"If you're not willing to learn no one can help you. If you're determined to learn no one can stop you."
Anon

Name

Tutor

Educating for life in all its fullness

St Cuthbert Mayne School
Year 10 Autumn Term

Knowledge Organiser

CORE VALUES

To have integrity and be courageous, compassionate and creative. These core values underpin how we work as a School Community and the values we look to develop in all members of the Community.

Courageous: Being confident, to embrace challenge.

Compassionate: Reflect the love of God. A care for others, to be peace makers who understand the importance of forgiveness and reconciliation.

Creative: To be inventive, resourceful and visionary.

Integrity: To do the right thing even when no one is watching.

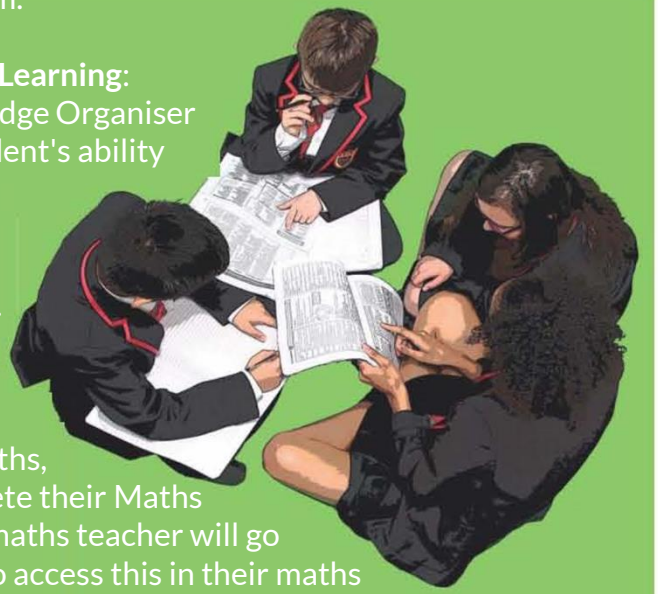
Introduction

This booklet provides you with all of the KNOWLEDGE that you will need to succeed in your learning this term. The minimum requirement from you is one full A4 page or 30 minutes per subject. Your home learning will be checked by your subject teachers each week. Subjects will set additional Home Learning to help you apply the knowledge from this booklet.

At St Cuthbert Mayne there are two strands to our Home Learning Strategy:

Subject Specific Home Learning: students will be set specific subject tasks linked to the curriculum.

Guided Independent Home Learning:
An approach using a Knowledge Organiser which aims to develop a student's ability to retain knowledge over an extended period of time. Students will routinely self test core subject knowledge.



Students will use SPARX Maths, an online platform to complete their Maths home learning. Your child's maths teacher will go through the details of how to access this in their maths lessons and communicate this home. Other subjects may also use online platforms to facilitate their subject specific tasks and those subjects will communicate this to students and to parents at the start of term.

Instructions for completing your Home Learning

Read — The definition a couple of times

Cover — The Page

Remember — The definition, think about it

Write — Write what you remember

Repeat — Each step until you can write the definition correctly

Home Learning Timetable

Monday	Tuesday	Wednesday	Thursday	Friday
Maths	RE	Option A	Science	English
Developmental Studies		Option B		
		Option C		

Timetable

	Week A					Week B				
	Mon	Tue	Wed	Thur	Fri	Mon	Tue	Wed	Thur	Fri
1										
2										
3										
4										
5										

KS4 Extra Home Learning Diary

Subject	Home Learning Task	Hand in Date	Done	Grade

KS4 Extra Home Learning Diary

Subject	Home Learning Task	Hand in Date	Done	Grade

UNIFORM AND APPEARANCE - OUR EXPECTATIONS

Students are expected to present themselves correctly and tidily at all times both in school and on the way to and from school or when involved in off-site visits. This not only helps to maintain the high standards of the school, but also is good training for later life.

There are separate guidelines on dress code for students in the 6th Form available on application to the school. If parents / carers are unsure about whether an item of uniform is suitable for school they should visit our website or contact us directly prior to purchasing.

- Blazers – This must be the school blazer (black with red braiding and school badge) purchased from Torre Sports / Pro-direct Sport. These must be worn at all times except if involved in physical activity on the field or on the yards during lunch and morning break when they can be removed if desired. If a student wishes to take his or her blazer off during a lesson then he/she should ask the teacher. A black V-neck jumper (not sweatshirt) may be worn under the blazer.

- Skirts – Black* knee length pleated skirt, as supplied by Torre Sports / Pro-direct Sport or an identical skirt. The skirts should be approximately knee length and not worn in a very short manner (e.g. Not more than 5cms above the knee). Tights if worn should be plain black. Socks if worn should be plain black ankle socks.

- Boys Trousers - Trousers must be plain black* formal style school trousers, as supplied by Torre Sports / Pro-direct Sport or an identical item. Not acceptable: black jeans, chino or denim style or any form of tight stretchy style of trouser. Plain black socks to be worn. If a belt is worn, it needs to be plain black (wide belts and large buckles are not appropriate).

- Girls Trousers – Trousers must be plain black* formal style school trousers, as supplied by Torre Sports / Pro-direct Sport or an identical item. Non acceptable items are as listed for boys.

Black* means that the colour and shade of the trousers /skirt must match that of the blazer (as supplied by Torre Sports / Pro-direct Sport

- Shoes – Formal black shoes that are fully polishable.

Moreover, Footwear, which displays a sports branding, is not appropriate for school i.e. the Nike tick. Moreover, trainers should not be worn. All students in the main school must wear shoes that are completely black including on their way between home and school. Shoes should be of a "sensible style" suitable for a wide variety of activities that students tackle each day. Shoes should be waterproof, flat soled, leather or leather like, able to be polished and cover the whole foot. Therefore, platform soles higher than 3cms, high heels higher than 5cms, mules, flip flops, sling backs and sandals, Converse, Vans or boots of any kind are inappropriate for school wear and must not be worn.

- School Bags – A suitable school bag which can carry at least A4 folders e.g. ruck sack not a large fashion handbag.

UNIFORM AND APPEARANCE - OUR EXPECTATIONS

• School Coat – Dark (blue/black) plain outdoor style coat (with no logo, design or graffiti), preferably waterproof. Denim or leather jackets, hoodies or other sweatshirts are not acceptable as school uniform even as outdoor clothing. Coats, hats, gloves or scarves should not be worn in classrooms at any time.

• Make-up – Make-up must be kept to a minimum and should be subtle and not noticeable. Nail varnish is not to be worn into school, if worn students will be instructed to remove it. False nails are not appropriate for school.

• Collared Shirt and Tie – Students must wear a white formal shirt which must button at the neck and be tucked in at all times. All ties must be the school's clip-on tie.

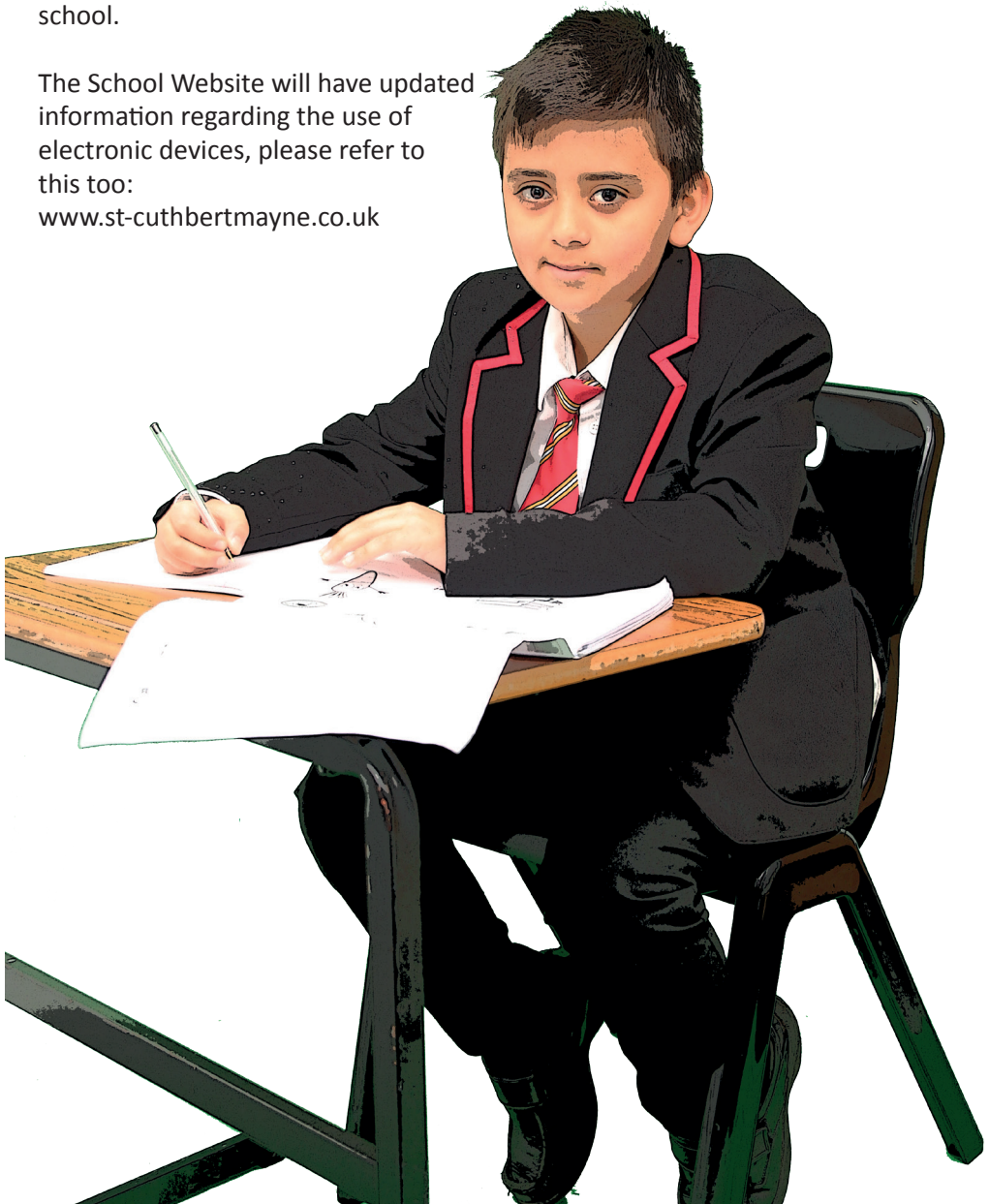
• Jewellery – Jewellery should be kept to a minimum and removed during PE or sporting activities. If students wear a necklace it should not be visible but worn under their shirt. Bracelets must not be worn to school. If excessive or inappropriate jewellery is worn (e.g. rings) the items will be confiscated and put in a safe place until collected by Parents / Carers (normally from Student Services).

• Earrings – For safety reasons any earring which is not of a small stud type should not be worn to school. There must be no more than one in each ear.
• Body piercings - Studs, rings, etc including on the face, nose and in the mouth must not be worn to school under any circumstances. Piercings that require a ring, retainer or object to remain in place whilst the site heals is not acceptable during school sessions. Nose studs cannot be worn in school.

• Hair – Non-natural occurring hair colours are unacceptable for school. Extreme hair styles are also not acceptable e.g. Mohicans, tram lines, highly gelled etc. Headwear of any kind should not be worn in school unless;
It is of a religious nature or for medical reasons and has been previously agreed with the Head teacher

• Additional notes:
Aerosols of any description, fizzy drinks, rugby balls, are not permitted in school.

The School Website will have updated information regarding the use of electronic devices, please refer to this too:
www.st-cuthbertmayne.co.uk



Transactional Writing - Reports and Articles

A	Anecdote
R	Rhetorical Question
E	Exaggeration
D	Direct Address
F	Fact
O	Opinion
R	Repetition
E	Emotive language
S	Statistic
T	Triad

Non-fiction:	Purpose:	Audience:	Form:
Writing that is informative and factual rather than invented stories.	Why has this text been written? What did the writer what to achieve?	Who did the writer intend to write this for?	What type of non-fiction writing is this? How do I know?

Features and format

Article:

- Engaging introduction - grab the reader straight away. Try using a fact, statistic or rhetorical question.
- Subheadings or clearly defined paragraphs to guide the reader
- Discourse markers, engaging vocabulary, varied sentence length
- Short conclusion to summarise the content of your article
- AREDFOREST techniques to make your writing interesting, persuasive and entertaining
- Colloquial tone with your opinion included is recommended - 1st person

Report:

- Factual writing - not opinionated
- Serious tone - no sarcasm, humour or overly-emotional tones (anger, for example) should be evident
- Subheadings for each section to clearly structure writing and guide the reader
- Bullet points
- Diagrams, charts, graphs if appropriate
- Not all AREDFOREST techniques are appropriate. Remember, this is not designed to be persuasive.
- Discourse markers, formal language, sophisticated vocabulary

Exam info

- Language Paper 2 - Section 2. Spend 45-55 mins on this part (5 mins to plan included in this time)
- Choice of 2 tasks; pick only 1 of them.
- Marked for 2 key skills - writing style and accuracy. SPaG is marked for and so is very important.
- Extended writing task - 2-3 pages at least.
- Take inspiration from the texts given in Section A, but do not copy from them.

Transactional Writing - Reports and Articles

Week 1	Week 2	Week 3
Learn this: ● Transactional writing is non-fiction ● It uses facts, opinions and formal language ● PAF and what that means ● The AREDFOREST acronym ● Identifying AREDFOREST devices in a text	**Learn this:** ● Explain the usage of AREDFOREST devices in a text ● Write analytical paragraphs about what you've noticed ● Apply this knowledge when learning the format and features or an article	**Learn this:** ● Key terms - colloquial, formal, informal, broadsheet, tabloid ● Writing style changes depending on the PAF ● What good article writing looks and sounds like
Do this: Using real transactional texts you have found (online, in a newspaper, seen on TV / printed advert), write down an example sentence of your own for each of the AREDFOREST devices. You can present this as a list or a poster.	**Do this:** Use the printout of the newspaper article to highlight and label the form and features of an article. Remember to look for: ● Layout features ● Language features ● Structural features ● Rhetorical devices (AREDFOREST)	**Do this:** Research task: Find out facts, statistics and general background information about online safety. The more info you collect, the better. Present this as an A4 Google document or Google slides presentation and print it out if you can.

Transactional Writing - Reports and Articles

Week 4	Week 5	Week 6
Learn this: ● Practicing writing articles ● Understand the difference between articles and reports. ● Features and format of reports ● PAF + tone of report writing ● AREDFOREST in reports and how some of these techniques are not appropriate for a formal report	**Learn this:** ● Discourse markers - ‘signposting’ and guiding readers through a text. ● Texts that don’t use discourse markers can be difficult to follow and have poor coherence and cohesion ● How opinion can be presented as fact. ● Writers can present their opinion as if it was a fact to make a reader / audience feel like there is no choice but to subscribe to the same view	**Learn this:** ● Components of a successful report ● Read examples of report writing from Grade 3 up to Grade 7 ● Get an idea of what excellent writing looks like ● How to improve less successful writing ● Produce a successful report
Do this: Create a 10 question quiz on the differences between articles and reports. This could be true / false questions, extended answer questions or ‘fill in the blank’ questions (or a mixture of all of these!) You can present this as a Google doc, handwritten on paper or even a Kahoot	**Do this:** Write down 5 sentences that are opinions presented as facts. Do not use phrases that clearly indicate opinion, such as ‘I think’, as that is a big giveaway. You want to make it difficult to immediately recognise your sentences as opinions.	**Do this:** Create a ‘Success criteria’ checklist document for report writing which can be used to assess a report that you have read. Include format, features, language, structure and tone elements in your checklist.

10.1 English Literature - Unseen Poetry Knowledge Organiser

Week 1: Poetic language

Poetic language	Meaning
Simile	A comparison made using the words “like” or “as.”
Metaphor	A comparison – made directly or indirectly – using ‘is’ or ‘was’ or just stating
Personification	Giving human characteristics to something which is not human.
Onomatopoeia	Words which attempt to imitate sounds.
Alliteration	A repetition of consonant sounds.
Plosive	“b,” “p,” “t” and “d” sounds – which can be harsh, aggressive or shocking.
Sibilance	Repeated “S” sounds – most often caused by “s” “ss” and “c.” These can be harsh, smooth or sickly.
Assonance	A repetition of vowel sounds.
Anaphora	A repetition of words, phrases or clauses.
Juxtaposition	Two things being placed close together for contrasting effect.
Oxymoron	A figure of speech in which two contradictory things are placed together in a way which makes peculiar sense. For example, “friendly fire.”
Semantic field	A set of words relating to the same topic. “Foul” and “Shot” would appear in the semantic field of sports.
Antithesis	Placing contrasting ideas together.
Ambiguity	A word, phrase or situation where there are two or more possible meanings and it is unclear which is the correct one.
Anachronism	A person or object placed in an inappropriate time.
Cliché	An overused phrase or saying
Hyperbole	Exaggeration.
Irony	Occurs where the way something turned out is very different from the intended effect or outcome.
Litotes	Deliberate understatement for effect – the opposite of hyperbole.
Metonymy	A related item or attribute is use to replace the word normally used. For example, “suit” used to replace businessman.
Pathetic fallacy	When a character’s feelings, thoughts or emotions are displayed through the environment around them. For example, when a character is depressed and it is raining.

Week 2: Poetic structures and forms

Poetic structures and forms	Meaning
Rhyme	The repetition of syllable sounds – usually at the ends of lines, but sometimes in the middle of a line (called internal rhyme).
Couplet	A pair of rhyming lines which follow on from one another.
Stanza	A group of lines separated from others in a poem.
Enjambment	The running over of a sentence from one line to the next without a piece of punctuation at the end of the line.
Caesura	A stop or a pause in a line of poetry – usually caused by punctuation.
Diatribe	A poem in which the speaker appears to be frustrated and ‘ranting’
Blank verse	Poetry written in non-rhyming, ten syllable lines.
Dramatic monologue	A poem in which an imagined speaker address the reader.
Elegy	A form of poetry which is about the death of its subject.
End stopped	A line of poetry ending in a piece of punctuation which results in a pause.
Epigraph	A quotation from another text, included in a poem.
Lyric	An emotional, rhyming poem, most often describing the emotions caused by a specific event.
Ode	A formal poem which is written to celebrate a person, place, object or idea.
Parody	A comic imitation of another writer’s work.
Quatrain	A four line stanza.
Sestet	A six line stanza.
Sonnet	A fourteen line poem, with variable rhyme scheme, usually on the topic of love for a person, object or situation.
Free verse	Non-rhyming, non-rhythmical poetry which follows the rhythms of natural speech.
Volta	A turning point in the line of thought or argument in poem.
Persona/ Narrative voice	The voice/speaker of the poem who is different from the writer.
Protagonist	The main character / persona in a poem that you favour positively.
Antagonist	A character/ person in a poem that you see as a ‘villain’

10.1 English Literature - Unseen Poetry Knowledge Organiser

Week 3: ME FLIRTS and PETER

ME FLIRTS
The meaning and effect of the poem is supported by the techniques used in FLIRTS. You do not have to find all of the techniques, just the ones that support your opinion of what the meaning and effect of the poem are. The key areas to really explore are **form, language and structure**, as these are referenced in exam questions and in the markscheme.

ME = Meaning and Effect - what is the poem about? What does the writer want to get across?

F = Form eg, is it a typical ballad? Free verse? Sonnet? Diatribe?What do we associate with the form?

L = Language eg, Metaphors, alliteration, contrast, similes, personification, slang, choice of verbs…

I = Imagery eg, imagery of colour, war, death, romance
R = Rhyme and rhythm, including half-rhyme and assonance, why and when are these used?

T = Tone - what is the 'voice' of the poem - how does it sound? How is it meant to come across?

S = Structure - how does it begin, develop and end? How are stanzas structured? How is punctuation used?

PETER paragraphs are used in your response to express your analytical findings:

Point - what is the message of that part of the poem? What is the poet trying to express?
Example - support the point you've made with evidence / a short quote
Terminology / Techniques - mention the name of the term or technique from the quote eg, it might be a simile, or an interesting verb, or repetition and so on
Explanation / effect on the...
...Reader- explore the quote and explain how it is works to communicate a specific effect or message to the intended audience or reader

Useful phrases to explain the effect of the example and technique:

suggests	implies	connotes	establishes	reinforces
creates	indicates	promotes	expresses	projects

Week 4 : Effects - concepts to learn and explore

Concept	Exploration	Your own modern-day examples of this concept
Feminism	**Feminism**, the belief in social, economic, and political equality of the sexes. Although largely originating in the West, feminism is manifested worldwide and is represented by various institutions committed to activity on behalf of women's rights and interests.	
Patriarchy	• a system of society or government in which the father or eldest male is head of the family and descent is reckoned through the male line. • a system of society or government in which men hold the power and women are largely excluded from it. • a society or community organised on patriarchal lines.	
Prejudice	• **Prejudice** means preconceived opinion that is not based on reason or actual experience. The word comes from the Latin "pre" (before) and "judge". People may prejudge any question, but the word is often used for an opinion about a person or group of people. • The word "prejudice" is often used when people dislike another group of people that are different from them. They may decide they do not like them because of their skin color (this is "racial prejudice"), religion (religious prejudice) or nationality. Such prejudices can lead to discrimination, hatred or even war.	
Trauma	• a deeply distressing or disturbing experience that can affect the mind and wellbeing of an individual • In medical terms, it could also mean physical injury	
Social Equality	**Social equality** is a state where people are treated fairly and given equal chances without any discrimination. The opposite of this is social inequality.	

10.1 English Literature - Unseen Poetry Knowledge Organiser

Week 5: Effects vocabulary - part 1

Thoughts/feelings which could be conveyed	Meaning
Aggravation	Irritation
Agitation	Annoyance
Alienation	Isolation or being kept apart
Anguish	Angry and pained
Apprehension	Nervousness
Bashfulness	Embarrassment
Bewilderment	Confusion
Compassion	Love/Caring
Contemptuousness	Deep hatred
Discouragement	Being put off
Dismay	Concern or distress
Eagerness	Keenness to take part
Ecstasy	Real excitement or happiness
Elation	Exceptional happiness
Enragement	Provoked anger that comes on suddenly
Euphoria	Extreme happiness
Envy	Jealousy
Exasperation	Exhaustion with frustration
Exhilaration	Being filled with excitement after having done something
Fatigue	Exhaustion/Tiredness after having done something
Glee	Being filled with happiness after having done something you're proud of
Grouchiness	Moodiness and irritation
Hassle	Annoyance at the hands of someone nagging you
Hesitation	Caution
Hostility	Aggressiveness
Humiliated	Made to feel foolish
Hysterical	Crazy
Indifferent	Not caring
Infatuated	Passionate about
Insecure	Uncertain or anxious
Irate	Furious
Irked	Annoyed
Isolated	Kept apart or alone

Week 6 : Effects vocabulary - part 2 - add your own ones at the end too

Thoughts/feelings which could be conveyed	Meaning
Loathing	Extreme hatred
Melancholy	Being exceedingly sad, upset or depressed
Mortification	Embarrassment or shame
Neglect	Being ignored
Optimism	Hope or confidence about the future
Outrage	Anger
Being overwhelmed	Feeling like everything has become too much
Pessimism	Lacking hope or confidence about the future
Queasiness	Sickened
Rapture	Intense pleasure or joy
Regret	A wish or desire that you hadn't done something
Reluctance	Not wanting or being unwilling to do something
Remorse	A feeling of guilt and regret
Resentfulness	Annoyance at someone or something
Repulsion	Being sickened by something or someone
Being riled	Irritation
Scorn	Looking down on something or someone
Spite	Being filled with hatred
Torment	Being continually upset or pained by
Triumph	Intense happiness at having won something
Vengeance	Looking to harm someone to get them back
Viciousness	Nastiness – possible with violence and aggression
Woe	Sadness
Weariness	Tiredness or exhaustion
Wrath	Looking to carry out an act of revenge
Zaniness	Craziness or wackiness
Zest	Liveliness

The power of Sparx for parents and carers

sparx

Be empowered to become a pivotal part of your child's education.

The challenge

Engaging young people with any homework can be tough, let alone tackling maths. At Sparx, we know that parents and carers can be very influential when it comes to homework, and that is why we are so keen for you to be involved in their maths learning journey.

What is Sparx?

In schools, Sparx Maths Homework automatically sets one hour of personalised learning for every student, every week.

Unique content, covering the KS3 and GCSE maths curriculum, is devised and written by our in-house teams. Over 33,000 hand-written questions are supported by more than 7,800 tutorial videos, which help explain concepts and encourage independent learning.

Receive reassurance

You will receive a weekly email keeping you up-to-date with your child's homework hand-in dates and what they are studying in the coming week.

Helpful videos

Your weekly emails contain a link to a topic-based video that can help you to understand the topic your child will be covering.

Personalised learning for every student

Our technology learns where students' strengths and weaknesses lie, and how long they take to complete different types of questions. It then determines which homework questions would help improve and consolidate their learning. Question difficulty is gradually increased to suit the learner and topics are repeated during the year to help them fully understand the skill for the long term.

Improves attainment

Additional teacher time and a bespoke learning experience drive both progress and attainment in maths.

Supports mental health

Progress in core subjects such as maths has a recognised effect on overall attainment. Tackling issues such as 'maths anxiety' and rewarding progress for all students creates confidence that is evidenced at a school-wide level.

Keeps your child motivated

Students collect XP (experience points) and are rewarded with mini-games.

Home Learning set weekly every Friday 16:00 and due every Thursday 08:00. If you have completed 30% by Monday, we recommend that you attend Bright SPARX.

" I used to hate maths, now I want to do maths every day "

Student from All Saints Academy

Bright SPARX clubs run every Monday and Tuesday from 15:10 – 16:10. Supervised by the Maths Department to help anyone who may have issues logging in or would like help on any aspect of the homework.

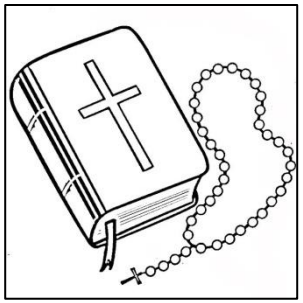
Year 10 RE Knowledge Organiser: Worship, Prayer, and Eucharist

Worship

Christian worship involves **praising** God in music and **speech**, readings from **scripture**, prayers of various sorts, **silence**, a **sermon**, and various holy ceremonies (often called sacraments) such as the **Eucharist**.

While worship is often thought of only as services in which Christians come together in a group, individual Christians can worship God on their own, and in any place.

Christians regard worship as something that they don't only do for God, but that God, through Jesus's example and the presence of the Holy Spirit is also at work in.



Style

Different churches, even within the same denomination, will use very different styles of worship. Some will be elaborate, with a choir singing difficult music, others will hand the music over to the congregation, who sing simpler hymns or worship songs.

Some churches leave much of the action to the minister or priest, while others encourage great congregational participation.

Some churches have lively energetic worship, while others are quieter and more meditative. The Quakers worship mostly in silence.

(Of course all churches encourage the congregation to take part fully in praising God with heart, mind, and soul, but some churches give the congregation more physical participation.)

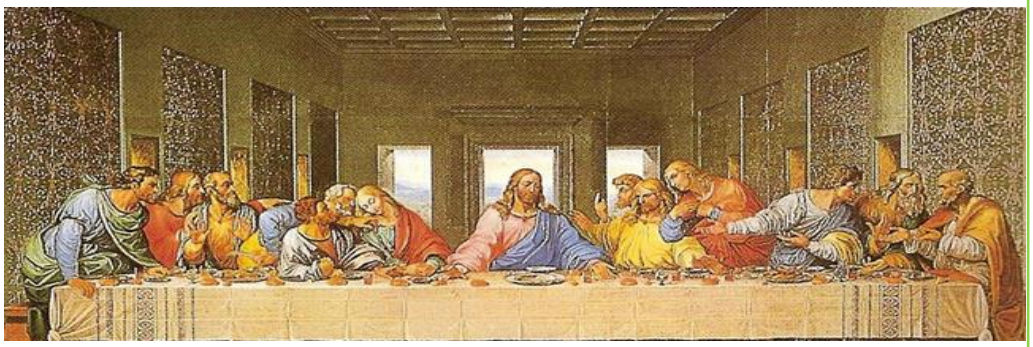
KEY WORDS

worship – honouring God who is worthy of praise
prayer – talking to, and listening to God
praise – recognising and celebrating God's glory
intercession – praying on behalf of someone else
petition – asking God for something in prayer
thanksgiving –thanking God
repentance – saying sorry to God
meditation – to reflect quietly in God's presence
retreat –spending time away from everyday life to focus on God and prayer
congregation – the people praying
chant – to sing a prayer over repeatedly
icons – a religious painting that is a 'window into seeing God'
Eucharist – a celebration where Christians pray and receive blessed bread and wine, the word is Greek for 'thanksgiving'
Holy Mass – Catholic name for the Eucharist
Holy Communion – another name for the Eucharist, often used by Anglicans
Lord's Supper - another name for the Eucharist, often used by Protestants
Commemoration – the belief that the Eucharist is remembering and obeying Jesus' Last Supper (Protestant view)
Transubstantiation - the belief that at the Eucharist the bread and wine actually become the Body and Blood of Christ (Catholic view)
Real Presence – the idea Jesus is present in the blessed bread and wine, but how is a mystery (Anglican view)
Last Supper – Jesus' last meal with the disciples where he started the Holy Communion
sacrifice –giving up something for the good of others
sacrament – a visible sign of God's inner gift

Prayer and meditation
Christians describe prayer as a conversation with God. Prayer can be silent or said out loud. It can use set words, or a person's own words. In prayer, Christians lift their minds and hearts to God.
There are many different kinds of prayer, including:
adoration - praising God for his greatness and admitting dependence on him
confession - owning up to sin and asking for God's mercy and forgiveness
thanksgiving - thanking God for his many blessings, eg health or children
petition - asking God for something, eg healing, courage or wisdom
intercession - asking God to help others who need it, eg the sick, poor, those suffering in war.

Nature and importance of prayer
Most Christians believe prayer deepens a person's faith. Praying can help the believer come to a greater understanding of God's purpose for their lives. Christians interpret the response they might get to their prayers in the following ways:
God answers prayers, but not always in the way the person wants. When a prayer is not answered, it may be that the person asked for something God thinks would not be good for them, or that their prayer will be answered later.
Sometimes Christians think that God has answered their prayers in quite spectacular ways, eg the recovery of a sick person. They may see this as a miracle.
For some Christians, meditation or contemplation is a way of trying to reach a higher spiritual level.
Others, especially Orthodox Christians, use the 'Jesus Prayer', Lord Jesus Christ, Son of God, have mercy on me, a sinner. They may chant this prayer over and over to clear their minds and achieve inner peace.
Other Christians, especially Roman Catholics, use a rosary to meditate on the life of Jesus.
Candles, a crucifix or a cross can all help Christians to focus on meditation and allow the Holy Spirit to enter their hearts.

Last Supper
On Maundy Thursday Christians remember when Jesus ate the Passover meal with his disciples, breaking bread and drinking wine, which is now known as the Last Supper.
Many Christians remember this by sharing **bread and wine** together in a service called Holy Communion, Eucharist or Mass. It is a reminder that Jesus sacrificed his life for humankind. At this meal Jesus told his followers that they should love and serve one another. He demonstrated this by washing the feet of the disciples - something a servant would normally do. You can read this story in the Bible in John Ch.13v1-15
The word *maundy* comes from the command (mandate) given by Jesus at the Last Supper, that we should love one another.
Roman Catholic church services include a ceremony in which the priest washes the feet of 12 people to commemorate Jesus' washing the feet of his disciples.



The Eucharist

The ***Eucharist***, which is also called the ***Holy Communion***, ***Mass***, the ***Lord's Supper*** or the ***Divine Liturgy***, is a sacrament accepted by almost all Christians.

Christians don't say that they 'do' or 'carry out' the Eucharist; they *celebrate* it.

What happens

The Eucharist is a re-enactment of the Last Supper, the final meal that Jesus Christ shared with his disciples before his arrest, and eventual crucifixion. At the meal Jesus ate bread and wine and instructed his disciples to do the same in memory of him.

The prayers and readings in a Eucharistic service remind those taking part of that final meal and of the solemn words and actions of someone standing at the edge of death.

The people taking part drink a sip of wine (or grape juice) and eat a tiny piece of some form of bread, both of which have been consecrated.

Different churches, different meanings

Roman Catholics believe that the bread and wine that is offered is the actual body and blood of Christ and another form of sacrifice. They believe that although the bread and wine physically remain the same, it is mysteriously transformed into the body, blood soul and divinity of Jesus. This is called **Transubstantiation**.

Protestants believe that Jesus made his sacrifice on the cross and simply follow the tradition of the sacrament in memory of the event, recalling its symbolic importance in the life of Jesus. This is **Commemoration**.

The Anglican Church teaches that Christ is truly present in the Eucharist, although how is a mystery. Some within the Church of England may believe in **Transubstantiation** and others in **Commemoration.**

Christianity – Sacraments

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Sacraments:

- Diversity of beliefs
- Baptism
- Eucharist
- Catholic
- Protestant

Key Terms:

Eucharist	'Thanksgiving' – an example of liturgical worship in the Catholic and Anglican traditions	**Baptists**	A Christian denomination who practice believer's baptism
Holy Communion	Receiving bread and wine during the Eucharist	**Lord's Supper**	Communion services in some denominations
Rites of Passage	Important stages in the life of a Christian	**Denomination**	Term used for different Christian churches
Baptism	A church service which welcomes a baby or adult into the Christian faith	**Mass**	Communion service in Catholic Church

Exam Practice:

- **Describe a celebration of baptism. (5)**
- **Create a venn diagram to show the similarities and differences in belief and practice of the Eucharist between two Christian traditions.**

Key Sources of Authority:

- John 3: 3-6

Key Beliefs:

Diversity	Christian **traditions** have diverse or different views on **some beliefs and practices**. There are **three** main Christian traditions; Catholic, Orthodox and Protestant, with many different **denominations**.
Baptism	This is the first **rite of passage** and some Christians believe it is a **sacrament**. Many Christians use the practice of **infant baptism** but others use the practice of **believer's baptism**. Baptism is a mark of entry to the **Christian** religion and is performed by a Christian **minister** and witnessed by the **family and church community**.
Eucharist	Eucharist means **'thanksgiving'** and is an important part of liturgical Christian worship. Christians have diverse beliefs about **'Holy Communion'**, which is part of the Eucharist, and the **meaning and significance** of Holy Communion.
Catholic	Catholics believe in **infant baptism** and in the **'Real Presence'** of Jesus in Holy Communion at the **Mass**. Catholics believe baptism and the Eucharist are regarded as **sacraments**. Catholics must be baptised in order to receive **Holy Communion** at the Mass and are expected to attend Mass weekly.
Protestant	Protestants have different views about the **nature of the sacraments**. Different **denominations** have different practices for baptism and the celebration of the Eucharist. Baptists use 'believers' baptism' and the 'Lord's Supper' as a communion service.

Key Connections:

Sacraments *Mission and Evangelism* *Ecumenical Movement*

Role of the local church as a place of worship *Nature of worship*

Christianity – Pilgrimage and Celebrations

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Pilgrimage and Celebrations:

- Walsingham
- Taize
- Christmas
- Easter
- Protestant

Key Terms:

Pilgrim	The name given to a person who undertakes a pilgrimage	**Miracle**	An unexplained event in some way connected to the power of God
Relic	An object which is revered by religious believers	**Worship**	To give 'worth' to God and the ways in which Christians show devotion to God
Sacred	Connected In some way to God	**Bible**	A sacred source of authority for Christians
Monastic community	Monks who have taken vows of chastity, poverty and obedience	**A church**	A building where Christians gather in community to worship God

Exam Practice:

- **Explain why pilgrimage to Taize is important to Christians. (8)**
- **Create a mind map for the topic 'Christmas – Beliefs and Practices' describing how Christians celebrate Christmas and explaining the most important beliefs about the birth of Jesus.**

Key Sources of Authority:

- The gospel accounts of the birth, death and resurrection of Jesus.

Key Beliefs:

Pilgrimage	Pilgrimage is a journey taken with a **religious** purpose and often to a **sacred** place or **shrine** associated with an **event** or **holy person**. It may involve the practice of **devotions** or special actions during the journey and is often carried out in a **communal way** with other pilgrims.
Celebrations	Celebrations are **festivals** which **commemorate** an important event in Christianity and allow Christians to focus their **worship**, often with special **practices** and **church services**. Christmas and Easter are the two most important annual festivals in the **Christian calendar**.
Walsingham	Walsingham is a place of pilgrimage for Anglicans and Catholics who visit the shrine of **'Our Lady of Walsingham'** in Norfolk.
Taize	Taize is the name of a monastic community in the village of Taize in France. It is a place of pilgrimage for thousands of people each year, particularly young people, who participate in the daily life of **prayer** with the **religious community** in the Church of the Reconciliation.
Christmas	Christmas, which means **'Christ's Mass'**, is an annual celebration to remember the **events of the birth** of Jesus in **Bethlehem**.
Easter	Easter is the most important Christian celebration as it remembers the events in the **last week** of the life of Jesus. The main focus of the celebration is on the miraculous resurrection of Jesus on **Easter Sunday**.

Key Connections:

Prayer *Worship* *Incarnation* *Atonement* *Resurrection*

Science Knowledge Organiser – Autumn Term

1. There is one page in here to be completed each week.

2. Each week complete the page with the correct date at the top.

3. Use the information sheets to help you answer the questions

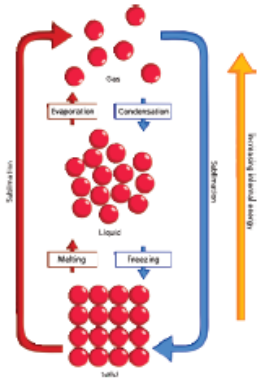
4. Once you have answered the questions or completed the task, spend the rest of your time learning the information. Try writing the answers in your green book, and then checking your page.

5. Ensure you have your knowledge organiser in Science lessons so that your teacher can check you have completed the work for the week.

6. You will also be tested on these questions during the week

Bonding and Structure Information sheet

AQA GCSE Chemistry (Combined Science) Unit 2: Bonding, Structure and Properties of Matter



The three states of matter are **solid, liquid and gas**.

For a substance to change from one state to another, **energy** must be **transferred**.

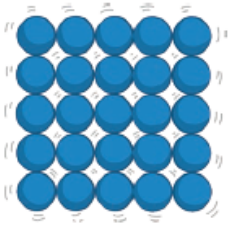
The particles gain energy. This results in the breaking of some of the **attractive forces** between particles during melting.

To evaporate or boil a liquid, more energy is needed to overcome the remaining chemical bonds between the particles.

Note the difference between **boiling** and **evaporation**. When a liquid **evaporates**, particles **leave the surface** of the liquid **only**. When a liquid **boils**, **bubbles** of gas form **throughout** the liquid before rising to the surface and escaping.

The amount of energy needed for a substance to change state is dependent upon the **strength** of the **attractive forces** between particles. The **stronger** the **forces of attraction**, the **more energy** needed to **break them apart**. Substances that have strong attractive forces between particles generally have **higher melting and boiling points**.

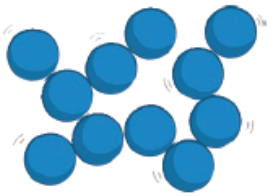
Solid



The particles in a **solid** are arranged in a regular pattern. The particles in a solid **vibrate** in a fixed position and are tightly packed together. The particles in a solid have a **low amount of kinetic energy**.

Solids have a **fixed shape** and are unable to flow like liquids. The particles **cannot be compressed** because the particles are very close together.

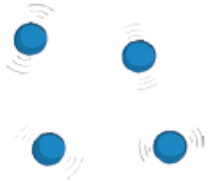
Liquid



The particles in a **liquid** are randomly arranged. The particles in a liquid are able to **move around** each other. The particles in a liquid have a **greater amount** of **kinetic energy** than particles in a **solid**.

Liquids are able to **flow** and can take the shape of the container that they are placed in. As with a solid, liquids **cannot be compressed** because the particles are close together.

Gas



The particles in a **gas** are randomly arranged. The particles in a gas are able to **move around very quickly** in all directions. Of the three states of matter, gas particles have the **highest amount** of **kinetic energy**.

Gases, like liquids, are able to **flow** and can fill the container that they are placed in. The particles in a gas are **far apart** from one another which allows the particles to move in any direction.

Gases can be **compressed**; when squashed, the particles have empty space to move into.

Limitations of the Particle Model (HT only)

The chemical bonds between particles are not represented in the diagrams above.

Particles are represented as solid spheres – this is not the case. Particles like atoms are mostly empty space. Particles are not always spherical in nature.

State Symbols

In chemical equations, the three states of matter are represented as symbols:

solid **(s)**
liquid **(l)**
gas **(g)**
aqueous **(aq)**

Aqueous solutions are those that are formed when a substance is dissolved in water.

Identifying the Physical State of a Substance

If the given temperature of a substance is **lower** than the **melting point**, the physical state of the substance will be **solid**.

If the given temperature of the substance is **between** the **melting point and boiling point**, the substance will be a **liquid**.

If the given temperature of the substance is **higher** than the **boiling point**, the substance will be a **gas**.

Bonding and Structure Information sheet

AQA GCSE Chemistry (Combined Science) Unit 2: Bonding, Structure and Properties of Matter

Formation of Ions

Ions are charged particle. They can be either positively or negatively charged, for example Na^+ or Cl^-.

When an element loses or gains electrons, it becomes an ion.

Metals **lose** electrons to become **positively charged**.

Non-metals **gain** electrons to become **negatively charged**.

Group 1 and 2 elements **lose** electrons and group 6 and 7 elements **gain** electrons.

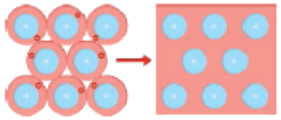
Group	Ions	Element Example
1	+1	$Li \rightarrow Li^+ + e^-$
2	+2	$Ca \rightarrow Ca^{2+} + 2e^-$
6	-2	$Br + e^- \rightarrow Br^-$
7	-1	$O + 2e^- \rightarrow O^{2-}$

Metals and Non-metals

Metals are found on the **left-hand side** of the **periodic table**. Metals are strong, shiny, malleable and good conductors of heat and electricity. On the other hand, non-metals are brittle, dull, not always solids at room temperature and poor conductors of heat and electricity. **Non-metals** are found on the **right-hand side** of the **periodic table**.

Metallic Bonding

Metallic bonding occurs between **metals only**. Positive metal ions are surrounded by a **sea of delocalised electrons**. The ions are tightly packed and arranged in rows.

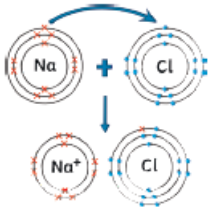


There are strong electrostatic forces of attraction between the positive metal ions and negatively charged electrons.

Pure metals are too soft for many uses and are often mixed with other metals to make alloys. The mixture of the metals introduces different-sized metal atoms. This **distorts the layers** and **prevents them from sliding over one another**. This makes it harder for alloys to be bent and shaped like pure metals.

Ionic Bonding

Ionic bonding occurs between a metal and a non-metal. Metals lose electrons to become positively charged. Opposite charges are attracted by electrostatic forces – an ionic bond.



Ionic Compounds

Ionic compounds form structures called giant lattices. There are **strong electrostatic forces of attraction** that **act in all directions** and act between the **oppositely charged ions** that make up the giant ionic lattice.

Properties of Ionic Compounds

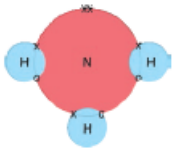
- High melting point – lots of energy needed to overcome the electrostatic forces of attraction.
- High boiling point
- **Cannot conduct electricity** in a **solid** as the ions are not free to move.
- Ionic compounds, when **molten** or in **solution**, can **conduct electricity** as the ions are free to move and can carry the electrical current.

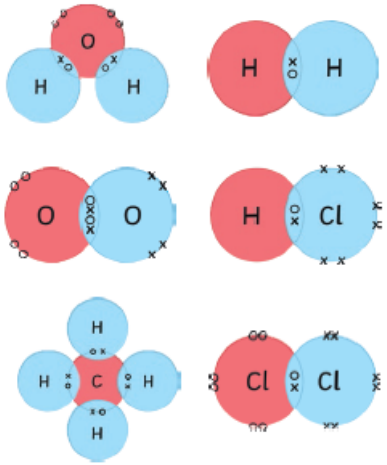
Covalent Bonding

Covalent bonding is the sharing of a pair of electrons between atoms to gain a full outer shell. This occurs between **non-metals only**. Simple covalent bonding occurs between the molecules below. Simple covalent structures have **low melting and boiling points** – this is because the **weak intermolecular forces** that hold the molecules together break when a substance is heated, not the strong covalent bonds between atoms. They **do not conduct electricity** as they do not have any free delocalised electrons.

Dot and cross diagrams are useful to show the **bonding** in **simple molecules**. The **outer electron shell** of each atom is represented as a **circle**, the circles from each atom overlap to show where there is a **covalent bond**, and the electrons from each atom are either drawn as **dots or crosses**. There are **two different types** of **dot and cross diagram** – one with a circle to represent the outer electron shell and one without.

You should be able to draw the dot and cross diagrams for the following simple covalent structures: chlorine, oxygen, nitrogen, water, ammonia, hydrogen chloride and methane.



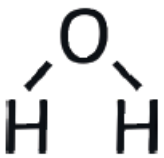


Bonding and Structure Information sheet

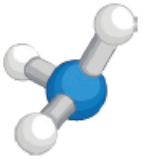
AQA GCSE Chemistry (Combined Science) Unit 2: Bonding, Structure and Properties of Matter

Structural Formulae

In this type of diagram, the element symbol represents the type of atom and the straight line represents the covalent bonding between each atom.

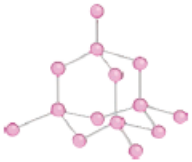


The structure of small molecules can also be represented as a 3D model.

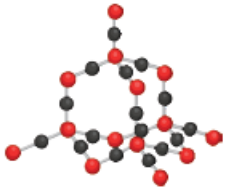


Giant Covalent Structure – Diamond

Each **carbon** atom is **bonded** to **four** other carbon atoms, making diamond very strong. Diamond has a high melting and boiling point. **Large** amounts of **energy** are needed to break the strong covalent bonds between each carbon atom. Diamond **does not conduct** electricity because it has **no free electrons**.

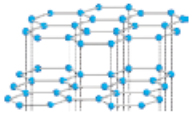


Silicon dioxide (silicon and oxygen atoms) has a similar structure to that of diamond, in that its atoms are held together by **strong covalent bonds**. Large amounts of energy are needed to break the strong covalent bonds therefore silicon dioxide, like diamond, has a high melting and boiling point.



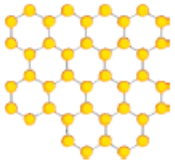
Giant Covalent Structure – Graphite

Graphite is made up of layers of **carbon** arranged in **hexagons**. Each carbon is bonded to **three** other carbons and has **one free delocalised electron** that is able to move between the layers. The layers are held together by weak intermolecular forces. The layers of carbon can slide over each other easily as there are no strong covalent bonds between the layers. Graphite has a high melting point because a lot of energy is needed to break the covalent bonds between the carbon atoms. Graphite can **conduct** electricity.



Giant Covalent Structure – Graphene

Graphene is one layer of graphite. It is very **strong** because of the covalent bonds between the carbon atoms. As with graphite, each carbon in graphene is bonded to three others with one **free delocalised electron**. Graphene is able to **conduct electricity**. Graphene, when added to other materials, can make them even stronger. Useful in electricals and composites.



Nanoscience

Nanoscience refers to structures that are **1–100nm** in size, of the order of a few hundred atoms. Nanoparticles have a **high surface area to volume ratio**. This means that smaller amounts are needed in comparison to normal sized particles. As the side length of a cube decreases by a factor of 10, the surface area to volume ratio increases approximately

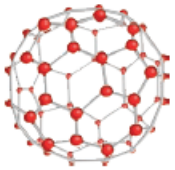
Name of Particle	Diameter
nanoparticle	1–100nm
fine particles (PM_{25})	100–2500nm
coarse particles (PM_{10})	2500–10000nm

Polymers

Polymers are long chain molecules that are made up of many smaller units called **monomers**. Atoms in a polymer chain are held together by **strong covalent bonds**. Between polymer molecules, there are **intermolecular forces**. Intermolecular forces **attract** polymer chains towards each other. Longer polymer chains have stronger forces of attraction than shorter ones therefore making stronger materials.

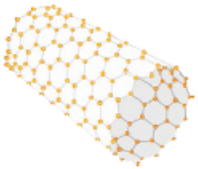
Fullerenes and Nanotubes

Molecules of carbon that are shaped like hollow tubes or balls, arranged in hexagons of five or seven carbon atoms. They can be used to **deliver drugs into the body**.



Buckminsterfullerene has the formula C_{60}

Carbon Nanotubes are tiny carbon cylinders that are very long compared to their width. Nanotubes can conduct electricity as well as strengthening materials without adding much weight. The properties of carbon nanotubes make them useful in electronics and nanotechnology.



Possible Risks of Nanoparticles

As nanoparticles are so **small**, it makes it possible for them to be inhaled and enter the lungs. Once inside the body, nanoparticles may **initiate harmful reactions** and toxic substances could bind to them because of their large surface area to volume ratio. Nanoparticles have many applications. These include medicine, cosmetics, sun creams and deodorants. They can also be used as catalysts.

Modern nanoparticles are a relatively new phenomenon therefore it is difficult for scientists to truly determine the risks associated with them.

Bonding & Structure

W/C 13th Sept

Key Recall Questions	Answers
How are the electrons arranged in atoms?	
How many electrons can go in the first shell?	
How many electrons does silicon have?	
How many electrons are in the outer shell of boron?	
An element has three shells and three electrons in the outer shell. What element is it?	
What is an ion?	
If something has gained electrons, what charge will it have?	
What charge do electrons have?	
What charge will an ion of lithium take?	
If something has lost electrons, what charge will it have?	
What charge will an ion of oxygen take?	
Why do atoms transfer electrons in ionic bonding?	
Explain in terms of electrons what occurs when lithium bonds with fluorine	
Explain in terms of electrons what occurs when magnesium bonds with oxygen	

Bonding & Structure

W/C 20th Sept

Key Recall Questions	Answers
Define giant ionic lattice	
State the melting points of ionic substances	
Explain why ionic substances have high melting points.	
What does molten mean?	
Explain why ionic compounds do not conduct electricity when solid	
Explain why ionic compounds conduct electricity in solution	
Explain why ionic compounds conduct electricity when molten	
What does soluble mean?	
What does insoluble mean?	
Magnesium carbonate is insoluble. What do you need to do before it will conduct electricity?	
Sodium fluoride is soluble. Explain what the easiest way for it to conduct electricity is	
Explain why chlorine and fluorine form covalent bonds	
What is the name given to the structure of diamond, graphite and silicon dioxide?	
How many bonds does each carbon have in diamond?	
Explain why diamond has a high melting point	
Explain why graphite conducts electricity	

Bonding & Structure

W/C 27th Sept

Key Recall Questions	Answers
Explain why graphite can act as a lubricant	
What is graphene?	
What is a fullerene?	
What type of substance are methane and water?	
What is a molecule?	
Describe the structure of simple covalent molecules	
What are intermolecular forces?	
Explain why methane has a low melting point	
What is a polymer?	
Describe the main features of metals in terms of their structure	
Explain why metals can conduct electricity	
Explain why pure metals are soft	
What is an alloy?	
Give a reason for alloying a metal	
Explain why alloys can be harder than pure metals	

Electricity Information sheet

Electricity – Foundation and Higher

Required Practical

Investigating Resistance in a Wire

Independent variable: length of the wire.

Dependent variable: resistance.

Control variables: type of metal, diameter of the wire.

Conclusion: As the length of the wire increases, the resistance of the wire also increases.

Investigating Series and Parallel Circuits with Resistors

Independent variable: circuit type (series, parallel).

Dependent variable: resistance.

Control variables: number of resistors, type of power source.

Conclusion: Adding resistors in series increases the total resistance of the circuit. In a parallel circuit, the more resistors you add, the smaller the resistance.

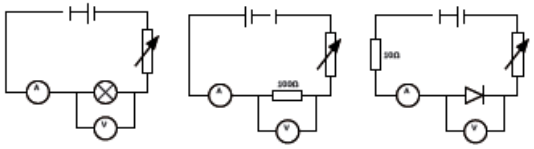
Investigating I-V Relationships in Circuits (Using a filament bulb, ohmic conductor, diode.)

Independent variable: potential difference/volts (V).

Dependent variable: current (A).

Control variable: number of components (e.g. 1 filament bulb, 1 resistor), type of power source.

Set up the circuits as shown below and measure the current and the potential difference.



Draw graphs of the results once collected.

Equations and Maths

Equations

Charge:	$Q = It$
Potential difference:	$V = IR$
Energy transferred:	$E = Pt$
Energy transferred:	$E = QV$
Power:	$P = VI$
Power:	$P = I^2R$

Maths

1kW = 1000W

0.5kW = 500W

Charge

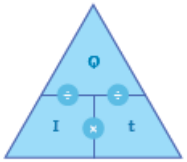
Electric current is the flow of electric charge. It only flows when the circuit is complete.

The **charge** is the current flowing past a point in a given time. Charge is measured in **coulombs (C)**.

Calculating Charge

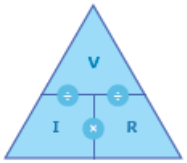
charge flow (C) = current (A) × time (s)

$Q = It$



potential difference = current x resistance

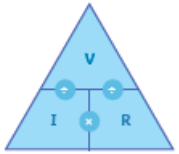
V (V) = I (A) × R (Ω)



Resistance

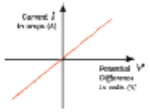
voltage (V) = current (A) × resistance (Ω)

V = IR



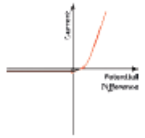
Graphs of I-V Characteristics for Components in a Circuit

1. **Ohmic conductor**: the current is directly proportional to the potential difference - it is a straight line (at a constant temperature).



2. **Filament lamp**: as the current increases, so does the temperature. This makes it harder for the current to flow. The graph becomes less steep.

3. **Diode**: current only flows in one direction. The resistance is very high in the other direction which means no current can flow.



Current and Circuit Symbols

Current: the flow of electrical charge.

Potential difference (voltage): the push of electrical charge.

Resistance: slows down the flow of electricity.

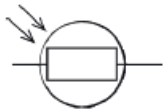
cell		closed switch		fuse	
resistor		ammeter	A	LDR	
battery		voltmeter	V	LED	
variable resistor		bulb		thermistor	
open switch		diode			

Electricity Information sheet

Electricity – Foundation and Higher

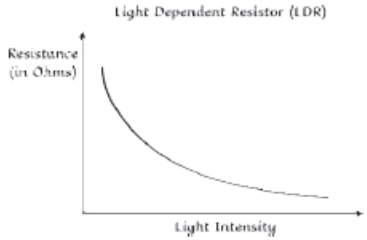
Circuit Devices

LDR – Light Dependent Resistor



An LDR is dependent on light intensity. In bright light the resistance falls and at night the resistance is higher.

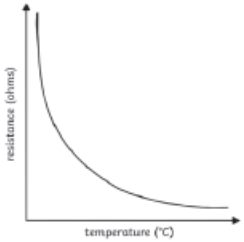
Uses of LDRs: outdoor night lights, burglar detectors.



Thermistor

A thermistor is a temperature dependent resistor. If it is hot, then the resistance is less. If it becomes cold, then the resistance increases.

Uses of thermistors: temperature detectors.



Series and Parallel Circuits

Series Circuits

Once one of the components is broken then all the components will stop working.

Potential difference – the total p.d. of the supply is shared between all the components.

$V_{total} = V_1 + V_2$

Current – wherever the ammeter is placed in a series circuit the reading is the same.

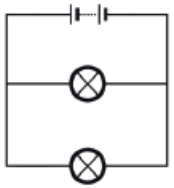
$I_1 = I_2 = I_3$

Resistance – In a series circuit, the resistance will add up to make the total resistance.

$R_{total} = R_1 + R_2$

Parallel Circuits

They are much more common - if one component stops working, it will not affect the others. This means they are more useful.



Potential Difference – this is the same for all components.

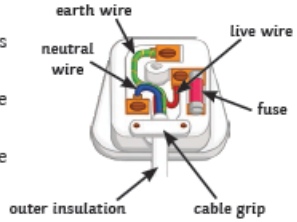
$V_1 = V_2$

Current – the total current is the total of all the currents through all the components.

$I_{total} = I_1 + I_2 + I_3$

Resistance – adding resistance reduces the total resistance.

Electricity in the Home



AC – alternating current. Constantly changing direction - UK mains supply is 230V and has a frequency of 50 hertz (Hz).

DC – direct current. Supplied by batteries and only flows in one direction.

Cables – most have three wires: live, neutral and earth. They are covered in plastic insulation for safety.

Live wire – provides the potential difference from the mains.

Neutral wire – completes the circuit.

Earth wire – protection. Stops the appliance from becoming live. Carries a current if there is a fault. Touching the live wire can cause the current to flow through your body. This causes an electric shock.

Energy Transferred – this depends on how long the appliance is on for and its power.

energy transferred (J) = power (W) × time (s) $E = Pt$

Energy is transferred around a circuit when the charge moves.

energy transferred (J) = charge flow (C) × potential difference (V) $E = QV$

power (W) = potential difference (V) × current (A) $P = VI$

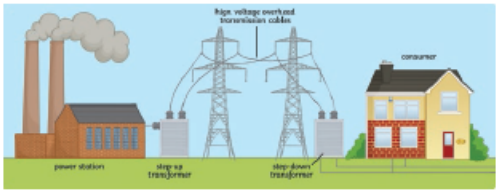
power (W) = current² (A) × resistance (Ω) $P = I^2R$

The National Grid

The National Grid is a system of cables and transformers. They transfer electrical power from the power station to where it is needed. Power stations are able to change the amount of electricity that is produced to meet the demands. For example, more energy may be needed in the evenings when people come home from work or school. Electricity is transferred at a low current, but a high voltage so less energy is being lost as it travels through the cables.

Step-up transformers – increase the voltage as the electricity flows through the cables.

Step-down transformers – decrease the potential difference to make it safe.



Electricity

W/C 4th Oct

Key Recall Questions	Answers
Draw the circuit symbol for a switch	
Draw the circuit symbol for a cell	
Draw the circuit symbol for a diode	
Draw the circuit symbol for a resistor	
Draw the circuit symbol for a variable resistor	
Draw the circuit symbol for an LED	
Draw the circuit symbol for a fuse	
Draw the circuit symbol for a voltmeter	
Draw the circuit symbol for a thermistor	
Draw the circuit symbol for an LDR	

Electricity

W/C 11th Oct

Key Recall Questions	Answers
State the rule for resistance in a series circuit	
State the rule for current in a parallel circuit	
State the rule for potential difference in a parallel circuit	
State the rule for resistance in a parallel circuit	
What colour is the live wire in a three core cable?	
What colour is the neutral wire in a three core cable?	
What colour is the earth wire in a three core cable?	
The brown wire in a plug is the _____	
The blue wire in a plug is the _____	
The green and yellow wire in a plug is the _____	

Electricity

W/C 18th Oct

Key Recall Questions	Answers
Current flows out of an appliance through the _____ wire	
The _____ wire is a safety feature of appliances	
Potential difference between the neutral wires and others in the plug should be __ V	
Electric Current is….?	
Potential difference between two points in a circuit is….?	
In a circuit the potential difference causes …..?	
Resistance is…?	
Particles which can be 'charges' in electric circuits are…	
What is a series circuit?	
What is a parallel circuit?	
State the equation which links charge flow, current and time	

Electricity

W/C 1st Nov

Key Recall Questions	Answers
State the equation which links current, potential difference and power	
State the equation which links current, power and resistance	
State the equation which links energy transferred, power and time	
State the equation which links charge, energy and potential difference	
What is the unit of charge flow?	
What is the unit of current?	
What is the unit for potential difference?	
What is the unit for resistance?	
What is the unit for power?	
Describe the I-V characteristic for a fixed resistor	

Electricity

W/C 8th Nov

Key Recall Questions	Answers
Describe the I-V characteristic of a diode	
Current which regularly changes direction is called…	
An example of alternating current is…?	
Current which flows in one direction is…?	
An example of direct current is…	
What is the potential difference of mains electricity in the UK?	
What is the frequency of the alternating current in UK mains electricity?	
The national grid consists of…?	
Are power stations part of the national grid?	
What does a step up transformer do?	

Magnetism Information sheet

AQA Combined Science: **Physics Topic 7 Magnetism and Electromagnetism**

Poles of a Magnet

A magnet has two ends called **poles**: the **north pole** and the **south pole**. The magnetic forces of the magnet are strongest at the poles.

When two magnets are brought close together, they will **attract** or **repel**, depending on which poles are brought together:

- **Like poles** will **repel** one another e.g. N-N or S-S.
- **Opposite poles** will **attract** e.g. N-S.

The forces exerted between the poles of two magnets are a type of **non-contact force**: the magnets do not have to be touching for the effect to be observed.

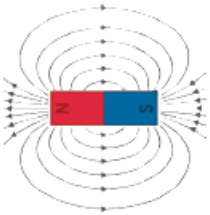
Remember that only **iron**, **cobalt** and **nickel** (or alloys containing these metals) are magnetic.

A **permanent magnet** is one with its own magnetic field. The magnetism cannot be turned on or off e.g. a bar magnet or a horseshoe magnet.

An **induced magnet** is a material which becomes magnetic only when placed within a magnetic field. Induced magnets only attract other materials and lose most (if not all) of their magnetism when removed from the magnetic field e.g. iron filings.

Magnetic Fields

The **magnetic field** is the area surrounding a magnet where the force is acting on another magnet or magnetic material. It can be observed using a compass placed at different points around a bar magnet. The field lines can be drawn by using the compass to mark the direction at a range of points.



A magnet always causes a magnetic material to be **attracted**. The strength of the magnetic field is determined by the proximity to the magnet.

When looking at a diagram of magnetic field lines, the force is strongest where the lines are closest together. The magnetic field of the magnet is strongest at the poles. The direction of the magnetic field shows the direction the force would act on another north pole.
As a result, magnetic field lines always come away from the north pole (like poles repel) and towards the south pole (unlike poles attract).

The earth produces a magnetic field and a magnetic compass uses this to help aid navigation. The core of the earth is made of iron (a magnetic material). A compass contains a small bar magnet shaped as a needle, which points in the direction of the earth's magnetic field.

Plotting Magnetic Field Lines

A magnetic compass can be used to plot and draw the magnetic field lines around a magnet.

You should be able to describe this method for a bar magnet.

1. Place the bar magnet in the centre of a sheet of plain paper.
2. Using a magnetic compass, position it on the paper somewhere around the magnet.
3. Observe the direction of the needle and carefully draw a dot at the circumference of the magnet, in line with each end of the needle. Make sure you include an arrow to indicate the direction of north.
4. Repeat steps 2 and 3 for several positions around the magnet.
5. Join the arrows to complete the magnetic field lines and whole pattern.

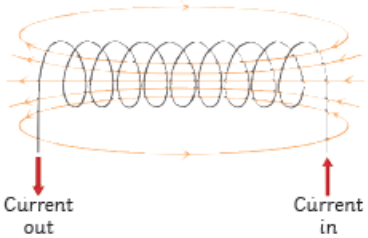
Electromagnetism

A circular **magnetic field** is produced when a current is passed through a conducting wire. This produces an **induced magnet**.

Switching off the current causes the magnetism to be lost.

The strength of the magnetic field can be increased by increasing the current flowing through the wire. The strength of the magnetic field is stronger closer to the wire.

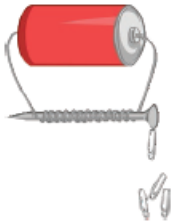
Coiling the wire to form a **solenoid** will also increase the strength of the magnetic field. The strength of the magnetic field created by a solenoid is strong and uniform throughout.



To increase the strength of the magnetic field around a solenoid you can...

- add an iron core;
- increase the number of turns in the coil;
- increase the current passing through the wire.

An **electromagnet** is a solenoid with an iron core. Electromagnets are **induced magnets** and can be turned on and off.



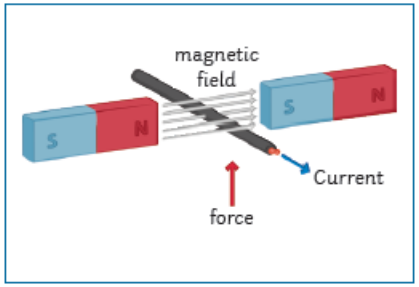
Electric motors, loudspeakers, electric bells and remotely controlled door locks all use **electromagnets**.

Magnetism Information sheet

AQA Combined Science: **Physics Topic 7 Magnetism and Electromagnetism**

The Motor Effect and Flemings Left-Hand Rule

When a wire carrying a current is exposed to the magnetic field of another magnet, then a **force** is produced on the wire at a **right angle** to the direction of the magnetic field produced.



This is called the **motor effect**.

The force produced by the motor effect can be calculated using this equation:

force (N) = magnetic flux density (T) × current (A) × length (m)

For example:
A current of 8A is flowing through a wire that is 75cm long. The magnetic field acting at a right angle on the wire is 0.5T. Calculate the force.

F = B × I × l

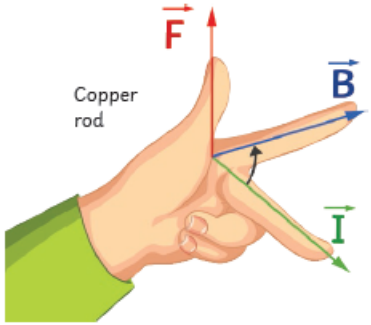
Remember: the equation uses length measured in m. The question gives you the length in cm so you need to convert it before you calculate your answer.

F = 0.5 × 8 × 0.75

F = 3N

From the equation we can see that the force acting on a given length of wire (e.g. 1m) will be increased if the current increases or the magnetic flux density increases. If the current flowing through a wire is **parallel** to the magnetic field, then **no force** is produced – there is no motor effect.

You might be shown a diagram and asked to indicate the direction of the force produced. **Fleming's left-hand rule** can help you do this because it represents the **relative orientation** of the force produced by the motor effect.

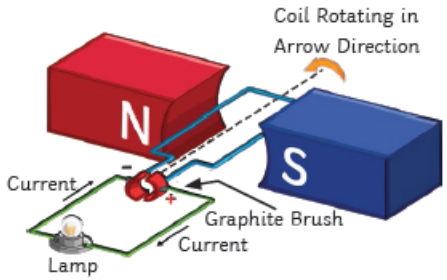


Remember:

- Use your **left hand**!
- The angle between your index finger and middle finger should be a **right angle** on the horizontal plane.
- The angle between your index finger and thumb should be a **right angle** on the vertical plane.
- Your **thumb** represents the direction of the **force**.
- Your **index finger** represents the direction of the **magnetic field**.
- Your **middle finger** represents the direction of the **current** flowing through the wire.

Electric Motors

When the wire carrying the current is **coiled**, the motor effect acting on it causes the wire to **rotate**. This is how an **electric motor** works.



As the **current** flows (from negative to positive), the force produced in each side of the coil acts in **opposite directions**, causing the coil to **rotate** overall.

When the coil reaches a **vertical position**, the force produced is now **parallel** to the magnetic field line and so would be **zero**. This would cause the motor to stop rotating.

To maintain the rotation of the coiled wire, a **split ring commutator** is used to supply the current to the wire. The DC supply reaches the split ring via graphite or metal **brushes** which maintain the connection while allowing it to rotate freely on the **axle**.

The two halves of the split ring commutator ensure that the **current supplied** to the wire **changes direction** each half-turn (or that the current supplied is the same direction on each side of the motor) and as a result, the force produced maintains a **constant rotation** in one direction overall.

Magnetism

W/C 15th Nov

Key Recall Questions	Answers
The places on a magnet where the magnetic forces are the strongest are called the…	
What is the definition of a magnetic field?	
The area around a magnet where a force acts on another magnet or magnetic material in the…	
Two like poles always _____	
Tow opposite poles always _____	
What is a permanent magnet?	
What is an induced magnet?	
A magnetic material which becomes a magnet when placed in a magnetic field is a _____ _____	
What type of magnet loses its magnetism when it is removed from a magnetic field?	
Which three elements are magnetic?	
Draw the magnetic field around a bar magnet	
Give the name for the magnet created using a coil of wire	
Where is the strongest field in an electromganet created by a coil of wire?	
What two words describe the magnetic field within the coil of a solenoid?	
What is an electromagnet?	
What is an important property of a solenoid/electromagnet as a magnet?	

Recap 1

W/C 22nd Nov

Key Recall Questions	Answers
What is an ion?	
If something has gained electrons, what charge will it have?	
Sodium fluoride is soluble. Explain what the easiest way for it to conduct electricity is	
Explain why chlorine and fluorine form covalent bonds	
Describe the structure of simple covalent molecules	
What are intermolecular forces?	
Draw the circuit symbol for a voltmeter	
Draw the circuit symbol for a thermistor	
What colour is the live wire in a three core cable?	
What colour is the neutral wire in a three core cable?	
What is a series circuit?	
What is a parallel circuit?	
What does a step up transformer do?	
What does a step down transformer do?	
What is an electromagnet?	
What is an important property of a solenoid/electromagnet as a magnet?	

Recap 2

W/C 29th Nov

Key Recall Questions	Answers
What charge do electrons have?	
What charge will an ion of lithium take?	
Define giant ionic lattice	
State the melting points of ionic substances	
What is graphene?	
What is a fullerene?	
State the rule for current in a series circuit	
State the rule for potential difference in a series circuit	
State the rule for resistance in a series circuit	
State the rule for current in a parallel circuit	
State the equation which links current, potential difference and power	
State the equation which links current, power and resistance	
What is the frequency of the alternating current in UK mains electricity?	
The national grid consists of…?	
What type of magnet loses its magnetism when it is removed from a magnetic field?	
Which three elements are magnetic?	

Bioenergetics Information sheet

AQA GCSE (Combined Science) Unit 4: Bioenergetics Higher

Photosynthesis

Photosynthesis is a chemical reaction which takes place in plants. It converts **carbon dioxide** and **water** into **glucose** and **oxygen**. It uses **light** energy to power the chemical reaction, which is absorbed by the green pigment **chlorophyll**. This means that photosynthesis is an example of an **endothermic** reaction. The whole reaction takes place inside the **chloroplasts** which are small organelles found in plant cells.

Plants acquire the carbon dioxide via diffusion through the **stomata** of their leaves. The water is absorbed from the soil through the **roots** and transported to the cells carrying out photosynthesis, via the **xylem**.

The glucose made in photosynthesis is used for respiration, stored as starch, fat or oils, used to produce cellulose or used to produce amino acids for protein synthesis.

The Rate of Photosynthesis and Limiting Factors

A **limiting factor** is something which stops the photosynthesis reaction from occurring at a faster rate. **Temperature**, **light intensity** and **carbon dioxide** level are all limiting factors.

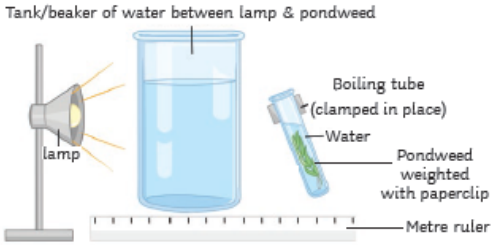
Increasing the temperature of the surroundings will increase the rate of reaction, but only up to around 45°C. At around this temperature, the enzymes which catalyse the reaction become denatured.

Increasing the light intensity will increase the rate of reaction because there is more energy to carry out more reactions.

Increasing the carbon dioxide concentration will also increase the rate of reaction because there are more reactants available.

The Effect of Light Intensity on the Rate of Photosynthesis (RPI)

The amount of light a plant receives affects the rate of photosynthesis. If a plant receives lots of light, lots of photosynthesis will occur. If there is very little or no light, photosynthesis will stop.



Method

1. Measure 20cm^3 of sodium hydrogen carbonate solution and pour into a boiling tube.
2. Collect a 10cm piece of pondweed and gently attach a paper clip to one end.
3. Clamp the boiling tube, ensuring you will be able to shine light onto the pondweed.
4. Place a metre rule next to the clamp stand.
5. Place the lamp 10cm away from the pondweed.
6. Wait two minutes, until the pondweed has started to produce bubbles.
7. Using the stopwatch, count the number of bubbles produced in a minute.
8. Repeat stages 5 to 7, moving the lamp 10cm further away from the pondweed each time until you have five different distances.
9. Now repeat the experiment twice more to ensure you have three readings for each distance.

The **independent** variable was the light intensity.

The **dependent** variable was the amount of bubbles produced. Counting the bubbles is a common method, but you could use a gas syringe instead to more accurately measure the volume of oxygen produced.

The **control** variables were same amount of time and same amount of pondweed. A bench lamp is used to control the light intensity and the water in the test tube containing the pondweed is monitored with a thermometer to monitor and control the temperature.

Interaction of Limiting Factors (HT only)

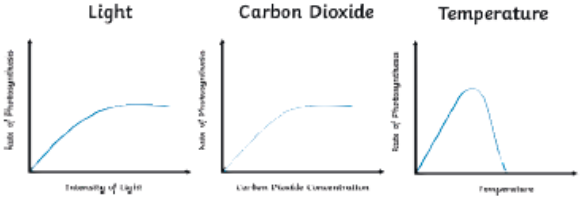
The limiting factor for the reaction will depend on the environmental conditions.

For example:

At night, light intensity is the limiting factor.

In winter, temperature is the limiting factor.

In other conditions, carbon dioxide is usually the limiting factor.



From the graph, you can see that increasing one of the factors will also increase the rate of reaction, but only for so long before it plateaus. This is because another factor will have then become the limiting factor. E.g. you could increase the supply of carbon dioxide, but if there is not enough chlorophyll to absorb the sunlight, then the sunlight will become the limiting factor instead.

Greenhouse Economics (HT only)

To grow plants in the most suitable conditions, a greenhouse can be used.

A greenhouse traps the sun's radiation as heat inside the greenhouse, so that temperature is not a limiting factor for the rate of photosynthesis.

Artificial lighting can be installed in the greenhouse to provide constant light energy and prevent light intensity being a limiting factor.

A paraffin heater can be used in the greenhouse to not only maintain a suitable temperature, but the by-product of the combustion off the paraffin is carbon dioxide.

Enclosing the crops in a greenhouse and regulating all the conditions in this way can be expensive; however, it is often outweighed because the harvest of the crop is much healthier, faster-grown crops. Furthermore, the enclosed conditions mean that disease and pests can be easily controlled and prevented.

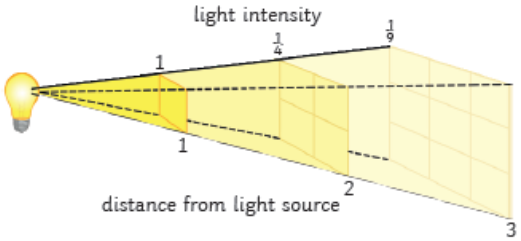
Bioenergetics Information sheet

AQA GCSE (Combined Science) Unit 4: Bioenergetics Higher

Inverse Square Law and Light Intensity

The **inverse square law** is used to describe the light intensity at different distances from the source.

The inverse square law states that: **the intensity of light is inversely proportional to the square distance from the source.**



Light intensity is calculated by the following equation:

$$\text{light intensity} \propto \frac{1}{\text{distance}^2}$$

- The symbol, ∝, means 'is proportional to'.
- Distance is measured in metres, m.

In other words, if an object is moved twice as far away from the light source, the light intensity received is reduced to just one quarter.

Worked example:

If the light source is 10cm from a plant, calculate the light intensity reaching the plant.

1 ÷ (distance^2)
1 ÷ (0.10 × 0.10)
1 ÷ 0.01
= 100 arbitrary units

If the light source is moved 25cm from the plant, calculate the light intensity reaching the plant.
1 ÷ (distance^2)
1 ÷ (0.25 × 0.25)
1 ÷ 0.06 25
= 16 arbitrary units

Respiration

Respiration is the chemical reaction which occurs inside the **mitochondria** of all living cells to release energy for living functions and processes, e.g. movement, warmth and building larger molecules for growth and repair. The reaction is **exothermic**, meaning that energy is released to the surroundings.

Respiration can be either **aerobic** (using oxygen) or **anaerobic** (without using oxygen).

glucose + oxygen → carbon dioxide + water + energy

$$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + ATP$$

In anaerobic respiration, the glucose is not completely oxidised. This means that there is less energy released than in aerobic respiration.

glucose → lactic acid + energy

$$C_6H_{12}O_6 \rightarrow 2C_3H_6O_3 + ATP$$

In plants and yeast, anaerobic respiration makes some different products. The reaction is also called fermentation and is used in bread-making and beer-brewing.

glucose → ethanol + carbon dioxide + energy

$$C_6H_{12}O_6 \rightarrow C_2H_5OH + CO_2 + ATP$$

Effect of Exercise

When a person exercises, their body (specifically their **muscles**) need much more energy. To release more energy, the amount of respiration reactions occurring has to increase.
The **heart** pumps faster and the **breathing** rate and breath volume all increase to supply more **oxygen** to the muscles via the bloodstream.

If the muscles are not receiving enough oxygen to keep up the demand needed by the respiration reactions, then **anaerobic** respiration begins to occur. This incomplete oxidation of the glucose produces **lactic acid**, which can build up in the muscles and results in an **oxygen debt**.

After long periods of exercise, the muscles can become fatigued and stop contracting. You might experience a pain commonly called a **stitch**.

Metabolism

Metabolism is the combination of all the reactions in a cell or in the body.

Energy released during respiration is used during metabolic processes to synthesise new molecules:

- Glucose is converted to starch, glycogen and cellulose.
- Glycerol and three fatty acids are joined to form a lipid molecule.
- Glucose and nitrate ions are joined to form amino acids.
- Amino acids are joined to form proteins.
- Excess proteins are broken down and released as urea during excretion.

Respiration itself is also a process which is included in metabolism.

Oxygen Debt (HT only)

During vigorous exercise, the body can begin to carry out **anaerobic respiration** and produces **lactic acid**.

Lactic acid is transported via the bloodstream to the **liver**. The liver converts the lactic acid back into **glucose**. However, **oxygen** is needed to carry out this reaction.

The **oxygen debt** is the amount of the oxygen required by the body to convert the built-up lactic acid back into glucose and remove it from the respiring cells.

Bioenergetics

W/C 6th Dec

Key Recall Questions	Answers
State the word equation for photosynthesis.	
State the balanced chemical symbol equation for photosynthesis.	
Is photosynthesis an endo- or exothermic reaction?	
What energy transfer occurs in photosynthesis?	
Where does photosynthesis occur in a plant or algal cell?	
What are chloroplasts filled with?	
What is the function of chlorophyll?	
Name the three factors which affect the rate of photosynthesis.	
What is the inverse square law?	
Why can't a commercial grower of plants just increase all three limiting factors of PHS to maximum levels to obtain optimum growth?	

Bioenergetics

W/C 13th Dec

Key Recall Questions	Answers
Name three ways glucose produced in photosynthesis is used in plants.	
What else, other than glucose, do plants need to produce proteins?	
Where are mineral ions absorbed from and through which plant organ?	
What is aerobic respiration and where does it occur in cells?	
What is anaerobic respiration and where does it occur in cells?	
Is respiration an endo- or exothermic reaction?	
State the balanced chemical equation for aerobic respiration.	
State the word equation for anaerobic respiration in animal cells.	
State the word equation for anaerobic respiration in plant and yeast cells.	
Is more or less energy transferred in anaerobic respiration compared to aerobic respiration?	