The Hyndburn Academy
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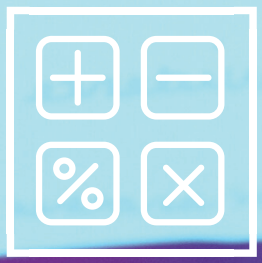
Part of United Learning

Year 10 Mid-Year Assessment Booklet

Revision Topics

Revision Tips



Sparx Help

A message from Mrs Jackson

Dear Student

Mid-Year Assessments

This booklet has been put together to help you prepare fully for your Year 10 Mid-Year Assessments which are taking place from the **12th - 16th January**. These are important assessments which your teachers will use to see whether you are working towards your full potential and to identify areas where you may need support to do so. As a result, it is critical that you prepare yourself fully to show your best on these assessments.

Use the following pages to form a revision timetable which will ensure you have looked over all the relevant information before your assessment. If you are not sure about any of the topics or content listed then please speak to your teacher and ask for more guidance. They will be happy to help!

When revising try to use a variety of strategies and formats to ensure you have materials to help you. This could include making mind maps, writing out key term definitions (and testing yourself!), doing practice questions on Seneca or Sparx, making flashcards with key facts, watching YouTube videos, and much more. When used together they will ensure you are fully prepared for your assessments.

Don't forget to also use your knowledge organisers.

Have a look for more tips on BBC Bitesize by following this link: Top Revision Techniques for Exams - https://tinyurl.com/4ptxdeuy

Remember, the effort that you put in will be reflected in your achievements. We are all here to support you to achieve your full potential and if you need any additional guidance or have any concerns please speak to your subject teacher, form tutor, or Head of Year.

Good Luck
Mrs Jackson
Assistant Head Teacher

Assessment Timetable

Assessment Timetable				
Date	**Exam**	**Year Group**	**Length**	**Period**
Monday 12th January	English Language	Year 10	1 hour 45 mins	P1 & P2
Tuesday 13th January	Maths	Year 10	1 hour 30 mins	P1 & P2
Wednesday 14th January	Science	Year 10	1 hour 15 mins	P1 & P2
Thursday 15th January	Geography/History	Year 10	1 hour 20 mins	P3 & p4
Friday 16th January	English Literature	Year 10	50 minutes	P1
In class assessment	Child Development	Year 10	45 minutes	TBC
In class assessment	Spanish	Year 10	2 x 45 minutes	TBC

HABIT - Get into the habit of working in a regular routine.

PLAN - Plan your weekly revision, homework and leisure time on the timetables provided. Make sure you can realistically keep to the schedule that you have planned.

PLACE - Make sure that you work in the best possible environment:

- The room should be well lit to reduce eye strain.
- Quiet with few distractions - no TV or phones.
- Sit on a chair at a table or desk rather than lounging on your bed or so close to a window that you might get distracted.
- Identify a set time and place for studying - most people study best in the mornings and evenings, but you need to work out the best time for yourself.

ORGANISATION

- Be fully prepared. Books, paper, pens, drinks etc. should all be organised before you start.
- Break each subject down into manageable chunks so that you can read over a topic once or twice in about 20to 30 minutes. If you come across topics that you really don't understand, make a note of them and ask the subject teacher for help.

VARIETY

- Get some variety into your revision. Vary your use of revision materials: notes, revision cards, books, websites, podcasts and videos. Keep a record of what you have done in this booklet to make sure you cover all topics and don't avoid the more difficult ones.
- Begin your revision by re-reading your notes from the previous session. This will improve your recall. At the end of the week revise the whole week's work. Revision should involve checking your notes and writing down the main points may help you learn them more than you would by just reading them.
- As the exam draws nearer have 'key words' which trigger your memory.
- Saying things out loud can help you to learn and can improve your use of appropriate vocabulary. It is important to test yourself after each piece of work. Identify some questions you might think will be on the paper and write an outline answer for each one.

RELAX - Try to stop revising at least an hour before you go to bed. Relax to help you sleep. Working late will make you feel tired the next day. Only watch TV programmes that you enjoy rather than to fill in time. Get up early to make good use of your time.

HONESTY - Always be honest with yourself. Teachers can help you but they cannot do the work for you. Ask for help when you need it.

PERSEVERE - Don't give up: it really is not a long time and it will be worth it!

Goodluck!

English Language

Assessment Format:
Section A - 1 hour
Section B - 45 minutes

Section A

Creative reading and writing
There will be 4 questions on the reading section of this paper:
Question 1 - Choose one answer for each question and shade the circle in the box of the one that you think is correct. (4 marks)
Question 2 - How does the writer use language to ... ? - 8 marks
How has the writer structured the text to create a '.....' mood/tone/atmosphere? (8 marks)
Question 4 - 'A student having read this said:' ___ ' How far do you agree? - 20 marks

Section B

Students will be asked to create a narrative or a descriptive piece, they will be given an image, a title or a sentence as a stimulus.

They must practise their writing regularly at home.

Here is a QR code you could refer to when revising for this paper:

English Literature

Assessment Format:
50 minutes

MacBeth

How is character/theme presented in the extract and throughout the rest of the play? (30 marks +4 AO4 marks).

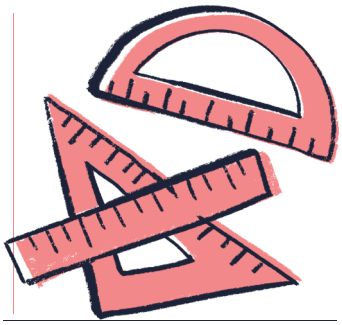
Revision

Revise big ideas and track the text in their response / linked references.

Maths

Mid-Year Calculator Assessment

Topic	Sparx topics – highlight as you complete these clips using the independent learning function
Solving equations and rearranging formulae	U755, U325, U870, U505, U556, U221, U373
Linear Graphs	U789, U741, U933, U889, U638, U669, U315, U377, U477, U848, U862 (U898 higher only)
Linear Simultaneous Equations	U760, U757, U836, U137
Volume 2	U786, U174, U915, U543 (U350, U426, U617, U116, U484 higher only)
Compound Measures	U914, U462, U896, U902, U388, U248, U468, U151, U256, U403, U910, U527
Quadratics – graphical	U989, U667, U601, U178, U963
Quadratics - algebraic	U228 (U178, U960, U589, U665, U150, U103, U437, U294, U685, U457, U824 higher only)

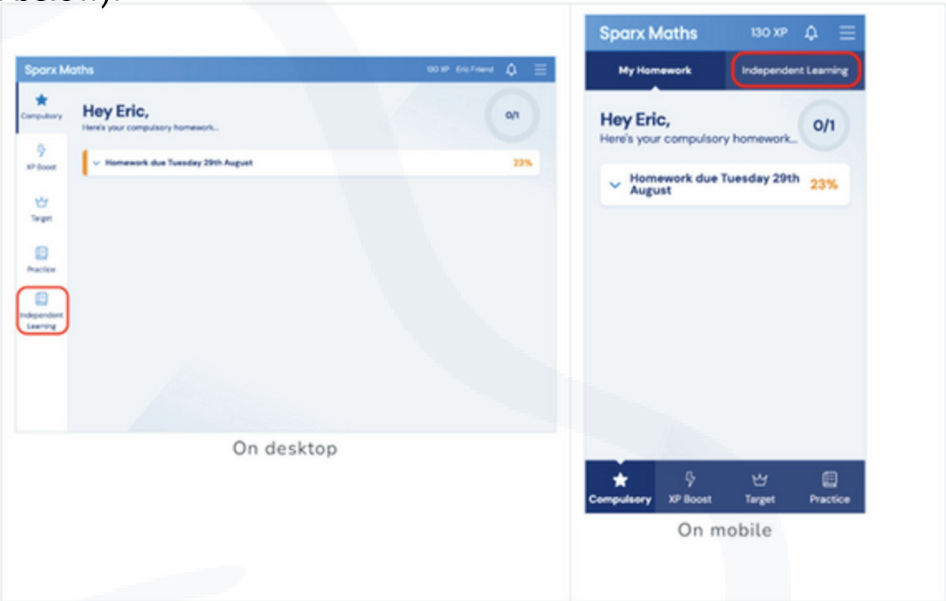


Sparx

Revising Independently with SPARX

STEP ONE: Finding independent learning

When you log in you will see the independent learning feature in the top right hand corner (circled in red below).



You can choose to work on any topic by:

- Typing one of the following in the Search for topics field:
  - The name of a topic
  - A keyword
  - A code given to you in the list on page 5.
- Browse the content by clicking on one of the main Strands.

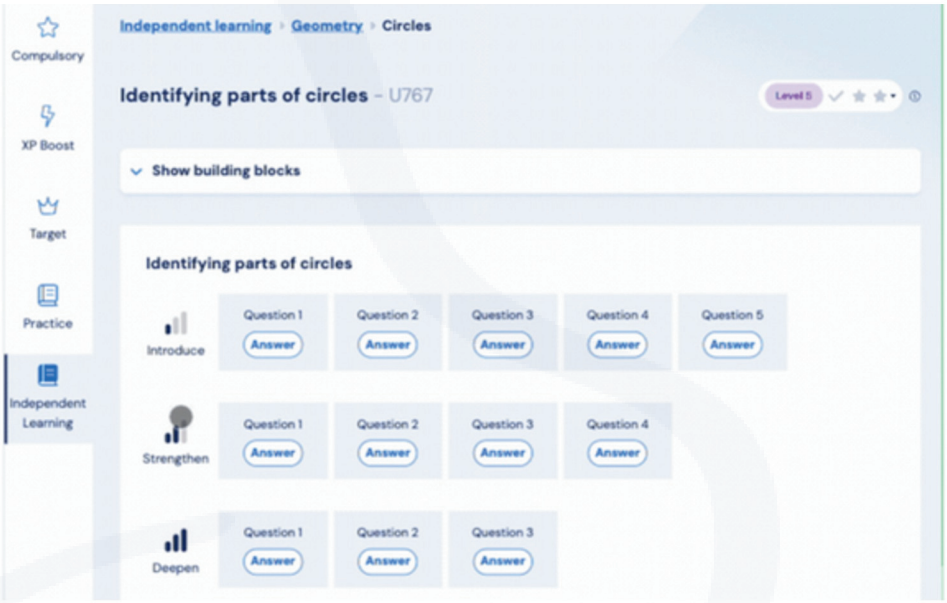
STEP TWO: Choosing the right work

The difficultly level will be in line with that of your normal homework.
You can choose to complete questions that introduce the topic if you don't remember much about it, strengthen the topic if you need a recap or deepen the topic if you are looking to increase your knowledge.

Sparx

Revising Independently with SPARX

An example of this is shown on the right with the topic of circles.



You will see the difficulty level is set to 5 (in the top right corner) but you can change this if you are finding questions too hard or too difficult.

Combined Science

Assessment Format:
Science paper – 1 x 60 min exam covering the topics below. Total of 70 marks. A calculator, a periodic table and a formula sheet will be provided.

Topics that will be covered in the assessment.

Biology - B1 Cells

- animal and plant cells
- microscopes
- transport in cells
- cell cycle and stem cells

Biology - B2 Organisation

- Organisation (cells – tissues – organs – organ systems – organism)
- Enzymes
- The lungs
- The circulatory system (heart, blood and blood vessels)
- Cardiovascular disease
- Risk factors and non-communicable disease
-

Chemistry - C1 Atomic Structure

- Structure of the atom
- Isotopes
- Periodic table development
- Group 1, 7 and 0
- Separation technique

Chemistry - C2 Bonding

- Ionic bonding
- Ionic compounds
- Covalent bonding
- Covalent structures (simple molecules and giant structures)
- Metallic bonding
- Alloys
- Particle model (solids, liquids and gases)

Combined Science

Physics - P1 Energy

- Energy stores and transfers
- Work done
- Power
- Energy resources

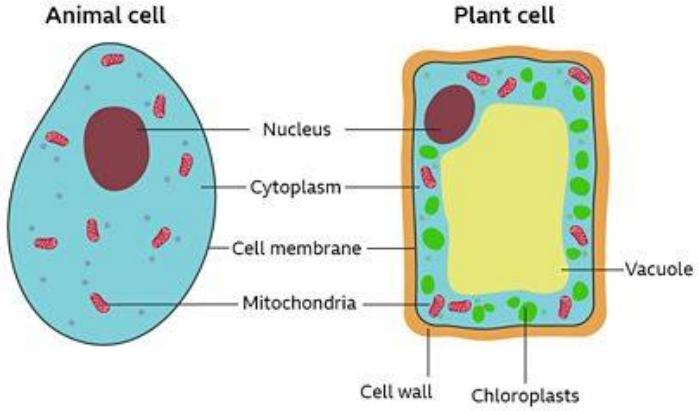
The questions will be a mixture of the following types of questions:

- **1-2 marks** Definitions, gap fills, matchup tasks and tick box questions
- **2-3 marks** Descriptions, simple calculations and graph skills
- **3-4 marks** Explanations and extended calculations
- **5-6 marks** Extended writing questions linked to Required Practical Activities, multi-step calculations and compare, evaluate or explain tasks

B1 – Cell Biology

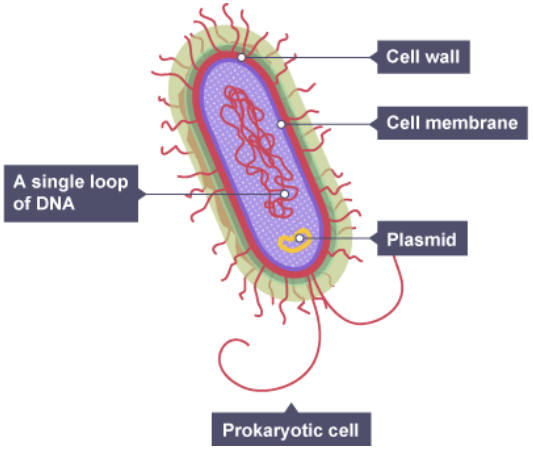
Eukaryotic Cells

They have a nucleus to contain the chromosomes. These can be animal, plant or fungus or protist cells. Animal and plant cells are shown below.



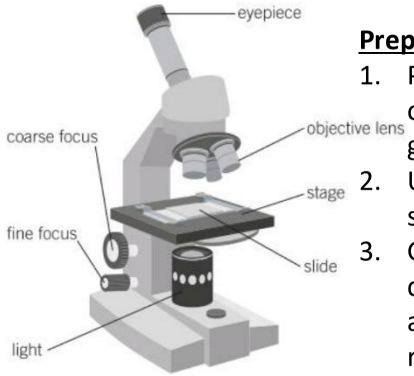
Prokaryotic Cells

They do not have a nucleus, they are usually a lot smaller and may contain plasmids.



Cell		Features
Animal	Sperm	High number of mitochondria Ribosomes that make enzymes in the head
	Nerve	Long Lots of branches (dendrites)
	Muscle	High number of mitochondria High Number of ribosomes Store glycogen
Plant	Xylem	Walls thickened with lignin to strength the cells into a tube
	Phloem	Sections between cells called sieves to help transport substances like dissolved sugars
	Root hair	Large surface area Lack of chloroplasts Large vacuole

RP1 – Microscopy; Observing Plant Cells



Preparing the slide:

1. Place a thin layer of onion membrane on a glass slide with forceps.
2. Use a drop of iodine to stain the cells.
3. Gently place a glass cover slip over the same and tap carefully to remove air bubbles.

Viewing the slide:

1. Place the slide on the stage and turn on the light.
2. Select the lowest magnification objective lens.
3. Look through the eyepiece and turn the coarse focus until the image can be seen.
4. Turn the fine focus until a clear image is formed.
5. Change the objective lens to another with a higher magnification and turn the fine focus re-focus the image.

Microscopes

The development of microscopes of the last 200 years has allowed us to study cells and the structures inside them in more and more detail.

Light Microscope	Electron Microscope
Low resolution Low magnification Cheap	High resolution High magnification Expensive

Calculating Magnification

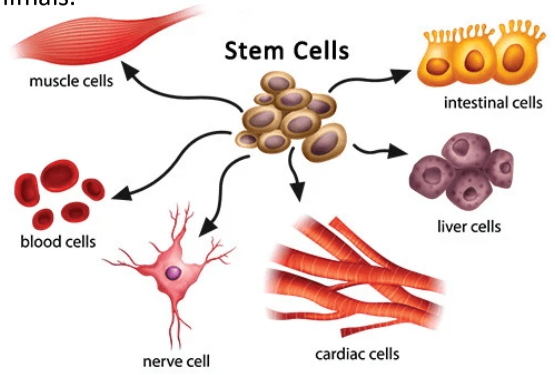
Units for image and actual size may need to be converted before using the equation below.

$$magnification = \frac{image\ size}{actual\ size}$$

mm → µm	x 1000
µm → mm	÷1000

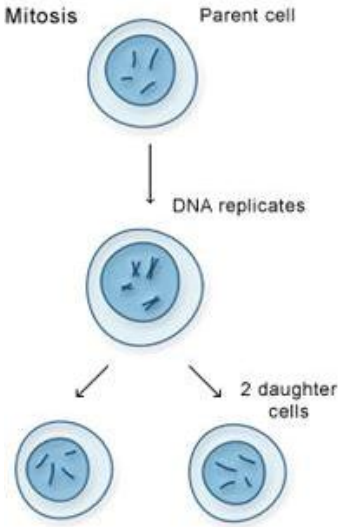
Cell Differentiation

As an organism develops, cells differentiate to form different types of cells. This is an example in animals.



B1 – Cell Biology

Mitosis

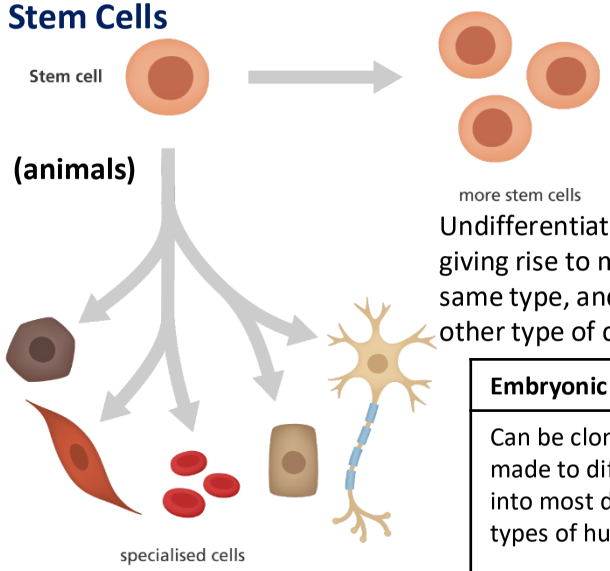


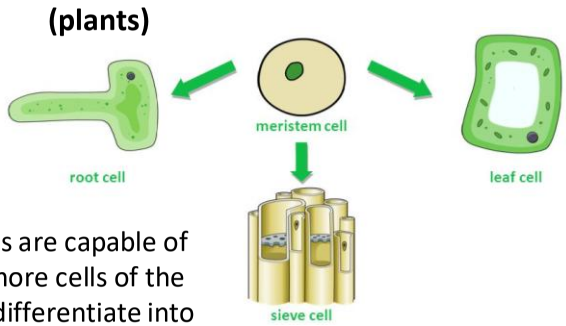
Before a cell can divide it needs to grow and increase the number of sub-cellular structures such as ribosomes and mitochondria. **The DNA replicates** to form two copies of each chromosome.

In mitosis one set of chromosomes is pulled to each end of the cell and the **nucleus divides**.

Finally the **cytoplasm and cell membranes divide** to form <u>two identical cells</u>.

Stem Cells

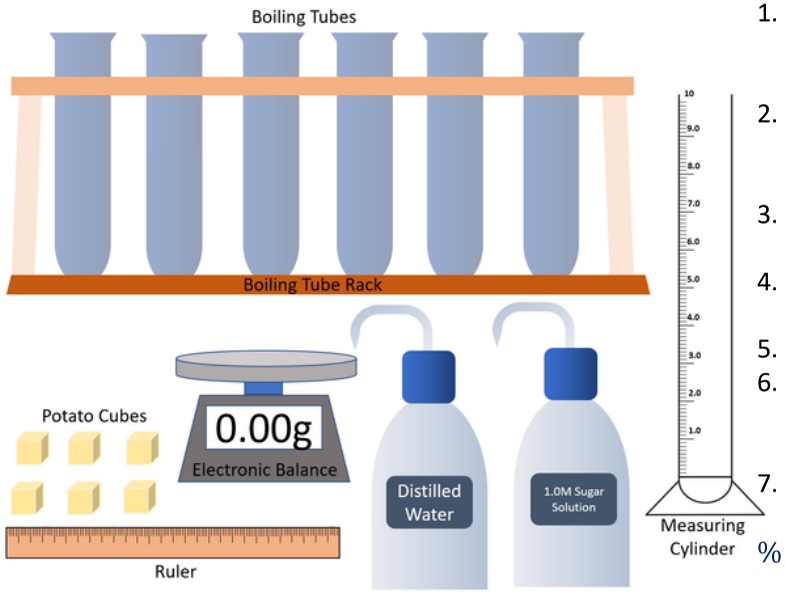




Undifferentiated cells are capable of giving rise to many more cells of the same type, and can differentiate into other type of cells.

Embryonic	Adult	Meristems
Can be cloned and made to differentiate into most different types of human cells	Bone marrow stem cells can form many types of cells including blood cells.	Can differentiate into any type of plant cell, throughout the life of the plant.

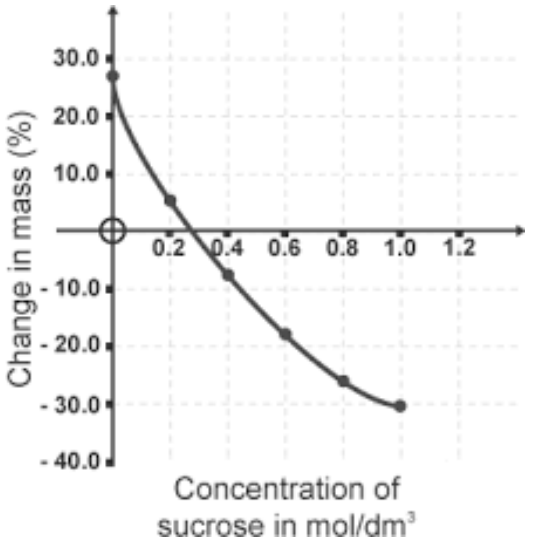
RP2 – Osmosis: The concentration of surrounding solution affects mass of plant tissue



1. Use a cork borer to create 5 cylinders of plant tissue (usually potato) and cut them all to the same length.
2. Measure the mass of each piece using a top pan balance and the length of each piece with a ruler. Record in a table.
3. Measure out 100cm^3 of each concentration of salt/sugar solution into labelled boiling tubes.
4. Place each piece of potato into a boiling tube for 24 hours.
5. Remove the pieces and blot with a paper towel.
6. Measure the mass of each piece using a top pan balance and the length of each piece with a ruler. Record in a table.
7. Calculate the percentage change in mass.

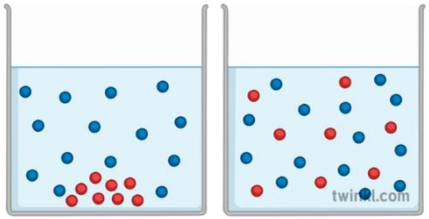
$$\%\ change\ in\ mass = \frac{change\ in\ mass\ (g)}{inital\ mass\ of\ potato\ (g)}$$

<u>Results Graph</u>

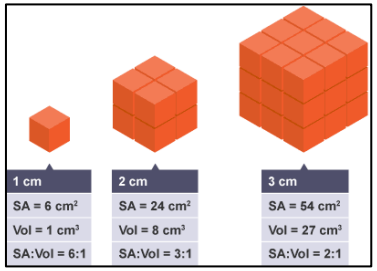


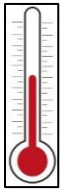
B1 – Cell Biology

Diffusion

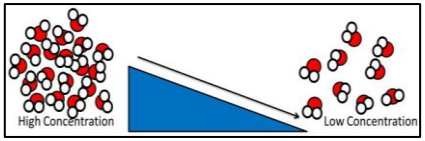


- Substances move a higher concentration of that substance (red particles pictured) to where there is a lower concentration of that substance. (High→ Low)
- This happens because of the random movement of the particles in a fluid (liquid or gas).





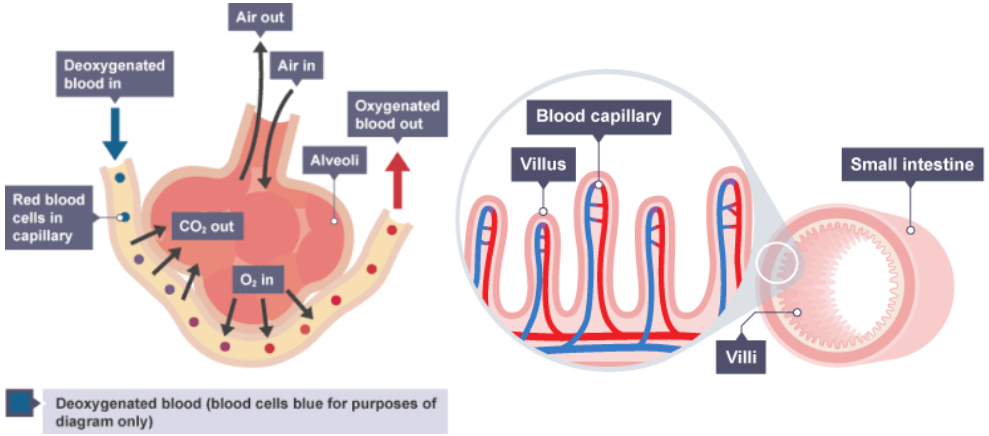
- There are ways the rate of diffusion can be changed:
  - the difference in concentrations (concentration gradient)
  - the temperature
  - the surface area of the membrane



Examples

Alveoli in the lungs and villi in the small intestine are both structured in similar ways so diffusion can happen at a high rate (fast).

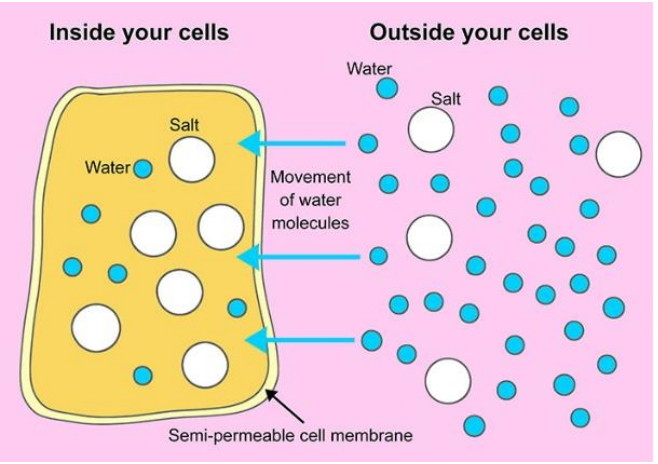
- having a large surface area
- a membrane that is thin, to provide a short diffusion path
- (in animals) having an efficient blood supply



Osmosis

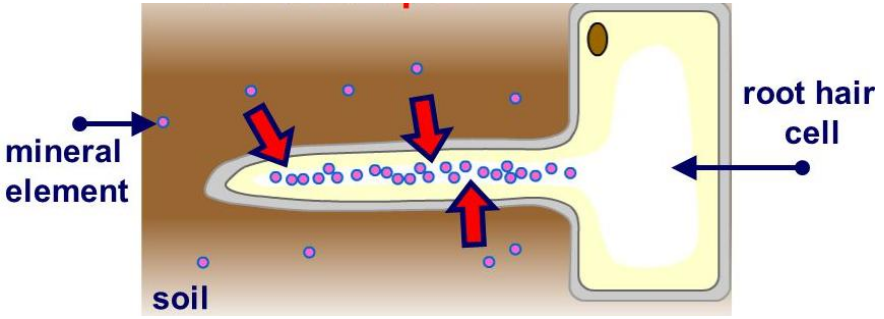
Water may move across cell membranes via osmosis.

Osmosis is the diffusion of water from a dilute solution to a concentrated solution through a partially permeable membrane (H→L).



Partially permeable means small molecules can move through but large molecules cannot.

Active Transport

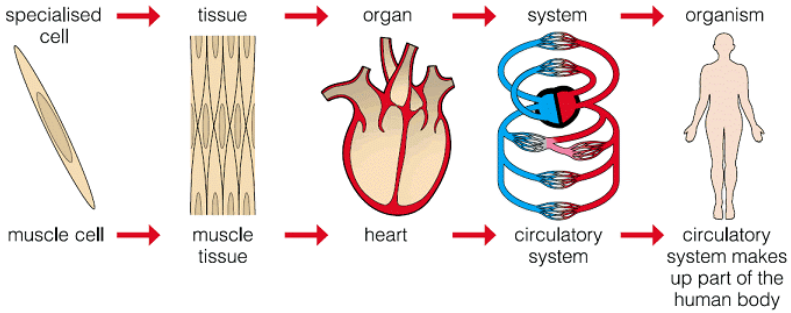


- Active transport is moving substances against the concentration gradient (L→H) so requires energy. This energy comes from respiration.
- This means that cells that carry out a lot of active transport (root hair cells, epithelial cells on villi in the small intestine) contain a lot of mitochondria.

B2 – Organisation

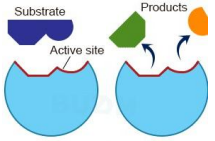
Levels of Organisation

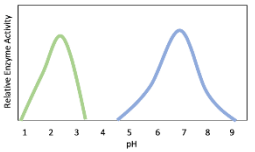
Cells = basic building blocks of all living organisms.
A tissue = group of cells with a similar structure and function.
Organs = aggregations of tissues performing specific functions.
Organs systems = organs organised to form organisms.



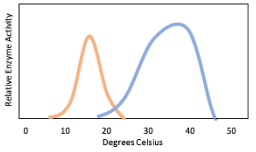
Enzymes

- Biological catalysts
- Digestive enzymes speed up the break down of insoluble food molecules
- Specific shape active site that matches substrate





Enzymes work best at certain temperatures or pH depending on their role.



Bile

The liver makes an **alkaline** solution called bile. Stored by the gall bladder.
Has two jobs:

- Emulsifies fats
- Neutralises stomach acid.

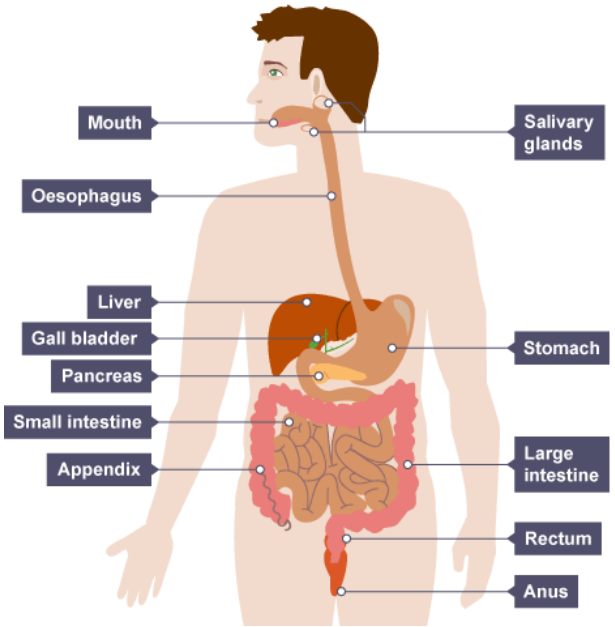
Digestive Enzymes

Starch —(amylase)→ Glucose

Protein —(protease)→ Amino Acids

Fats —(lipase)→ Fatty acids + Glycerol

Digestive System



Organ	Function
Mouth	Teeth and tongue to chew food.
Salivary Glands	Releases saliva containing enzymes.
Oesophagus	Muscle tube to squeeze food along.
Stomach	Contains enzymes and hydrochloric acid. Is made of muscle to churn food. Hydrochloric acid kills bacteria in food
Small Intestine	Where digestion is completed and soluble food particles (glucose, amino acids, fatty acids, glycerol). are absorbed
Large Intestine	Absorbs water.
Liver	Produces bile.
Gall Bladder	Stores bile.
Pancreas	Releases enzymes.

Where are the enzymes?

Enzyme	Salivary glands	Stomach	Pancreas	Small intestine
Amylase	X		X	X
Protease		X	X	X
Lipase			X	X

RP3 – Food Tests

Summaries of the four food tests.

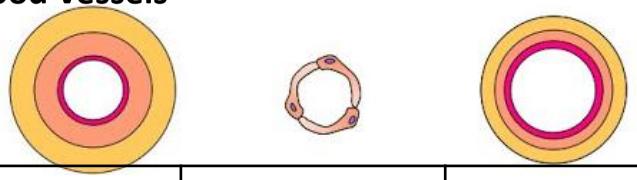
Protein Add Biuret's reagent Positive test; Blue solution turns **Purple**	**Starch** Add Iodine Positive test; solution turns from orange to **Black**
Fats Add Ethanol and water Positive test – solution turns **Cloudy**	**Glucose** Add Benedict's and heat Positive test blue solution turns **Brick red** Water Bath

B2 – Organisation

The effect of pH on the rate of reaction of amylase

1. Add 2cm² amylase solution, 2cm² of starch solution and 2cm² of pH2 buffer to a water bath (37°) in separate test tubes. Wait 10 minutes.
2. While waiting, add 2 drops of iodine solution to each well on the spotting tile.
3. Once the solutions in the water bath have reached 37° pour the amylase and PH2 buffer into the starch solution.
4. Immediately take a sample with a pipette and add to the first well of the spotting tile.
5. Repeat step 4 every 30 seconds until there is no colour change when testing with iodine solution.
6. Repeat steps 1-5 with pH4, pH6, pH8 and pH10 buffers.

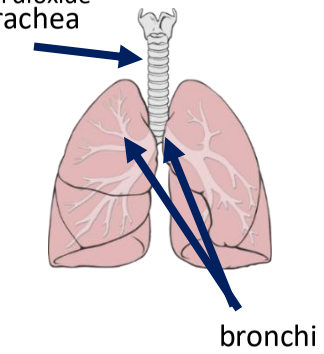
Blood Vessels



Arteries	Capillaries	Veins
• Blood carried away from heart • Thick muscular and elastic walls = withstands high pressure • Small lumen = maintains high pressure	• Walls only one cells thick = shorter diffusion pathway • Lumen just bigger than red blood cell • Blood flows very slowly • Diffusion takes place here	• Blood carried back to heart • Thin walls as blood is low pressure • Large lumen – lower resistance for blood passing through • Valves prevent back flow

Respiratory System

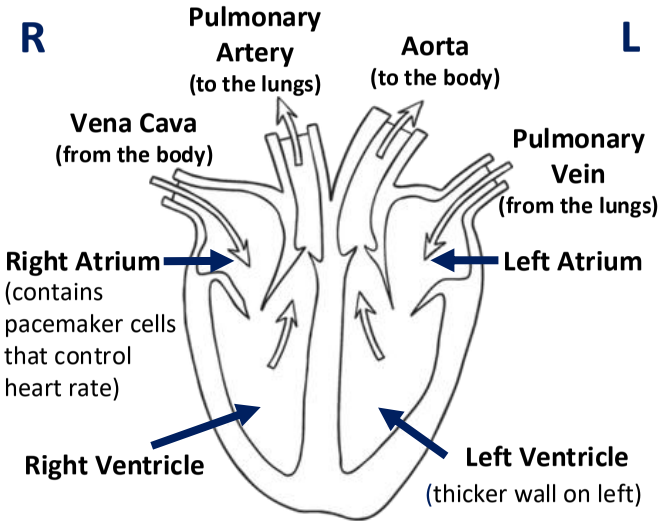
The lungs have two jobs – to get oxygen into the blood and remove carbon dioxide



Structures that cannot been seen on this diagram are the **alveoli and capillary network** – see 'unit 1 - diffusion'.

The Human Heart

Double pump because - left side pumps to whole body, right side pumps to the lungs.



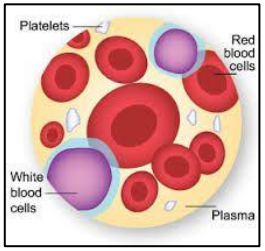
Blood – 4 components

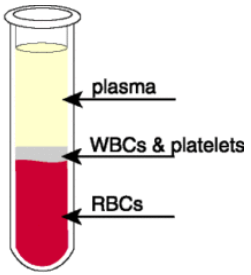
Red blood cells – contain haemoglobin to carry oxygen. More detail…

White blood cells – fight pathogens (see unit 3 – infection and response).

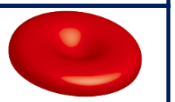
Platelets – cell fragments that clot blood.

Plasma – liquid part that transports cells, cell fragments and dissolved substances (salts, urea, CO_2, hormones…)



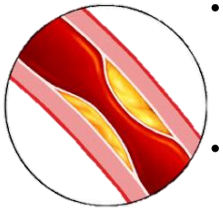


Red Blood Cells (RBCs)



- Contain chemical 'haemoglobin'.
- This reacts/ binds with oxygen to be carried around the body.
- RBCs are ~8µm (relative small animal cell) allows them to fit through capillaries
- Bi-concave disc shape for large SA:V

Coronary Heart Disease (CHD)



- Coronary arteries supply heart muscle with blood (containing glucose and oxygen for respiration)
- Can become narrowed/blocked by fatty deposits if cholesterol high, reducing blood flow.
- Reduced muscle contraction in heart

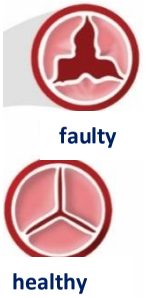
B2 – Organisation

Heart Disease Treatment – Statins vs Stents

Statins	Stents
• Medication to be taken everyday • Lowers blood cholesterol • Does not work immediately	• Mesh tube to be inserted into artery to hold it open • Surgery required • Works immediately

Faulty Valves

- Valves in veins and the heart prevent backflow of blood
- Faulty valves = don't open or close fully
- Can be replaced with man-made valves or transplants from donors



Cancer

Uncontrolled cell growth

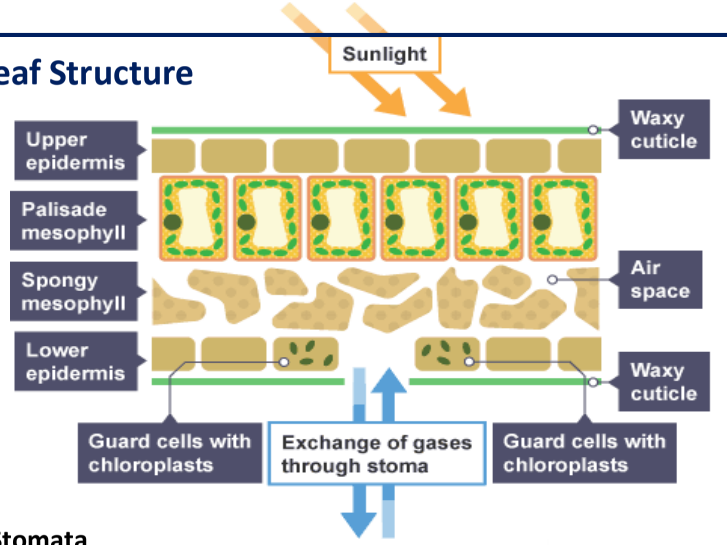
Benign tumours = abnormal cells, contained in one area, in a membrane, do not invade other parts of body.

Malignant tumours = cancer cells, not in a capsule, invade neighbouring tissue, and spread into blood and form secondary tumours.

Risk Factors

Lifestyle factors can have be risk factors for certain diseases. E.g. obesity is a risk factor for type 2 diabetes, or drinking and smoking while pregnant affects the development of the foetus.

Leaf Structure

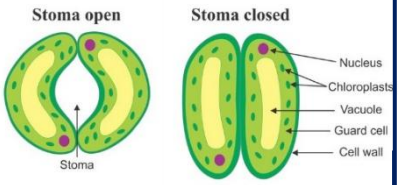


Stomata

Tiny pores on the underside of the leaf.

Allow oxygen and CO_2 to diffuse in and out

Guard cells surround the stomata and can open and close the pore

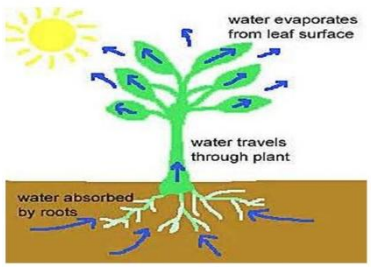


Interaction of Diseases

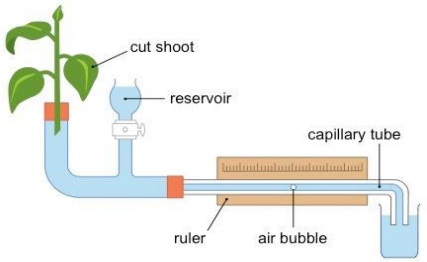
- Defects in the immune system - individual is more likely to suffer from infectious diseases.
- Viruses can trigger cancers, e.g. HPV can trigger cervical cancer.
- Immune reactions caused by pathogens can trigger allergies such as asthma or rashes
- Severe physical ill health can lead to depression and other mental illness.

Transpiration

Movement of water through plant from roots to leaves, driven by evaporation through the stomata



Measuring transpiration



Record the distance the bubble of air moves along the scale during set amount of time to calculate volume of water uptake per minute.

Transpiration	Translocation
Movement of water from roots to leaves	Movement of dissolved sugars from leaves all round the plant
Xylem - hollow tubes strengthened by lignin.	Phloem – tubes of elongated cells.
One way system – roots to leaves.	Two way system – sugars taken to wherever they are needed.

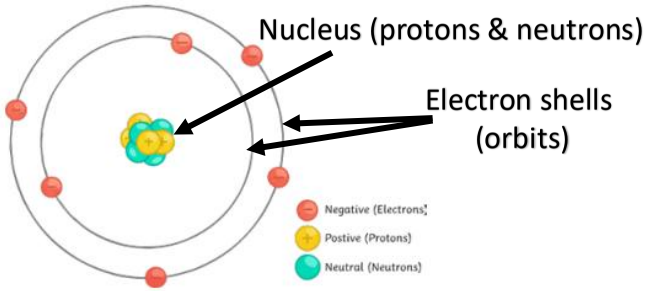
Increasing the rate of transpiration

- Higher temperature
- Lower humidity
- Higher light intensity
- Higher air movement

C1 – Atomic Structure and The Periodic Table

Atoms

- Made up of **protons, electrons** and **neutrons**.



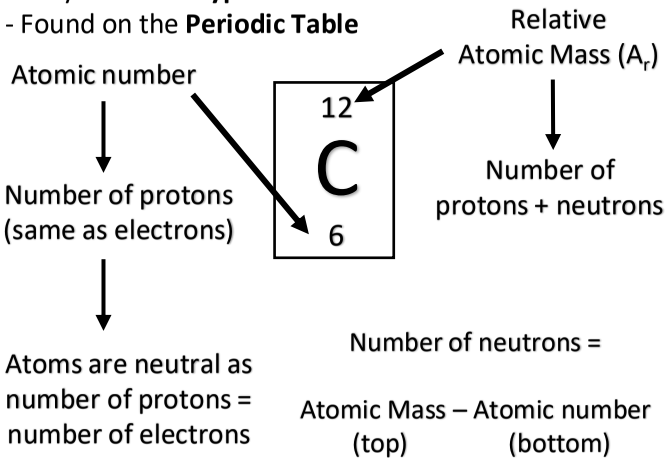
Subatomic particle	Relative Mass	Charge
Proton	1	Positive
Neutron	1	Neutral
Electron	Very small	Negative

Atoms have a radius of about 0.1nm ($1x10^{-10}$ m)

Radius of nucleus = about $1x10^{-14}$ m

Elements

- Only have **one type** of atom
- Found on the **Periodic Table**

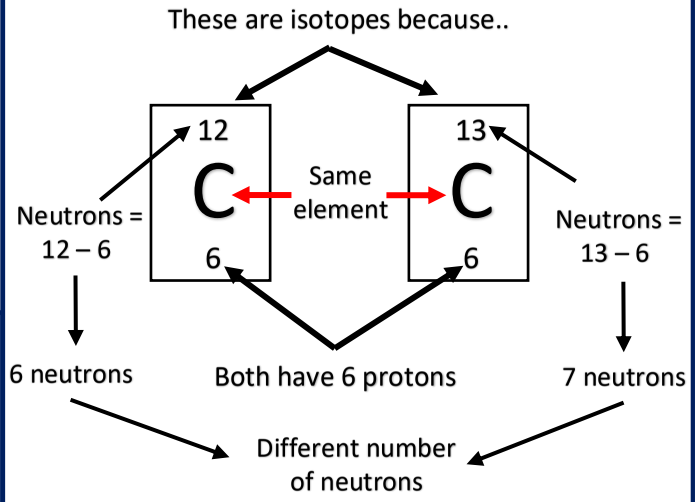


Compounds

- Two or more elements **chemically combined**.
- Formed by chemical reactions
- For example: CO_2 H_2O CH_4 HCl NaCl

Isotopes

Isotope = atoms of the **same element** which have the **same number of protons**, but **a different number of neutrons**.



Chemical Equations

- Shown by using a **word equation**.

e.g. magnesium + oxygen → magnesium oxide

Left of the arrow = **reactants**
Right of the arrow = **products.**

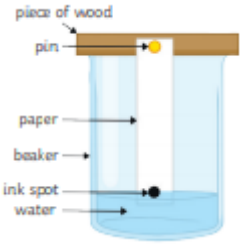
- Also can be shown by a **symbol equation**

e.g. $2Mg + O_2 \rightarrow 2MgO$

Mixtures and Separation

Mixtures – two or more elements or compounds **not** chemically joined.
This means the different components of the mixture can be separated by physical methods (below)
E.g. air is a mixture mainly made of nitrogen, oxygen and carbon dioxide.

Chromatography
to separate out mixtures (usually liquids) (e.g. colours in ink)



Filtration
To separate insoluble solids from liquids (e.g. sand and water)

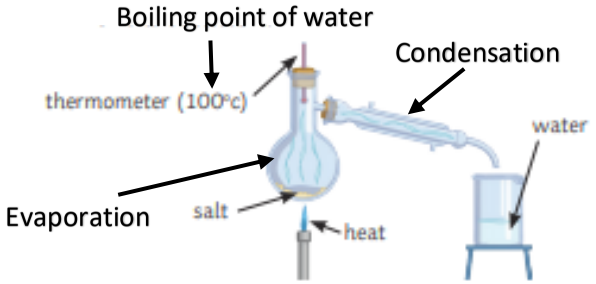
Evaporation
To quickly separate soluble solids from a solution.
(e.g. salt and water)

Crystallisation
To slowly separate a soluble salt from a solution.
(e.g. copper sulfate crystals)

C1 – Atomic Structure and The Periodic Table

Distillation

Simple distillation – separating a liquid from a solution.



- Liquid is heated to boiling point and evaporates
- Vapours travel up into the condenser
- Condenser has cold water around it.
- Vapours cool and condense (turn back into a liquid).

Electronic Structure

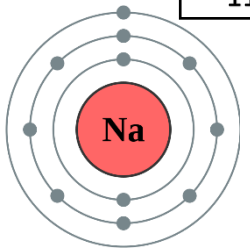
- Electrons are found on shells (orbits) orbiting the nucleus.
- There is a maximum number of electrons allowed on each shell:

First shell = 2 electrons
Second shell = 8 electrons
Third shell = 8 electrons.

11 electrons

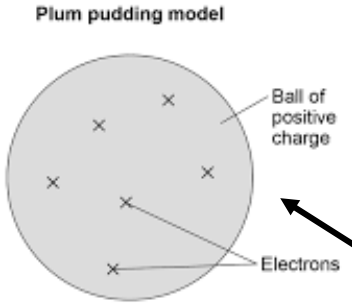
23
Na
11

1st shell = 2
2nd shell = 8
3rd shell = 1



Total = 11 electrons

History of the atom



Scientist	Time	Discovery
John Dalton	Start of the 19th century	Atoms were first described as solid spheres.
JJ Thomson	1897	Plum pudding model – atom is a ball of + charge with electrons scattered
Ernest Rutherford	1909	Alpha scattering experiment - mass concentrated at the centre, only the nucleus is + charged. Most of the atoms is empty space.
Niels Bohr	Around 1911	Electrons are in shells orbiting the nucleus
James Chadwick	Around 1940	Discovered that there are neutrons in the nucleus.

Differences to nuclear model
- Ball of positive charge (no protons)
- No nucleus
- No neutrons
- Evenly distributed mass

Rutherford tested the plum pudding model

What happened?

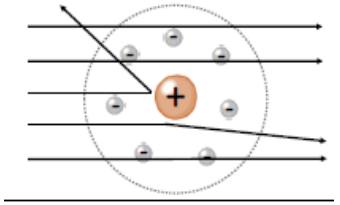
Rutherford's scattering experiment

alpha particles are positively charged

Fired at gold foil

some alpha particles are deflected/ repelled

most alpha particles passed straight through



Conclusions made

Observation	Conclusion
Most of the particles passed straight through	Most of the atom is empty space
Some were deflected to the sides	The particles had passed close by a positive charge
A very small number were repelled straight back	The alpha particles had approached the nucleus straight on. the tiny number told him that the positive charge is in a very small dense core

C1 – Atomic Structure and The Periodic Table

Development of the Periodic Table

John Newlands – Law of Octaves

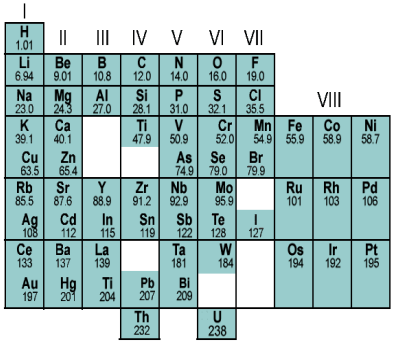
- Elements ordered by **atomic weight**.
- Noticed a pattern with every eighth element.
- Some elements placed inappropriately – metals and non-metals grouped together.
- Rejected by other scientists.

H	Li	Be	B	C	N	O
F	Na	Mg	Al	Si	P	S
Cl	K	Ca	Cr	Ti	Mn	Fe
Co, Ni	Cu	Zn	Y	In	As	Se
Br	Rb	Sr	Ce, La	Zr	Di, Mo	Ro, Ru

John Newlands' Law of Octaves

Dimitri Mendeleev

- Still ordered by atomic weight
- Left gaps for **undiscovered elements**
- Could predict properties of undiscovered elements.
- Some elements didn't fit pattern – switched them to keep pattern of **similar properties**.



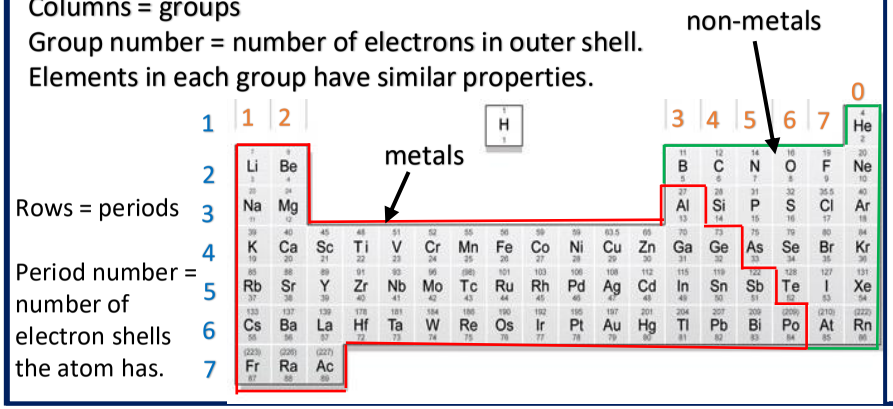
Dimitri Mendeleev left gaps for undiscovered elements

Eventually, knowledge of isotopes explained why elements could not be ordered by atomic weight.

The Modern Periodic Table

- Ordered by **atomic (proton) number**.

Columns = groups
Group number = number of electrons in outer shell.
Elements in each group have similar properties.



Group 0 (Noble Gases)

- Full outer shell – unreactive as they don't need to lose or gain any electrons

He
Ne
Ar
Kr
Xe
Rn

As you go down…
- Boiling point increases
- More electron shells
- Bigger atoms
- More intermolecular forces
- More energy needed to break forces.

Group 1 (alkali metals)

- Similar properties as all have 1 electron in outer shell.
- All lose one electron in reactions to form 1+ ions
- Soft, grey, shiny metals
- Stored in oil as would react with oxygen in air.
- When placed in water they produce an alkali (hence alkali metals) and hydrogen gas

E.g Lithium + water → lithium hydroxide + hydrogen

Reactivity of Group 1

Li
Na
K
Rb
Cs
Fr

As you go down the group…
- Elements are more reactive because:
- More electron shells
- Outer electron = further from nucleus and more shielded by the other shells
- The electrostatic force of attraction between outer electron and nucleus is weaker
- Easier for outer electron to be lost

Group 7 (Halogens)

- 7 electrons in outer shell – all react similarly
- All gain one electron when they react to form 1- ions
  - Form molecules (e.g. Cl_2, F_2)
  - Non-metals.
  - A more reactive halogen can replace a less reactive halogen in a reaction **(displacement)**

Reactivity of Group 7

F
Cl
Br
I
At

As you go down the group…
- Elements **are less** reactive because:
- More electron shells
- Outer shell is further from nucleus and is **more shielded** by the other shells
- The electrostatic force of attraction between free electron and nucleus is **weaker**
- Harder to attract an electron into the outer shell.

C2 – Bonding, structure, and the properties of matter

Formation of Ions

- **Ions** = a charged particle made when atoms lose or gain electrons
- **Positive ion** = atom has lost electrons
- **Negative ion** = atom has gained electrons.

Metals form **positive ions**
Non-metals form negative ions

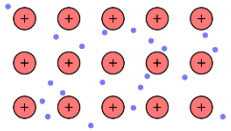
Group	Ions	Example
1	+1	$Li \rightarrow Li^+ + e^-$
2	+2	$Ca \rightarrow Ca^{2+} + 2e^-$
6	-2	$O + 2e^- \rightarrow O^{2-}$
7	-1	$Br + e^- \rightarrow Br^-$

Lost electrons

Gained electrons

Metallic Bonding

- Happens in **metals only.**
- Positive metal ions surrounded by **sea of delocalised electrons (can move).**
- Ions tightly packed in rows.

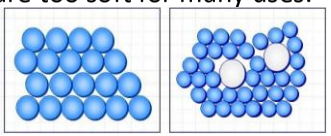


- Strong **electrostatic forces of attraction** between positive ions and negative electrons.

Alloys

- **Alloys** = mixture of two or more metal atoms
- Pure metals are too soft for many uses.

Pure Metal



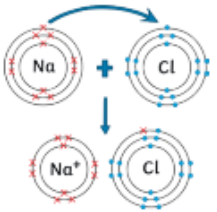
Alloy

- Atoms same size
- Layers slide
- Softer

- Different sized atoms
- Layers cannot slide
- Stronger

Ionic Bonding

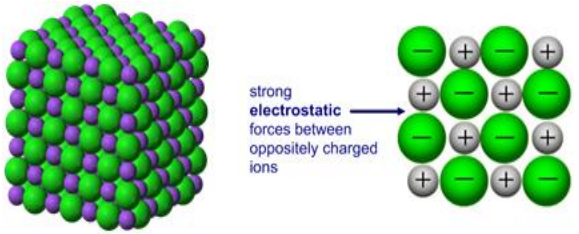
- Between a metal and non-metal.
- Metals give electrons to non-metals so both have a full outer shell.
- **Electrostatic force of attraction** between positive and negative ions.



E.g. Sodium loses one electron to become Na^+. Chlorine gains one electron to become Cl^-. The two ions attract to form sodium chloride.

Ionic compounds

- Form **giant lattices, as the attraction between ions acts in all directions**



Properties of Ionic Compounds

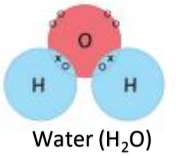
- **High melting point** – lots of energy needed to overcome electrostatic forces.
- **High boiling point**
- **Cannot conduct electricity as solid** – ions cannot move
- **Conducts electricity when molten or dissolved** – ions are free to move.

Covalent Bonding

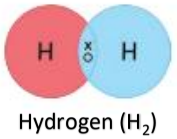
- **Covalent bonding** = sharing a pair or pairs of electrons for a full outer shell.
- Between **non-metals only.**

Dot and cross diagrams

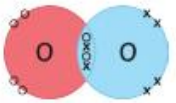
- Show the bonding in simple molecules.
- Uses the outer shell of the atoms
- Crosses and dots used to show electrons
- You should be able to draw the following:



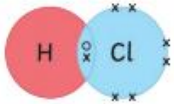
Water (H_2O)



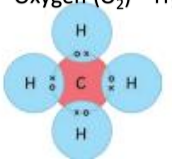
Hydrogen (H_2)



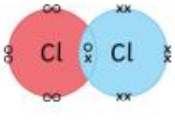
Oxygen (O_2)



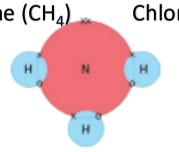
Hydrogen chloride (HCl)



Methane (CH_4)



Chlorine (Cl_2)



Ammonia (NH_3)

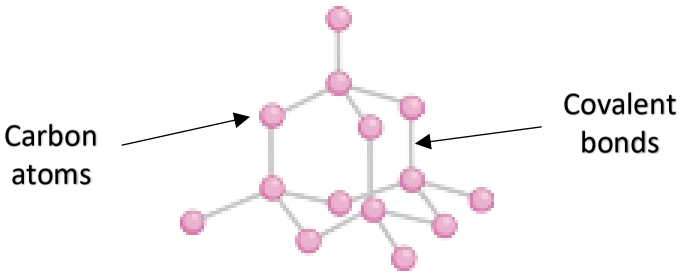
Simple Covalent Molecules

- Form when all atoms have full outer shells so bonding stops
- Examples are the molecules shown above.
- Have **low melting and boiling points**
- Due to **weak intermolecular forces**
- Do not conduct electricity

C2 – Bonding, structure, and the properties of matter

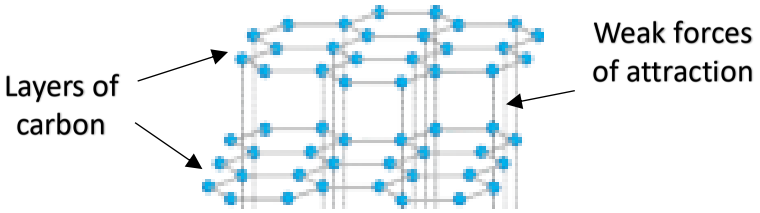
Giant Covalent Structure – Diamond

- Each carbon atom **covalently** bonded to **four** others.
- Forms a giant structure
- This makes diamond **strong** → a lot of **energy** needed to break lots of strong covalent bonds.
- **Does not conduct electricity** – has no free electrons.



Giant Covalent Structure – Graphite

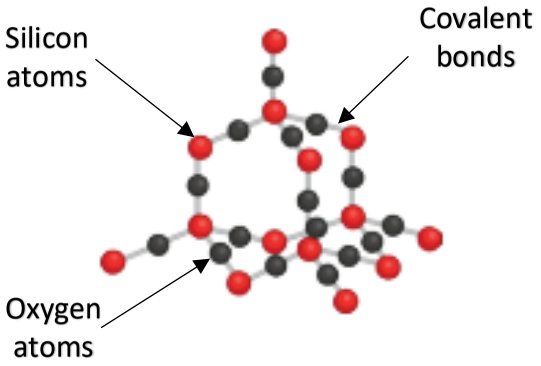
- Layers of **carbon** arranged in **hexagons.**
- Each carbon bonded to **three** other carbons.
- Leaves **one delocalised electron** → moves to carry electrical charge **throughout structure.**



- Layers held together by **weak forces**
- Layers can **slide** over each other easily
- Makes graphite **soft/slippery** → good lubricant.
- Has **high melting point** as has many strong covalent bonds.

Silicon Dioxide

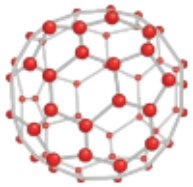
- Similar structure to diamond
- Giant covalent structure.
- Lots of **strong covalent bonds**.
- These require lots of **energy** to break.
- High melting and boiling points.



Fullerenes and Nanotubes

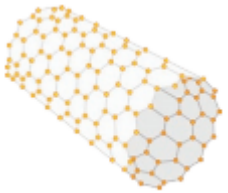
- Molecules of carbon shaped into hollow tubes or balls.
- Used to **deliver drugs into body**

Buckminsterfullerene
Formula = C_{60} →



- **Carbon nanotubes** = long narrow tubes
- Can conduct electricity

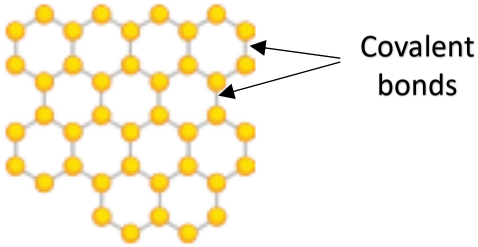
- Can strengthen materials without adding weight.



- Used in electronics and nanotechnology.

Graphene

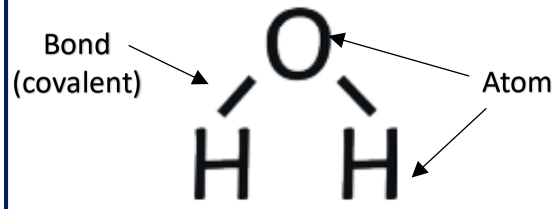
- Graphene = one layer of graphite.
- Very strong → lots of strong covalent bonds.

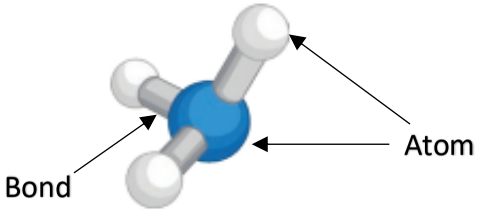


- Each carbon bonded to three others.
- One **free delocalised electron** → can move to **carry electrical current** throughout **the structure.**

Molecular models

- There are different ways to show a molecule other than dot and cross diagrams.



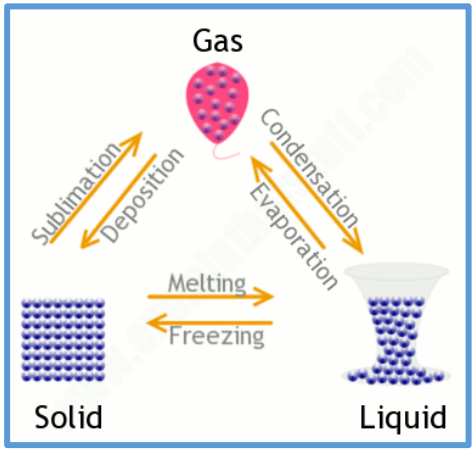


3D model

C2 – Bonding, structure, and the properties of matter

States of Matter

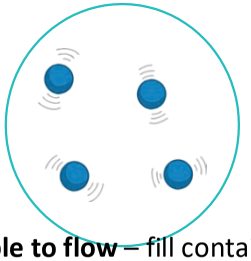
- Three states of matter: **solid, liquid & gas.**
- To change state, **energy** must be **transferred**.



- When heated, particles **gain energy**.
- **Attractive forces** between particles begin breaking when melting or boiling points are reached
- **Amount of energy** needed to change state depends on how strong forces are.

Gas

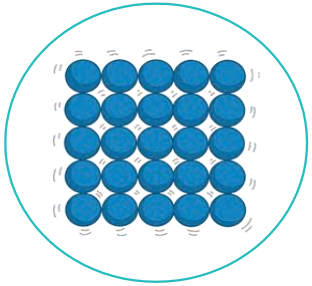
- Randomly arranged.
- Particles **move quickly** – all directions.
- Highest **amount** of **kinetic energy.**



- Gases **are able to flow** – fill containers
- **Can be compressed as there is space between particles**

Solid

- **Regular** pattern (rows and columns)
- Particles **vibrate** in a **fixed position**.
- Particles have **low amount of kinetic energy.**

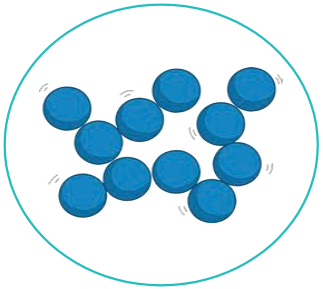


-

- Have a **fixed shape** – cannot flow because of strong forces of attraction between particles
- **Cannot be compressed** – particles close together.

Liquid

- Particles **randomly** arranged and touching.
- Particles can **move around.**
- **Greater amount** of **kinetic energy** than solid



- Liquids **able to flow** – take shape of containers.
- **Cannot be compressed** – particles are close together and cannot be pushed closer

State symbols

- States of matter shown in chemical equations:
- Solid **(s)**
- Liquid **(l)**
- Gas **(g)**
- Aqueous **(aq)**
- **Aqueous** solutions = substance dissolved in water.

Identifying Physical State of Substances

- If the temperature is **lower** than a substance's melting point – substance is **solid**.
- If the temperature is **between** the melting point and boiling point – substance is **liquid**.
- If the temperature is **higher** than the boiling point – substance is a **gas.**

~~Limitations of Particle Model (HT)~~

- ~~No chemical bonds are shown.~~
- ~~Particles shown as solid spheres – not the case, particles are mostly empty space like atoms.~~
- ~~The diagrams don't show any of the forces between particles~~
- ~~The diagrams are unable to show the movement of the particles.~~

P1 Energy

Energy Stores
There are 8 energy stores:

Store	Stored in…
Kinetic	moving objects
Gravitational potential	objects raised above ground
Elastic potential	Stretched or compressed objects
Thermal	All objects due to particle movement
Chemical	Substances (foods, fuels) that can release energy in a chemical reaction
Nuclear	The nucleus of atoms
Magnetic	Magnets attracting or repelling
Electrostatic	Separation of charges

Conservation of energy law:
Energy is NEVER created or destroyed

Energy is transferred by different pathways – by heating or when work is done

When energy is transferred, some is often transferred to the environment – this is wasted or dissipated energy

Efficiency
Tells us how much of the energy is transferred usefully.

$$\text{Efficiency} = \frac{\text{Useful output energy transferred by the device}}{\text{Total input energy supplied to the device}}$$

$$\text{Efficiency} = \frac{\text{Useful power out}}{\text{Total power in}}$$

Wasted energy always ends up in the **thermal store** of the surroundings

Calculating energy stores

The energy stored in a raised object can be calculated using:

GPE = mass x height x gravitational field strength
GPE= mgh

The energy stored in a moving object can be calculated using:

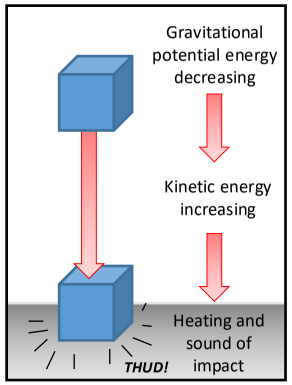
$KE = \frac{1}{2} \text{ mass} \times \text{velocity}^2$
$KE = \frac{1}{2} m v^2$

Energy stored in a stretched or compressed object can be calculated using :

$E = \frac{1}{2} \text{ spring constant} \times \text{extension}^2$
$E = \frac{1}{2} k e^2$

Transfers of energy:

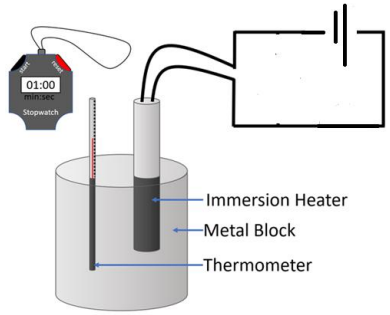
E.g. An object above ground has GPE.
If that object falls:
1. Decreases its GPE store
2. Increases its KE store as it falls
3. Waste energy transferred to the environment by heating and sound



Specific heat capacity
The amount of energy needed to change the temperature of 1Kg of a substance by 1ºC
It is calculated by:
E = specific heat capacity x mass x temp change
$E = SHC \times m \times \theta$

Units for SHC are J/Kg/°C
Different materials have different specific heat capacity values.

This can be investigated using the equipment below:



- Energy is supplied to the block by the immersion heater over a fixed time period (e.g 5 mins)
- The thermometer measures the temperature of the block at the start and the end of the experiment
- The stopwatch measures the time
- If the power of the heater is known (e.g 50W) the energy transferred to the block can be found using the equation:

Energy (J) = Power (W) x time (s)

The specific heat capacity of different materials can be investigated by:
- changing the metal **(independent variable)**
- measuring the temperature increase **(dependent variable)**
- Keeping the energy supplied, mass and insulation the same **(control variables)**

Insulating the block reduces energy transferred to the thermal store of the environment, improving accuracy

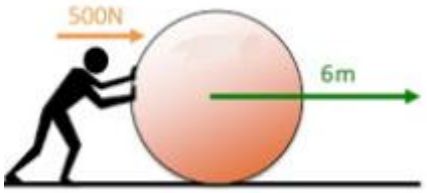
Power and work done

Work done = energy transferred

Energy transferred mechanically is calculated:

Work done = force x distance

W (J) = F (N) x s (m)



Work done = 500N x 6m

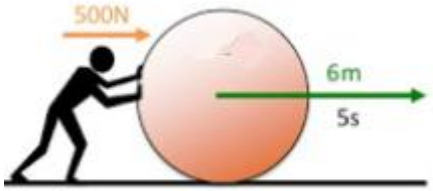
= 3000 J

Power = energy transferred per second

1 Watt = 1 Joule per second

Power = energy transferred ÷ time

P (W) = e (J) ÷ t (s)



Power = Energy ÷ time

= 3000 J ÷ 5 s

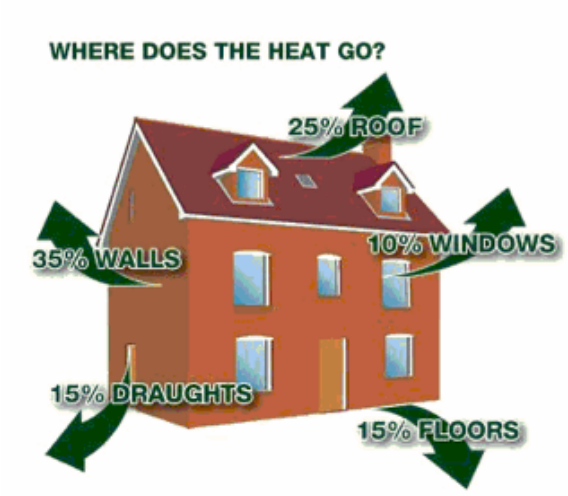
= 600W

A more powerful appliance transfers more energy per second, eg:

Reducing unwanted energy transfers

Reducing wasted energy means lower costs

Materials that conduct heat well have a high **thermal conductivity**.



Reducing energy transfers in homes

- Double glazing
- Thick walls
- Walls made of materials with low thermal conductivity
- Insulation – wall and loft

Reducing energy transfers in appliances:

- Lubrication – reduces friction

- Streamlining – reduces air resistance

Energy resources

We use energy resources for electricity generation, transport and heating

Non-renewable – ones that are being used faster than they can be replaced and will run out.

Example	+	-
Coal, oil, natural gas	Reliable method of generating electricity	Release CO_2 which contributes to global warming
nuclear	No CO_2 released	Produces radioactive nuclear waste

Renewable resources:

Ones that will not run out , they are being replenished as they are used

Example	+	-
Solar	No CO_2 released	Don't work at night or well on cloudy days
wind	No CO_2 released	Doesn't work if it isn't windy
Hydro	No CO_2 released	Damage to habitats
Geothermal	No CO_2 released	Only found in specific places
waves	No CO_2 released	Damage to habitats
Biofuel	Carbon neutral	Uses crop land to grow new forests

Geography

Assessment Format:
1 x 1 hour assessment covering Unit 1A and Unit 2B

Topics covered in the assessments:

Unit 1: Living with the Physical Environment (Unit 1 A only, The Challenges of Natural Hazards)

- Natural hazards
- Tectonic hazards
- Weather hazards
- Climate change

Unit 2: Challenges in the Human Environment (Unit 2B only - The Changing Economic World)

- Measuring development
- Uneven development
- Reducing the Global Development Gap
- Economic development in India and the UK

Revision:

- Use BBC Bitesize – Geography – AQA
- Make revision mind maps and notes
- CGP Revision Guides

History

Assessment Format:
History paper – 1 x 1 hour 20 minutes

Topics covered in the assessment:

Paper 1 Medicine through Time and the Western Front

Section A:

- Q1. a Describe one feature of… (2 marks)
- b. Describe on feature of… (2 marks)
- Q2. How useful are sources A and B for an enquiry into… (8 marks)
- Q3. How would you follow up source _ for an enquiry into… (4 marks)
- Section B:
- Q4. Explain one way that ___ was similar/different in _____ and _____ (4 marks)
- Q5. Explain why… (12 marks)
- Q6/7. _____ "How far do you agree? – a choice of 2 questions (16 + 4 SPaG marks)

Topis covered

- Section A – The Western Front (so far)
- Western Front content covered so far
- Section B – Medicine Through Time 1250 – Present
- Medieval Medicine – 1250 – 1500: Cause, treatment/surgery, prevention, case study (Black Death)
- Renaissance Medicine – 1500 -1700: Cause, treatment/surgery, prevention, case study (Great Plague)
- Industrial Medicine (18th and 19th century) 1700 – 1900: : Cause, treatment/surgery, prevention, case study (Cholera)
- Modern Medicine 1900 – Present: : Cause, treatment/surgery, prevention, case study (lung cancer)

Revision:

- Exercise books
- GCSE Pod
- BBC Bitesize – history – Edexcel
- Knowledge organisers
- Revision guides

Spanish

Assessment Format:
You will sit these assessments in class.

Topics covered in the Assessments:

Paper 1 - Reading and Listening

A - Listening dictation (each line repeated 3 times)
B - Reading Comprehension

Paper 2 - Writing

- A - Photo Card
- B - Sentence Translations
- C - 90 to 130 word essay

What to revise?

All papers will be testing the following topics covered so far in the course:

- **Lifestyle and Wellbeing** (Sport, free time, healthy lifestyle, wellbeing)
- **Media and Technology** (TV programmes, films, technology)
- **My Personal World** (family, friends, free time with friends, personal plans

My Revision Planner

Week: .....

	9am	10am	11am	12am	1pm	2pm	3pm	4pm	5pm	6pm	7pm	8pm	9pm
Monday													
Tuesday													
Wednesday													
Thursday													
Friday													
Saturday													
Sunday													

My Revision Planner

Week: .....

	9am	10am	11am	12am	1pm	2pm	3pm	4pm	5pm	6pm	7pm	8pm	9pm
Monday													
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