

Year 10 Core Subjects

Knowledge Organiser

September - December 2023

AMBITION, CONFIDENCE, CREATIVITY,
RESPECT, DETERMINATION

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Why do we have knowledge organisers?

Knowledge organisers are a collation of the basic essential knowledge for success in each subject area that will underpin your learning for the term.

They are designed to provide the information you will need to be committing to your long term memory through recall exercises in Low Stakes Quizzing.

How do we use knowledge organisers?

You should be using these KOs to create your homework quizzes so that you are practising retrieving information.

1. You can do this by testing yourself on the definition of key terms (both recalling the key term and then swapping to recall the definition), practice labelling diagrams, retrieves reasons and justifications for the main learning points.
2. They can also be used for 'memory dumps' where you try to recall as much of the information about a topic as possible and then use the KP to fill in the gaps.
3. They can also be used in class to assist with retrieval of the core knowledge needed for each subject.

You should have these with you at all times in school and out on your desk in all lessons.

If you lose your KO or it becomes too dishevelled, please purchase a new one from the Head of Year or the School Office.

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**AMBITION, CONFIDENCE, CREATIVITY,
RESPECT, DETERMINATION**

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Key characters

- **Ebenezer Scrooge** Transforms from misanthropist to philanthropist
- **Bob Cratchit** Represents the noble poor, challenges perceptions of the poor
- **Ghost of Christmas Past** Shows us Scrooge was not always hard and cold, importance of memory
- **Ghost of Christmas Present** Shows Scrooge what Christmas spirit really is. Introduces Ignorance and Want to teach Scrooge the error of his ways
- **Ghost of Christmas Yet to Come** Shows Scrooge his dire fate unless he changes
- **Tiny Tim** Represents Christian values and is a symbol for the most vulnerable in society. He is a key character in Scrooge's transformation
- **Jacob Marley** Scrooge's dead business partner, the catalyst for Scrooge's transformation.
- **The Portly Gentlemen** An example of those members of society who were socially responsible.
- **Fezziwig** A shining example of how a boss could practice philanthropy

Key Themes

- **Redemption** Dickens shows Victorians it is possible to change their ways through the transformation of Scrooge
- **Family** Offers warmth and love – complete contrast to Scrooge's chosen life
- **Christmas** A time of love, hope, charity and kindness to show Dickens' moral message
- **Social Injustice** Dickens highlights the social injustice of Victorian England to bring about reform
- **Threat of Time** Scrooge needs to act quickly or he will walk in purgatory for all time.
- **Social responsibility** Dickens uses the novella to demonstrate the importance of generosity.
- **Generosity** The need to share and fulfil Christian obligations
- **Philanthropy** those characters who share this trait are much happier as a result of their behavioural choice.
- **Supernatural** A fashionable 1843 theme which is used to teach Scrooge how to change.

A Christmas Carol KO Lit Paper 1

Key Vocabulary

- **Misanthropy** Dislike of humankind (Greek miso – hating Greek - Anthropos – man)
- **Philanthropy** Desire to help others, usually through charity (Greek – philanthopos – man-loving)
- **Stave** The parallel lines music is written on (English – staff, support)
- **Novella** A short novel (Italian – novel)
- **Avarice** Greed (Latin – avarus – greedy)
- **Penitence** Sorrow for committing sin (Latin – paenitent – repenting)
- **Industrial** Related to industry and factories (French – industriel – resulting from labour)
- **Revolution** A great change (Latin – revolve – turn, roll back)
- **Apparition** Supernatural appearance (Latin – apparitionem – an appearance)
- **Benevolent** Wishing to do well, kindly (Latin – benevolentum – wishing someone well)
- **Covetous** Desiring to obtain and own (French – coveitos – desire, eagerness, ambition)
- **Ominous** An indication of coming evil (Latin – ominosus – full of foreboding)
- **Tremulous** Shaking (Latin – tremulus – shaking, quivering)

Top Tips for an extract question:

- ✓ Work through the novella chronologically – beginning, middle and end. Fit the extract into your plan and make sure you reference the whole novella
- ✓ Remember to explore the language in each quotation using appropriate subject terminology
- ✓ Identify the writer's purpose- Dickens wanted to change middle class attitudes towards poverty and make them more generous.
- ✓ Include a thesis statement to introduce your argument

Devices used

- **Omniscient Narrator** Dickens makes use of a narrator that is not a direct part of the story. They provide us with an overview of the story but focuses specifically on Scrooge and his responses to what is happening. They do not offer a sympathetic portrait; often the style is one of mockery. It is clear we are meant to detest Scrooge at the beginning but the gradual unfolding of his story allows us to like him by the end.
- **Pathetic Fallacy** A technique that links human emotion to the weather. Throughout the novella warmth is linked to community and love and coldness is linked to hard-heartedness and a lack of love. This is further emphasized with Scrooge when we find out that 'no warmth could warm, no wintry weather chill him.' Scrooge is the most extreme version of the effects of self-interested capitalism.
- **Antithesis** The opposite of someone or something, antithesis is used throughout the novella to show that there is a better way. Fezziwig's form of business is an antithesis to Scrooge's, the first stave is the antithesis of the final stave, Bob is the antithesis of Scrooge...
- **Allegory** A story that teaches a moral lesson, using the characters as symbols. In ACC Scrooge represents the Victorian businessmen that take advantage of the poor. Fred represents the ideal of the middle class. The Cratchits represent the noble poor. Tiny Tim represents children and their vulnerability. Fezziwig represents an alternative way of doing business.
- **Parallel Stave** (1 and 5) Basically, the end is the reverse of the beginning- everything that Scrooge fails to do in Stave 1 is reversed in Stave 2 to symbolise his transformation.
- **Symbolism** As an allegorical story, much of what is presented by Dickens is a device used to explore his message of generosity and benevolence.

Useful terminology
Satire- use of humour or ridicule to criticise
Asyndeton- list without conjunctions
Polysyndeton- list with conjunctions (and)
Simile- comparing using 'like' or 'as'
Metaphor- saying one thing is another
Personification- make object human
Pathetic fallacy- weather to create mood
Pathos- language to evoke pity
Allusion- reference to another literary work
Hyperbole- exaggerated statement
Connotation- associated meaning of word
Characterisation- built up description of character in text
Semantic field- words related in meaning
Imagery- visually descriptive language
Writer's purpose: social reform

Dickens is writing to influence the reader at a time when the middle classes took little social responsibility for the effects of the industrial revolution on the working classes. Workers were kept in servitude due to appalling pay and conditions. They were powerless to alter their situation until the middle classes, like Scrooge, chose to improve their situation.

Structure and form
Conflict- problem faced by characters
Resolution- point where conflict is resolved
Foreshadowing- clue about something later
Foreboding- sense that something will occur
Juxtaposition- two contrasted ideas
Backstory- insight into character's past
Exposition- revelation of something
Poetic justice- good rewarded bad punished
Melodrama- exaggerated characters/events
Motif- repeated image or symbol
Antithesis- contrast of ideas in same grammatical structure
Authorial intrusion- where author pauses to speak directly to reader
Allegory- characters/events represent ideas about religion, morals or politics
Polemic- a moral lecture versus novella- short novel
Parallel stave- many elements in the first stave is inverted in the final stave.
Malthusian economics – Reformation of the Poor Laws in 1834 left the poor destitute and reliant on workhouses. Malthusian economists supported the idea that the unproductive poor should work their way out of poverty and charity should not be given to those who were 'undeserving'. Scrooge is a supporter of Malthus- "If they would rather die they had better do it and decrease the surplus population." Dickens challenges these ideas continually through the novella.

Plot summary:
STAVE 1: ● Christmas Eve and Scrooge is at work in his counting house. Despite the cold, he refuses to spend money on coals for the fire for himself or Bob Cratchit. Scrooge is miserable and alone. ● Scrooge is visited by the Ghost of Marley, his dead business partner. Marley tells Scrooge because of his sinful, greedy life, he has to wander the Earth wearing heavy chains. Marley tries to stop Scrooge from doing the same. He tells Scrooge that three spirits will visit him during the next three nights. Scrooge falls asleep.
STAVE 2: ● The Ghost of Christmas Past takes Scrooge into the past. Scrooge revisits: his childhood school days, his apprenticeship with Fezziwig, and his engagement to Belle, who leaves Scrooge as he loves money too much to love another human being. Scrooge sheds tears of regret before being returned to his bed.
STAVE 3 ● The Ghost of Christmas Present. Scrooge watches the Cratchit family eat, enjoy and be thankful for a tiny meal in their little home. He sees Bob Cratchit's crippled son, Tiny Tim, whose kindness and humility warm Scrooge's heart. The spectre shows Scrooge his nephew's Christmas party. Scrooge asks the spirit to stay until the very end. At the end of the stave, the ghost reveals two starved children, Ignorance and Want.
STAVE 4 ● The Ghost of Christmas Yet to Come takes Scrooge through a sequence of scenes linked to an unnamed man's death. Scrooge, is keen to learn the lesson. Scrooge learns the dead man is himself and is desperate to change his fate and promises to change his ways. He suddenly finds himself safely tucked in his bed.
STAVE 5 ● Scrooge is a changed man. He rushes out onto the street hoping to share his newfound Christmas spirit. He sends a turkey to the Cratchit house and goes to Fred's party, As the years go by, he continues to celebrate Christmas with all his heart. He treats Tiny Tim as if he were his own child, gives gifts for the poor and is kind, generous and warm

Question 5: Descriptive or narrative writing.

40 marks

24 marks for content, 16 marks for technical accuracy.

45 minutes writing time approximately.

You are given an image.

From this image, you are asked to create either a piece of descriptive or narrative writing.

The image is there to springboard your ideas and you are not expected to write a photographic representation. Your writing should be using the image for inspiration.

A suggested paragraph structure could include:

Wide focus, narrow focus, switched focus to a person and then either their internalised thoughts or how they make you feel as the narrator.

DO NOT ATTEMPT UNTIL YOU HAVE PLANNED!!!

- Choose a narrative perspective and a mood - this will drive your content and vocabulary choices
- Remember, the image a springboard to help your imagination!
- Maintain a high standard of SPaG throughout- proof read. It's worth 16 marks.
- Include a variety of techniques consistently throughout the piece of writing and make your paragraphs cohesive.

English Language Paper 1 Section B

Punctuation should be accurate a varied and you need to be able to use the following your writing:

- . to mark the end of a sentence that is a complete statement
- , use in lists, in direct speech, to separate clauses, with however.
- ; indicating a pause, typically between two main clauses, takes the place of a co-ordinating conjunction (and, but, or, so).
- : used to precede a list of items, a quotation, or an expansion or explanation.
- A versatile punctuation mark that creates a short pause and emphasise an embedded clause.
- () used to enclose words or figures so as to separate them from the context.
- ... inserted into a sentence to indicate a pause or silence.
- ‘ ’ inverted commas are used for quotations or can sometimes be used to create a sarcastic tone.
- “ ” Used to show direct speech.
- ? Used at the end of questions
- ! Used to add impact. DO NOT use more than one at a time!

Sentence types:

- Simple sentence: one main clause with a subject and a verb
- Compound sentence: 2 or more main clauses on the same topic joined by a co-ordinating conjunction or semi colon.
- Complex sentence : has one subordinate clause which needs the main clause to make sense.
- Embedded clause : subordinate clause inserted into a main clause to add information
- Fragmented clause: doesn't follow the rules for a main. If used, use very sparingly!
- Vary sentence starters- -ly, double adjective, similes, verbs and prepositions.

Techniques to include:

- Imagery, sensory description, meaningful similes and strong verbs to add tone!
- Make sure you are specific in your noun choices to further show your reader.
- Paragraphs: your work **must** have cohesive paragraphs.

words to use instead of very.

Very noisy

Deafening, clamorous, rowdy, riotous

Very often

Frequently, repeatedly, habitually

Very old

Ancient, elderly, decrepit

Very old-fashioned

Archaic, antiquated, obsolete,

Very painful

Excruciating, agonizing, harrowing

Very pale

Ashen, muted, wan, pallid

Very poor

Destitute, impoverished, deprived

Very powerful

Compelling, dominant, formidable

Very quiet

Hushed, tranquil, serene, undisturbed

Very sad

Sorrowful, inconsolable, forlorn

Very shiny

Gleaming, glossy, lustrous

Very short (in extent)

Brief, condensed, compact

Very shy

Timid, reticent, introverted

Very small

Miniscule, diminutive, squat

Very large

Gargantuan, colossal, tremendous

Very young

Juvenile, babyish, infantile

Very pretty/attractive

Prepossessing, winsome, ravishing

Very scared

Petrified, hysterical, agitated

Very worried

Disturbed, overwrought, fretful

Question 1 – retrieval, 4 marks, 5 minutes

SKILL: identify specific information.

- Only select answers from within the specified section of the text.
- Use quotations or paraphrase.
- Make sure your responses are relevant to the focus of the question.

Question 2 – language analysis, 8 marks 10-12 minutes

SKILLS: identify and comment on specific language choices and methods used by the writer.

- Only select quotations from within the specified section of the text.
- Consider the connotations of the language.
- What do you find out? How is this achieved by the writer? Why does the writer show you this?
- Look for patterns or a semantic field in the language and then explore the effect.
- Aim to include 2-3 developed responses to quotations.

Useful techniques to look for might include:

- Tone: The writer's attitude towards the subject
- Metaphor: Direct comparison of two things
- Simile : Comparison using 'like' or 'as if'
- Symbol: The use of an object, figure or event to represent something else
- Verb: Action word, they drive the pace
- Modifier: Adjectives and adverbs modify nouns and verbs
- Personification: Giving an object human characteristics
- Onomatopoeia: Words that directly represent sounds
- Semantic Field: A group of words or images that are linked by theme
- Imagery: Description that helps visualisation.

AQA Language Paper 1 Section A

Question 3: Structure 8 marks, 10-12 minutes

Skill: to explore the structure of a text and comment on writers' structural choices.

- Look for the focus shifts. These can include changes in things such as mood, place, time, characters, narrative perspective, tense, repetition of ideas.
- Look at the text holistically and see how ideas progress and develop, and why this may be.
- Where something changes, again, explore why this may be.

Useful structural techniques may include:

- Narrative Frame: A story within a story
- Foreshadowing: When a writer indirectly hints at events that will come later in the story
- Juxtaposition : Comparing and contrasting of two or more (usually opposite) ideas, characters, objects etc.
- Antithesis :Two opposing ideas put together in a sentence.
- Contrast: The state of being strikingly different from something else
- Repetition: A word, image or idea that is repeated throughout
- Flashback: An interruption to a narrative that refers back to earlier events
- Climax : The most intense, exciting or important point
- Focus Shift: The point where the reader's attention is redirected.
- Development: The process in which someone or something changes or grows

Question 4: evaluation of a text against a statement. 20 marks, 20-25 minutes

Skill: To be able to critically respond to a text, evaluating evidence to support a convincing argument.

- The statement will always give you two things to explore within the text.
- You can agree or disagree or partially agree with the statement.
- At least 4 quotes to discuss.
- Start with a thesis statement outlining your views having identified the two points for evaluation from the statement.
- Make sure you have at least 4 points to explore. Constantly refer to the keywords (or synonyms) from the statement.
- Comment on the writer's methods and how and WHY they either support or oppose the
- Statement, making sure you explain why they make you think something.
- Keep including the keywords from the statement throughout your 'argument'.

Useful phrases could include:

- In relation to the statement...
- In connection with the statement....
- To a certain extent, in connection to the statement...
- The writer seems to suggest...
- The writer seems to imply...
- The writer emphasises....
- The writer conveys....
- A reader here....
- A reader can certainly see...
- A reader interprets this as....

Algebra **M813 M608 M237 M960**

Algebraic notation

$$\begin{aligned} ab &= a \times b \\ 3y &= y + y + y \\ a^2 &= a \times a \\ a^3 &= a \times a \times a \\ a^2b &= a \times a \times b \\ \frac{a}{b} &= a \div b \end{aligned}$$

Laws of indices

For any value a :

$$\begin{aligned} a^x \times a^y &= a^{x+y} \\ \frac{a^x}{a^y} &= a^{x-y} \\ \frac{a^y}{a^x} &= a^{y-x} \\ (a^x)^y &= a^{xy} \\ \rightarrow \left(\frac{2pq^4}{p^3q}\right)^3 &= \frac{8p^3q^{12}}{p^9q^3} = \frac{8q^9}{p^6} \text{ or } 8q^9p^{-6} \end{aligned}$$

Expanding brackets

$$\begin{aligned} \rightarrow p(q+r) &= pq + pr \\ \rightarrow 5(x-2y) &= 5x - 10y \\ (x+a)(x+b) &= x^2 + ax + bx + ab \\ \rightarrow (2x-3)(x+5) &= 2x^2 - 3x + 10x - 15 \\ &= 2x^2 + 7x - 15 \end{aligned}$$

Reverse of expanding is factorising - putting an expression into brackets.

M184 M707 M509 M554 M852

Rearrange a formula

The subject of a formula is the term on its own. Use rules that "balance" the formula to change its subject

→ **Make x the subject of**

Here, subtract $3y$ from both sides...

$$2x + 3y = z$$

$$2x = z - 3y$$

...then divide both sides by 2...

$$x = \frac{z - 3y}{2}$$

Equations, Inequalities and Sequences

Equations and identities

An equation is true for some particular value of x ...

→ $2x + 1 = 7$ is true if $x = 3$

...but an identity is true for every value of x

→ $(x+a)^2 \equiv x^2 + 2ax + a^2$ (note the use of the symbol $\equiv$)

Simultaneous equations

$$\rightarrow \text{Solve } \begin{cases} 2x + 3y = 11 \\ 3x - 5y = 7 \end{cases}$$

Multiply to match a term in x or y

$$\begin{cases} 10x + 15y = 55 \\ 9x - 15y = 21 \end{cases}$$

Add or subtract to cancel...

$$19x = 76, \text{ so } x = 4$$

Finally, substitute and solve...

$$2 \times 4 + 3y = 11, \text{ so } y = 1$$

U178 U150 U759 U206 U498

Quadratics

Solve a quadratic by factorising.

→ Solve $x^2 - 8x + 15 = 0$

Put into brackets (taking care with any negative numbers)

$$(x-3)(x-5) = 0$$

...then either $x - 3 = 0$ or $x - 5 = 0$,

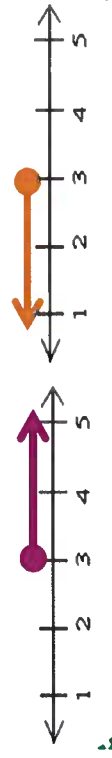
so that $x = 3$ or $x = 5$.

Inequalities

$$x > 3 \quad x < 3$$



$$x \geq 3 \quad x \leq 3$$



Sequences

n th term of an arithmetic (linear)

sequence is $an + d$

→ n th term of 5, 8, 11, 14, ... is $3n + 2$

(always increases by 3; first term is

$$3 \times 1 + 2 = 5.)$$

Geometric sequence; multiply each

term by a constant ratio

→ 3, 6, 12, 24, ... (ratio is 2)

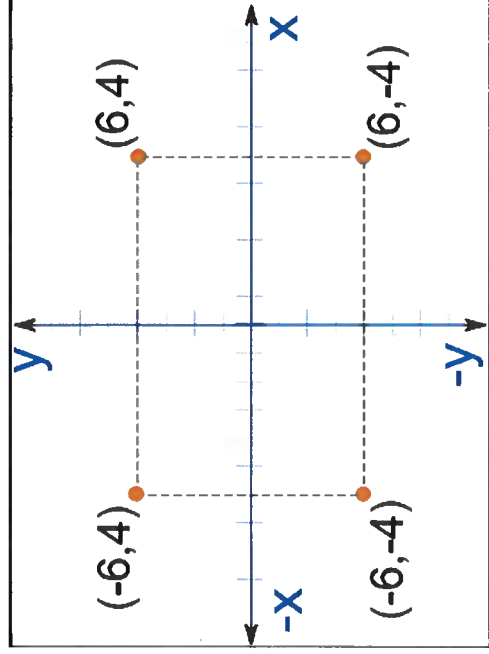
Fibonacci sequence; make the next

term by adding the previous two ...

→ 2, 4, 6, 10, 16, 26, 42, ...

Graphs U789 U933 U741 U848

Cartesian coordinates

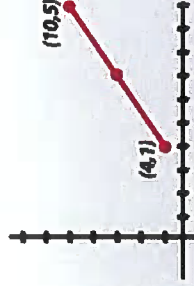


The Midpoint Formula

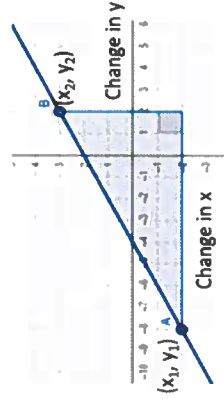
$$\text{midpoint} = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

$$= \left(\frac{4 + 10}{2}, \frac{1 + 5}{2} \right)$$

$$= (7, 3)$$



Gradient of a Straight Line



$$\text{Gradient} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{\text{Change in } y}{\text{Change in } x}$$

Graphs U741 U848

$$y = mx + c$$

Equation of straight line $y = mx + c$

m is the gradient; c is the y intercept:

→ Find the equation of the line that joins (0, 3) to (2, 11)

Find its gradient...

$$\frac{11 - 3}{2 - 0} = \frac{8}{2} = 4$$

...and its y intercept...

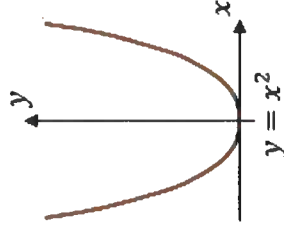
Passes through (0, 3), so $c = 3$.

Equation is $y = 4x + 3$.

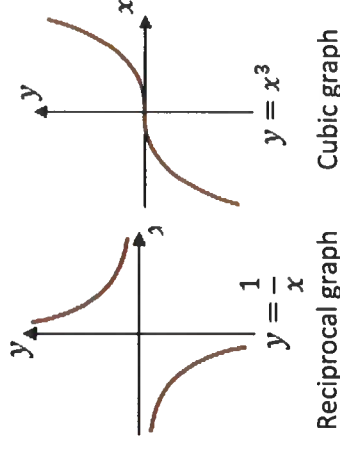
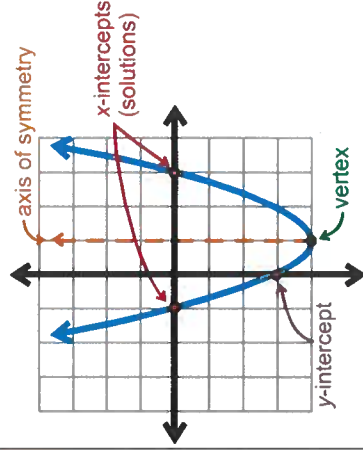
Parallel lines: gradients are equal;

→ $y = 2x + 3$ and $y = 2x - 5$ are parallel to each other; $y = 2x + 3$

Quadratic graphs U989 U593 U980



The graph of a quadratic function is curved. It is called a parabola.

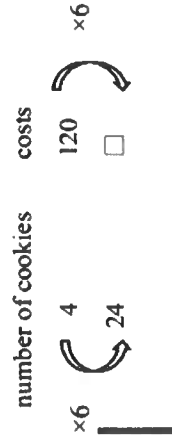


KPI 1 – Ratio & Proportion U577 U921 U676 U138 U407

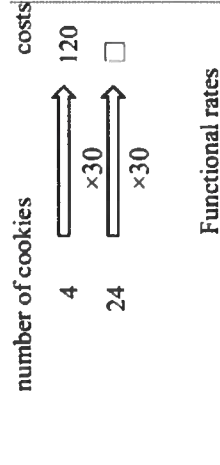
Link between ratios and fractions

→ Boys to girls in ratio 2:3
 $\frac{2}{5}$ are boys, $\frac{3}{5}$ are girls.

Multiplicative Reasoning



Scalar ratios



KPI 5 – Sequences U498 U978 U680 U206

n th term of an arithmetic (linear)

sequence is $bn + c$

→ n th term of 5, 8, 11, 14, ... is $3n + 2$
(always increases by 3; first term is $3 \times 1 + 2 = 5$.)

n th term of a quadratic sequence is

$an^2 + bn + c$

→ First three terms of

$n^2 + 3n - 1$ are 3, 9, 17, ...

Geometric sequence; multiply each

term by a constant ratio

→ 3, 6, 12, 24, ... (ratio is 2)

Fibonacci sequence; make the next

term by adding the previous two ...

KPI 2 – Algebraic proportion/proof U582

y is directly proportional to x :

$y = kx$ for a constant k

→ b is directly proportional to a^2 ;

$a = 6$ when $b = 90$. Find b if $a = 8$.

$b = ka^2$; $a = 6$ and $b = 90$ for k ;

$90 = k \times 6^2$ so $k = 2.5$, $b = 2.5a^2$

$b = 2.5 \times 8^2 = 160$

y is inversely proportional to x :

$yx = k$ or $y = \frac{k}{x}$ for a constant k

n	A number
$2n$	An even number
$2n + 1$	An odd number
$n, n+1, n+2$ etc.	Consecutive numbers
$2n, 2n+2,$ $2n+4$ etc.	Consecutive even number
$2n+1, 2n+3,$ $2n+5$ etc.	Consecutive odd number

KPI 5 – Sequences U958

Geometric sequence; multiply each

term by a constant ratio

→ 3, 6, 12, 24, ... (ratio is 2)

Fibonacci sequence; make the next
term by adding the previous two ...

KPI 3 – Sampling U328 U162

Random sampling is where each member of a population is equally likely to be selected.

Methods include: Random number generators or rolling a number of dice

Stratified sampling is used to select a sample that is representative of different groups. If the groups are of different sizes, the number of items selected from each group will be proportional to the number of items in that group.

Capture-recapture method:

number in 1st sample $\times$ number in 2nd sample
number in 2nd sample previously marked

KPI 6 – Surds

U633 U338 U872 U499

Look for the biggest square number factor of the number:

→ $\sqrt{80} = \sqrt{16 \times 5} = 4\sqrt{5}$

**KPI 4 – Fractions, Decimals, %
U689**

Make a recurring decimal a fraction:

→ $n = 0.2\bar{3}6$
(two digits are in the recurring pattern, so multiply by 100)
 $100n = 23.\bar{6}$
(this is the same as $23.6\bar{3}$)
 $99n = 23.6\bar{3}6 - 0.2\bar{3}6 = 23.4$
 $23.4 \quad 234 \quad 13$
 $n = \frac{234}{99} = \frac{234 \div 3}{99 \div 3} = \frac{78}{33} = \frac{78 \div 3}{33 \div 3} = \frac{26}{11}$

KPI 4 – Fractions, Decimals, % U773 & U671

Percentage increase or decrease; use a multiplier (powers for repetition)

→ **Initially there were 20 000 fish in a lake. The number decreases by 15% each year. Estimate the number of fish after 6 years.**

$20\,000 \times 0.85^6 = 7\,500$ (2sf)

KPI 6 – Surds

U633 U338 U872 U499

Rationalise the denominator

Multiply the numerator and denominator by an expression that makes the denominator an integer:

→ $\frac{4}{\sqrt{7}} = \frac{4 \times \sqrt{7}}{\sqrt{7} \times \sqrt{7}} = \frac{4\sqrt{7}}{7}$

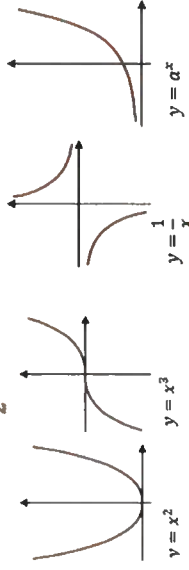
→ $\frac{2}{4 + \sqrt{5}} \times \frac{4 - \sqrt{5}}{4 - \sqrt{5}} = \frac{2(4 - \sqrt{5})}{11}$

KPI 7 – Perpendicular lines U898

Parallel lines: gradients are equal;
perpendicular lines: gradients are “negative reciprocals”.

→ $y = 2x + 3$ and $y = 2x - 5$ are parallel to each other; $y = 2x + 3$

and $y = -\frac{1}{2}x + 3$ are perpendicular



Equation of a circle

$x^2 + y^2 = r^2$ is a circle with centre (0,0) and radius r .

→ $x^2 + y^2 = 25$ has centre (0,0) and radius 5.

KPI 8 – Algebraic equations

U665 U397 U589 U769

If a quadratic equation cannot be factorised, use the formula

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

→ Solve $2x^2 + 3x - 7 = 0$

$x = \frac{-3 \pm \sqrt{9 - (-56)}}{2 \times 2} = -2.73$

or $x = \frac{-3 + \sqrt{9 - (-56)}}{2 \times 2} = 1.23$

Complete the square to find the turning point of a quadratic graph.

→ $y = x^2 - 6x + 2$

$y = (x - 3)^2 - 9 + 2$

$y = (x - 3)^2 - 7$

Turning point is at (3, -7)

U547 U760 U757

Simultaneous equations

A19

One linear, one quadratic;

→ Solve $\begin{cases} x + 3y = 10 \\ x^2 + y^2 = 20 \end{cases}$

Rearrange the linear, and substitute into the quadratic

$x = 10 - 3y$
so $(10 - 3y)^2 + y^2 = 20$

Expand and solve the quadratic

$100 - 60y + 9y^2 + y^2 = 20$

$10y^2 - 60y + 80 = 0$

$y = 2$ or $y = 4$

Finally, substitute into the linear and solve, pairing values...

$x + 3 \times 2 = 10$ so $(x, y) = (4, 2)$

$x + 3 \times 4 = 10$ so $(x, y) = (-2, 4)$

Year 10 Chemistry Knowledge Organiser

Energy Changes page 1

Box 1 - Energy in reactions

In a chemical reaction, bonds are broken and bonds are made.

Breaking a chemical bond means you need to overcome the force of attraction in the bond, which requires energy – It is **endothermic**.

Making a chemical bond is **exothermic**: energy is released when bonds form.

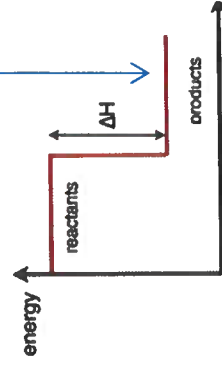
In a chemical reaction the difference between the energy required to break the bonds and the energy gained from making the bonds decides whether the overall reaction is exothermic or endothermic.

Type	What happens?	Why?	Example
Exothermic	Energy is transferred to the surroundings, so the temperature increases.	The energy required to break chemical bonds is less than the energy released by making chemical bonds. The excess energy is released to the surroundings.	Combustion reaction, reactions used in hand warmers
Endothermic	Energy is taken in from the surroundings, so the temperature decreases.	The energy required to break chemical bonds is more than the energy released by making chemical bonds. The needed energy is absorbed from the surroundings.	The reaction of citric acid and sodium hydrogen carbonate, the reactions used in ice packs

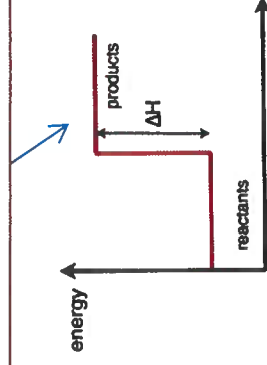
Box 2 - Reaction Profiles

Reaction profiles can be used to show the relative energies of reactants and products, and the overall energy change of a reaction.

This is the reaction profile of an **exothermic reaction**: the energy of the products is lower than that of the reactants. The difference in energy is released to the surroundings, causing a temperature rise.



This is the reaction profile of an **endothermic reaction**: the energy of the products is higher than that of the reactants. The difference in energy is absorbed from the surroundings, causing the temperature to fall.



Key Terms

exothermic

A reaction that gives out heat to the surroundings. Exothermic reactions increase the temperature of the surroundings.

endothermic

A reaction that takes heat in from the surroundings. Endothermic reactions decrease the temperature of the surroundings.

reactant

Reactants are chemicals used in a chemical reaction.

product

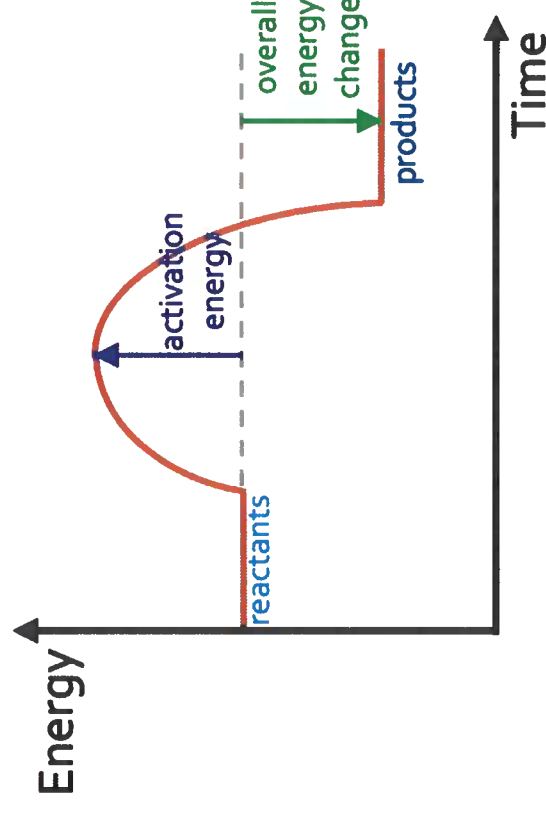
Products are chemicals made in a chemical reaction.

reaction profile

A graph which shows the energies of the products and reactants in a chemical reaction.

Box 3 - Reaction profiles and activation energy

Chemical reactions occur only when reacting particles collide with each other with sufficient energy. The minimum energy that particles need to react is called **activation energy**.



Key features

The **activation energy** the quantity of energy that is needed to break the bonds in the reactants.

Heating a reaction mixture often provides the activation energy needed for the reaction to occur.

Year 10 Chemistry Knowledge Organiser

Energy Changes page 2

Box 4 - Higher Tier: Calculating Bond Energies

The difference between the energy needed to break bonds in the reactants and the energy released when bonds in the products are formed is the overall energy change of the reaction.

Exothermic reactions have negative energy change – energy is released to the surroundings, causing the temperature to rise.

Endothermic reactions have positive energy change – energy is taken in from the surroundings, causing the temperature to fall.

Overall energy change = Total energy to break bonds in reactants – Total energy to make bonds in products

Example 1

Consider the reaction: $\text{N}_2 + 3\text{H}_2 \rightarrow 2\text{NH}_3$

Bond energies (in kJ/mol): H-H 436, H-N 391, $\text{N}\equiv\text{N}$ 945

Total energy to break bonds: $1 \times \text{N}\equiv\text{N}$ and $3 \times \text{H-H}$, so $945 + (3 \times 436) = 2253$ kJ/mol

Total energy to make bonds: $6 \times \text{H-N}$, so $6 \times 391 = 2346$ kJ/mol

Overall energy change = $2253 - 2346 = -93$ kJ/mol

→ The total energy change is negative, so the reaction is exothermic

Example 2

Consider the reaction: $2\text{H}_2\text{O}_2 \rightarrow 2\text{H}_2\text{O} + \text{O}_2$

This reaction can also be shown as below. It shows that hydrogen peroxide breaks down to make water and oxygen.



We can use bond energies below to work out the overall energy change in the reaction.

Bond	Bond energy in kJ per mole
H – O	464
O – O	146
O = O	498

Total energy to break bonds: $4 \times \text{H-O}$ and $2 \times \text{O-O}$, so $(4 \times 464) + (2 \times 146) = 2148$ kJ/mol

Total energy to make bonds: $4 \times \text{H-O}$ and $1 \times \text{O=O}$, so $(4 \times 464) + (1 \times 498) = 2354$ kJ/mol

Overall energy change = $2148 - 2354 = -206$ kJ/mol

→ The total energy change is negative, so the reaction is exothermic

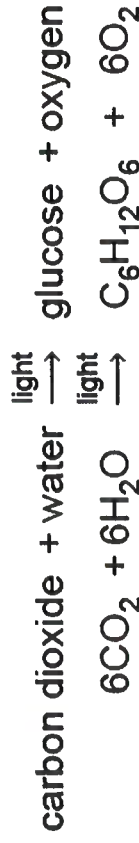
Year 10 Biology Knowledge Organiser Bioenergetics 1 – Photosynthesis

Box 1 - Photosynthesis

Photosynthesis is the chemical reaction that plants use to make food and transfer energy to the chemical store of glucose.

The reaction is **endothermic** – energy is absorbed from the surroundings.

The word and symbol equation for photosynthesis are:



Photosynthesis occurs in the **chloroplasts**.

Chlorophyll is a green pigment inside chloroplasts that **absorbs the light**.

Box 2 - Using The Glucose From Photosynthesis

Plants use the glucose in the following ways:

- Used in **respiration** in the cells of the plant/algae
- Converted into **starch** for storage.
- Used to produce **fats or oils (lipids)** for storage (particularly in seeds and nuts.)
- Used to produce **cellulose**, which is a component of the cell wall. Cellulose strengthens the cell wall.
- Used to produce **amino acids**, which in turn are used to **synthesise (make) proteins** (in the ribosomes). To produce amino acids, plants also require **nitrates** from the soil.

Box 3 - The Rate Of Photosynthesis

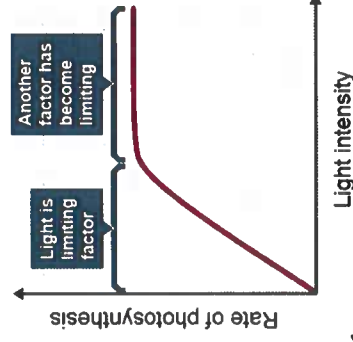
The following factors affect the rate of photosynthesis and are called limiting factors:

- Temperature:**
- Carbon dioxide concentration**
- Light intensity:**
- Amount of chlorophyll:**

HT: at any given time, any one of these factors may be **limiting** the rate of photosynthesis. A limiting factor is something that prevents a reaction happening faster at that moment.

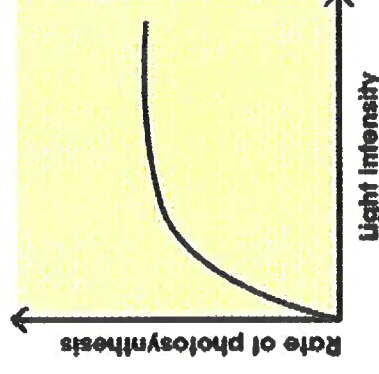
Light intensity decreases as distance increases

according to an *inverse square law*: $\text{light intensity} = \frac{1}{\text{distance from source}^2}$



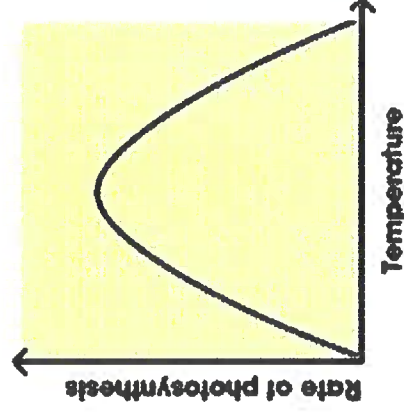
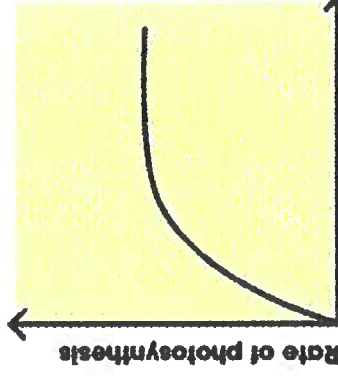
Key Terms	Definitions
nitrates	Ions containing nitrogen and oxygen. These are found in the soil; plants need nitrates to produce amino acids.
rate	How much a factor changes over time, for example how much glucose is produced every minute.
light intensity	The amount/strength of light. Use this term instead of 'amount of light'.
chlorophyll	The green pigment in leaves that absorbs light for photosynthesis. Chlorophyll is found in chloroplasts .
endothermic	A reaction that takes in energy from the surroundings.

Box 4 – Limiting factor graphs



As **light intensity** and **carbon dioxide concentration** increase the rate of photosynthesis increases and then plateaus – stops increasing. Something else is the limiting factor.

As **temperature** increases the rate of photosynthesis increases initially until the optimum (best) temperature. The rate of photosynthesis then decreases as the temperature rises further. Enzymes have become denatured.



Year 10 Physics Knowledge Organiser

Electricity I page 1

Box 1 - Electric charge and current

Every atom contains particles with an electric charge: protons and electrons. When electrical charges flow, work can be done (i.e. energy is transferred)

To make charges flow, a **closed**, or complete circuit is needed and a source of **potential difference**.

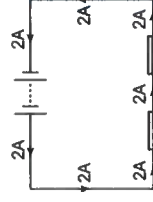
Cells, batteries and mains provide a source of **potential difference**. This provides the force to make the **electric charges** in the conductors **flow**.

Electric current is the rate of flow of electrical charge.

The size of an electric current is the **rate (speed)** of flow of electric charge.

$$\text{So current } (I) = \frac{Q}{t} \quad \text{or} \quad Q = It$$

In a circuit, in **any closed loop** of the circuit, the size of the **current** is the **same throughout** the loop (see diagram)



Key Terms	Definitions
Charge flow	A positive or negative charge – usually electrons.
current	The rate of flow of electric charge.
potential difference	The potential difference is a measure of how much work is done per coulomb of charge. Also known as voltage, or p.d.
resistance	Resistance determines the size of the current for a particular potential difference.

Equation	Meanings of terms in equation
$Q = I t$	Charge flow = Current x time $Q = \text{charge flow (coulombs, C)}$ $I = \text{current (amperes, A)}$ $t = \text{time (seconds, s)}$
$V = I R$ *	Potential difference = Current x resistance $V = \text{potential difference (volts, V)}$ $I = \text{current (amperes, A)}$ $R = \text{resistance (ohms, } \Omega \text{)}$

Box 2 - Current, resistance and potential difference

A component is any part of a circuit (e.g. a resistor, a bulb a motor etc.).

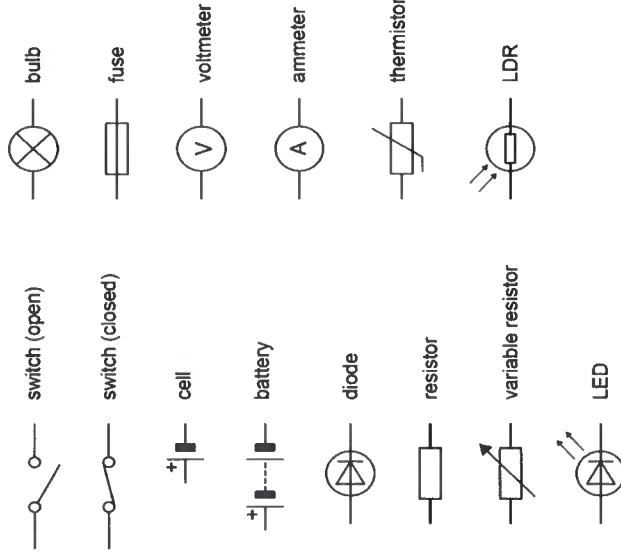
The **current** through a component depends on this **potential difference** across the component, but also its **resistance**.

The greater the resistance the smaller the current for a given potential difference.

The smaller the resistance, the greater the current for a given p.d.

Current, potential difference and resistance can be calculated using the equation below.

$$\text{Potential difference} = \text{Current} \times \text{Resistance.}$$



Resistors - I-V graphs		
	Ohmic conductor	At a constant temperature, current is directly proportional to the p.d. across the resistor. Resistance is constant.
	Filament lamp	As current increases , the resistance increases . The temperature increases as current flows.
	Diode	Current flows in one direction only (forward.) Very high resistance in reverse.
Thermistor - Resistance of a thermistor decreases as temperature increases. Used in thermostats (e.g. ovens or central heating) LDR - Resistance of an LDR decreases as light intensity increases. E.g. used to turn on night lights when it gets dark.		

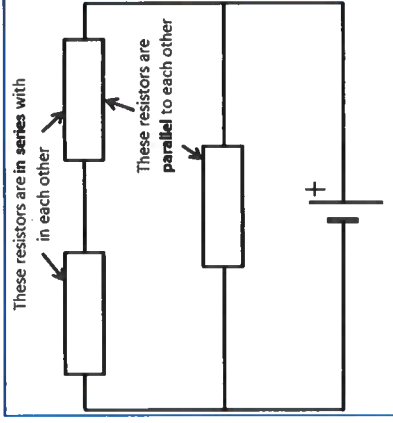
Year 10 Physics Knowledge Organiser

Electricity 1 page 2

Box 3 - Series and parallel circuits

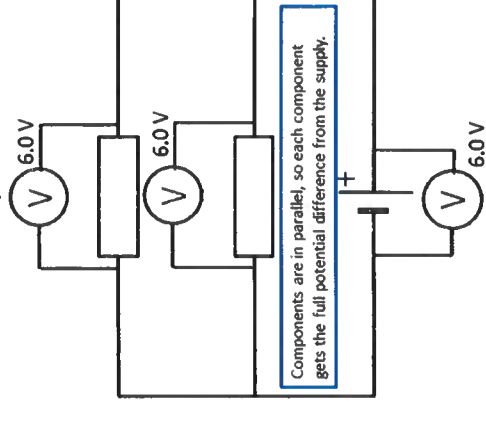
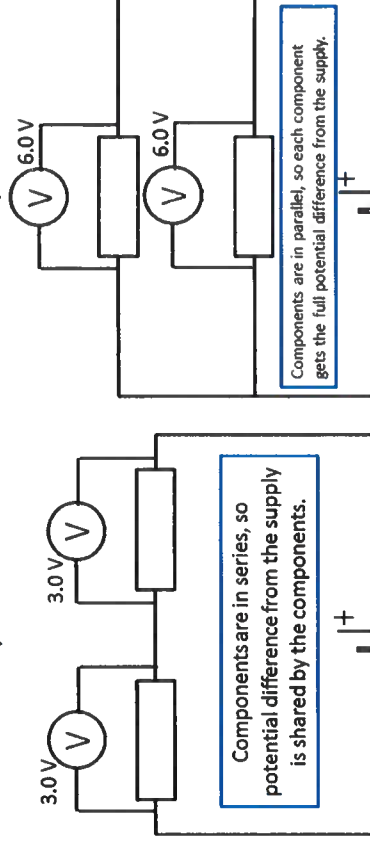
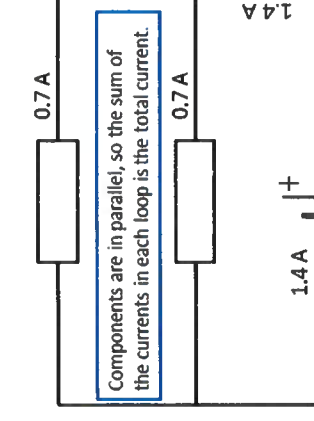
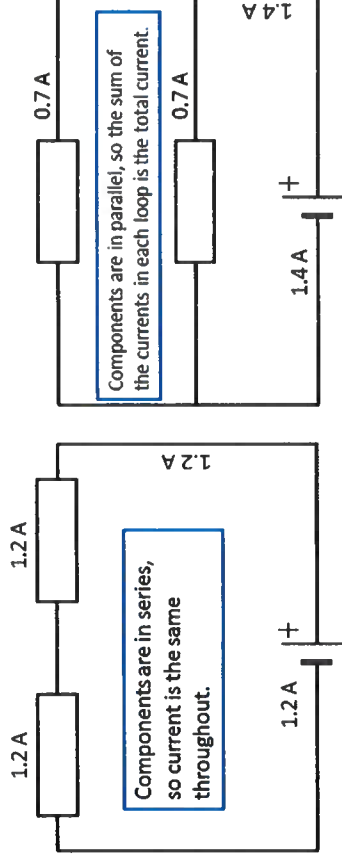
We can connect components in a circuit in series or in parallel – see definitions in key terms.

In some circuits, there are components in series AND components in parallel – see the example in the diagram.



Key Terms	Definitions
series	Components connected one after another in a closed loop – one route for the current.
parallel	Components connected in different loops of a circuit.
resistor	An electrical component that regulates current in a circuit.

Equation	Meanings of terms in equation
for series circuits: $R_{total} = R_1 + R_2$ *	R_{total} = total resistance (ohms, Ω) R_1 = resistance of first component (Ω) R_2 = resistance of next component (Ω) – and so on



Quantity	Components connected in series...	Components connected in parallel...
Current	The current through each component is the same	Shared between the loops. The total current through the whole circuit is the sum of the currents through each loop of the circuit.
Potential difference	The potential difference provided by the power supply is shared between the components in series (not necessarily equally shared out – it depends on the resistance of each component).	The potential difference across each component is exactly the same , and the same as the potential difference provided by the power supply.
Resistance	The total resistance of two components is the sum of the resistance of each component (see equation).	The total resistance of two components in parallel is always less than the resistance of the smallest individual resistor

Year 10 Physics Knowledge Organiser

The Particle Model of Matter page 1

Box 1 - States of matter and changes of state

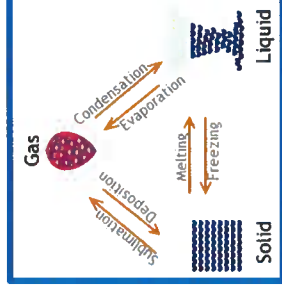
The particle model is used to explain differences between the properties of the three states of matter (solids, liquids and gases) and also changes of state.

Solids are difficult to change shape and can't be compressed. In a **solid**:

- Particles are **fixed in position**
- Particles **vibrate**
- **Strong forces of attraction** between the particles.
- Particles have **least energy** in their kinetic stores.

Liquids take the shape of their container and flow but can't be compressed. In a **liquid**:

- Particles are still **very close together**.
- Particles are **randomly arranged**
- Particles can **move/flow** past each other.
- There are **weaker forces of attraction** between the particles.



Gases expand to fill the space and are easy to compress. In a **gas**:

- Particles are **randomly arranged and further apart**.
- Particles move very quickly in **random** directions
- **There is empty space** between the particles.
- There are **very weak (almost no) forces of attractions** between the particles.
- Particles have **most energy** in their kinetic stores.

Changes of state are called **physical changes**. This is because the material recovers its original properties when the change is reversed.

Box 2 - Density and the particle model

Density is a measure of the mass of a substance per unit volume.

A **denser material** has particles that are **more tightly packed together**.

Substances generally have the highest density when they are in solid form and gases have the lowest density.

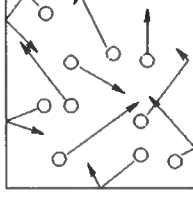
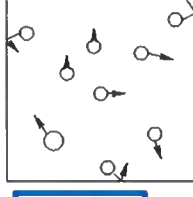
Density can be calculated using the equation given below. You need to learn this equation.

Equation	Meanings of terms in equation
$\rho = \frac{m}{V}$	Density = Mass ÷ Volume ρ = density (kilograms per metre cubed, kg/m^3) m = mass (kg) V = volume (metres cubed, m^3)

Key Terms	Definitions
particle model	The model that represents the arrangement and movements of the molecules or atoms and shows them as small, hard spheres. It is sometimes called the kinetic model.
melt	The change of state from solid to liquid
freezing	The change of state from liquid to solid
evaporation	The change of state from liquid to gas.
condensation	The change of state from gas to liquid.
sublimation	The change of state from a solid straight to a gas.
gas pressure	The force exerted per unit area, by particles in a gas, when they hit the walls of a container.

Box 3 - Pressure in gases

Cooler gas – particles have less energy in the kinetic stores.



Hotter gas – particles have more energy in the kinetic stores.

Particles in a gas are constantly moving randomly – so they store energy in their **kinetic stores**. When they move they **collide** with the walls of their container, and **exert a force**. This is pressure.

The total force exerted on a certain area of the wall is the **gas pressure**.

Increasing the temperature of a gas (but keeping the volume the same) **increases the pressure of the gas**.

The **temperature of a gas** is related to the **average kinetic energy** of the **molecules**. The higher the temperature, the more energy the particles have in their kinetic stores. This means, on average, they move faster. Therefore, there are more collisions with the container walls and they exert a greater force when they collide with the walls. This means that the pressure increases.

Year 10 Physics Knowledge Organiser

The Particle Model of Matter page 2

Box 4 - Internal energy and the particle model

Any substance, whether solid, liquid or gas, **stores energy**. The quantity of energy stored is called the **internal energy**.

The particles (atoms and molecules) have energy in kinetic stores (since they move/vibrate) and potential energy stores (e.g. energy stored in their chemical bonds).

The total of the kinetic energy and the potential energy of the particles is called the **internal energy**.

Heating changes the energy stored within a system by increasing the energy of the particles that make up the system, so increasing the internal energy. This **increasing internal energy either raises the temperature of the system or causes a change of state**. Look at the graph on the right. The temperature remains constant when the change of state (melting or boiling) occurs.

Box 5 - Specific heat capacity and temperature changes

Some substances are harder to heat up than others, and cool down less easily.

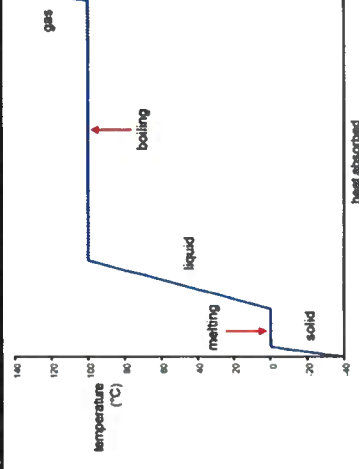
The measurement of this is called **specific heat capacity**. This is the amount of energy needed to heat 1kg of a substance by 1°C.

The value for specific heat capacity is different for different substances.

When heating something, the **temperature rise** of the system **depends on**:

- the **specific heat capacity** of the substance being heated
- the **mass** of the substance
- the **amount of energy put** into the system.

Key Terms	Definitions
system	Object or group of objects.
internal energy	The total kinetic energy and potential energy of all the particles (atoms and molecules) that make up a system.
kinetic energy store	The energy store associated with the movement of the particles. Then higher the temperature, the more energy there is in this store.
specific heat capacity	The amount of energy required to raise the temperature of 1 kg of a substance by 1°C
latent heat	The energy needed for a substance to change state. This is calculated using an equation you will be given.
specific latent heat	The amount of energy required to change the state of 1 kg of a substance with no change in temperature.



Box 6 - Changes of state and specific latent heat

When a substance **changes state**, the **internal energy increases**, but the **temperature stays the same** (see graph above). The energy is being used to overcome the forces (break the bonds) between the particles instead of raising the temperature

The quantity of **energy needed for a substance to change state is called the latent heat**.

Specific latent heat is specific to a substance, and is the energy required to change the state of 1kg of the substance, with **no** change in temperature. The energy needed for a state change depends on mass and specific latent heat of a substance – as the second equation on the left shows.

Specific latent heat of fusion is for changes from solid to liquid. **Specific latent heat of vaporisation** is for changes from liquid to gas (vapour).

Equation	Meanings of terms in equation
$\Delta E = m c \Delta \theta$	ΔE = change in thermal energy (joules, J) m = mass (kg) c = specific heat capacity (joules per kilogram per degree Celsius, J/kg °C) $\Delta \theta$ = temperature change (°C)
$E = m L$	E = energy (joules, J) m = mass (kg) L = specific latent heat (J/kg)

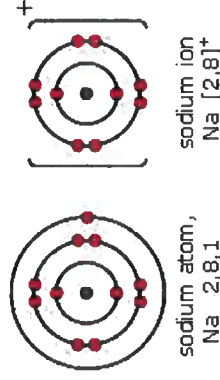
Year 10 Chemistry Knowledge Organiser

Bonding, Structure and Properties of Matter page 1

Box 1 - Formation of Ions

Chemical reactions occur between atoms so the participating atoms can have a full outer shell of electrons, and therefore become stable. Metal atoms will lose electrons to get a full outer shell and non-metals will gain electrons to get a full outer shell.

Ions are particles with a positive or negative charge. Positive ions are formed when an atom loses electrons, negative ions are formed when an atom gains electrons. For example, sodium has one electron in its outer shell - it loses one electron to form a Na^{+1} ion. We represent ions with square brackets around the ion and the charge in the top right corner.



The **group number** indicates how many electrons an atom would have to lose or gain to get a full outer shell of electrons. See below to see what ions different groups form

Group	What happens to the electrons?	Charge on ions	Example
1	Lose 1	+1	Li^+ , Na^+ , K^+
2	Lose 2	+2	Mg^{2+} , Ca^{2+}
3	Lose 3	+3	Al^{3+}
5	Gain 3	-3	N^{3-}
6	Gain 2	-2	O^{2-} , S^{2-}
7	Gain 1	-1	F^- , Cl^- , Br^- , I^-

Box 2 - Ionic Compounds –Giant Ionic Lattice

An ionic compound is a **giant structure of ions**. They are held together by strong **electrostatic forces** of attraction between oppositely charged ions. These forces act in **all directions** in the lattice and this is called ionic bonding

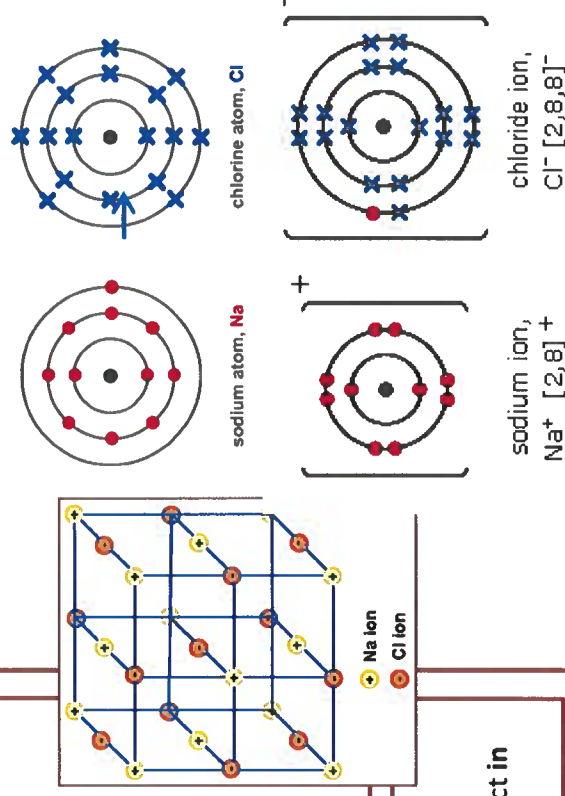
Key Terms

Key Terms	Definitions
Metal	An element that can form positive ions when it reacts
Non-metal	An element that can form negative ions when it reacts
Ion	A charged particle is formed when one or more electrons are lost or gained from an atom or a molecule.
Ionic bond	A bond formed by the electrostatic attraction of oppositely charged ions. Ionic bonds form between atoms of metals and non-metals.
Electrostatic	The force between a positive and negative charge.

Box 3 - Ionic Bonding

When metal and non-metal atoms react together, **electrons** in the outer shell of the **metal atom** are **transferred** to the outer shell of the **non-metal atom**. The metal forms a positively charged ion, and the non-metal forms a negatively charged ion. There is an **electrostatic attraction** between the two ions, and an ionic bond is formed. Both ions formed have a **full outer shell**, similar to the electronic structure of a noble gas, and are stable within the new compound.

See example below of how sodium chloride (NaCl) is formed.



Single electron in outer shell of Na atom transfers to the outer shell of the chlorine atom.

Electrostatic attraction between the oppositely charged ions and an ionic bond is formed.

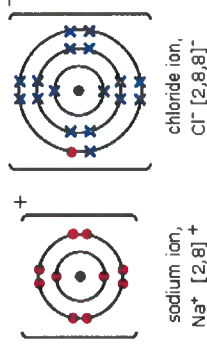
Year 10 Chemistry Knowledge Organiser

Bonding, Structure and Properties of Matter page 2

Box 4 - Ionic Bonding- Models

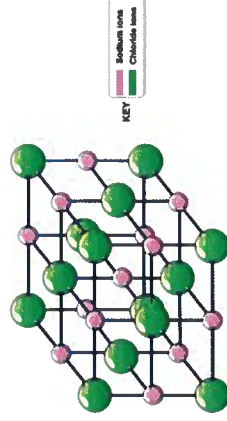
Ionic compounds can be represented using different models. Each model has **advantages (+) and limitations (-)**. Below are models of diagrams representing sodium chloride, NaCl

Dot and cross diagrams (and some other 2D models)



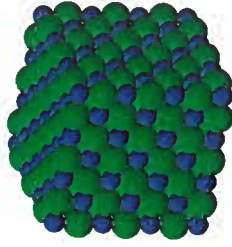
- + Show how the electrons are transferred
- Doesn't show the 3D structure of a giant ionic compound
- Doesn't show the relative sizes of the ions or how they're arranged

Ball and Stick models



- + Show the regular pattern in an ionic lattice
- + Show how the ions are arranged
- + Suggests that the structure extends beyond what is shown
- Sometimes the ions are not shown to size scale
- Suggests there are gaps between the ions (sticks) when there are not

3D Models



- + Shows the relative sizes of the ions
- + Shows the regular pattern of an ionic crystal
- Only shows outer layer of the compound
- Doesn't show how the bonds are formed
- Only shows a very small part of a compound that would be billions of ions

Key Terms	Definitions
Ionic lattice	A closely-packed regular arrangement of charged particles (ions) held together by electrostatic forces of attraction.
Model	Something used to describe or display how an object or system behaves in reality.
Aqueous	When a substance is dissolved in water
Empirical formula	A chemical formula showing the simplest possible whole number ratio of atoms in a compound

Box 5 - Properties of ionic compounds

The bonding in ionic compounds affects their properties. Ionic compounds have:

- **high melting points and high boiling points** due to strong electrostatic attraction between the ions. It takes a large amount of energy to overcome the attraction and break the many strong bonds.
- Most ionic compounds **dissolve easily** in water (**soluble**) to form **aqueous** solutions
- Solid ionic compounds do not conduct electricity as the ions are held in fixed positions. They only **conduct electricity** when **molten (liquid state)** or **dissolved** in aqueous solutions. This is because the **ions are free to move** and so charge can flow.

Box 6 - Empirical Formula of Ionic Compounds

To calculate empirical formulae:

From dot and cross diagrams: count the numbers of metal ions to non-metal ions. Eg: In sodium chloride, 1 sodium atom transfers one electron to one chlorine atom, so the empirical formula is **1:1, NaCl**. But when sodium bonds with oxygen, sodium only transfers one electron but oxygen gains two. There are two Na atoms for every O atom, so the empirical formula is **2:1 Na_2O** .

From a 3D or ball and stick model: The diagrams are used to work out the ions in the compound. The charges of the ions counted need to balance so the overall charge is zero. E.g. A ball and stick model of sodium chloride contains Na ions with a +1 charge and Cl ions with a -1 charge. Only 1 of each is needed to produce a zero charge $(+1) + (-1) = 0$, so the formula is NaCl

E.g. in a 3D model of potassium oxide, the K ion has a charge of +1, and the O ion has a charge of -2. So 2 K ions are needed for every O ion to produce a zero charge $(+1) + (+1) + (-2) = 0$, so the formula is K_2O

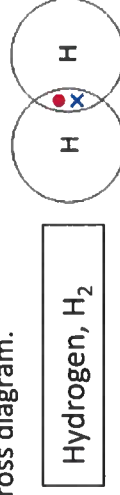
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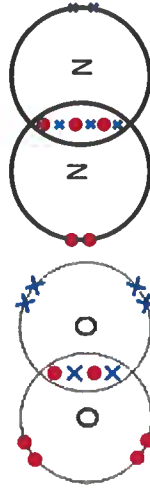
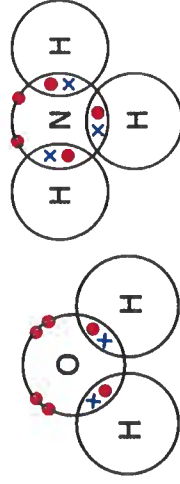
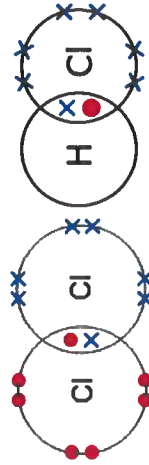
Box 7 - Covalent Bonding

Covalent bonding occurs between atoms of **non-metal elements**. Atoms **share** electrons with each other in order to get full outer shells. Each covalent bond provides one extra electron for each atom. Each atom involved must make enough covalent bonds to fill up the outer shell.

E.g. H_2 Hydrogen atoms have one electron in their outer shell. Each H atom needs one extra electron to fill up its outer shell (H has only one shell). So a H atom will form one covalent bond with another H atom, to give both atoms a full outer shell, we can show this bond on a dot and cross diagram.



Dot and cross diagrams are used to show covalent bonding in molecules. It is important to represent the electrons on one atom with a dot and on the other atom with an X and place shared electrons **in the middle** of the overlap. Also **only** the **outer shell** of each atom is shown. A pair of shared electrons is a **single** covalent bond.



In each molecule of chlorine, Cl_2 , and each molecule of hydrogen chloride, HCl – each atom needs only one electron to make a full shell, so each atom must form **one** single covalent bond.

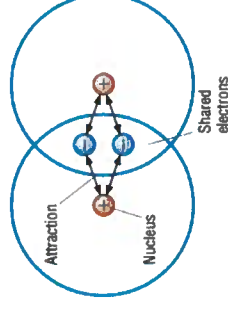
In water, H_2O , the O atom needs to form 2 covalent bonds to get 2 extra electrons for its outer shell. It bonds with 2 atoms of H. In ammonia, NH_3 , the Nitrogen atom needs to form 3 bonds to get 3 extra electrons and so bonds with 3 atoms of H.

Oxygen, O_2 , shares two electrons per atom to make a **double bond**. (**2 pairs of shared electrons**). Nitrogen, N_2 , shares 3 electrons per atom to make a **triple bond (3 pairs of shared electrons)**. In both cases, the sharing of the electrons gives a full outer shell for each atom involved.

Key Terms	Definitions
Covalent bond	A bond formed when a pair of electrons is shared between 2 atoms.
Molecule	A substance which contains two or more covalently bonded atoms
Lone pair	A pair of outer electrons that are not part of the covalent bond.

Box 8 - The Nature of a Covalent Bond

Covalent bonds are **strong** because there is electrostatic attraction between the electrons in the covalent bond and the positively charged nucleus. This means a lot of energy is required to break a covalent bond.



Box 9 - Properties of Simple Covalent Compounds

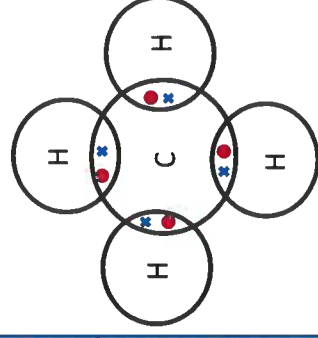
Simple covalent compounds e.g. O_2 , CO_2 , CH_4

- have low melting and boiling points
- are often gases at room temperature
- **Strong covalent bonds** between the atoms in each molecule
- **Weak intermolecular forces** between whole molecules. This means that only a small amount of energy is required to overcome these weak forces – hence low melting and boiling points.

Strong Covalent Bond



The dot and cross diagram on the left is methane, CH_4 . You will need to **memorise** how to draw dot and cross diagrams for this and **ALL** the molecules on this page.



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Box 10 - Properties of Simple Covalent Molecules-Continued

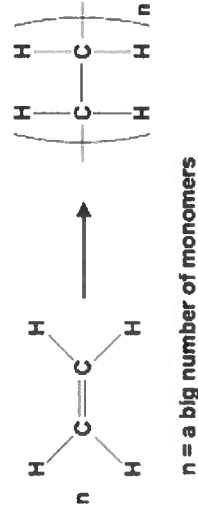
- Do not conduct electricity in any state as no ions or free electrons to carry the charge
- In order to melt or boil a simple covalent substance, the **intermolecular forces** must be overcome. The strong covalent bonds between atoms in a simple covalent molecule are too strong to be broken.
- Most simple covalent substances are gases or liquids at room temperature but some can be solids.
- As molecules get bigger, the strength of the **intermolecular forces** increases, so more energy is needed to overcome them and melting point and boiling point increase.
- Group 7, the halogens, form simple covalent molecules (F_2 , Cl_2 etc)
- The molecules increase in size down the group because the atoms have extra electron shells.
- The intermolecular forces increase, and so melting points and boiling points do too

Increasing size

Element	Melting Point °C	Boiling Point °C	State at room temperature
Fluorine, F_2	-220	-188	Gas
Chlorine, Cl_2	-101	-34	Gas
Bromine, Br_2	-7	59	Liquid
Iodine, I_2	114	184	Solid

Box 11 - Polymers – larger covalent substances

- Large covalent compounds which can be many thousands of atoms in length.
- Made from small molecules known as **monomers** joined together.
- All atoms in a polymer joined by strong covalent bonds
- Represented by drawing the **repeating unit**
- Repeating unit** is the monomer structure in square brackets with an n after the brackets to show that it is repeated many times



The diagram shows many (n) ethene molecules joined together to form poly(ethene) or polythene.
Molecular formula = $(C_2H_4)_n$

Key Terms

Polymer

A long chain molecule that is formed by joining lots of smaller molecules (monomers) together.

Repeating unit

The shortest repeating section of a polymer

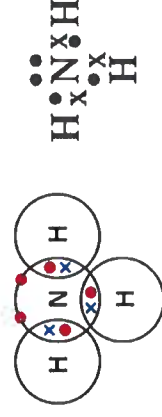
Intermolecular forces

The force of attraction between two molecules

Box 12 - Representing Simple Covalent Molecule

There are variety of ways that scientists use to represent covalent compounds.

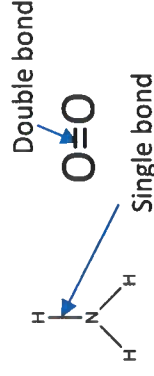
1. Dot cross diagrams



With electron orbitals

Without orbitals

2. Displayed formula



Double bond

Single bond

3. 3D models & ball and stick models



- Shows atoms and their arrangement
- Ball & stick model shows bonds
- Doesn't show electrons in bonds
- Confusing in large molecules

- Covalent bonds as lines between atoms
- Shows how atoms are connected
- Doesn't show 3D structure
- Doesn't show the origin on electrons in covalent bonds

- Show which atom the electrons in a covalent bond come from
- Doesn't show how the atoms are arranged in space
- Doesn't show the relative sizes of the atoms

Box 13 - Polymer properties

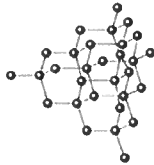
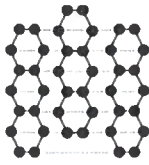
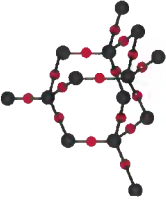
- Higher melting points and boiling points than simple covalent molecules such as CO_2 , O_2
- Intermolecular forces between the long polymer chains are stronger and so require more energy to overcome in order to change state
- Most polymers are solid at room temperature
- But intermolecular forces in polymers are still weaker than bonds in giant ionic and giant covalent structures so the melting points are lower than those compounds

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Box 14 - Giant Covalent Structures (Macromolecules)

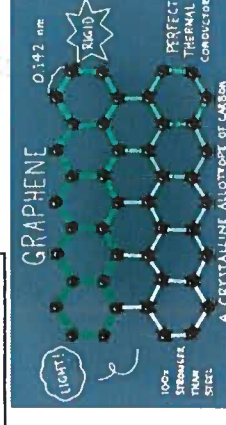
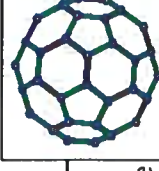
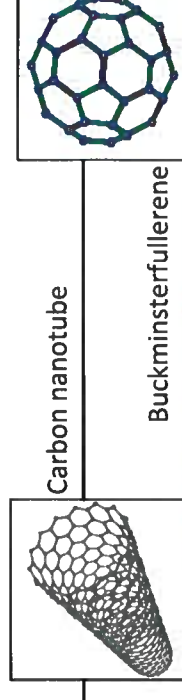
- All atoms are bonded to each other by strong covalent bonds.
- Have a **high melting point** and **boiling points** because many strong covalent bonds between the atoms need to be overcome to change state and this requires a lot of energy.
- Examples are diamond, graphite (=allotropes of carbon), and silicon dioxide (silica)

Substance	Diagram	Description	Properties
Diamond		Each carbon atom is covalently bonded to four other carbon atoms	- Very hard due to rigid structure - Very high melting point, due to strong covalent bonds between all the atoms - Does not conduct electricity as no free electrons or ions
Graphite		Each carbon atom is covalently bonded to 3 other carbon atoms – one outer electron in each atom is free Sheets (layers) of carbon atoms arranged in hexagons Weak intermolecular forces between layers	- High melting point – due to covalent bonds - Conductor of electricity and heat due to free delocalised electrons which can move - Slippery as layers can slide over each other because of weak intermolecular forces
Silica (silicon dioxide)		Each silicon atom is covalently bonded to 2 oxygen atoms and vice versa	- Strong due to rigid structure and covalent bonds - High melting point – due to covalent bonding

Box 15- Graphene and Fullerenes – other allotropes of carbon

Graphene is a **single layer of graphite** and it is 1 atom thick. It is strong due to covalent bonds, light so can be added to composite materials to improve strength for a lower mass, and conducts electricity due to delocalised electrons. Used in electronics.

Fullerenes are hollow molecules of carbon. **Nanotubes** are cylindrical fullerenes and **buckminsterfullerene** (C_{60}) is a sphere. They are **strong** and are excellent **conductors** of both **heat and electricity**. Used in drug delivery, as catalysts (due to high surface area), as lubricants, as strengthening materials and in electronics.



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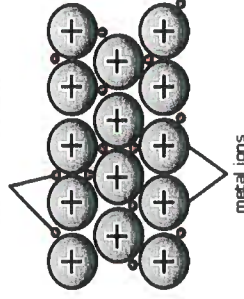
Box 16 - Metallic Bonding

Metals form giant structures. The metal atoms are arranged in a regular pattern, closely packed and in rows. The electrons in the outer shell of the atoms are not associated with any atom are so are **delocalised**. This forms positive metal ions which are in a “**sea of delocalised electrons**”.

Strong electrostatic forces of attraction between the ions and the electrons, known as metallic bonding, hold the structure together.

Delocalised electrons are free to move, so conduct heat and electricity

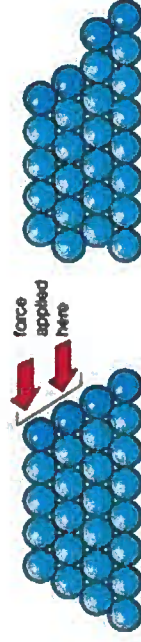
free electrons from outer shells of metal atoms



This would be the structure of a group 1 metal like sodium, if it were a group 2 metal (e.g. magnesium) then the charge on the ions would be 2+

Box 17 - Properties of Metals

- **High melting points and boiling points** due to strong electrostatic forces between metal ions and delocalised electrons so a large amount of energy is needed to overcome these forces.
- **Good conductors of electricity**, due to the delocalised electrons, which can move so charge can flow. Metals are also **good conductors of heat** as the free electrons can transfer the energy through the metal.
- **Malleable** - can be bent and shaped as well as hammered and rolled into shapes. The regular layers of ions can easily slide over one another. This means that many pure metals are too soft for uses such as building.



Key Terms

Definitions

Metallic bond
The attraction between metal ions and delocalised electrons in a metal.

Mixture
A substance made from 2 or more elements or compounds that aren't chemically bonded to each other.

Alloy
A metal that is a mixture of 2 or more metals, or a mixture involving metals and non-metals

Delocalised electron
An electron that isn't associated with a particular atom or bond and is free to move within a structure.

Malleable
The ability of a material to be bent into shape.

Box 18 - Alloys

Pure metals are often too soft (easily malleable) to be used in everyday applications. They are mixed with other metals to make them harder.

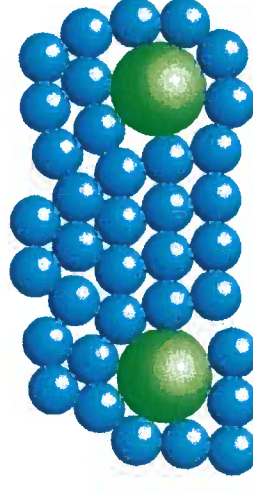
An **alloy** is a metal that is a mixture of 2 or more metals, or a mixture involving metals and non-metals.

Different metal elements have different sized atoms. When mixed together, the layers are distorted by the different sized atoms and they cannot easily slide past each other when a force is applied, making them harder, and less malleable.

Brass = copper and zinc alloy used for musical instruments

Nitinol = nickel and titanium alloy used in orthodontic braces

An alloy of 2 different metals with different sized atoms means that the layers are distorted. (compare with pictures on left)



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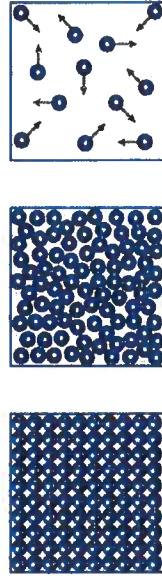
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Box 19 - Materials and States of Matter

All materials can exist in 3 different forms called states of matter. These are **solid, liquid and gas**. The state of matter depends on how strong the forces of attraction are between the particles of the material. This depends on:

- The material – the structure of the substance and type of bonds between particles
- The temperature
- The pressure

The particle theory model explains how particles behave in each of the three states of matter.



State of matter	Arrangement of particles	Movement of particles	Property
Solid	Regular, in rows, with particles closely packed and touching each other Strong forces of attraction between particles	Vibrate around a point. Vibrate more when heated. Cannot move from place to place	Rigid Fixed shape and volume Can't be compressed Expand slightly when heated
Liquid	Irregular but particles are still touching Weak forces of attraction between particles	Can move past each other Flow to fill the bottom of a container Constantly moving with random motion	Not rigid No fixed shape Fixed volume Can't be compressed Expand slightly when heated
Gas	Irregular, random arrangement. Particles are far apart (not touching) Very weak forces of attraction between particles	Constant rapid random motion in all directions. Travel in straight lines until they collide with container walls or each other Increase temperature results in faster movement	Not rigid No fixed shape No fixed volume Can flow Can be compressed Expand when heated – increase pressure if contained

Higher Tier - Limitations of Particle Theory Model:

- particles are not solid inelastic spheres, they are atoms, ions or molecules
- Model doesn't show strength of forces between particles, size of particles or distance between them

Key Terms	Definitions
Particle Theory Model	A model that represents how the particles in a material behave in each of the three states of matter. Each particle is a small, solid inelastic sphere.
State of matter	The physical arrangement of particles determines the state of a particular substance: solid, liquid or gas.
Changing state	A physical change between different states of matter. No new chemical substance is formed, and the change is reversible. Mass stays the same.
Melting / freezing	The change of state from solid to liquid/liquid to solid which takes place at the melting point
Evaporation/condensation	Change of state from liquid to gas/ gas to liquid which takes place at the boiling point

Box 20 - Changing state

- Physical change. Only arrangement or energy of the particles change – not the particles themselves.
- As a solid material is heated, the particles gain more energy and vibrate. Attractive forces are weakened and at the melting point the particles have enough energy to break free from their positions and change to a liquid.
- If the liquid is heated, the particles move faster, the forces are weakened more and at the boiling point the particles overcome the forces holding them together and form a gas.
- When substances are cooled from a gas to a liquid to a solid, the particles have decreasing amounts of energy in their kinetic stores and cannot overcome the forces of attraction. The attractive forces get progressively stronger and hold the particles in position.
- The stronger the forces of attraction between the particles in a substance, the higher the melting and boiling points.

Box 21 - Atomic and bulk properties

- In bulk, there are many billions of atoms or molecules
- How this bulk behaves are 'bulk properties'
- Bulk properties include density and melting point which stays the same even if the number of particles in bulk changes
- Bulk properties depend on how the particles interact
- Single atoms or molecules therefore behave differently

Box 22 - State symbols – used in chemical reactions

- Show the physical state of the reactants and products
- (s) solid (l) liquid (g) gas (aq) aqueous

GCSE Full and Short course Year 10 – Theme A Religion and Relationships		
Adultery	Having sex with someone who is not your husband or wife, outside of marriage	Gender Prejudice Holding biased opinions about people based on their gender
Artificial Contraception	Methods of preventing pregnancy e.g. condoms, the pill, the coil	Heterosexual Sexual attraction to the opposite gender
Cohabitation	Living and starting a family with someone who you are not married to	Homosexual Sexual attraction to the same gender
Divorce	The legal ending of a marriage	Marriage A legal and religious ceremony joining two people together in love
Family Planning	Using a woman's natural cycle of fertility to try and avoid pregnancy	Procreation Bringing babies into the world
Gender Discrimination	Acting against people based on their gender	Remarriage Marrying someone else after divorce

Topic	Christianity		Buddhism
Human sexuality	- The Roman Catholic church teaches that sex between people of the same gender is 'disordered' - They argue that homosexual relationships are banned by the Bible - Gay marriage is banned in the Catholic Church and Church of England - "Do not have sexual relations with a man as one does with a woman" – <i>Leviticus 18:22</i>	- Liberal Christians teach that Jesus wanted people to love each other and show mercy and that we should be accepting of homosexuals - The Bible was speaking to a culture and society that doesn't exist today and are fine with same-sex marriage.	- Buddhism does not favour one form of sexuality over another - Most important teachings is to '<i>not harm others</i>' - Same sex marriage is now legal in the UK
Sexual relationships	- Roman Catholics argue that all sex before marriage and after a divorce is unacceptable. Sex should only take place inside a marriage which is a lifelong, loving relationship. - Chastity - Adultery is prohibited by the Bible and Christians argue it is wrong as it undermines marriage involves lies and secrecy. - "<i>You shall not commit adultery</i>" - <i>Exodus 20:14</i>	- Liberal Christians believe sex before marriage can be a valid expression of love - Cohabitation - Disagree with promiscuity - "<i>Flee from sexual immorality</i>"	- No teaching on sex before marriage - Most important teachings is to '<i>not harm others</i>' - Adultery seen as an unskillful action
Artificial	- God tells Adam and Eve (the first couple) to "<i>be</i>"	- The Church of England argues that	- Acceptable to use

Contraception	<i>fruitful and multiply</i>" (Genesis 1:2) which encourages them to have children. - The Catholic Church argues that all sexual acts inside marriage must be open to procreation - Natural law - They may use family planning as it is a natural method.	contraception should be allowed so that couples can take time and consider if they want to have children.	contraception - Some may see contraception as breaking the first moral precept - In Buddhist cultures there is no obligation to have children
Marriage and Divorce	- During the ceremony you agree to be together for life saying <i>"till death do us part"</i> - Many Christians do not like divorce as it is seen to break the promises made in a marriage. - The Catholic Church do not support divorce. They believe that sex after divorce is a form of adultery and you cannot get remarried in a Catholic Church once you have been divorced. Jesus says <i>"if a man divorces his wife [...] he involves her in adultery"</i> (Matthew 5:32)	- The Church of England accepts divorce, especially if it is for reasons of abuse but you have to receive special permission to get remarried in a church. They might see it as a merciful option.	- No teaching on divorce - Clinging onto attachment results in suffering (Dukkha) - Accept if suffering is caused - Remarriage an opportunity to commit to a new and healthy relationship
Family	- Nuclear Family is a family with a mother, father and children - Extended Family is a family where grandparents and other relatives are involved - Single Parent Family this is a family where one parent brings up the child Purpose of the Family - Procreation – the family should be for the purpose of having and bringing up children - Stability – the family should be for providing a secure, stable environment for children - Faith – the family should be a way of bringing children up as good Christians	some Christians argue this is the ideal	
Gender	- The Catholic Church argues that women have a special role as mothers and they do not allow women to be priests - Some Christians argue that men were in authority during Jesus' life. All the disciples were men. Women should be quiet in church - <i>"Women should remain silent in the churches. They are not allowed to speak"</i>	- The Church of England has allowed women priests since 1994 - Other Christians say all are equal, Jesus respected women, the Good Samaritan teaches against discrimination, all are created in God's image - <i>"There is neither male nor female for you are all one in Christ"</i>	- Buddha ordained women as nuns - <i>Aparimitayur Sutra</i> suggests women must be reborn as men before reaching enlightenment - <i>Lotus Sutra</i> teaches Buddhist that men and women are equal

PCSHE – Year 10 Term 1 – Financial Decision Making

Key Terms:

- **Income Tax:** Income tax is the money that individuals or businesses have to pay to the government based on the money they earn or the profits they make.
- **Earnings:** Earnings are the money or income that individuals or businesses receive from their work, businesses, or investments.
- **Employee:** An employee is a person who works for an employer or a company. They do a job or provide services in exchange for a salary or wages.
- **Employer:** An employer is a person, company, or organisation that hires and pays employees to do work for them.
- **Tax returns:** Tax returns are forms that individuals or businesses fill out and send to the government to report their income and calculate how much tax they owe or if they are owed a refund.
- **Budgets:** Budgets are plans that help individuals or businesses keep track of their money. They show how much money is coming in (income) and how much is going out (expenditure), helping to control spending and save money.
- **Income:** Income is the money or earnings that individuals or businesses receive from various sources, such as jobs, investments, or business activities.
- **Expenditure:** Expenditure is the money that individuals or businesses spend or use to pay for goods, services, or bills.
- **Disposable:** Disposable refers to the income or money that individuals or households have left after paying taxes and essential expenses. It is the money available for spending or saving on non-essential items.
- **Mortgage:** A mortgage is a loan from a bank or lender that helps people buy a house. The borrower pays back the loan over time, along with interest, until the loan is fully repaid.
- **Loan:** A loan is an amount of money borrowed from a bank or lender. The borrower agrees to repay the loan over time, usually with interest added.
- **Gambling:** Gambling refers to playing games of chance or betting on uncertain outcomes, usually involving money. It involves taking a risk with the hope of winning more money or prizes.
- **Value:** Value refers to the worth or importance of something. It can be the monetary worth of an item or the significance or usefulness it holds.
- **HMRC:** HMRC stands for Her Majesty's Revenue and Customs. It is the government agency in the United Kingdom responsible for collecting taxes and enforcing tax laws. HMRC ensures that individuals and businesses meet their tax obligations and provides guidance and support regarding tax-related matters.
- **PAYE:** PAYE stands for Pay As You Earn. It is a system used by employers in the United Kingdom to deduct income tax and National Insurance contributions from their employees' salaries or wages.
- **Tax obligations:** Tax obligations refer to the legal responsibilities or duties that individuals or businesses have to fulfill regarding their taxes.
- **Debt:** Debt refers to an amount of money that one party (person) owes to another.
- **Prosecution:** Prosecution refers to the legal process of charging and following up a case against an individual or group accused of committing a crime.
- **Fraud:** Fraud is a dishonest act carried out with the intention to gain an unfair advantage (*hiding*) of information, or manipulation of facts for personal or financial gain.

KPI 1: Tax

Income Tax:

As an employee:

- You pay 0% on earnings up to £12,750 for 2020-21
- Then you pay 20% on anything you earn between £12,751 and £50,000
- You'll pay 40% income tax on earnings between £50,001 to £150,000
- If you earn £150,001 and over you pay 45% tax.

For example, if you earn £52,000 a year, you pay:

- Nothing on the first £12,750
- 20% on the next £37,500
- 40% on the next £2,000.

Therefore, you would expect to pay:

- £8,300 per year / £691.66 per month

What happens if I don't pay income tax?

Most people pay Income Tax through PAYE. This is the system your employer or pension provider uses to take Income Tax before they pay your wages or pension. If your employer makes a mistake and under pays your tax, you could be made to repay that amount through the next years PAYE if the amount is under £3,000 and you earn under £30,000 per year. In some very limited circumstances, it may be possible for HMRC to write off the debt, or, if your employer or pension payer is at fault, to collect the tax from them instead. If you are a self-employed person, you are responsible for filing your tax returns each year with the HMRC. Failure to do so or filing late or inaccurate returns can result in a HMRC Enquiry. If the enquiry find you are guilty of deliberately misleading or faking your tax record you can be prosecuted for fraud. In most cases you will be given a bill for the unpaid tax and a set time frame to pay it back.

PCSHE – Year 10 Term 1 – Financial Decision Making

KPI2: Budgeting

BUDGETS are a valuable tool for managing your money. They are used to manage INCOME (money coming in) and EXPENDITURE (spending on a weekly, monthly and yearly basis). Most Budgets contain a list of all spending that is ESSENTIAL, and spending that is optional (DISPOSABLE).

Why is budgeting important?

Since budgeting allows you to create a spending plan for your money, **it ensures that you will always have enough money for the things you need** and the things that are important to you. Following a budget or spending plan will also keep you out of debt or help you work your way out of debt if you are currently in debt.

Advantages of budgeting:

- Makes it easier to track and control spending
- Shows where you are spending too much
- Can relieve and reduce money related stress
- Can help with managing debt
- Can help free up and save money
- Can help with investing money (a way to make more profit from your money)
- Can help prepare for emergencies
- Can help when applying for a loan or a mortgage

How to stick to a budget:

- Consider quality versus price – cheaper things cost less but might need frequent replacement, so in the long term you end up spending more
- Keep your budget up to date – regular checks of your money allows you to see if you need to make changes
- Treat yourself – always factor in money for entertainment, holidays and rewards
- Self-discipline – changing spending habits takes a lot of willpower
- Be realistic – what can you really afford to spend, and pay off?
- Motivation – remember your reasons for spending and saving

Consequences of poor budgeting:

- A person may fall into debt
- A person might not be able to reach their goals
- A person might not be able to pay for essential items
- Difficulty in saving for the future
- Stress because of less money and debt

KPI3: Gambling

What is gambling?

Gambling is the act of wagering something of value (usually money), on an event/game with an uncertain outcome. The aim of which is to win something else of value (usually higher value).

How common is gambling?

More than two million people in the UK either have a gambling disorder or are at risk of addiction. Technology enables greater accessibility to gambling from an early age. E-sports gambling (i.e. betting on online match-play rather than in-person sporting events) is a particular vulnerability for young people.

Why do people gamble?

- For social reasons – This may be because it's what a group of friends do when they get together, or because it makes a social gathering more enjoyable.
- For financial reasons – to win money, because someone enjoys thinking about what they would do if they won a jackpot, or because winning would change someone's lifestyle.
- To clear debt – The temptation to get rid of financial worries in one day is a reason people gamble. People can win a lifetimes salary in the space of a day, or lose everything.
- For entertainment reasons – because they like the feeling, to get that rush or "high", or because it makes them feel good.
- For coping reasons – for someone to forget their worries, because they feel more self-confident, or because it helps when they are feeling nervous or depressed.

Someone may be a compulsive gambler if they...

- spend more money on gambling than you can afford
- gamble when you should be doing something else, like working or spending time with family
- feel anxious or stressed about your gambling
- use gambling to deal with problems or difficult feelings
- lie to family and friends about your gambling
- borrow or steal to fund your gambling.

Problems gambling can cause:

- Relationship problems
- Financial problems, including bankruptcy
- Legal problems or imprisonment
- Poor work performance or job loss
- Poor general health
- Suicide, suicide attempts or suicidal thoughts

PCSHE Year 10 - Topic 2 – Emotional Wellbeing and Mental Health

KPI1: Key Definitions

- **Mental Health:** The capacity to live a full, productive life as well as the flexibility to deal with its ups and downs. In children and young people, it is especially about the capacity to learn, enjoy friendships, to meet challenges, to develop talents and capabilities.
- **Mental Wellbeing:** your mental state – how you are feeling and how well you can cope with day-to-day life.
- **Stigma:** Stigma is when someone sees you in a negative way because of your mental illness.
- **Discrimination:** Discrimination is when someone treats you in a negative way because of your mental illness.
- **Body Image:** Body image refers to a person's perception (*understanding*), thoughts, and feelings about their own body. It includes how individuals perceive (*view*) their physical appearance, weight, size, and overall attractiveness. Body image can be influenced by societal standards (*society beliefs*), the media (*TV, social media*), and personal experiences, and it can greatly impact a person's self-esteem and mental well-being.
- **Mindfulness:** Mindfulness is a mental state of being fully present and aware of the current moment without judgment. It involves intentionally paying attention to one's thoughts, feelings, bodily sensations, and the surrounding environment. Practicing mindfulness helps individuals create a greater sense of clarity (*understanding*), calmness, and self-awareness, promoting overall well-being and reducing stress.
- **Bereavement:** Bereavement refers to the period of mourning and grief that follows the death of a loved one. It involves experiencing and processing the emotional, psychological, and social impact of the loss. Bereavement is a natural response to loss and can involve various emotions, such as sadness, anger, confusion, and loneliness. It is a personal and unique experience that requires time and support to navigate.
- **Emotional Resilience:** Emotional resilience refers to a person's ability to adapt and bounce back from challenges, or stressful situations. It involves having the capacity (*ability*) to effectively manage emotions, cope with setbacks, and maintain a positive outlook in the face of difficulties. Emotional resilience allows individuals to maintain their well-being, persevere through tough times, and recover from setbacks more easily.

KPI2: Everyone is different and what affects someone's mental wellbeing won't necessarily affect others in the same way. Everyone will have times when they have low mental wellbeing, where they feel stressed, upset or find it difficult to cope. Common life events that can affect your mental wellbeing include:

- loss or bereavement
- loneliness
- relationship problems
- issues at work
- worry about money

Other influences upon someone's mental health can include factors such as social media, body image, and substances. However, there are times when there is no discernible reason for the way a person feels which can be extremely frustrating.

KPI 3: Strategies to promote emotional wellbeing and positive mental health

- Relaxation techniques like mindfulness and deep breathing
- Following interest in hobbies that provide enjoyable distractions
- Keeping active by walking, cycling, swimming or by doing another favourite sport
- Getting outside into nature
- Spending time with friends and family
- Getting plenty of good quality sleep
- Doing dedicated exercises intended to promote relaxation e.g. yoga
- Online mindfulness, stress and anxiety apps
- Asking for help from teachers, family, friends or online support when things get a bit much
- Set Realistic Goals: Set achievable goals and break them down into smaller, manageable steps. Celebrate accomplishments along the way, which helps to boost self-confidence and motivation.
- Take Breaks and Practice Relaxation: Incorporate regular breaks and relaxation into your daily routine. Engage in activities like listening to music, reading, taking walks in nature, or engaging in hobbies to relax and recharge.

Remember, everyone's needs and preferences are unique. It's essential to explore and find strategies that work best for you and prioritize self-care and mental well-being as a lifelong practice.

PCSHE Year 10 - Topic 2 – Emotional Wellbeing and Mental Health

KPI4: Types of Mental Health Problems	What is it?	Potential Signs	Strategies and Treatments	If you need any support... Home/school support: Friends, teachers, tutor, parents/carer, Mr Ogden, Mrs Jones, Mrs Loveridge, Mrs Jones, Mr Hayward. Reputable Organisation: - Young Minds – www.youngminds.org.uk - Young Minds CRISIS MESSANGER: Text YM to 85258 - Childline – www.childline.org.uk Phone: 0800 1111 - Samaritans – www.samaritans.org Phone: 11612 - Young Mind Matters – Text 07480635723 - Kooth – Kooth.com - TIC+ - online text chat – 07977334433 - Self-Harm Helpline Rethink Gloucestershire – webchat: www.gloucestershireselfharm.org Text: 07537410022 Phone: 0808 8010606 Self-help apps: - Calm Harm – Managing Self-Harm - MindShift – to help manage anxiety and urges to self-harm - Cove – express your mood with music - Stress and Anxiety Companion – helps to manage stress and anxiety - Chill Panda – relaxation and breathing exercises. <i>On the school website, use the following link to report a concern:</i> 
Depression	It's a feeling of low mood that lasts for a long time and affects her everyday life. It can make you feel hopeless, despairing, guilty, worthless, unmotivated and exhausted. It can affect herself esteem, sleep, appetite, sex drive and your physical health.	- Feels like something is 'missing'. - Feel like you cannot cope - Withdrawn, pulling out of activities	Medication – can provide relief while building other support strategies Cognitive behavioral therapy – practical techniques Activities – Photography and going for a walk Sport/physical exercise - Cognitive behavioral therapy - Yoga and Pilates - Meditation - Diary to reassure that things will pass - Small steps to build confidence - Talking to friends and family - Avoiding researching physical symptoms as this can make things worse.	
Anxiety	What we feel when we are worried, tense or afraid – particularly about things that are about to happen , or which we think could happen in the future.	- Physical symptoms e.g. shaking, heart palpitations, pins and needles, stomach pains - Withdrawn - Seeking reassurance - Perfectionism - Can be linked with depression Occasional anxiety is a normal human experience. But if your feelings are anxiety are very strong, or last for a long time, they can be overwhelming. You might also experience physical symptoms such as sleep problems and panic attacks.	- Physical symptoms e.g. shaking, heart palpitations, pins and needles, stomach pains - Withdrawn - Seeking reassurance - Perfectionism - Can be linked with depression	
Stress	Stress is the body's reaction to feeling threatened or under pressure. It's very common, can be motivating to help us achieve things in our daily life, and can help us meet the demands of home, work and family life. But too much stress can affect our mood, our body and our relationships – especially when it feels out of our control. It can make us feel anxious and irritable and affect our self-esteem. Experiencing a lot of stress over a long period of time can also lead to a feeling of physical, mental and emotional exhaustion, often called burnout.	- Disrupted sleep cycle - False FFF (fight, flight, freeze) responses i.e.. So wired that small stressors provide big reactions. - Can cause depression and anxiety.	- Mind tools - Exercise - Quality sleep - Relaxation - Sharing feelings with friends.	