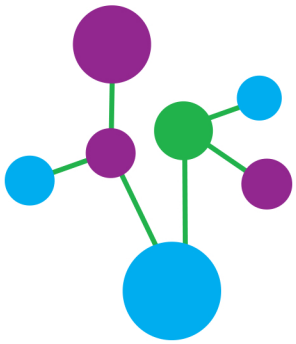
NAME: _____

TERM 1&2

YEAR 10

CORE



PLYMPTON ACADEMY

HANDBOOK

TERM 1&2

Exposure- Wilfred Owen

Content, Meaning and Purpose -Speaker describes war as a battle against the weather and conditions. -Imagery of cold and warm reflect the delusional mind of a man dying from hypothermia.
-Owen wanted to draw attention to the suffering, monotony and futility of war.

Language
-"Our brains ache" physical (cold) suffering and mental (PTSD or shell shock) suffering.
-Semantic field of weather: weather is the enemy.
-"the merciless iced east winds that knive us..." – personification (cruel and murderous wind); sibilance (cutting/slicing sound of wind); ellipsis (never-ending).
-Repetition of pronouns 'we' and 'our' – conveys togetherness and collective suffering of soldiers.
-'mad gusts tugging on the wire' – personification

Cluster One- War.

Bayonet Charge by Ted Hughes

Content, Meaning and Purpose -The poem explores the dehumanising impact of leaving the trenches into no-man's land. A soldier in the midst of battle suddenly questions his reasons for risking his life for his country. In a split second of realization, he recognises his own insignificance in war and the values he once held important become trivial to him. Hughes also had an avid interest in nature. *The poem describes the process of soldiers 'going over the top' and running across no-man's land. These types of dangerous charges often resulted in heavy casualties and deaths.

Language
- 'Suddenly' literally, happening ,coming, made, or done quickly, without warning, unexpectedly Occurring without transition from the previous form, state, Impetuous; rash. When we couple that with 'awoke' we have the awful notion that the soldier is not prepared and is linked to the 'yellow hare' trapped and perhaps about to die.
- Semantic field of panic.
- Imagery of both nature and war. Consider why Hughes blends these two together.
- 'Clock metaphor – representing a universe without emotion.

Charge of the Light Brigade- Alfred Lord Tennyson

Content, Meaning and Purpose - Published six weeks after a disastrous battle against the Russians in the (unpopular) Crimean War - Describes a cavalry charge against Russians who shoot at the lightly-armed British with cannon from three sides of a long valley. -Of the 600 hundred who started the charge, over half were killed, injured or taken prisoner. -It is a celebration of the men's courage and devotion to their country, symbols of the might of the British Empire.

Language
-"Into the valley of Death": this Biblical imagery portrays war as a supremely powerful, or even spiritual, experience.
-"jaws of Death" and "mouth of Hell": presents war as an animal that consumes its victims.
-"Honour the Light Brigade/Noble six hundred": language glorifies the soldiers, even in death. The 'six hundred' become a celebrated and prestigious group.
-"shot and shell": sibilance creates whooshing sounds of battle.

Cluster Two-Effects of War.

War Photographer- Carol Ann Duffy

Content, Meaning and Purpose -Tells the story of a war photographer developing photos at home in England: as a photo develops he begins to remember the horrors of war – painting a contrast to the safety of his dark room. -He appears to be returning to a warzone at the end of the poem. -Duffy conveys both the brutality of war and the indifference of those who might view the photos in newspapers and magazines: those who live in comfort and are unaffected by war.

Language
"All flesh is grass": Biblical reference that means all human life is temporary – we all die eventually.
"He has a job to do": like a soldier, the photographer has a sense of duty.
"running children in a nightmare heat": emotive imagery with connotations of hell.
"blood stained into a foreign dust": lasting impact of war – links to Remains and 'blood shadow'.
"he earns a living and they do not care": 'they' is ambiguous – it could refer to readers or the wider world.

Poppies- Jane Weir

Content, Meaning and Purpose -A modern poem that offers an alternative interpretation of bravery in conflict: it does not focus on a soldier in battle but on the mother who is left behind and must cope with his death. -The narration covers her visit to a war memorial, interspersed with images of the soldier's childhood and his departure for war.

Language
-Contrasting semantic fields of home/childhood ("cat hairs", "play at being Eskimos", "bedroom") with war/injury ("blockade", bandaged", "reinforcements")
-Aural (sound) imagery: "All my words flattened, rolled, turned into felt" shows pain and inability to speak, and "I listened, hoping to hear your playground voice catching on the wind" shows longing for dead son.
-"I was brave, as I walked with you, to the front door": different perspective of bravery in conflict.

Remains- Simon Armitage.

Content, Meaning and Purpose -Written to coincide with a TV documentary about those returning from war with PTSD. Based on Guardsman Tromans, who fought in Iraq in 2003. -Speaker describes shooting a looter dead in Iraq and how it has affected him. -To show the reader that mental suffering can persist long after physical conflict is over.

Language
-"Remains" - the images and suffering remain.
-"Legs it up the road" - colloquial language = authentic voice
-"Then he's carted off in the back of a lorry" – reduction of humanity to waste or cattle
-"he's here in my head when I close my eyes / dug in behind enemy lines" – metaphor for a war in his head; the PTSD is entrenched.
-"his bloody life in my bloody hands" – alludes to Macbeth: Macbeth the warrior with PTSD and Lady Macbeth's bloody hands and guilt

A Christmas Carol Knowledge Organiser

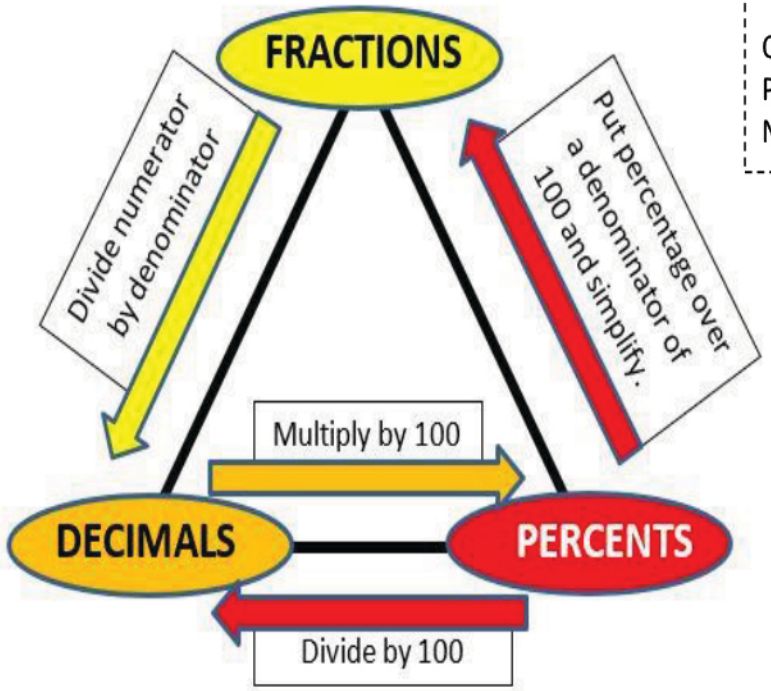
	Key quotations
Scrooge	‘as solitary as an oyster’ ‘as hard and sharp as flint’ ‘squeezing, wrenching, grasping, covetous old sinner’ ‘tight-fisted hand at the grindstone’ ‘no warmth could warm, no wintry weather chill’ ‘Are there no prisons? Are there no workhouses?’ ‘decrease the surplus population’ ‘a solitary boy neglected by his friends’ ‘lonely boy sitting by a feeble fire’ “Nothing. There was a boy singing a Christmas Carol at my door last night. I should like to have given him something: that's all” “if you have aught to teach me, let me profit by it” ‘ Scrooge hung his head to hear his own words quoted by the Spirit, and was overcome with penitence and grief’ "Spirit!" he cried, tight clutching at its robe, "hear me. I am not the man I was” “I will honour Christmas in my heart, and try to keep it all the year. I will live in the Past, the Present, and the Future” “I am as giddy as a schoolboy” “Not a farthing less. A great many back payments are included in it” ‘Scrooge was better than his word. He did it all, and infinitely more; and to Tiny Tim, who did not die, he was a second father’
Marley	‘ Old Marley was as dead as a door-nail’ “I wear the chain I forged in life…I made it link by link, yard by yard, and of my own free will I wore it” ‘ The chain was made up of cash boxes, ledgers, heavy purses’ “Mankind was my business! […] The deals of my trade were but a drop in the comprehensive ocean of my business”
Ghost of Christmas Past	‘like a child: yet not so like a child as like an old man’ ‘ from the crown of its head there sprung a bright clear jet of light’ “ would you so soon put out, with worldly hands, the light I give. Is it not enough that you are one of those whose passions made this cap, and force me through whole trains of years to wear it low upon my brow” "Rise. And walk with me.” “Leave me! Take me back. Haunt me no longer!"
Ghost of Christmas Present	‘there sat a jolly Giant, glorious to see, who bore a glowing torch, in shape not unlike Plenty's horn, and held it up, high up, to shed its light on Scrooge’ ‘ It was clothed in one simple green robe, or mantle, bordered with white fur’ ‘free as its genial face, its sparkling eye, its open hand, its cheery voice, its unconstrained demeanour, and its joyful air’ “I see a vacant seat […] in the poor chimney-corner, and a crutch without an owner, carefully preserved. If these shadows remain unaltered by the Future, the child will die” “If he be like to die, he had better do it, and decrease the surplus population” ‘the ghost grew older, clearly older’ ‘From the foldings of its robe, it brought two children; wretched, abject, frightful, hideous, miserable’ “This boy is Ignorance. This girl is Want. Beware them both, and all of their degree, but most of all beware this boy, for on his brow I see that written which is Doom”
Ghost of Christmas Yet to Come	‘The Phantom slowly, gravely, silently approached. When it came, Scrooge bent down upon his knee; for in the very air through which this Spirit moved it seemed to scatter gloom and mystery’ ‘Scrooge feared the silent shape so much that his legs trembled beneath him’ "Spirit…I see, I see. The case of this unhappy man might be my own. My life tends that way, now” ‘ Still the Ghost pointed downward to the grave by which it stood’
Belle	“Our contract is an old one” “Another idol has displaced me” “A golden one” “I have seen your nobler aspirations fall off, until the master passion, Gain engrosses you”
Fezziwig	"Why, it's old Fezziwig! Bless his heart; it's Fezziwig alive again!" ‘They shone in every part of the dance like moons’ ‘Fezziwig cut -- cut so deftly, that he appeared to wink with his legs’ “The happiness he gives, is quite as great as if it cost a fortune” “Yo ho there! Ebenezer! Dick! No more work tonight!”
Fred	“I have always thought of Christmas as a good time, a kind, forgiving, charitable, pleasant time” “Don’t be angry Uncle. Merry Christmas!” "I mean to give him the same chance every year, whether he likes it or not, for I pity him." "Let him in! It is a mercy he didn't shake his arm off."
Crachit family	‘ The clerk’s fire was so very much smaller that it looked like only one coal’ ‘dressed out but poorly in a twice-turned gown’ ‘his threadbare clothes darned up and brushed, to look seasonable’ ‘Alas for Tiny Tim, he bore a little crutch, and had his limbs supported by an iron frame’ “he hoped the people saw him in the church, because he was a cripple, and it might be pleasant to them to remember upon Christmas Day, who made lame beggars walk, and blind men see” ‘Such a bustle ensued that you might have thought a goose the rarest of all birds; a feathered phenomenon’ ‘Mrs Cratchit entered -- flushed, but smiling proudly -- with the pudding, like a speckled cannon-ball’ ‘ Bob held his withered little hand in his, as if he loved the child, and wished to keep him by his side, and dreaded that he might be taken from him’ “A merrier Christmas, Bob, my good fellow, than I have given you for many a year. I'll raise your salary, and endeavour to assist your struggling family”

Key themes and ideas	Settings
Poverty, Fate, Charity, Transformation, Capitalism, Greed, Money, Redemption, Family, Friendship, Religion, Morality, Isolation/Loneliness, Choices, Memory and the past, Compassion, Forgiveness, Guilt and blame, Time, Rationality	Scrooge’s workplace, Scrooge’s living room, Scrooge’s bedroom, the village from Scrooge’s childhood, Scrooge’s school, Fezziwig’s party, the Crachit residence, the streets of London, the Beetling shop, Fred’s residence, the graveyard.

Poverty	Industrial Revolution	The Workhouse	Capitalism
The population of the towns and cities was increasing rapidly. Due to the effects of the industrial revolution, people were flocking into the towns and cities in search of employment. Large numbers of people were looking for work, so wages were low, barely above subsistence level. If work dried up, or was seasonal, men were laid off, and because they had hardly enough to live on when they were in work, they had no savings to fall back on. Living conditions for the poor were appalling- large houses were turned into flats and the landlords who owned them, were not concerned about the upkeep or the condition. These houses were extremely overcrowded and dirty. There were children living with their families in these desperate situations but there were also numerous homeless children living on the streets of London. Sometimes, the only water the poor had access to was from the sewage ditch in the street.	During the Victorian era, Britain became one of the world's primary economic powers. After the invention of steam power, many people moved from rural areas to the cities to search for higher paying work. The people who moved to the city in search of work were dubbed the "working class". Britain became an industrial hub and the economy was strong. With a sharp increase in production, Britain's trade industry increased drastically as well. Everything converted from traditional, manual labour to machine-driven, highly-productive labour. This caused a reduction in the amount of men needed for work, which therefore increased poverty levels and crime in the cities. Working with machinery was also was more dangerous and life threatening for the workers.	The Poor Law Amendment Act of 1834 allowed the poor to receive public assistance only if they went to the workhouse. Workhouses were deliberately made to be miserable in order to deter the poor from relying on public assistance. In the workhouse, the poor had to work for their food and accommodation. Workhouses were appalling places and the poor would often beg on the streets or die to avoid going to these places. Upon entering the workhouse, the poor were stripped and bathed. If a family entered the workhouse, they were split up and they would be punished if they tried to speak to one another. Children received an education which did not include the two most important skills of all, reading and writing, which were needed to get a good job. They sometimes were 'hired out' to work in factories and mines where they were made to do dangerous and deadly jobs.	The word capital means "something of value". Capitalism is an economic system in which people who own the means of production (factories, land, shops, tools, machines, shipping companies etc.) are able to make a lot of money by producing what people want and need. Capitalism has a more or less free market economy. That means prices move up or down according to the availability of the products. The people who own the businesses (capitalists) produce these popular goods and employ workers on a wage to produce them. These workers use their skills to produce products which are then sold for a profit by the business owner. The profit is not shared with the employees. Some people argue that this system hurts workers, because businesses make more money by selling things than they pay the workers. Business owners become rich while workers remain poor and exploited.
Dickens' ideas and intentions		**Language**	**Structure and Form**
Dickens' writing criticised economic, social, and moral issues in the Victorian era. He showed compassion and empathy towards the vulnerable and disadvantaged people in English society, and help to bring about several important social reforms. Dickens' deep social commitment and awareness of social issues come from his traumatic childhood, where his father was imprisoned for debt, and he was forced to work in a shoe-blacking factory at 12 years old. In his adult life, Dickens developed a strong social conscience and empathised with the victims of social and economic injustice. Dickens' intention in A Christmas Carol is to draw readers' attention to the plight of the poor and to highlight the hypocrisy of Victorian society. He juxtaposes the wealth and greed of capitalists with the poorer classes and draws attention to the way in which the greed and selfishness of some impacts on the quality of the lives of others. His moral message appears to be that we should care for our fellow man. The transformation of Scrooge suggests that Dickens feels it is never too late for change and redemption. Dickens emphasises the importance of family, friendship and charity in bringing about this change.		**Satire**- use of humour or ridicule to criticise **Asyndeton**- list without conjunctions **Polysyndeton**- list with conjunctions (and) **Simile**- comparing using 'like' or 'as' **Metaphor**- saying one thing is another **Personification**- make object human **Pathetic fallacy**- weather to create mood **Pathos**- language to evoke pity **Allusion**- reference to another literary work **Hyperbole**- exaggerated statement **Connotation**- associated meaning of word **Characterisation**- built up description of character in text **Semantic field-** words related in meaning **Imagery**- visually descriptive language	**Conflict**- problem faced by characters **Resolution**- point where conflict is resolved **Foreshadowing**- clue about something later **Foreboding**- sense that something will occur **Juxtaposition**- two contrasted ideas **Backstory**- insight into character's past **Exposition**- revelation of something **Poetic justice**- good rewarded bad punished **Melodrama**- exaggerated characters/events **Motif**- repeated image or symbol **Antithesis**- contrast of ideas in same grammatical structure **Authorial intrusion**- where author pauses to speak directly to reader **Allegory**- characters/events represent ideas about religion, morals or politics

Maths Knowledge Organiser - Number

Stage 7



Percentages

OV x PM = NV

OV= Original value
PM= Percentage multiplier
NV= New Value

Stage 8

Numbers in standard form are written in this format:

$$a \times 10^n$$

Where **a** is a number **1 ≤ a < 10** and **n** is an **integer**.

$$\text{Speed (s)} = \frac{\text{distance (d)}}{\text{time (t)}}$$

$$a^x \times a^y = a^{x+y}$$

$$a^x \div a^y = a^{x-y}$$

$$\left(a^x\right)^y = a^{xy}$$

$$a^0 = 1$$

Stage 9

$$\text{Pressure (p)} = \frac{\text{force (F)}}{\text{area (A)}}$$

$$\text{Density (d)} = \frac{\text{mass (m)}}{\text{volume (V)}}$$

Higher

Compound interest-

OV x PM^n = NV

OV= Original value
PM= Percentage multiplier
n= number of percentage changes
NV= New Value

$$a^{-x} = \frac{1}{a^x}$$

$$a^{\frac{x}{y}} = \sqrt[y]{a^x} = \left(\sqrt[y]{a}\right)^x$$

Maths Knowledge Organiser – Geometry and Measure

Shape	Perimeter	Area
Triangle	P = a + b + c	A = ½ (b x h)
Square	P = 4b	A = b²
Rectangle	P = 2 (b + h)	A = (b x h)
Parallelogram	P = 2 (b + h)	A = (b x h) b = the length
Rhombus	P = 2 (b + w)	A = (b x h) b = the length
Trapezium	P = a + b + c + d	A = ½ (a + b) h

Stage 7

Volume of a cuboid
= length × width × height
= lwh

Surface Area of a Cuboid= 2(lw + wh + lh)

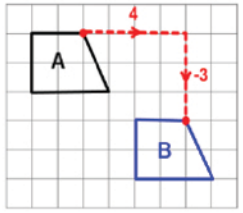
When a shape is **translated**, it is **moved to a different position**, without being turned or flipped.

Vectors such as $\begin{bmatrix}4\\-3\end{bmatrix}$ are used to describe translations.

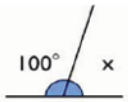
The **top** number is the **horizontal** movement:
← *left if negative* or *right if positive* →

The **bottom** number is the **vertical** movement:
↓ *down if negative* or *up if positive* ↑

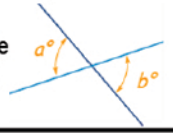
Translate shape A by the vector $\begin{bmatrix}4\\-3\end{bmatrix}$



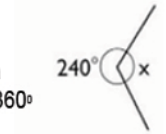
Angles on a straight line add up to 180⁰



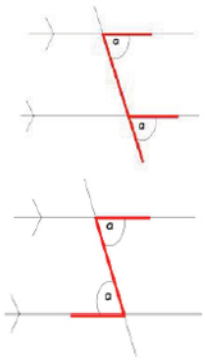
Vertically opposite angles are equal



Angles around a point add up to 360⁰



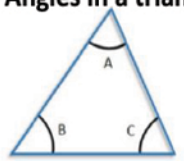
Stage 8



Corresponding Angles
F shape
Angles are equal

Alternate Angles
Z shape
Angles are equal

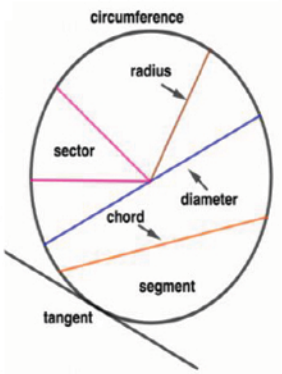
Angles in a triangle



A + B + C = 180°

Regular Polygons

	Interior	Exterior
Sum of all Angles	$(n-2)180°$	360°
Each Angle (Regular Polygon)	$\frac{(n-2)180°}{n}$	$\frac{360°}{n}$



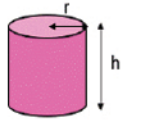
Circumference

$C = \pi D$

Area

$A = \pi r^2$

Volume of a Cylinder

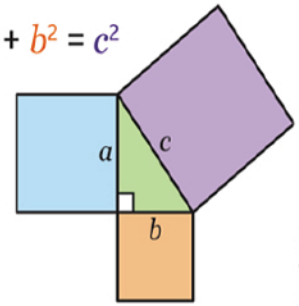


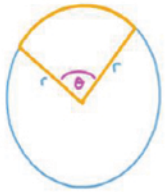
Volume = $\pi r^2 h$

Stage 9

Pythagoras Theorem

$a^2 + b^2 = c^2$





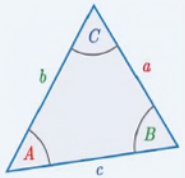
Arc length = $\frac{\theta}{360} \times \pi d$

Area of sector = $\frac{\theta}{360} \times \pi r^2$

Describing transformations
Translation- vector
Enlargement – scale factor
- centre of enlargement
Rotations – Angle
- direction
-centre of rotation
Reflection – line of reflection

Surface Area Cylinder
= $2\pi r^2 + \pi dh$

Higher



Area of a triangle: $\frac{1}{2}ab\sin(C)$

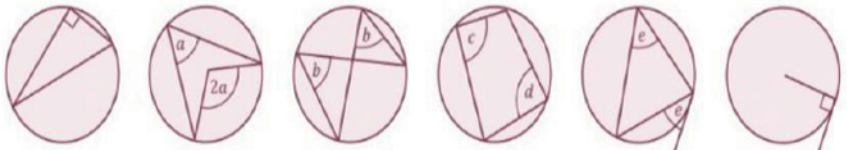
Sine Rule: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine Rule: $a^2 = b^2 + c^2 - 2bc\cos A$

or

$\cos(A) = \frac{b^2 + c^2 - a^2}{2bc}$

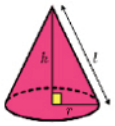
Circle theorems G10



Angle in a semicircle is 90°
Angle at the centre is double the angle at the circumference
Angles in the same segment are equal
Opposite angles in a cyclic quadrilateral total 180°
Alternate segment theorem
Tangent and radius are perpendicular

Volume of sphere = $\frac{4}{3}\pi r^3$

Surface area of sphere = $4\pi r^2$

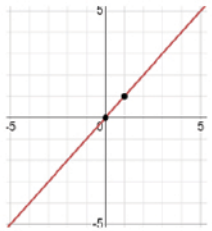


Curved surface area of cone = πrl where l is the slant height

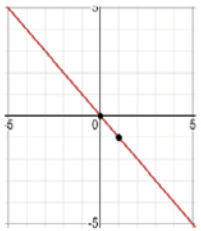
Volume of cone = $\frac{1}{3}\pi r^2 h$

Maths Knowledge Organiser - Algebra

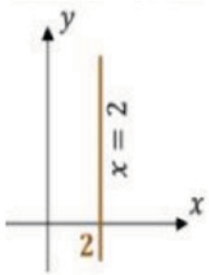
Stage 7

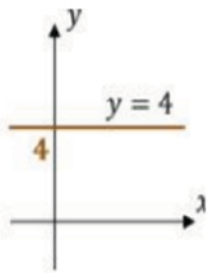


y = x



y = -x





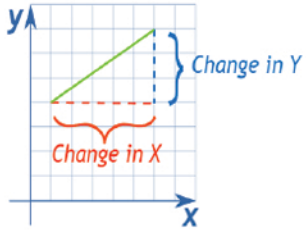
Stage 8

The general equation of any straight line is:

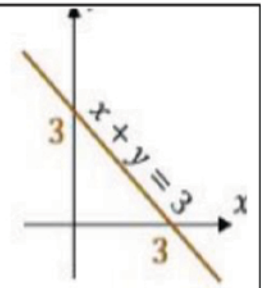
$$y = mx + c$$

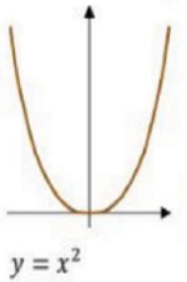
c is the y-intercept (where the line crosses the y-axis)

m is the **gradient** (steepness) of the line

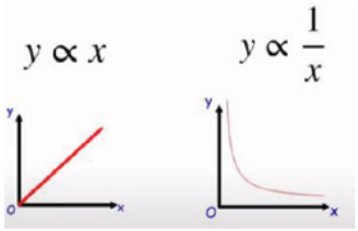


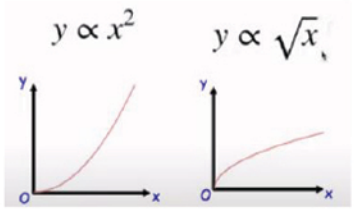
$$\text{Gradient} = \frac{\text{Change in Y}}{\text{Change in X}}$$



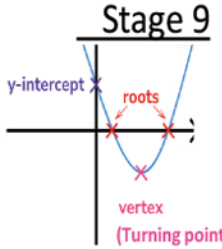


$y = x^2$

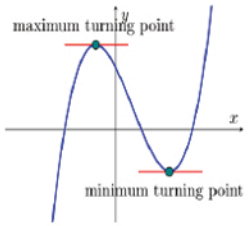




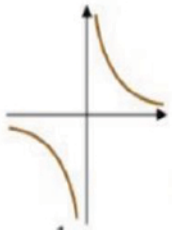
Stage 9



Straight line graphs-
Parallel lines have the same gradient
$m_1 = m_2$



$y = x^3$



$y = \frac{1}{x}$

$y = a^x$

Direct proportionality:
(y is proportional to x, x^2)

$$y \propto x \rightarrow y = kx$$

$$y \propto x^2 \rightarrow y = kx^2$$

Inverse proportionality:
(y is inversely proportional to x, x^2)

$$y \propto \frac{1}{x} \rightarrow y = \frac{k}{x}$$

$$y \propto \frac{1}{x^2} \rightarrow y = \frac{k}{x^2}$$

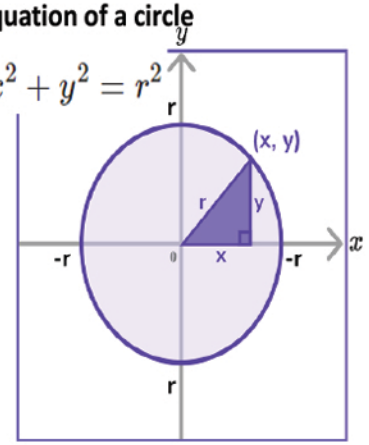
Quadratic Equation

$$ax^2 + bx + c = 0$$

Quadratic Formula

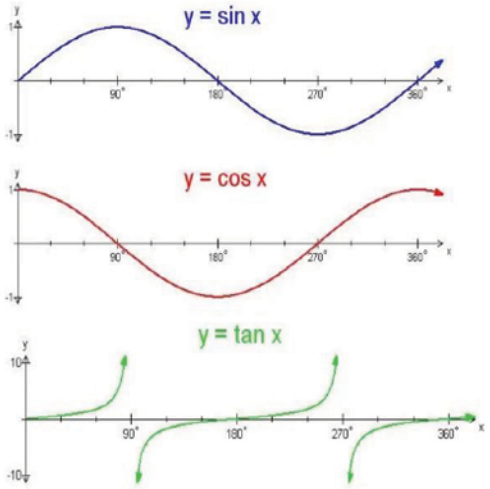
$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Equation of a circle



Higher

Straight line graphs-
Perpendicular lines have gradients that multiply to get –1 $m_1 \times m_2 = -1$



Maths Knowledge Organiser - Statistics

Stage 7

Pie Charts

$$Sector\ Angle = 360 \times \left(\frac{Category\ Frequency}{Total\ Frequency}\right)$$

The **mean, median and mode** in maths are averages

Mean

Find the total of the values and divide the total by the number of values

$$\text{mean} = \frac{\text{total}}{\text{number of values}}$$

Median

Arrange the values in numerical order and find the middle value

Mode

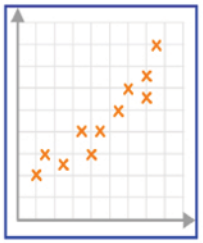
Find the most frequently occurring item in the data set

Range – Not an average – measures consistency

Biggest value - Smallest value

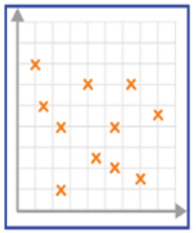
Stage 8

Positive correlation



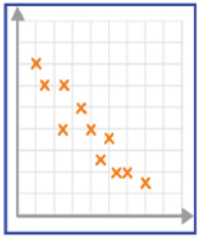
- As one variable increases so does the other
- Upward trend in the data

No correlation

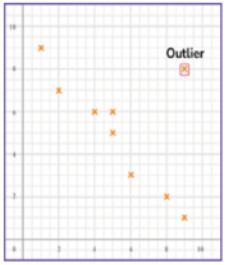


- No trend between the variable
- Plots are random and no linear pattern.

Negative correlation



- As one variable increases, the other decreases
- Downward trend in the data



Outlier

- A point that is 'far away' from the main group of data.
- They **lie outside** the other values

Stage 9

Independent events are events which are not affected by the occurrence of other events.

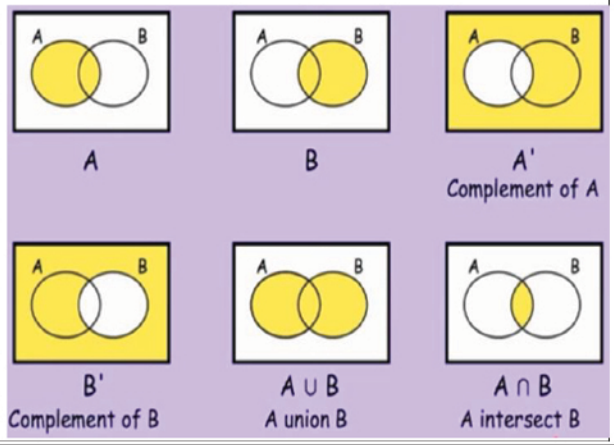
Dependent events are events which **are** affected by the occurrence of other events.

Higher

Interquartile Range
= Upper Quartile – Lower Quartile

$$Frequency\ Density = \frac{Frequency}{Class\ Width}$$

Symbol	Description
$\{\}$	Curly Brackets, contain all items in a set
,	Comma - separates all items in a set
'	Complement - the items not in a set
ξ	The Universal Set - contains all items in every set and subset required
ϕ	The Empty Set - contains no items



AQA BIOLOGY UNIT 2: ORGANISATION

Tissues and Organs

Tissues: cells working together

Animal	Glandular	• Ribosomes – make enzymes and hormones • Vesicles to store enzymes and hormones
	Muscular	• Long, thin cells contracts • Lots of mitochondria for energy
	Epithelial	• Goblet cells make mucus • Cells have cilia
Plant	Mesophyll	• Lots of chloroplasts • Photosynthesis
	Epidermal	• Thin and translucent to allow light through
	Xylem	• Transports water
	Phloem	• Transports sugars

Organs: tissues working together

Stomach: Glandular: Makes enzymes and acid
Epithelial: mucus protects lining
Muscular: contracts, churns food

Enzymes – biological catalyst made from protein in ribosomes

- Enzymes have an active site (shape)
- Active site fits a substrate and breaks it down

enzyme + reactant ↔ enzyme-reactant complex ↔ enzyme + products

Denature: Active site changes
No longer recognises substrate

- **Temperature** – too cold too slow
  - optimum = 37°C
  - too hot = denatures
- **pH** – enzymes only work at specific pH
  - stomach enzymes need pH 1-2 (acid)
  - intestinal enzymes need pH 7-8 (bile)

Digestive Enzymes

Carbohydrase (e.g. amylase)	Large sugars (starch) → Simple sugars (glucose)	Salivary glands, pancreas, Small intestine	pH7-8 37°C
Protease (e.g. pepsin)	Protein → Amino acids	Stomach Pancreas Small intestine	Stomach = pH1-2 37°C
Lipase (e.g. pancreatic lipase)	Fats → Fatty acids and glycerol	Stomach Pancreas Small intestine	pH 7-8 37°C

Commercial Use – speed up reactions, increase yields but need to monitor temperature and pH.

Industry	Function of Enzymes
Diet foods	change glucose into fructose, which is sweeter so less is needed and is used in 'slimming' foods (isomerase).
Baby food	start off digestion of food (proteases and lipases)
Biological detergent	break down stains (proteases and lipases).

REQUIRED PRACTICAL: Food Tests

Type of Food	Name of Test	Positive Result	Negative Result
Starch	Iodine	Blue/Black	Brown
Glucose	Benedict's (must be heated)	Green → Yellow → Brick red	Blue
Protein	Biuret	Lilac	Blue
Lipids	Emulsion	Cloudy precipitate	Clear

Health and Risk Factors

- **Communicable disease**: Any disease transmitted from one person or animal to another, also called contagious disease.
- **Non Communicable disease**: Medical condition or disease that is non-infectious or non-transmissible.

Risk Factors:

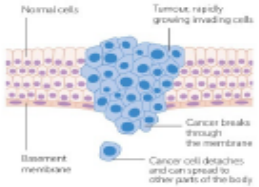
- **Cardiovascular disease**: diet/obesity, age, genetics and exercise.
- **Lung disease**: smoking and cleanliness of the environment.
- **Liver disease**: alcohol, diet/obesity, genetics, drugs and viral infection
- **Type 2 diabetes**: genetics, diet/obesity and exercise

Cancer

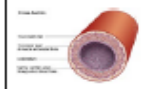
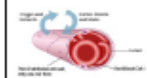
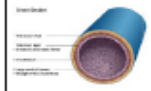
When our cells divide, mutations can occur in the DNA which lead to abnormal cells.

Malignant cancer can spread to other parts of the body. We call this **metastasis**.

A cancer cell can detach from the tumour and be carried by the blood to other parts of the body. The cancer cell can become stuck in a capillary by an organ and then begin growing until it has invaded that organ too.



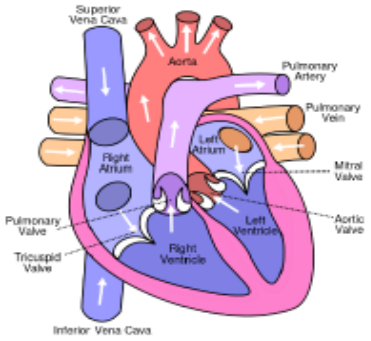
Blood Vessels

Blood Vessel	Diagram	Type of Blood	Pressure	Special Features
Artery		Oxy	High	Thick muscular elastic walls Smaller lumen
Capillary		Both	Med	1 cell thick walls for fast diffusion
Vein		Deoxy	Low	Large lumen Valves to prevent back flow of blood

Blood

- Red Blood Cells – haemoglobin carries oxygen, biconcave disk increases surface area, no nucleus to fit in more haemoglobin.
- White blood cells – fight pathogens
- Plasma – transports dissolved substances
- Platelets – bits of cytoplasm used to form blood clots

The Heart



Double circulation

Right = lungs for gas exchange

Left = Rest of body

Needed because humans are more active and lungs are very delicate so blood can't be at a high pressure but must be to go round the rest of the body.

What could happen if our coronary arteries narrow?

Plaque (fatty deposit) builds on the walls of the blood vessel.

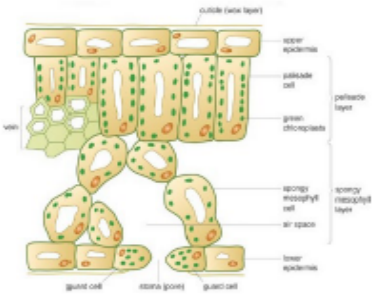
The blood vessel can become blocked or in some cases the blood pressure increases causing some plaque to break away.

The plaque blocks narrower vessels causing blood clots and a lack of oxygen to tissue and organs.

- Lack of oxygen
- Lack of glucose
- For respiration
- No energy for contraction of cardiac muscle
- Heart stops (cardiac arrest)

Plants and Photosynthesis

Roots	• Uptake of water and minerals • Large surface area due to root hair cells • Protein channels for active transport • Meristems – plant stem cells
Stem	• Hold leaves in position • Waxy epidermis to prevent water loss • Xylem – transports water • Phloem – transports sugars
Leaves	• Broad, flat to increase surface area • Contain 4 types of tissue to carry out photosynthesis (see below) • Guard cells close stomata at night to prevent water loss by transpiration • Waxy epidermis to prevent water loss



How is the leaf adapted for efficient photosynthesis?

- Sun hits palisade cells at top
- Palisade – lots of chloroplasts
- Spongy mesophyll allows gas movement
- Xylem brings water
- Phloem maintains concentration gradient by removing glucose
- Guard cells open to allow carbon dioxide to diffuse into the leaf.

CHD and Other Heart Defects

Procedure	How they work	Advantages	Disadvantages
Statins	Drugs that lower blood cholesterol levels preventing plaque forming	Cheap Preventative	Can cause side effects
Stents	Insert a balloon and wire mesh to artery. Inflate balloon and leave wire in place	Invasive Minor surgery	Anticoagulant drugs are needed which prevents blood clotting
Bypass Surgery	Piece of vein is grafted from leg to bypass the blocked coronary artery	Permanent solution	Expensive Scars Major surgery
Mechanical Valve Replacement	Synthetic valve used to replace faulty one.	Last longer	Need anticoagulant drugs
Biological Valve Replacement	Animal valve used to replace faulty one	No drugs needed	Only lasts 15 years
Pacemaker	Device used to trigger the heart to beat in its normal rhythm	Keeps heart beating properly	Surgical procedure Can stop working near machinery and electronic devices
Heart Transplant	Donor heart used to replace patient's heart	Permanent solution	Major surgery Rejection Immunosuppressant drugs needed

Transpiration and Translocation

Phloem

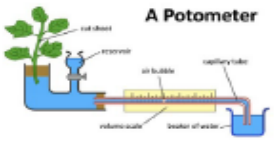
- Phloem vessels are made of long, thin-walled cells that form tubes.
- Sugars and amino acids dissolved in sap are transported in the phloem by a process called **translocation**.
- The ends of the phloem tubes are called **sieve plates** and they have small holes in them to allow transport in both directions.
- Phloem cells have no nuclei. They have **companion cells** next to them to control them which are filled with mitochondria.

Xylem

- Xylem tubes are made from long cells with thick, reinforced walls made from **lignin**.
- The vessel has a large hollow lumen for water and minerals to flow through in one direction.
- The cell walls are waterproof which makes the cells die which results in wood in trees!

Transpiration Stream

1. Higher concentration of water in soil than in roots
2. Water moves into roots by osmosis
3. Higher concentration of water in roots than in leaves
4. Water moves up the xylem by osmosis to the leaves
5. Water lost through stomata and used for photosynthesis maintains concentration gradient.
6. This causes more water to be drawn in by the roots. This is called the transpiration stream



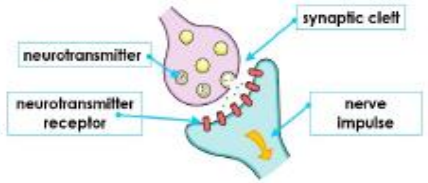
AQA BIOLOGY UNIT 5: HOMEOSTASIS

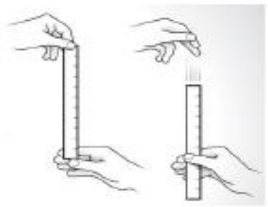
Reflexes – Prevent harm, avoid conscious parts of the brain (faster)

1. Stimulus	e.g.	stand on nail
2. Receptor		pain
3. Sensory neurone		electrical impulse
4. Relay neurone (CNS)		CNS
5. Motor neurone		electrical impulse
6. Effector		muscles

Synapse – Gap between two neurones

1. Electrical impulse arrives at synapse
2. Neurotransmitter diffuses across synapse
3. Bind to receptors on 2nd neurone
4. Electrical impulse passed on





REQUIRED PRACTICAL

Independent Variable:
- Number of practices

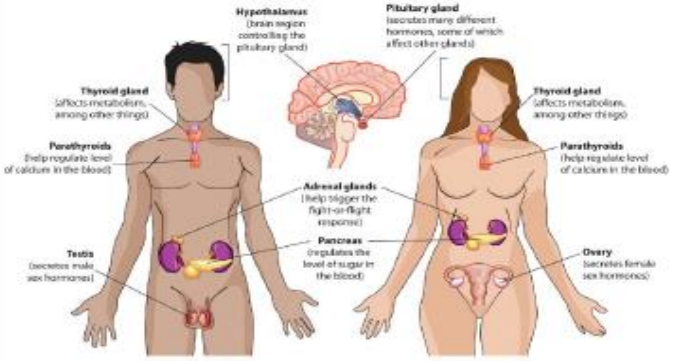
Dependent Variable:
- Reaction time (distance where ruler is caught converted into a time)

Control Variables:
- Ruler dropped from same height
- Use weaker hand each time
- Same mass of ruler
- Same thickness of ruler

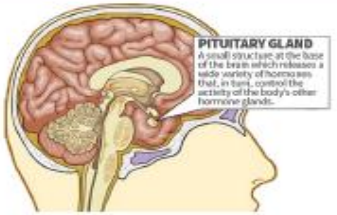
Homeostasis – the maintenance of a constant internal environment.

The main things we need to control in the body are:
- Temperature (thermoregulatory centre in the brain)
- Blood glucose (pancreas)
- Water (kidneys)
- Mineral ions/salts (kidneys)
- Urea (waste) (liver and kidneys)

Endocrine System – the glands of the body – secrete hormones

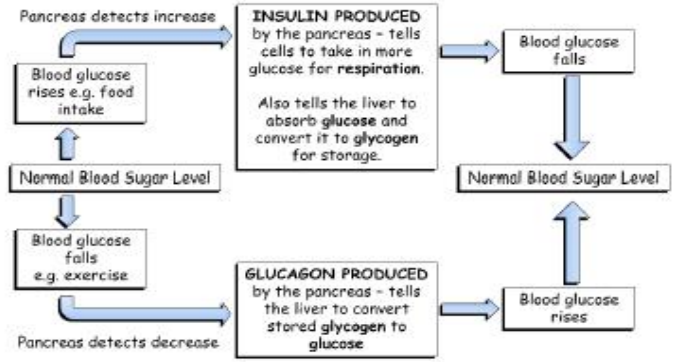


The **pituitary gland** is often referred to as the **master gland** because it stimulates other glands in the body e.g. TSH stimulates the thyroid, FSH and LH stimulate the ovaries.



	NERVOUS SYSTEM	ENDOCRINE SYSTEM
What type of message?	Electrical impulse	Chemical hormone
What do they travel through?	Along neurones	In the blood
Speed?	Faster	Slower
Local or general response?	Local i.e. affects one particular part of the body	General i.e. can affect several organs in the body
How long does the effect last?	Short lasting	Long lasting

Glucose Regulation – Prevent nerve and brain damage



Problem	Hormone	Effect
Too much glucose	insulin	Stores glucose as glycogen and tells cells to increase respiration
Too little glucose	glucagon	Converts glycogen to glucose

Type 1 Diabetes
- Born with it
- Don't make insulin

Treatment
- Insulin injected daily
- Pancreas transplant

Type 2 Diabetes
- Brought on by bad diet/obesity
- Body desensitized to insulin

Treatment
- Careful diet
- Exercise

Menstrual Cycle – 28 days (ovulation day 14)

FSH	• From pituitary gland • Egg matures in ovary
Oestrogen	• From ovaries • Stops FSH • Thickens uterus lining • Stimulates LH
LH	• From pituitary gland • Egg released (ovulation day 14)
Progesterone	• Maintains thick uterus lining

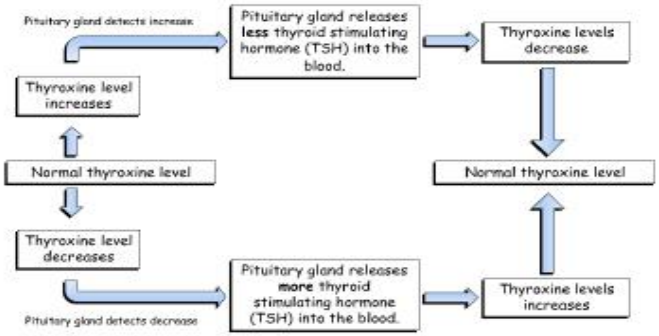
Contraception
- Hormonal methods (pill, patch, implant, injection) contain oestrogen and/or progesterone to prevent FSH release so no egg matures.
- Barrier methods (condoms, diaphragm, cap) can also help prevent spread of STDs.
- Intrauterine devices (coils) prevent implantation of embryo.

IVF (HT ONLY)
1. Give **fertility drugs** (FSH and LH)
2. Remove mature eggs from ovaries
3. Mix with sperm in petri dish
4. Incubate until it is an embryo
5. Insert into woman's uterus

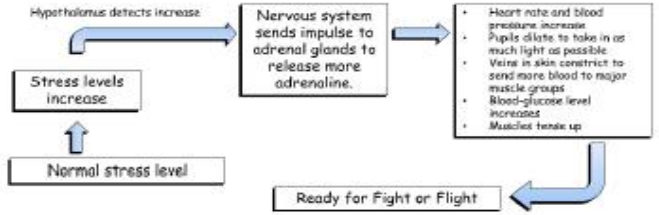
IVF Downsides
Expensive, poor success rate, multiple pregnancies (low birth-weight babies)

Negative Feedback (HT) – Prevent nerve and brain damage

Thyroxine – Metabolism, growth, brain development in children



Adrenaline – This is positive feedback.



The rate of a reaction can be measured by the rate at which a reactant is used up, or the rate at which a product is formed.

- We can **measure the rate** of a reaction by looking at:
- how fast solid **reactants are used** up,
- how quickly **gas is produced** or
- how **quickly light is blocked** (the disappearing cross)

The quantity of reactant or product can be measured by:

- mass in grams or volume in cm^3. The units are: **g/s or cm^3/s.**
- HT: quantity of reactants in terms of moles and units for rate of reaction in **mol/s.**

$$\text{mean rate of reaction} = \frac{\text{quantity of reactant used}}{\text{time}} \text{ or } \frac{\text{quantity of product formed}}{\text{time}}$$

There are 3 different methods that can be used to measure the rate of a reaction. Measuring the;

1. Decreasing mass of a reaction mixture (e.g. marble chips (calcium carbonate) & HCl
2. Increasing volume of a gas given off
3. Decreasing light passing through a solution (i.e. disappearing X)

Reactions, particles and collisions

Reactions take place when particles collide with a certain amount of energy.
The minimum amount of energy needed for the particles to react is called the **activation energy**, and is different for each reaction.
The rate of a reaction depends on two things:

- the **frequency** of collisions between particles
- the **energy** with which particles collide.

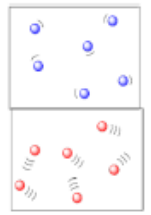
If particles collide with less energy than the activation energy, they will not react. The particles will just bounce off each other.

What factors affect the rate of reactions?

- increased **temperature**
- increased **concentration** of dissolved reactants
- increased **pressure** of gaseous reactants
- increased **surface area** of solid reactants
- use of a **catalyst**

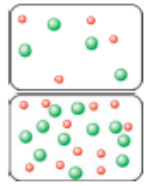
Effect of temperature on rate of reaction

At a higher temperature, particles have more energy. This means they move faster and are more likely to collide with other particles.
When the particles collide, they do so with more energy, and so the number of successful collisions increases.



Effect of concentration on rate of reaction

At a higher concentration, there are more particles in the same amount of space.
This means that the particles are more likely to collide and therefore more likely to react.



Effect of pressure on rate of reaction

As the pressure increases, the space in which the gas particles are moving becomes smaller.
The gas particles become closer together, increasing the frequency of collisions. This means that the particles are more likely to react.

Effect of surface area on rate of reaction

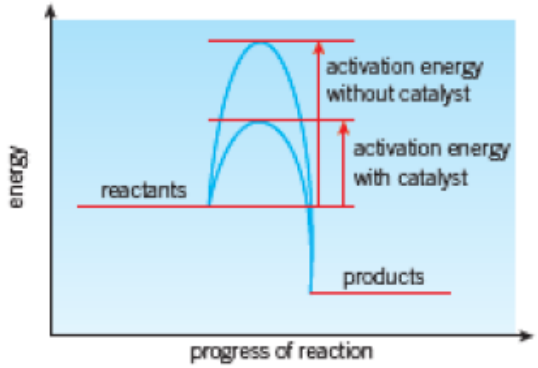
This means that there is an increased area for the reactant particles to collide with.
The smaller the pieces, the larger the surface area. This means more collisions and a greater chance of reaction.

Effect of catalysts on rate of reaction

Catalysts are substances that change the rate of a reaction without being used up in the reaction.

Catalysts never produce more product – they just produce the same amount more quickly.
Different catalysts work in different ways, but most lower the reaction's activation energy (E_a).

- **Nickel** is a catalyst in the production of margarine (hydrogenation of vegetable oils).
- **Iron** is a catalyst in the production of ammonia from nitrogen and hydrogen (the Haber process).
- **Platinum** is a catalyst in the catalytic converters of car exhausts. It catalyses the conversion of carbon monoxide and nitrogen oxide into the less polluting carbon dioxide and nitrogen.



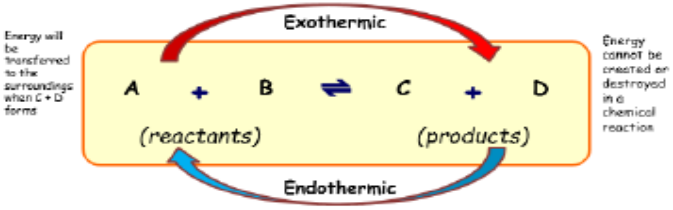
Why are catalysts so important for industry?

- Products can be made more quickly, saving time and money.
- Catalysts reduce the need for high temperatures, saving fuel and reducing pollution.
  - Catalysts often come in the form of **powders, pellets** or **fine gauzes,** this provides the largest possible surface area for them to work.

AQA Science: The rate and extent of chemical change

Reversible reactions

Reversible reactions occur when the backwards reaction (reactants → products) takes place relatively easily under certain conditions. The products turn back into the reactants.



Litmus is a complex molecule. This can be represented as HLit (where H is hydrogen). HLit is red. If you add alkali, HLit turns into the Lit– ion by losing an H+ ion. Lit– is blue. If you then add more acid, blue Lit– changes back to red HLit, and so on.

$$\underset{\text{red litmus}}{HLit(aq)} \rightleftharpoons \underset{\text{blue litmus}}{H^+(aq) + Lit^+(aq)}$$

Reversible reactions can be endothermic and exothermic. The energy transferred **from** the surroundings by the endothermic reaction is **equal to** the energy transferred **to** the surroundings during the exothermic reaction. E.g. thermal decomposition of hydrated copper sulfate.

HT: Le Chatelier's Principle

If a system is at equilibrium and a change is made to any of the conditions, then the system responds to counteract the change. The effects of changing conditions on a system at equilibrium can be predicted using Le Chatelier's Principle.

1. Temperature...

If the temperature of a system at equilibrium is increased:

- the relative amount of products at equilibrium increases for an endothermic reaction
- the relative amount of products at equilibrium decreases for an exothermic reaction.

Equilibrium

When reversible reactions **reach equilibrium** the forward and reverse reactions are still happening but at the same rate, so the concentrations of reactants and products do not **change**. The balance point can be affected by temperature, and also by pressure for gasses in **equilibrium**

When you heat ammonium chloride, a reversible reaction takes place. Ammonium chloride breaks down on heating. It forms ammonium chloride and hydrogen gases (colourless gases). This is an example of a DECOMPPOSITION REACTION.

ammonium chloride	⇌	ammonia	+	hydrogen chloride
NH_4Cl (s)	⇌	NH_3 (g)	+	HCl (g)

NH_4Cl decomposes back into NH_3 and HCl gases, when heated. White solid NH_4Cl reforms in the cooler part of the test tube.

1. Temperature continued...

If the temperature of a system at equilibrium is decreased: • the relative amount of products at equilibrium decreases for an endothermic reaction •the relative amount of products at equilibrium increases for an exothermic reaction.

$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$

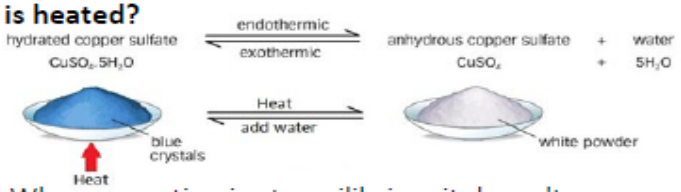
Here the forward reaction is exothermic – a decrease in temperature moves equilibrium to the right (more NH_3).

2. Pressure...

For gaseous reactions at equilibrium:

- an **increase in pressure** causes the equilibrium position to shift towards the side with the smaller number of molecules as shown by the symbol equation for that reaction
- a **decrease in pressure** causes the equilibrium position to shift towards the side with the larger number of molecules as shown by the symbol equation for that reaction.

What happens when hydrated copper (II) sulfate is heated?



When a reaction is at equilibrium it doesn't mean the amounts of reactants and products are equal.

- If the equilibrium **lies to the right,** the concentration of **products** is **greater** than that of the reactants.
- If the equilibrium **lies to the left**, the concentration of **reactants** is **greater** than that of the products.

The **position of equilibrium** depends on the following conditions:

1. Temperature
2. Pressure (this only affects equilibria of gases)
3. Concentration of the reactants and products

$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$

There are 4 moles to the left (1 of N_2 and 3 of H_2) but only 2 on the right. So if you increase the pressure, the equilibrium shifts to the right (more NH_3).

3. Concentration...

If the concentration of one of the reactants or products is changed, the system is no longer at equilibrium and the concentrations of all the substances will change until equilibrium is reached again.

- If the concentration of a reactant is **increased**, more products will be formed until equilibrium is reached again.
- If the concentration of a product is **decreased**, more reactants will react until equilibrium is reached again.

$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$

If more N_2 or H_2 is added, the forward reaction increases to produce more NH_3.

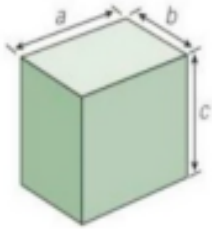
Section 1: Key Terms

Density	How much **mass** a substance contains **compared to its volume**. Solids are usually dense because the particles are closely packed.
State of matter	The way in which the **particles are arranged** – solid, liquid or gas.
Change of state	When a substance **changes from one state of matter** to another (e.g. melting is the change from a solid to a liquid). Energy changes the state, not the temperature.
Physical change	A change that can be **reversed** to recover the original material. **E.g. a change of state.**
Chemical change	A change that **creates new products**. It **should not be reversed**. E.g. a chemical reaction.
Internal energy	The **energy stored** inside a system **by the particles** (atoms and molecules) that make up the system. Internal energy is the **total kinetic energy and potential energy of all the particles.**
Kinetic energy	**Energy stored** within **moving objects** (e.g. particles).
Potential energy	**Energy stored** in **particles** because of their **position.** The **further apart** particles are, **the greater the potential energy.**
Specific heat capacity	The specific heat capacity of a substance is the **amount of energy** required to **raise the temperature of one kilogram** of the substance **by one degree Celsius**.
Temperature	The **average kinetic energy** of the **particles**.
Specific latent heat	The **amount of energy** required to **change the state of one kilogram** of the substance with **no change in temperature**.
Latent heat of fusion	**Energy required** to change state from **solid to liquid**.
Latent heat of vaporisation	**Energy required** to change state from **liquid to vapour**.
Gas Pressure	The **force** exerted by gases on surface as the **particles collide** with it. **As temperature increases, gas pressure increases** if the volume stays constant.

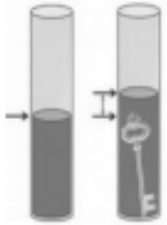
Section 2: Density

The **density of water** is **1000 kg/m^3** . Objects that have a lower density than water will float in water. **Density** can be **calculated** by measuring its **mass** and **volume**.

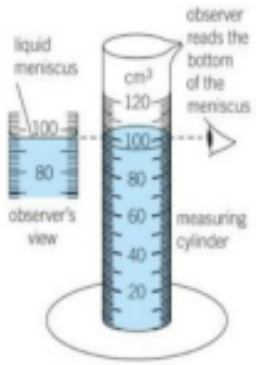
Measure **volume** of a **cuboid** = a x b x c



Volume of **an irregular object** can be found by **dropping in a liquid** and **measuring Displacement**.



When reading a meniscus the observer must read the **bottom** of the **meniscus**.

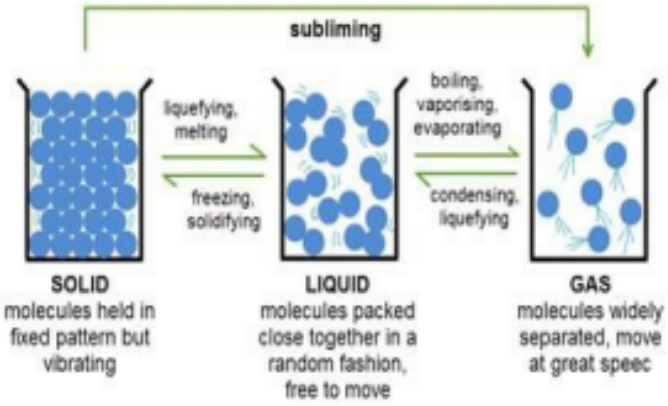


Calculation	Equation	Symbol equation	Units
Density	Density = mass / volume	$\rho = \frac{m}{v}$	Density = kg/m^3 Mass = kg Volume = m^3

Section 3: States of matter

Everything around you is made up of matter and exists in one of **three states**. **Solids**, **liquids** and **gases** are made of particles, the physical arrangement of particles determines the state of a particular substance.

Kinetic theory of matter

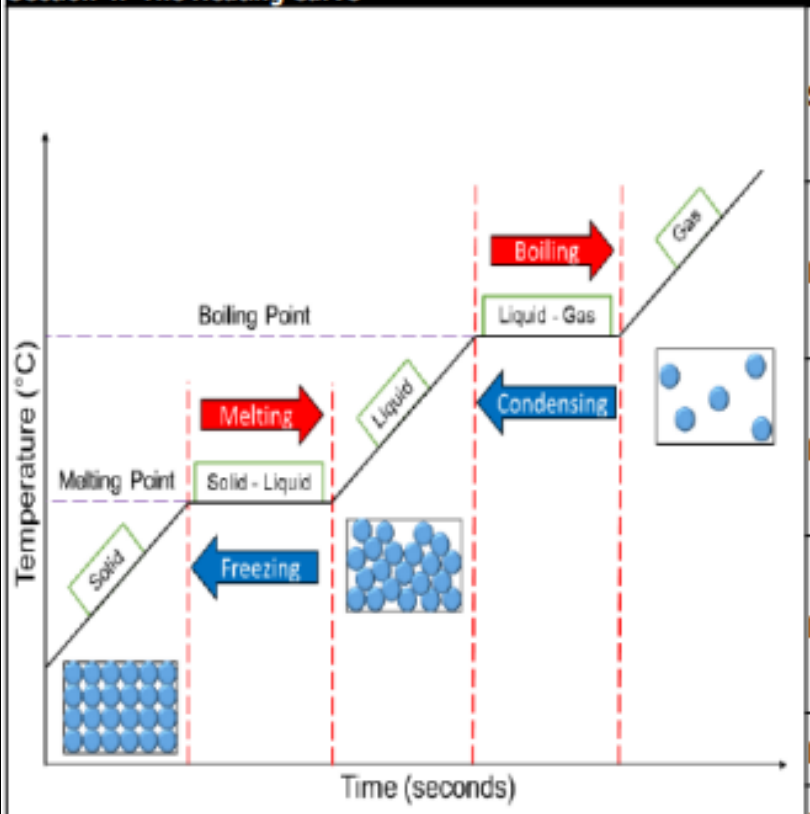


Changes of state

Condensation	Process in which a gas turns into a liquid
Evaporation	Process in which a liquid turns into a gas
Freezing	Process in which a liquid turns into a solid
Melting	Process in which a solid turns into a liquid
Sublimation	Process in which a solid turns into a gas

PHYSICS - Particle model of matter

Section 4: The Heating Curve



Solid	Particles are closely packed, fixed and arranged in regular layers. As more energy is absorbed the kinetic energy and therefore the internal energy of the material increases.
Melting	Temperature doesn't change. Energy is used to weaken the forces between particles. As more energy is absorbed the potential energy and therefore the internal energy of the material increases.
Liquid	Particles are touching but no longer arranged regularly. They are able to move. As more energy is absorbed the kinetic energy and therefore the internal energy of the material increases.
Evaporation	Temperature doesn't change. Energy is used to weaken the forces between particles. As more energy is absorbed the potential energy and therefore the internal energy of the material increases.
Boiling point	The temperature at which a liquid boils and turns into a gas
Melting point	The temperature at which a solid melts and turns into a liquid.
Gas	Particles move randomly. As more energy is absorbed the particles move more quickly and the temperature increases.

State	Particle arrangement	Distance between molecules	Strength of forces	Movement of particles	Internal energy
Solid	Fixed	Close together	Strong	vibrates	Lowest internal energy
Liquid	Not fixed	Touching but not arranged regularly	Weak	Move about	Higher than solids but lower than gases
Gas	Not fixed	Far apart	Very weak (insignificant)	Move about freely	Highest internal energy.

Section 5: Internal energy

The energy stored by the **particles** of a substance is called its **internal** energy. This is caused by their individual motions and positions. The internal energy is the sum of a particles

- **kinetic energy** (due their individual motions relative to each other.)
- **potential energy** (due to their individual positions relative to each other.)

Increasing the temperature increases the **internal energy** of a substance because:

- Increasing temperature increases kinetic energy
- If it melts or boils, the potential energy increases.

Section 6: Specific latent heat

The **latent heat** is the **energy needed** for a substance to **change its state without changing** its **temperature**.

Specific latent heat of fusion $L_f = \frac{\text{energy, E}}{\text{mass, m}}$

Specific latent heat of vaporisation $L_v = \frac{\text{energy, E}}{\text{mass, m}}$

Section 7: Gas Pressure

Gas Pressure	Caused by the force exerted when particles collide with their container
Increasing temperature increases the gas pressure	Gas molecules move faster and hit the surfaces with more force. The number of impacts between the gas molecules and the surface of the container increases, so the total force of impact increases
Motion of gases	The unpredictable motion of smoke particles is evidence of the random motion of gas molecules – this is called Brownian motion

PLYMPTON ACADEMY

TERM ONE & TWO

HANDBOOK

YEAR 10