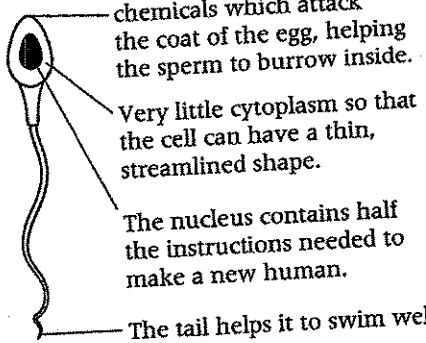
Female – ovaries are where the female sex cells (**egg cells**) are produced.



Male – testes are where the male sex cells (**sperm cells**) are produced.

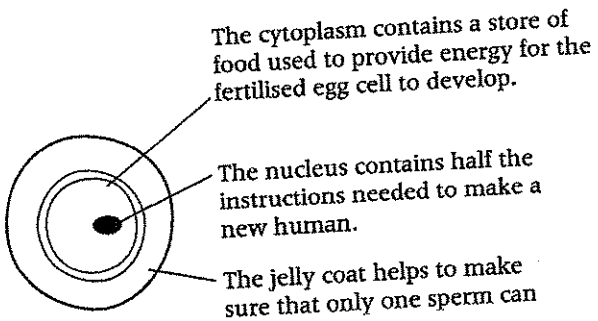
Sex Cells

Male

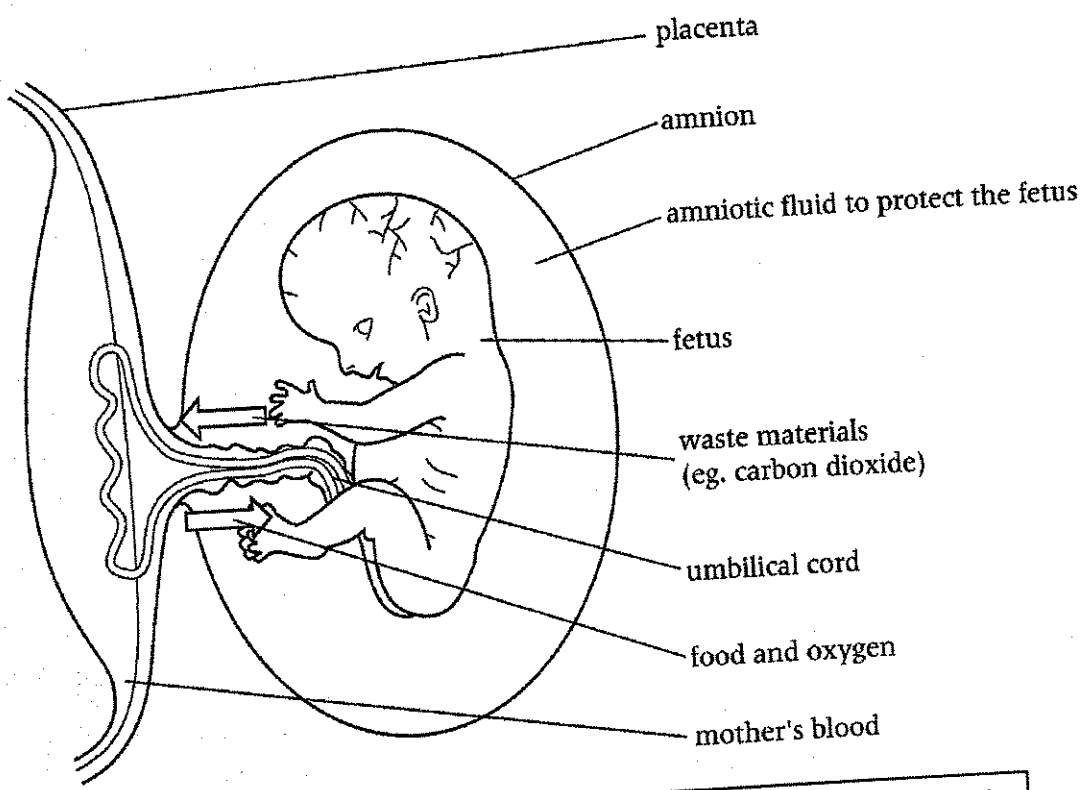


A sperm cell is much smaller than an egg cell.

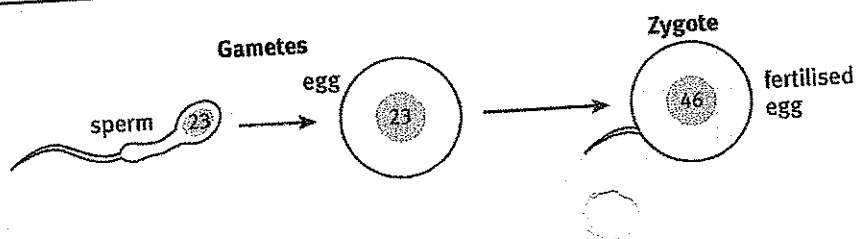
Female



The egg cell is about the size of a full stop.



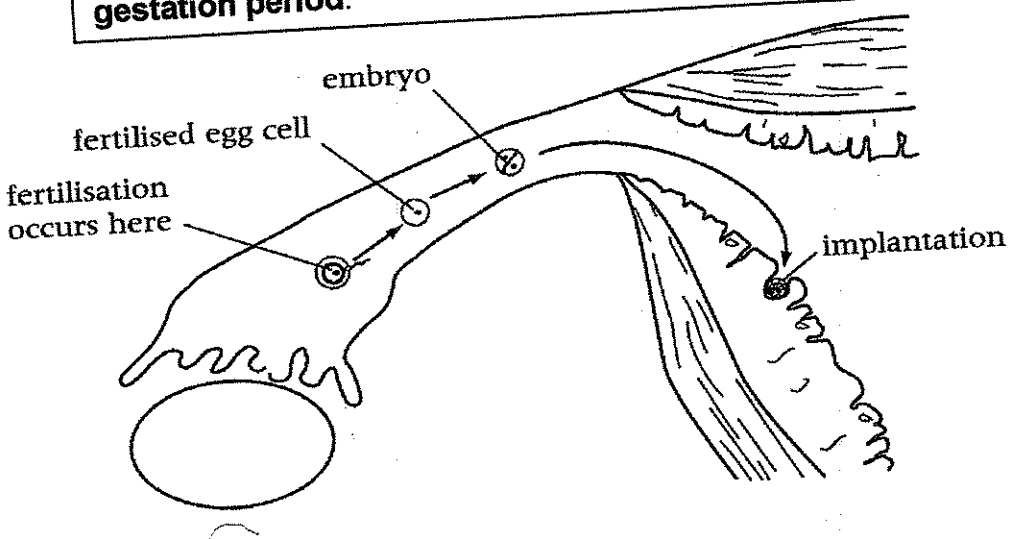
While inside the uterus, the **fetus** is supplied with oxygen and food by the **placenta**. The placenta also gets rid of waste (especially carbon dioxide) from the fetus. The **cord** (or **umbilical cord**) connects the fetus to the placenta.
Food and **oxygen diffuse** across from the mothers blood. The placenta acts as a big exchange surface between the mother and baby, with blood capillaries filling it from both sides.
Unfortunately **harmful substances** can also pass from mother, such as **alcohol, bacteria, viruses, drugs** and **carbon monoxide** from **cigarette smoking**.



Menstral Cycle:
The **menstrual cycle** starts with **menstruation** (the loss of the uterus lining and some blood through the vagina). It takes 28–32 days for each cycle. About 14 days after menstruation starts, an egg cell is released from an ovary. This is called **ovulation**. If the egg cell is not fertilised, the uterus lining starts to break down and the cycle starts again.

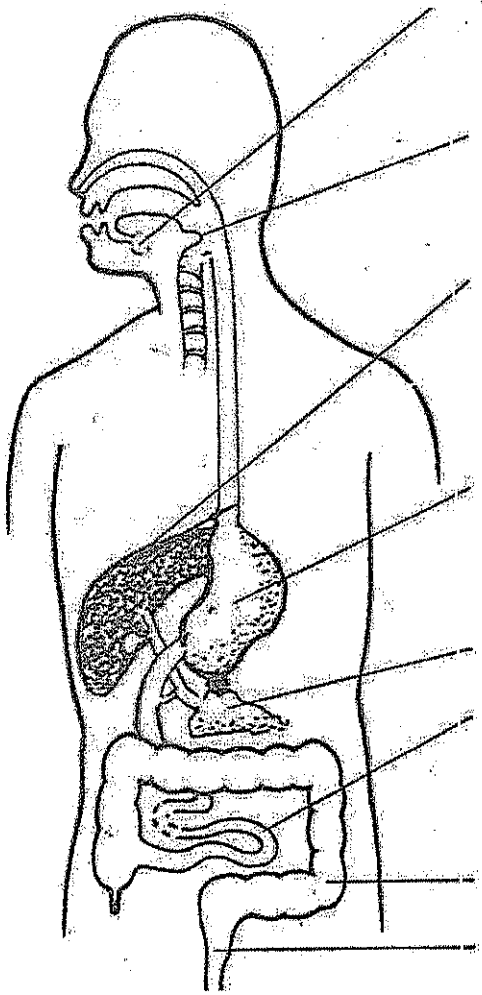
Sex:
The sperm cells enter the **vagina** during **sexual intercourse**. **Semen** (sperm cells mixed with special liquids from the **glands**) is forced out of the penis and into the top of the vagina. This is called **ejaculation**. The semen is moved into the top of the uterus and the sperm cells can swim down the oviducts.

Pregnancy:
If the egg cell meets a sperm cell in an oviduct fertilisation can occur. The fertilised egg cell **(Zygote)** divides to form a ball of cells (an **embryo**). The embryo travels to the uterus where it sinks into the soft lining (**implantation**). The woman is now **pregnant**. Once it has developed all its organs (after about 10 weeks) it is called a **fetus**. It takes about 40 weeks (9 months) for a fertilised egg cell to grow into a baby ready to be born. This time is called the **gestation period**.



Digestion & Diet

Digestion is the break down of food from **large insoluble** molecules to **small soluble** so that they can be **absorbed into the blood**.



Salivary glands : produce saliva (amylase) begins digestion of starch. **Teeth** - chewing.
Epiglottis : closes trachea during swallowing, food passes into the Gullet/ Oesopagus
Liver : makes bile; emulsifies fats. Alkaline to give right pH for enzymes in small intestine.

Stomach ; produces HCl (acid) kills bacteria. Produces Protease.

Pancreas: producse enzymes ; protease, lipase, carbohydrase
Ileum/Small intestine : produces more enzymes. Food is absorbed through gut wall into the blood.

Colon/Large intestine : water reabsorbed.
Rectum : Faeces stored

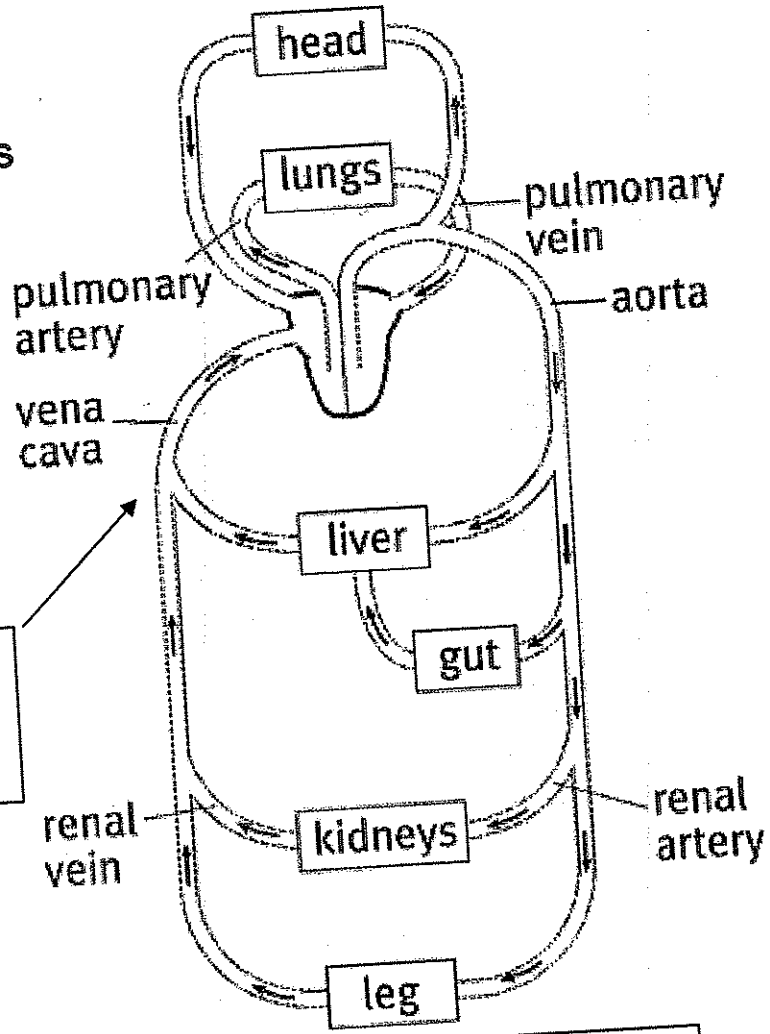
Diet

Carbohydrates: fuel for body/Energy. E.g. Bread/potatoes/pasta
Protein: Growth & Repair E.g. Meat/eggs/fish
Fats: store of energy. E.g. Butter/ cooking oil/cream
Vitamins: keep vital processes happening. E.g. Veg/ fruit/ cereal
Minerals: Iron (red meats) – blood, calcium (milk) – bones, Sodium (salt) – nerves.
Roughage: Helps with digestion. E.g. Veg/ fruit/Cereal.
Water: 75% of our body, chemical reactions

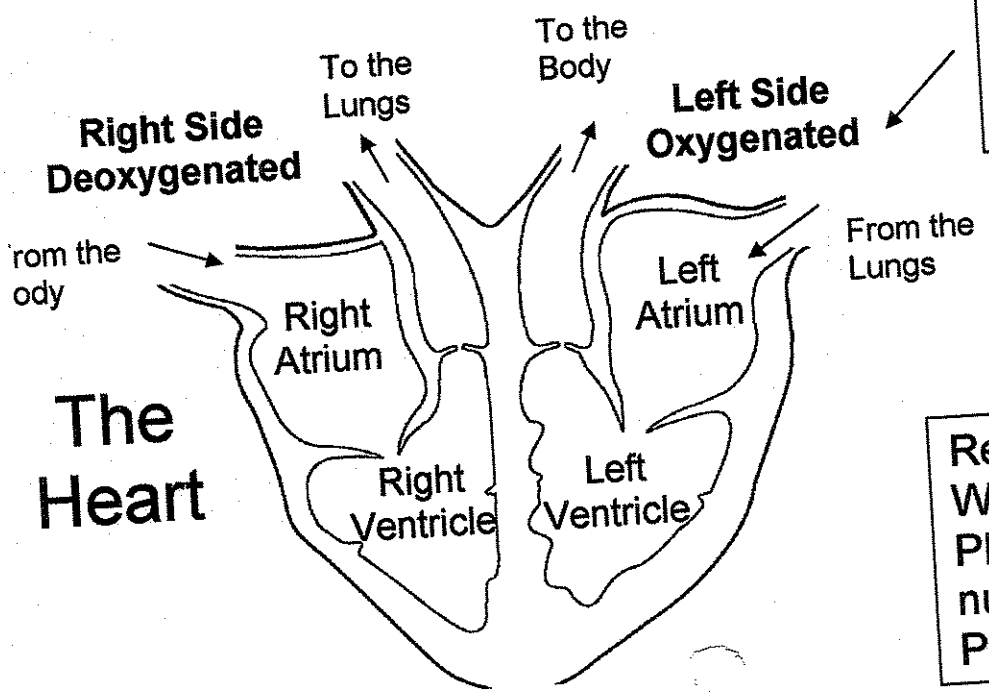
Circulation

Blood vessels

A	B	C
Arteries	**Capillaries**	**Veins**
• High blood pressure • Oxygenated Blood • Blood away from heart.	• Thin walls helps food, oxygen and waste pass through.	• Low pressure blood. • Blood back to the heart. • Valves to prevent back flow. • Deoxygenated blood.

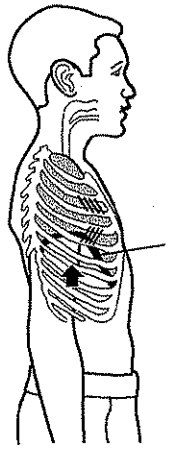


Human Body
Circulatory System

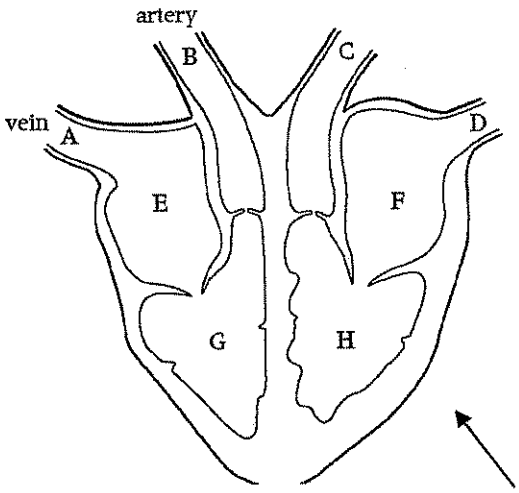


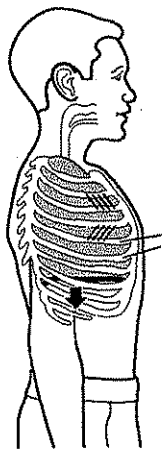
The Heart

Red Blood Cells: carry oxygen.
White Blood Cells: kills microbes.
Plasma: carries waste (urine/Carbon dioxide), nutrients, hormones, regulates body temperature.
Platelets: dead cells involved in the blood clotting.



Breathin out (exhailing); Intercostal muscle relax; ribs move down and in. Diaphragm (relaxes) 'springs' up making chest volume smaller; pressure inside lungs increases causing air to rush out.





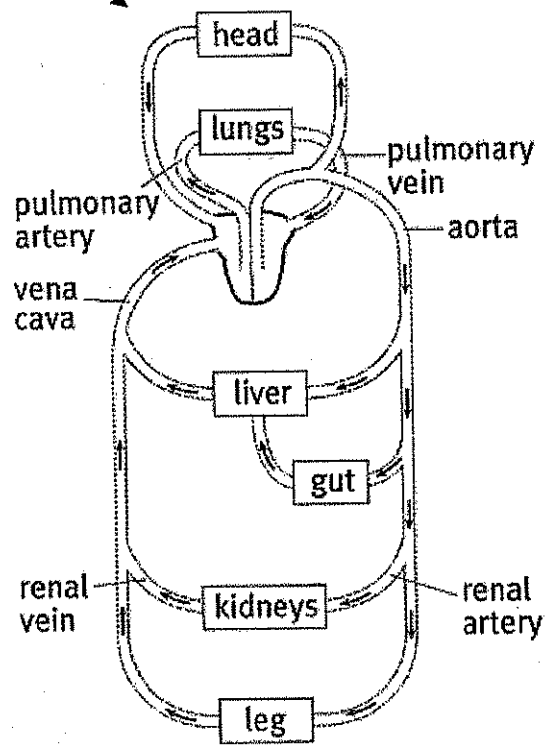
Breathin in (inhailing); Intercostal muscle contract; ribs move up and out. Diaphragm (contracts) pulls down making chest volume bigger; pressure inside lungs decreases causing air to rush in.

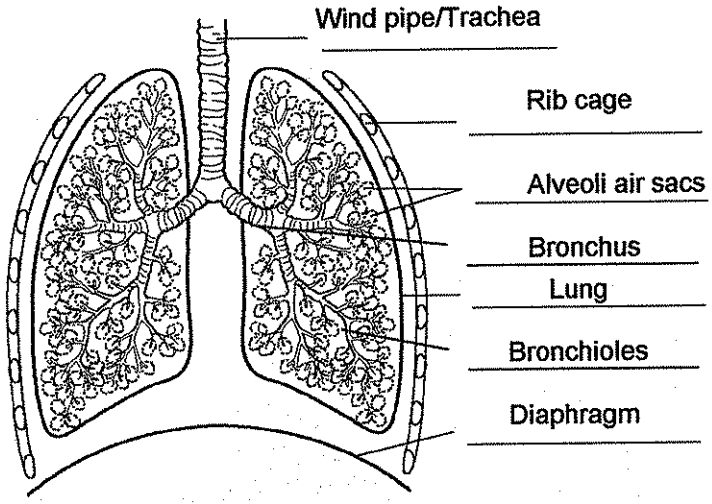
A = Vena Cava (from body)
B = Pulmonary artery (to lungs)
C = Aorta (to body)
D = Pulmonary vein (from lungs)
E = Right atrium (deoxygenated)
F = Left atrium (oxygenated)
G = Right ventricle (deoxygenated)
H = Left ventricle (oxygenated)
Order: A, E, G, B, (lungs) D, F, H, C, (body).

Human Body
Circulatory & Respiratory

Arteries: carry high blood pressure, oxygen, blood away from heart.
Capillaries: Thin walls helps food, oxygen and waste pass through.
Veins: carry low pressure blood back to the heart. Valves to prevent back flow. Deoxygenated blood.

Blood
Red cells; Hb + O
Plasma; salt, sugar, Pr.
White cells; kill microbes
Platelets; clot blood (dead)





Animal Kingdom

Vertebrates (Backbone)

Amphibeans

- Moist skin
- Lay eggs in water.
- Eggs coated in jelly.
- Live in damp places.
- Live on land breed in water.

Birds

- Feathers
- Eggs have hard shell
- Beak

Reptiles

- Dry Scales
- Eggs have leathery shell.
- Scales to prevent water loss.

Fish

- Wet scales
- Fins to move
- Gills to breathe
- Live in water

Mammals

- Hair/fur
- Give birth to live young.
- Produce milk

Invertebrates (No Backbone)

Arthropods

- Jointed legs
- Bodies in sections
- Thick, hard exoskeleton

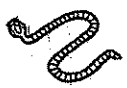
Molluscs

- Fleshy pad
- Shell

Sponges

Echinoderms

- Bodies in 5 parts
- Spiny outer cover



Flatworm

Roundworms

Annelid

Cnidarians

- Body has no front/rear
- Tentacles
- Sting cells

Crustaceans

- 5-7 pairs of legs
- Body in two parts
- Chalky shell

Arachnids

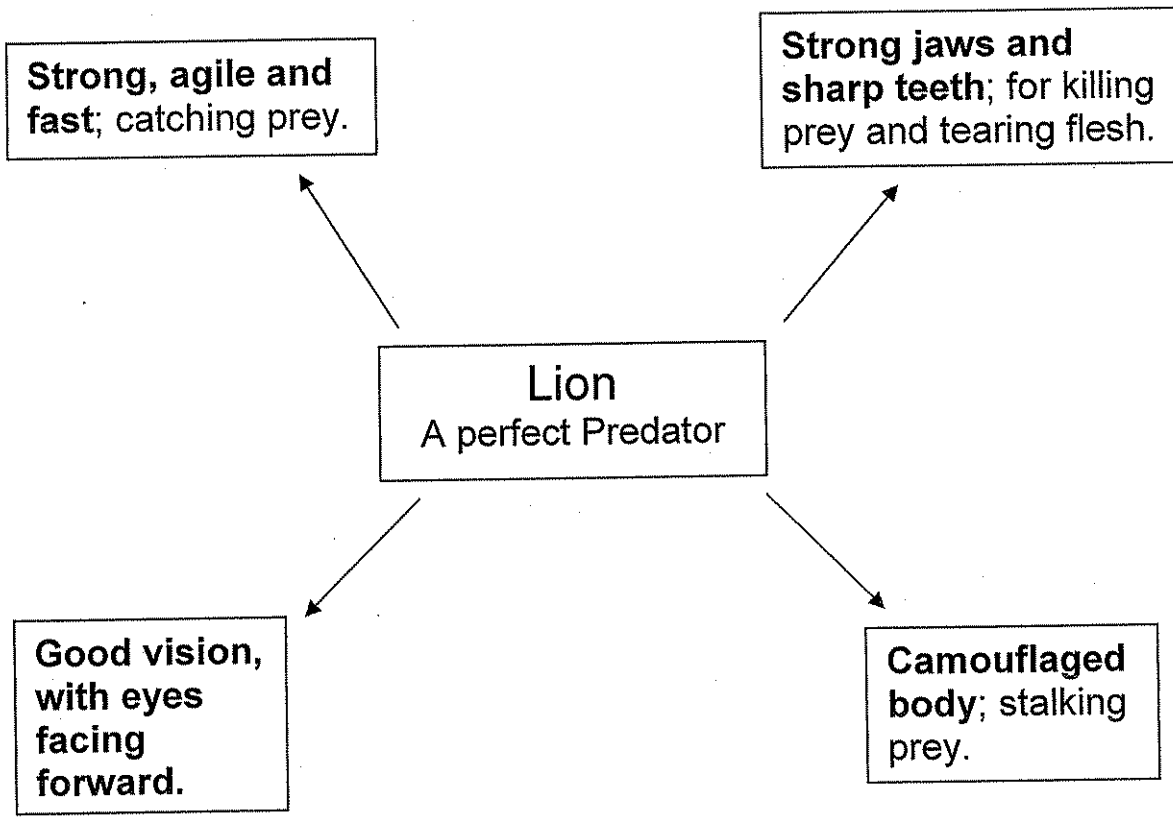
- 8 legs
- body in two parts

Insects

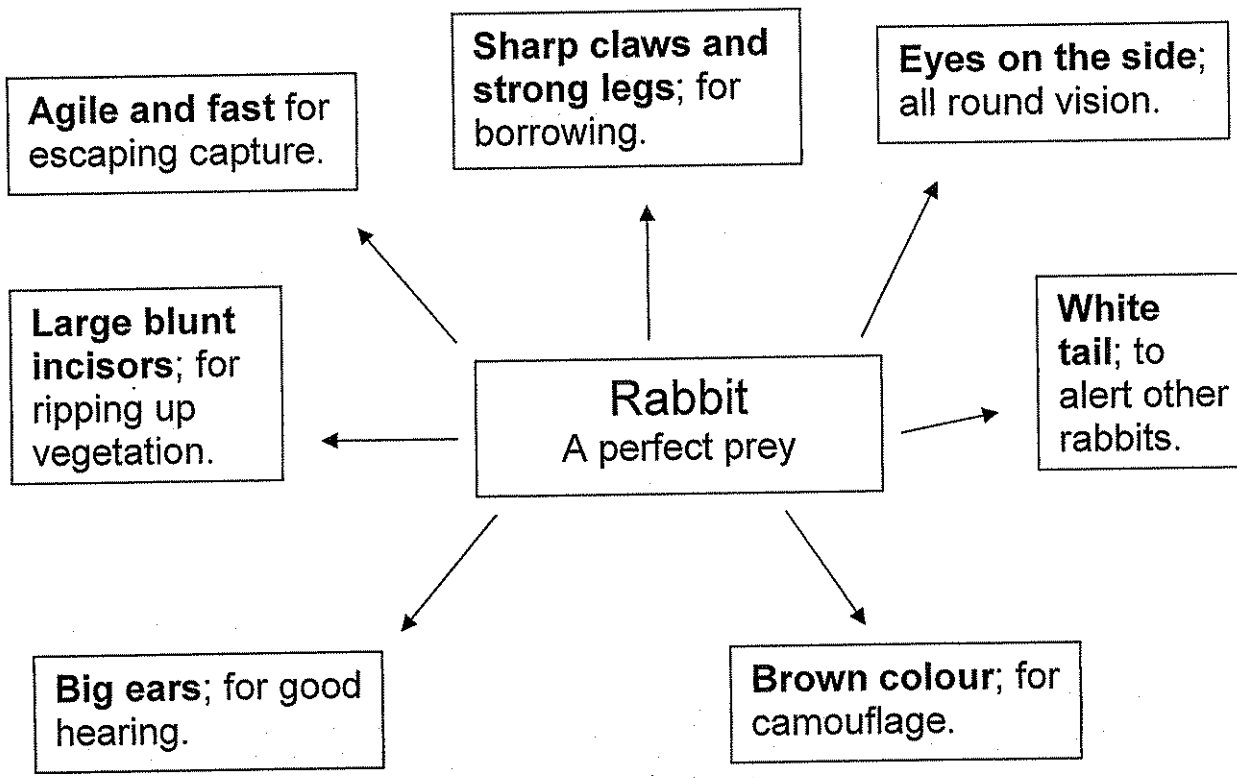
- 6 legs
- 3 body parts
- 1-2 pairs of wings

Centipedes/Millipedes

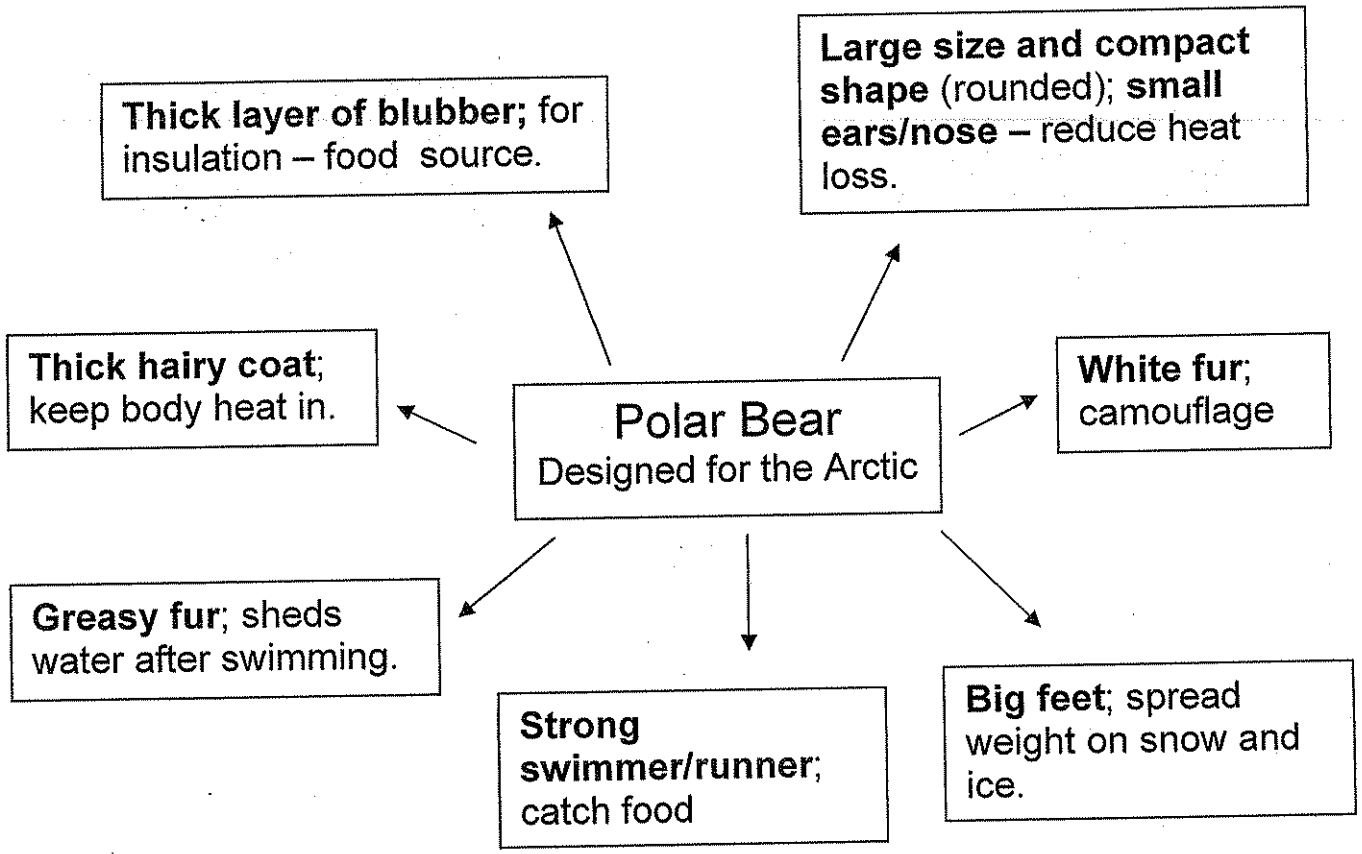
- Many pairs of legs
- Many body sections



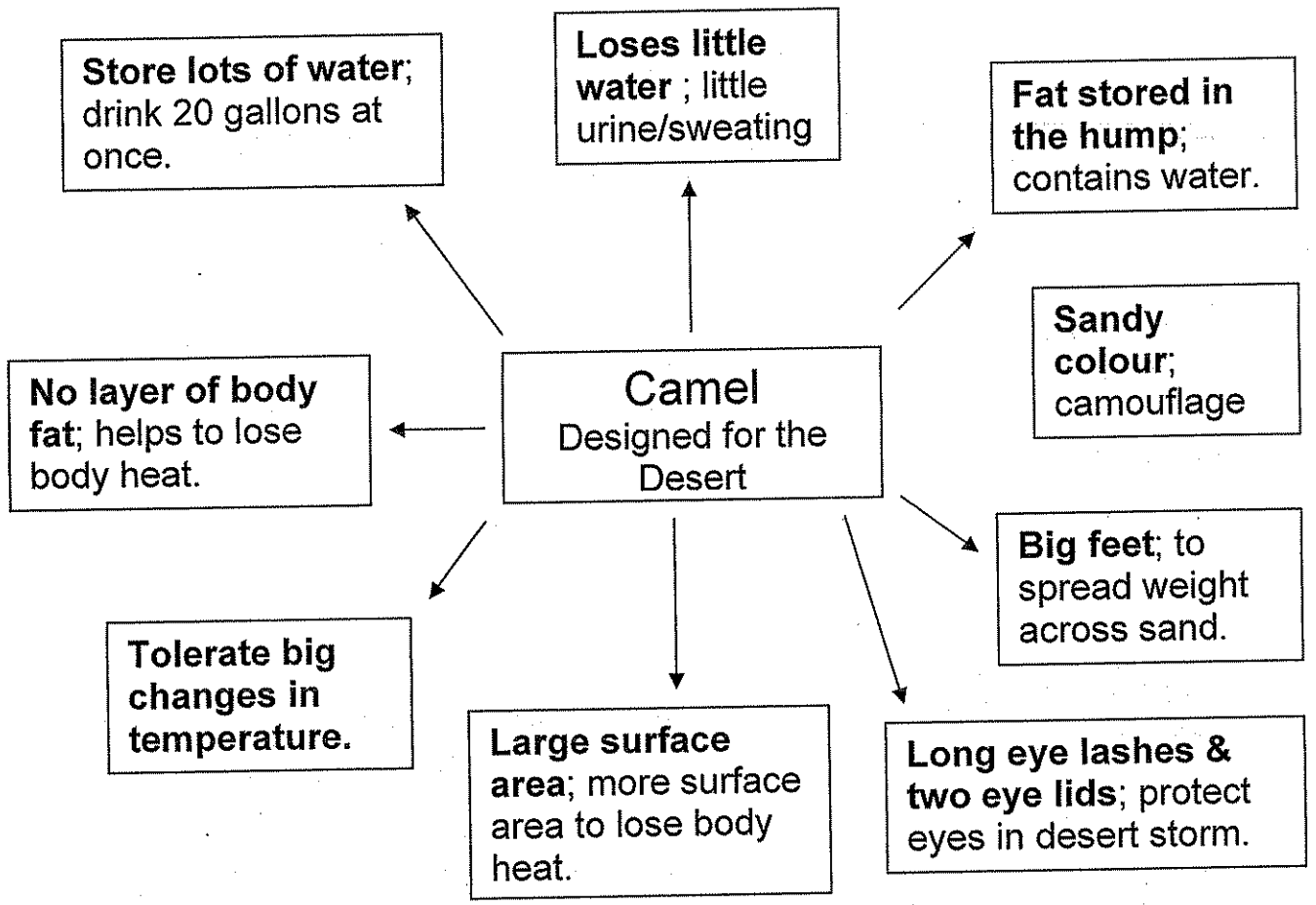
PREDATOR Verses PREY



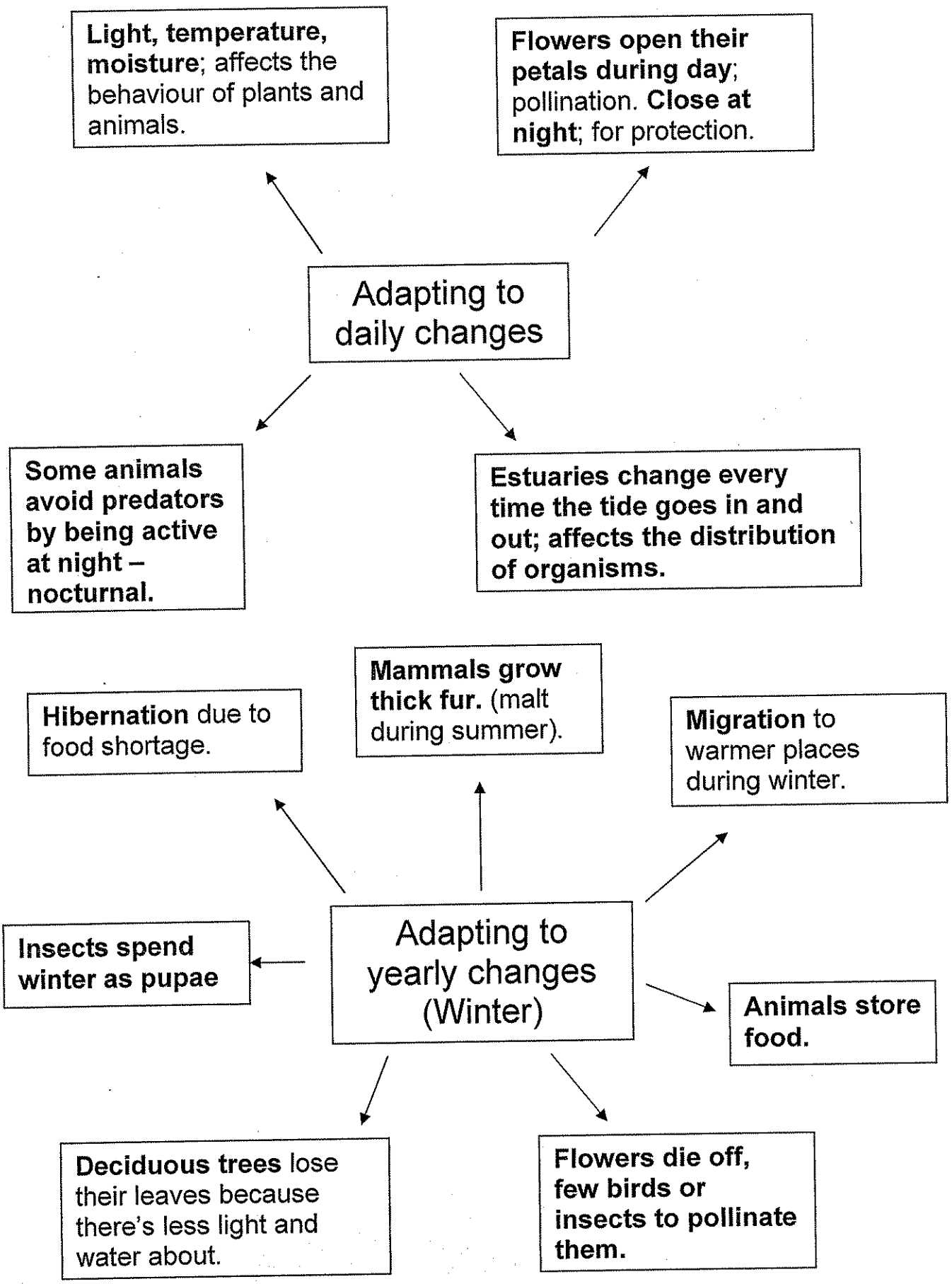
Mr Burley



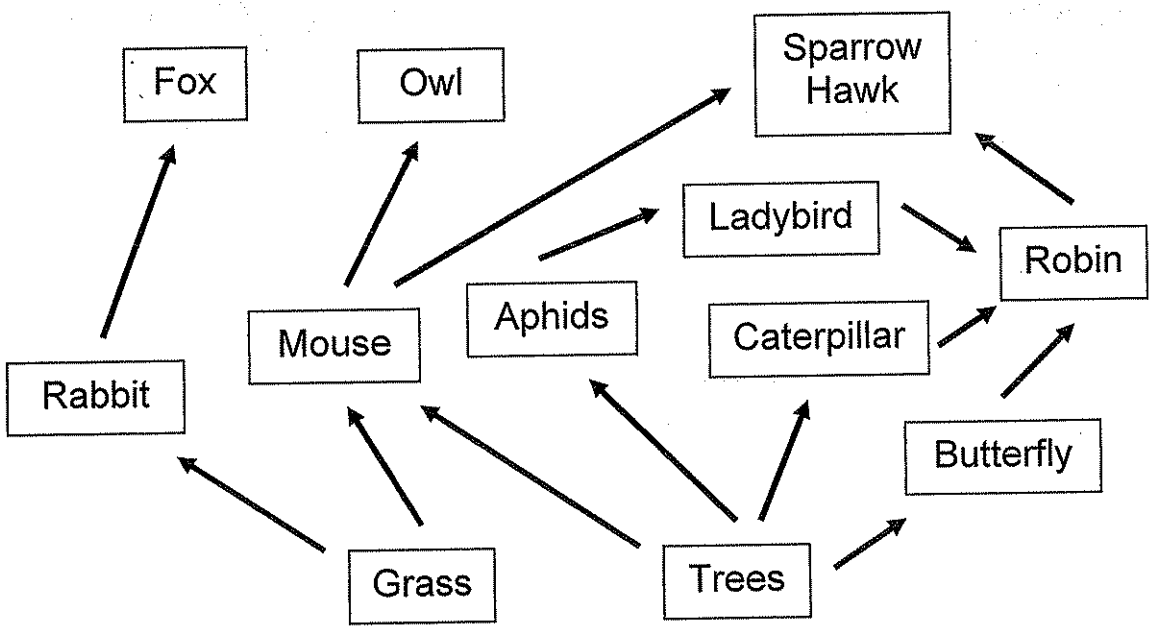
HOT & COLD Climates



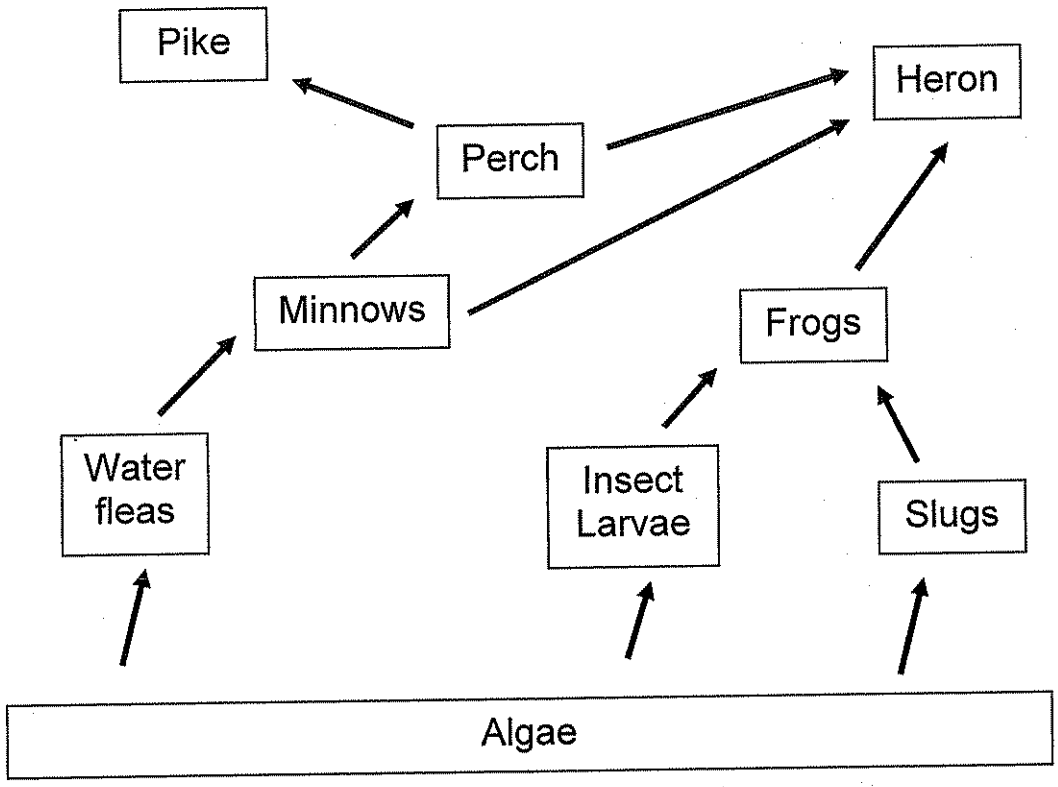
Mr Burley


Light, temperature, moisture; affects the behaviour of plants and animals.
Flowers open their petals during day; pollination. **Close at night**; for protection.
Adapting to daily changes
Some animals avoid predators by being active at night – nocturnal.
Estuaries change every time the tide goes in and out; affects the distribution of organisms.
Hibernation due to food shortage.
Mammals grow thick fur. (malt during summer).
Migration to warmer places during winter.
Insects spend winter as pupae
Adapting to yearly changes (Winter)
Animals store food.
Deciduous trees lose their leaves because there's less light and water about.
Flowers die off, few birds or insects to pollinate them.

Woodland Food Web

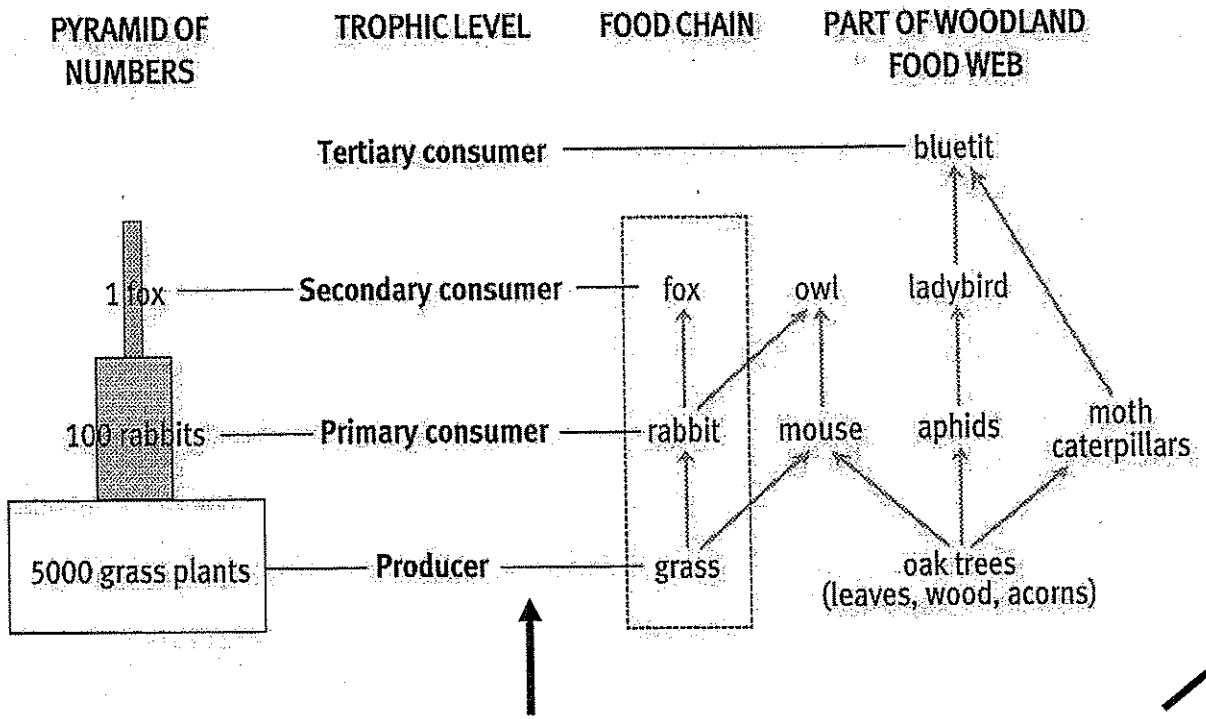


Pond Food Web



	Plants (Producers).
	Herbivores (Primary Consumers).
	Carnivores (2nd Consumers).
	Top Carnivore (Tertiary Consumers).

Mr Burley



Ecology: Food chains & Webs

Key Words:

Producer: plants who use the Sun's energy to produce food energy.

Herbivore: animals which only eat plants.

Consumers: all animals are consumers.

Primary Consumers: a herbivore, eats plants.

Secondary Consumer: eats primary consumers.

Tertiary Consumer: eats secondary consumers

Carnivore: eats only animals

Top carnivore: is not eaten by anything else.

Omnivore: eats both plants and animals

Food Chains: show what is eaten by what (food to feeder). Organism in a food chain are usually in the same **ecosystem**. All the living things in one **habitat** are called a community – and a **community** and it's **environment** are known as an **ecosystem**.

NB: arrows go from food to feeder.

grass → **rabbit** → **fox**

producer → primary consumer → secondary consumer

oak leaf → **earthworm** → **shrew** → **kestrel**

producer → primary consumer → secondary consumer → tertiary consumer

Plants

Plant Nutrition

Root hairs take in water and essential minerals for plant growth:

Nitrates – making proteins (deficiency symptom→ small with yellow leaves).

Phosphates – respiration (deficiency symptom→ poor root growth and purple leaves).

Potassium – makes enzymes (p/s & respiration) (deficiency symptom→ yellow leaves and dead bits).

Photosynthesis & Plant Growth

Photosynthesis makes food from **sunlight**, which takes place in every green plant. **Chlorophyll** (green) is found in **chloroplasts**, and turns carbon dioxide and water into glucose and oxygen. P/S takes place during the day. P/S equation below:

Carbon Dioxide + Water → Glucose (Sugar) + Oxygen

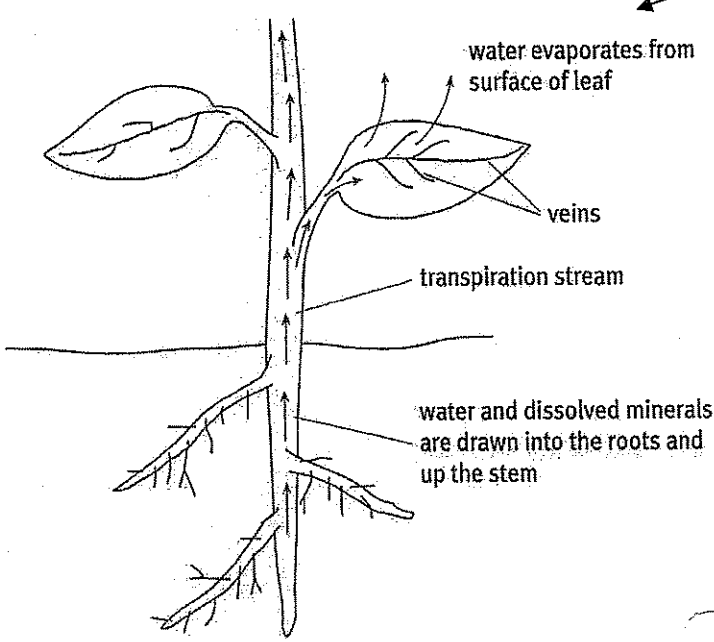
$CO_2 + H_2O \rightarrow C_6H_{12}O_6 + O_2$

Respiration: in every cell every second:
Glucose + Oxygen → Water + CO2 + Energy

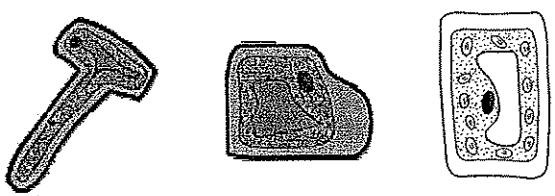
Four factors which affects P/S:

- Light
- Water
- Temperature
- CO_2 levels

Transpiration



Specialised cells for plants



A B C

A: Root hair – Large surface area, thin membrane – adapted to absorb water and minerals.

B: Guard Cell – Located underside of leaf – controls water loss, gas in & out.

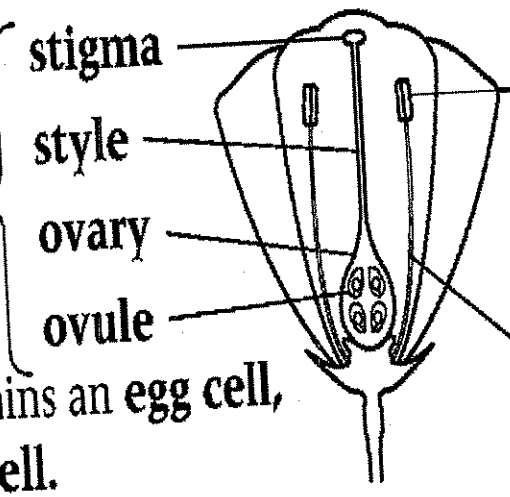
C: Palisade cell – P/S – contains lots of chloroplasts and located near top of leaf.

Stem
carries substances (such as water) around the plant and holds the leaves in place.

Leaf
makes food by the process of **photosynthesis.**

Root
takes water out of the soil and holds the plant in the ground.

Structure and Function of Flowering Plant



Carpel: this is the female reproductive organ.

Each ovule contains an **egg cell**, the female **sex cell.**

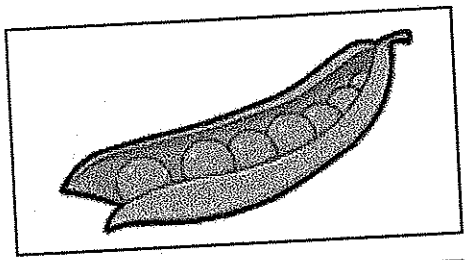
Anther: the anther makes **pollen grains**, the male **sex cells.**

Stamen: this is the male reproductive organ.

Name of flower part	Location and function
Sepals	**Protective** coverings on the outside of the flower – usually green during bud.
Petals	Inside petals are often coloured to **attract pollinating insects.**
Nectary	Produces sugar liquid that **attracts insects** at base of petals
Stamens	The **male sex organs** that produce pollen (anther + supporting filament)
Stigma	**Sticky surface which receives the pollen**. Insect-pollinated plants the stigmas are held within the flower, whereas in wind pollinated species they hang outside it.
Carpel	The **female sex organs** that produce ovules (ovary + style + stigma)

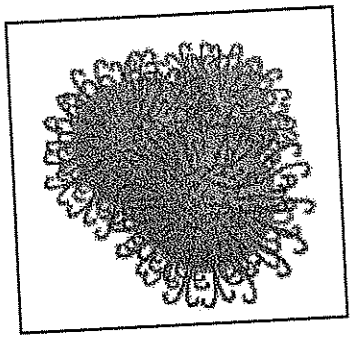
Seed Dispersal

Peas



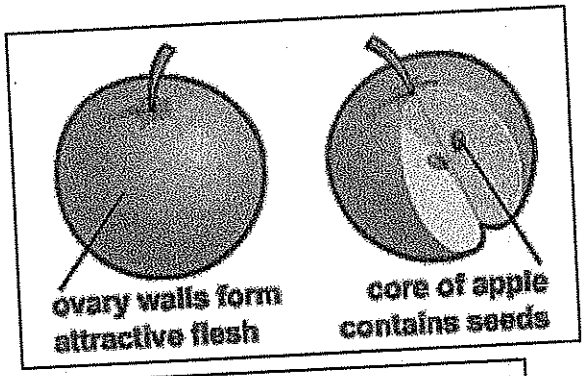
Ovary wall (pod) dries out (heat), twists and splits open scattering seeds (**explosion**).

Burdock



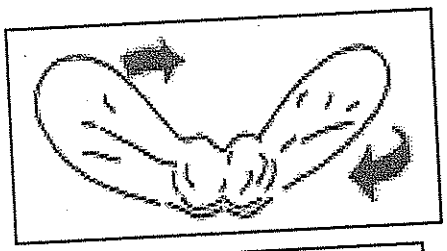
Flower head forms seeds with spiny hooks that attach to **animals**

Apple



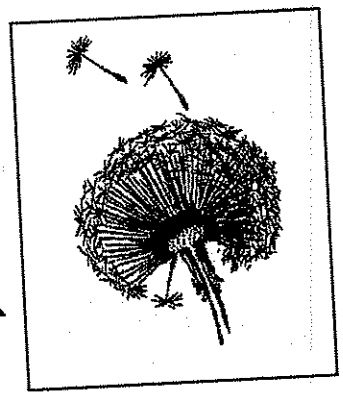
Ovary walls form attractive flesh. Core of apple contains seeds eaten by **animals**

Sycamore



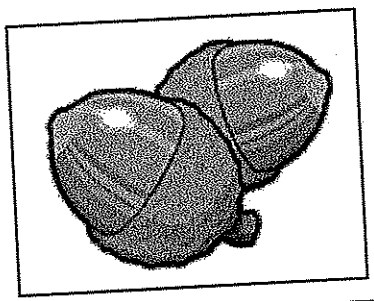
Spinning seeds can be carried great distances by **wind**

Dandelion



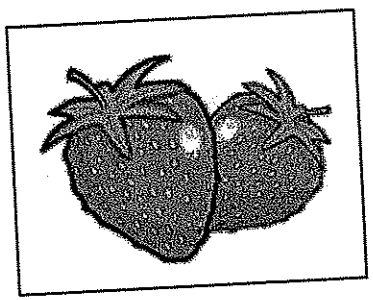
Parachute of hairs for **wind** dispersal attached to seeds on seed-head

Acorn



Single nut seed used as food source by **animals** which buries uneaten

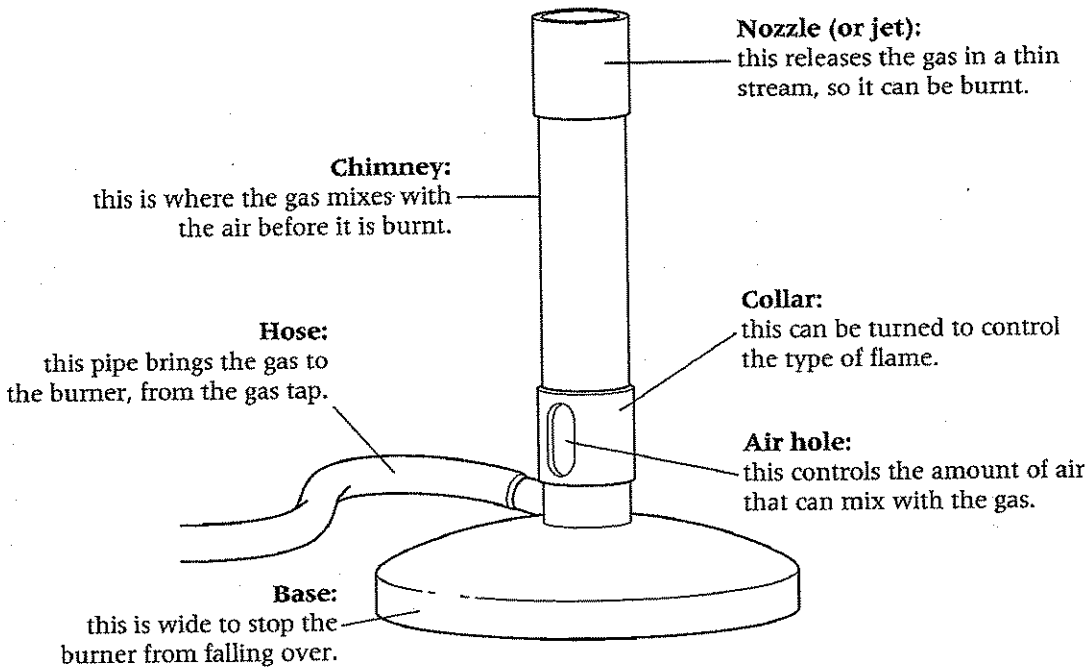
Strawberry



Many seeds embedded in fruit mass that is eaten by **animals**

Chemistry

Bunsen Burner
Physical/Chemical change
Acids & Alkali
States of Matter
Change of State
Separation
Materials
Combustion
Dissolving/saturation
Basic Chemistry terms (metals/non-metals)
Chemical Reactions



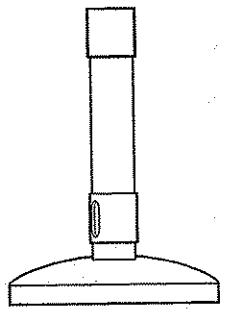
The Bunsen burner is used to heat things in the laboratory. The diagram above shows the different parts of the Bunsen burner and explains what each part does.

If you are not using your Bunsen burner, you should either **turn it off**, or **close the air** hole so that people can **see the flame.**

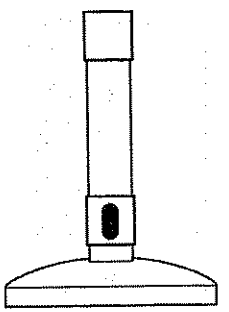
Bunsen Burner

The **hottest** part of the flame (roaring) is the tip of the blue cone!

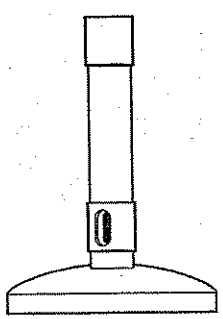
Safety flame:
- air hole closed, so hardly any air mixes with the gas
- quiet, bright yellow flame
- Flame is not as hot as the medium flame
- not used for heating, because the flame leaves a layer of soot on things

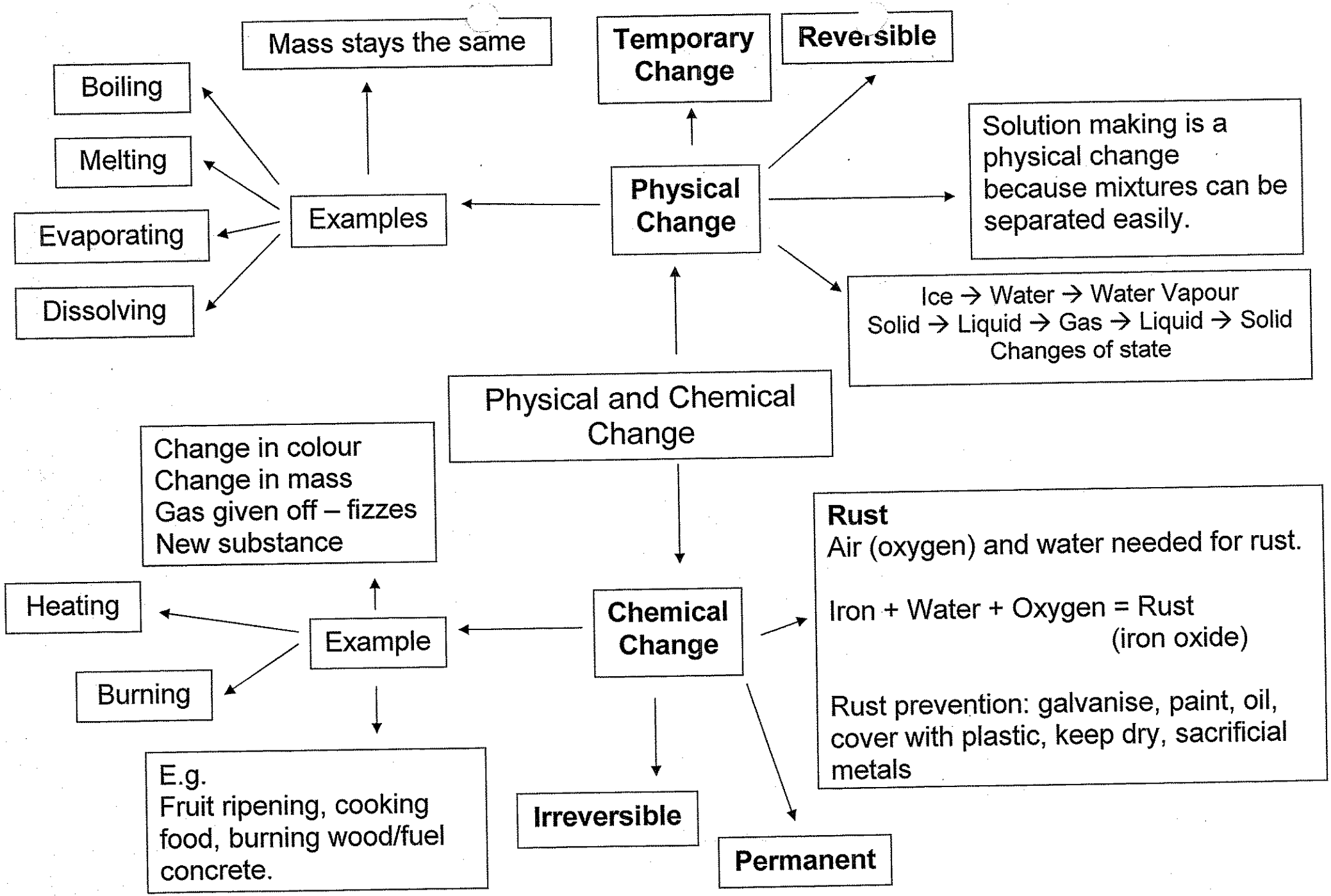


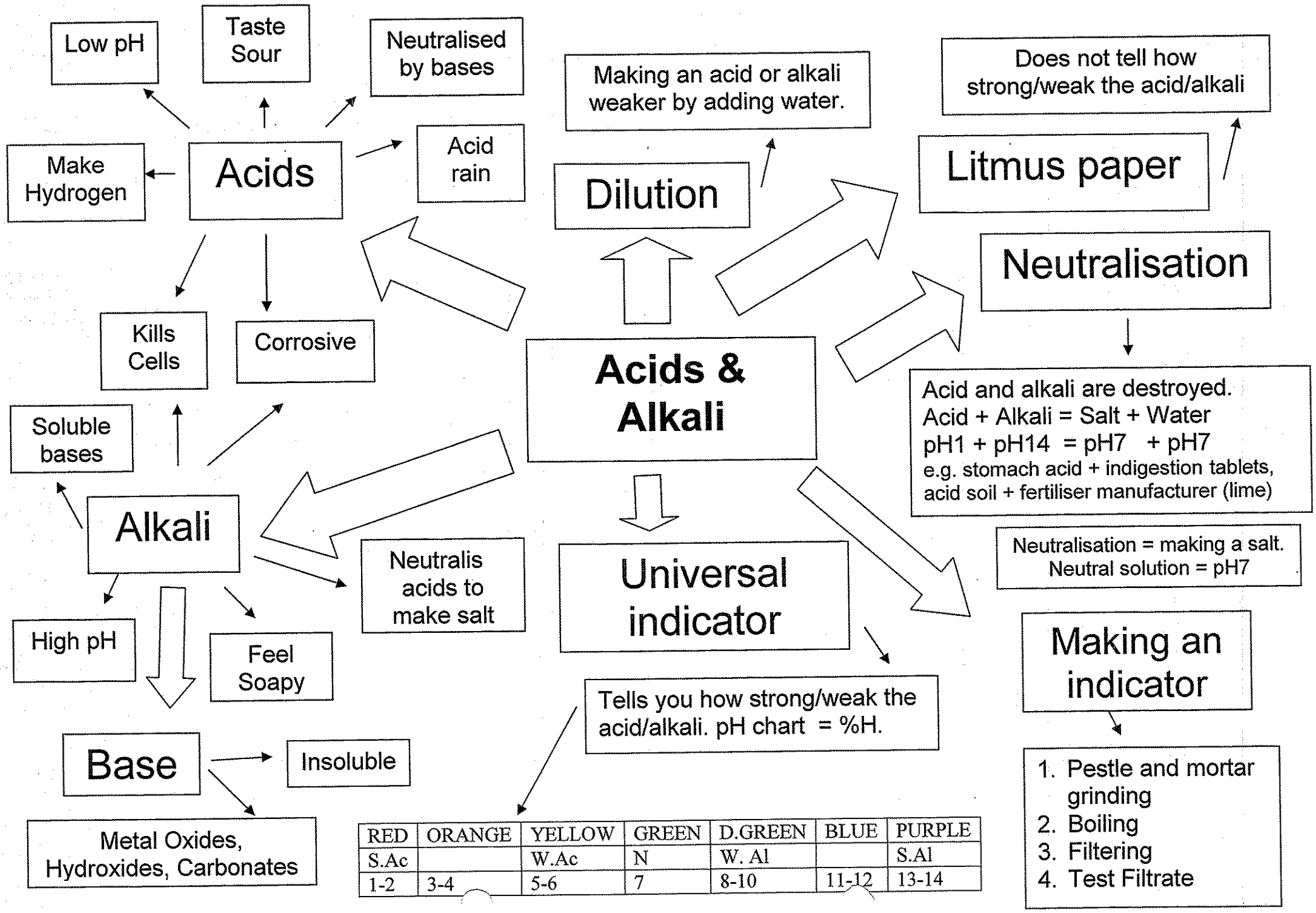
Roaring flame:
- air hole open, so lots of air mixes with the gas
- noisy, blue flame
- very hot flame
- used for heating things quickly



Medium flame:
- air hole half-open, so some air mixes with the gas
- light blue flame, which is quieter than the roaring flame
- flame is quite hot
- used for heating liquids, especially if you are using a boiling tube




Physical and Chemical Change
Physical Change
Temporary Change
Reversible
Mass stays the same
Examples
Boiling
Melting
Evaporating
Dissolving
Solution making is a physical change because mixtures can be separated easily.
Ice → Water → Water Vapour
Solid → Liquid → Gas → Liquid → Solid
Changes of state
Chemical Change
Change in colour
Change in mass
Gas given off – fizzes
New substance
Example
Heating
Burning
E.g.
Fruit ripening, cooking food, burning wood/fuel concrete.
Irreversible
Permanent
Rust
Air (oxygen) and water needed for rust.
Iron + Water + Oxygen = Rust
(iron oxide)
Rust prevention: galvanise, paint, oil, cover with plastic, keep dry, sacrificial metals



RED	ORANGE	YELLOW	GREEN	D.GREEN	BLUE	PURPLE
S.Ac		W.Ac	N	W. Al		S.Al
1-2	3-4	5-6	7	8-10	11-12	13-14

States of Matter

Solids

Particles are very close together.

Bonds between the particles are strong.

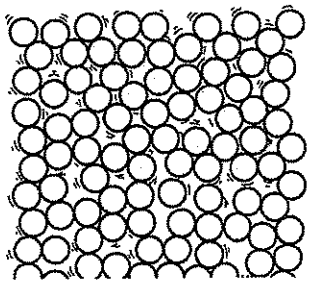
Cannot be squashed.

Do not flow.

Fixed shape.

Fixed volume

High density.



Liquid

Liquids

Particles are fairly close together.

Bonds between the particles are weaker than the bonds in solids.

Cannot be squashed.

Flows quite easily.

Fixed volume.

No fixed shape.

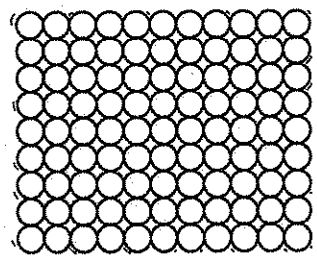
Usually have a lower density than solids.

Melting

Freezing

Evaporation

Condensation



Solid

Subliming

Gas

Particles are well spread out

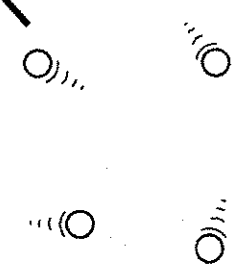
No bonds between them.

Easy to squash

Flow easily

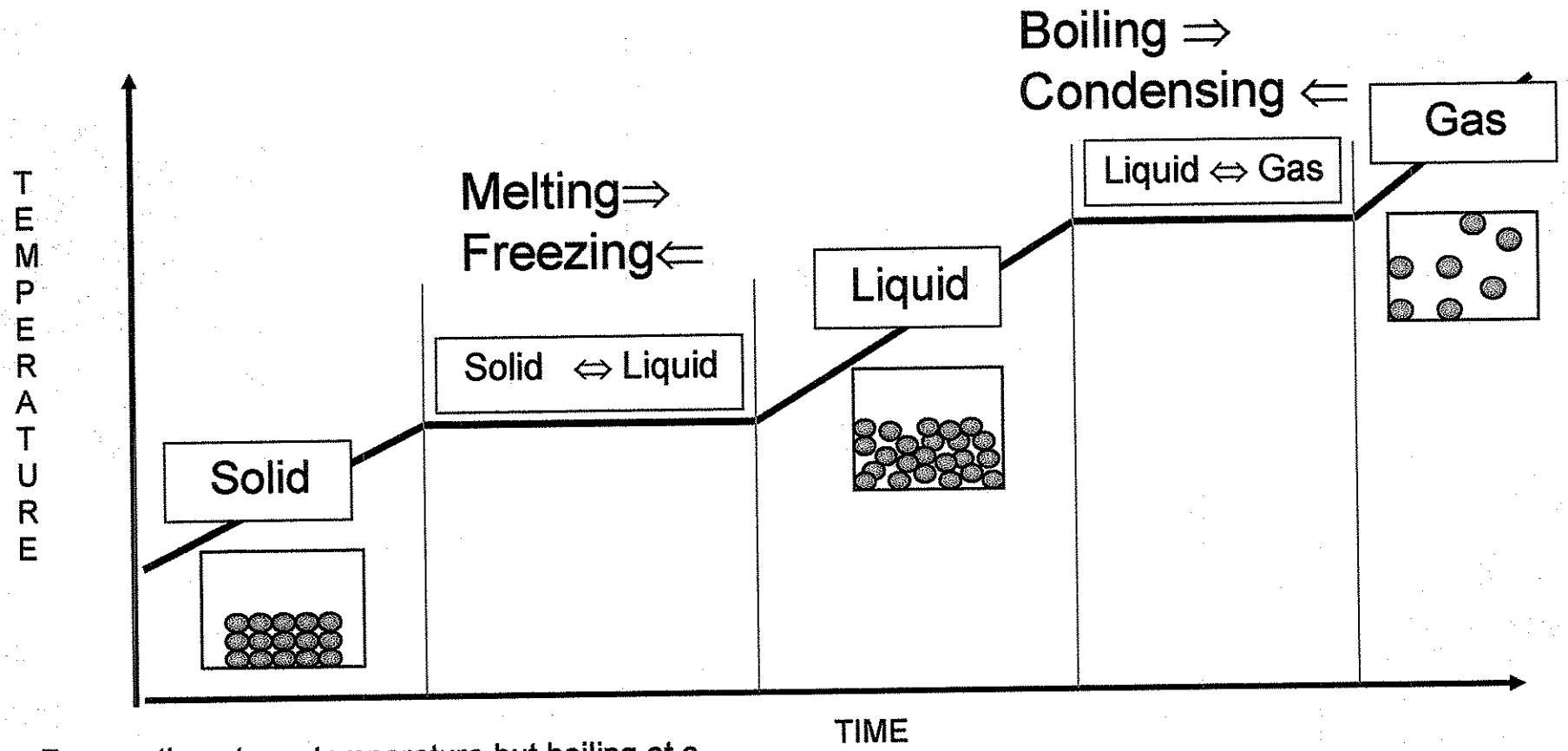
No fixed volume and no fixed shape.

Lower density than liquids.

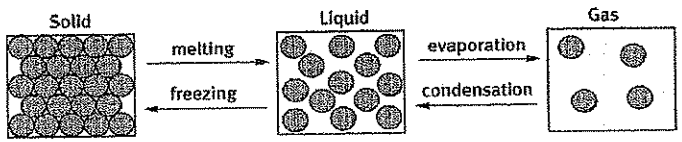


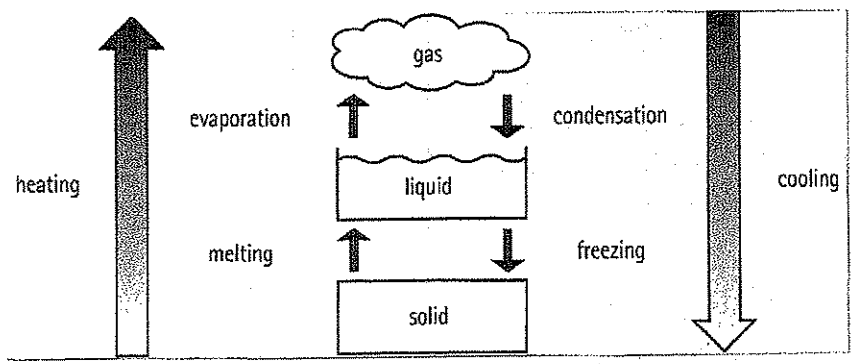
Gas

Change of State



Evaporation at any temperature but boiling at a specific temperature
Boiling point as a test for pure water = 100°C
Water freezes at 0 °C (*solid*) e.g. ice.
Water is a *liquid* between 1 °C - 99 °C e.g. solvent
Water turns in to a *gas* at 100°C e.g. water vapour





Separation

Decanting
Pouring off the solvent from an insoluble solute

Different sized solutes
Sieving

Separation of a solute from a solvent
Evaporation/ condensation

Separate magnetic from non-magnetic.
Magnetism

Simple Distillation
Separates different solvents using their boiling

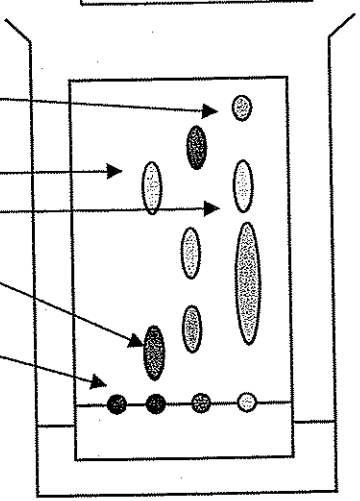
Filtration
Separation of a soluble solute from an insoluble solute.

Fractional Distillation
Leibig condenser

Evaporation
Separates a solute from a solvent.
Crystallisation

Chromatography
Separation of different pigments according to their solubility

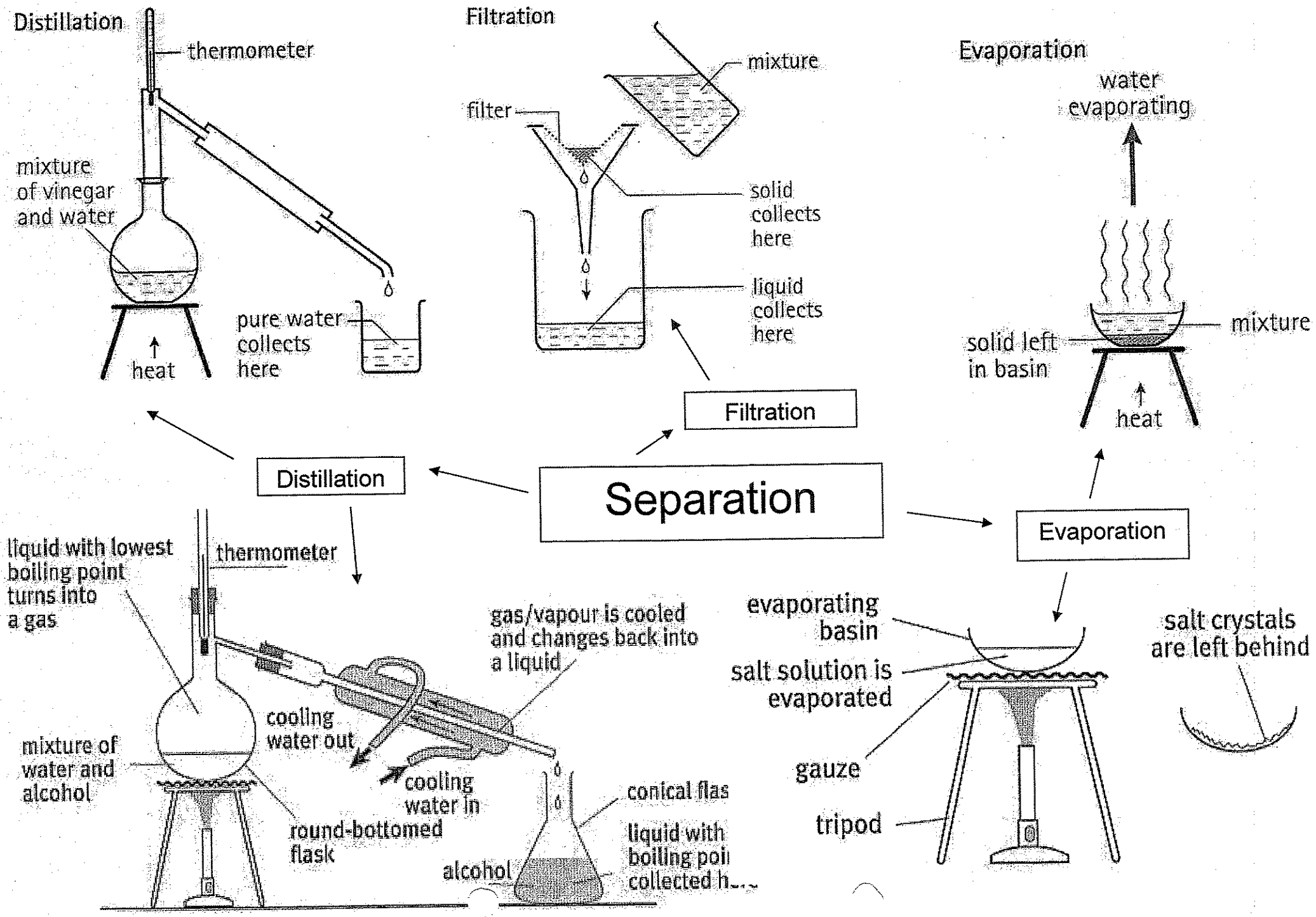
Most soluble
Same pigment
Least Soluble
Insoluble



Dissolving: the effects of dissolving:

- **Temperature of the solvent**
- **Size of the particles (cubes/granules)**
- **Stirring**

Solute: Solid
Solvent: Liquid
Solution: Solid and the Solvent
Dissolving: Break down of a solute using a solvent
Saturated: A solution that won't dissolve any more solute.
Super Saturated: Dissolve more solute into solvent when you increase the temperature.
Soluble: Means it will dissolve


Distillation
thermometer
mixture of vinegar and water
heat
pure water collects here
Filtration
mixture
filter
solid collects here
liquid collects here
Evaporation
water evaporating
mixture
solid left in basin
heat
Filtration
Distillation
Separation
Evaporation
liquid with lowest boiling point turns into a gas
thermometer
gas/vapour is cooled and changes back into a liquid
cooling water out
cooling water in
mixture of water and alcohol
round-bottomed flask
conical flas
liquid with boiling poi
collected h...
alcohol
evaporating basin
salt solution is evaporated
gauze
tripod
salt crystals are left behind

Materials and their Properties / Uses

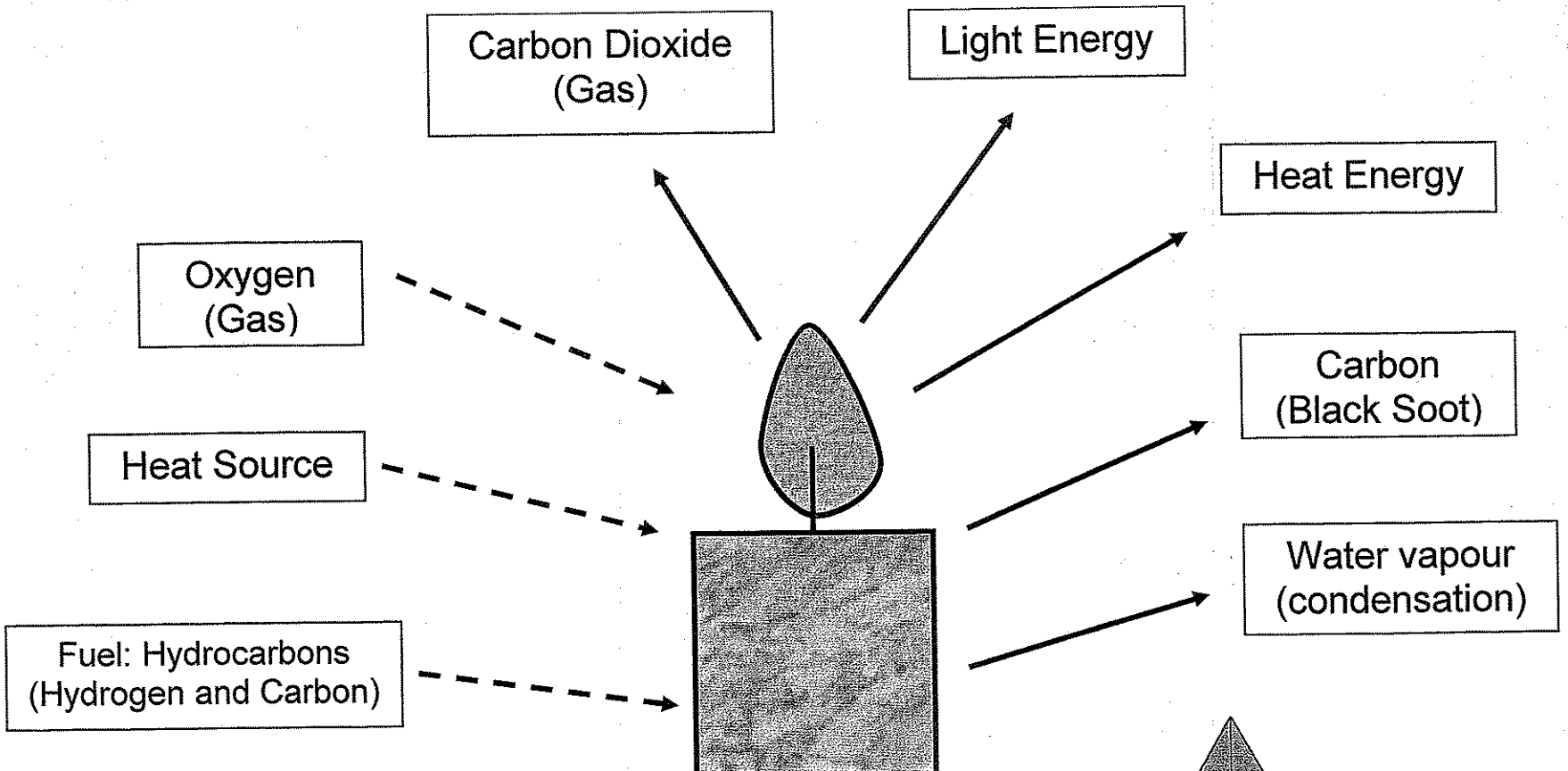
Material / Element	Properties	Uses
Copper	Good conductor of heat/electricity. Malleable/ductile.	Copper wire in circuits, cooking pans. Bronze & brass.
Nickel	Hard wearing, magnetic.	Used in coins, batteries.
Iron	Magnetic, strong (alloy steel)	steel and other alloys, tools, essential to human life, construction, magnets.
Aluminium	Light, high density (strong), conduct electricity. Resists corrosion.	Aeroplanes, cooking utensils, cans easy to recycle.
Gold	Colourful, uncreative, high density.	Jewellery.
Tin	Resists corrosion. Soft metal. Low melting point for a metal.	Plating steel food cans. Alloy with copper - bronze). Lead in batteries.
Zinc	Malleable, good conductor of electricity.	Alloy with copper - brass. Galvanising paints cover other metals to prevent corrosion (iron). X-ray/TV screens, cosmetics, batteries.
Nitrogen	78% of atmospheric gas.	Refrigerators, ammonia is used in fertilizers.
Mercury	Liquid at room temperature.	Used in thermometers, barometers, fluorescent lamps and batteries.

Gases

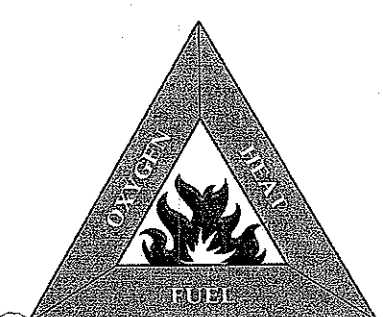
	How is it made	How do you test it	Use or properties	% in the air
Oxygen	Breakdown of $KMnO_4$	Relights a glowing splint.	Needed for respiration & combustion. Product of P/S	21
Carbon dioxide	Break down a Carbonate. Produced by Plants	Turns lime water milky/cloudy.	Product of respiration & combustion. Needed for P/S	0.04
Hydrogen	Reactive metal in water/acid.	Gives off a 'squeaky pop' sound.	Found in a water molecule (H_2O) Rocket fuel	Water Vapour (Varies)

Combustion is Burning

- A fuel reacts with oxygen to release useful energy (heat and light).
- Most fuels are hydrocarbons, i.e. they contain carbon and hydrogen only.
- The products of burning are oxides of hydrogen and carbon – i.e. water (H_2O) and carbon dioxide (CO_2).



- Three things needed for combustion: Fuel, Heat and Oxygen.
- Uses: heating, Fuels, generating electricity.



Dissolving/Saturation

Key Words:

- **Solute** – Solid. E.g. Salt
- **Solvent** – Liquid. E.g. Water
- **Solution** – Solute and Solvent mixed together. E.g. Salty Water

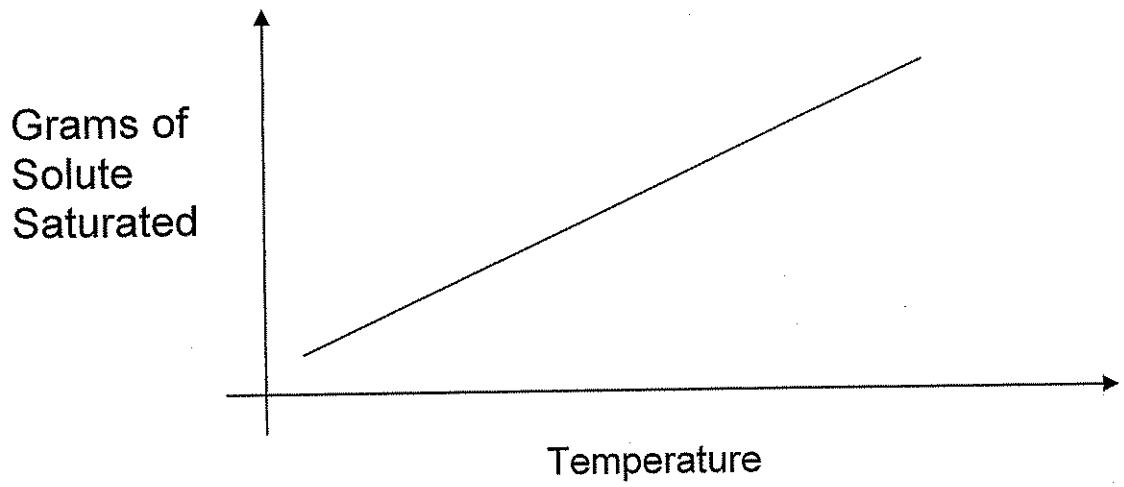
- **Soluble** – Solute will dissolve.
- **Insoluble** – Solute will not dissolve.
- **Dissolving** – the breakdown of a solute in a solvent. Dissolving is not disappearing! Can't see particles with the naked eye.

E.g. 20g Solute + 100g Solvent = 120g Solution

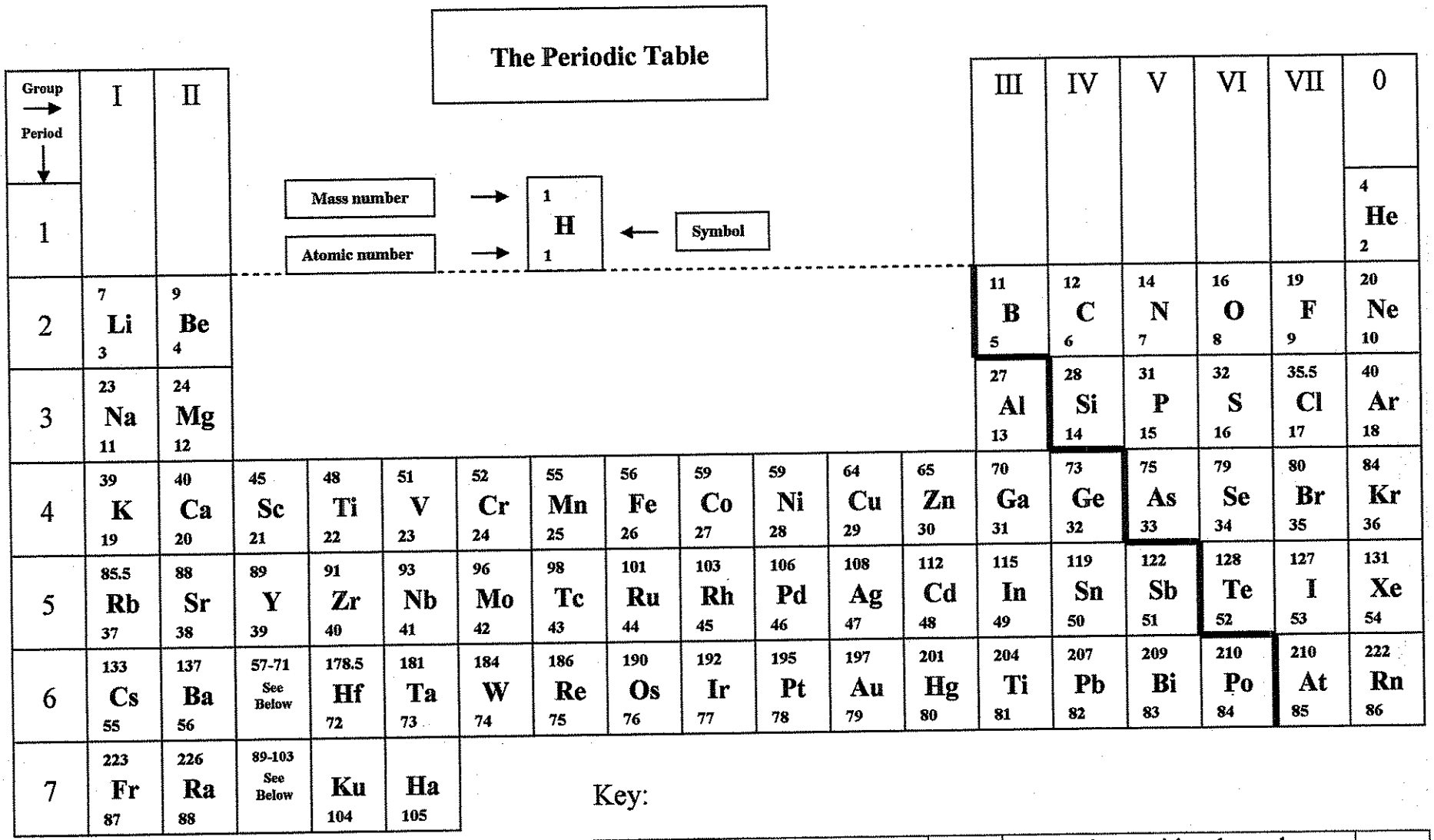
Three typical ways of increasing the speed at which a solute dissolves in a solvent:

1. Heat the solvent
2. Stirring
3. Particle size - Use granules of sugar instead of cubes.

Saturation – a solution that won't dissolve any more solute at that temperature.
Unsaturated – if more of the solute can be dissolved into the solvent.
Supersaturated – when the solvent contains more solute than it can dissolve; as solvent cools the solute gets pushed out – formation of crystals.



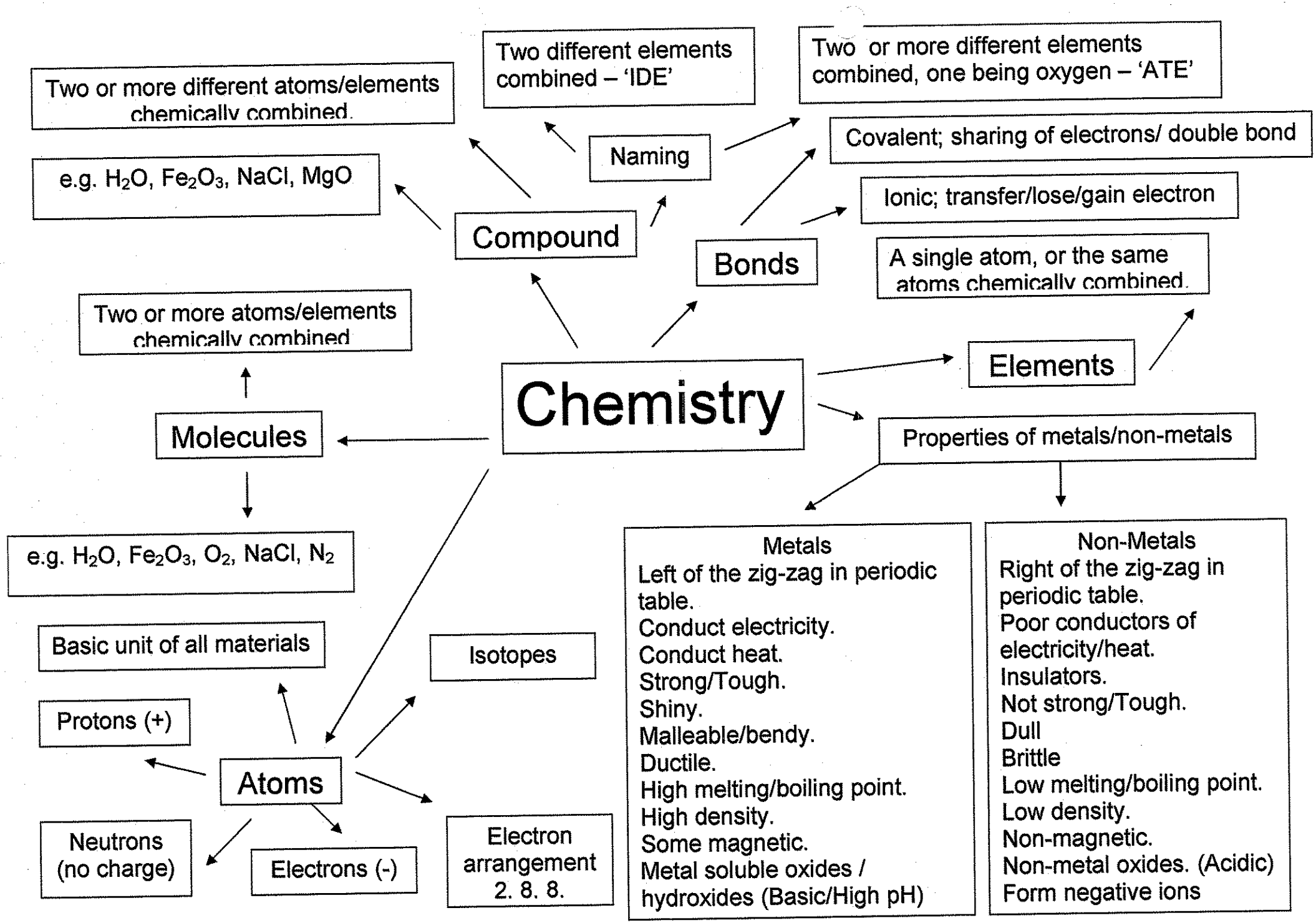
The Periodic Table



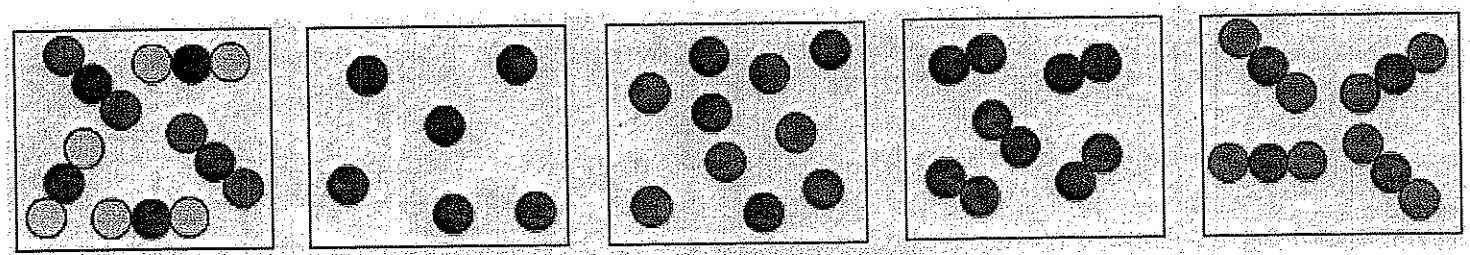
Key:

Alkali metals		Magnetic transitional metals	
Alkali earth metals		Halogens	
Transitional metals		Noble gases	
Other metals		Halogen to conduct electricity	
Other non-metals		Atmospheric gases	
Liquids at room temp.			

Mr Burley


Chemistry
Compound
Two or more different atoms/elements chemically combined.
e.g. H_2O, Fe_2O_3, NaCl, MgO
Naming
Two different elements combined – 'IDE'
Two or more different elements combined, one being oxygen – 'ATE'
Bonds
Covalent; sharing of electrons/ double bond
Ionic; transfer/lose/gain electron
A single atom, or the same atoms chemically combined.
Elements
Properties of metals/non-metals
Metals
Left of the zig-zag in periodic table.
Conduct electricity.
Conduct heat.
Strong/Tough.
Shiny.
Malleable/bendy.
Ductile.
High melting/boiling point.
High density.
Some magnetic.
Metal soluble oxides / hydroxides (Basic/High pH)
Non-Metals
Right of the zig-zag in periodic table.
Poor conductors of electricity/heat.
Insulators.
Not strong/Tough.
Dull
Brittle
Low melting/boiling point.
Low density.
Non-magnetic.
Non-metal oxides. (Acidic)
Form negative ions
Molecules
Two or more atoms/elements chemically combined
e.g. H_2O, Fe_2O_3, O_2, NaCl, N_2
Atoms
Basic unit of all materials
Protons (+)
Neutrons (no charge)
Electrons (-)
Isotopes
Electron arrangement 2. 8. 8.

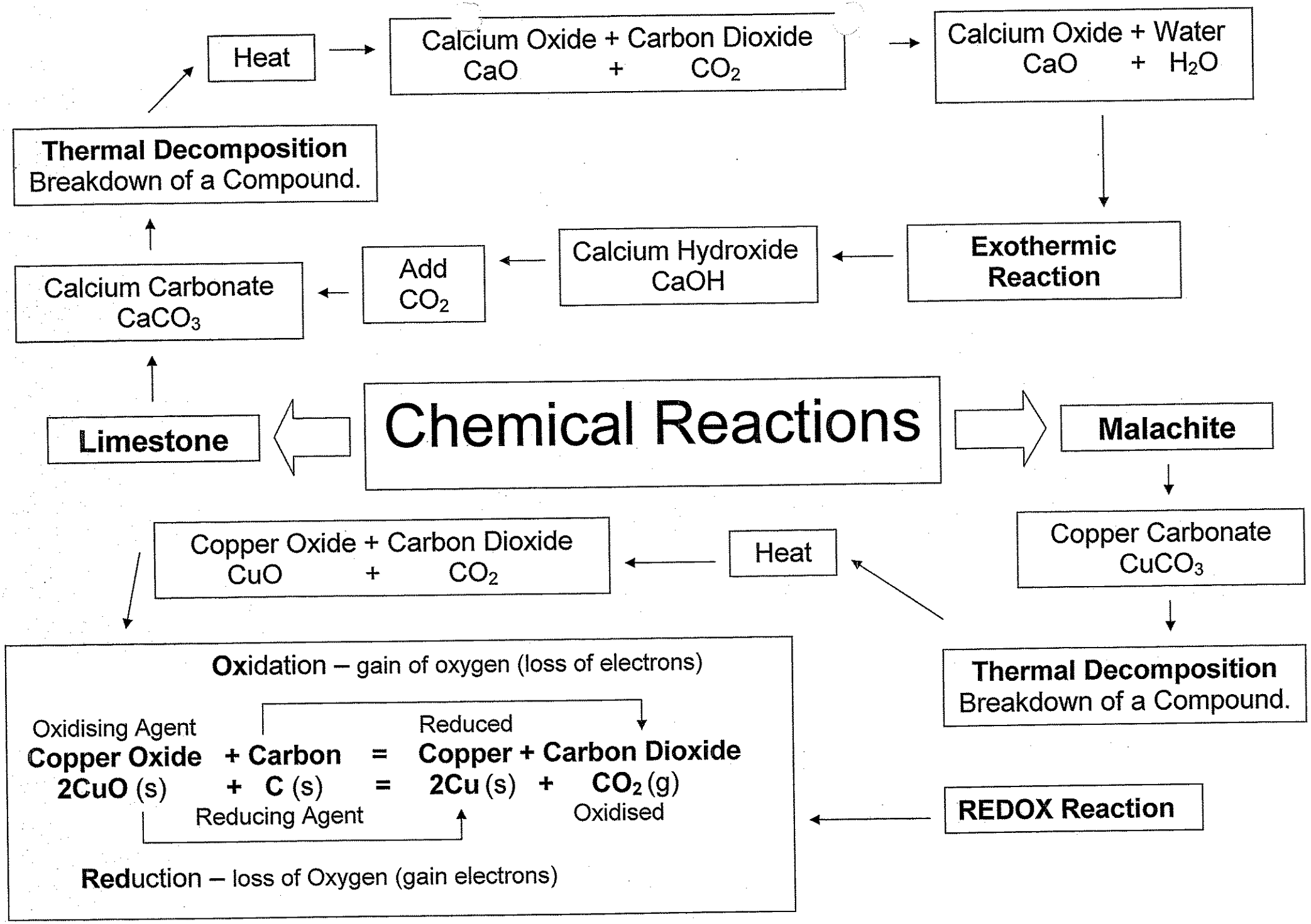
Elements, Compounds and Mixtures

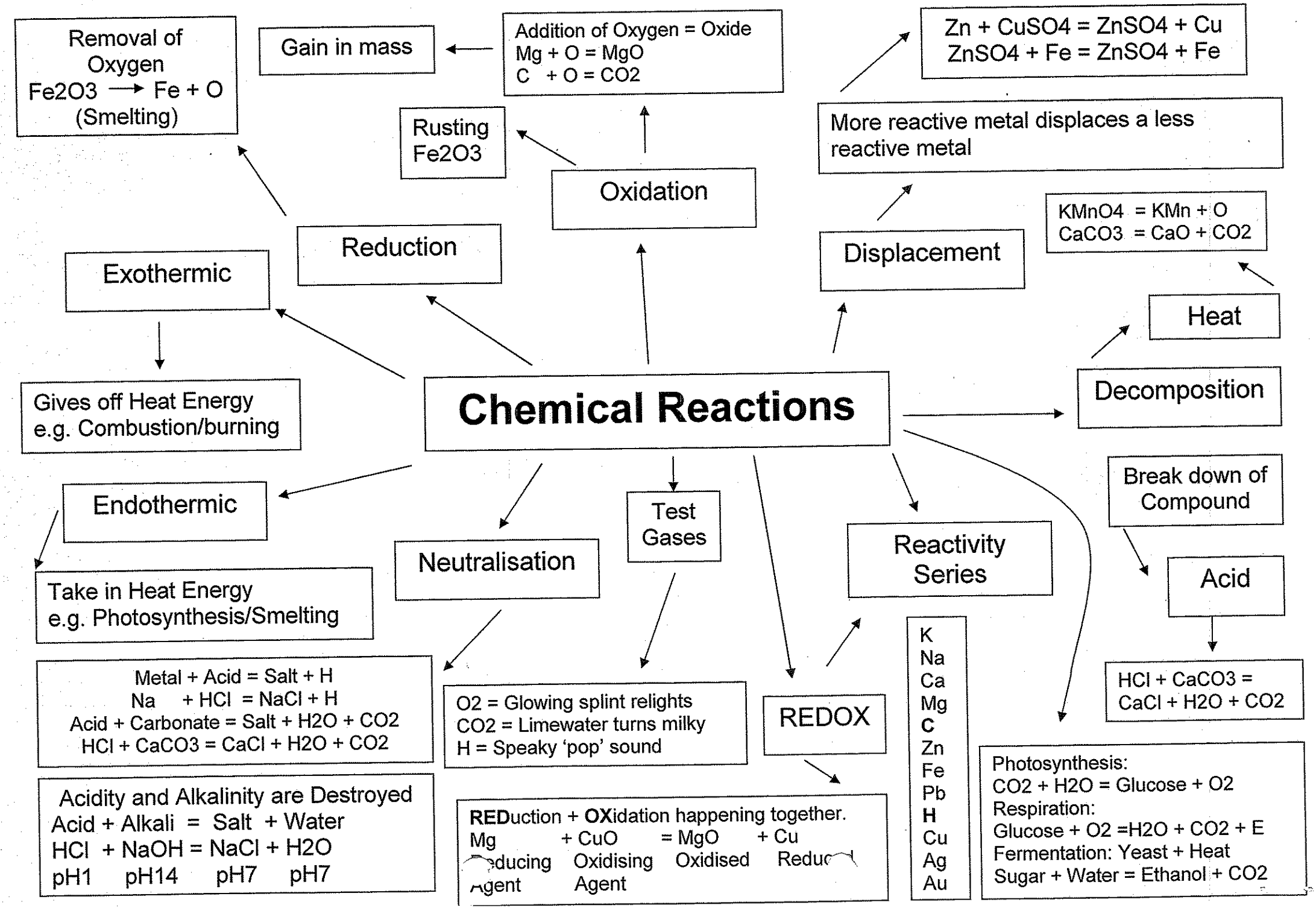


Mixture of Compound | Element | Mixture of Elements | Element & Molecule | Compound & Molecule

FORMULA AND NAME	NUMBER OF ATOMS IN THE MOLECULE
H_2O Water	H_2O is really H_2O_1 Therefore total number of atoms = 3
CH_4 Methane	CH_4 is really C_1H_4 4 Hydrogen + 1 Carbon = 5 atoms in total

	FORMULA	NAMES OF THE ELEMENTS IN THE COMPOUND	NAME OF THE COMPOUND
A	NaCl	Sodium, chlorine	Sodium chlor*ide*
B	MgS	Magnesium, sulphur	Magnesium sulph*ide*
C	$MgSO_4$	Magnesium, sulphur, oxygen	Magnesium sulph*ate*
D	Ca_3N_2	Calcium, nitrogen	Calcium nitr*ide*
E	$Ca(NO_3)_2$	Calcium, nitrogen, oxygen	Calcium nitr*ate*
F	Na_2CO_3	Sodium, carbon, oxygen	Sodium carbon*ate*
Element: one type of atom chemically combined			
Compound: two or more different elements chemically combined			
Molecule: two atoms chemically combined			
Mixture: elements/compounds that are not chemically combind			


Heat
Calcium Oxide + Carbon Dioxide
CaO + CO_2
Calcium Oxide + Water
CaO + H_2O
Thermal Decomposition
Breakdown of a Compound.
Exothermic Reaction
Calcium Hydroxide
CaOH
Add
CO_2
Calcium Carbonate
$CaCO_3$
Limestone
Chemical Reactions
Malachite
Copper Carbonate
$CuCO_3$
Heat
Copper Oxide + Carbon Dioxide
CuO + CO_2
Thermal Decomposition
Breakdown of a Compound.
Oxidation – gain of oxygen (loss of electrons)
Oxidising Agent
Reduced
Copper Oxide + Carbon = Copper + Carbon Dioxide
2CuO (s) + C (s) = 2Cu (s) + CO_2 (g)
Reducing Agent
Oxidised
Reduction – loss of Oxygen (gain electrons)
REDOX Reaction


Chemical Reactions
Removal of Oxygen
Fe2O3 → Fe + O
(Smelting)
Gain in mass
Addition of Oxygen = Oxide
Mg + O = MgO
C + O = CO2
Rusting
Fe2O3
Oxidation
Reduction
Zn + CuSO4 = ZnSO4 + Cu
ZnSO4 + Fe = ZnSO4 + Fe
More reactive metal displaces a less reactive metal
Displacement
KMnO4 = KMn + O
CaCO3 = CaO + CO2
Heat
Decomposition
Exothermic
Gives off Heat Energy
e.g. Combustion/burning
Endothermic
Take in Heat Energy
e.g. Photosynthesis/Smelting
Neutralisation
Test Gases
Reactivity Series
Break down of Compound
Acid
Metal + Acid = Salt + H
Na + HCl = NaCl + H
Acid + Carbonate = Salt + H2O + CO2
HCl + CaCO3 = CaCl + H2O + CO2
O2 = Glowing splint relights
CO2 = Limewater turns milky
H = Speaky 'pop' sound
REDOX
K
Na
Ca
Mg
C
Zn
Fe
Pb
H
Cu
Ag
Au
HCl + CaCO3 =
CaCl + H2O + CO2
Acidity and Alkalinity are Destroyed
Acid + Alkali = Salt + Water
HCl + NaOH = NaCl + H2O
pH1 pH14 pH7 pH7
REDuction + OXidation happening together.
Mg + CuO = MgO + Cu
Reducing Agent
Oxidising Agent
Oxidised
Reduced
Photosynthesis:
CO2 + H2O = Glucose + O2
Respiration:
Glucose + O2 =H2O + CO2 + E
Fermentation: Yeast + Heat
Sugar + Water = Ethanol + CO2

Physics

Magnets
Forces
Light
Sound
Astronomy
Electricity
Transfer of Energy
Equations
Density
Energy Types
Alternative Energy
Symbols/Units/Formulae

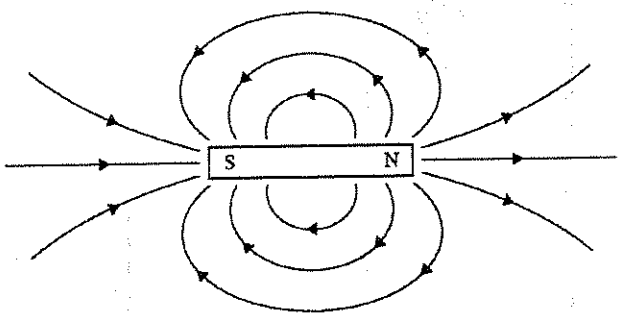
Magnets

Magnetism is a non-contact force. Magnets attract magnetic materials. *Iron, nickel and cobalt* are **magnetic materials**. Mixtures, like steel, that include a magnetic material will also be attracted to a magnet.

A wire with electricity flowing through it has a magnetic field around it. An **electromagnet** is a coil of wire with an electric current flowing through it.
You can make an electromagnet stronger by:

- increasing the number of coils of wire
- increasing the size of the current (by increasing the voltage)
- using an iron core.

The Earth has a magnetic field. A **compass** is a small magnet that always points north. But magnetic materials placed near a compass can change the direction that it points.

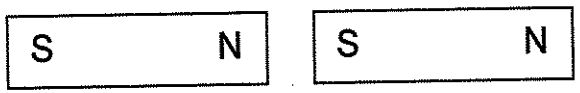


The two ends of a bar magnet are called the **north seeking pole** and the **south seeking pole** or north pole and south pole for short.

- A north pole and a south pole **attract** each other.
- Two north poles or two south poles will **repel** each other.

The space around a magnet where it has an effect is called its **magnetic field**.
You can find the shape of the magnetic field using iron filings or using a plotting compass.

Attract



Repel

Magnetic Strength: the experiment.

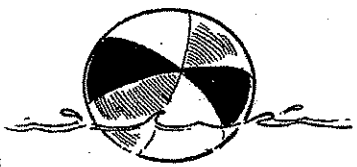
- Number of nails it can pick up.
- The magnetic which picks up the greatest number of nails is the strongest magnet.

Fair Test: same size magnet, same size nails

Forces

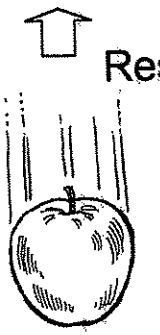
Balanced Forces

The forces in opposite directions are equal = **balanced**.
Up-thrust = Gravity
No effect on movement



Unbalanced Forces

When two forces in the opposite direction are not the same = **unbalanced.**
The force of gravity is greater than the force of air resistance. The apple in gaining speed.
Unbalanced forces change speed

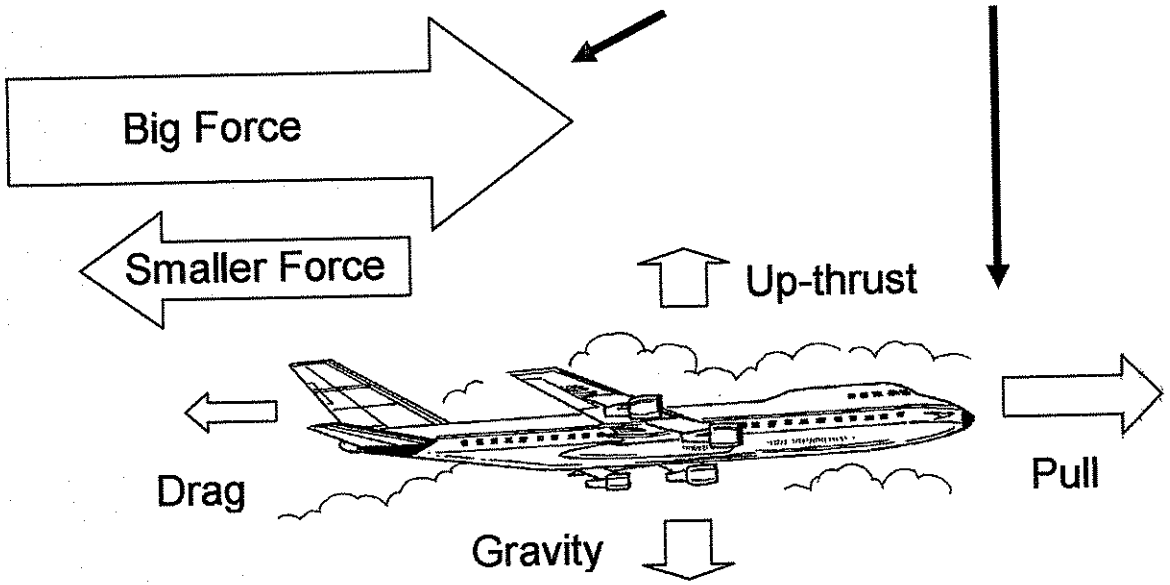


Weight is the pull of gravity.
Weight can be measured with a **Newton meter** (N).
Gravity causes objects to fall towards Earth.
Gravitational attraction between two masses.

The **Sun's gravitational** pull (force) keeps all the planets in the solar system in **orbit**.

The **Earth's gravitational** pull keeps the **moon in its orbit.**

Jupiter has the **greatest gravitational force** because it has the greatest mass out of all the planets. The greater the mass the stronger the gravitational (force of attraction pull.



Forces
(Pushes and Pulls)
Opposing Forces

Balanced/Unbalanced

Balanced forces: when two forces are the same strength but working in opposite directions. E.g. objects that are not moving except when moving at a constant speed.

Unbalanced forces: When two forces working in opposite directions that are not the same strength. E.g. objects slowing or accelerating.

Forces can:

1. change the **shape** or **size** of an object
2. change the **speed** things are moving (make them move faster or slower)
3. change the **direction** of a moving object.

Friction is a force caused by two things rubbing together, opposes movement. **Air resistance** and **water resistance** are kinds of friction. They are sometimes called **drag**; prevented by streamlining.

Upthrust pushes things up. Solid things, like your chair, give you upthrust. Things float in water because of Upthrust.

Friction: heat, noise, wearing, rubbing.
Reducing friction:
Lubricant, Smoothen surfaces.

Non-contact forces:

- **magnetism**
- **gravity**
- **static electricity.**

Mass = Kg / g

Weight/Force = Newtons (N)

Converting Weight and Mass
Kg to N = times by 10
N to Kg = divide by 10
G to N = divide by 100
N to G = times by 100

Density and floating
You can decide if something will float by working out its **density**. Density is the **mass** of a certain **volume** of something, and it can be calculated using this formula:
Density = mass / Volume (g/cm^3).
The density of water is **$1g/cm^3$**. If an object has a density less than $1g/cm^3$ it will **float**. If its density is greater it will **sink**.

Contact forces need to touch the thing that they are affecting:

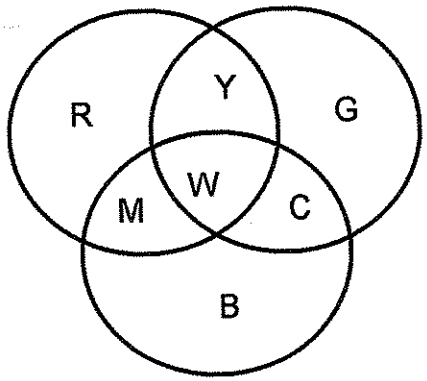
- **friction**
- **air resistance**
- **water resistance**
- **upthrust.**

Light

Properties of Light

1. Travels in straight lines.
2. Shadows are places where the light can not shine.
3. Light travels faster than sound.
4. We see things because light reflects into our eyes.

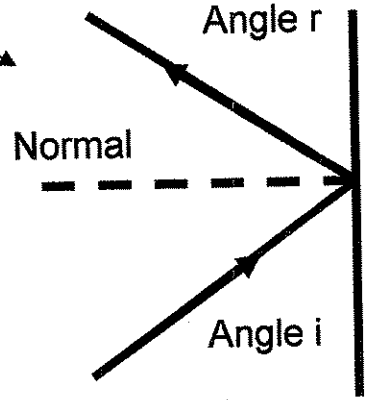
Colour



Reflection

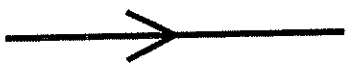
Angle of incidence = Angle of reflection

Angle I = Angle r



Drawing light rays

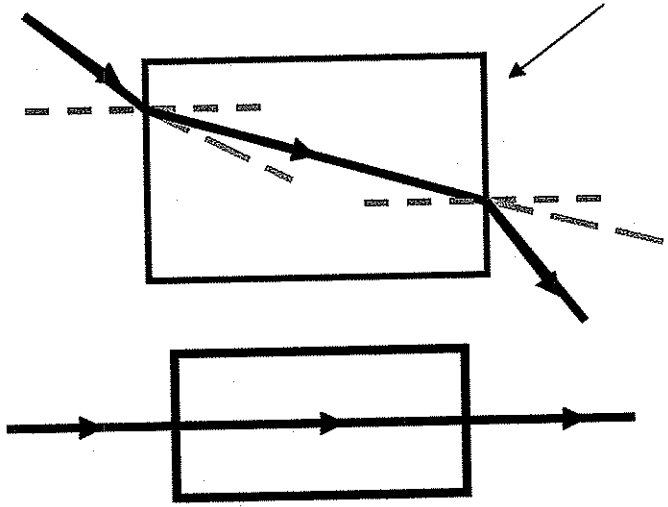
Pencil, ruler with arrows.



Refraction

When light goes from a Less Dense to a More Dense medium; light bends Towards the Normal.

When light goes from a More Dense to a Less Dense medium; light bends Away from the Normal.

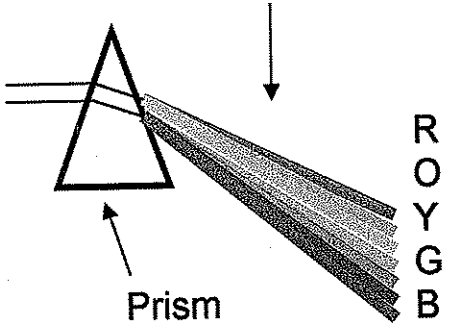


Mirrors

Concave: image smaller/upside down

Convex: image bigger/right way up

Dispersal of white light gives a spectrum.



Key words

Transparent: See through/clear image.

Translucent: Allows some light through, not a clear image.

Opaque: Allows no light through, casts a shadow.

Luminous: Gives off it's own light

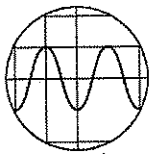
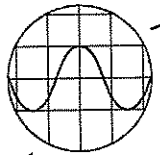
Dull: Only reflects light.

Sound

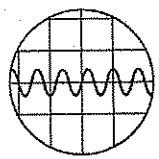
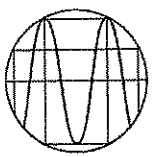
Facts

- Type of Energy
- Travels in waves
- Ear drum picks up vibrations
- Caused by vibrations, not always visible.

Frequency/ Pitch

- How high/Low the note.
  - High
  - Low
  - 
  - 
- Hertz (Hz)
- Number of vibrations/waves per second
- High Pitch: short, thin tight string.
  Low pitch: Long, thick, loose string

Amplitude

- Loudness/ Volume
  - Quiet
  - 
  - Loud
  - 
- Size of vibrations/wave

Sound reflecting off a solid object

- Echo

Speed of Sound

330m/s; Air
1500m/s; Water
6,000m/s; Steel

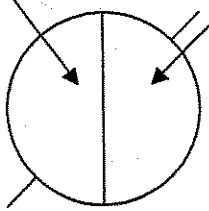
Sound can't travel through a vacuum, it needs a medium; Solid, liquid, gas.

Oscilloscope can show sound waves

Astronomy

Night

Day



Sun

Gravity:
Sun's gravity keeps planets in orbit.

Mercury
Venus
Earth
Mars
Jupiter
Saturn
Uranus
Neptune
Pluto

Earth
Spins on it's axis once = 24h / 1 day
Natural satellite = moon
Orbits sun: 365 ¼ / 1 year
Life: 78% N_2, 21% O_2, 0.02% CO_2

Natural: Moons

Day and Night

Order of Planets

Earth

Summer: warmer, longer days, shorter shadows. Sun high in sky.

Artificial: man-made;
Communications
Pictures
Weather reports
Exploring
Navigation

Satellites Orbit planets

Seasons

Winter: colder, shorter days, longer shadows. Sun low in sky.

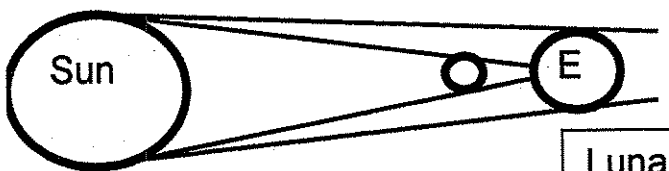
Phases of the moon
New, crescent, half, gibbous, full.

Eclipses

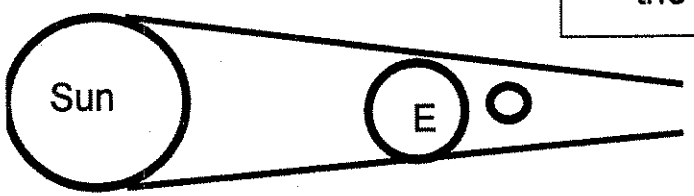
NH: Tilts towards Sun. Sun's rays cover smaller area; Summer. **SH**: Winter

NH: Tilts away from Sun. Sun's rays cover larger area; Winter. **SH**: Summer

Solar/Eclipse of the Sun.



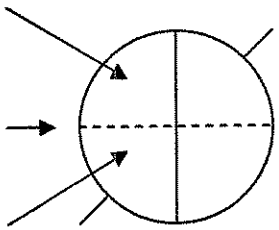
Lunar/Eclipse of the Moon.



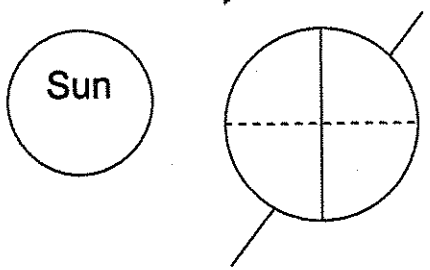
Northern Hemisphere (NH)

Equator

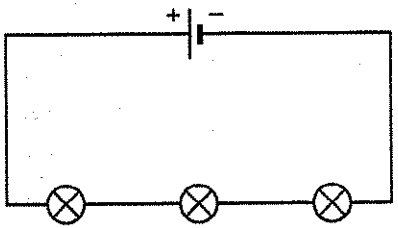
Southern Hemisphere (SH)



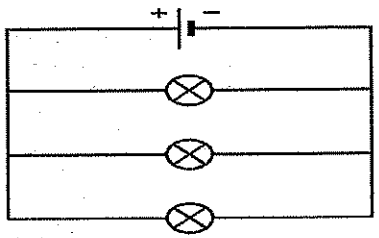
Axis



Electricity



Series Circuit



Parallel Circuit

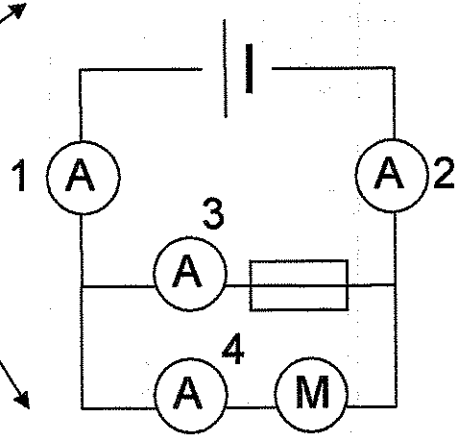
Type of ENERGY

Long/thin wire increases the resistance.
Short/thick wire lowers the resistance.

If you increase the voltage – then more current will flow.
If you increase the resistance – then less current will flow

Resistance

Ammeter in series



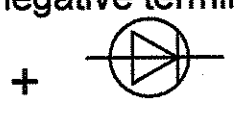
Current

Electromagnet

- A wire with a current in it has a magnetic field round it.
- The strength of an electromagnet can be increased in three ways:

1. more current/cells
2. More turns/coils around solenoid.
3. A core solenoid (iron)

Diode; only allows current to flow in one direction; triangle points towards the negative terminal.



Current

Voltmeter

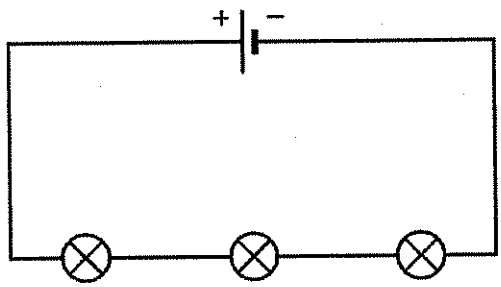
Measures volts (v) (potential difference) parallel circuit

Electrons in **metals** carry current. It is the flow of charge.

A1 = A2
A1 = A3 + A4
e.g.
A1=5 amps, A2=5 amps,
A3 =2 amps, A4=3 amps

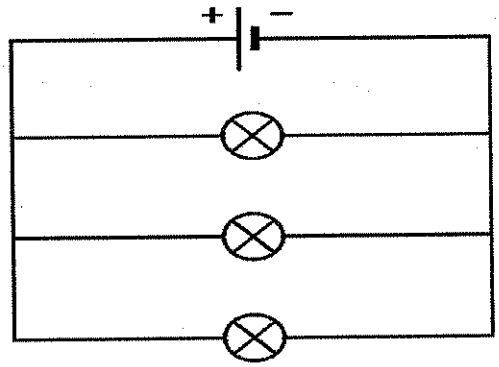
Current is measured by an **Ammeter** (amps). Number of electrons that pass through a component per sec.

Electrical circuits



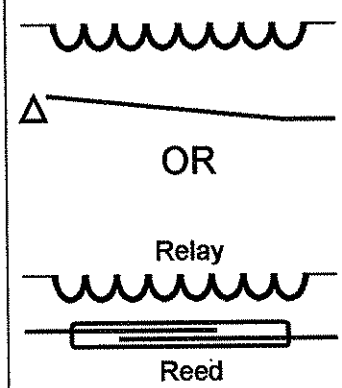
Series circuit:

- The current is the same anywhere in the circuit.
- Current has no choice of route.
- Current is either off or on.
- A break in the circuit – all lights turn off.
- Bulbs are dimmer compared to parallel.
- The more bulbs in series the dimmer they become.
- More cells the brighter the bulbs.

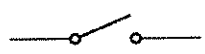
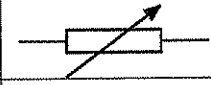
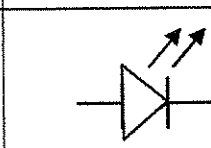
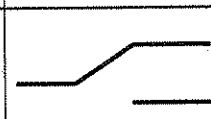
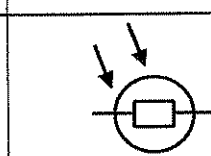
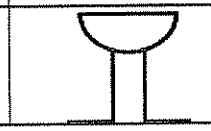


Parallel circuit:

- The current has a choice of route.
- Current may be different within the circuit depending on the resistance of the components.
- Some parts of the circuit can be on while others may be off.
- Bulbs are all the same brightness.

Reed Relay		A relay is an **electrically operated switch**. Current flowing through the coil of the relay creates a magnetic field which attracts a lever and changes the switch contacts. The coil current can be on or off so relays have two switch positions and they are **double throw** (**changeover**) switches. Relays allow one circuit to switch a second circuit which can be completely separate from the first.

Electrical Symbols

Component	Symbol	Description
Cell		A cell stores chemical energy, and converts it into electrical energy when it is put in a circuit.
Battery		A battery is two or more cells connected together.
Switch		A switch is used to control the flow of electricity in a circuit. No current can flow when the switch is open.
Bulb		A bulb converts electrical energy into light and heat energy.
Ammeter		An ammeter measures the current (the amount of electricity flowing). An ammeter is always connected *in series*.
Voltmeter		A voltmeter measures the voltage across a cell or component. A voltmeter is always connected *in parallel*.
Fixed resistor		A resistor makes it difficult for current to flow. Resistors are used to control the size of the current flowing in a circuit.
Variable resistor		A variable resistor can be adjusted to control the amount of current in a circuit.
Motor		A motor converts electrical energy into kinetic (movement) energy.
Diode		Diode; only allows current to flow in one direction; the direction of the triangle
LED		Light Emitting Diode; gives off light.
SPDT		Single pole double throw (switch)
Fuse		Follows a certain amount of current pass. Protects the components within the circuit.
LDR		Light Dependant Resister; shining a light on a LDR lowers the resistance increasing the current.
Buzzer		A buzzer converts electrical energy into sound energy.

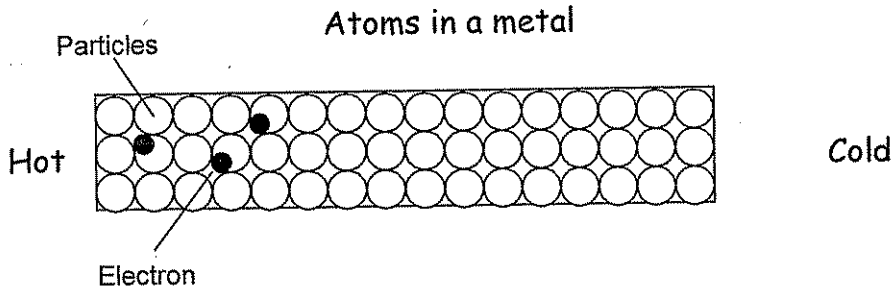
Transfer of Energy

Heat will only transfer if there is a temperature difference.

Temperature is measured in **degrees Celsius** (°C). Heat (**thermal**) energy is measured in **joules** (J).

1. Conduction.

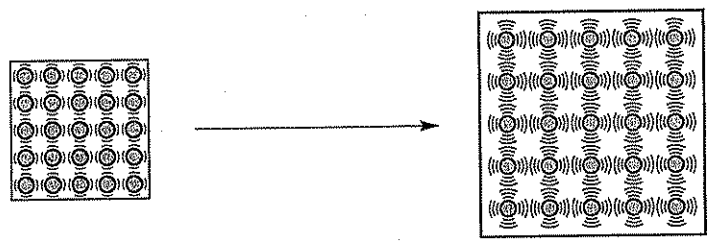
This is when vibrating particles pass on their extra vibrational energy to neighbouring particles.



Heat carries along the metal by free electrons and vibration of atoms.

Travelling heat

The **kinetic theory** or **particle model of matter** helps to explain how some forms of heat energy travel. The theory suggests that everything is made of moving or vibrating particles. When these particles are heated they move faster.

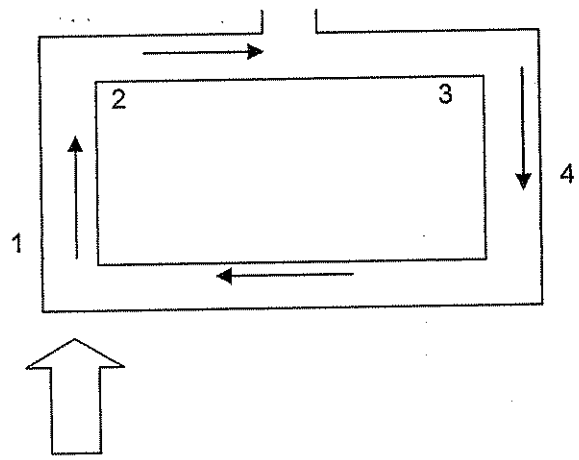


When the particles vibrate faster the material **<u>expands.</u>**

Conduction takes place in solids and can also happen in liquids (although not very well). The particles in a solid are held together tightly. When they gain energy they vibrate faster and the vibrations are passed on. Particles are not as close in a liquid, so conduction is not very good. Metals are the best conductors. Most other solids are poor conductors.

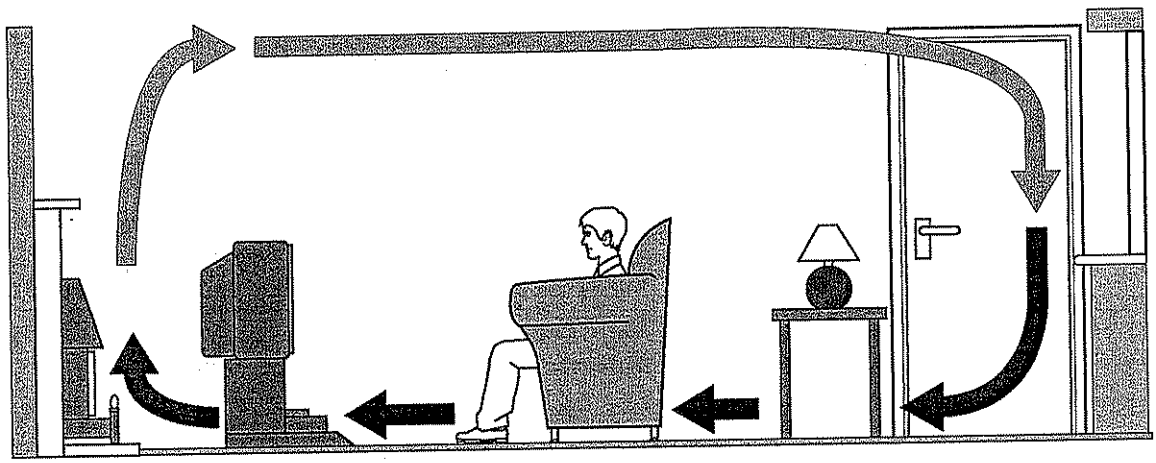
2. Convection.

Convection of heat is when heated particle moves in bulk to a cooler region and takes the heat with it. The circular movement of the fluid is called a convection current.



1. The liquid gas is warmed.
2. The fluid expands, becomes less dense and rises.
3. Heat is carried to all parts of the tube by convection current.
4. Fluid cools, becomes more dense and falls.

Convection takes place in liquids and gases.



When the air near the fire is heated, the particles spread further apart and the air becomes less dense and rises. As it rises it meets cooler air and passes the energy on. Having passed on the energy, it cools and becomes denser. The denser air sinks, setting up a cycle or **convection current.**

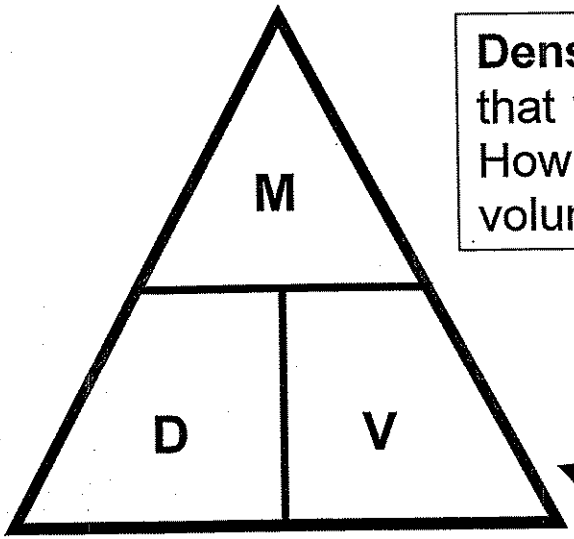
3. Radiation.

All hot objects radiate heat to the surroundings by invisible heat waves.

Heat radiation does not need particles so it means heat can travel through a vacuum. E.g. Sun, Heater

Density

Density: The amount of mass that 1cm^3 of a substance has. How heavy something is for its volume.

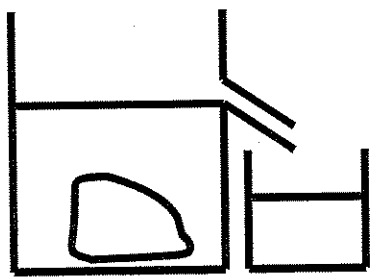


M = **Mass** (kg/g)
V = **Volume** (cm^3/m^3)
D = **Density** (g/cm^3 or Kg/m^3)

Regular shape: L x W x H

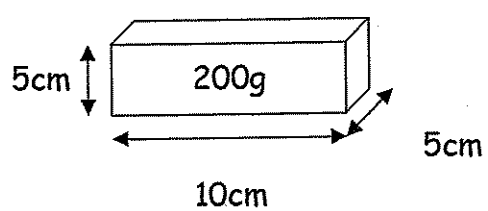
Volume

Irregular shape:
Eureka beaker – water displacement.
1cm3 = 1ml



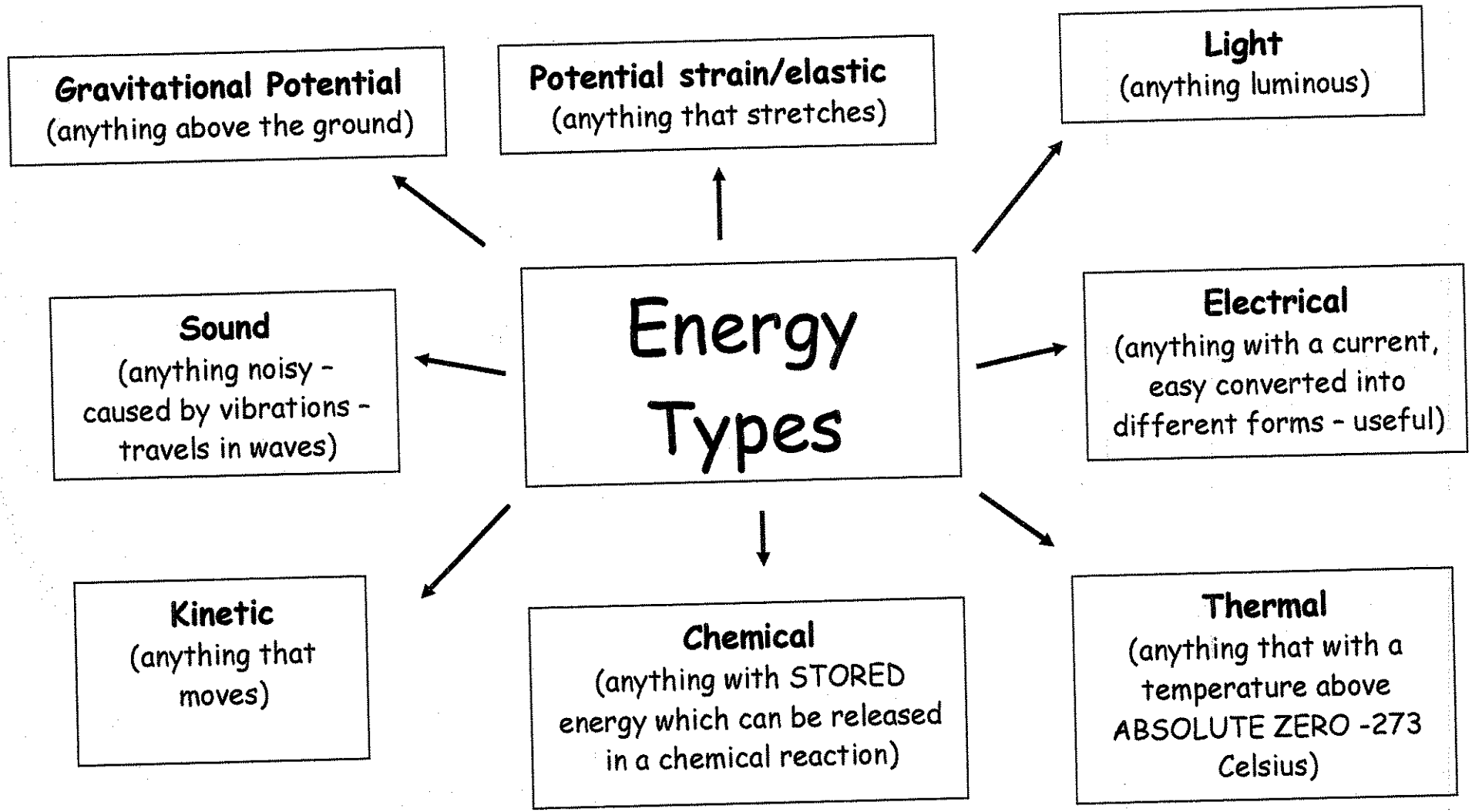
Calculating Density

Volume:
5 x 5 x 10 = 250cm^3
Density:
200g/250cm^3 = 0.8g/cm^3



Sink or Float in Water
Density of Water = 1 g/cm^3
Sink = more than 1 g/cm^3
Float = less than 1 g/cm^3

Energy can be transferred from one form to another - Energy is never lost!
e.g. Torch - Chemical → Electrical → Light & Heat
e.g. Solar powered calculator - Light → Electrical

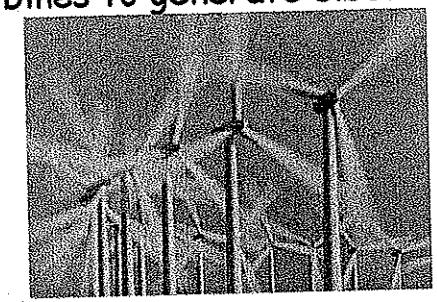


Alternative Energy

Renewable energy won't run out and does not contribute to global warming (it's clean - **does not produce pollution**). It be **costly** to set up initially.
The sun is the source of all these Energy Resources.

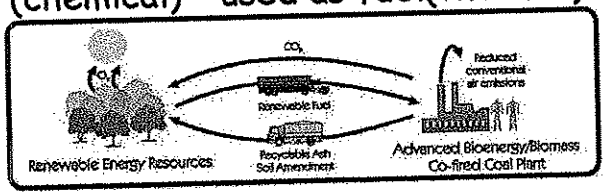
Wind

Kinetic energy of wind turns turbines to generate electricity.



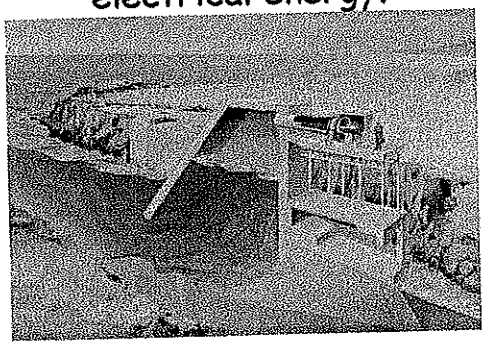
Biomass

Light energy - growing of trees (chemical) - used as fuel(thermal).



Wave

Kinetic energy of waves into electrical energy.

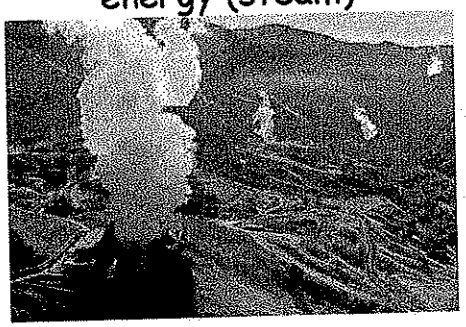


Tidal

Kinetic energy of tides turns turbines.

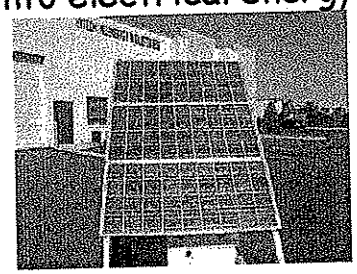
Geothermal

Thermal energy from the under the Earth's crust into kinetic energy (steam)



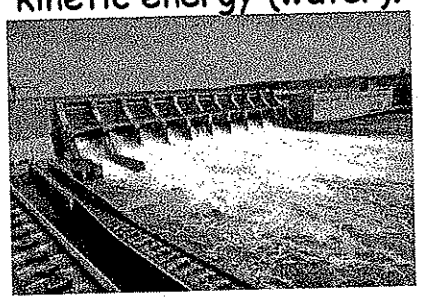
Solar

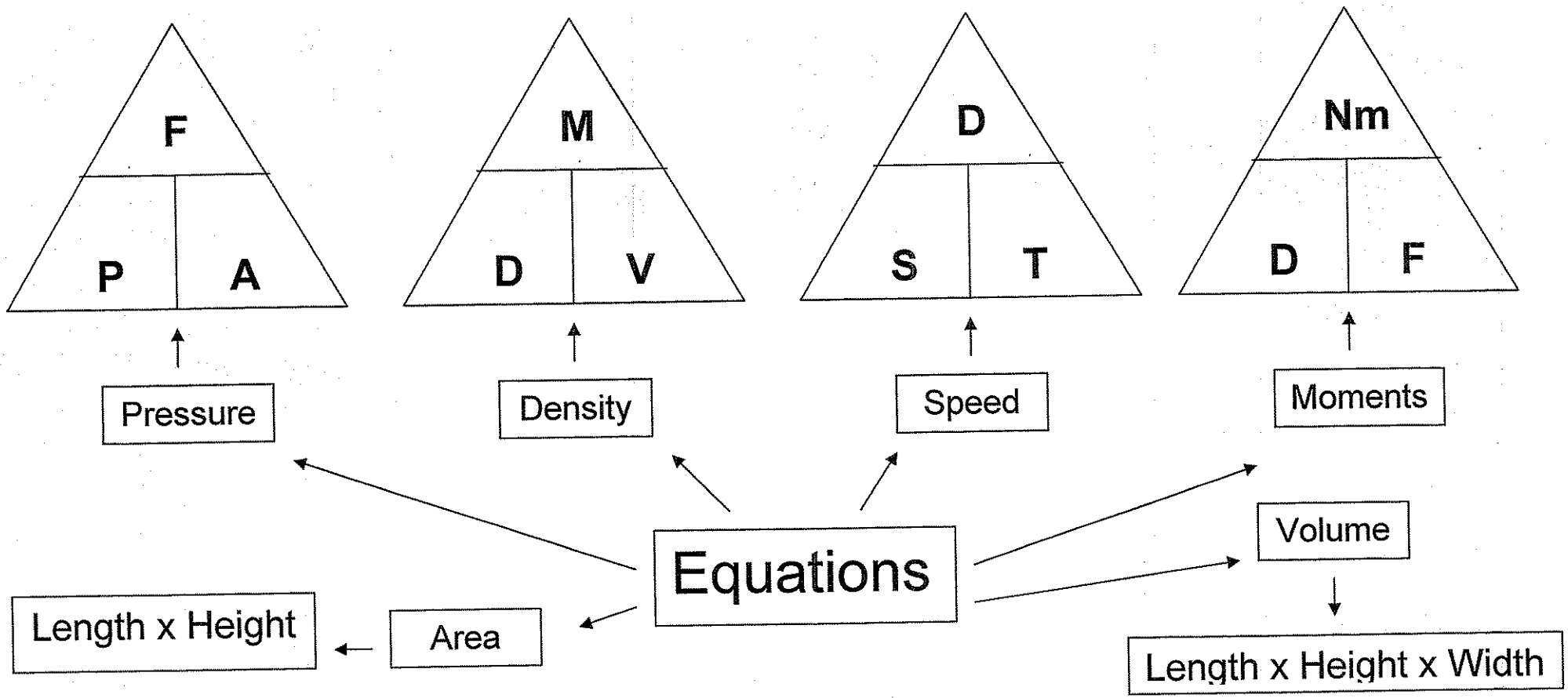
Light energy from the sun into electrical energy.



Hydroelectric

Gravitation potential into kinetic energy (water).





Quantity	Symbol	Units	Quantity	Symbol	Units
Distance	D	M, Km, m, cm	Speed	S	m/s, Km/h
Area	A	M^2, cm^2	Weight	F	N
Volume	V	M^3, cm^3	Moment	Nm	Nm
Mass	M	Kg, g	Energy	E	Kj, j
Density	D	Kg/m^2, g/cm^3	Current	I	Amps
Force	F	N	Resistance	R	Ohms
Pressure	P	$Pa, N/m^2$	Potential Diff.	v	Volts
Time	T	h, s	Temperature	^oC	Celsius, ^oC