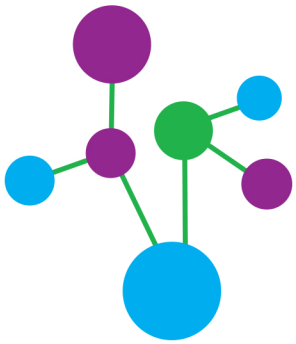
NAME: _____

TERM 1&2

YEAR 11

CORE



PLYMPTON ACADEMY

HANDBOOK

TERM 1&2

Romeo and Juliet by William Shakespeare

Prologue: A sonnet, recited by the chorus, outlines the play.

Act 1

Act I, Scene 1: Capulet and Montague servants fight in the streets. Benvolio tries to break them up, but Tybalt arrives and challenges him. The Prince arrives and declares that any further fighting will be punished with death. After this, the Montagues discuss Romeo's melancholy state and Benvolio learns Romeo is in love with Rosaline.

Act I, Scene 2: Paris seeks Capulet's permission to marry his daughter Juliet. Capulet says she is too young, but Paris should try to win her affections at his banquet. Capulet's invitation list is intercepted by Benvolio and Romeo, who decide to attend the event.

Act I, Scene 3: The Nurse and Lady Capulet tell Juliet about Paris, and she agrees to consider him as a potential suitor.

Act I, Scene 4: Romeo, Benvolio, and Mercutio arrive at the banquet, and Mercutio banters with Romeo.

Act I, Scene 5: Romeo and Juliet see each other and fall in love immediately. Tybalt sees Romeo and wants to fight him, but Lord Capulet stops him.

Act 2

Act II, Scene 1: Romeo separates himself from his friends as they leave the party.

Act II, Scene 2: Romeo listens to Juliet at her balcony, and they exchange vows to marry. Juliet says she will send a messenger to Romeo the next day to arrange the wedding.

Act II, Scene 3: Romeo goes to see Friar Lawrence to ask for his help with marrying Juliet. The Friar agrees, hoping that their alliance will end their families' feuding.

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Act II, Scene 5: The Nurse returns to an impatient Juliet. She teases her charge by withholding the message but then tells her the good news.

Act II, Scene 6: Juliet comes to Romeo in Friar Lawrence's cell, and they greet each other joyfully. The Friar prepares to marry them.

Act 3

Act III, Scene 1: Benvolio and Mercutio encounter Tybalt, and Mercutio mocks him.
Romeo arrives and refuses to accept Tybalt's challenge to a duel (due to his secret marriage to Juliet). Mercutio thinks this is cowardly so fights on his behalf. Romeo tries to intervene and Mercutio is killed under his arm, cursing the families as he dies. Romeo fights and kills Tybalt to get revenge. At Benvolio's urging, Romeo flees. The Prince appears and interrogates Benvolio. Judging Tybalt to be guiltier than Romeo, he spares the latter the death sentence but banishes him from Verona.

Act III, Scene 2: Juliet longs for night, when Romeo is to come. The Nurse brings her word of Tybalt's death and Romeo's banishment, and volunteers to bring Romeo to the distraught girl.

Act III, Scene 3: Romeo is in a state of anger and disbelief, hiding with the Friar. The Nurse arrives with word of Juliet's distress. The Friar chastises Romeo for behaving so foolishly and proposes that, after a night with Juliet, Romeo should flee to Mantua until everything is cleared up. Romeo agrees and leaves.

Act III, Scene 4: Capulet decides to marry Juliet to Paris in three days to cheer her up.

Act III, Scene 5: Romeo and Juliet awake after spending the night together and Romeo leaves. Lady Capulet arrives and tells Juliet about her impending marriage. Julie refuses and her parents fly into a rage. The Nurse advises that Juliet ignore her marriage to Romeo, which no one else knows about, and marry Paris.

Act 4

Act IV, Scene 1: Juliet interrupts Paris talking to Friar Lawrence and, when he leaves, threatens to kill herself if the Friar doesn't help her. He agrees to provide her with a potion that will make her seem to be dead, until Romeo collects her from the family crypt.

Act IV, Scene 2: Juliet apologizes to her father, promising to obey him and marry Paris. Capulet moves the wedding up a day to the next morning.

Act IV, Scene 3: Juliet drinks the potion.

Act IV, Scene 4: Capulet sends the Nurse to awaken Juliet on the morning of her wedding day.

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Act V, Scene 1: Balthasar arrives in Mantua and tells Romeo that Juliet has
died. Romeo immediately plans to join her and buy a poison from and Apothecary.

Act V, Scene 2: Friar John reports to Friar Lawrence that he has been unable to deliver Lawrence's letter to Romeo. Lawrence sends John to fetch
a crow bar, planning to open the vault and take Juliet into hiding in his own cell until Romeo can be summoned.

Act V, Scene 3: Paris visits Juliet's tomb at night. Romeo appears with Balthasar, whom he sends away with a letter to Montague. Paris steps forth
to challenge him. They fight, and Romeo kills Paris. Romeo then enters the crypt, drinks the poison, and dies. Friar Lawrence arrives tells Juliet what has happened and begs her to flee. She refuses and stays. She kisses her dead lover and stabs herself with his dagger. The watchmen appear, arresting Balthasar and the Friar as the Prince arrives, followed by both families. The Friar explains what has happened, and his tale is confirmed by Balthasar and by Romeo's letter to his
father. Montague and Capulet make peace and vow to erect golden statues of the two lovers.

Historical context

Queen Elizabeth I – She was queen while Shakespeare was writing, and supported him. Elizabeth I made Protestantism the official religion of England, which angered many Catholics, and led to much conflict. Shakespeare may be referencing this in 'Romeo and Juliet', with the two warring families.

Patriarchy – patriarchal societies are ones where men are dominant, and have control over women e.g. by choosing who they would marry. Nurses – employed by wealthy families to feed and care for their children.

The Humours – Elizabethans believed the body contained four 'humours': blood, phlegm, yellow bile and black bile. The amount you had of each determined your personality. People with too much phlegm are emotional. People with too much blood are irresponsible and gluttonous. People with too much yellow bile are violent and vengeful. People with too much black bile are depressed and self- centred.

Fate - the belief that your life is mapped out for you, or 'written in the stars'. Many Elizabethans believed God decided your fate, and that astrology could help you identify your course in life.

Bubonic Plague/Black Death – a plague that killed many people. Sufferers were quarantined in their houses, with a red 'X' painted on the door, and left to die.

Critical Vocabulary:

Shakespeare presents the Montagues and their supporters as…

Romeo

1. Melancholic – someone who is prone to moping and being depressed.
2. Quixotic – extremely idealistic: unrealistic and impractical.
3. Ardent – enthusiastic and passionate.

Benvolio

1. Appeasing- someone who tries to pacify others.
2. Sincere - honest and genuine.
3. Stalwart – loyal and reliable.

Mercutio

1. Anarchic – unruly and chaotic.
2. Impulsive – someone who acts on a whim, without thinking.
3. Precocious – someone who 'shows off' their intelligence arrogantly.

Shakespeare presents the Capulets and their supporters as…

Juliet

1. Idealistic – someone who believes whole-heartedly in something, even if it is unrealistic.
2. Ingenuous – innocent, naïve and unworldly.
3. Resolute – someone who has made their mind up and whose opinion cannot be changed.

Tybalt

1. Volatile – someone who could explode at any moment.
2. Tempestuous –someone who is unpredictable and has many conflicting emotions.
3. Righteous – someone who believes what they are doing is morally justifiable.

Nurse

1. Maternal – motherly.
2. Submissive – will bend to a dominant authority and 'do what they are told'

Techniques and terminology

Prologue – sets up the story and foreshadows events.

Foreshadowing – when an author drops hints about what will happen through language or symbolism.

Dramatic irony – when an audience knows something the characters do not.

Symbolism – when an image represents an idea, e.g. light symbolises happiness, flowers symbolise youth etc.

Soliloquy- When a character, thinking they are alone, speaks their thoughts aloud.

Rhyming Couplets – two lines next to each other that rhyme with each other, often used for dramatic impact.

Oxymoron- the combination of words or ideas that have opposite or very different meanings.

Pun- a joke based on the different possible meanings of a word or the fact that there are words that sound alike but have different meanings.

Prose- lines which use a natural, unstructured rhythm similar to speech

Key themes:

Conflict
Power
Fate
Loyalty
Family
Religion
Love
Hatred
Violence
Death

Symbolism:

Light- Juliet's beauty, hope and optimism, the overwhelming power of Romeo and Juliet's love.

Darkness- The secrecy of Romeo and Juliet's love, loss of hope, Romeo and Juliet's impending death.

Poison- It is in the power of human hands and human will to extract potential evil or fatal harm from an object or thing.

Key terms:

Hamartia- a fatal flaw leading to the downfall of a tragic hero.

Hubris- exalted pride of the protagonist which leads to their defiance of authority.

Peripeteia- A sudden negative reversal in fortune or change in circumstances leading to downfall.

ENGLISH LITERATURE

Blood Brothers- Literature Paper Two.

Vocabulary	Definition
Poverty	Lacking in money linked to deprivation in social conditions, housing and education
Wealth	The abundance of money or possessions
Liverpudlian	A person who comes from Liverpool (often with a distinct accent)
Deceit	Concealing or misrepresenting the truth
Death	Ending of life
Innocence	The state of being pure and lacking in corrupt behaviour
Superstition	Irrational belief in widely held supernatural instances
Class System	The concept that there is more than one social class of people: working class, middle class and upper class and the rules which govern the lives of people in different classes lead to societal unfairness
Hierarchy	Ranking of members of society due to status or authority
Disillusioned	Disappointment in someone or something that appears to be less good than initially thought
Condescension	A patronising, condescending attitude towards others
Snobbery	The character or quality of being a snob
Underprivileged	Not having access to the same standard of living as other people in society
Omniscient Narrator	All knowing narrative voice
Dialogue	Speech
Accent	A distinctive way of pronouncing words
Dramatic Irony	From Greek tragedy: the audience is aware of the importance of events but the characters are not
Foreshadowing	Predicting or warning of a future event in the text
Pathetic Fallacy	Linking of nature and weather to human emotions/moods
Metaphor	Where one thing becomes another in a comparison
Musical	The form of the play: music plays an important part in revealing the action/events
Symbolism	Using symbols in literature to represent ideas or qualities
Motif	A dominant or recurring idea in the play

SKILLS

Analysis Points:

Link to the question

Link to the terminology (Lang/Structure – evaluating choice)

Short Quote(s) -or Moment

Explain meaning and effect – both obvious and hidden (explicit and implicit)

Zoom in on words/explore connotations and effect

Suggest what other readers might think/feel (offering an alternative opinion)

Link to the writer's intentions (step out from the close analysis to give an overview of meaning)

Explore a linking quote/supporting idea

KEY THEMES

Wealth, Poverty, Class, Superstition, Childhood, Death

ESSAY QUESTION– 45 mins (including planning time)

Typical Questions

Write about the theme of _____ and how it is presented at different points in the play/text

In your response you should:

- **refer to the extract and the play as a whole;**
- **show your understanding of theme and events in the play. [35+5]**

5 of this question's marks are allocated for accuracy in spelling, punctuation and the use of vocabulary and sentence structures.

This question assesses AO1, AO2 and AO4 (5 additional marks).

Event Guide:

Act 1

- The narrator introduces the plot in a Greek Chorus (we realise the play is a tragedy)
- Meet two very different women, Mr J v poor agrees to give away one of her twins to Mrs L who is rich.
- Meet the twins ages 7: they are very different in many ways (nurture) but do have quite similar natures. They're treated differently by the police/school.
- Mrs L is paranoid her son will discover his adoption so moves the family to the country to get away from Mickey and Mrs J. Years later, the council rehouses the Johnstone family in the country.

ACT 2

- The boys meet again aged 14 and their friendship continues. The boys, again, display similar natures. They have very different qualities if education. Mickey is in love with Linda.
- Mrs L becomes increasingly mad at the thought of Edward finding out and tries to kills Mrs J.
- Aged 18, Edward goes to university and Mickey to a full-time job which he hates. The gap is widening between them.
- Linda is pregnant so she & Mickey marry. Mickey loses his job, helps Sammy rob a garage & is sent to prison. Nothing is the same for him and Linda again.
- Mickey is released from prison but is addicted to anti-depressants. Desperate, Linda asks Edward for help. He gets them a house & Mickey a job, but starts a brief affair with Linda.
- Mrs L tells Mickey about the affair, he confronts Edward with a gun in the council chamber. Mrs J reveals that they are twins. Mickey shoots Eddie and the police kill Mickey.

MRS JOHNSTONE

- "He told me I was sexier than Marilyn Monroe" Recurring motif – Her looks were all she had going for her and when they were gone so was her husband.
- "By the time I was twenty-five, I looked like forty-two" Hyperbole – showing the impact on her appearance of having a hard life and so many children so young.
- "during the dance, she acquires a brush, dusters and a mop" stage directions – showing that she is happy to be working even if it is in a menial job
- "never put new shoes on a table" Foreshadowing – this superstition suggests that something bad will happen right from the start of the play. Mrs Johnstone believes in these superstitions.
- "silver trays to take meals on" / "a bike with both wheels on" – Mrs J & Mrs L Juxtaposition – Highlights the different lifestyles both boys would have. Envy from Mrs J. too
- "Mrs Lyons shows the Bible to Mrs Johnstone" Religious imagery and stage directions – showing how once a pact has been made and sworn on the bible you can't change your mind. Important symbolically as this is the point of no return in giving a baby away.
- "don't you ever come round here again" / "I'm very sorry, but it's Edward's bedtime" – Mrs J and Mrs L juxtaposition of the characters
- "She removes a locket from around her neck" Symbolism
- "bright new day, we're goin' away" Foreshadowing and cheerful tone
- "I curse you! Witch!" – Mrs L to Mrs J hyperbole

THE NARRATOR

- "I'm up to here with hard luck stories" – Milkman/narrator
- First person – shows a lack of caring and the poverty that the family live in.
- "the devil's got your number" – narrator
- Foreshadowing –song shows us that she won't get away with giving up her son
- did you never hear how the Johnstones died" – narrator Foreshadowing - the narrator tells us the ending at the start of the play
- "the mother, so cruel, there's a stone in place of her heart" – narrator Hyperbole – The narrator exaggerates how horrible Mrs J. is which we find out if not true. He is being very judgemental and patronising towards her.
- "a debt is a debt, and must be paid" – narrator repetition – here the narrator is giving a double meaning, physical money and the fact that she will have to pay for giving up her child.
- "There's a mad man" – narrator Alliteration – referring to Mickey and his desire to kill Edward with the gun from Sammy's robbery.
- "Do we blame superstition for what came to pass? Or could it be what we, the English, have come to know as class?" – the narrator
- Rhetorical questions – questioning tone as to whether the blame lies with society rather than the characters themselves.
- "Did you ever hear the story of the Johnstone twins, as like each other as two new pins" – narrator Cyclical structure of the novel – repetition of the opening – showing their deaths were inevitable from the start.
- "the music pulsates and builds" stage directions – showing the culmination of the action and the building to the deaths

EDWARD/MICKEY

- "mam" / "mummy" "pissed off" / "you say smashing things" "the two of them immediately wriggle and giggle with glee" – Edward and Mickey Juxtaposition and difference in speech patterns
- "we're blood brothers" Mickey and Edward Symbolism – childhood ritual and the fact they are actually twins
- "if you cross your fingers and if you count from one to ten" – the children Foreshadowing – showing childhood beliefs and superstitions
- "Peter Pan" Symbolism of never growing up – foreshadowing later difficulty when both boys do grow up
- "take a flying fuck at a rolling donut" / "it's borin'" Juxtaposition - of trouble at school for Mickey and Edward
- "a game of piggy-in-the-middle" the stage directions and foreshadowing – showing where Linda is in the middle of Mickey and Edward throughout both their childhood and into adulthood too.
- "workin' overtime" / "I go away to university tomorrow" – Mickey and Edward statements – shows the contrast in lifestyles and class for both boys
- "How come you got everything… an' I got nothin'?" – Mickey, to Edward Dialogue – jealousy from Mickey to Edward showing he sees the unfairness in society
- "I could have been him!" – Mickey shouting accusatory tone –how unfair the whole situation has been and despondency Mickey at his poverty
- "walkin' round in circles" – Mickey Tone – Mickey is resentful and angry at what has happened
- "I grew up. An' you didn't, because you didn't need to" – Mickey to Edward Emotive language – shows jealousy of Edward's freedom, money and Uni.
- "chronically depressed" – Mickey Emotive language – Mickey is reliant on pills after prison.
- "You sorted it out. You and Councillor Eddie Lyons" – Mickey Sarcastic tone –not grateful for Eddie's help.
- Edward is "on a platform" stage directions –Edward is isolated and an easy target

MRS LYONS

- "give one to me" imperative – demanding tone showing that she is desperate for a baby and will do anything to get one.
- "How can you possibly avoid some of them being put into care?" Rhetorical Question – persuade her to give one of the twins to her.
- "You'll be locked up" Directive – threatening Mrs J.
- "It's just… just this place" repetition – shows her bad state of mind
- "has a lethal-looking kitchen knife in her hand" Stage directions – she is trying to stab Mrs J. showing that she is going mad.

MINOR CHARACTERS

Mr Lyons
"it's a sign of the times, Miss Jones" Statement – showing that there is no work for anyone (linking to Mickey being unemployed and unable to find a job).

Police
"he was about to commit a serious crime" / "it was more of a prank, really" juxtaposition of the treatment of Mickey and Edward by the police – unfairness and class stereotyping

Sammy
"Sammy burnt the school down" Foreshadowing – that he will be trouble and lead Mickey into trouble too.

Schoolteacher
"This is a boys' school, Lyons" –negative tone – showing Edward getting into trouble.

ENGLISH LITERATURE

Romeo and Juliet by William Shakespeare.

Prologue: A sonnet, recited by the chorus, outlines the play.

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Act I, Scene 1: Capulet and Montague servants fight in the streets. Benvolio tries to break them up, but Tybalt arrives and challenges him. The Prince arrives and declares that any further fighting will be punished with death. After this, the Montagues discuss Romeo's melancholy state and Benvolio learns Romeo is in love with Rosaline.
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Key themes:

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ENGLISH LITERATURE

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.

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.

Kamikaze- Beatrice Garland

Content, Meaning and Purpose -In World War 2, Japanese Kamikaze pilots would fly manned missiles into targets such as ships. - This poem explores a kamikaze pilot's journey towards battle, his decision to return, and how he is shunned when he returns home. - As he looks down at the sea, the beauty of nature and memories of childhood make him decide to turn back.

Language
-The Japanese word 'kamikaze' means 'divine wind' or 'heavenly wind', and has its origin in a heaven-sent storm that scattered an invading fleet in 1250.
-"dark shoals of fish flashing silver": image links to a Samurai sword – conveys the conflict between his love for nature/life and his sense of duty. Also has sibilance.
- "they treated him as though he no longer existed": cruel irony – he chose to live but now must live as though he is dead.
-"was no longer the father we loved": the pilot was forever affected by his decision.

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

Ozymandias by Percy Bysshe Shelley

Content, Meaning and Purpose -The narrator meets a traveller who tells him about a decayed statue that he saw in a desert. -The statue was of a long forgotten ancient King: the arrogant Ozymandias, 'king of kings.' -The poem is ironic and one big metaphor: Human power is only temporary – the statue now lays crumbled in the sand, and even the most powerful human creations cannot resist the power of nature.

Language
-'sneer of cold command': the king was arrogant, this has been recognised by the sculptor, the traveller and then the narrator.
-'Look on my works, ye Mighty, and despair.': 'Look' = imperative, stressed syllable highlights commanding tone;
ironic – he is telling other 'mighty' kings to admire the size of his statue and 'despair', however they should really despair because power is only temporary.
'The lone and level sands stretch far away.': the desert is vast, lonely, and lasts far longer than a statue

My Last Duchess by Robert Browning

Content, Meaning and Purpose -The Duke is showing a visitor around his large art collection and proudly points out a portrait of his last wife, who is now dead. He reveals that he was annoyed by her over-friendly and flirtatious behaviour. -He can finally control her by objectifying her and showing her portrait to visitors when he chooses. - He is now alone as a result of his need for control. - The visitor has come to arrange the Duke's next marriage, and the Duke's story is a subtle warning about how he expects his next wife to behave.

Language
-'Looking as if she was alive': sets a sinister tone.
-'Will't please you sit and look at her?' rhetorical question to his visitor shows obsession with power.
-'she liked whate'er / She looked on, and her looks went everywhere.': hints that his wife was a flirt.
-'as if she ranked / My gift of a nine-hundred-yearsold name / With anybody's gift': she was beneath him in status, and yet dared to rebel against his authority.
-'I gave commands; Then all smiles stopped together': euphemism for his wife's murder.
-'Notice Neptune, though / Taming a sea-horse': he points out another painting, also about control.

Cluster Three- The Power of Identity.

Tissue by Imtiaz Dharker

Content, Meaning and Purpose -Two different meanings of 'Tissue' (homonyms) are explored: firstly, the various pieces of paper that control our lives (holy books, maps, grocery receipts); secondly, the tissue of a human body. -The poet explores the paradox that although paper is fragile, temporary and ultimately not important, we allow it to control our lives. -Also, although human life is much more precious, it is also fragile and temporary.

Language
-Semantic field of light: ('Paper that lets light shine through', 'The sun shines through their borderlines', 'let the daylight break through capitals and monoliths') emphasises that light is central to life, a positive and powerful force that can break through 'tissue' and even monoliths (stone statues).
-'pages smoothed and stroked and turned': gentle verbs convey how important documents such as the Koran are treated with respect.
-'Fine slips [...] might fly our lives like paper kites': this simile suggests that we allow ourselves to be controlled by paper.

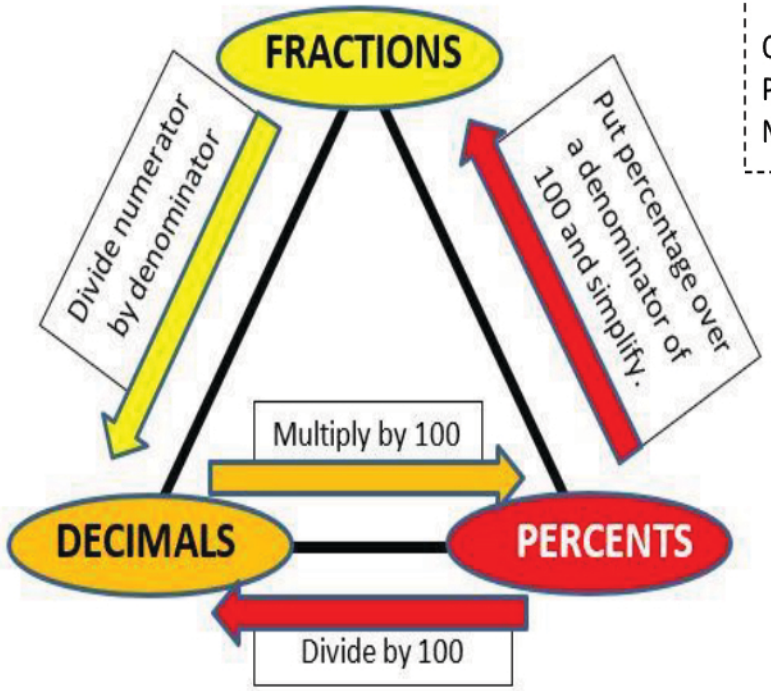
Checking Out Me History by John Agard

Content, Meaning and Purpose -Represents the voice of a black man who is frustrated by the Eurocentric history curriculum in the UK – which pays little attention to the black history. -Black history is quoted to emphasise its separateness and to stress its importance.

Language
-Imagery of fire and light used in all three stanzas regarding black historic figures: "Toussaint de beacon", "Fire-woman", "yellow sunrise".
-Uses non-standard phonetic spelling ("Dem tell me wha dem want", to represent his own powerful accent and mixes Caribbean Creole dialect with standard English.
-"I carving out me identity": metaphor for the painful struggle to be heard, and to find his identity.

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	$P = a + b + c$	$A = \frac{1}{2}(b \times h)$
Square	$P = 4b$	$A = b^2$
Rectangle	$P = 2(b+h)$	$A = (b \times h)$
Parallelogram	$P = 2(b+h)$	$A = (b \times h)$ *b = the length*
Rhombus	$P = 2(b+w)$	$A = (b \times h)$ *b = the length*
Trapezium	$P = a + b + c + d$	$A = \frac{1}{2}(a+b)h$

Stage 7

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

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

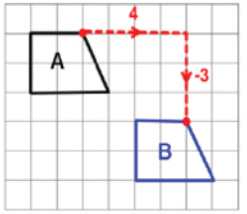
When a shape is **translated**, it is **moved to a different position**, without being turned or flipped.

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

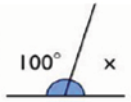
The **top** number is the **horizontal** movement:
← *left if negative* or *right if positive* →

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

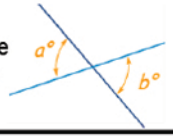
Translate shape A by the vector $\begin{pmatrix} 4 \\ -3 \end{pmatrix}$



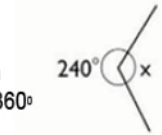
Angles on a straight line add up to 180°

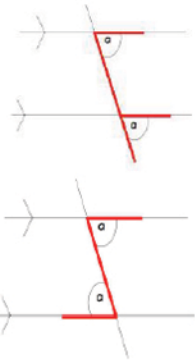


Vertically opposite angles are equal



Angles around a point add up to 360°



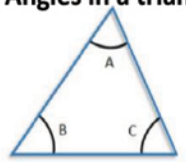


Corresponding Angles
F shape
Angles are equal

Alternate Angles
Z shape
Angles are equal

Stage 8

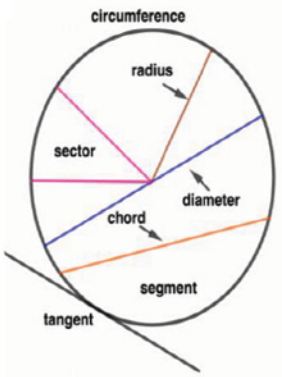
Angles in a triangle



A + B + C = 180°

Regular Polygons

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



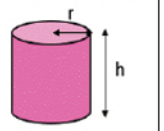
Circumference

$C = \pi D$

Area

$A = \pi r^2$

Volume of a Cylinder

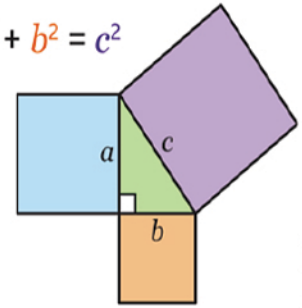


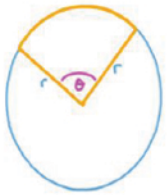
Volume = $\pi r^2 h$

Stage 9

Pythagoras Theorem

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





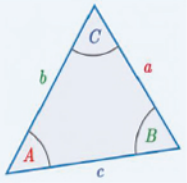
Arc length = $\frac{\theta}{360} \times \pi d$

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: $\frac{1}{2}ab\sin(C)$

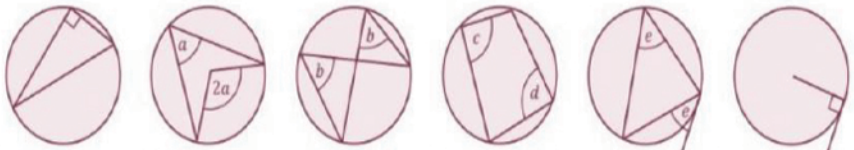
Sine Rule: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

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

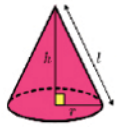
Opposite angles in a cyclic quadrilateral total 180°

Alternate segment theorem

Tangent and radius are perpendicular

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

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

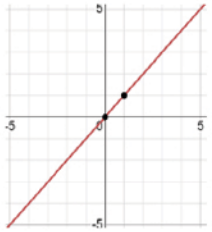


Curved surface area of cone $= \pi rl$ where l is the slant height

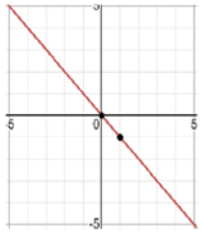
Volume of cone $= \frac{1}{3}\pi r^2 h$

Maths Knowledge Organiser - Algebra

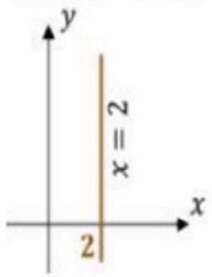
Stage 7

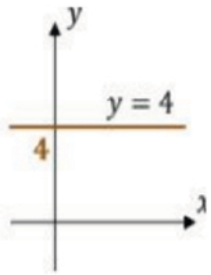


y = x



y = -x





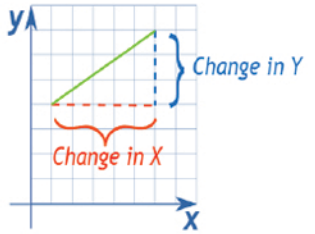
Stage 8

The general equation of any straight line is:

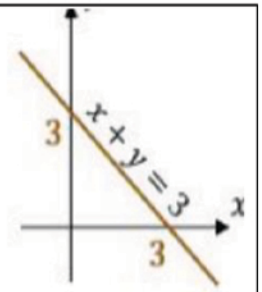
$$y = mx + c$$

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

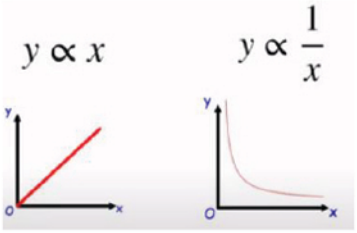
m is the **gradient** (steepness) of the line

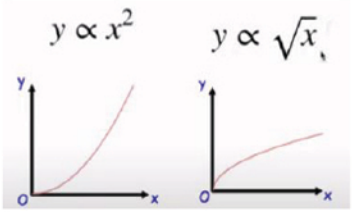


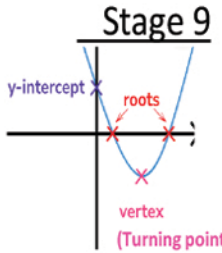
$$\text{Gradient} = \frac{\text{Change in Y}}{\text{Change in X}}$$



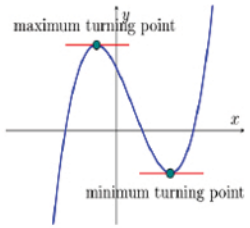
Stage 9

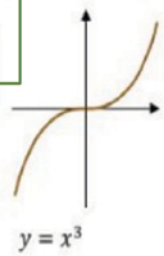


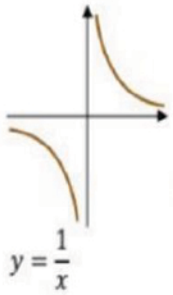




Straight line graphs-
Parallel lines have the same gradient
$m_1 = m_2$







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

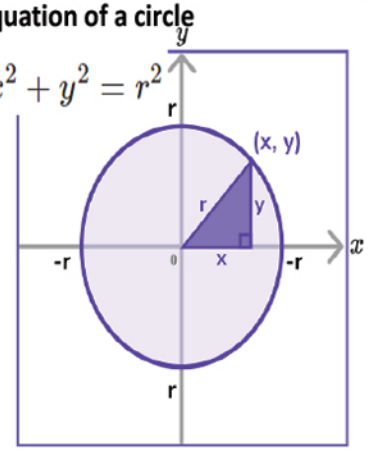
$$ax^2 + bx + c = 0$$

Quadratic Formula

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

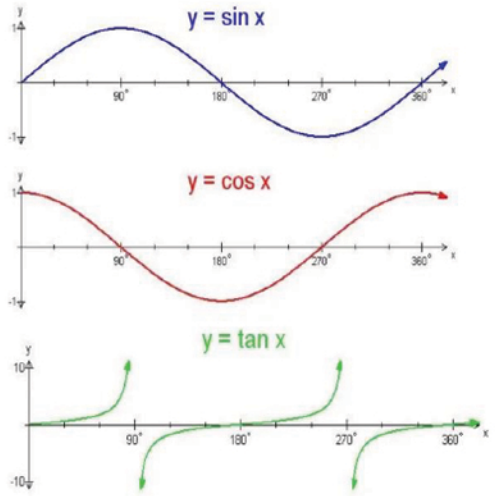
Equation of a circle

$$x^2 + y^2 = r^2$$



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

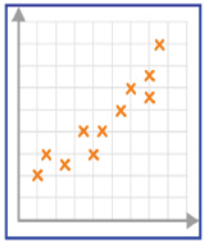
Find the most frequently occurring item in the data set

Range – Not an average – measures consistency

Biggest value - Smallest value

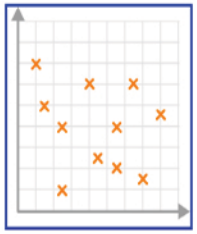
Stage 8

Positive correlation



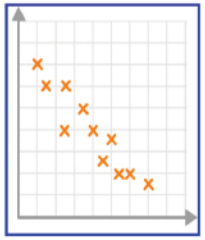
- As one variable increases so does the other
- Upward trend in the data

No correlation

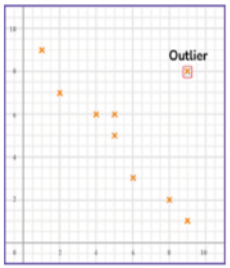


- No trend between the variable
- Plots are random and no linear pattern.

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.

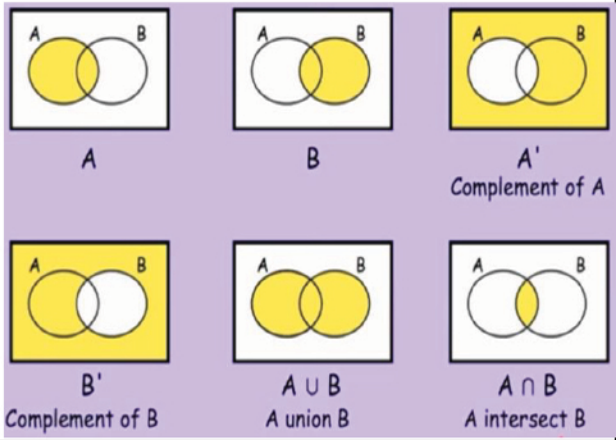
Dependent events are events which **are** affected by the occurrence of other events.

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



Variation

- **Genetic** – inherited e.g. eye colour, hair colour
- **Environmental** – scars, tattoos, piercings
- **Both** – skin colour (tan), hair style (naturally curly but straightened)

Chromosome – long strands of DNA (23 pairs in normal cells, 23 in sex cells (gametes))
DNA – double helix, all info to make an organism

Sexual Reproduction
- Fertilisation
- Gametes
- Genetic variation in offspring

Asexual Reproduction
- No fertilisation
- No gametes
- Identical clones are made
- E.g. runners in plants

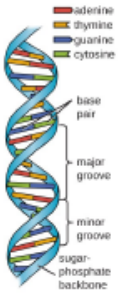
Gender Determination

XX = female
XY = male

During meiosis, 1 sex chromosome goes into one gamete, and the other goes into a second gamete.

The **punnet square** shows there is a **50%** chance of having a boy or a girl every time.

	X	Y
X	XX	XY
X	XX	XY



DNA – Instructions to make an organism.

- Double helix polymer
- Sugar phosphate backbone
- Nucleotides made up of 4 bases that pair up A-T and G-C.
- Every 3 base pairs is the instructions given to a ribosome to make an **amino acid**. These are combined to make **proteins**.

Sections of coding parts of DNA are called **genes**. Non-coding sections of DNA can turn on and off different genes to make different proteins.

Mutation -= change (mistake) in DNA
Mutations in coding = change to characteristic
Mutations in non-coding = bigger changes to the organism

Genome– All genes of an organism

Human Genome Project - map out all 21000 genes

Advantages of HGP	Issues and Concerns with HGP
• Cancer diagnosis • Forensics • Evidence for evolution	• Genetic discrimination • Re-engineer human species • Very expenisive

Genetic Crosses

e.g. A heterozygous brown eyed dog mates with a homozygous blue eyed dog. Brown eyes is dominant.

1. Write genotype of parents

Bb x bb

2. Draw punnet square, write parents on top and side and fill in the boxes

	b	b
B	Bb	Bb
b	bb	bb

3. Write out the possible phenotypes of the offspring

50% chance heterozygous brown eyed
50% chance homozygous blue eyed
or a 1:1 chance of brown : blue

Gene – a section of DNA that codes for 1 characteristic

Allele – different forms of a gene

Genotype – Symbols used to show genes for 1 characteristic e.g. Bb

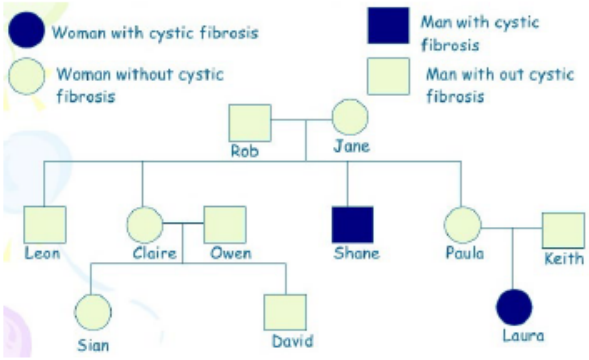
Phenotype – Description of genes e.g. Brown eyes

Homozygous – Both genes are the same i.e. BB or bb

Heterozygous – Both genes are different i.e. Bb

Genetic Diseases

- Polydactyly – **dominant** allele – extra finger or toe
- Cystic Fibrosis – **recessive** allele – excess mucus



Rob and Jane must be Ff (where f means has CF)

Ff x Ff

	F	f
F	FF	Ff
f	Ff	ff

25% chance of CF

Genetic Engineering – adding wanted characteristics to organisms.

e.g. Making Insulin

1. Remove wanted insulin gene using enzymes
2. Take a plasmid from a bacteria (vector)
3. Open plasmid and insert insulin gene with DNA ligase
4. Put plasmid back in bacteria
5. Incubate to allow bacteria to grow and make insulin.

GM Crops

+ Resistant to insects, viruses, fungi
+ Grow bigger, taste better, more nutritious
+ Crops can be grown all over the World
+ Increased crop yield

- Worries over long term effects
- Reduced biodiversity
- Could develop allergies to the food
- Herbicide resistant gene could spread to weeds making superweeds!

Natural Selection

1. Variation occurs naturally within a species due to mutations
2. Some organisms have adaptations increasing their chances of survival
3. These organisms are more likely to reproduce
4. The genes responsible for the adaptation are passed on to their offspring.

Reasons why people didn't believe Darwin at first:
- Against religious beliefs
- They didn't know about genes or mutations at the time so Darwin couldn't explain why some organisms had more useful characteristics
- Not enough evidence

Selective Breeding

Humans breed animals/plants to gain desirable characteristics in offspring (takes many generations).

e.g. disease resistance, increased milk production, behaviour, scented flowers etc.

Downsides – Reduces variation limiting success of survival if conditions change, new diseases might wipe out every member of the same species, inbreeding in animals leads to defects.

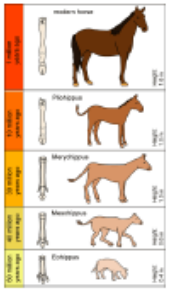
Fossils

These can be made from:

- Bones and teeth
- Minerals that have replaced bone and tissue
- Organisms trapped in amber or ice
- Burrows, tracks, where organisms have laid

Softer body parts such as tissue, muscle etc. **decay** if conditions are suitable.

Fossil record - collection of fossils that show evolution of an organism over many years.



- Usually incomplete as most organisms don't become fossils, softer bodies decay, fossils melt underground due to Earth movement, not been found yet,

- Usually need to comment on changes over time e.g. shape, length or number of bones.

Extinction - Living things become extinct because:

- Habitat changes – not adapted to survive
- New predator – not adapted to get away or hide
- Disease – lack of immunity
- New, more successful competitor – better adapted species will get food, space, water etc.

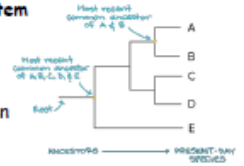
Classification

Carl Linnaeus	Carl Woese

• Grouped according to characteristics and structures that make up organisms.
• Kingdom, Phylum, Class, Order, Family, Genus, Species
	• Three-domain system
	• Based on new chemical analysis techniques that prove some species aren't as closely related as once thought.
	  ▪ Archaea – primitive bacteria
	  ▪ Bacteria – true bacteria
	  ▪ Eukaryota – fungi, animals, plants, protists
	• These are sub-divided into K,P,C,O,F,G and S.

Organisms are named using **binomial system** (genus and species in latin) . It is used worldwide regardless of language.

Evolutionary trees show common ancestors . The more recent the common ancestor, the more closely related they are.

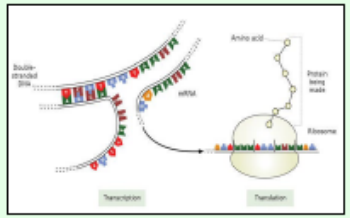


History of Genetics

TRIPLE ONLY

- **Mendel** studied pea plants and discovered that characteristics are controlled by 2 'units' that can be dominant or recessive.
- In the late 19th century behaviour of chromosomes during cell division was observed.
- In the early 20th century it was observed that chromosomes and Mendel's factors behaved in similar ways, leading to the idea that the factors (genes) were located on chromosomes.
- In the mid-20th century the structure of DNA was determined and the mechanism of gene function worked out.

Protein Synthesis



1. DNA strands unwind.
2. A corresponding template of ATGC is made called mRNA.
3. This leaves the nucleus and binds to a ribosome.
4. With the help of tRNA, amino acids are made.
5. The protein is then released from the ribosome.

Animal Cloning

TRIPLE ONLY

Adult Cell Cloning – makes copy of adult

1. Take nucleus from an adult cell
2. Take nucleus out of an egg cell
3. Put adult nucleus into empty egg cell
4. Electric shock
5. When it becomes an embryo, insert into uterus

Embryo Transplant – makes cloned offspring

1. Sperm and egg mixed in petri dish
2. Grow into an embryo
3. Split the embryo into cells
4. Each cell develops into an identical embryo
5. Insert into host uteruses

Plant Cloning

Cuttings – Cut a bit off and plant it.
- Cheap and quick

Tissue Culture – Cells put in growth medium with hormones. Grown all year, can make lots, more expensive.

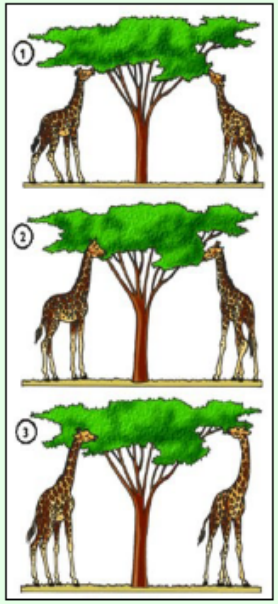
Evolution Theories

TRIPLE ONLY

Lamarck – the more a characteristic is used the more developed it becomes and is then passed on to offspring. *(which is nonsense!)*

E.g. Giraffes stretched their necks to reach higher food and passed on the characteristic to their offspring.

Darwin proposed that a mutation made some giraffes have longer necks so they would be more likely to eat, survive and reproduce.



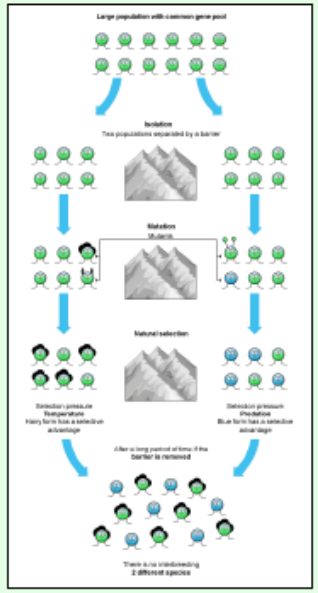
Speciation – making a new species

TRIPLE ONLY

A new species is made by:

Alfred Wallace wanted to publish his findings on natural selection before Darwin which prompted the Origin of the Species.

1. Geographical **isolation** (species split by water or mountains)
2. Genetic variation in both groups means some are more adapted to survive in their own conditions
3. Natural selection – best breed and pass on desirable genes
4. Speciation – new species can't interbreed with the other species



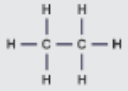
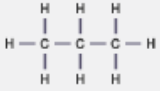
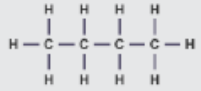
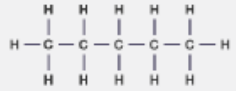
Key Terminology – Health & Disease

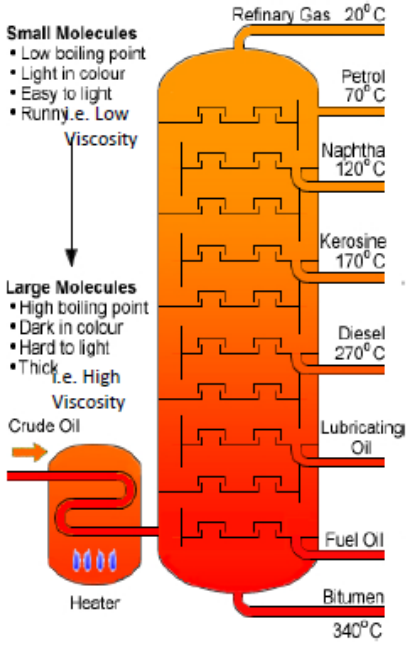
Key Word	Definition
Antibiotics	Medicines that help to cure bacterial disease by killing infective bacteria inside the body.
Clinical drug testing	Drug testing done on healthy human volunteers and patients.
Communicable disease	A disease that can be spread between individuals either directly or indirectly.
Double blind trial	A study performed where neither the researcher or patient know whether the patient is taking the drug or a placebo.
Gonorrhoea	A sexually transmitted disease (STD) caused by a bacterium with symptoms of a thick yellow or green discharge from the vagina or penis and pain on urinating.
Human Immunodeficiency Virus (HIV)	An infectious virus that weakens the immune system and can lead to AIDS (acquired immunodeficiency syndrome).
Malaria	A disease caused by a protist that causes recurrent episodes of fever and can be fatal.
Measles	A serious disease caused by a virus that shows symptoms of fever and a red skin rash.
Non-communicable disease	A disease which cannot be spread between individuals.
Pathogens	Microorganisms that cause infectious disease.
Placebo	A substance designed to be indistinguishable from a drug being
Preclinical drug testing	A substance designed to be indistinguishable from a drug being tested but has no actual effect on the patient.
Rose black spot	A fungal disease where purple or black spots develop on leaves, which often turn yellow and drop early.
Salmonella	A bacterial disease that is spread by bacteria ingested in food and can cause a fever, abdominal cramps, vomiting and diarrhoea. ,
Side effects	Other additional effects that the drug has that are different from the expected effect of the drug
Tobacco Mosaic Virus (TMV)	A widespread plant pathogen affecting many species of plants which produces a mosaic pattern on the leaves and limits the plant growth.
Vaccination	The process of introducing small quantities of dead or inactive forms of a pathogen into the body to stimulate the white blood cells to produce antibodies
White blood cell	An important type of cell that makes up the immune system and produces antibodies and antitoxins.

AQA Science: Organic Chemistry

Hydrocarbons: Are fuels that are made of just hydrogen and carbon atoms only, joined together by single chemical bonds called covalent bonds.

Alkanes: Are saturated hydrocarbons – This means that their carbon atoms are joined to each other by **single C-C bonds** and that they can have as many hydrogen atoms as possible. **Alkanes have the formula: $C_nH_{(2n+2)}$**

Alkane	Molecular formula	Structural formula
Methane	CH_4	
Ethane	C_2H_6	
Propane	C_3H_8	
Butane	C_4H_{10}	
Pentane	C_5H_{12}	



Fractional Distillation

What factors affect the properties of hydrocarbons?

Small molecules means that they have short carbon chains.

Large molecules means that they have long carbon chains.

Combustion (burning)

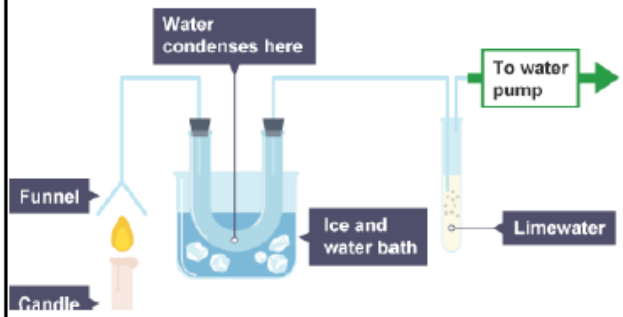
When a hydrocarbon is burned with sufficient oxygen supply, the products are always carbon dioxide and water vapour.

Hydrocarbon + oxygen → carbon dioxide + water (+ energy)

E.g. Butane + Oxygen → Carbon Dioxide + water

$2C_4H_{10}(g) + 13O_2(g) \rightarrow 8CO_2(g) + 10H_2O(g)$

During combustion both carbon and hydrogen from the hydrocarbon are **oxidised**. Hydrocarbons are used as **fuels** due to the amount of energy released when they combust completely.



Crude Oil

Formed from the buried remains of plants and animals (mainly plankton). Over millions of years with high temperature and pressure, the remains turn into crude oil. Fossil fuels such as coal, oil and gas are non-renewable. Crude oil Is a mixture of lots of different hydrocarbons (mostly alkanes). Crude oil can be split up into separate fractions by fractional distillation.

Fractional Distillation (see diagram in the middle box above)

1) Crude oil enters the **bottom** of a fractional distillation column and is **heated** to about **350°C** until most of it has turned to gas
2) The temperature is controlled
3) Most of the substances in the crude oil **evaporate**. The mixture of vapours then passes up the tower and **condense**
4) Hydrocarbons with **high** boiling points (long chains) **condense** first, **low down** in the tower
5) Some hydrocarbons have **very low** boiling points and so they are gases. They don't condense but are collected as 'fuel gases'.

Crude Oil uses are important in the modern world

Oil provides the fuel for most modern transport – cars, trains, planes etc. E.g. diesel, kerosene, heavy fuel oil etc. come from crude oil..

The **petrochemicals industry** uses some of the hydrocarbons from crude oil as **feedstock** (raw material to supply or fuel a machine or industrial process) to make new compounds for use in things such as *solvents, lubricants, polymers, detergents etc.*

Cracking (is a thermal decomposition reaction)

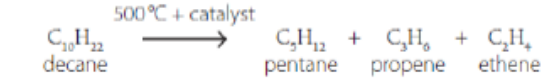
This mean splitting up long-chain hydrocarbons using heat. Short-chain hydrocarbons are flammable so make good fuels and are high in demand. Long-chain hydrocarbons are thick, gooey liquids = not that useful. **Cracking** is the breakdown of large , long-chain hydrocarbon **alkanes** into smaller, more useful **alkanes** and **alkenes**. This process requires high temperatures and high pressure.

Alkenes are used as a **starting material** when making lots f other compounds and be used to make **polymers**.

Methods for Cracking: Catalytic and steam cracking.

1) Heat long-chain hydrocarbons to **vaporise** them (turn them into gas)
2) **Vapour** is passed over **hot** powdered aluminum oxide **catalyst**
3) Long-chain molecules split apart on the surface of the speck of the **catalyst** = **catalytic cracking**

1. **Vaporise** hydrocarbons and mix them with **steam**
2. **Heat** to very high temperature = **steam cracking**



This cracking reaction is an example of thermal decomposition.

Alkenes: Are unsaturated hydrocarbons. This means they have 2 fewer H atoms and are joined by **double C=C bonds.**

Testing to see if it's an alkane or an alkene

Add orange bromine water and shake

Alkane = stays orange

Alkene = colourless

AQA Science: Quantitative chemistry

Conservation of mass

Mass is never lost or gained in chemical reactions. We say that mass is always **conserved.** In other words, the total mass of products at the end of the reaction is equal to the total mass of the reactants at the beginning.

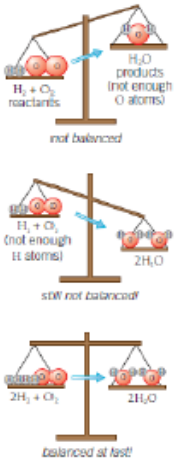


Figure 1 *Balancing an equation*

Balancing equations rules

- Never change the chemical formula
- Total number of reactants must equal total number of products
- Never put a small number yourself
- The big number in front applies to all the atoms in the compound/element
- The small number behind an element applies to that element only
- Use big numbers only and start with 2

Relative formula mass M_r

Mass number = number of protons + number of neutrons
Atomic number = number of protons
Neutron number = mass number – atomic number

The mass of a molecule is called the relative formula mass, M_r. This is calculated by adding up the relative atomic masses of all the atoms in the molecule.

What is the M_r (Relative Formula Mass) of carbon dioxide? Formula for carbon dioxide CO_2

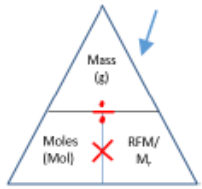
Element	Number of atoms in compound		Mass Number (A_r)	=	Relative atomic mass of atom(s) in compound
C	1	x	12	=	12
O	2	x	16	=	32
Relative Formula Mass (M_r) of carbon dioxide (CO_2) is....					44

Examples of M_r below:
H_2SO_4 → M_r = (1x2=2) + 32 + (16x4=64) = 98
$Ca(OH)_2$ → M_r = 40 + (16 x 2=32) + (1 x 2=2) = 74
$Mg(HCO_3)_2$ → M_r = 24 + (1x2=2) + (12x2=24) + (16x6=96) = 146
$Al_2(SO_4)_3$ → M_r = (27x2=54) + (32x3=96) + (16x12=192) = 342

Moles and Reacting Masses

One mole of a substance contains the same number of the stated particles, atoms, molecules or ions as one mole of any other substance. The number of atoms, molecules or ions in a mole of a given substance is the Avogadro constant which is 6.02×10^{23} per mole.

Formula to calculate moles



The rules for working out reacting masses & example:

If 28 g of iron reacts with copper sulphate solution, what mass of copper will be made?

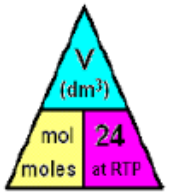
- **Step 1.** Write down the balanced symbol equation.
  Fe (28 g) + $CuSO_4$ → Cu (?) + $FeSO_4$
- **Step 2.** Write down the relative atomic/formula masses.
  Fe = 56 Cu = 64
- **Step 3.** Write down the ratio of reactants and products.
  Fe : Cu = 1 : 1
- **Step 4.** Convert to ratio of reacting masses.
  Fe : Cu = 1 : 1 = 56 g : 64 g
- **Step 5.** Calculate the scale factor and apply this to the ratio of reacting masses.
  scale factor = 28 g / 56 g = 0.5
  mass of Cu made = 64 g x 0.5 = 32 g

Limiting Reactant (LR)

Is the reactant that gets used up first in a reaction. This is the reactant that is NOT in excess. Therefore, the amounts of product formed in a chemical reaction are determined by the LR

Volume of Gases

One mole of any gas has a volume of 24 dm^3 or 24,000 cm^3 at rtp (room temperature (20°C) and pressure (1 atmosphere)). This volume is called the molar volume of a gas.



Concentrations

The concentration of a solution is usually expressed as the amount of solute (mol) dissolved in a given volume (dm^3) of solution.

Figure 1 *The orange squash is getting less concentrated going left to right (the darker colour indicates more squash is in the same volume of its solution)*

Figure 2 *Volumetric flasks are used to make up solutions. They have a graduation mark around their narrow necks. Water is added to the solute until the bottom of its meniscus (the curve at the surface of the solution when viewed from the side) is level with the mark*

Concentration continued...

The equations to calculate concentration:

$$\text{concentration (g/dm}^3\text{)} = \frac{\text{amount of solute (g)}}{\text{volume of solution (dm}^3\text{)}}$$

If you are working in centimetres cubed (cm^3), convert the volume to dm^3 by dividing it by 1000, and use the equation above. Alternatively, substitute your data in cm^3 into the following equation:

$$\text{concentration (g/dm}^3\text{)} = \frac{\text{amount of solute (g)}}{\text{volume of solution (cm}^3\text{)}} \times 1000$$

*** to convert cm^3 → dm^3, divide by 1000 (0.001 dm^3)**
*** to convert dm^3 → cm^3, multiply by 1000 (1000 cm^3)**

You can increase the concentration of an aqueous solution by:

- adding more solute and dissolving it in the same volume of its solution
- evaporating off some of the water from the solution so you have the same mass of solute in a smaller volume of solution.

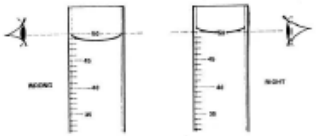
Titrations (TRIPLE ONLY)

Measuring the EXACT volumes of acid and alkali that are needed to react together. **What is this reaction called?** NEUTRALISATION

$H^+ + OH^- \rightarrow H_2O$

You can measure the exact volumes of acid and alkali needed to react with each other using a technique called titration. The point at which the acid and alkali have reacted completely is called the end point of the reaction. You judge when the end point has been reacted using an acid/base indicator.

Measuring to the meniscus

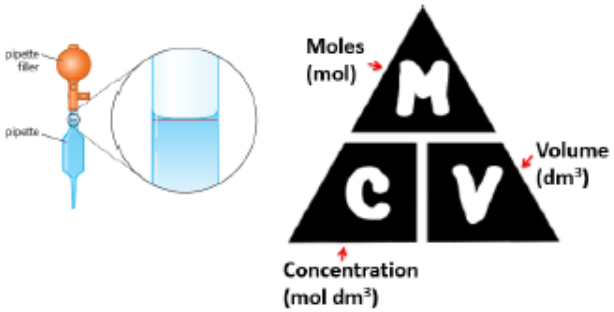


such as Phenolphthalein Indicator. It turns colourless in an neutral solution and pink in an alkaline solution.

Titrations continued...Carrying out a titration

1. First wash the pipette with distilled water, then with some alkali. Empty alkali into a conical flask.
2. Add a few drops of indicator to the conical flask. Swirl
3. Rinse a **burette** with distilled water and then with some acid. Acid added to burette, starting volume of acid is read accurately.
4. Record the reading on the burette. Open tap to release a bit of acid into flask, swirl.
5. Repeat step 4 until acid in burette has almost run in, then add one drop at a time. Neutralisation occurs. The volume of acid recorded.
6. Repeat 3 times. Discard anomalous results. Repeat the titrations until two results are within of 0.1 cm^3 each other. These precise results are called concordant. Calculate a mean.
7. Calculate the concentration of the acid or alkali.

- A volumetric pipette is used to accurately measure a volume of an alkali.
- A pipette filler is used to draw solution into the pipette safely.
- Neutralisation is a change in colour when acid and alkali have been mixed = titration is complete.
- Titre is the volume recorded from a burette



Percentage yield and Atom economy (TRIPLE)

$$\% \text{ yield} = \frac{\text{mass of product obtained}}{\text{maximum theoretical mass of product}} \times 100$$

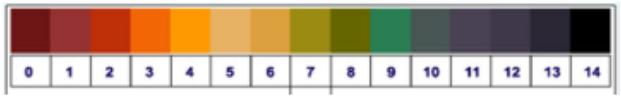
- The reaction may be reversible – as products form they react to re-form the reactants again. You show reversible reactions using this symbol ⇌ instead of the normal arrow between reactants and products. Chemists can manipulate reversible reactions by the conditions they choose in the reaction vessels in chemical plants.
- Some reactants may react to give unexpected or unwanted products in alternative reactions.
- Some of the product may be lost in handling or left in the apparatus.
- The reactants may not be pure (as in the case of the lime kiln).
- Some of the desired product may be lost during its separation from the reaction mixture.

$$\text{Atom economy} = \frac{\text{mass of wanted product from equation}}{\text{total mass of products from equation}} \times 100$$

Yield Industrial processes –
Industrial processes need as high a percentage yield as possible, because this:
1) Reduces the waste of reactants
2) Reduces the cost of the process

Atom Industrial processes –
Industrial processes need as high an atom economy as possible, because this:
1) Reduces the production of unwanted products
2) Makes the process more *sustainable*
3) Conserve the Earth's resources and minimise pollution

pH and Acids + Alkalis



Acids produce H^+ (as H_3O^+) ions in water and they taste sour. They also corrode metals and have a pH of less than 7. They also turns blue litmus paper to red.

Alkalis produce OH^- ions in water and they taste bitter with a pH greater than 7. Alkalis turns red litmus paper to blue.

A solution is defined as an acid if the concentration of H^+ ions is greater than the concentration of OH^- ions. $[H^+] > [OH^-]$

A solution is defined as alkali/base if the concentration of hydrogen ions is less than the concentration of hydroxide ions. $[H^+] < [OH^-]$

Strong and weak acids

A strong acid is completely ionised in aqueous solution. $HCl + H_2O \longrightarrow H^+ + Cl^-$

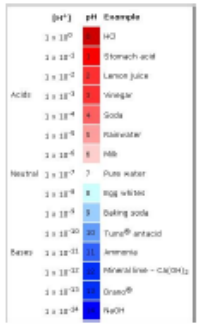
Examples of strong acids are hydrochloric, nitric and sulfuric acids.

A weak acid is only partially ionised in aqueous solution. $CH_3COOH + H_2O \rightleftharpoons CH_3COO^- + H^+$

Examples of weak acids are ethanoic, citric and carbonic acids.

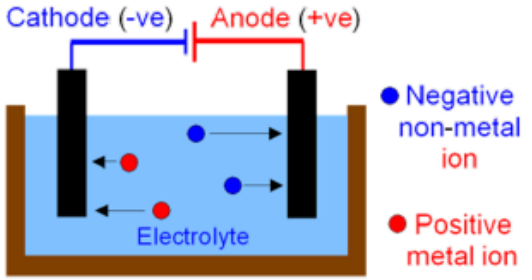
For a given concentration of aqueous solutions, the stronger an acid, the lower the pH.

As the pH decreases by one unit, the hydrogen ion concentration of the solution increases by a factor of 10.



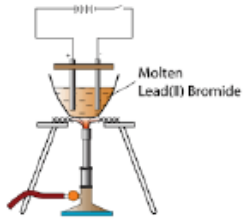
Electrolysis

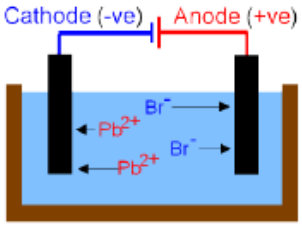
When an ionic compound is melted or dissolved in water, the **ions** are free to move about within the liquid or solution. These liquids and solutions are able to conduct electricity and are called electrolytes. Passing an electric current through electrolytes causes the ions to move to the electrodes. Positively charged ions move to the negative electrode (the cathode), and negatively charged ions move to the positive electrode (the anode).



Electrolysis of molten ionic compounds

When a simple ionic compound (eg lead bromide) is electrolysed in the molten state using inert electrodes, the metal (lead) is produced at the cathode and the non-metal (bromine) is produced at the anode.





Cathode (-ve electrode)

$Pb^{2+} + 2e^- \rightarrow Pb$

Anode (+ve electrode)

$2Br^- - 2e^- \rightarrow Br_2$

OR $2Br^- \rightarrow Br_2 + 2e^-$

Electrolysis Extended

At the negative electrode, hydrogen is produced if the metal is more reactive than hydrogen.
At the positive electrode oxygen is produced unless the solution contains halide ions when the halogen is produced.

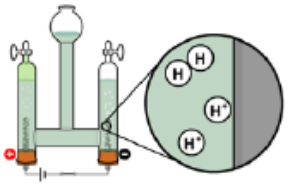
This is due to water molecules breaking down in aqueous solution to form hydrogen and hydroxide ions.

At the cathode positively charged ions gain electrons, whereas as the negatively charged ions lose electrons at the anode. These are both examples of oxidation and reduction. These can be represented as half equations.

$2H^+ + 2e^- \rightarrow H_2$

$4OH^- \rightarrow O_2 + 2H_2O + 4e^-$

$4OH^- - 4e^- \rightarrow O_2 + 2H_2O$



At the cathode

Whether hydrogen or a metal is produced at the cathode depends on the position of the metal in the metal **reactivity series**:

- the metal is produced at the cathode if it is less **reactive** than hydrogen
- hydrogen is produced at the cathode if the metal is more reactive than hydrogen

Rules for determining products

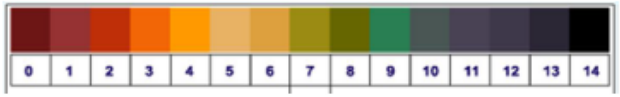
At the anode

Oxygen is produced (from hydroxide ions), unless **halide** ions (chloride, bromide or iodide ions) are present. In that case, the negatively charged halide ions lose electrons and form the corresponding **halogen** (chlorine, bromine or iodine).

The table summarises the product formed at the anode during the electrolysis of different **electrolytes** in solution.

Negative ion	Element given off at anode
Chloride, Cl^-	Chlorine, Cl_2
Bromide, Br^-	Bromine, Br_2
Iodide, I^-	Iodine, I_2
Sulfate, SO_4^{2-}	Oxygen, O_2
Nitrate, NO_3^-	Oxygen, O_2

pH and Acids + Alkalis



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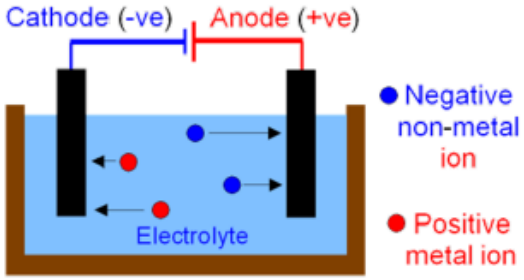

Electrolysis Extended

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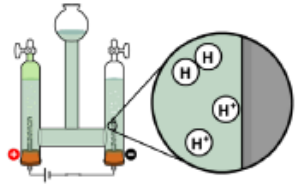
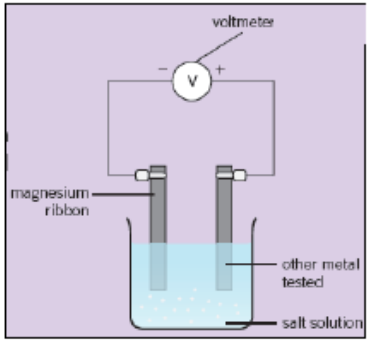


Cells and batteries continued...

- Metals lose electrons and form positive ions.
- When 2 metals are dipped in a salt solution and joined by a wire, the more reactive metal will donate electrons to the less reactive metal. This forms a simple electrical cell.
- The greater the difference in reactivity between the 2 metals, the higher the voltage produced by the cell.

Investigating chemical cells

This apparatus is used to investigate the voltage produced by different metals paired with magnesium ribbon. You can compare magnesium against zinc, iron, copper & tin in your electrical cells.



Fuel Cells

Scientists are developing hydrogen as a fuel.

Hydrogen + Oxygen → Water

$2H_2 + O_2 \rightarrow 2H_2O$

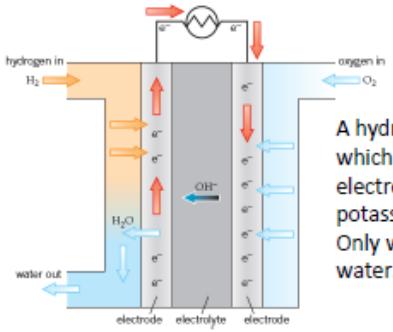
- The world relies on fossil fuels. However, they are non-renewable and they cause pollution.
- Hydrogen is one alternative fuel. It can be burned in combustion engines or used in fuel cells to power vehicles.
- Hydrogen gas is oxidised and provides a source of electrons in the hydrogen fuel cell, in which the only waste product is water.

Hydrogen gas is supplied as a fuel to the negative electrode. It diffuses through the graphite electrode and reacts with hydroxide ions to form water and provides a source of electrons to an external circuit.

$$2H_2(g) + 4OH^-(aq) \rightarrow 4H_2O(l) + 4e^-$$

Oxygen is supplied to the positive electrode. It diffuses through the graphite and reacts to form hydroxide ions, accepting electrons from the external circuit.

$$O_2(g) + 2H_2O(l) + 4e^- \rightarrow 4OH^-(aq)$$



A hydrogen fuel cell which has an alkaline electrolyte, such as potassium hydroxide. Only waste product is water.

Advantages of hydrogen fuel cells –

1) Do not need to be electrically recharged
2) No pollutants are produced
3) Can be a range of sizes for different uses

Disadvantages of hydrogen fuel cells–

1) Hydrogen is highly flammable
2) Hydrogen is sometimes produced for the cell by non-renewable sources
3) Hydrogen is difficult to store

Section 1: Key terms

Displacement	The **distance** an object moves in a given **direction**. A **vector** quantity.
Velocity	The **speed** of an object in a **given direction**. A **vector**.
Acceleration	The **change** of an object's **velocity per second**.
Deceleration	A negative acceleration, the object is slowing down.
Gradient	Change in quantity on the y-axis divided by change in quantity on the x-axis.

Section 2: Distance-time graphs

A distance-time graph **shows** the **distance** of an object from a starting point (plotted on y-axis) **against** the **time** taken (plotted on the x-axis.)

Constant speed - **straight line** that slopes **upwards**.

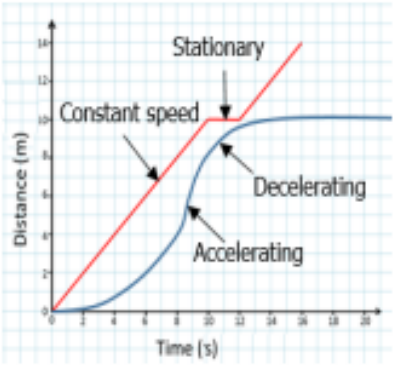
Accelerating - **curved** line getting **steeper**.

Decelerating - curved line getting **less steep**.

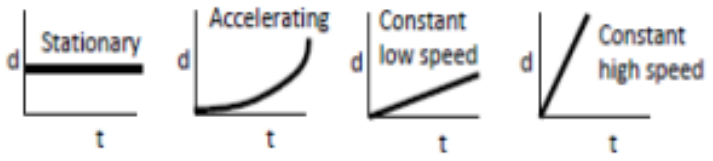
Stationary - **horizontal** line, the **gradient** is **zero**.

The **gradient** represents the object's **speed**.

The **steeper** the gradient, the **greater** the speed.



Slopes of distance-time graphs



Section 3: Velocity-time graph

A velocity-time graph **shows** the **velocity** of an object (plotted on y-axis) **against** the **time** taken (plotted on the x-axis.) A **motion sensor** linked to a computer can be used to **measure velocity changes**.

Constant velocity (zero acceleration)- **horizontal line**

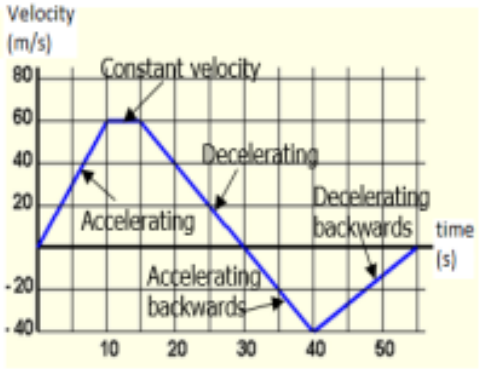
Constant acceleration - **straight line** with velocity **increasing**

Constant deceleration - **straight line** with velocity **decreasing**

Stationary - **horizontal line on x-axis** (velocity = 0)

Moving **backwards** - **below x-axis**

The **steeper** the **gradient** the **greater** the **acceleration**.

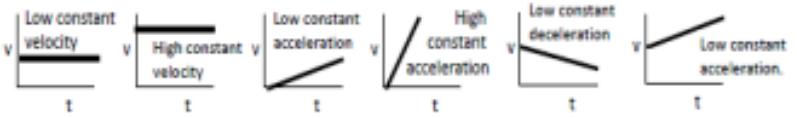


Velocity-time graph

A **positive gradient** represents **acceleration**, a negative gradient represents deceleration.

Area under the graph represents **distance** travelled (HT).

Slopes of velocity-time graphs

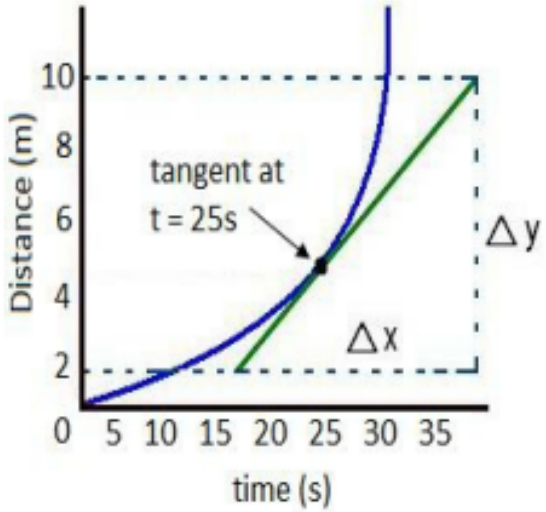


Section 4: Equations to learn

Distance = speed x time s = v x t	Distance – metres (m) Speed – meters per second (m/s) Time – seconds (s)
Acceleration = change in velocity / time taken a = ΔV/t	Acceleration – metres per second (m/s^2) Change in velocity – meters per second (m/s) Time taken – seconds (s)

Section 5: Calculating the gradient (HT)

The distance-time graph for an object moving at **changing speed** is a **curve**. **To find the speed** at a particular instant in time, draw a **tangent** to the line **at that instant** and determine the **gradient** of the tangent.



Calculating the gradient:

$$\text{slope} = \frac{\Delta y}{\Delta x}$$

or

$$\text{slope} = \frac{y_2 - y_1}{x_2 - x_1}$$

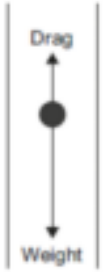
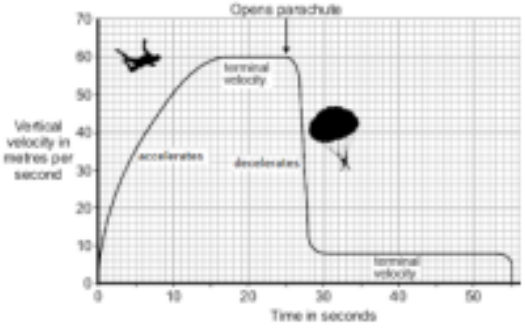
Section 1: Key terms

Displacement	The **distance** an object moves in a given **direction**. A **vector** quantity.
Velocity	The **speed** of an object in a **given direction**. A **vector**.
Acceleration	The **change** of an object's **velocity per second**.
Resultant force	The **overall force** once all the forces have been considered.
Terminal velocity	The **velocity** an object **eventually reaches** when it is falling. The **weight of the object** is then **equal** to the **frictional force** on the object.
Stopping distance	The **shortest distance** a vehicle can **safely stop** in. It depends on **thinking distance** and **braking distance**.
Momentum	A **moving object** with **mass** has momentum. Momentum is "**mass in motion**" It is a vector quantity.
Conservation of momentum (HT)	In a closed system, **total momentum before** an event **is the same** as the **total momentum after** the event.
Closed system (HT & Triple)	A **system** with **no external forces** acting on it.

Section 2: Forces and acceleration

Newton's second law of motion	The acceleration of an object is: • Directly proportional to the force • Indirectly proportional to mass	We can **investigate** the **relationship** between force and acceleration by using a trolley with constant mass, newton-meter, motion sensor and a computer.
Effect of force	The **greater the resultant force** on an object, the **greater** the objects **acceleration**. If an object is not accelerating then the resultant force on the object must be zero.	
Effect of mass	The **greater the mass** of an object, the **smaller** its **acceleration** for a given force.	
Calculation of resultant force	Resultant force = mass x acceleration $f = m \times a$	Force – newtons (N) Mass – kilograms (kg) Acceleration = metres per second squared (m/s^2)
Inertia (HT)	the inertia of an object is its tendency to stay at rest or in uniform motion (moving at constant speed in a straight line.)	

Section 3: Weight and terminal velocity

Weight	The weight of an object is the force acting on the object **due to gravity**. Measured in newtons, N.
Mass	The **quantity** of matter in it. Measured in Kg.
Gravitational field strength.	The gravitational force on a 1 kg object is called the gravitational field strength. An object acted on only by gravity accelerates at about 10 m/s^2 on the Earth.
Calculating weight	weight = mass x gravitational field strength. $w = m \times g$ Weight – newtons (N) Mass – kilograms (kg) GFS – newtons per kilogram (N/kg)
Terminal velocity Ball bearing falling though a fluid.  The ball bearing reaches its terminal velocity when the **drag is equal to the weight**.	When a parachutist jumps out of a plane, the only force acting is weight (gravity.) As the parachutist falls air resistance acts upwards. The resultant force is downwards as weight is greater than air resistance, hence the parachutist accelerates. As velocity increases, so does air resistance. **Terminal velocity** is reached **when** the **forces are balanced** (when air resistance = weight.)  When the parachute opens, the surface area increases hence there's much more air resistance. The weight (downwards force) is still the same, hence the **terminal velocity decreases** allowing the parachutist to hit the ground at a safe speed.

Section 4: Forces and braking

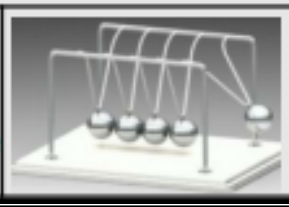
Thinking distance	The **distance** a **car travels** while the **driver reacts**.
Factors affecting thinking distance	1. Tiredness 2. Drugs 3. Alcohol 4. Distractions (e.g. mobile phones)
Braking distance	The **distance a car travels** while the car is **stopped** by the **brakes**.
Factors affecting braking distance	1. How fast you are going 2. Road conditions (weather e.g. Water or ice) 3. Conditions of tyres and brakes. 4. Type of road surface 5. Mass of vehicle
Stopping distance	The **sum** of the **thinking distance** and **braking distance**.

Section 5: Momentum (HT)

All moving objects have momentum. The greater the mass **and** velocity of an object, the greater its momentum. Momentum has size **and** direction so is a vector quantity.

Calculating Momentum	Momentum = mass x velocity p = m x v	Momentum – Kg m/s Mass - Kg Velocity – m/s

In a **closed** system, **total momentum before** an event **is the same** as the **total momentum after** the event. Momentum is conserved in a collision or an explosion as no external forces act on the objects. After a collision, the colliding objects may move off together or may move apart.



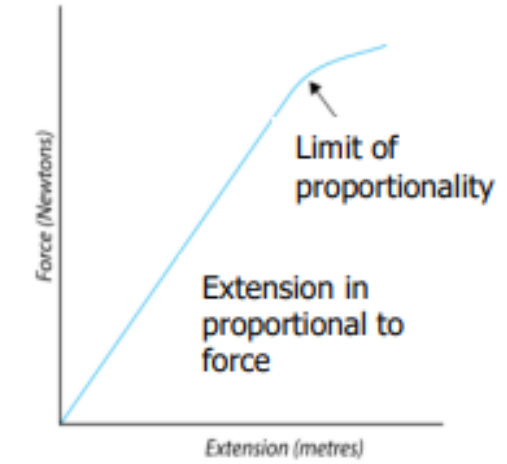
Section 6: Forces and elasticity

Elastic deformation	Occurs when a **spring is stretched** and **can** then **return** to its **original length**.
Inelastic deformation	Occurs when a **spring is stretched** and its **length** is **permanently altered**.
Limit of proportionality	The **length** a spring can be **stretched before it no longer is able to return to its original length**. Beyond the limit of proportionality, a force-extension graph is curved.
Extension	Difference between the length of an object and its original length.

Force extension graph

If you hang small weights from a spring it will stretch. If you plot a graph of the spring's extension against force applied, you get a straight line that passes through the origin. The **extension** is **directly proportional** to the **force applied.**

However if you **apply too much force**, the line begins to **curve** because you have exceeded the **line of proportionality**.



Objects and materials that behave like this are said to obey **Hooke's law**. Hooke's law states that extension is directly proportional to the force applied, provided the limit of proportionality is not exceeded.

Hooke's law	Force applied = spring constant x extension F = k x e	Force – newtons, N Spring constant N/m Extension – metres m

Section 1: Key terms

Pressure	The **force per unit area**, measured in **Pa** (which is equal to 1 N/m^2).
Density	**Mass per unit volume** of a substance.
Fluid	A **liquid or** a **gas**.
Earth's atmosphere	Relatively **thin layer of gases** that **surround** planet **Earth**.
Atmospheric pressure	The **pressure exerted** by the **weight** of the **atmosphere**.
altitude	The **height** of an object in **relation to sea level**.
Upthrust (HT)	The **upward force** that **acts** on a **body** partly or completely **submerged** in a **fluid**.
Flotation (HT)	The action of **floating** in a **liquid or** a **gas**.

Section 2: Pressure and surfaces

Pressure is caused when **objects exert forces** on each other, or when a **fluid exerts a force** on an object in contact with the fluid.

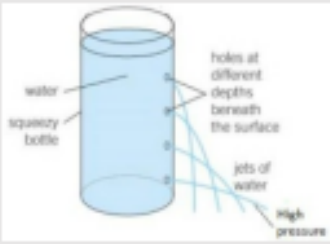
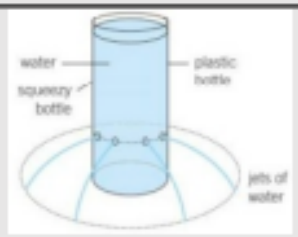
Pressure depends on	• **Area of contact** on which the force acts • **Size** of the **force**	
Calculating pressure	Pressure = $\frac{\text{force}}{\text{area}}$ $p = F/A$	Pressure – pascals, Pa Force – newtons, N Area – metres squared m^2
Effect of area on pressure	Caterpillar tracks fitted to vehicles **increases the contact area** that the tracks have to the ground. This **reduces the pressure** of the vehicle on the ground because its **weight** is **spread over** a **larger contact area**. Useful for **driving** on **sandy, muddy or snow covered ground.**	

Section 3: Pressure in a liquid at rest (HT)

The pressure at the bottom of a column of liquid depends upon:
- Height of the column (higher the column, the greater the pressure.)
- Density of the liquid (greater the density, the greater the pressure.)

Calculating pressure due to column height of a liquid of given density.	Pressure = height x density x gravitational field strength $P = h \times \rho \times g$	Pressure – Pa Height – m Density – m^3 Gravity – N/kg

Section 3: Pressure in a liquid at rest continued (HT)

Pressure increases with depth	The **further the hole** is **below** the level of water in the bottle, the **greater the force** which the **jet leaves** the bottle	
Same pressure at same depth	The **pressure along** the **horizontal line** is **constant** (the jets from these holes are at the same pressure.	

Section 4: Atmospheric pressure

Air molecules colliding with a surface create atmospheric pressure.

Atmospheric pressure	At sea level 100 kPa Mount Everest 30 kPa
Altitude	Atmospheric pressure **decreases with higher altitude** as the number of air molecules (& hence the weight of air) above a surface decreases as the height above ground level increases.
Density of atmosphere	The atmosphere gets less dense with increasing altitude.

Section 5: Upthrust and flotation. (HT)

When an object floats, it experiences a greater pressure on its base, compared to the top surface. This creates a resultant force upwards called **upthrust**.

The upthrust on an object in a fluid:
- Is an upward force on the object due to the fluid
- Is caused by the pressure of the fluid

The pressure at a point in a fluid depends on the density of the fluid and the depth of the fluid at that point.

An object sinks if its weight is greater than the upthrust on it when it is fully immersed. A ship floats because it displaces more water than the weight of the ship hence its weight is equal to the upthrust.

PLYMPTON ACADEMY

TERM ONE & TWO

HANDBOOK

YEAR 11