



The Lowry Academy
The best in everyone™
Part of United Learning

Knowledge Organiser



2026-27

Year 8



Aspiration | Respect | Confidence | Creativity | Resilience



YEAR 8

ENGLISH



HT1 | WRITING

Key Terms & Definitions
Questions

HT2 | READING - DRACULA

Key Terms & Definitions
Questions

HT3 | NARRATIVE WRITING - SOMEONE

Key Terms & Definitions
Questions

HT4 | READING - RICHARD III

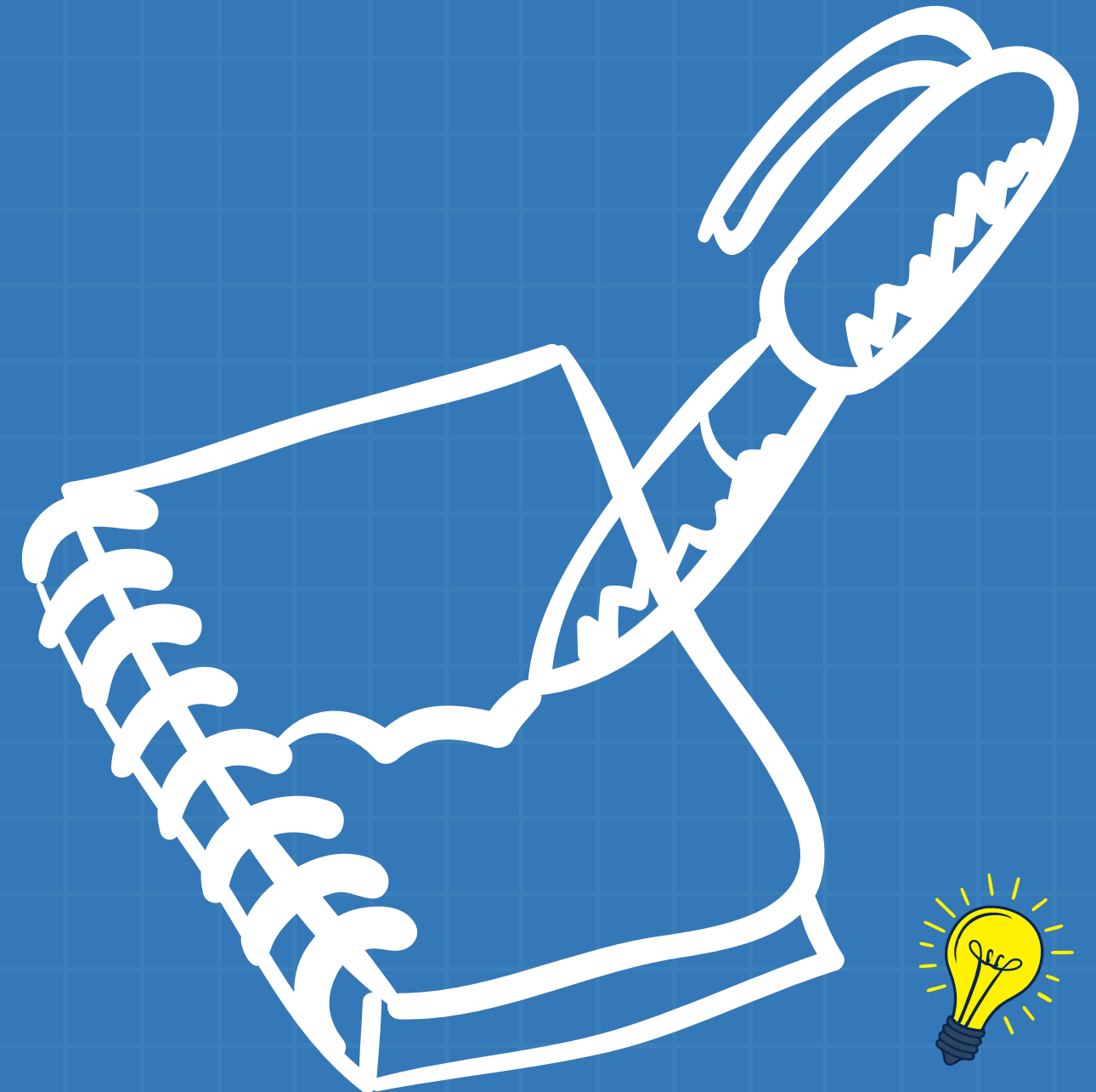
Key Terms & Definitions
Questions

HT5 | WRITING - TRANSACTIONAL

Key Terms & Definitions
Questions

HT6 | READING - SOCIAL JUSTICE

Key Terms & Definitions
Questions



Key Term	Definition
Subject	The subject of a sentence is the person, place, thing, or idea that performs the action or is being described in the sentence.
Abstract Noun	A noun that names an idea, feeling, or quality – something you can't touch. Example: Stillness, love, jealousy
Main Clause	Can stand alone as a sentence and contains a subject and a verb, and it expresses a complete thought.
Introductory Phrase	A group of words at the beginning of a sentence that provides background or context for the main part of the sentence. It is usually followed by a comma.
Pathetic Fallacy	Pathetic fallacy is a type of personification where human emotions are given to nature or the weather to reflect a character's mood or the atmosphere of a scene.
Noun	A word (not a pronoun) used to identify people, places, or things. Example: The peaks were covered in thick white snow.
Complete thought	The sentence must express a clear and complete idea . If it leaves you wondering what happens next, it's not complete. Example: The peaks were covered in thick white snow.
Simple sentences	A sentence with one independent clause. It needs one subject, one verb and it needs to be a complete thought. Example: The air was crisp and warm.
Compound sentences	A sentence with two or more independent clauses, joined by a coordinating conjunction (like and, but, or, so). Example: The snow fell quietly, and the wind howled through the trees.
Complex sentences	A complex sentence has one independent clause and at least one dependent clause , joined by a subordinating conjunction (like because, although, since, when, if, while). Example: Although snow capped the mountains, the sun warmed the valley below.
Verb Phrase	A group of words that includes a main verb and one or more helping (auxiliary) verbs . Example: She has been studying all night.
Conjunctions	Words that connect other words, phrases, or clauses in a sentence. Example: and, but, or, so, yet, for, nor

Key Term	Definition
Coordinating Conjunctions	Conjunctions that connect words or groups of words that are equal in structure. Example: and, but, or, nor, for, so, yet, therefore
Subordinating Conjunctions	Conjunctions that connect a dependent clause to an independent clause. Example: because, although, since, unless, while, if
Correlative Conjunctions	Connectives that work in pairs to connect equal elements. Example: either...or, neither...nor, not only....but also
Adjective	A word that describes or modifies a noun. Example: Golden.
Subordinate Clause	A group of words with a subject and a verb, but it does not express a complete thought and cannot stand alone as a sentence.
Predicate Verb	This tells what the subject does or is . It includes the main verb and any helping words. Example: The peaks were covered in thick white snow.
Adverb	Describes or modifies a verb, adjective, or another adverb. Example: The snow glistened brilliantly in the golden morning sun.
Preposition	A word that shows the relationship between a noun (or pronoun) and other words in a sentence, often describing position, direction, time, or manner. Example: In, under, over, beyond, within.
Subject	This is who or what the sentence is about. It's usually
Personification	Human qualities are given to animals, objects, or ideas. Example: The towering peaks were silent guardians of the sky.



Questions

1. Write an example of a common noun.
2. What’s the difference between a proper noun and an abstract noun?
3. Write an example of a proper noun.
4. What is a collective noun?
5. What is another name for a noun that you can see, hear, touch, smell or taste called?
6. What is a complete thought?
7. What is a simple sentence?
8. What type of sentence is this? Although snow capped the mountains, the sun warmed the valley below.
9. What type of sentence is this? The snow fell quietly, and the wind howled through the trees.
10. What is a group of words that includes a main verb and one or more helping (auxiliary) verbs?

Questions

1. Write three examples of conjunctions.
2. What type of conjunctions connect words or groups of words that are equal in structure?
3. What type of conjunctions are these? either...or, neither...nor, not only....but also
4. What type of conjunctions are these? because, although, since, unless, while, if
5. Which device has been used in this sentence? The towering peaks were silent guardians of the sky.
6. What type of adjective is this an example of? Well-known.
7. Which part of this sentence is the Predicate Verb? The peaks were covered in thick white snow.
8. Which word is an adverb in the below sentence? The snow glistened brilliantly in the golden morning sun.
9. Which is the preposition in this sentence? The sun shone over the beautiful, clear seascape.
10. Which is the subject of this sentence? The peaks were covered in thick white snow.

Key Term	Definition
Foreboding	A feeling that something bad will happen; fearful apprehension.
Exposition	The insertion of background information within a story or narrative about a story's events, settings, characters etc.
Patriarchy	A system of society or government in which men hold the power and women are largely excluded from it.
Archetype	A very typical example of a certain person or thing.
Power	Possession of control, authority, or influence over others.
The New Woman	A term used to describe an independent feminist ideal that became popular in the late 19th century and influenced feminism in the 20th century.
The Angel in the House	The traditional Victorian woman who should be meek, pure and obedient.
Atmosphere	The tone or mood created in a piece of literature.
Symbolism	The use of symbols to express ideas or qualities.
Imagery	Visually descriptive or figurative language.
Ominous	Giving the worrying impression that something bad is going to happen.

Key Term	Definition
Physiognomy	A person's facial features or expression, especially when regarded as indicative of character or ethnic origin.
Grotesque	Comically or repulsively ugly or distorted.
Relentless	Continuing in a severe or extreme way.
Malevolent	Having or showing a wish to do evil to others.
Explicit characterisation	Something the author tells us directly about a character, e.g., age, appearance, job.
Implicit characterisation	Something that we have to infer about a character through their actions, dialogue, what others say etc.
Allegory	A story that can be interpreted to reveal a hidden meaning, typically a moral or political one.
Rising Action	The section of the plot leading up to the climax, where the tension grows.



Questions

- 1. Foreboding is a feeling that something _____ will happen; fearful apprehension.
- 2. An exposition is the insertion of _____ information within a story or narrative about a story's events, settings, characters etc.
- 3. What does a patriarchal society mean for the women in that society?
- 4. What kind of example is an archetype?
- 5. What do you posses if you have power?
- 6. When did the term New Woman become popular?
- 7. What kind of woman should be meek, pure and obedient?



Questions

- 1. _____ is the tone or mood created in a piece of literature.
- 2. What is the use of symbols to express ideas or qualities?
- 3. What do writers use imagery for?
- 4. How is the image representative of a Gothic fiction?
- 5. Physiognomy focuses on which elements of a character's features?
- 6. Which is another word for repulsively ugly?
- 7. A character who gives up easily can be described as relentless. True or false?
- 8. A villain who enjoys causing pain to others is malevolent. True or False?
- 9. "John was a tall man with grey hair and a serious expression." is an example of explicit characterisation. True or false?
- 10. "He always arrived early and helped others without being asked." suggests the character is responsible and kind. True or false?
- 11. An allegory is a story that can be interpreted to reveal a hidden meaning. True or false?

Key Term	Definition
Sentence Form	The grammatical arrangement of words in sentences and complete in meaning.
Simple sentences	A sentence with one independent clause. It needs one subject, one verb and it needs to be a complete thought. Example: The air was crisp and warm.
Compound sentences	A sentence with two or more independent clauses, joined by a coordinating conjunction (like and, but, or, so). Example: The snow fell quietly, and the wind howled through the trees.
Complex sentences	A complex sentence has one independent clause and at least one dependent clause, joined by a subordinating conjunction (like because, although, since, when, if, while). Example: Although snow capped the mountains, the sun warmed the valley below.
Main clause	A clause that can stand alone as a complete sentence because it expresses a complete thought.
Subordinate clause	A clause that cannot stand alone as a sentence and depends on a main clause to make sense.
Independent clause	A group of words that contains a subject and verb and expresses a complete thought. It can stand alone as a sentence.
Conjunction	A word used to connect clauses or sentences (e.g., and, but, if, although).
Simile	A figure of speech comparing two different things using like or as. Example: The snow was as soft as a blanket.
Metaphor	A figure of speech that describes something as if it were something else. Example: The classroom was a zoo.
Personification	Human qualities are given to animals, objects, or ideas. Example: The towering peaks were silent guardians of the sky.

Key Term	Definition
Explicit characterisation	Something the author tells us directly about a character, e.g., age, appearance, job.
Implicit characterisation	Something that we have to infer about a character through their actions, dialogue, what others say etc.
Preposition	A word that shows the relationship between a noun (or pronoun) and other words in a sentence (e.g., in, on, at, by, with).
Present participle	The -ing form of a verb used to form continuous tenses or as an adjective. Example: running, singing.
Past participle	The form of a verb typically ending in -ed (for regular verbs) used in perfect tenses or as an adjective. Example: walked, broken.
Adjective	A word that describes a noun or pronoun. Example: blue, tall, happy.
Adverb	A word that modifies a verb, adjective, or another adverb. It often tells how, when, where, or to what extent. Example: quickly, very, yesterday.



Questions

- 1. What is the grammatical arrangement of words in sentences that is complete in meaning called?
- 2. What type of sentence contains only one independent clause?
- 3. What are the three essential components of a simple sentence?
- 4. What type of sentence contains two or more independent clauses joined by a coordinating conjunction?
- 5. Which conjunctions are commonly used in compound sentences?
- 6. What type of sentence includes one independent clause and at least one dependent clause?
- 7. What kind of conjunction is used to join clauses in a complex sentence?
- 8. Give an example of a subordinating conjunction.
- 9. What is a clause that can stand alone as a complete sentence called?
- 10. What is a clause that cannot stand alone and depends on another clause called?
- 11. What do we call a group of words that contains a subject and verb and expresses a complete thought?
- 12. What is the function of a conjunction in a sentence?

Questions

- 1. A _____ is a figure of speech comparing two different things using "like" or "as".
- 2. A _____ describes something as if it were something else, without using "like" or "as".
- 3. _____ is when human qualities are given to animals, objects, or ideas.
- 4. "The snow was as soft as a blanket" is an example of a _____.
- 5. "The classroom was a zoo" is an example of a _____.
- 6. "The towering peaks were silent guardians of the sky" is an example of _____.
- 7. Explicit characterisation is when the author directly tells us about a character's age. True/False?
- 8. Implicit characterisation requires us to infer information about a character through their actions. True/False?
- 9. A preposition shows the relationship between a noun and other words in a sentence. True/False?
- 10. The present participle form of a verb ends in -ed. True/False?
- 11. The past participle form of regular verbs typically ends in -ing. True/False?
- 12. An adjective describes how, when, or where an action takes place. True/False?
- 13. An adverb modifies verbs, adjectives, or other adverbs and often tells how, when, where, or to what extent. True/False?

Key Term	Definition
Soliloquy	A speech or passage in a drama when a character on stage speaks to himself /herself or the audience, expressing their inner thoughts and feelings.
Supernatural	Manifestations or events considered to be some force beyond scientific understanding or the laws of nature.
Amoral	Lacking a moral sense; unconcerned with the rightness or wrongness of something.
Juxtaposition	The placement of two contrasting objects, images or ideas next to each other.
Restoration	The act or process of returning something to its earlier good condition or position.
Façade	A deceptive outward appearance.
Tyranny	A cruel and oppressive ruler.
Kingship	The state or position of being a king.
Corrupt	Having or showing a willingness to act dishonestly in return for money or personal gain.
Vengeance	Punishment inflicted or retribution exacted for an injury or wrong.
Divine	The word divine refers to something that is related to or comes from God, it often implies a sense of holiness and power.

Key Term	Definition
Hierarchy	Hierarchy is a system or organisation in which people, groups, or things are ranked one above the other according to status, authority, or importance.
Villainous	Wicked or criminal behaviour.
Usurp	To take a position of power or importance illegally or by force.
Power	The capability or ability to direct or influence the behaviour of others or the course of events.
Ambition	A strong desire to do or achieve something.
Deception	Hiding the truth, especially to get an advantage.
Patriarchy	A society where men hold the power.



The Great Chain of Being

God
Angels
Kings and Queens
Commoners
Animals
Plants
Nonliving Things



Questions | True or False

- 1. A soliloquy is when a character speaks their thoughts aloud to the audience.
- 2. Corrupt means being honest and fair in all dealings.
- 3. Divine refers to something related to science and logic.
- 4. Patriarchy is a society where women hold the power.
- 5. Deception involves hiding the truth to gain an advantage.
- 6. Restoration refers to the act of destroying something permanently.
- 7. Hierarchy is a system where everyone is considered completely equal in status and authority.
- 8. Amoral means someone is unconcerned with whether something is right or wrong.
- 9. Kingship refers to the role or position of being a king.
- 10. The supernatural includes events that can be fully explained by science.

Questions

- Complete each sentence with the correct missing word from the knowledge organiser.
- 1. R_____ is the act of returning something to its earlier good condition.
 - 2. _____ refers to the state or position of being a king.
 - 3. Someone who is _____ shows a willingness to act dishonestly for personal gain.
 - 4. _____ is punishment inflicted for an injury or wrong.
 - 5. _____ is the ability to influence the behaviour of others or events.
 - 6. _____ means lacking a moral sense.
 - 7. _____ is the placement of two contrasting ideas next to each other.
 - 8. The word _____ refers to something related to or coming from God.

Questions

1. Write the correct key word that matches each definition.
2. A cruel and oppressive ruler —>_____
3. A deceptive outward appearance —>_____
4. A strong desire to do or achieve something —>_____
5. To take power illegally or by force —>_____
6. A speech where a character expresses inner thoughts aloud —>_____
7. Wicked or criminal behaviour —>_____
8. A society where men hold the power —>_____
9. Hiding the truth to gain an advantage —>_____
10. A system where people are ranked by status or authority —>_____
11. Events beyond scientific understanding —>_____

Key Term	Definition
Problem	Consider whether there are big ideas behind the statement e.g. politics, gender, morality, class, economics etc. Does this topic raise any big, global issues or discussion points? 'Imagine a world...' <i>Here we outlined our thoughts on if it was beneficial or detrimental to be ambitious.</i>
Argument One	Consider your personal experiences of the topic. Where have you encountered it? How have these encounters shaped your views? How do they correlate with wider ideas around the topic? <i>Here we used emotive language and anecdotes.</i>
Argument Two	Consider the topic expertly. What do experts say? What are case studies saying about this issue? Here we included facts and statistics from experts.
Future	Consider the future of the topic. Where is it headed next? It is cause for optimism or concern? Link this back to the opening paragraph. 'Now imagine a world...' Here we returned to our initial ideas and used rhetorical devices to support the changes we wanted to happen.
Tone	Tone indicates the writer's mood, voice and attitude.
Statistics	Factual, numerical evidence which are convincing.
Expert Opinion	A belief or judgment about something given by an expert on the subject.
Call to action	Asking people for concrete, realistic changes.
Inclusive Pronouns	A pronoun which includes the speaker and the audience, and possibly others. This includes we, us, ours, ourselves.

Key Term	Definition
Emotive language	Language used to evoke an emotion from an audience.
Anecdote	A short, often humorous story inserted into a wider narrative or conversation.
Empathy	The ability to understand and share the feelings of another.
Anaphora	Repetition of a word or phrase at the beginning of successive clauses.
Rhetorical Question	a question asked to create a dramatic effect or to make a point rather than to get an answer.
Direct Address	When a speaker or writer directly refers to the person or group they are communicating with, often using pronouns like "you" or names, to engage them in the message.
Stance	The attitude/standpoint of a person or organisation towards something.



Questions

1. When a speaker uses “you” to engage the audience, they are using _____.
2. A person’s _____ shows their attitude or standpoint on an issue.
3. A writer might use _____ to make the audience feel personally involved in the message.
4. _____ can make a message more persuasive by appealing to the audience’s emotions.
5. A speaker might use _____ to repeat a phrase for emphasis at the beginning of several sentences.
6. A rhetorical question is not meant to be answered but to provoke thought or highlight a point.
7. When someone shares a personal story to support their argument, they are using an anecdote.
8. A writer’s tone can influence how their message is received by the audience.
9. Inclusive pronouns are used to show that the speaker is part of the group they are addressing.
10. A demonstration of empathy is used to show that the speaker understands and shares the audience’s feelings.

Questions

1. The writer’s _____ reveals their mood, voice, and attitude.
2. Using _____ provides factual, numerical evidence to support an argument.
3. An _____ is a belief or judgment given by someone with authority in a subject.
4. A _____ encourages the audience to make specific, realistic changes.
5. Words like “we,” “us,” and “ourselves” are examples of _____ pronouns.
6. _____ language is used to provoke strong feelings in the audience.
7. A short, often humorous story inserted into a wider narrative is called an _____.
8. Showing _____ means understanding and sharing another person’s feelings.
9. _____ is the repetition of a word or phrase at the beginning of successive clauses.
10. A _____ question is asked to make a point rather than to get an answer.

Which paragraph is this?	Consider whether there are big ideas behind the statement e.g. politics, gender, morality, class, economics etc. Does this topic raise any big, global issues or discussion points? ‘Imagine a world...’ <i>Here we outlined our thoughts on if it was beneficial or detrimental to be ambitious.</i>
Which paragraph is this?	Consider your personal experiences of the topic. Where have you encountered it? How have these encounters shaped your views? How do they correlate with wider ideas around the topic? <i>Here we used emotive language and anecdotes.</i>
Which paragraph is this?	Consider the topic expertly. What do experts say? What are case studies saying about this issue? <i>Here we included facts and statistics from experts.</i>
Which paragraph is this?	Consider the next steps of the topic. Where is it headed next? It is cause for optimism or concern? Link this back to the opening paragraph. ‘Now imagine a world...’ <i>Here we returned to our initial ideas and used rhetorical devices to support the changes we wanted to happen.</i>

Key Term	Definition
Ignorance	A lack of knowledge, understanding, or information about something.
Identity	Who or what a person or thing is.
Collective Responsibility	Where everyone is responsible for each other.
Ideological	Based on or relating to a particular set of ideas or beliefs.
Intolerance	Unwillingness to accept views, beliefs, or behaviour that differ from one's own.
Representation	The fact of including different types of people, for example in literature, films, politics, or sport, so that all different groups are represented.
Refrain	A word, line or phrase that is repeated within in the lines or stanzas of the poem itself.
Juxtaposition	When two or more ideas, images, words etc. are placed side by side to develop comparisons and contrasts.
Extended	A metaphor which is developed through the text.
Metaphor	A comparison in which one thing is said to be another.

Key Term	Definition
Simile	A comparison of two things using the words as or like.
Oppression	A situation in which people are governed in a cruel and unjust way.
Authoritarian	Favouring or enforcing strict obedience to authority at the expense of personal freedom.
Empowered	To make someone stronger and more confident, especially in controlling their life and claiming their rights.
Freedom	• Definition 1 (Freedom TO): The power or right to act, speak, or think as one wants. • Definition 2 (Freedom FROM): Not being enslaved, imprisoned, or subject to or affected by something undesirable.
Symbolism	The use of symbols to represent ideas or qualities
Normalised	To make something normal or return it to its normal state.



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| ◦ Favouring or enforcing strict obedience to authority at the expense of personal freedom. |
| ◦ To make someone stronger and more confident, especially in controlling their life and claiming their rights. |
| ◦ Based on or relating to a particular set of ideas of beliefs. |
| ◦ Unwillingness to accept views, beliefs, or behaviour that differ from one’s own. |
| • A word, line or phrase that is repeated within in the lines or stanzas of the poem itself. |
| • When two or more ideas, images, words etc. are placed side by side to develop comparisons and contrasts. |
| • A metaphor which is developed through the text. |
| • A comparison in which one thing is said to be another. |
| • A comparison of two things using the words as or like . |

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|---|
| ▪ A situation in which people are governed in a cruel and unjust way. |
| ▪ Favouring or enforcing strict obedience to authority at the expense of personal freedom. |
| ▪ To make someone stronger and more confident, especially in controlling their life and claiming their rights. |
| ▪ Definition 1 (Freedom TO): The power or right to act, speak, or think as one wants.
▪ Definition 2 (Freedom FROM): Not being enslaved, imprisoned, or subject to or affected by something undesirable. |
| ▪ The use of symbols to represent ideas or qualities |
| ▪ To make something normal or return it to its normal state. |
| ▫ A lack of knowledge, understanding, or information about something. |
| ▫ Who or what a person or thing is. |
| ▫ Where everyone is responsible for each other. |
| ▫ Based on or relating to a particular set of ideas of beliefs. |
| ▫ Unwillingness to accept views, beliefs, or behaviour that differ from one's own. |
| ▫ The fact of including different types of people, for example in literature, films, politics, or sport, so that all different groups are represented. |

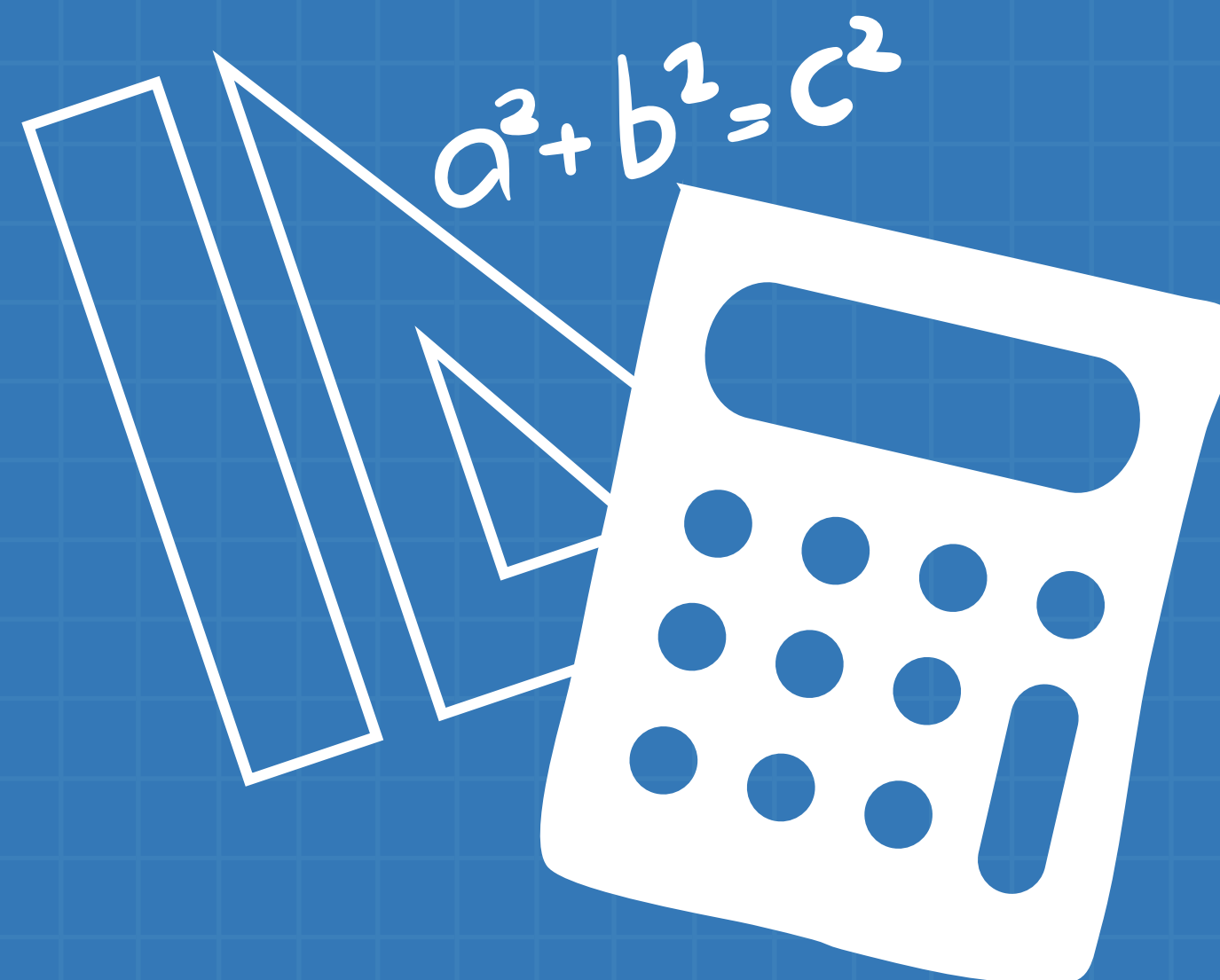


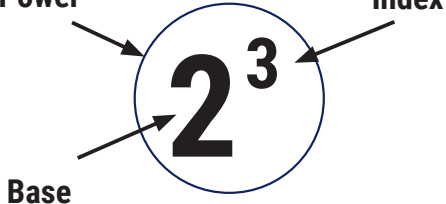
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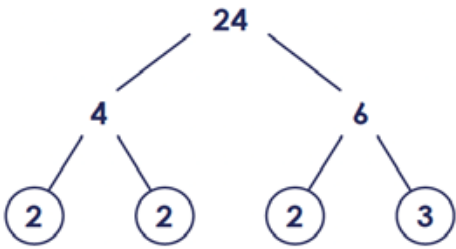
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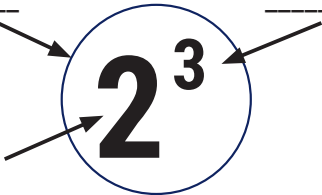


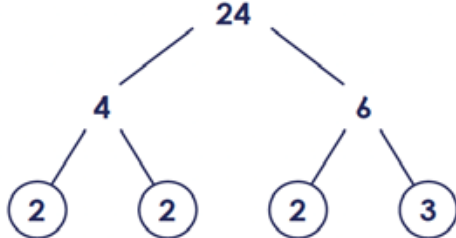
- 8.01 | POWERS AND ROOTS
- 8.02 | PRIME FACTORISATION
- 8.03 | ROUNDING
- 8.04 | FRACTIONS
- 8.05 | SOLVING EQUATIONS 1
- 8.06 | ANGLES IN PARALLEL LINES 1
- 8.07 | CIRCUMFERENCE
- 8.08 | DIRECT PROPORTION
- 8.09 | FRACTIONS, DECIMALS AND PERCENTAGES
- 8.10 | PERCENTAGE CALCULATIONS
- 8.11 | RATIO
- 8.12 | AREAS OF CIRCLES
- 8.13 | STATISTICS 1
- 8.14 | AVERAGES & SPREAD
- 8.15 | 3D VISUALISATION
- 8.16 | VOLUME



1. Square number	The result of multiplying a number by itself. It will always be positive. The first 12 square numbers are: 1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121,144.
2. Square root	The opposite of squaring a number to find the original factor. e.g. $\sqrt{64} = 8$ or -8 because $8^2 = 64$ and $(-8)^2 = 64$
3. Cube number	The result of multiplying a number by itself, then itself again. The first 10 cube numbers are: 1, 8, 27, 64, 125, 216, 343, 512, 729, 1000.
4. Cube root	The opposite of cubing a number to find the original factor. e.g. $\sqrt[3]{8} = 2$ because $2^3 = 8$ Note: $(-2)^3 = -8$ so $\sqrt[3]{8} \neq -2$
5. Index notation	Example $a \times a \times a \times a = a^4$. The number 4 is called the index (plural indices). This tells us how many times the “base” a has been multiplied by itself. Power 
6. Multiplying powers	$a^m \times a^n = a^{m+n}$ ADD the powers only if the bases are the same. E.g. $a^5 \times a^3 = a^{5+3} = a^8$
7. Dividing powers	$a^m \div a^n = a^{m-n}$ SUBTRACT the powers only if the bases are the same. E.g. $a^6 \div a^2 = a^{6-2} = a^4$
8. Indices with brackets	$(a^m)^n = a^{m \times n}$ MULTIPLY the powers. E.g. $(a^3)^5 = a^{3 \times 5} = a^{15}$
9. Indices with brackets	$(ab)^n = a^n \times b^n$ Raise each number or variable to the same power. E.g. $(2p)^4 = 2^4 \times p^4 = 16p^4$
10. Power of 0	$a^0 = 1$. Any number or variable to the power of zero equals 1.
11. Power of ½	$a^{\frac{1}{2}} = \sqrt{a}$ E.g. $16^{\frac{1}{2}} = \sqrt{16} = 4$

1. Prime numbers	A prime number only has two distinct factors: 1 and itself. 2 is the only even prime number. 1 is not a prime number. Prime numbers between 1 and 100: 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79, 83, 89, 97.
2. Prime factor decomposition	The process of expressing a number as a product of its prime factors. $24 = 2 \times 2 \times 2 \times 3$ $24 = 2^3 \times 3$
3. Prime factor trees	

1. Square number	The result of _____. It will always be positive. The first 12 square numbers are: 1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144.
2. Square root	The _____ of squaring a number to find the original _____. e.g. $\sqrt{64} = 8$ or -8 because $8^2 = 64$ and $(-8)^2 = 64$
3. Cube number	The result of _____. The first 10 cube numbers are: 1, 8, 27, 64, 125, 216, 343, 512, 729, 1000.
4. Cube root	The _____ of cubing a number to find the original _____. e.g. $\sqrt[3]{8} = 2$ because $2^3 = 8$ Note: $(-2)^3 = -8$ so $\sqrt[3]{8} \neq -2$
5. Index notation	Example $a \times a \times a \times a = a^4$. The number 4 is called the _____ (plural indices). This tells us how many times the " _____ " a has been multiplied by itself. 
6. Multiplying powers	$a^m \times a^n = a^{m+n}$ _____ the powers only if the bases are the same. E.g. $a^5 \times a^3 = a^{5+3} = a^8$
7. Dividing powers	$a^m \div a^n = a^{m-n}$ _____ the powers only if the bases are the same. E.g. $a^6 \div a^2 = a^{6-2} = a^4$
8. Indices with brackets	$(a^m)^n = a^{m \times n}$ _____ the powers. E.g. $(a^3)^5 = a^{3 \times 5} = a^{15}$
9. Indices with brackets	$(ab)^n = a^n \times b^n$ Raise each number or variable to the same _____. E.g. $(2p)^4 = 2^4 \times p^4 = 16p^4$
10. Power of 0	$a^0 = \underline{\hspace{2cm}}$ Any number or variable to the power of zero equals _____.
11. Power of $\frac{1}{2}$	$a^{\frac{1}{2}} = \sqrt{a}$ E.g. $16^{\frac{1}{2}} = \sqrt{16} = 4$

1. Prime numbers	A prime number only has _____: 1 and itself. 2 is the only _____ prime number. 1 is not a prime number. Prime numbers between 1 and 100: _____, _____, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79, 83, 89, 97.
2. Prime factor decomposition	The process of expressing a number as a _____ of its _____ _____. $24 = 2 \times 2 \times 2 \times 3$ $24 = 2^3 \times 3$
3. Prime factor trees	 <pre> graph TD 24 --> 4 24 --> 6 4 --> 2_1((2)) 4 --> 2_2((2)) 6 --> 2_3((2)) 6 --> 3((3)) </pre>

Rounding

1. Significant figures

The total number of digits in a number, not counting zeros at the beginning of a number or at the end of a decimal number.

345 000 has 6 significant figures.

0.3047 has 4 significant figures.

10.500 has 3 significant figures.

2. Rounding to significant figures

Round to...	0.007638 to 3 sf	0.007638 to 2 sf	0.007638 to 1 sf	2.0507 to 3 sf	2.0507 to 2 sf	2.0507 to 1 sf
Answer	0.00764	0.0076	0.008	2.05	2.1	2

3. Estimate

Find a rough or approximate answer by calculating with numbers rounded to one significant figure.

e.g. $2.3 \times 18.4 \approx 2 \times 20 = 40$

$\approx$ "approximately equal to"

Fractions	
1. Converting an improper fraction to a mixed number	$\frac{15}{7} = 2\frac{1}{7}$
2. Converting a mixed number to an improper fraction	$3\frac{4}{5} = \frac{(3 \times 5) + 4}{5} = \frac{19}{5}$
3. Adding and subtracting fractions	Make the denominators the same (find the LCM). Use equivalent fractions to ensure fractions have a common denominator. Add/subtract the numerators only. $\frac{2}{7} + \frac{2}{5} = \frac{10}{35} + \frac{14}{35} = \frac{24}{35}$
4. Multiplying fractions	Multiply the numerators. Multiply the denominators. Simplify where possible. $\frac{4}{5} \times \frac{3}{8} = \frac{12}{40} = \frac{3}{10}$
5. Dividing fractions	Keep the first fraction the same. Change the second to its reciprocal. Multiply the fractions. Simplify or convert to a mixed number where possible. $\frac{4}{5} \div \frac{3}{8} = \frac{4}{5} \times \frac{8}{3} = \frac{32}{15} = 2\frac{2}{15}$

1. Significant figures		The total number of _____ in a number, not counting zeros at the beginning of a number or at the end of a decimal number. 345 000 has 6 significant figures. 0.3047 has 4 significant figures. 10.500 has 3 significant figures.				
2. Rounding to significant figures						
Round to...	0.007638 to 3 sf	0.007638 to 2 sf	0.007638 to 1 sf	2.0507 to 3 sf	2.0507 to 2 sf	2.0507 to 1 sf
Answer	0.00764	0.0076	0.008	2.05	2.1	2
3. Estimate		Find a _____ answer by calculating with numbers rounded to one significant figure. e.g. $2.3 \times 18.4 \approx 2 \times 20 = 40$ $\approx$ "approximately equal to"				

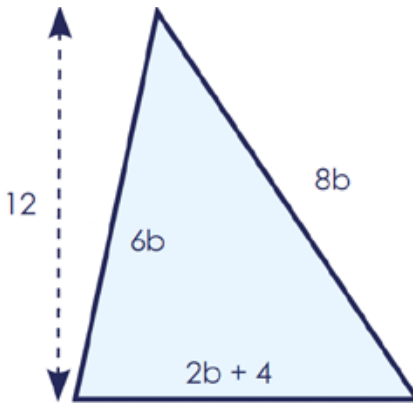
Fractions	
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3. Adding and subtracting fractions	Make the denominators the same (find the _____). Use _____ fractions to ensure fractions have a _____. Add/subtract the _____ only. $\frac{2}{7} + \frac{2}{5} = \frac{10}{35} + \frac{14}{35} = \frac{24}{35}$
4. Multiplying fractions	Multiply the _____. Multiply the _____. _____ where possible. $\frac{4}{5} \times \frac{3}{8} = \frac{12}{40} = \frac{3}{10}$
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1. Inverse operations	Addition and Subtraction are inverse operations. Multiplication and Division are inverse operations. Squaring and taking the square root are inverse operations.	
2. Variable	A letter used to represent any number.	
3. Coefficient	The number to the left of the variable. This is the value that we multiply the variable by. $4x \longrightarrow$ The coefficient of x is 4. $x \longrightarrow$ The coefficient of x is 1.	
4. Term	A single number, variable or numbers and variables multiplied together.	
5. Collecting like terms	Combining the like terms in an expression. $7x + 3y - 2x$ is simplified to $5x + 3y$.	
6. Expression	A mathematical statement which contains one or more terms combined with addition and/or subtraction signs e.g. $4x + 3y$.	
7. Linear equation	Contains an equals sign (=) and has one unknown. E.g. $5x - 2 = 2x + 7$.	
8. Solve	Use inverse operations to find the solution of an equation.	
E.g. 1. (One step)	E.g. 2. (Two step)	E.g. 3. (Unknown on both sides)
$\begin{array}{r} x \\ x4 \quad \frac{\quad}{4} = 12 \quad x4 \\ x = 12 \end{array}$	$\begin{array}{r} 3p - 7 = 8 \\ +7 \quad +7 \\ 3p = 15 \\ \div 3 \quad \div 3 \\ p = 5 \end{array}$	$\begin{array}{r} 2x + 10 = 19 - 9x \\ +9x \quad +9x \\ 11x + 10 = 19 \\ -10 \quad -10 \\ 11x = 9 \\ \div 11 \quad \div 11 \\ x = \frac{9}{11} \end{array}$

9. Form and solve a linear equation

E.g. 1
Jake is y years old. Lilly is 15. Kobe is 3 years younger than Jake. They have a total age of 36. Work out their individual ages.
 $y + 15 + y - 3 = 36$
 $2y + 12 = 36$
 $2y = 24$
 $y = 12$
Jake: 12, Lilly: 15, Kobe: 9

E.g. 2
The area of the triangle is 120 cm^2 . Find the value of b .



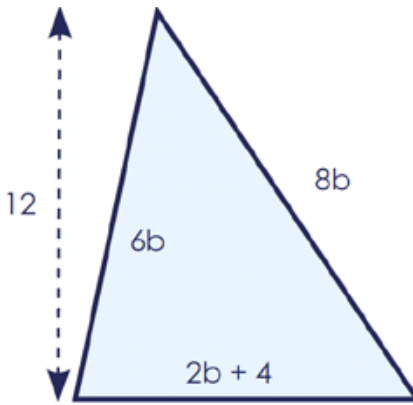
$$\frac{12(2b + 4)}{2} = 120$$
$$\frac{24b + 48}{2} = 120$$
$$12b + 24 = 120$$
$$12b = 96$$
$$b = 8\text{cm}$$

1. Inverse operations	Addition and _____ are inverse operations. _____ and Division are inverse operations. Squaring and taking the _____ are inverse operations.	
2. Variable	A letter used to represent any _____ .	
3. Coefficient	The number to the left of the variable. This is the value that we multiply the variable by. $4x \longrightarrow$ The _____ of x is 4. $x \longrightarrow$ The _____ of x is 1.	
4. Term	A single number, variable or numbers and _____ multiplied together.	
5. Collecting like terms	_____ the like terms in an expression. $7x + 3y - 2x$ is simplified to $5x + 3y$.	
6. Expression	A mathematical statement which contains one or more terms combined with _____ and/or _____ signs e.g. $4x + 3y$.	
7. Linear equation	Contains an _____ and has _____ . E.g. $5x - 2 = 2x + 7$.	
8. Solve	Use inverse operations to find the solution of an equation.	
E.g. 1. (One step)	E.g. 2. (Two step)	E.g. 3. (Unknown on both sides)
$\begin{array}{rcl} \frac{x}{4} & = & 12 \\ \times 4 & & \times 4 \\ x & = & 12 \end{array}$	$\begin{array}{rcl} 3p - 7 & = & 8 \\ +7 & & +7 \\ 3p & = & 15 \\ \div 3 & & \div 3 \\ p & = & 5 \end{array}$	$\begin{array}{rcl} 2x + 10 & = & 19 - 9x \\ +9x & & +9x \\ 11x + 10 & = & 19 \\ -10 & & -10 \\ 11x & = & 9 \\ \div 11 & & \div 11 \\ x & = & \frac{9}{11} \end{array}$

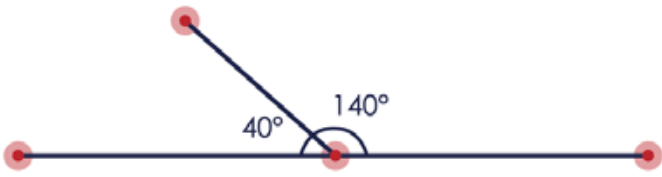
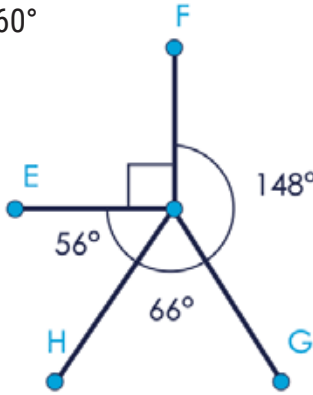
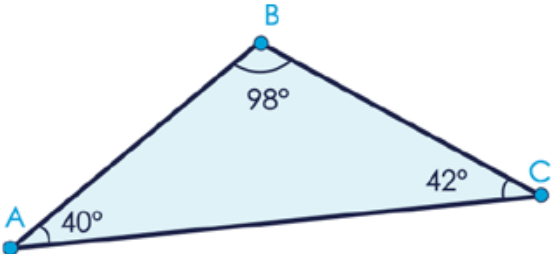
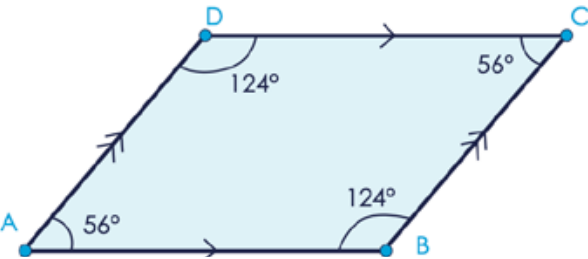
9. Form and solve a linear equation

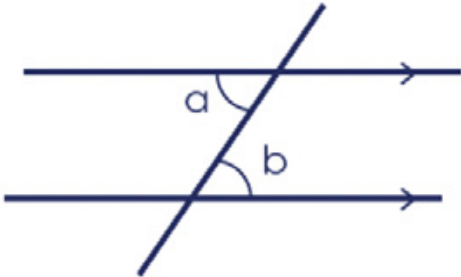
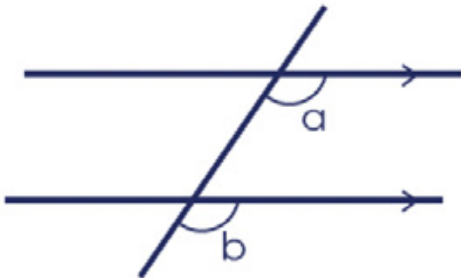
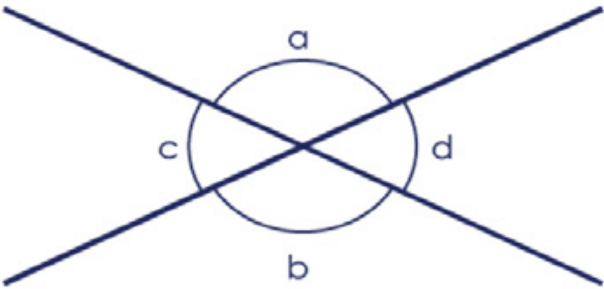
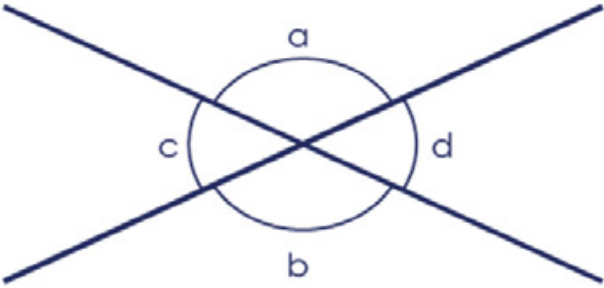
E.g. 1
Jake is y years old. Lilly is 15. Kobe is 3 years younger than Jake. They have a total age of 36. Work out their individual ages.
 $y + 15 + y - 3 = 36$
 $2y + 12 = 36$
 $2y = 24$
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Jake: 12, Lilly: 15, Kobe: 9

E.g. 2
The area of the triangle is 120 cm^2 . Find the value of b .



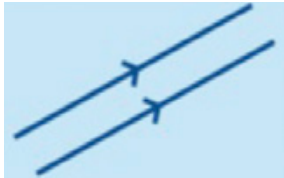
$$\frac{12(2b + 4)}{2} = 120$$
$$\frac{24b + 48}{2} = 120$$
$$12b + 24 = 120$$
$$12b = 96$$
$$b = 8\text{cm}$$

1. Parallel lines	Always equidistant. Parallel lines have the same gradient. They never meet however far they are extended. 
2. Angles on a straight line	Angles on a straight line sum to 180° 
3. Angles around a point	Angles around a point sum to 360° 
4. Angles In a triangle	Angles in a triangle sum to 180° 
5. Angles In a quadrilateral	Angles in a quadrilateral sum to 360° 

6. Alternate angles	Alternate angles are equal, so $a = b$ 
7. Corresponding angles	Corresponding angles are equal, so $a = b$ 
8. Vertically opposite angles	Vertically opposite angles are equal, so, $a = b$ and $c = d$ 
9. Co-Interior angles	Co-interior angles sum to 180°, so $a + b = 180^\circ$ 

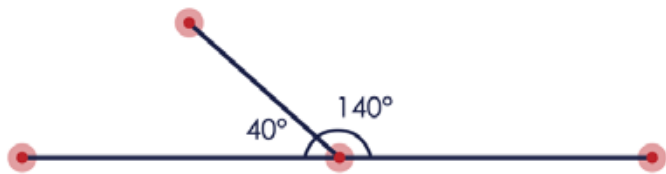
1. Parallel lines

Always _____ .
Parallel lines have the same _____ .
They never meet however far they are extended.



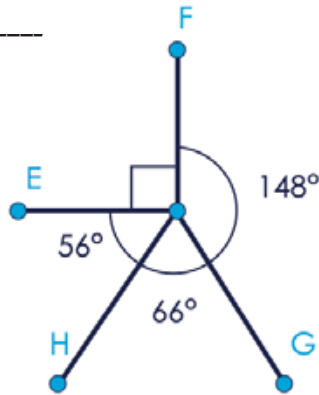
2. Angles on a straight line

Angles on a straight line sum to _____



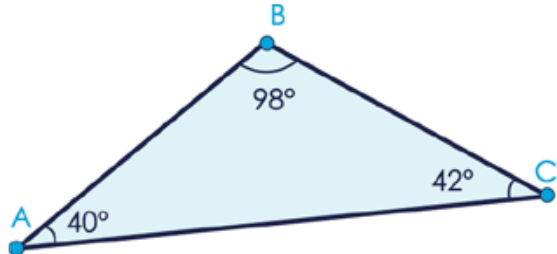
3. Angles around a point

Angles around a point sum to _____



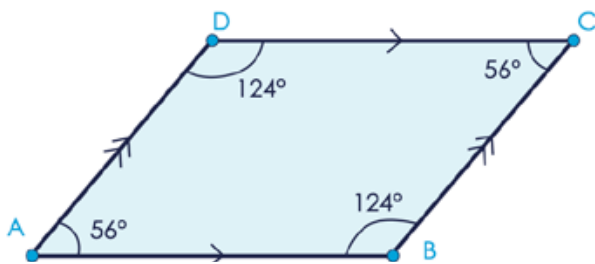
4. Angles In a triangle

Angles in a triangle sum to _____



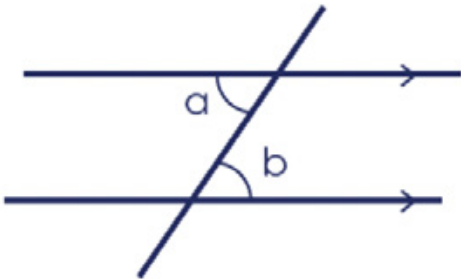
5. Angles In a quadrilateral

Angles in a quadrilateral sum to _____



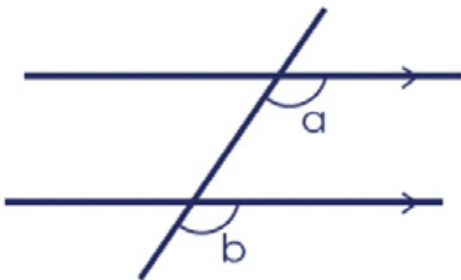
6. Alternate angles

_____ angles are equal, so $a = b$



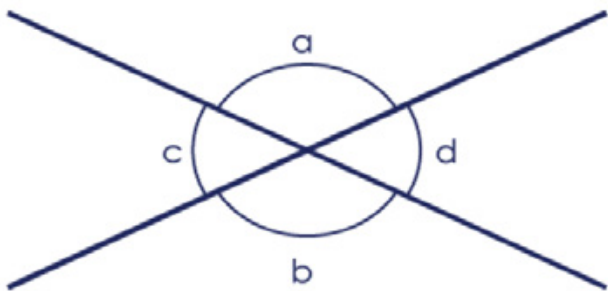
7. Corresponding angles

_____ angles are equal, so $a = b$



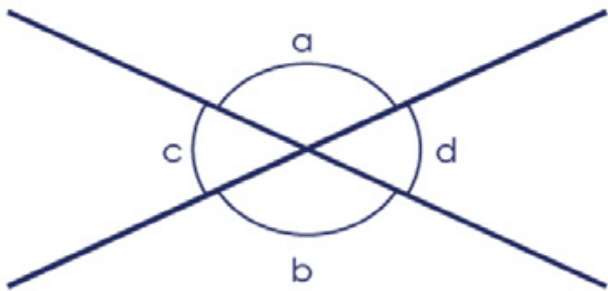
8. Vertically opposite angles

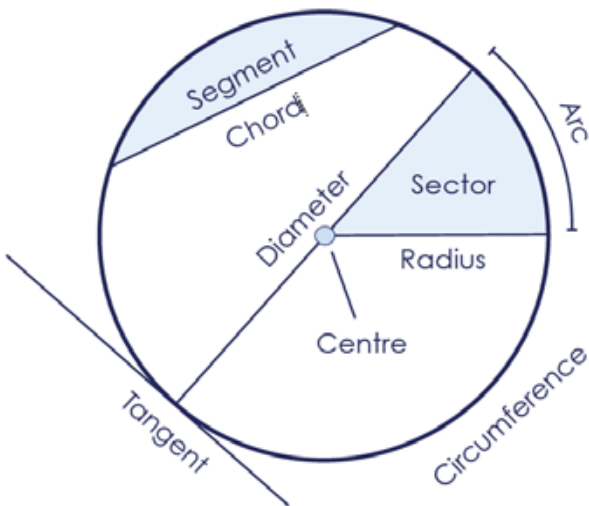
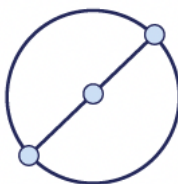
_____ opposite angles are equal, so, $a = b$ and $c = d$

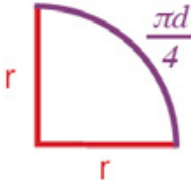
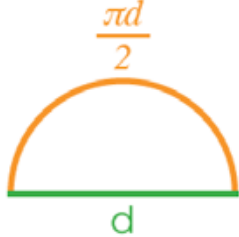
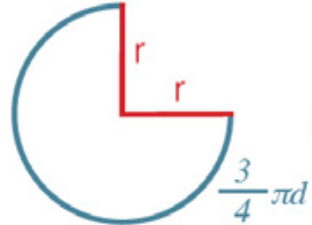


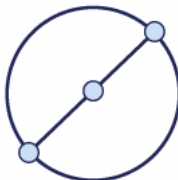
9. Co-Interior angles

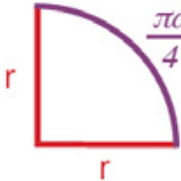
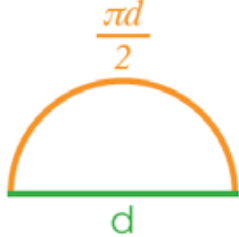
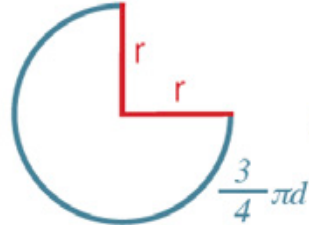
_____ angles sum to 180° , so $a + b = 180^\circ$

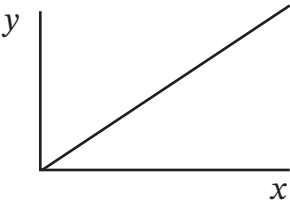
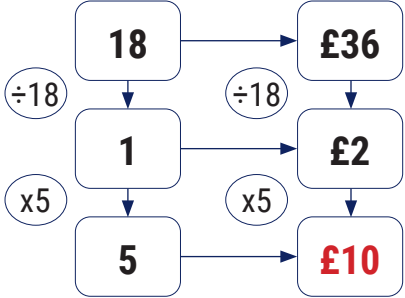
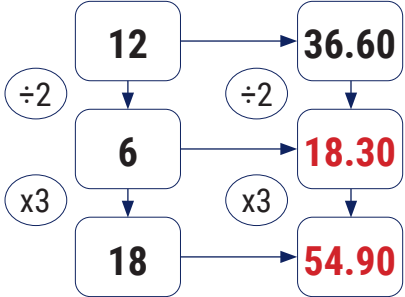


1. Diameter	A straight line going straight through the centre of the circle and touching the circumference at each end.	
2. Radius Plural-radii	A straight line joining the centre to the circumference	
3. Chord	A straight line joining any two parts of the circumference.	
4. Tangent	A straight line that touches the circumference at a single point.	
5. Arc	A section of the circumference	
6. Sector	The area bound by two radii and an arc	
7. Segment	The area bound by the circumference and a chord	
8. Circumference	The perimeter of the circle. $C = \pi \times \text{diameter}$ $C = \pi d$  $d = 5\text{cm}$ $c = \pi$ $c = \pi \times 5$ $c = 5\pi \text{ cm}$ $c = 15.70796327\text{cm}$ $c = 15.7\text{cm (3sf)}$	

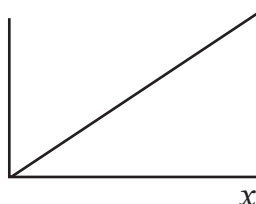
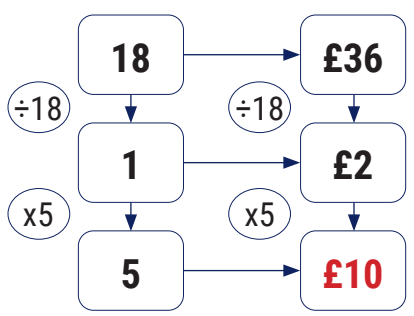
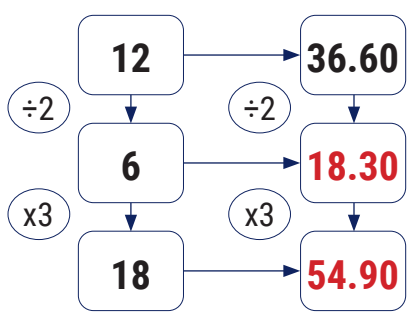
9. π (Pi)	The ratio of a circle's circumference to its diameter. It has an estimated value of $\frac{22}{7}$ or 3.14 rounded to 3 significant figures.
10. Revolution	A revolution is a full turn of a circle. The distance covered by one revolution is equal to the circumference of the circle.
11. Quarter circle	 Perimeter $\frac{\pi d}{4} + 2r$
12. Semi circle	 Perimeter $\frac{\pi d}{2} + d$
13. Three quarter circle	 Perimeter $\frac{3}{4}\pi d + 2r$

1. Diameter	A straight line going _____ _____ of the circle and touching the circumference at each end.	
2. Radius Plural-radii	A straight line joining the _____ to the _____	
3. Chord	A straight line joining _____	
4. Tangent	A straight line that touches _____	
5. Arc	A _____ of the _____	
6. Sector	The area bound by _____ and _____	
7. Segment	The area bound by the _____ and a _____	
8. Circumference	The _____ of the circle. C = _____ C = _____  d = 5cm c = π c = $\pi \times 5$ c = 5π cm c = 15.70796327cm c = 15.7cm (3sf)	

9. π (Pi)	The ratio of a circle's _____ to its _____. It has an estimated value of $\frac{22}{7}$ or 3.14 rounded to 3 significant figures.
10. Revolution	A revolution is a _____. The distance covered by one revolution is equal to the _____.
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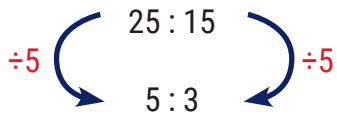
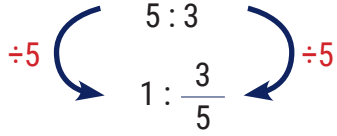
1. Proportion	A relationship between two quantities.
2. Direct proportion	A relationship between two variables where, as one increases, the other also increases. The graphical representation of this relationship is a straight line through the origin. 
3. Unitary method	To find the value of one unit first. 
4. Lowest Common Multiple (LCM)	
5. Best buy	Better value for money means that the cost is cheaper when buying an identical item or amount. Equal quantities must be compared.
6. Recipes	Option 1: Find the amount of ingredients needed for a specific number of people. Option 2: Find how much of the recipe can be made with the quantities available in the question.

1. Common conversions	<table><tr><th>Fraction</th><th>Decimal</th><th>Percentage</th></tr><tr><td>$\frac{1}{10}$</td><td>0.1</td><td>10%</td></tr><tr><td>$\frac{1}{8}$</td><td>0.125</td><td>12.5%</td></tr><tr><td>$\frac{1}{5}$</td><td>0.2</td><td>20%</td></tr><tr><td>$\frac{1}{4}$</td><td>0.25</td><td>25%</td></tr><tr><td>$\frac{1}{3}$</td><td>0.33333....</td><td>33.3% (1dp)</td></tr><tr><td>$\frac{1}{2}$</td><td>0.5</td><td>50%</td></tr><tr><td>$\frac{3}{4}$</td><td>0.75</td><td>75%</td></tr><tr><td>$\frac{1}{1}$</td><td>1</td><td>100%</td></tr></table>	Fraction	Decimal	Percentage	$\frac{1}{10}$	0.1	10%	$\frac{1}{8}$	0.125	12.5%	$\frac{1}{5}$	0.2	20%	$\frac{1}{4}$	0.25	25%	$\frac{1}{3}$	0.33333....	33.3% (1dp)	$\frac{1}{2}$	0.5	50%	$\frac{3}{4}$	0.75	75%	$\frac{1}{1}$	1	100%
Fraction	Decimal	Percentage																										
$\frac{1}{10}$	0.1	10%																										
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$\frac{1}{3}$	0.33333....	33.3% (1dp)																										
$\frac{1}{2}$	0.5	50%																										
$\frac{3}{4}$	0.75	75%																										
$\frac{1}{1}$	1	100%																										
2. Fraction to decimal	Divide the numerator by the denominator. $\frac{1}{5} \longrightarrow 1 \div 5 \longrightarrow \begin{array}{r} 0.2 \\ 5 \overline{) 1.0} \end{array}$																											
3. Decimal to percentage	Multiply by 100 and add the percentage symbol. $0.09 \longrightarrow 0.09 \times 100 = 9\%$																											
4. Percentage to fraction	Write the percentage as the numerator and make 100 the denominator. Simplify if possible. $30\% \longrightarrow \frac{30}{100} = \frac{3}{10}$																											
5. Percentage change	Percentage Increase or Decrease = $\frac{\text{Change}}{\text{Original}} \times 100$																											

1. Proportion	A _____ between two quantities.
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3. Unitary method	To find the value of _____. 
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6. Recipes	Option 1: Find the amount of ingredients needed for a specific number of people. Option 2: Find how much of the recipe can be made with the quantities available in the question.

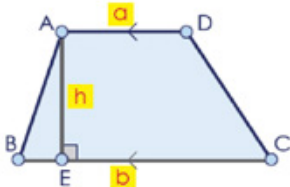
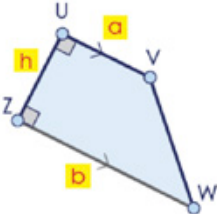
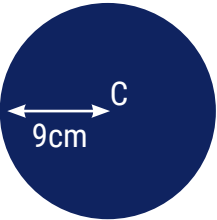
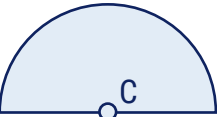
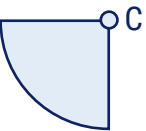
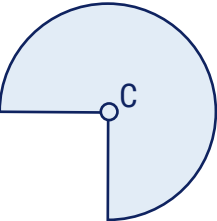
1. Common conversions	<table><tr><th>Fraction</th><th>Decimal</th><th>Percentage</th></tr><tr><td>$\frac{1}{10}$</td><td>0.1</td><td>10%</td></tr><tr><td>$\frac{1}{8}$</td><td>0.125</td><td>12.5%</td></tr><tr><td>$\frac{1}{5}$</td><td>0.2</td><td>20%</td></tr><tr><td>$\frac{1}{4}$</td><td>0.25</td><td>25%</td></tr><tr><td>$\frac{1}{3}$</td><td>0.33333....</td><td>33.3% (1dp)</td></tr><tr><td>$\frac{1}{2}$</td><td>0.5</td><td>50%</td></tr><tr><td>$\frac{3}{4}$</td><td>0.75</td><td>75%</td></tr><tr><td>$\frac{1}{1}$</td><td>1</td><td>100%</td></tr></table>	Fraction	Decimal	Percentage	$\frac{1}{10}$	0.1	10%	$\frac{1}{8}$	0.125	12.5%	$\frac{1}{5}$	0.2	20%	$\frac{1}{4}$	0.25	25%	$\frac{1}{3}$	0.33333....	33.3% (1dp)	$\frac{1}{2}$	0.5	50%	$\frac{3}{4}$	0.75	75%	$\frac{1}{1}$	1	100%
Fraction	Decimal	Percentage																										
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$\frac{1}{2}$	0.5	50%																										
$\frac{3}{4}$	0.75	75%																										
$\frac{1}{1}$	1	100%																										
2. Fraction to decimal	Divide the _____ by the _____. $\frac{1}{5} \longrightarrow 1 \div 5 \longrightarrow \begin{array}{r} 0.2 \\ 5 \overline{) 1.0} \end{array}$																											
3. Decimal to percentage	_____ add the percentage symbol. $0.09 \longrightarrow 0.09 \times 100 = 9\%$																											
4. Percentage to fraction	Write the percentage as the _____ and make 100 the _____. _____ if possible. $30\% \longrightarrow \frac{30}{100} = \frac{3}{10}$																											
5. Percentage change	Percentage Increase or Decrease = _____ x																											

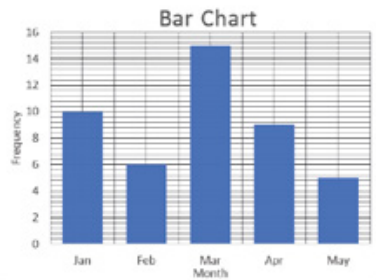
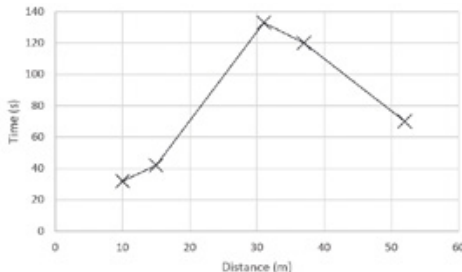
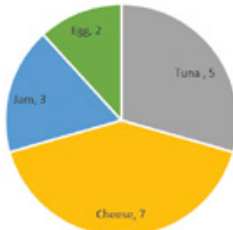
1. Multiplier	A percentage written as a decimal is the percentage multiplier.
2. Percentage of an amount with a calculator	The percentage multiplier multiplied by the amount.
3. Percentage change	$\frac{\text{Difference}}{\text{Original}} \times 100$
4. Reverse percentages	$\text{Original} = \frac{\text{New amount}}{\text{Multiplier}}$

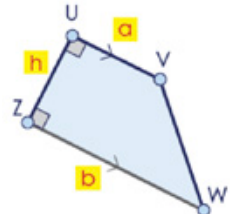
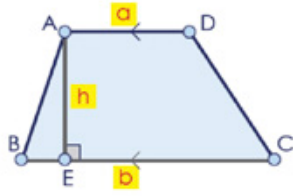
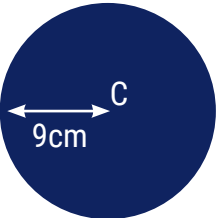
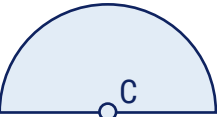
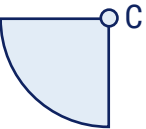
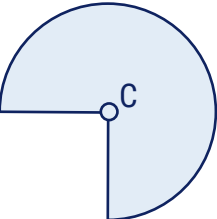
1) Ratio	A part- to-part comparison. The ratio of a to bis written a:b
2. Ratio as a fraction	Fraction of shapes which are squares: $\frac{1}{4}$  Fraction of shapes which are circles: $\frac{3}{4}$
3. Equivalent ratios	Found by multiplying or dividing all parts of the ratio by the same number.
4. Simplifying ratios	Ratios can be simplified by dividing each part of the ratio by the same number. 
5) Sharing into a given ratio	Add the parts together. Divide the total by this. Multiply this by each part of the ratio. Share £ 18 in the ratio of 5:4 Add the part 4 + 5 = 9 parts £18.... 9 = £2 1 part = £2 5 parts: 5 x £2 = £10 4 parts: 4 x £2 = £8 £10: £8
6. Simplifying ratios	Write the ratio 5:3 in the form 1:n 

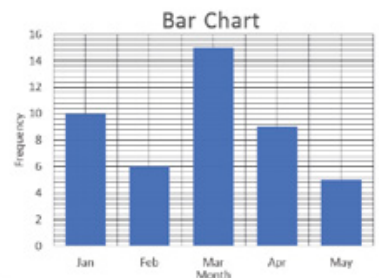
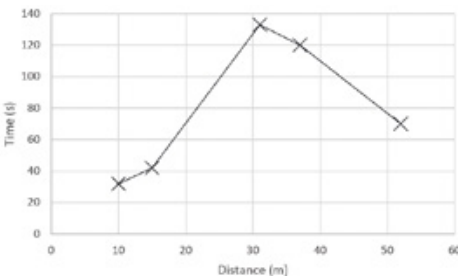
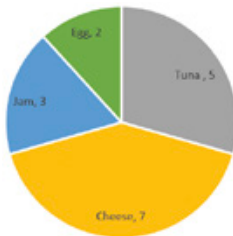
1. Multiplier	A percentage written as a _____ is the percentage multiplier.
2. Percentage of an amount with a calculator	The percentage multiplier _____ by the amount.
3. Percentage change	
4. Reverse percentages	

1. Ratio	A _____ comparison. The ratio of a to b is written a:b
2. Ratio as a fraction	Fraction of shapes which are squares: Fraction of shapes which are circles:
3. Equivalent ratios	Found by _____ or _____ all parts of the ratio by the same number.
4. Simplifying ratios	Ratios can be simplified by dividing each part of the ratio by the same number. ÷5 25 : 15 5 : 3 ÷5
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6. Simplifying ratios	Write the ratio 5:3 in the form 1:n ÷5 5 : 3 1 : $\frac{3}{5}$ ÷5

1. Trapezium	Quadrilateral with one pair of parallel sides.
2. Isosceles trapezium	Quadrilateral with one pair of parallel side and two right angles.
3. Area of trapezium	Sum of the parallel sides Divide by 2. Multiply by the vertical height. $A = \left(\frac{a + b}{2} \right)$ 
4. Area of a circle	$A = \pi r^2$ $A = \pi \times 9^2$ $A = 81\pi \text{ cm}^2$ 
5. Area of a semi-circle	$A = \frac{\pi r^2}{2}$ 
6. Area of a quarter-circle	$A = \frac{\pi r^2}{4}$ 
7. Area of a three-quarter circle	$A = \frac{3\pi r^2}{4}$ 

1. Frequency table	A table showing how often (frequent) something occurs. Can include tally charts. <table><tr><th>Score</th><th>Tally</th><th>Frequency (f)</th></tr><tr><td>1</td><td> </td><td>4</td></tr><tr><td>2</td><td> </td><td>9</td></tr><tr><td>3</td><td> </td><td>6</td></tr><tr><td>4</td><td> </td><td>8</td></tr><tr><td>5</td><td> </td><td>3</td></tr><tr><td>6</td><td> </td><td>1</td></tr></table>	Score	Tally	Frequency (f)	1		4	2		9	3		6	4		8	5		3	6		1
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2. Bar chart	A way of displaying data, using horizontal or vertical bars which are the same width and have gaps between them. Data can also be presented in dual and composite bar charts in which case a key word would be used. 																					
3. Line graph	Uses lines to join points on a graph to represent a data set. 																					
4. Pie chart	Method of displaying proportional information by dividing a circle up into different-sized sectors. 																					
5. Stem and leaf diagrams	Presents data in a table where the place value columns are split. For example, the tens and the ones columns may be split where the tens become the "stem" and the ones become the "leaf". Stem and leaf diagrams come with a key and must always be written in order. <table><tr><td>12</td><td>5</td><td>0</td><td>5 6</td></tr><tr><td>34</td><td>31</td><td>1</td><td>2 9</td></tr><tr><td>27</td><td>22</td><td>2</td><td>2 7</td></tr><tr><td>19</td><td>6</td><td>3</td><td>4 9</td></tr><tr><td>39</td><td>40</td><td>4</td><td>0</td></tr></table> Key 2 9 = 29	12	5	0	5 6	34	31	1	2 9	27	22	2	2 7	19	6	3	4 9	39	40	4	0	
12	5	0	5 6																			
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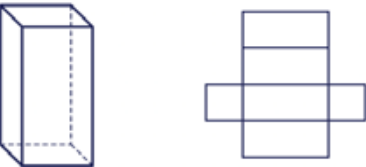
1. Trapezium	Quadrilateral with one pair of parallel sides.
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1. Frequency table	A table showing _____ Can include tally charts. <table><tr><th>Score</th><th>Tally</th><th>Frequency (f)</th></tr><tr><td>1</td><td> </td><td>4</td></tr><tr><td>2</td><td> </td><td>9</td></tr><tr><td>3</td><td> </td><td>6</td></tr><tr><td>4</td><td> </td><td>8</td></tr><tr><td>5</td><td> </td><td>3</td></tr><tr><td>6</td><td> </td><td>1</td></tr></table>	Score	Tally	Frequency (f)	1		4	2		9	3		6	4		8	5		3	6		1
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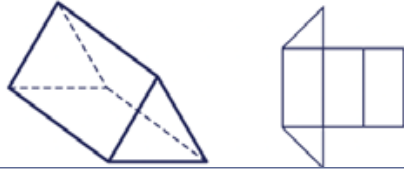
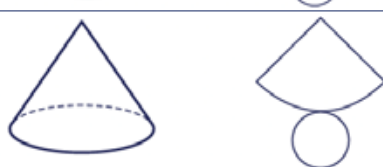
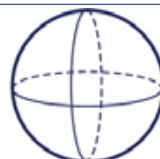
Averages and Spread

1. Average	The central or typical value in a data set. There are three types of averages - mode, median and mean.
2. Mode	The most common/frequent value from a set of data. Mode of 3, 3, 6, 7, 7, 7, 8, 9, 10 = 7
3. Median	The middle value when the data is in order. Median of 9, 5, 15, 6, 8 → 5, 6, 8, 9, 15 = 8
4. Mean	Add up all the numbers and divide the total by how many numbers there are. Mean of 7, 8, 9: $\frac{7 + 8 + 9}{3} = \frac{24}{3} = 8$
5. Range	A measure of the spread of the data, = Largest Value - Smallest Value.
6. Reversing the mean	If we have the mean but one of the data points is missing, we can find the missing value by: 1) Multiplying the 'mean' by the number of data points to get the total of the values; 2) Subtracting the sum of the known values from the total of all values. E.g. The mean of three numbers is 5. Two of the numbers are 3 and 10. Find the third value. Total of the values: $5 \times 3 = 15$ $15 - (3 + 10) = 2$ The third value is 2

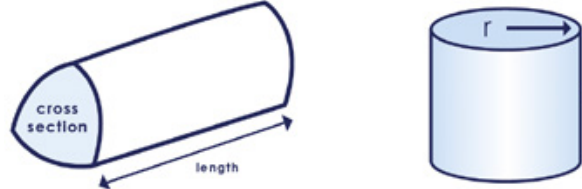
3D Visualisation

1. Face	A face is a single flat surface
2. Edge	An edge is a line segment between faces
3. Vertex	A vertex is a corner
4. Cube	6 faces 12 edges 8 vertices 
5. Cuboid	6 faces 12 edges 8 vertices 

3D Visualisation

6. Triangular prism	5 faces 9 edges 6 vertices 
7. Pentagonal prism	7 faces 15 edges 10 vertices 
8. Square based pyramid	5 faces 8 edges 5 vertices 
9. Triangular-based pyramid	4 faces 6 edges 4 vertices 
10. Cylinder	3 faces 2 edges 0 vertices 
11. Cone	2 faces 1 edge 1 vertex 
12. Sphere	1 face 0 edges 0 vertices 

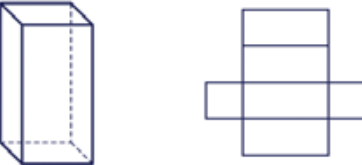
Volume

1. Volume	The volume of a solid body is the amount of 'space' it occupies. It is measured in cubic units e.g. cubic centimetres (cm³).
2. Volume of a prism	Volume of a prism = area of cross section x length Volume of cylinder = $\pi r^2 h$ 
3. Units of capacity	1 L = 1000ml; 1 L = 1000cm³

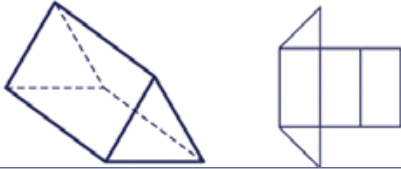
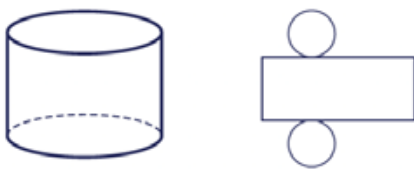
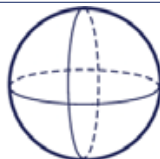
Averages and Spread

1. Average	The _____ or typical value in a data set. There are three types of averages - mode, median and mean.
2. Mode	The most _____ / _____ value from a set of data. Mode of 3, 3, 6, 7, 7, 7 , 8, 9, 10 = 7
3. Median	The _____ value when the data is in _____. Median of 9, 5, 15, 6, 8 → 5, 6, 8 , 9, 15 = 8
4. Mean	_____ up all the numbers and _____ the total by how many numbers there are. Mean of 7, 8, 9: $\frac{7 + 8 + 9}{3} = \frac{24}{3} = 8$
5. Range	A measure of the _____ of the data, = _____ Value - _____ Value.
6. Reversing the mean	If we have the mean but one of the data points is missing, we can find the missing value by: 1) _____ the 'mean' by the number of data points to get the total of the values; 2) _____ the _____ of the known values from the total of all values. E.g. The mean of three numbers is 5. Two of the numbers are 3 and 10. Find the third value. Total of the values: $5 \times 3 = 15$ $15 - (3 + 10) = 2$ The third value is 2

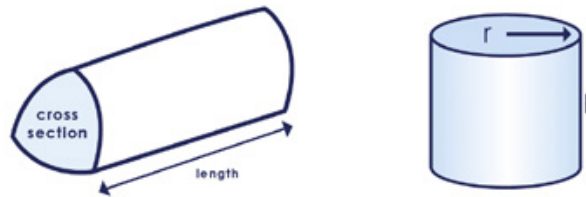
3D Visualisation

1. Face	A face is a single flat _____
2. Edge	An edge is a _____ between faces
3. Vertex	A vertex is a _____
4. Cube	____ faces ____ edges ____ vertices 
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3D Visualisation

6. Triangular prism	____ faces ____ edges ____ vertices 
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11. Cone	____ faces ____ edge ____ vertex 
12. Sphere	____ face ____ edges ____ vertices 

Volume

1. Volume	The volume of a solid body is _____. It is measured in cubic units e.g. cubic centimetres (cm³).
2. Volume of a prism	Volume of a prism = _____ Volume of cylinder = $\pi r^2 h$ 
3. Units of capacity	1 L = _____ ml; 1 L = _____ cm³

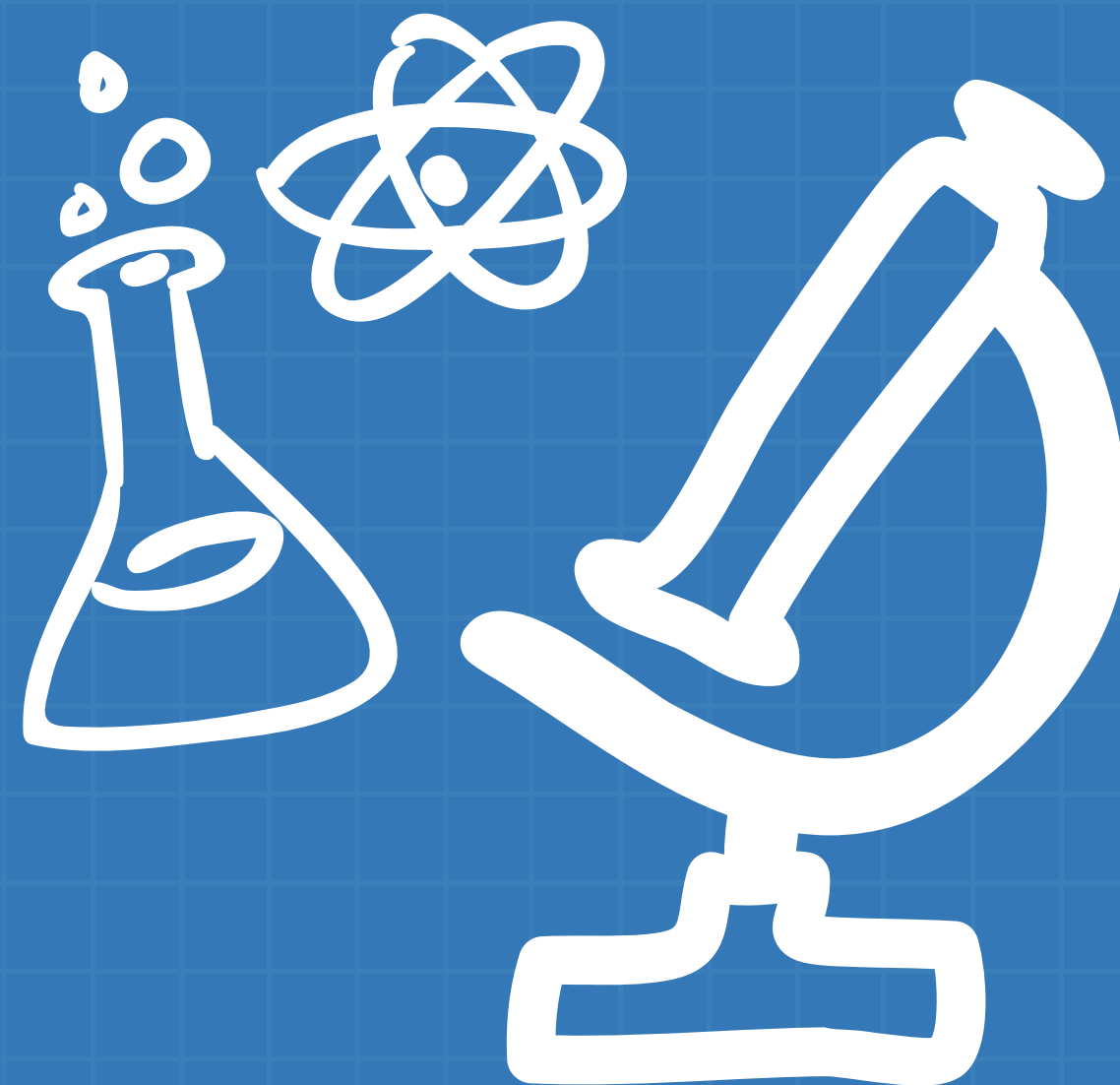


YEAR 8

Science

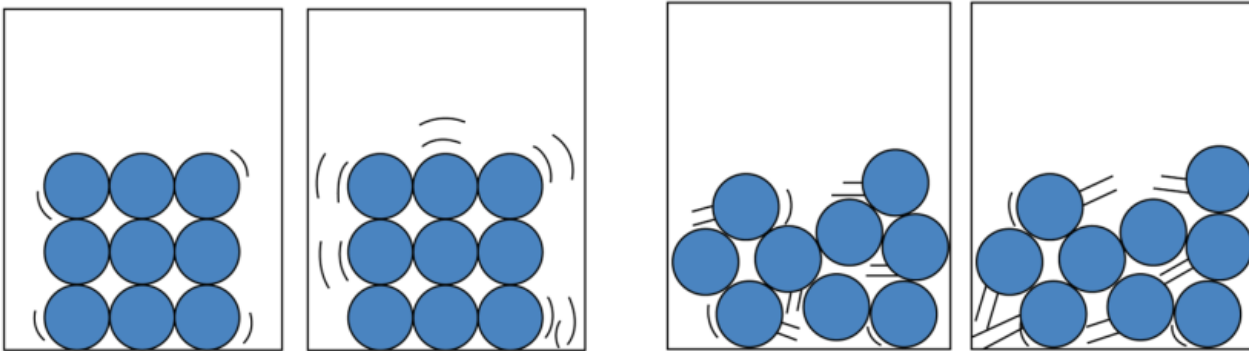


- 8.01 | HEATING AND COOLING
- 8.02 | EARTH AND THE ATMOSPHERE
- 8.03 | FORCES AND MOTION
- 8.04 | PLANTS AND THEIR PROCESSES
- 8.05 | ELECTRICITY 1
- 8.06 | INTERACTIONS AND INTERDEPENDENCE
- 8.07 | FORCES AND WORK
- 8.08 | ACIDS AND ALKALIS
- 8.09 | NUTRITION AND DIGESTION
- 8.10 | SPACE 1



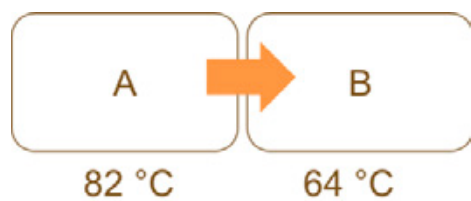
Temperature

A physical quantity which is a measure of the average energy of particles due to their motion



Changing Temperature

Heating and cooling affect an object's thermal store of energy.



Net flow of energy is always from hotter to colder objects' thermal store

A thermal store can be changed by any energy pathway depending on the mechanism causing it.



Mixing' Objects



Same masses



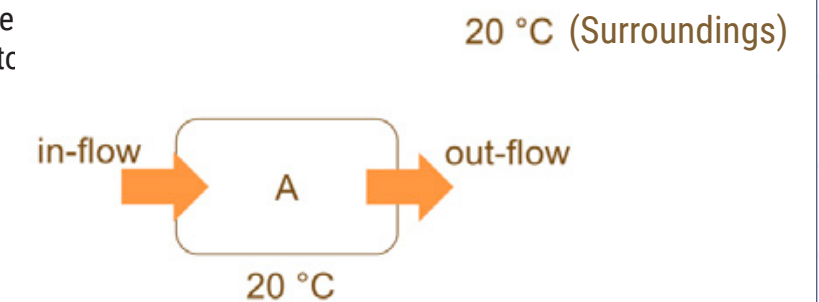
Different masses

Resulting temperature: halfway between initial temperatures.

Resulting temperature: between initial temperatures and closer to that of larger mass.

Thermal Equilibrium

- when two objects reach the same temperature
- with no net flow of energy between thermal stores
- Often the result of energy dissipating to the cooler surroundings.



Unchanging / Changing Temperature

Unchanging

But not thermal equilibrium (i.e. two objects not the same temperature).

higher than surroundings

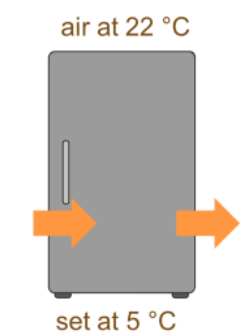
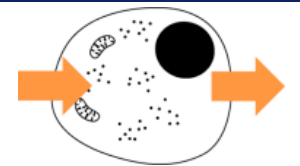
rate of supply

rate dissipated to surroundings

lower than surroundings

rate supplied by surroundings

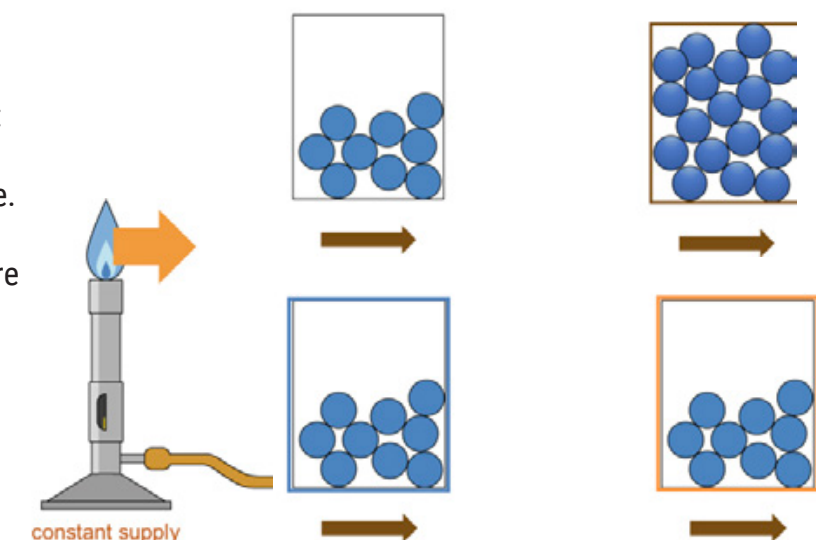
rate of removal



Changing Temperature

For the same energy supplied:

- Greater mass/volume, -> smaller temperature change.
- Different starting temperature -> same temperature change.



Energy in Thermal Stores

Hotter objects have more energy in their thermal store.

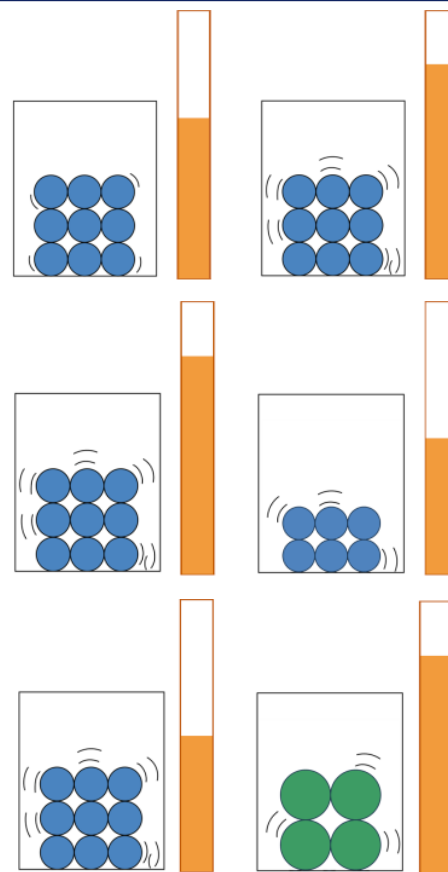
- Particles moving more.
- Each particle has more energy.
- Total energy of all particles: more.

Larger masses have more energy in their thermal store.

- Greater mass: more particles.
- At same temperature, each particle has same energy.
- Total energy of all particles: more.

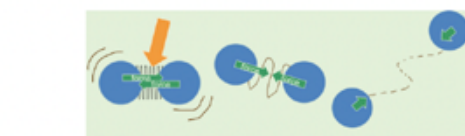
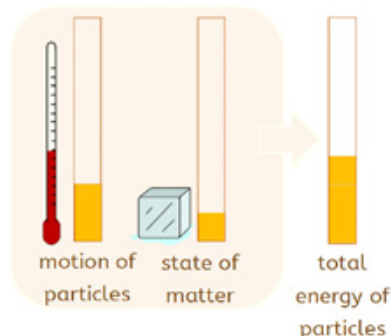
Some materials have more energy in their thermal store.

- Some materials have particles that require more energy to vibrate.
- At same temperature, each particle is vibrating the same, but they required more energy to do so.
- Total energy of all particles: more.

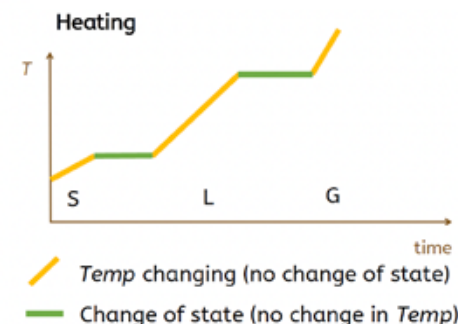


Internal Energy

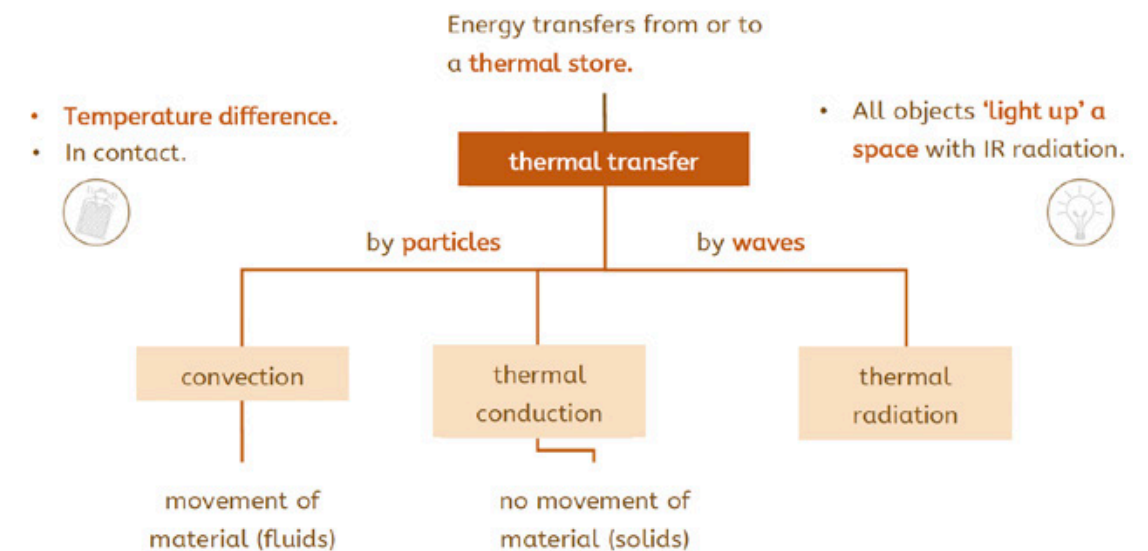
- Total energy within an object due to the motion and position of its particles



- Force reaches limit for motion.
- More energy in, Force increases, ↑.
- Separation increases, ↑ (then stays same).
- Energy stored by material.

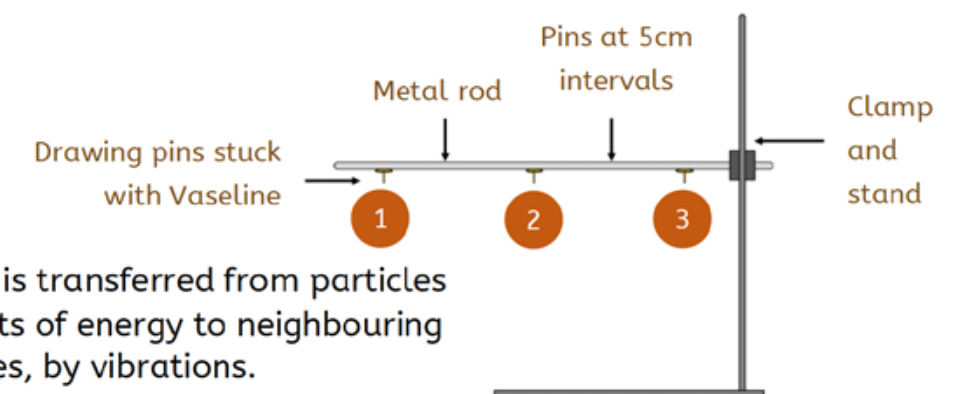


Thermal Transfer

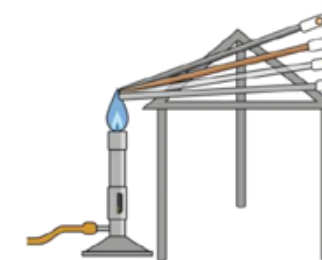


Thermal Conduction

- Spontaneous process of energy transfer between a hotter and a cooler object in contact, without the movement of the material



Thermal conductivity



Good conductors have a higher thermal conductivity: energy transmitted easily through them.

Metals are the best thermal conductors.

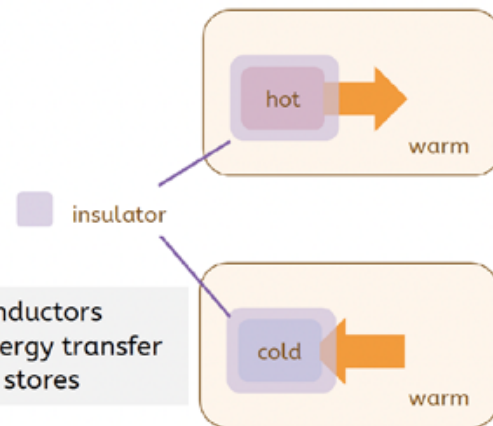
Thermal Conduction (continued)

Rate of thermal conduction

temperature difference	greater	} → higher rate
material	higher thermal conductivity	
thickness	less thick	
surface area	greater	

Insulators

- poor thermal conductors that minimise energy transfer to/from thermal stores



Pressure

- Quantity resulting from a force acting on a surface

Pressure on objects

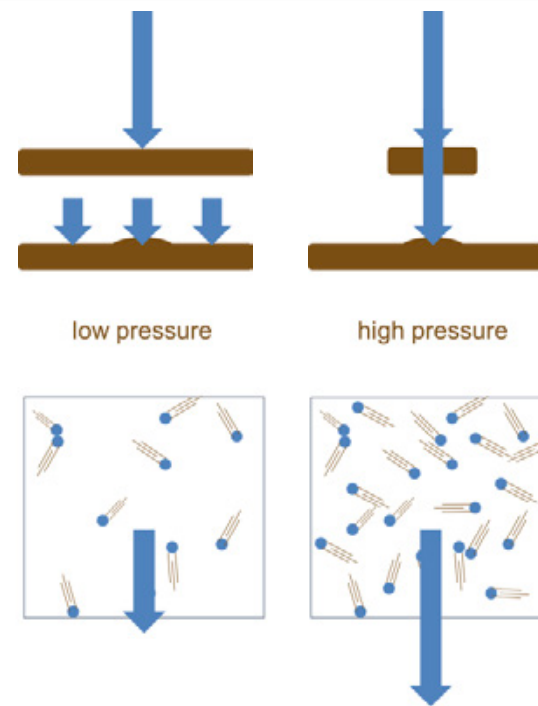
Pressure is higher when:

- a force acts over a smaller surface area
- a large force acts.

Pressure by a fluid

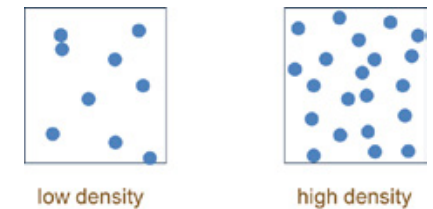
Forces between particles, and between particles and the inside walls of the container cause pressure on the gas.

If more particles are causing a higher pressure – greater weight – higher pressure on surface.



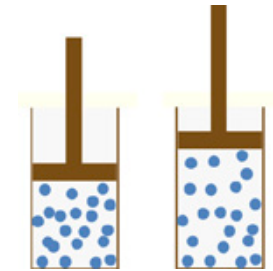
Density

Greater mass in the same volume -> higher density.



Greater volume of the same mass -> lower density.

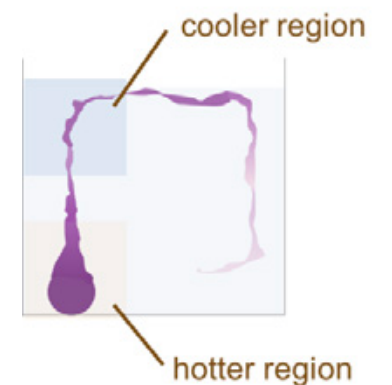
$$\text{density (g/cm}^3\text{)} = \frac{\text{mass (g)}}{\text{volume (cm}^3\text{)}}$$



Convection

Movement of a hotter fluid to a colder region

- The less dense region rises.
- The rest of the fluid is more dense.
- The less dense matter 'floats' on more dense matter.



- A region of fluid that is colder sinks to replace the hotter fluid.

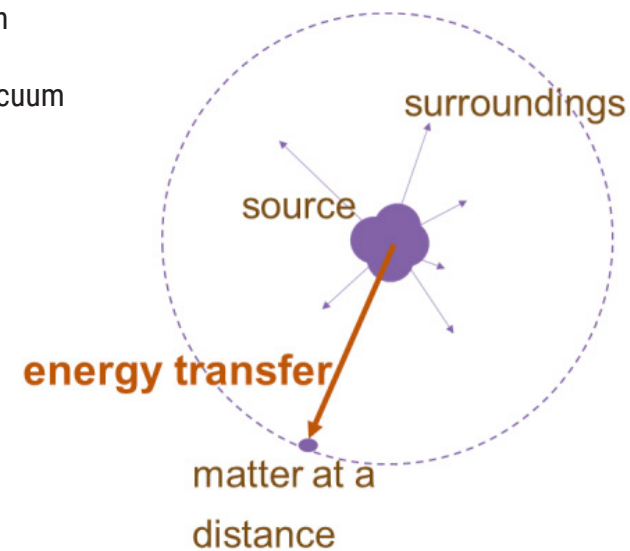
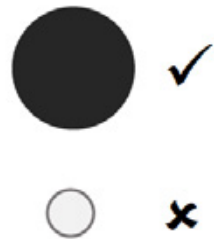
- A region of the fluid gets hotter.
- Particles move more.
- The separation between particles increases.
- Fluid expands.
- Its density decreases.

Thermal Radiation

- Energy transfer to or from a thermal store by absorption or emission of light
- **No contact** necessary: can be transmitted through a vacuum
- All objects emit and absorb infra-red radiation.
- Hotter objects emit more energy by IR radiation (more intense).

Surfaces that absorb and emit energy from IR radiation best:

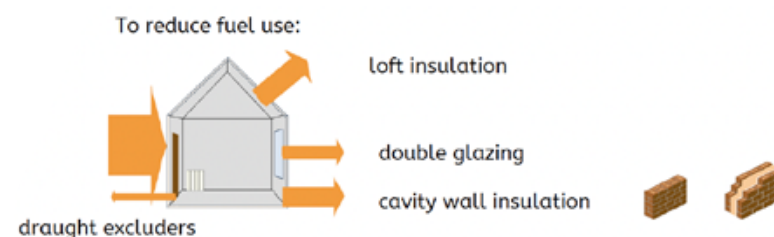
- dark
- matt/rough/dull
- large surface area



Real-world Contexts

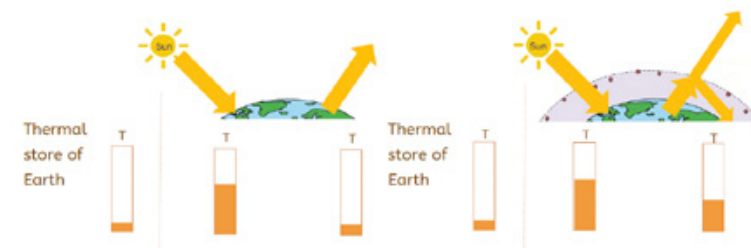
Building Design

To maintain steady temperature independent of surroundings. The greater the energy supplied, the greater the fuel use and costs.



Greenhouse Effect

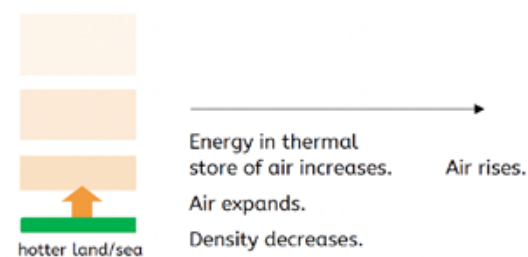
Causes a medium, steady average global temperature.



Weather Systems

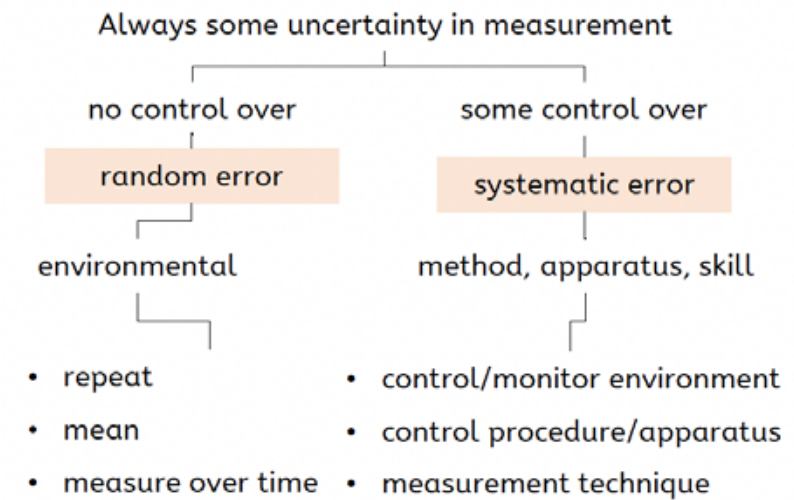
Driven by temperature differences of different surfaces of the Earth.

- Low density air exerts less force on Earth's surface: low-pressure.
- Air rises in low-pressure systems.



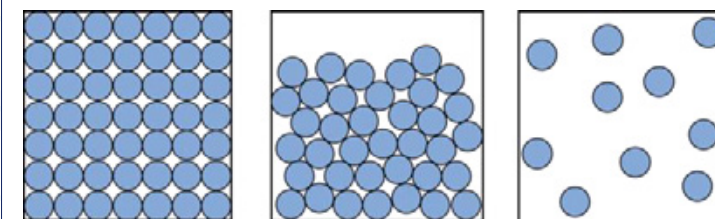
Measurement Error

- The difference between the measured value and the true value of the quantity being measured

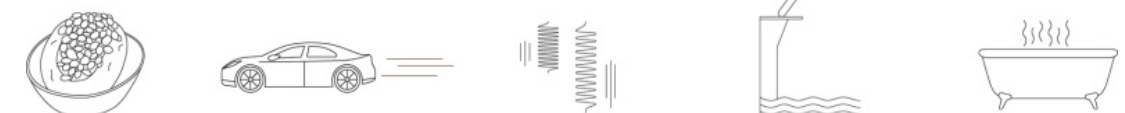
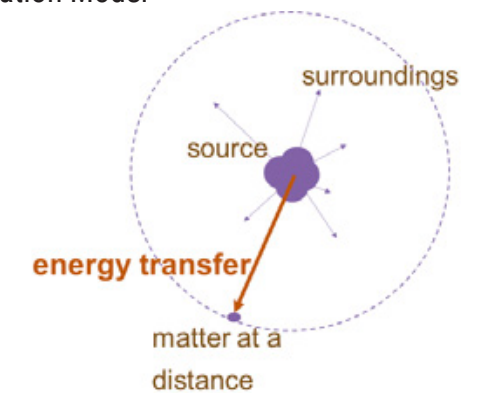


Using Models

Particle Model



Radiation Model



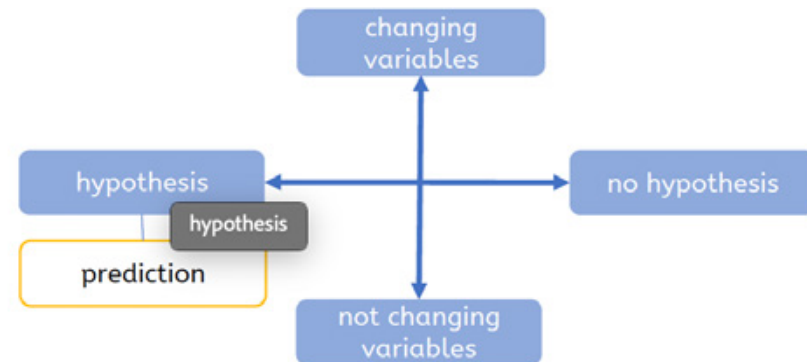
During events, energy transfers from energy stores by an energy pathway.



Energy Stores and Pathways

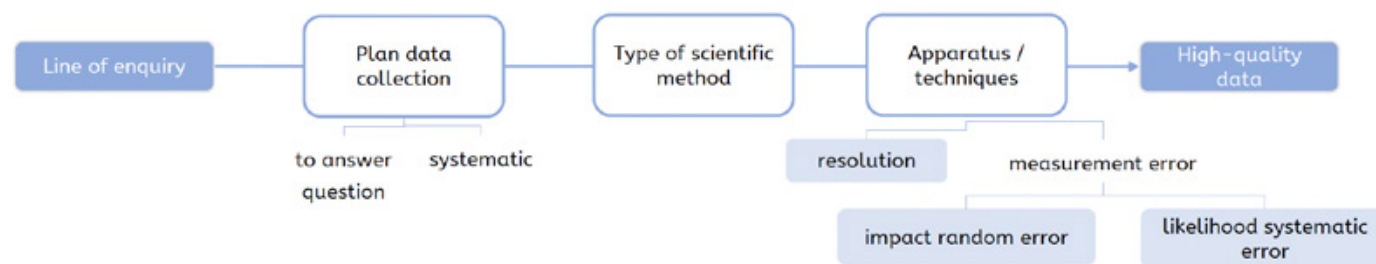
Scientific Methods

There is not a single way of doing research or a single scientific method



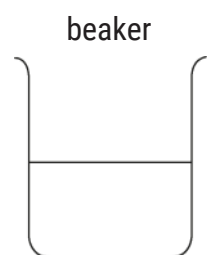
Scientific Methods

There is not a single way of doing research or a single scientific method



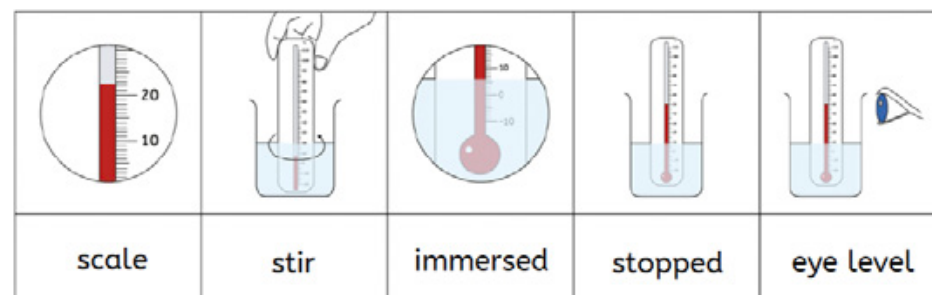
Equipment

- Select the appropriate size.
- Place on a flat stable surface.
- Graduated markings: approximate volume.
- Pour in/out liquid carefully.
- After heating, move with tongs or wait to cool.
- If stirring, use a stirrer.



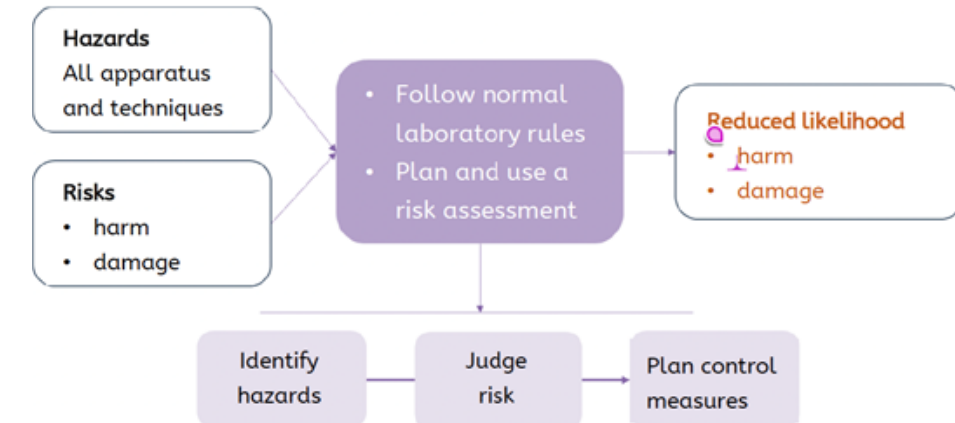
Skilful Techniques

To use a liquid thermometer

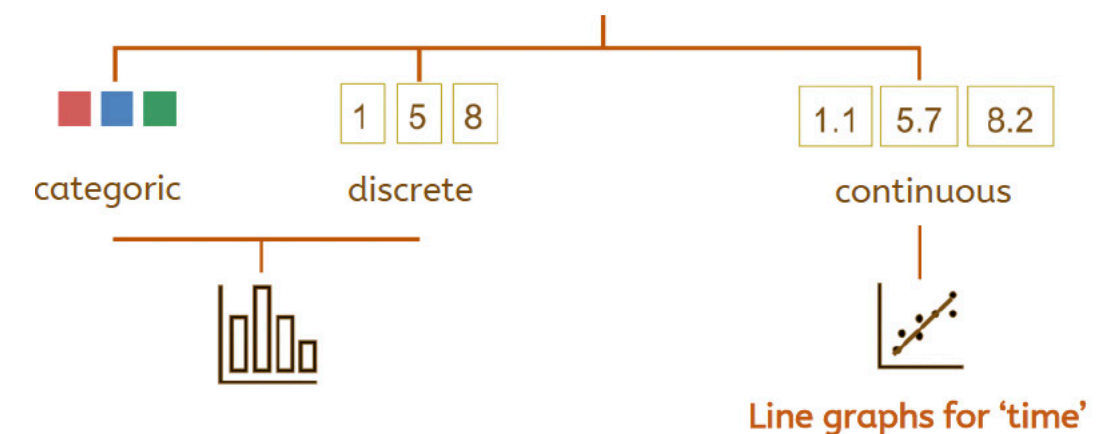


Safe Practicals

- The difference between the measured value and the true value of the quantity being measured

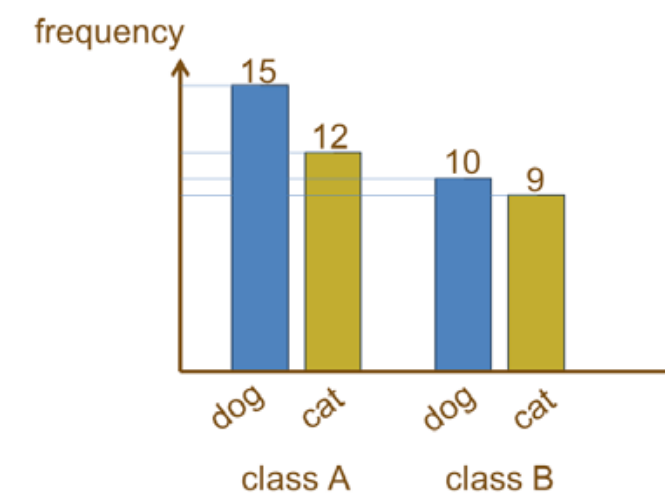


Interpreting Data



Identifying the most appropriate chart or graph depends on the type of data and the line of enquiry:

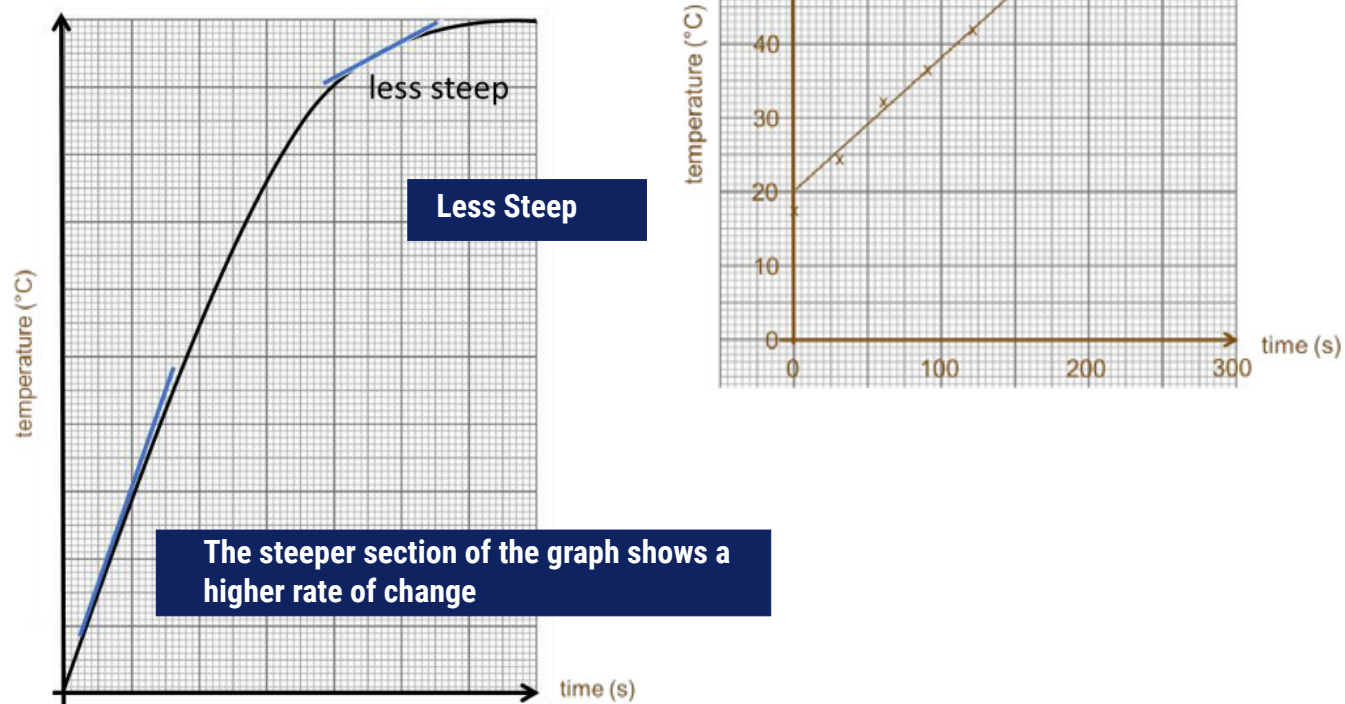
Compound bar charts are useful to compare a variable across different categories.



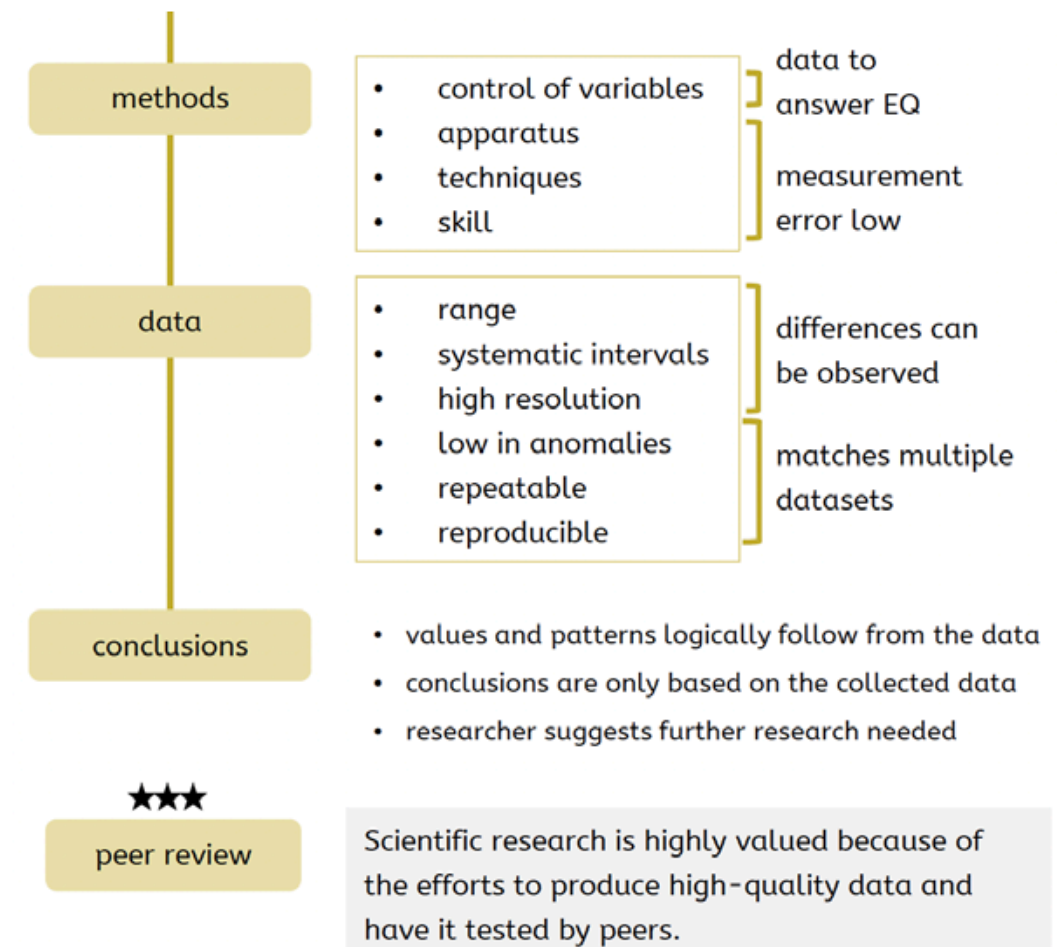
Interpreting Data

Values are read off from the best-fit line.

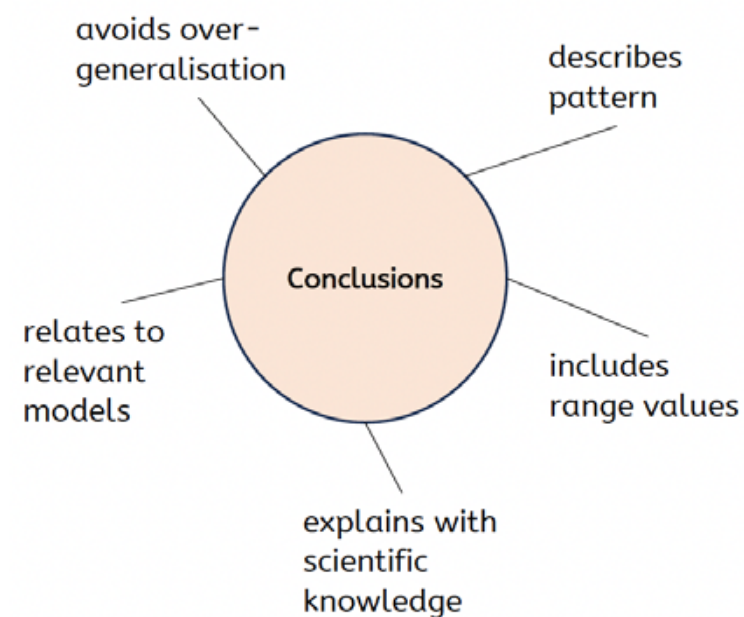
Patterns/trends are found by noticing what happens to one variable when the other is changed.



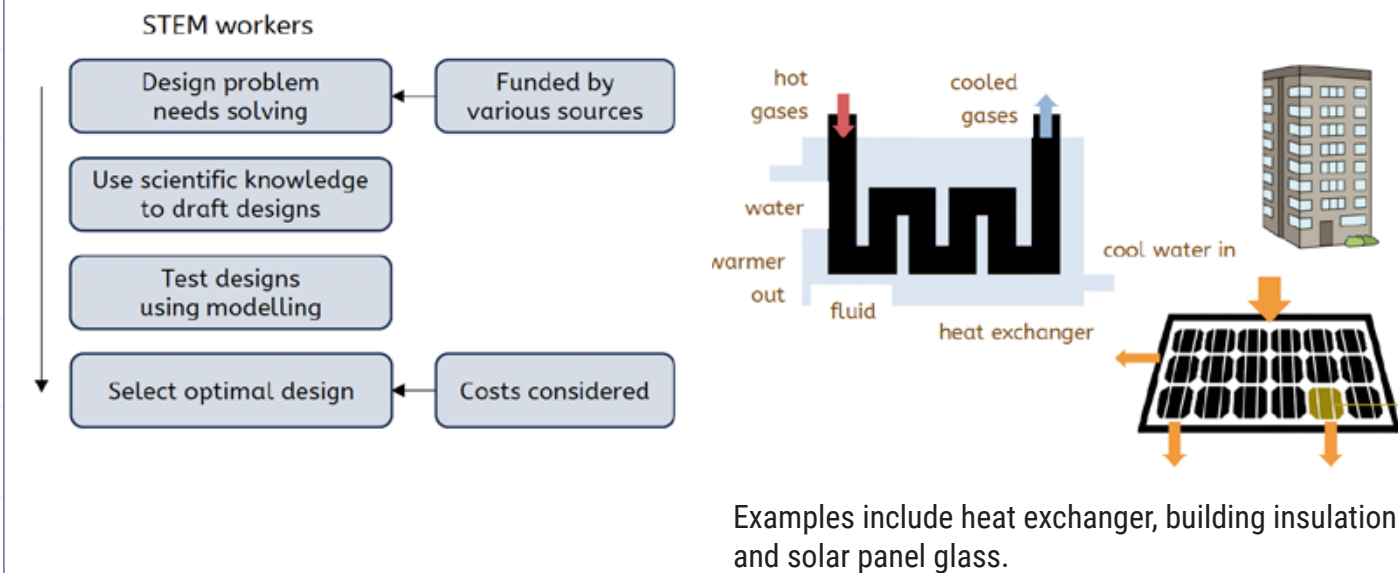
Evaluating Quality of Research



Making Conclusions



Applications to Industry

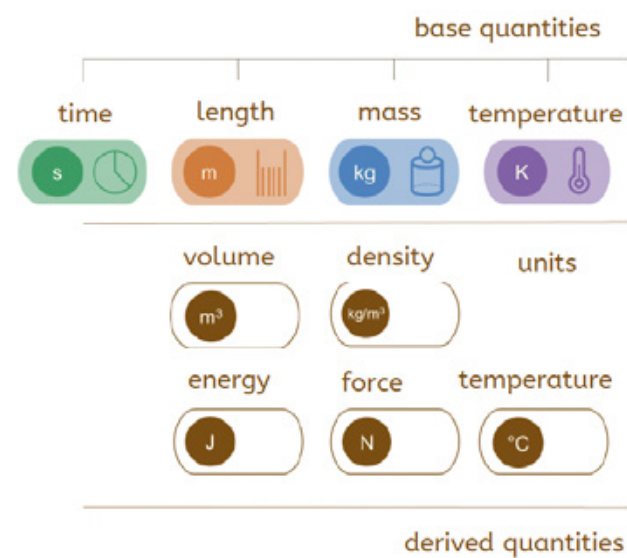


Measurement Values

Quantities and their units:

Base quantities: length, mass, time, temperature (K).

Derived quantities include energy, volume and density and the commonly used temperature unit, °C.

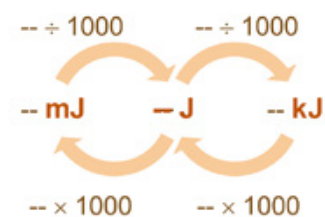


Unit Prefixes:

Range of unit prefixes which differ by the factor of 1000.

Prefixes change numbers to a more human scale.

Easier to compare values that have the same unit prefix.



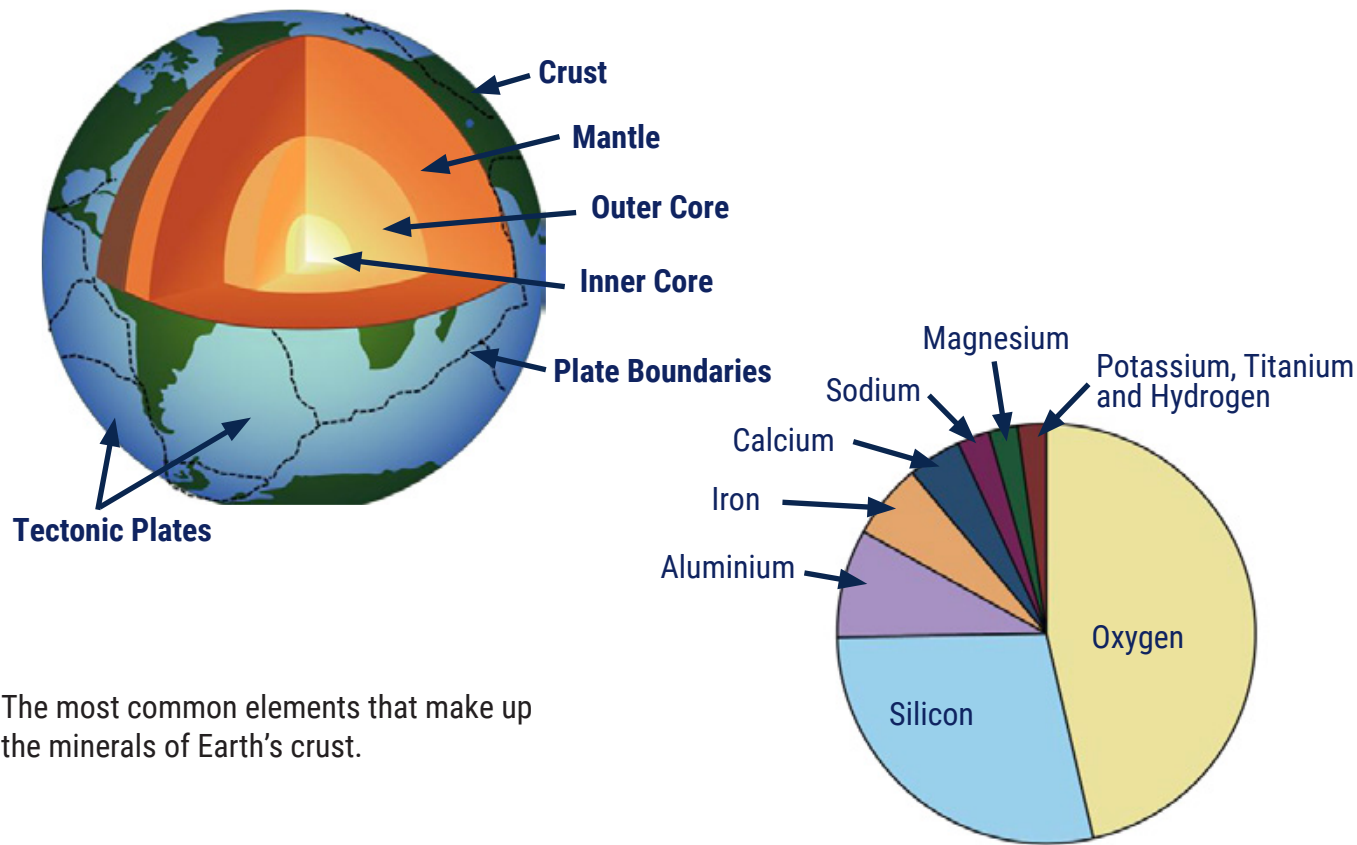
Questions

1. What is temperature defined as?
2. In which direction does thermal energy flow?
3. What is thermal equilibrium?
4. What is internal energy?
5. What are the three methods of thermal energy transfer?
6. What is conduction?
7. Which materials are the best thermal conductors?
8. What is convection?
9. What happens to the density of a substance when it is heated?
10. What is thermal radiation?

Questions

11. Which type of energy transfer can occur in a vacuum?
12. Which surfaces are the best absorbers of infrared radiation?
13. What is pressure?
14. What happens to pressure when the area decreases?
15. What is density?
16. What is an insulator?
17. What is the effect of greater mass on temperature change?
18. What factors affect the rate of conduction?
19. What happens to temperature during a change of state?
10. What causes pressure in gases?

Composition and structure of the Earth



The most common elements that make up the minerals of Earth’s crust.

Layer	State	Composition	Thickness (km)	Temperature (°C)
Crust	solid	rocks and minerals	5 to 70	0 to 30
Mantle	solid	rocks and minerals	2900	1400 to 3000
Outer Core	liquid	molten iron and nickel	2200	4400
Inner Core	solid	molten iron and nickel	1200	5430

The two types of crust are continental crust, which is found beneath landmasses, and oceanic crust, which is found below the oceans. Continental crust is the thickest. Earth’s crust is broken up into tectonic plates that meet at plate boundaries.

Scientists can’t explore deep inside Earth, so they use models to show what it’s like. These models have limitations and can change when new evidence is found.

An apple

- has a thin outer layer
- has a thick middle layer
- has a core

+

- not spherical
- the outer layer is the same thickness all around
- the inner and outer cores are not clear

A layer cake

- has a thin outer layer
- has thicker middle layers
- has 4 layers

+

- not spherical
- doesn’t show the difference in layer thickness
- the core is not hot the core is not hot

Scientific theory: continental drift

After data collection, scientific thinkers propose a scientific theory; it is based on a body of facts and is repeatedly confirmed by observation (and experiment).

The theory of continental drift is the theory that the continents were once connected in a land mass (Pangaea) but have broken apart and drifted away over time.

- Three pieces of evidence that support the theory are:
- The coastlines of many continents appear to fit together like a jigsaw puzzle.
 - There were similar types of rocks across continents that are now far apart.
 - There were identical plant and animal fossils found on different continents that are now far apart.

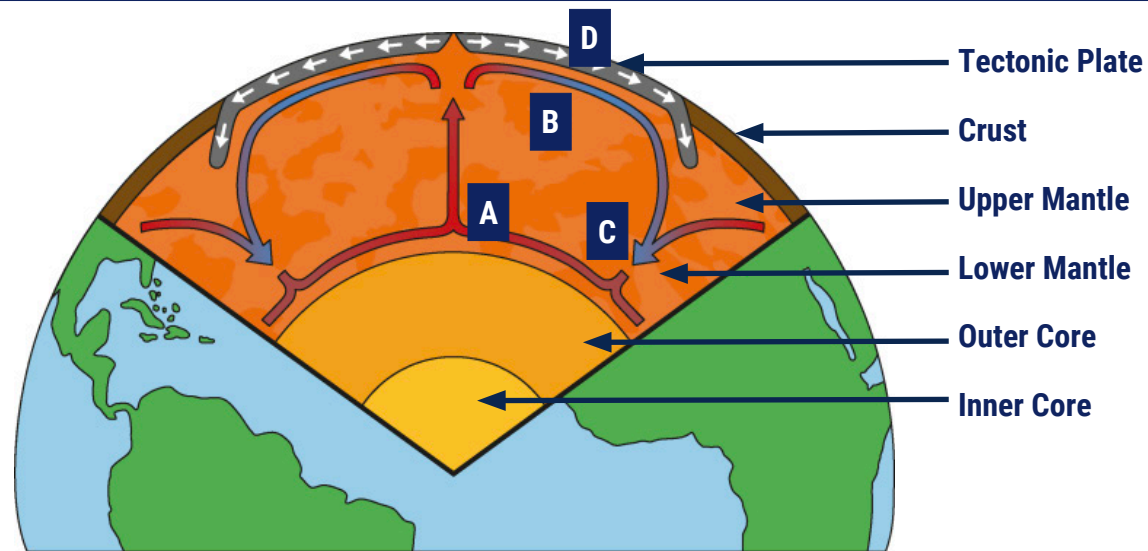
Peer review

Scientific thinkers present evidence to their peers in order to support an opinion and explain their reasoning.

Peer review is when researchers submit work for peer feedback. Peer review is important because it helps to make sure that the research is trustworthy and of high quality.



Convection currents cause continent movement



- A. Hot, less dense rock rises towards the upper mantle.
 B. In the upper mantle, the hot rock spreads and moves sideways.
 C. As it cools, it becomes more dense and sinks back down, creating convection currents.
 D. These convection currents cause the tectonic plates above to shift.
 As a result, the continents slowly change position over millions of years.

Rocks and the rock cycle

Igneous rock

- Igneous rocks are formed when molten rock crystallises.
- Molten rock above the Earth's surface is called **lava** and forms **extrusive** igneous rock when it cools and crystallises.
- Molten rock below the Earth's surface is called **magma** and forms **intrusive** igneous rock when it cools and crystallises.
- If molten rock cools **slowly**, it will form rock with large crystals.
- If molten rock cools **quickly**, it will form rock with small crystals.

Metamorphic rock

- Metamorphic rocks form from existing rocks, deep within the Earth's crust due to high temperature and pressure, causing chemical changes in minerals.
- Over millions of years, sedimentary and igneous rocks transform into metamorphic rocks, often near tectonic plate boundaries.

Sedimentary rock

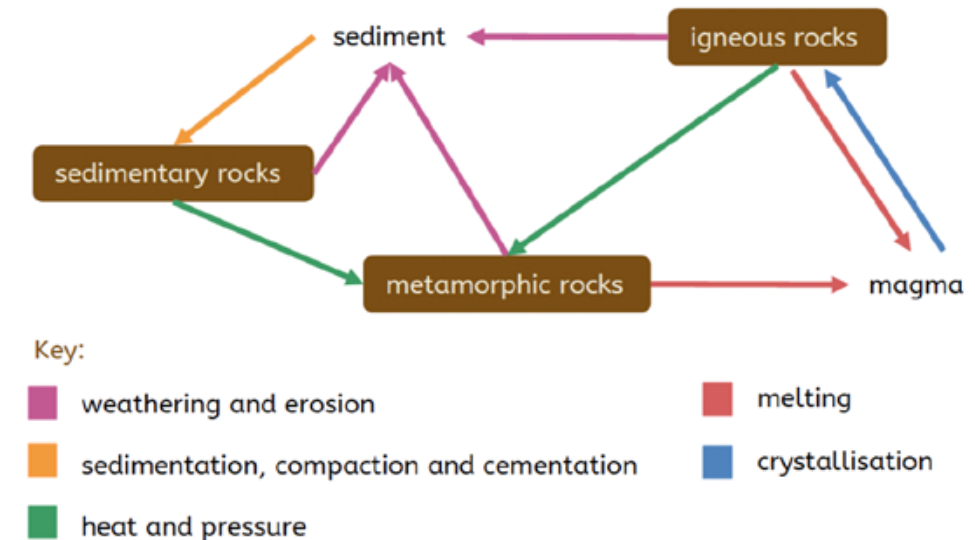
Sedimentary rocks are formed through:
 weathering → transportation → deposition → sedimentation → compaction → cementation
 Layers, called **strata**, can be seen in sedimentary rock.

Weathering is the slow breakdown of rocks while they are in place. It can be **biological** (by living organisms), **chemical** (by chemical reactions) or **physical** (by forces e.g. freeze-thaw).

Erosion is the movement and carrying away of rock fragments.

The rock cycle

The rock cycle involves the recycling of rocks, during which rocks can change into different types.



Fossils

Fossils are the preserved remains or traces of a dead organism that was alive millions of years ago. Fossils can be trace fossils (preserved imprints or evidence), body fossils (actual remains) or mineralised fossils (when hard parts are replaced by minerals).

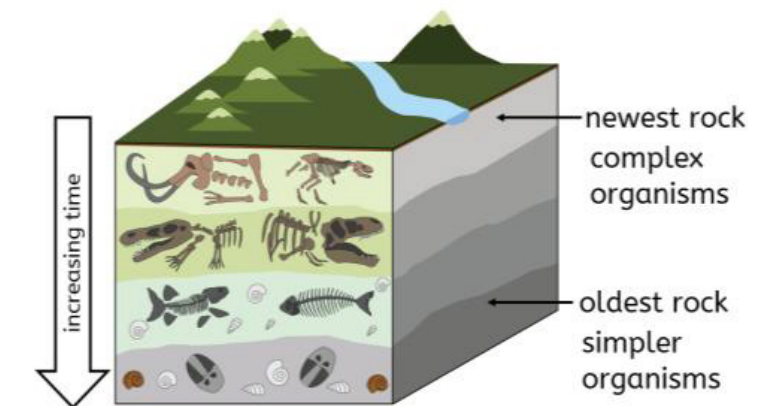
Fossils are found in sedimentary rocks. High temperatures and pressures destroy fossils, so they are not found in metamorphic or igneous rocks.

Fossilisation process:

Organism dies → buried in sediment → soft parts rot, hard parts stay → pressure compacts layers → minerals replace hard parts → fossil forms → uplift exposes fossil

The fossil record is a collection of fossils documenting the history of life on Earth. It shows how organisms and environments have changed over time.

More complex fossil organisms are found at the top in newer rocks. Simpler fossils are deeper in older rocks.



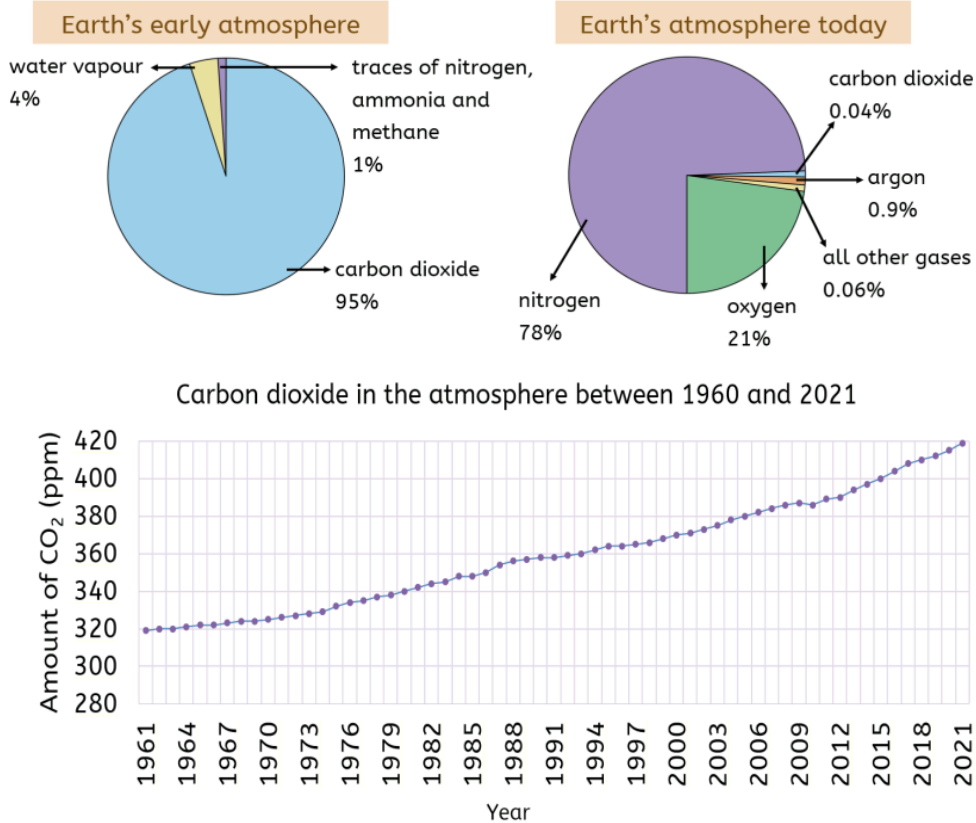
Fossil fuels

Fossil fuels are natural resources formed over millions of years from the remains of dead organisms, such as plants and animals. Fossil fuels are **non-renewable** energy resources because they take a very long time to replenish. Fossil fuel extraction provides energy, products, and jobs, but causes pollution, habitat loss, resource depletion, and global social inequality.

	Coal Swamp plants die → buried in mud and sediment → form peat → more burial → heat & pressure → peat turns to coal Coal is extracted through surface and underground mining. Uses: heating, generating electricity, steel production.
	Crude Oil Plankton die → sink → buried in sediment → pressure and heat → oil and gas form → trapped under impermeable rock Crude oil and natural gas are extracted by drilling wells through impermeable rock.
	Natural Gas Uses of crude oil: refined to make petrol, diesel, plastics. Uses of natural gas: cooking, generating electricity, industry.

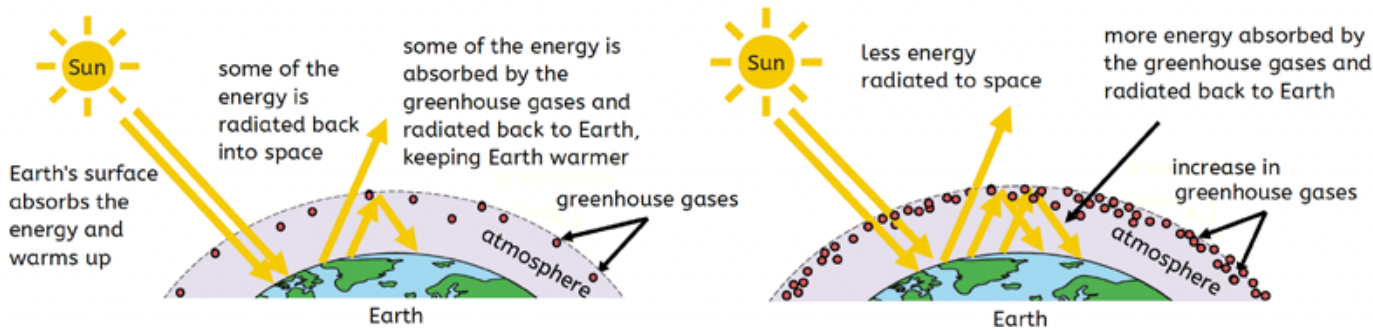
Earth’s atmosphere

Human activities, such as the combustion of fossil fuels, which release large amounts of CO₂ into the atmosphere, result in an increase in atmospheric CO₂ concentration.

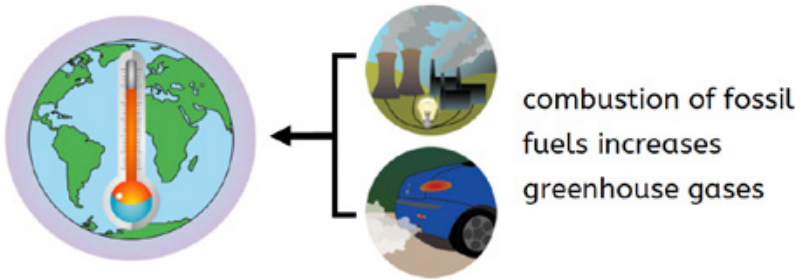


The greenhouse effect, global warming and climate change

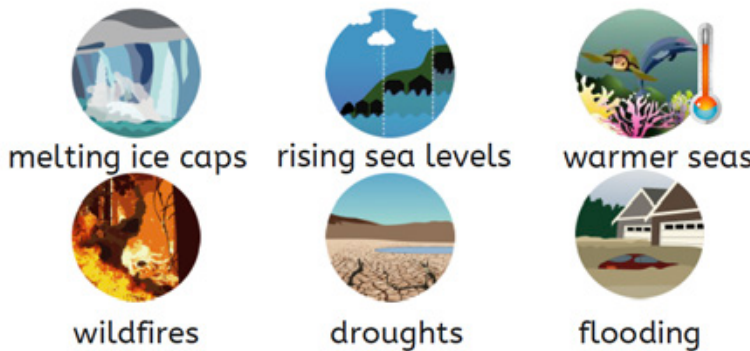
Earth’s atmosphere contains greenhouse gases (carbon dioxide, methane, water vapour), which keep Earth warmer than it would be without them. The greenhouse effect is the natural warming of the planet to habitable temperatures, caused by greenhouse gases. The enhanced greenhouse effect is the unnatural warming of the Earth due to increased greenhouse gases in the atmosphere.



Global warming is the increase in Earth’s average temperature, caused by the enhanced greenhouse effect.



Climate change is the change in the Earth’s long-term weather patterns, including precipitation, wind and temperature. It leads to social, economic and environmental impacts. Environmental impacts cause habitat loss, food shortages, wildlife threats, farming issues, water problems, and human displacement.



Questions

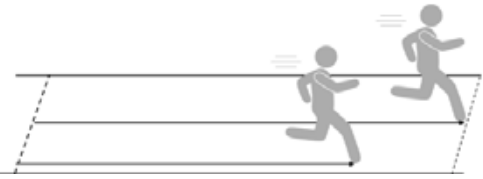
1. What are the four layers of the Earth?
2. Which layer of the Earth is liquid?
3. What are tectonic plates?
4. What is continental drift?
5. What was Pangaea?
6. What evidence supports continental drift?
7. What causes tectonic plates to move?
8. What is peer review?
9. How are igneous rocks formed?
10. How are metamorphic rocks formed?

Questions

11. What is weathering?
12. What are two types of weathering?
13. Where are fossils found?
14. What are fossil fuels?
15. What type of energy source are fossil fuels?
16. Which gas is released when fuels burn?
17. What is the greenhouse effect?
18. What is global warming?
19. What is climate change?
20. What is one impact of climate change?

Speed

The rate of change of distance.



uniform speed = unchanging speed

Higher speed:

- greater distance in same time interval
- same distance, shorter time interval

$$\text{average speed} = \frac{\text{distance travelled}}{\text{time taken}}$$



Instantaneous Speed

Speed at a particular moment in time.

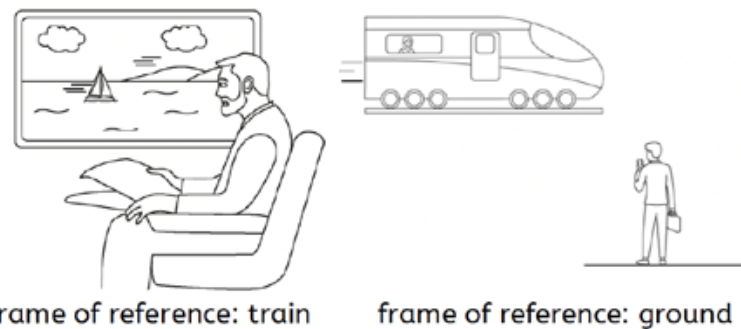


Average Speed

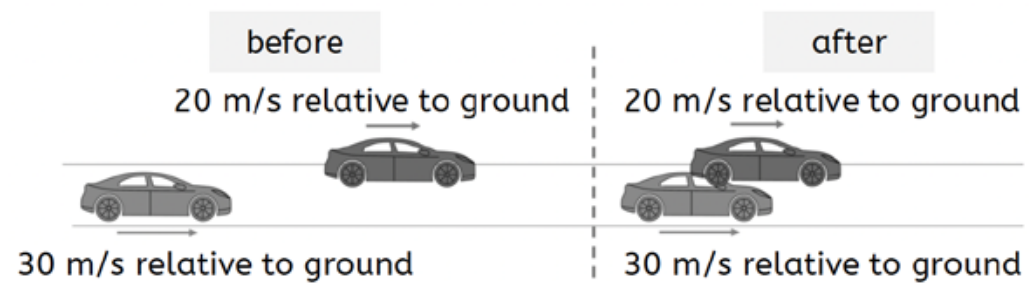
Speed for distance travelled, measured over a longer time interval.

Relative Motion

- movement of one moving object relative to another object
- depends on the frame of reference

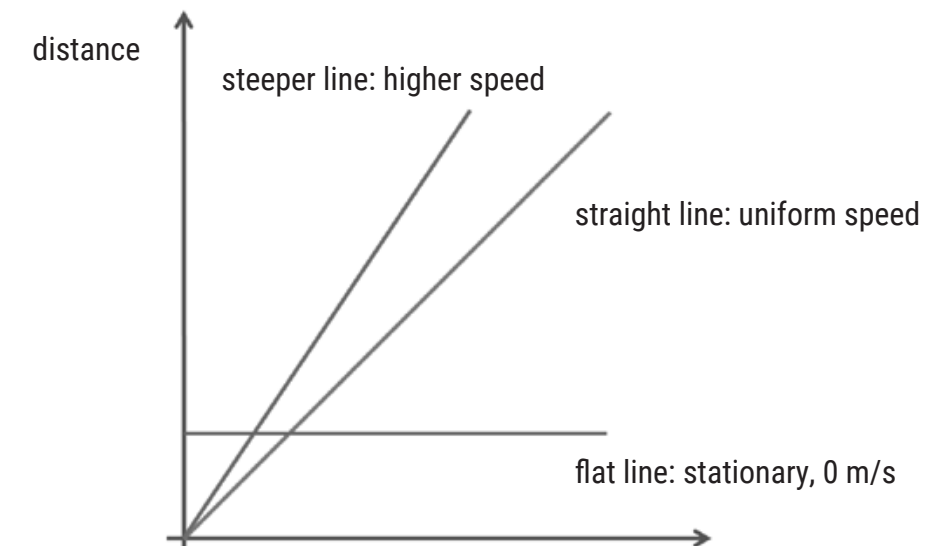


Two moving objects relative to the ground



Every second: relative distance changes by 10 m.
Relative speed = 10 m/s

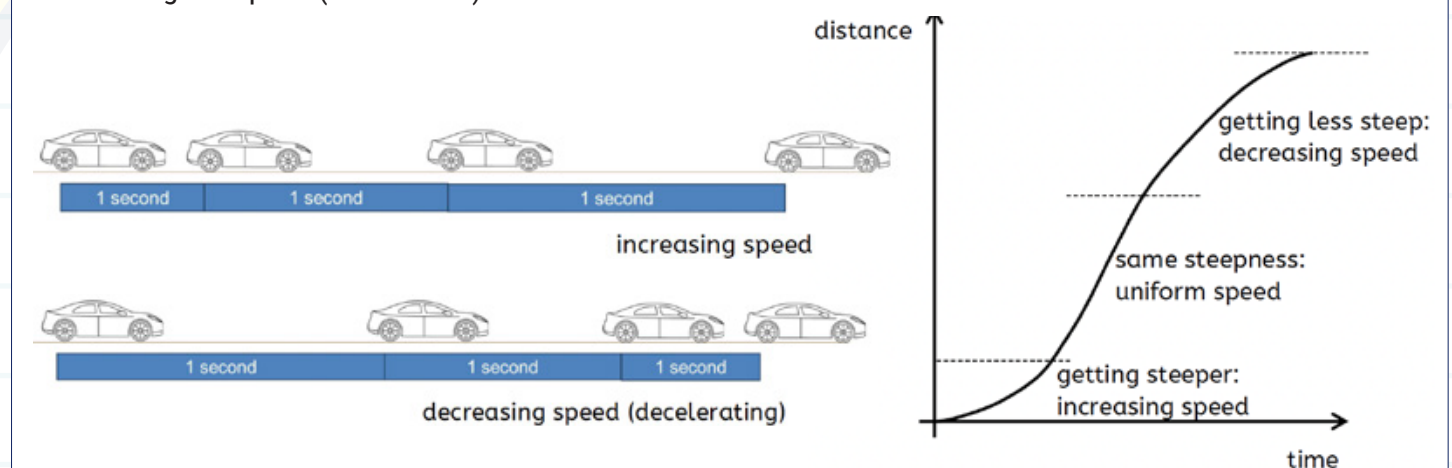
Distance-time Graphs



- Measurement results are plotted on a d-t graph.
- Lines-of-best-fit average out an object's position over time.
- Lines indicate general trends of motion.
- Values read off from the line to interpret specific parts of motion.

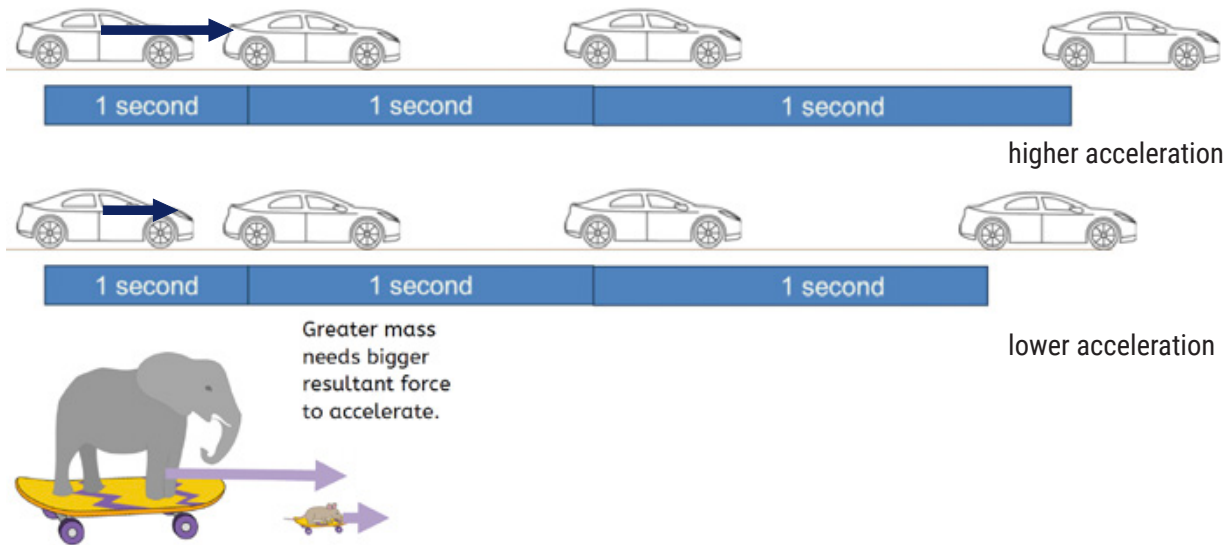
Acceleration

- The change of speed (or direction) over a time interval

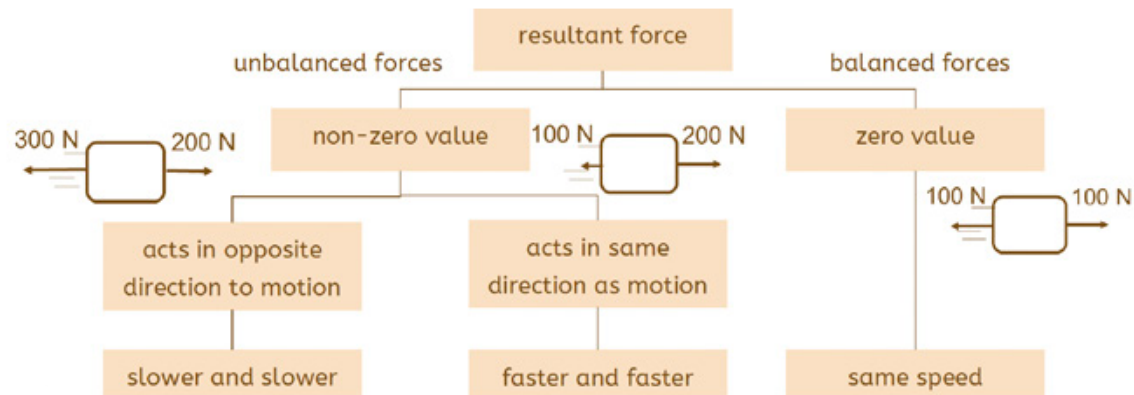


Affects on Acceleration

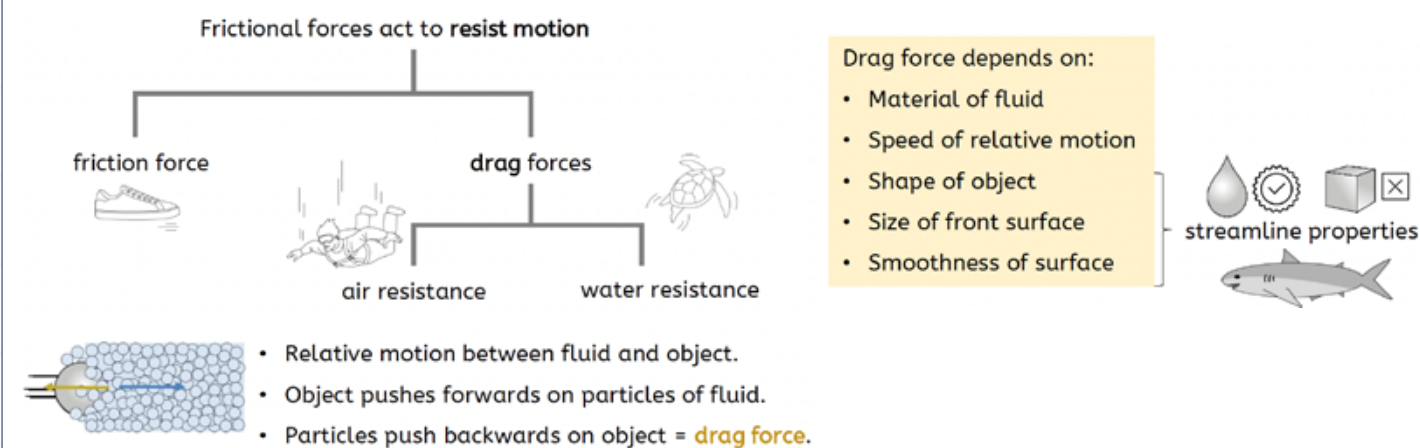
Greater resultant force causes higher acceleration.



Resultant Force and Acceleration



Motion in Fluids

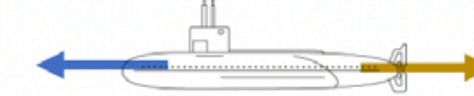


Propelled or Not

Propelled: has **driving force**

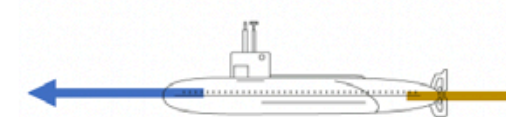
Moving: has **drag force**

moving slowly



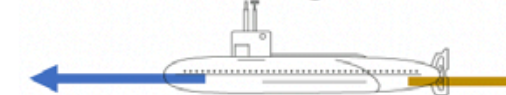
- Resultant force is 0 N: uniform speed, no change to forces

increases thrust



- Resultant force ← increasing speed, drag will increase

moving fast



- Resultant force is 0 N: uniform speed, no change to forces

remove propulsion



- Resultant force → decreasing speed, drag will decrease

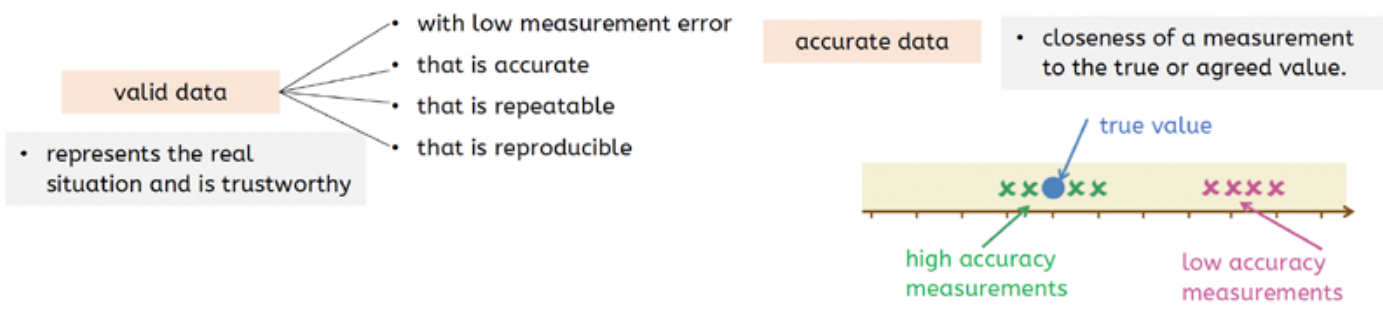


Accelerates until drag equals size of weight.

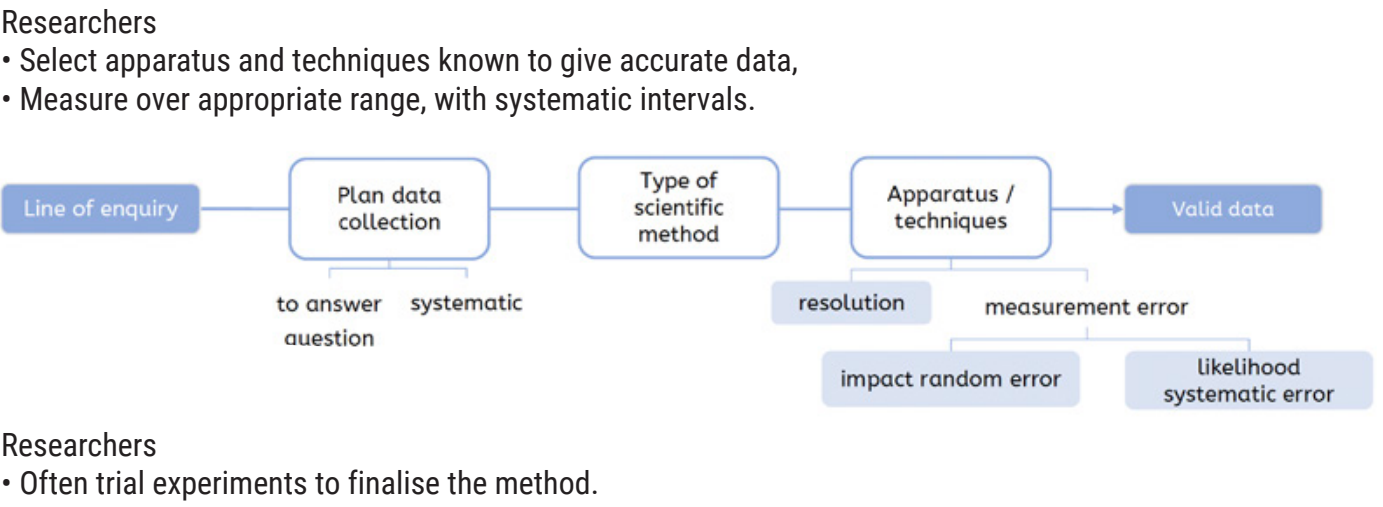


Parachute released, increases drag, resultant force acts upwards decreases speed, drag decreases etc.

High-Quality Data



Developing a Method



Safe Practicals

Researchers			
May redesign experiments to reduce risk to acceptable levels.			
	Hazard	Risk	Control Measure
	Falling	Damage to bones on impact with floor or other fixed objects	Do not stand on tables, stools etc. Reduce maximum height to one students can reach.

Selecting Apparatus and Techniques

Datalogging

- a process where sensors measure the physical properties of a system.

Researcher sets up the constraints on the computer to record data, e.g. time intervals and the logging period.

Each light gate is set up to measure time for card to pass; processor calculates speed at each gate.

Digital Filming

- multiple images recorded (frames); each frame is over a strict time interval

Recorded against a measurement background, any change can be observed.

Measuring Speeds (time and distance)

uniform speed – select greater distance

changing speed – select small distances

Ramp is 'banked up' to reduce effect of friction.

Air track removes almost all friction.

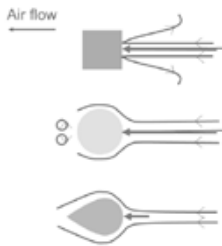
Apparatus	Advantages
Datalogging	- over very short intervals - consistent and not subjective - high resolution - removes reaction time (timing)
Digital filming	- not subjective - removes reaction time (timing) - removes measurement error while object moving (distance)

Applications of Technology on Science

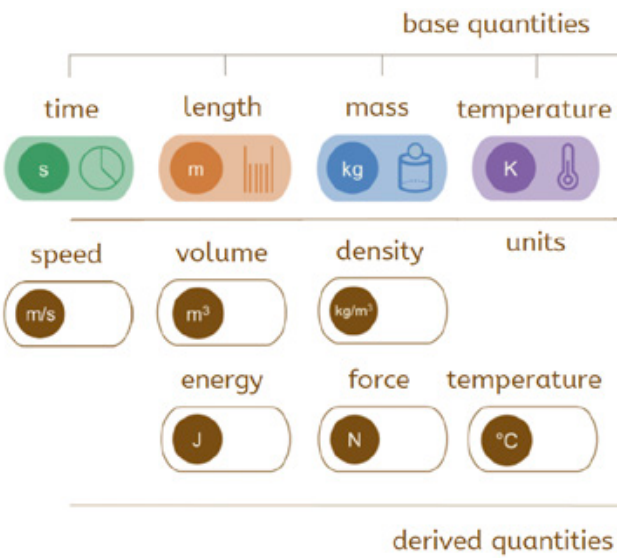
- Researchers select apparatus that:
- Restricts control variables.
 - Has higher resolution.
 - Automates measurement (more often, longer duration).
 - Removes random error related to human judgement (subjectivity).

Applications of Science on Industry

Knowledge of fluid flow around objects allows engineers to produce better designs, e.g. more efficient cars.

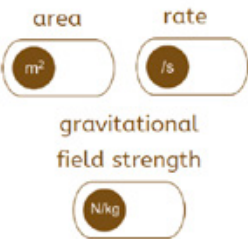


Measurement Values



Quantities and their units:
Base quantities: length, mass, time, temperature (K).

Derived quantities also include:



Questions

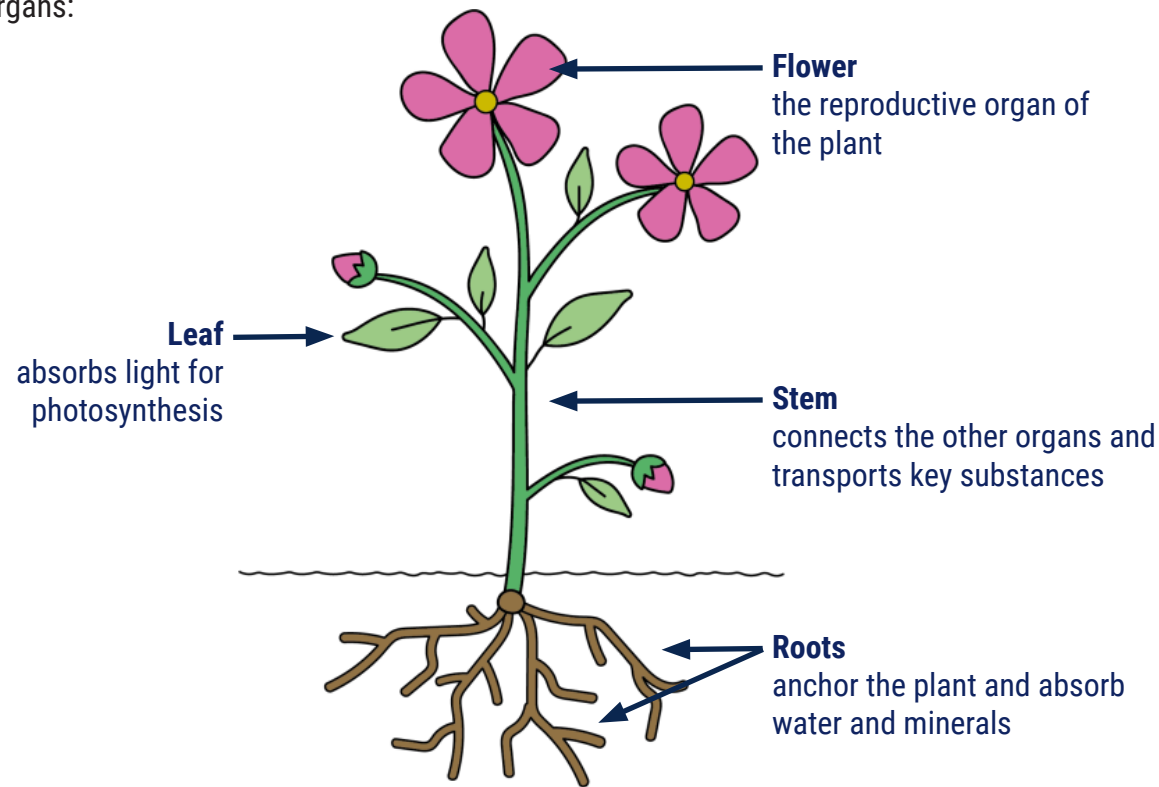
1. What is the equation for calculating speed?
2. What is the equation for average speed?
3. What is instantaneous speed?
4. What is relative motion?
5. What does a flat distance-time graph show?
6. What does a straight sloped line on a distance-time graph show?
7. What does a steeper line on a distance-time graph indicate?
8. What is acceleration?
9. What causes acceleration?
10. What happens when forces are balanced?

Questions

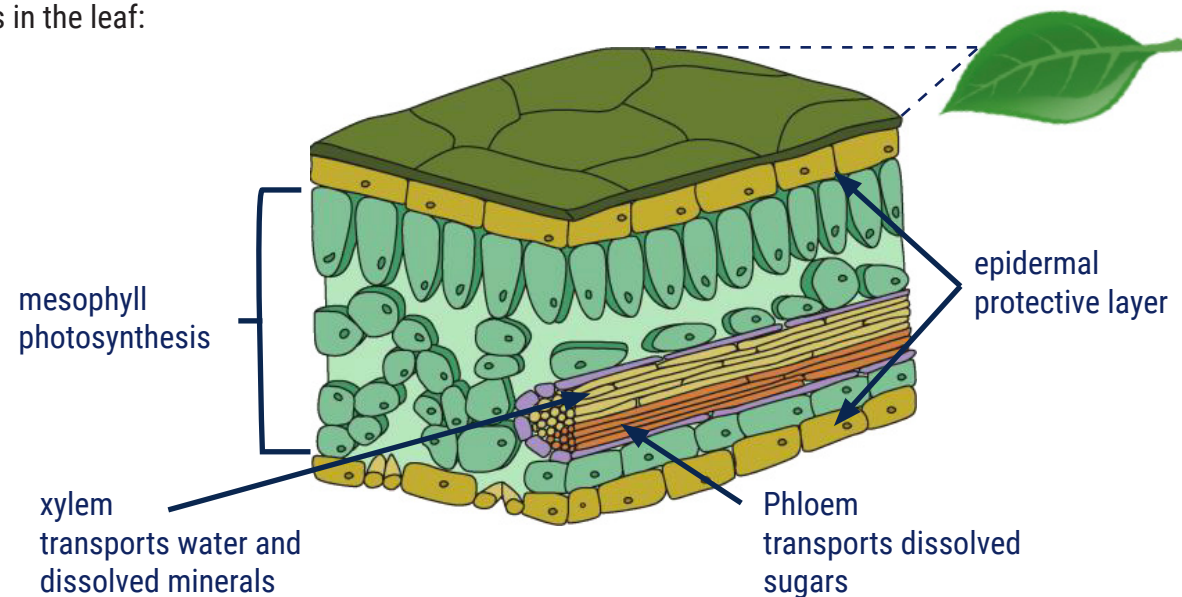
11. What happens when forces are unbalanced?
12. What is drag?
13. What factors affect drag?
14. What is terminal velocity?
15. What is the effect of increasing thrust?
16. What is uniform speed?
17. What is deceleration?
18. What is valid data?
19. How can measurement accuracy be improved?
20. Which tool can measure motion accurately?

Plants as Organisms

Plant organs:

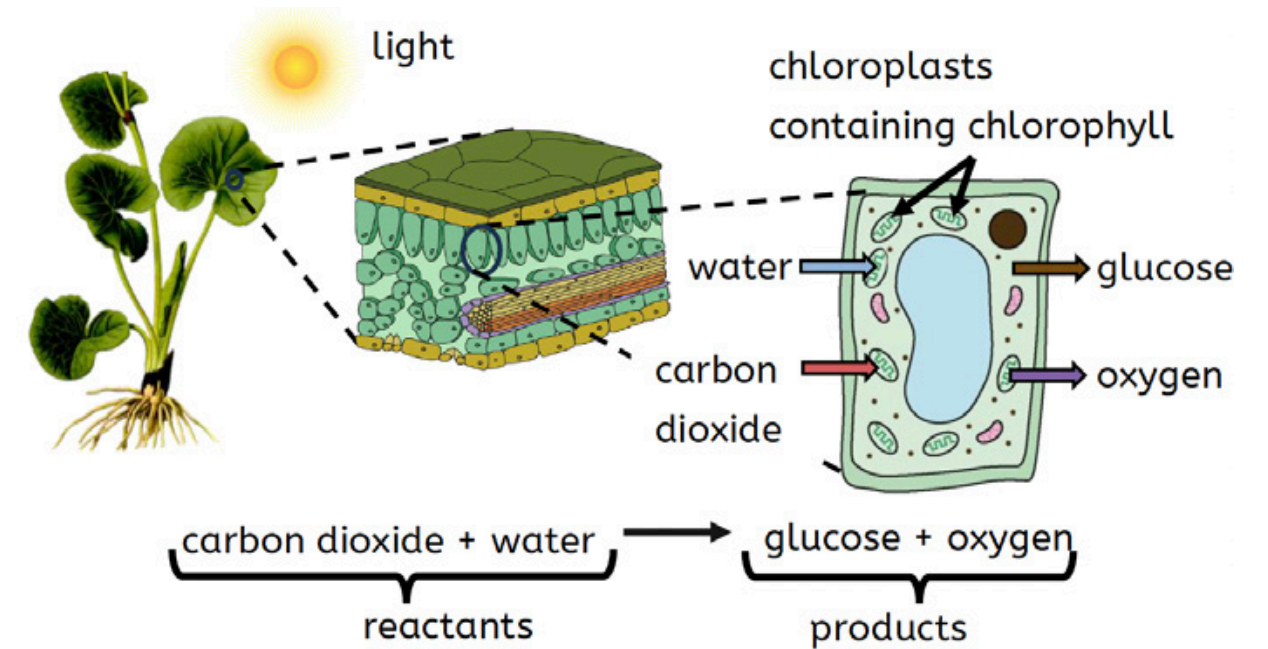


Tissues in the leaf:



Photosynthesis

Photosynthesis is a series of chemical reactions in which plants use carbon dioxide and water to make glucose and oxygen, driven by energy from light. Photosynthesis occurs in the chloroplasts and is absorbed by the green pigment called chlorophyll.

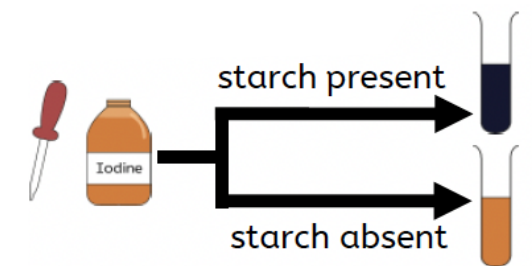


Uses of glucose:

1. used by the plant for respiration to release energy
2. turned into cellulose to build cell walls
3. turned into starch and stored for use later by the plant

Photosynthesis is an endothermic process because it requires energy to be transferred from its surroundings.

We can test a leaf for starch using iodine. Iodine will turn from orange-brown to blue-black when it is in contact with starch.



Photosynthesis Continued

A leaf is tested for starch using the following steps:

Step	Reason
Hold the leaf in the hot water	soften leaf
Cover the leaf with ethanol	remove chlorophyll
Place the boiling tube into the beaker of hot water	speed up removal
Rinse the leaf in the beaker of hot water	soften leaf again
Place the Petri dish containing the leaf on white tile	see colour change
Add a few drops of iodine solution to cover the leaf	test for starch

Results of the iodine test for starch on a variegated leaf:

Before



After



starch not present

starch present

Only green parts of the leaf photosynthesise and make starch, so iodine stays orange-brown on non-green parts.

When testing for starch, control measures should be taken using the hazardous substances:

• iodine



• ethanol



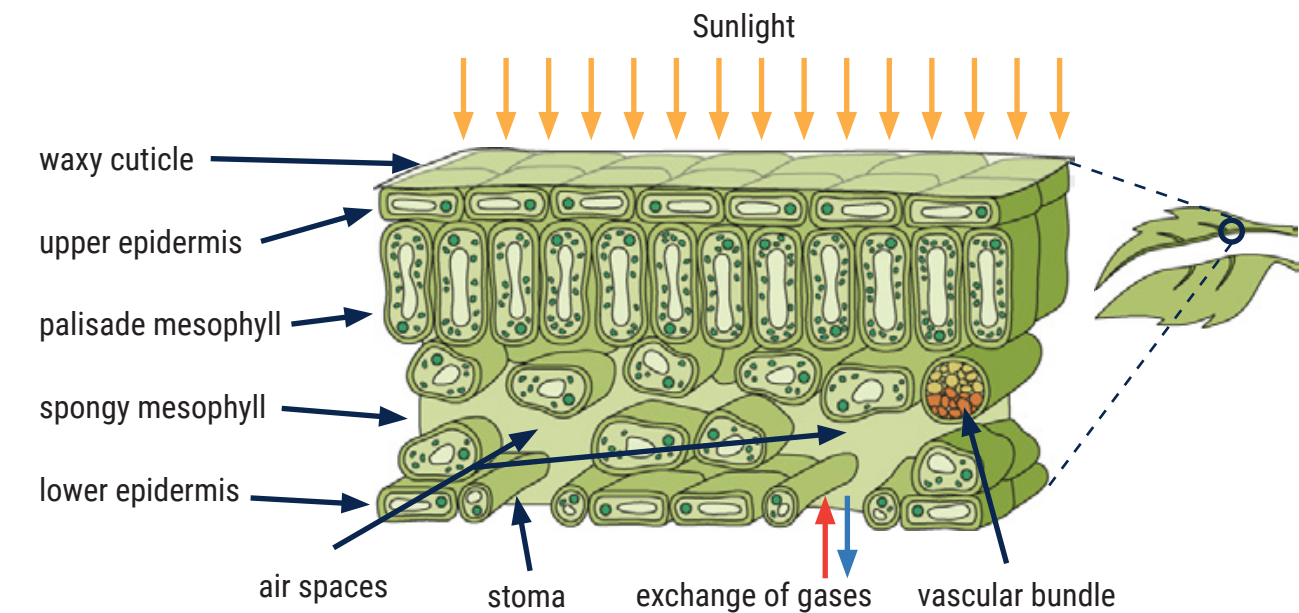
Changing Understanding of Photosynthesis

People used to incorrectly believe that plants gain mass by taking in soil through roots. Van Helmont’s experiment with the willow tree showed plants gain mass from water, not soil. Today, scientists know that plant mass comes from carbon dioxide, which is used in photosynthesis to make glucose for growth.

Leaf Structure and Adaptations

People used to incorrectly believe that plants gain mass by taking in soil through roots. Van Helmont’s experiment with the willow tree showed plants gain mass from water, not soil. Today, scientists know that plant mass comes from carbon dioxide, which is used in photosynthesis to make glucose for growth.

Leaf adaptation	Function of adaptation
Many chloroplasts	Contain chlorophyll to absorb light
Large surface area	Absorbs more light
Thin	Short diffusion distance for gases
Veins	Transport water, minerals, and sugars
Stomata (underside)	Allow gas exchange (CO ₂ in, O ₂ out)



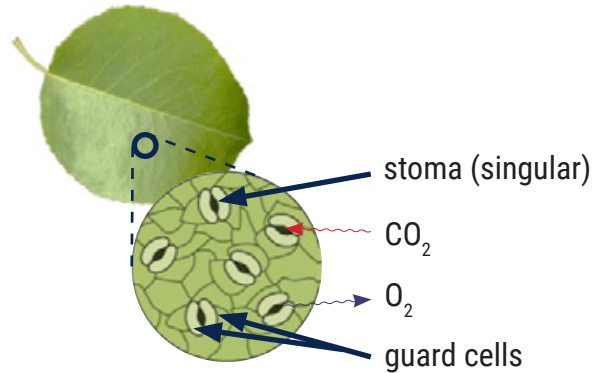
Leaf Structure and Adaptations Continued

Structure	Step	Reason
upper epidermis	allows light to pass through	thin and transparent
palisade mesophyll	photosynthesis	cells have lots of chloroplasts and are tightly packed
spongy mesophy	supports diffusion of gases in and out of leaf	air spaces
lower epidermis	supports diffusion of gases in and out of leaf	stomata
vascular bundle	transports substances	xylem and phloem tissue
waxy cuticle	reduces water loss	Waterproof

Guard cells and gas exchange:

- Control opening/closing of stomata for gas exchange
- Sensitive to light
- Open stomata in day for CO₂ to enter for photosynthesis
- Close stomata at night when photosynthesis stops

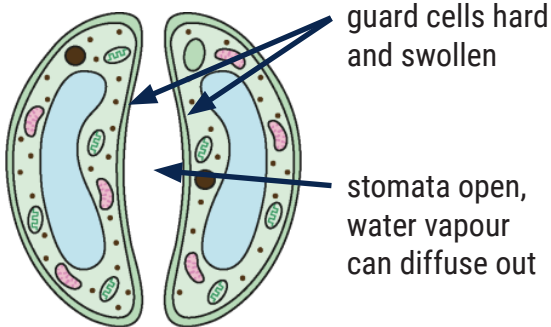
A light microscope can be used to observe an imprint of the structure of the stomata. Stomata are on the underside of the leaf because it is cooler and more shaded.



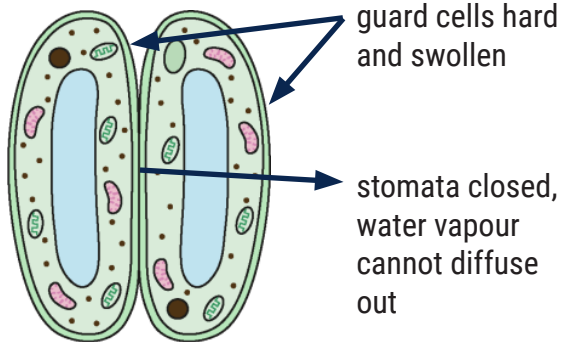
Guard cells and water loss:

- Guard cells open and close stomata to reduce water loss.

Plant hydrated



Plant lacking water



Root structure and adaptations

Root hair cells are adapted for the absorption of water and mine with a long extension to increase surface area.

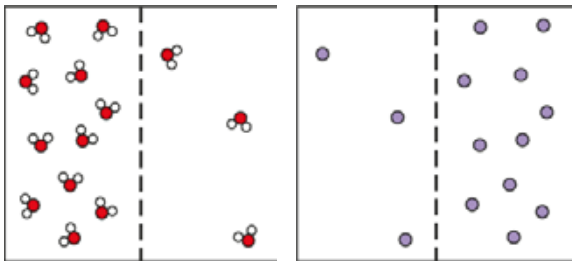
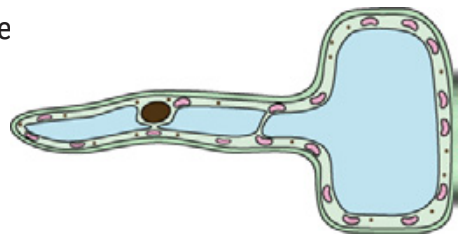
They contain many mitochondria to provide energy for active transport. They have no chloroplasts.

Water is essential for photosynthesis.

It maintains the structure of the plant and enables chemical reactions by acting as a solvent in which reactants and products are dissolved. Plants also need minerals:

- Nitrates → healthy growth
- Phosphates → healthy roots
- Potassium → healthy leaves and flowers
- Magnesium → makes chlorophyll

Water is absorbed through osmosis, moving from an area of high water concentration in the soil to an area of lower concentration in root hair cells.



high → low
water concentration

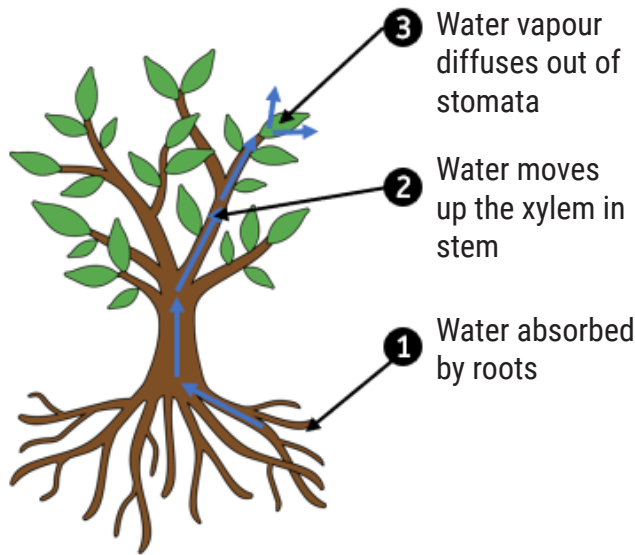
low → High
water concentration

Transpiration

Transpiration is the loss of water vapour from the leaves of plants, through the stomata. When the stomata are open, plants lose water vapour through them.

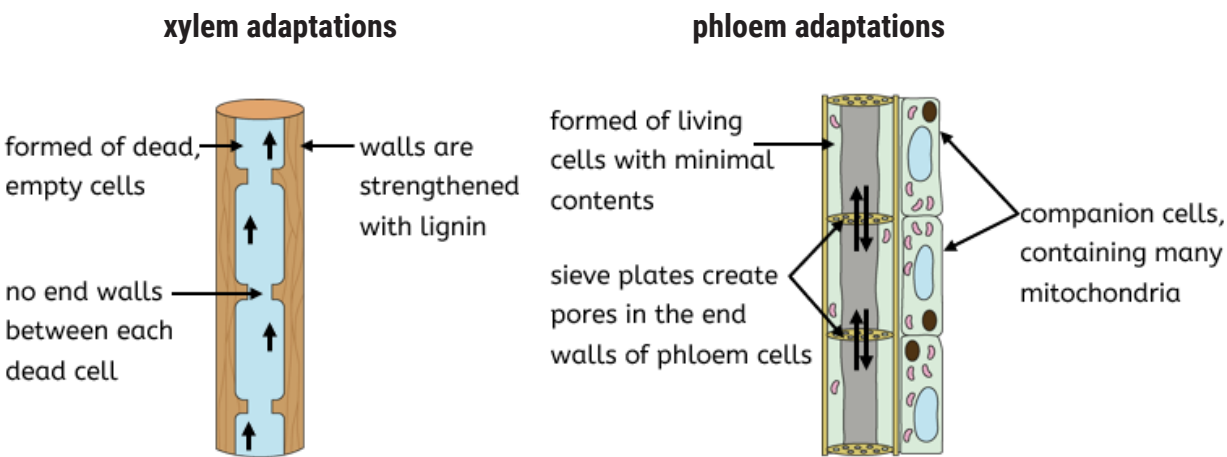
The rate of transpiration is increased by:

- increased temperatures
- increased light intensity
- increased wind
- decreased humidity



Transport in Plants

Xylem transports water and dissolved minerals up the stem, from roots to leaves. Phloem transports dissolved sugars. Sugars are transported up or down the stem, depending on where sugars are needed.

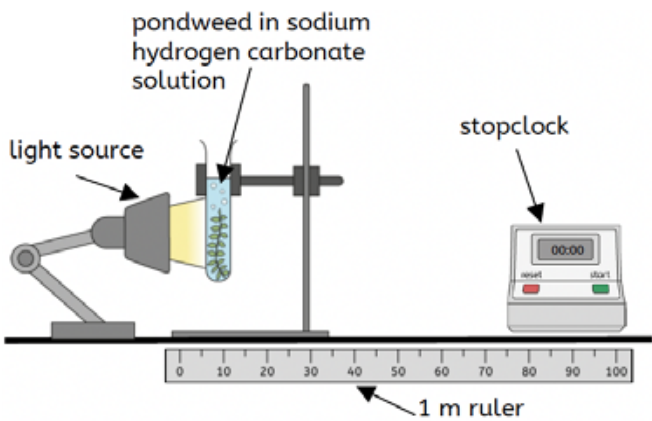


Rate of Photosynthesis

An increase in light intensity, temperature, chlorophyll, water and carbon dioxide increases the rate of photosynthesis.

Effect of light intensity on rate of photosynthesis

- Variables**
- Independent:** light intensity - distance between light and pondweed
 - Dependent:** rate of photosynthesis - number of bubbles per minute
 - Control:** temperature, CO₂, water, chlorophyll, time, size/mass of pondweed

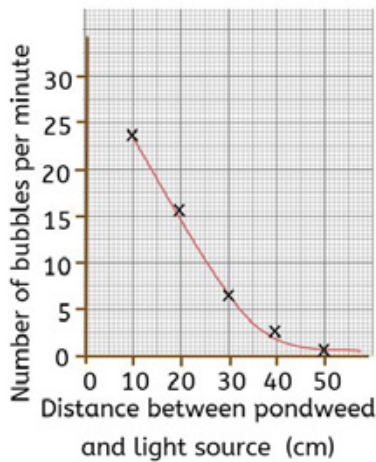


Rate of Photosynthesis Continued

Step	Explanation
1. Set up the LED light source and meter ruler	it doesn't heat up during use, so temperature won't be affected
2. Fill the boiling tube with the sodium hydrogen carbonate solution	to provide carbon dioxide
3. Put the piece of pondweed into the boiling tube with the cut end at the top and keep it underwater	to observe bubbles of oxygen
4. Place the boiling tube with pondweed 10cm from the light source	this is the first independent variable light intensity to test
5. Leave the pondweed for three minutes	allows the photosynthesis rate to stabilise

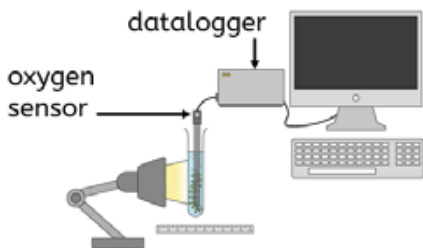
Typical results

As the distance between the pondweed and light increases, the number of bubbles per minute decreases. This is because less energy is transferred and absorbed by the chlorophyll for photosynthesis.



Datalogging and technology in science

Datalogging: Automatic data collection using sensors and computers (e.g. light, temperature, oxygen). Data is recorded at regular intervals (e.g., every second or minute). Technology improves experiments: Cameras, sensors, and computers make observations clearer and more accurate.

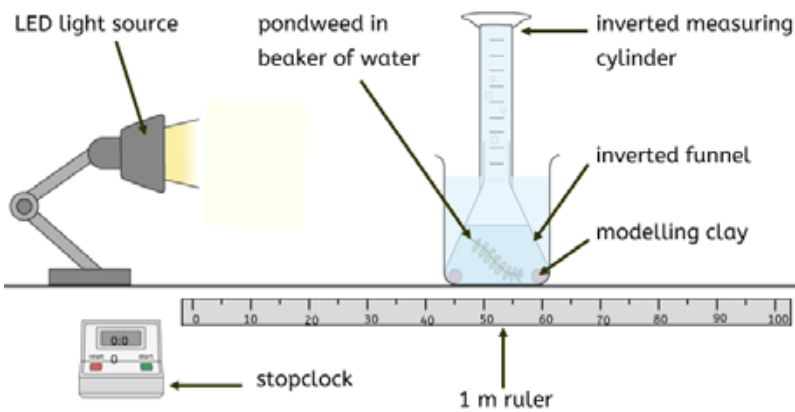


Limitations and improvements in measuring photosynthesis

Counting bubbles → Simple but inaccurate and biased (bubble size, bubble speed).

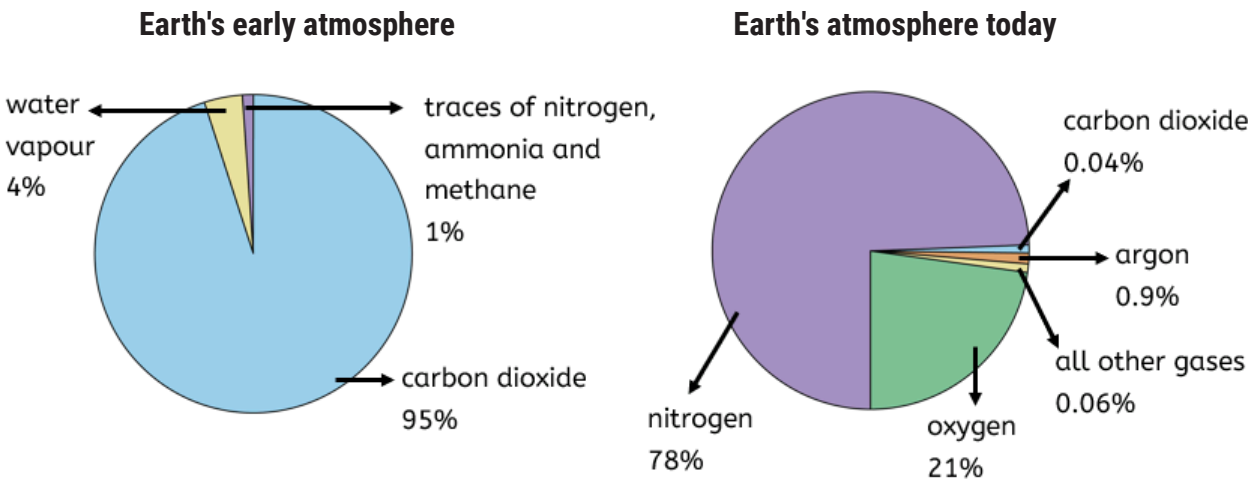
Better method → Measure volume of oxygen using inverted funnel and measuring cylinder (more accurate, objective).

Digital tools → Data loggers collect continuous data, reduce error and bias, improve validity and analysis.

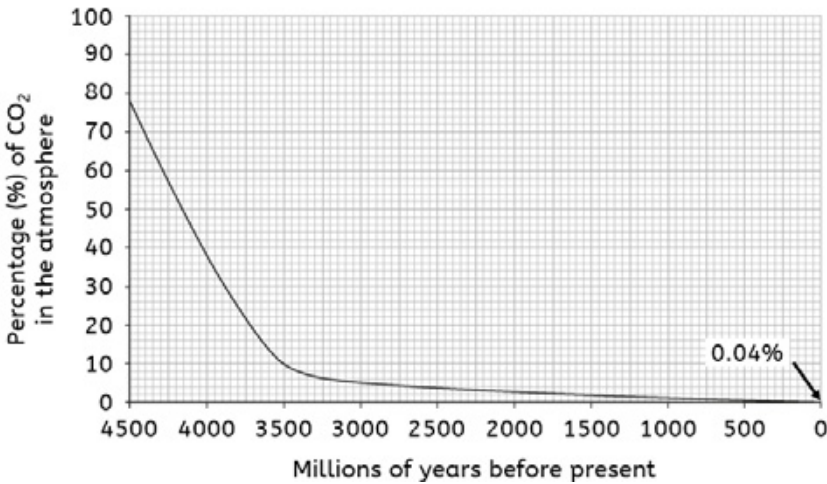


Plants and the Atmosphere

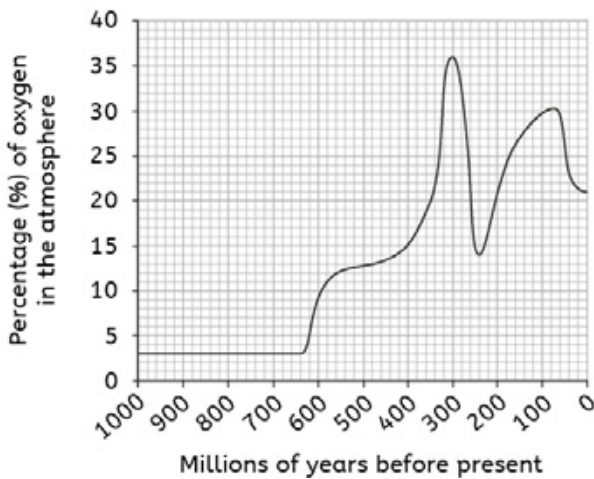
Early Earth's atmosphere was mostly carbon dioxide, with almost no oxygen. Over time, oxygen rose and CO₂ fell.



Carbon dioxide levels decreased because the oceans formed and carbon dioxide dissolved into them. Plants and algae then used it in photosynthesis.



Oxygen levels increased because algae and plants released oxygen during photosynthesis. Fluctuations occurred because early oxygen was absorbed by oceans and seabed rocks.



Plants as Producers

Plants are producers that make their own food through photosynthesis. Plants provide food for humans and other animals, forming the basis of food chains.

- Foods that contain starch can be identified using iodine.
- Raw data in tables may need to be processed by finding frequency.
- Insect pollination is essential for crop growth and food production.
- A significant portion of our food relies on pollinators.
- The decline in bee populations threatens food security.

Starch Test Result	Tally	Frequency
Starch present		18
No starch		12

Questions

1. What is photosynthesis?
2. Where in a plant cell does photosynthesis occur?
3. What pigment absorbs light during photosynthesis?
4. What are the reactants for photosynthesis?
5. Is photosynthesis an exothermic or endothermic reaction?
6. What is one use of glucose in plants?
7. What does the iodine test detect?
8. What colour change shows a positive iodine test?
9. What is one leaf adaptation for maximum light absorption?
10. What is the function of stomata?

Questions

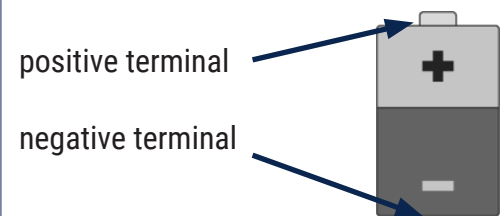
11. What controls the opening and closing of stomata?
12. What is transpiration?
13. What is the function of xylem?
14. What is the function of phloem?
15. How is water absorbed by plant roots?
16. How are minerals absorbed by plant roots?
17. What factors affect the rate of photosynthesis?
18. What is an example of an independent variable in a photosynthesis experiment?
19. What is an example of a dependent variable in a photosynthesis experiment?
20. Why are dataloggers used in experiments?

Electric Circuits

- A complete conducting loop
- Components connected into circuit by two electrical contact points
- With an energy source

Batteries

- An energy source for circuits
- Two terminals
- Chemical reaction of reactants inside when terminals connected in a circuit



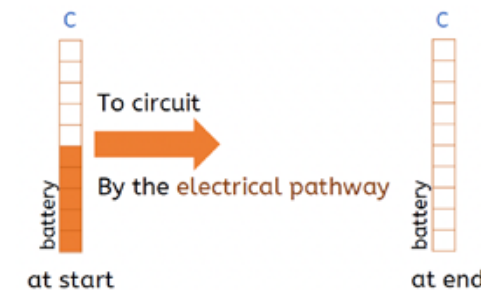
Batteries run down when the circuit is working

Electrostatic Force

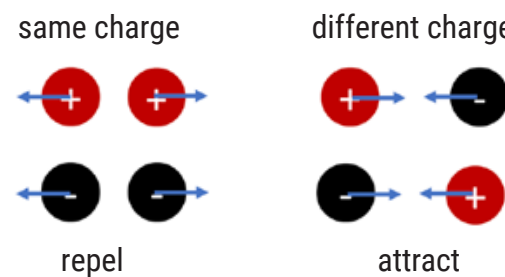
- All electrical effects are caused by an electrostatic force
- Acts between charged objects
- Electrical charge is a property of some objects

Circuit Symbols

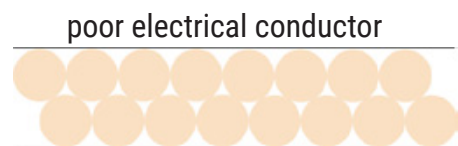
component	symbol
wire	—
switch (open)	—○—
cell (battery)	⎓
bulb	⊗
motor	Ⓜ
buzzer	ⓑ



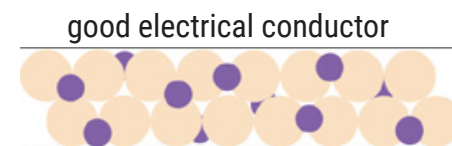
Effects of Electrostatic Force different charge



Electrical Conductors



Particles with no separation, fixed in position, vibrating



Also has freely moving charged particles of the same type

In a Working Circuit

- Particles carrying same charge
- Electrostatic forces exerted
- Repel



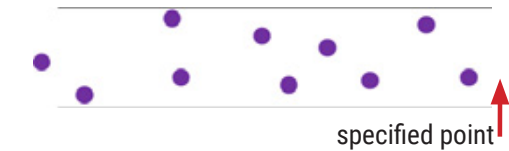
- One charged particle caused to move
- Repels nearby charged particle
- Net movement of all charged particles
- At the same time

Electric Current

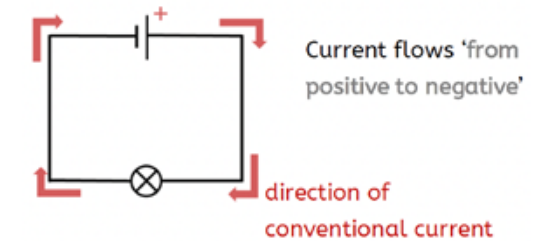
Rate of flow of charge, measured in amps (A)

If all pass this point in one second, the size of the current is 1 A.

These particles carry a total of 1 C of charge.

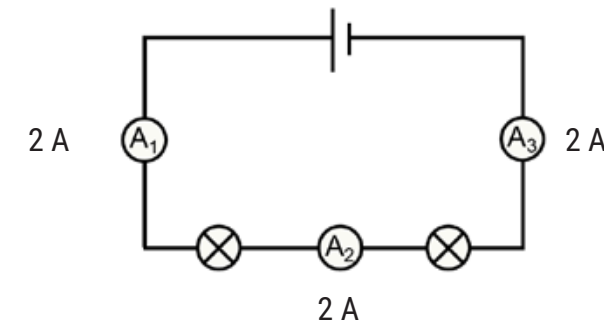


$$\text{current (A)} = \frac{\text{charge flow (C)}}{\text{time taken (s)}}$$



Electric current is

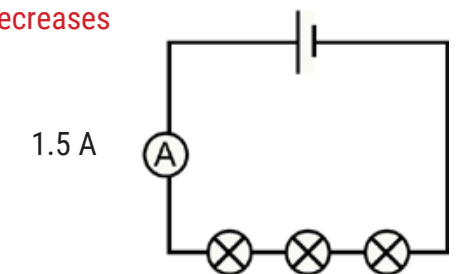
- a quantity
- the same size in all parts of a series circuit



Changing Number of Components

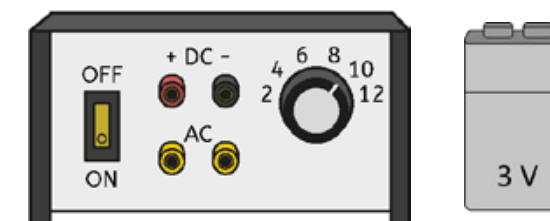
More components

- Each component resists flow of charged particles
- Harder for current to flow
- Current decreases



Voltage

- An electrical push



All energy sources for circuits have a voltage.

Changing Voltage



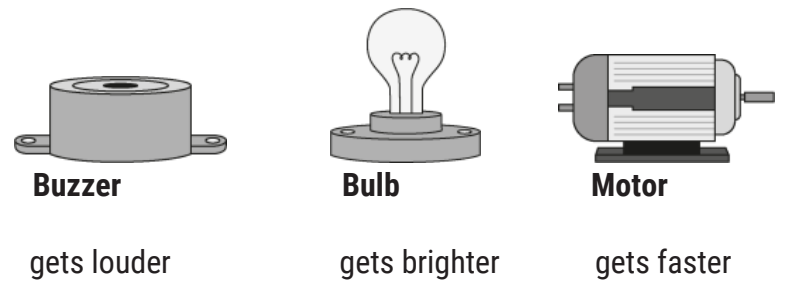
electrostatic force on charged particle by battery



greater electrostatic force on charge particle by battery

A higher voltage of battery provides a greater push on the current.

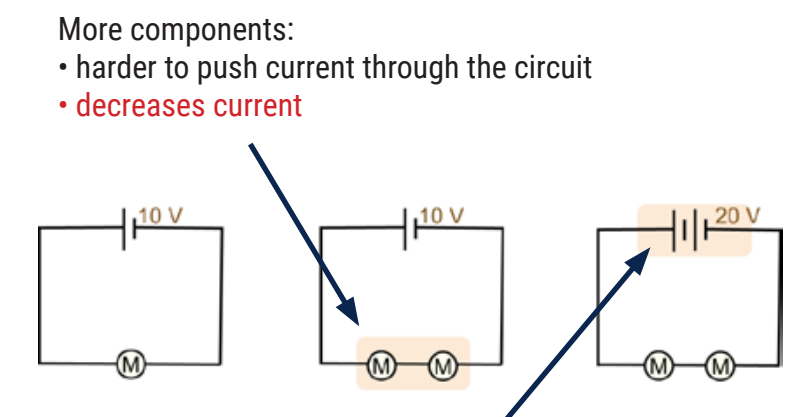
Voltage Continued



Increasing voltage
of energy source

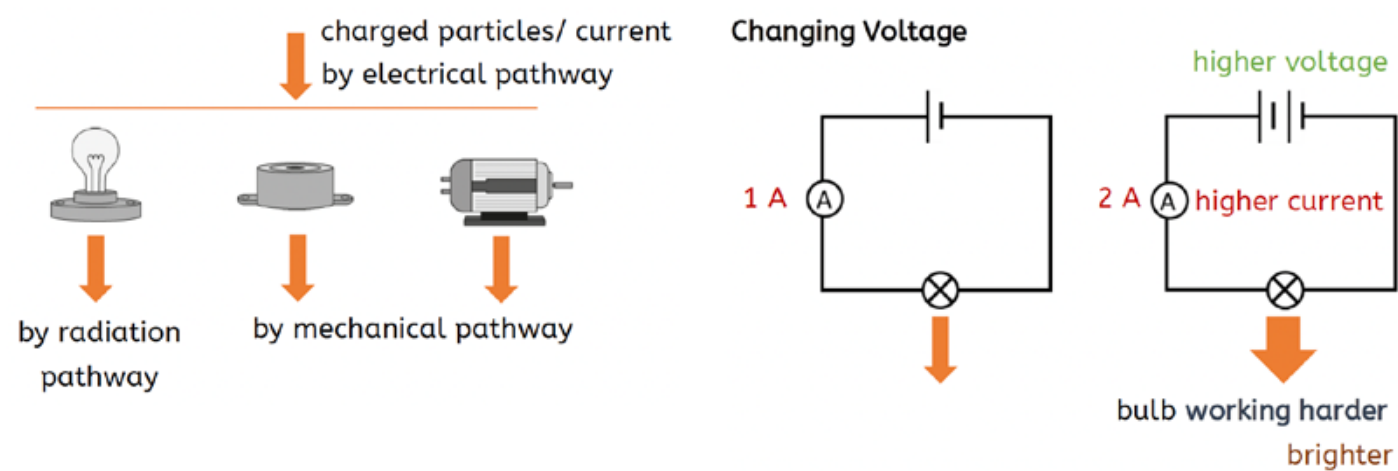
increasing number
of devices

Changing Number of Components



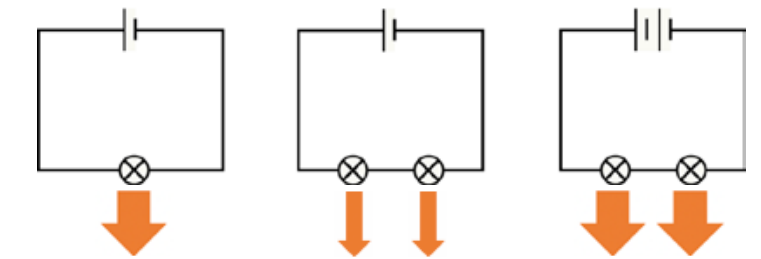
Increase voltage:
 • though harder to push current
 • battery **pushes harder**
 • **increases current again**

Energy Transfer in Circuits



Dissipated Energy

Changing Number of Components

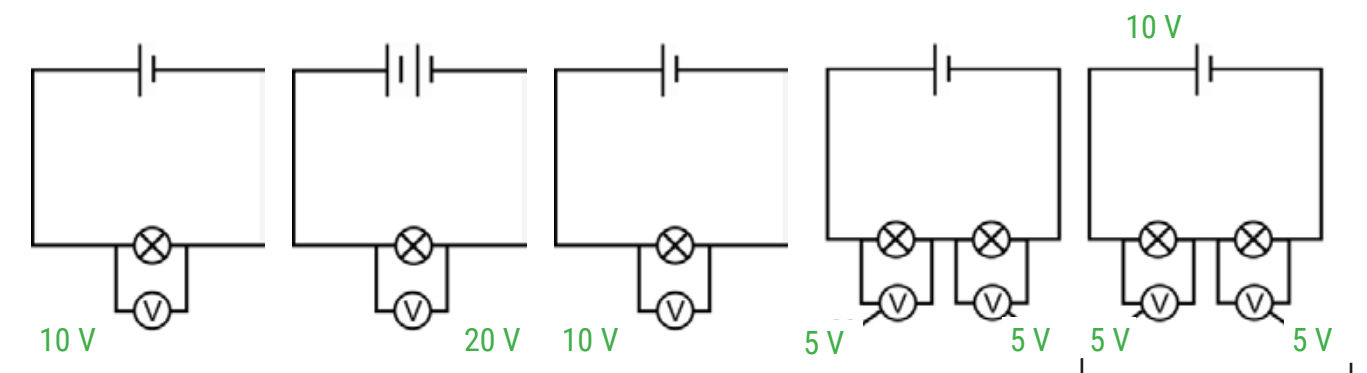


- Harder to push current through two components
- **Current decreases**
- **Less energy transferred** each second
- **More energy** needed to push current with same effect
- **Increase voltage**

Moving charged particles collide with fixed particles
 Energy transfers to particles of circuit
 Fixed particles vibrate more
 Components get **hotter**
 • Thermal store of surroundings increases



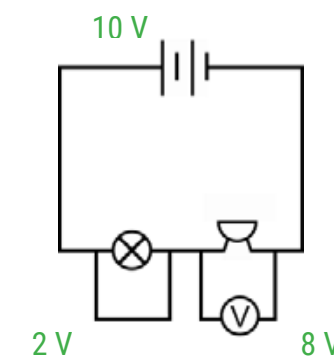
Voltage Across Components



If **supply voltage increases**,
voltage across each bulb
increases

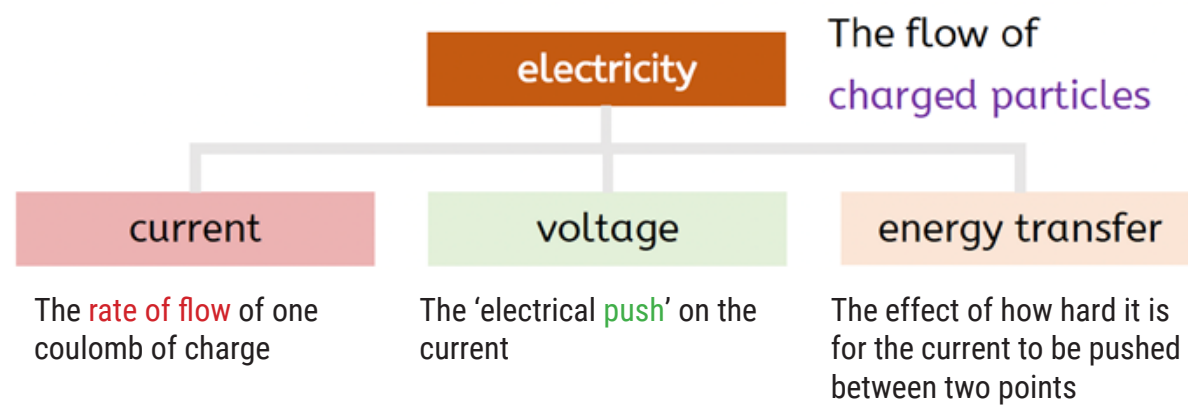
If number of bulbs increases,
voltage across each bulbs
decreases

The **sum** of the **voltages**
across components
equals the **supply**
voltage



Current is same through both components.
Greater voltage across buzzer
More energy transferred at buzzer
 It must be **harder to push current** through buzzer than bulb

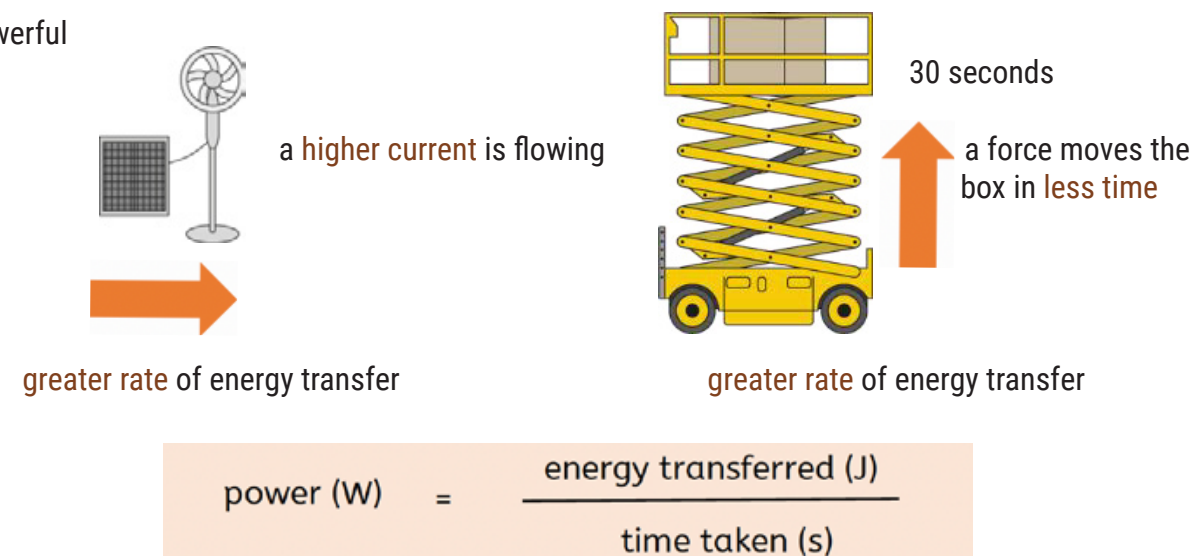
Comparing Terms



Power

- Rate of energy transfer by an object, measured in watts (W)

More Powerful

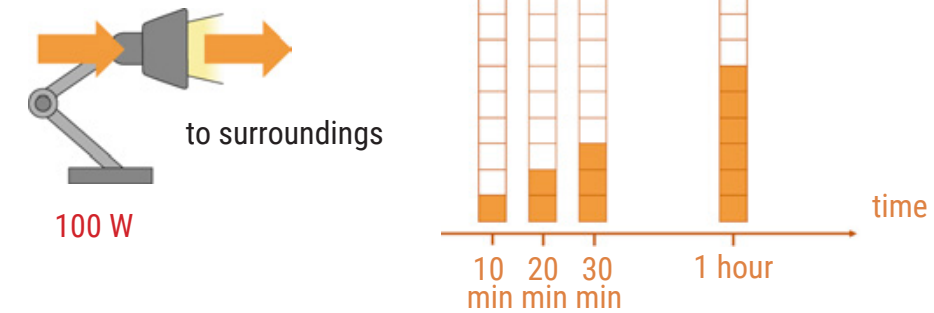


Domestic Appliances

- Work faster, work harder or go further
- Appliances that heat need to be most powerful



Working Over Time
From current



Costs of Electricity

Electricity companies supply households



- Households are charged:
- for the number of domestic electrical units supplied
 - a standing charge

$$\text{cost (p)} = \text{number of units (kWh)} \times \text{price per unit (p)}$$

Air Fryer
Model: AF100UK JM1
220-240V ~ 50-60Hz **1550W**

One unit = one kWh

$$\text{energy supplied (kWh)} = \text{power (kW)} \times \text{time (h)}$$

- If power is in watts, it is converted to kilowatts
- If time used for is in seconds, it is converted to hours

Sources of Electricity

- Electricity is a secondary source of energy
- The UK electricity supplies originate from primary sources



fossil fuels
(coal, oil and
natural gas)



nuclear
fuel



renewables
(wind, solar etc.)

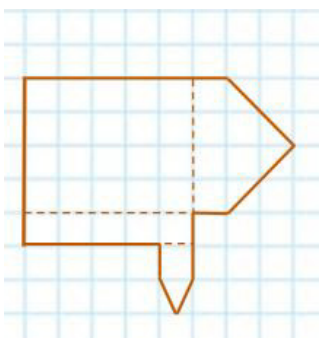
Raw Resources

Sources of Electricity

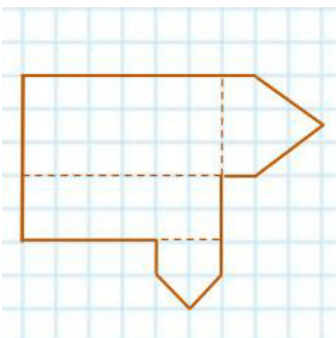
- There are disadvantages to using any source
- Using less electricity (or any energy source) saves money and is better for the environment

Efficiency

More efficient



Less efficient



less energy
transferred usefully

larger proportion wasted

More efficient appliances cost less and cause less environmental damage - only if they are not used more.

Validity

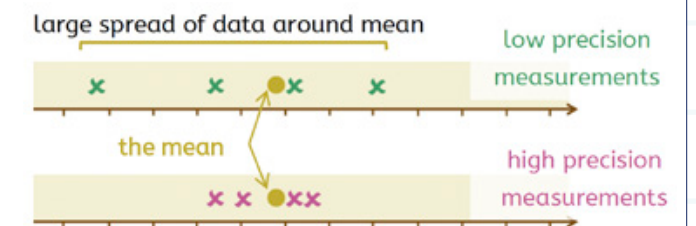
valid data

- with low measurement error
- that is accurate
- that is precise
- that is repeatable
- that is reproducible

Represents the real situation
and is trustworthy

Precision

Measurements are precise if there is little spread around the mean



Developing the Method

Researchers plan to collect valid data:

- select apparatus and techniques known to give accurate and precise data
- measure over appropriate range, with systematic intervals
- often trial experiments to finalise the method

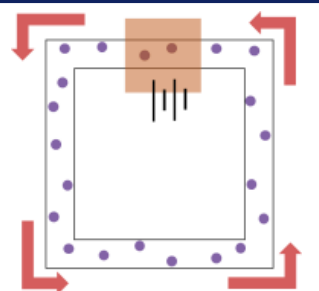
Interpreting Data

Researchers ensure all data is included in their report before publication:

- Collected data, including control variable data
- Processed data, for example, means and calculated results

Electric Circuit Model

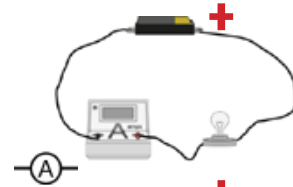
- Charged particles are all part of the circuit; no charged particles are lost from it
- The energy source provides an 'electrical push' on the nearby charged particles
- Their movement affects others and so on
- All charged particles start to move at the same time, drifting at the same rate, in the same direction



Selecting Apparatus and Techniques

Measuring Current

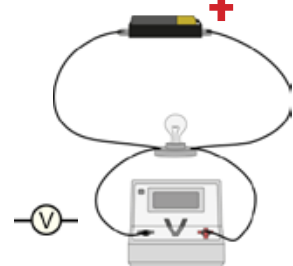
An **ammeter** measures the size of the **electric current** flowing in a part of a circuit. Connect **in series** to components.



Measuring Current

A **voltmeter** measures the **voltage**, the **push** exerted **on the current** to **transfer energy to the component**.

Connect **across** the two contact points of a component.



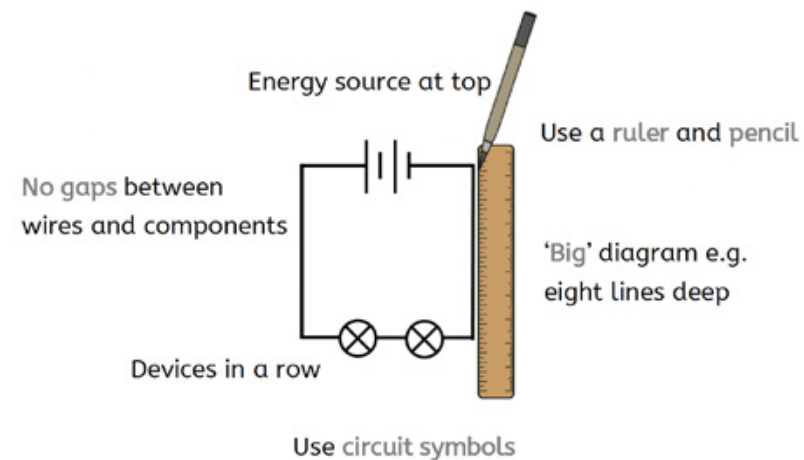
Circuit Set-Up

Series circuits are set up, so that there is

- A single, complete conducting loop
- With one component following another

Circuit Diagrams

- Represent real circuits.
- Simplify connections between components.



Applications of Science on Industry

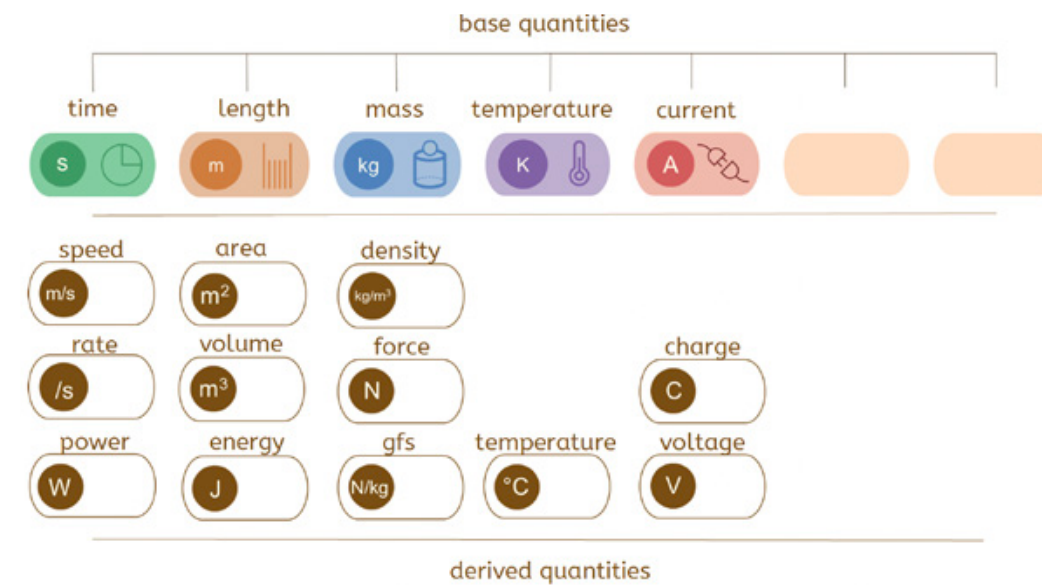
Mechanical engineers use scientific knowledge to design solutions to our energy needs:

Electrified Transport

- Cars
- Buses
- Trains
- Trams
- Lorries

Less air pollution
 Less greenhouse gases
 More demand for electricity
 More demand for (new) raw materials

Managing Quantities



Converting Quantities

$$1000 \text{ W} = 1 \text{ kW}$$

$$\div 1000$$

$$60 \text{ min} = 1 \text{ h}$$

$$\div 60$$

Questions

1. What is a circuit?
2. What is an energy source in a circuit?
3. What is electric current?
4. What is the unit of current?
5. What is the equation for current?
6. What is the direction of current?
7. What is voltage?
8. What is the effect of increasing voltage?
9. What is the effect of adding more components?
10. What is resistance?

Questions

11. What happens when current increases in a bulb?
12. What types of energy can electrical energy transfer into?
13. What happens when a battery runs down?
14. What is power?
15. What is the unit of power?
16. What is the equation for calculating power?
17. What is efficiency?
18. What is dissipated energy?
19. Which instrument measures electric current?
20. Which instrument measures voltage?

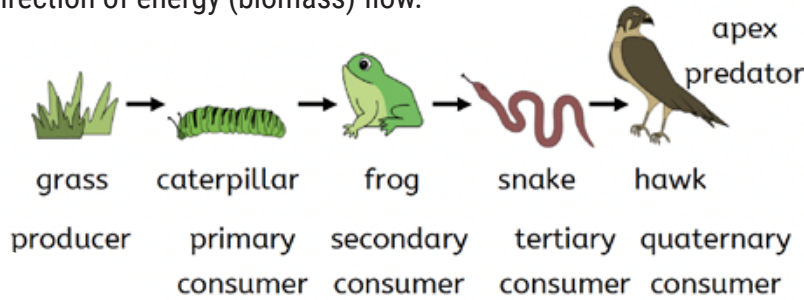
Interdependence

Key term	Definition
Population	A group of organisms of the same species living in an area
Community	A group of different populations living in the
Ecosystem	A community of living organisms interacting with each other and their non-living surroundings (e.g. soil, rocks, water, air, light)

Feeding relationships are shown in food chain diagrams. The trophic level is the position of an organism in a **food chain**. Food chains always start with a **producer** and end with a **consumer**.

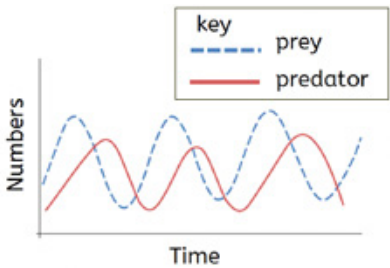
Biomass is the dry mass of one or more organisms. It is transferred through feeding relationships.

Arrows indicate the direction of energy (biomass) flow.



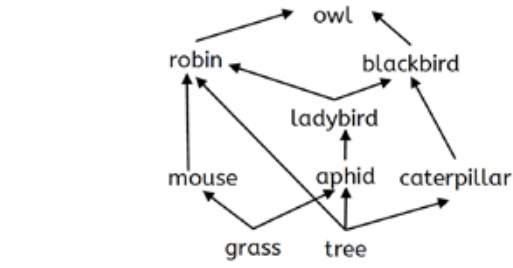
The size of a population is the number of organisms of one species living in a particular area and changes due to births, deaths and migration. These processes are affected by factors such as new predators, disease, seasonal changes, natural disasters and human activities like habitat destruction or conservation.

All species in an ecosystem are interdependent. They depend on each other for resources like food, shelter, oxygen and minerals. Changes in one population affects others.



Predator and prey populations are interdependent: more prey means predator numbers rise, but as predators increase, prey numbers fall, causing predator numbers to drop later.

- This cycle, with a time lag between peaks, helps maintain a stable community where populations stay relatively constant.

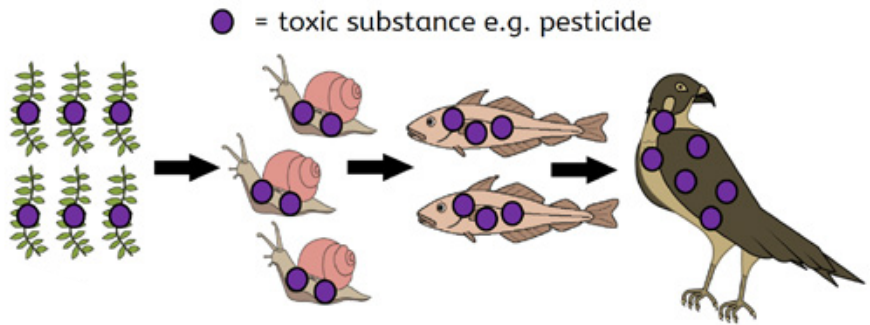


Food webs show interconnected food chains and energy transfer, giving a more realistic picture of feeding relationships. Changes in one population can have impacts throughout the food web, including indirect impacts through competition or shared resources. Human activities

Bioaccumulation

- **Fertilisers** supply minerals like nitrates and phosphates to help plants grow and boost food production.
- **Fertilisers** can reduce minerals in soils and pollute water, causing algae to overgrow on the top of the water and block sunlight. This kills producers and disrupts food chains.
- **Pesticides** kill pests to protect crops. **Herbicides** kill producer pests and **insecticides** kill consumer pests.
- Pesticides can also harm pollinators, beneficial insects, and other nearby plants. This reduces producers and pollinators, disrupting food chains and ecosystems, and can even lower crop production in the long term.

Bioaccumulation happens when **toxic substances**, like pesticides, build up in organisms because they cannot be broken down. These toxic substances pass along food chains and become more concentrated at each trophic level, which can harm or kill top predators.

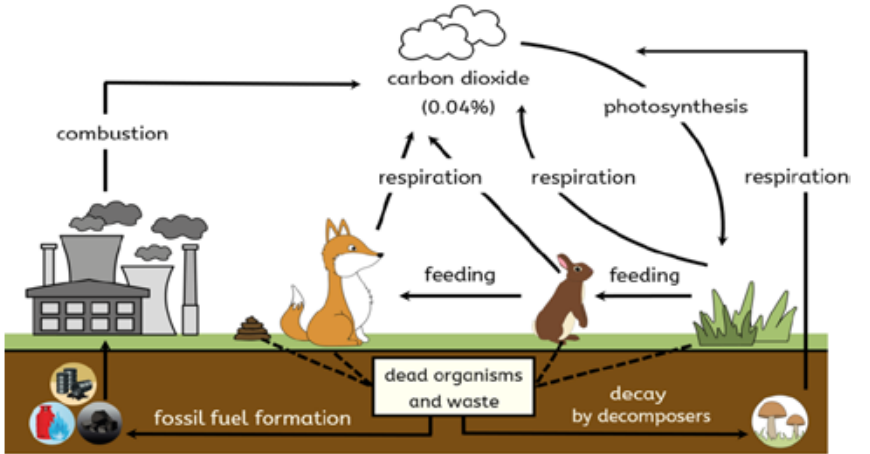


Materials Cycling

- Decay is the breakdown of dead organisms and waste by decomposers.
- Decay recycles nutrients by releasing them back into the ground, so that it can be used for new plant growth and to support food chains.
- Decay also returns carbon dioxide to the atmosphere for photosynthesis, cleans the environment, and helps with fossil formation by breaking down the soft tissues of a dead organism and leaving behind hard parts.

- The **ideal conditions** for decay are:
1. **Plenty of oxygen**, so that decomposers can respire.
 2. **Warm temperatures** so that decomposers are more active.
 3. **Moisture** to allow chemical reactions to take place.

The **carbon cycle** is a closed system that continuously recycles carbon between the atmosphere, living organisms and the Earth.



Classification

- Classification is the sorting of items into groups based on shared characteristics. The scientific practice of classifying organisms is called taxonomy.
- Organisms can be classified based on observable physical features and microscopic characteristics such as cell structure.
- Carl Linnaeus developed the modern classification system. Organisms are grouped into kingdom, phylum, class, order, family, genus and species.
- Kingdom is the largest group, with many organisms.
- Species is the smallest group, with just one type of organism.
- Classification helps scientists identify and name organisms accurately, track species for conservation, predict characteristics, understand relationships and study evolution.



An adaptation is a characteristic that allows an organism to compete, survive and reproduce in its environment. Adaptations can be:

- Structural (physical features like thick fur, sharp claws and spines on plants)
- Behavioural (actions like migration, huddling for warmth and growing towards light)
- Functional (internal processes like producing venom, conserving water and slowing heart rate during hibernation).

Competition and Adaptation

- Competition is the struggle between organisms for the same limited resource. The more similar the needs, the more intense the competition.
- Animals compete for food, water, shelter and mates.
- Plants compete for sunlight, water, minerals, space, pollinators and seed dispersers.
- Interspecific competition occurs between different species and intraspecific competition occurs within the same species.



Polar bear

- White coat → camouflage
- Large paws → spread weight over ice
- Thick layer of fat → insulation to keep warm
- Thick coat → insulation to keep warm
- Small ears → small surface area
- Small tail → small surface area
- Sharp claws → kill prey and grip ice
- Sharp teeth → kill and eat prey



Camel

- Hump with fat → stay cool (fat in one place)
- Sandy colour → camouflage
- Large feet → spread weight over sand
- Long eyelashes → keep sand out
- Minimal sweat/urine → conserve water



Cactus

- Shallow long roots → absorb water quickly
- Waxy skin → minimise water loss
- Thick fleshy stems → store water
- Spines instead of leaves → reduce water loss
- Spines → protection from being eaten

Natural Selection, Evolution and Extinction

Individuals within a species show genetic variation because offspring inherit a random mix of genes from their parents. This causes differences in characteristics, some of which give an advantage in competition and make individuals better adapted to survive and reproduce.

- Natural selection is a process by which organisms that are better adapted to their environment (due to genetic variation) are more likely to survive, reproduce and pass on their genes to their offspring.
- Over many generations, these beneficial characteristics become more common in the population.
- This idea was proposed by Charles Darwin.
- The process of natural selection involves the following steps:

1. **Variation** Individuals within a species have different characteristics due to random genetic variation.
2. **Advantage** Some characteristics can give individuals an advantage.
3. **Competition** This advantage makes them more likely to compete successfully.
4. **Survival** This makes them more likely to survive.
5. **Reproduction** They are more likely to reproduce and have offspring.
6. **Inheritance** They are more likely to pass on their genes to their offspring.
Over generations these characteristics become more common.

Evolution

- Evolution is the process in which the characteristics of species change over many generations, sometimes leading to new species.
- Darwin's theory of natural selection explains how evolution occurs: organisms better adapted to their environment survive, reproduce and pass on their genes.
- Over billions of years, life evolved from simple ancestors into more complex organisms.
- Fossil evidence supports this scientific theory, showing older rocks contain simple organisms and newer rocks contain more complex ones, despite gaps in the fossil record.

Extinction

- Extinction is the complete loss of all members of a species because it could not adapt to its environment.
- Causes of extinction include climate change, habitat destruction, pollution, new diseases, new predators, new competitors and natural disasters.
- Human activities like deforestation, overhunting, introducing species and climate change make extinction more likely.
- Species at risk of extinction are called endangered.

Datalogging and Technology in Science

Researchers use GPS and datalogging technology to monitor populations, studying predator-prey interactions, behaviour and habitats. This supports conservation efforts.

Questions

1. What is a population?

2. What is a community?

3. What is an ecosystem?

4. What is a producer?

5. What is a consumer?

6. What is a food chain?

7. What is a food web?

8. What is biomass?

9. What is interdependence?

10. What is a predator?

Questions

11. What is prey?

12. What is bioaccumulation?

13. What is decay?

14. What are decomposers?

15. What factors affect population size?

16. What is competition?

17. What is an adaptation?

18. What is natural selection?

19. What is evolution?

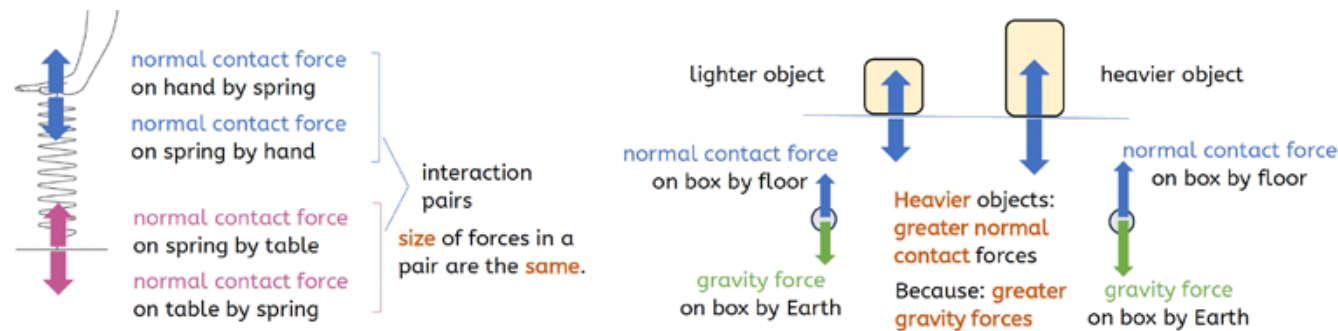
20. What is extinction?

Support Forces

Objects supporting another in **static equilibrium** experience distortion.

Compression process of squashing, causing contraction.
 Most solid objects can experience some compression, even if it cannot be seen.

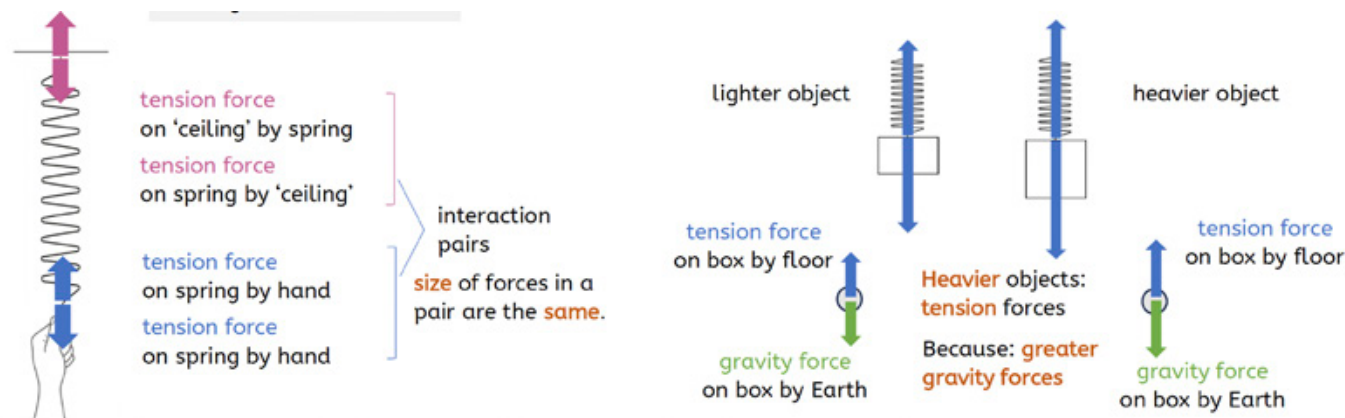
static equilibrium:
 unmoving and having balanced
 forces acting on it



- When compression is happening, normal contact forces are acting.
- Flexible connectors cannot be compressed, e.g. ropes.

Tension process of stretching, causing extension.

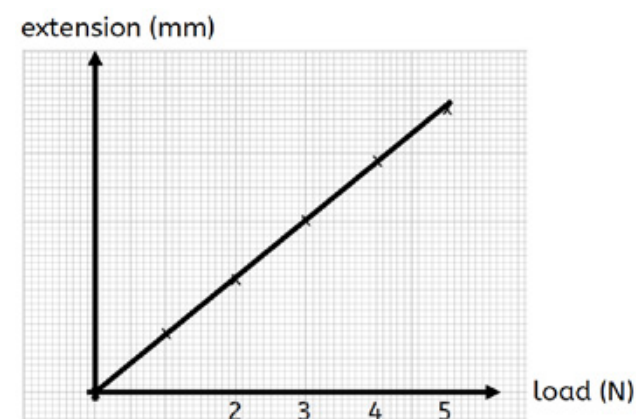
All solid objects can experience some tension, even if it cannot be seen.



- When tension is happening, tension forces are acting.

Force-extension Relationship

- As load increases, extension increases in **proportion**.
- This relationship is known as **Hooke's Law**.
- When objects extend under tension and return to their original shape and size, they are behaving **elastically**.
- Every material has its limits: **elastic limit**.
- Above this limit: permanent change to shape and size; no longer elastic



Work

Mechanical Work

Doing work is a **process** which results in energy transfer.

Mechanical work is done when a **force** is exerted and moves an object through a **distance**.

- Greater force on object, greater work done.
- Greater distance moved, greater work done.

$$\text{work done (J)} = \text{force (N)} \times \text{distance moved (m)}$$

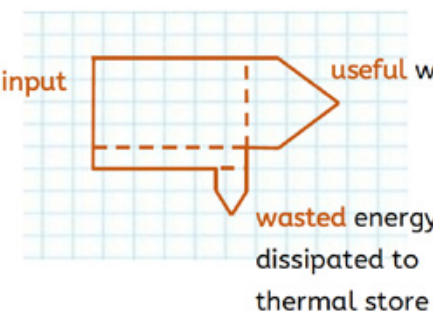
During mechanical work,
 energy can be transferred to
 a variety of stores.



by **mechanical** pathway

Efficiency the proportion of useful energy transfer by an object

total work input



$$\text{efficiency} = \frac{\text{useful work output (J)}}{\text{total work input (J)}}$$

Turning Effects

The turning effect is how strongly a force makes something turn around a pivot.

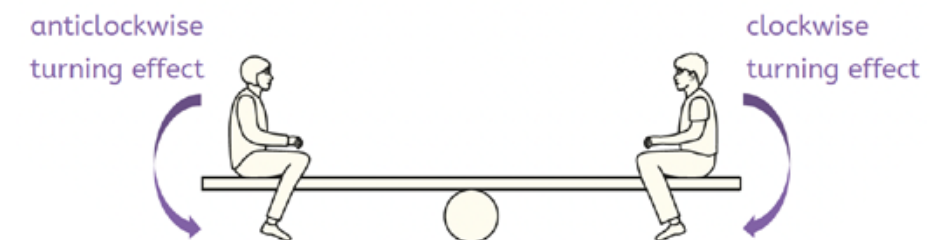
- Greater force on object, greater turning effect.
- Greater distance of force from pivot, greater turning effect.

Objects turn if they have:

- a pivot to turn around
- a force acting a distance from the pivot.

$$\text{turning effect (Nm)} = \text{force (N)} \times \text{distance from pivot (m)}$$

Rotational Equilibrium unmoving and having balanced turning effects acting on it; no overall turning effect



In rotational equilibrium

$$\text{total clockwise turning effect} = \text{total anticlockwise turning effect}$$

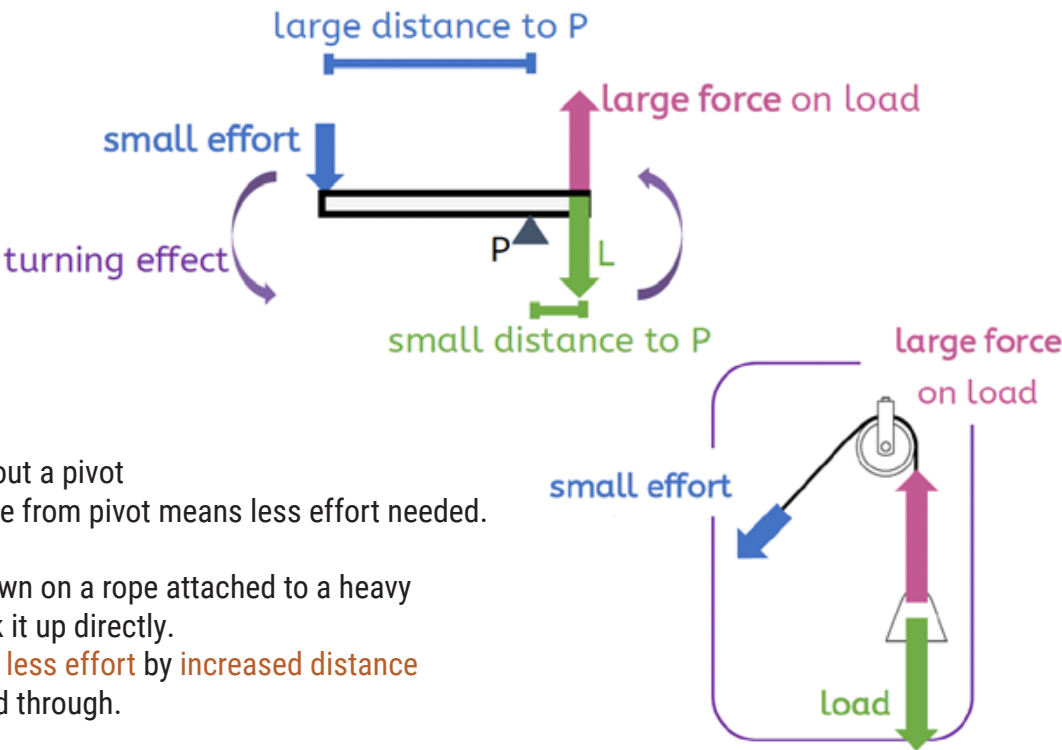
If turning effects are not balanced, object tips in direction of the larger turning effect.

Simple Machines

Include levers, pullies and gears.

Effort force is applied (input force), results in an output force (with a **different size** or **direction**).

Levers

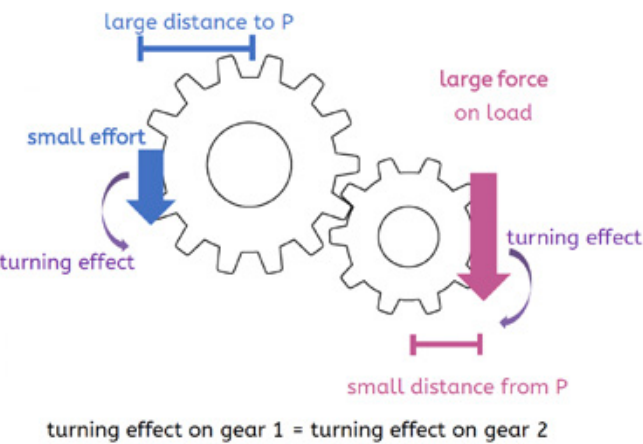


Pullies

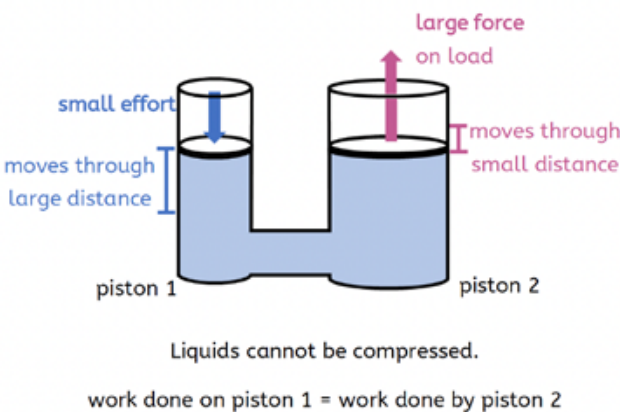
- Lever turns about a pivot
- Longer distance from pivot means less effort needed.

Easier to pull down on a rope attached to a heavy load than to pick it up directly.
Several pullies = **less effort** by **increased distance** the load is pulled through.

Gears Toothed wheels (cogs) that fit together and turn each other.



Hydraulic Machines A more advanced machine, putting an enclosed liquid under pressure.



All machines are not **100 % efficient**.
The useful work done (output) is always less than the total work done (input).
Wasted energy is transferred to the thermal store of the surroundings.
Effort moves **larger distance** and **more friction** against the applied force.

Seeking Evidence

Data which has been shown to be valid



- Researchers base claims only on the evidence.
- Leads to greater confidence in their claims.

Valid data represents the real situation and is trustworthy

Critically Thinking about the Research

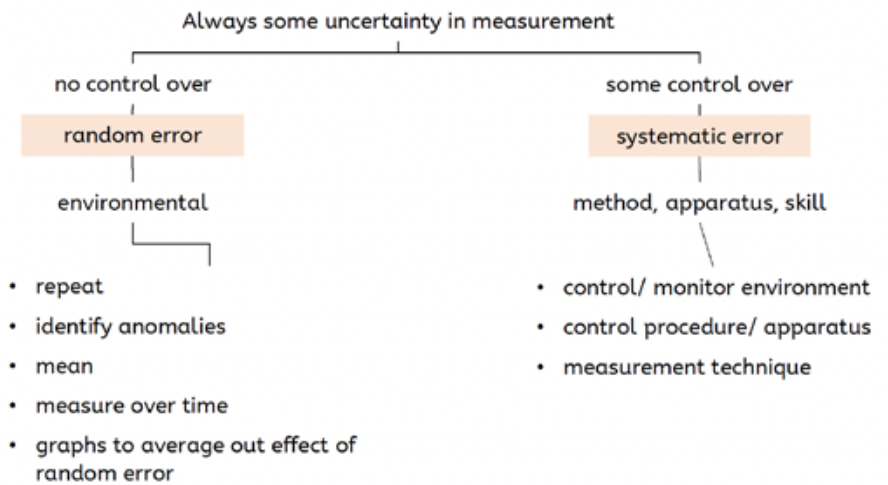
Method Validity	Data Validity	Interpretation and Conclusion Validity	Limitations of Findings
• Control of variables (IV, DV, CV), range, measurement intervals • Method Design (apparatus, resolution, technique, skill)	• Accuracy • Precision • Repeatability • Reproducibility	• Data processing • Charts or graphs • Described patterns • Explained using scientific knowledge	• Unexpected data, limitations and bias • Further research (to improve accuracy and precision, or scope)

Reflecting on the Data

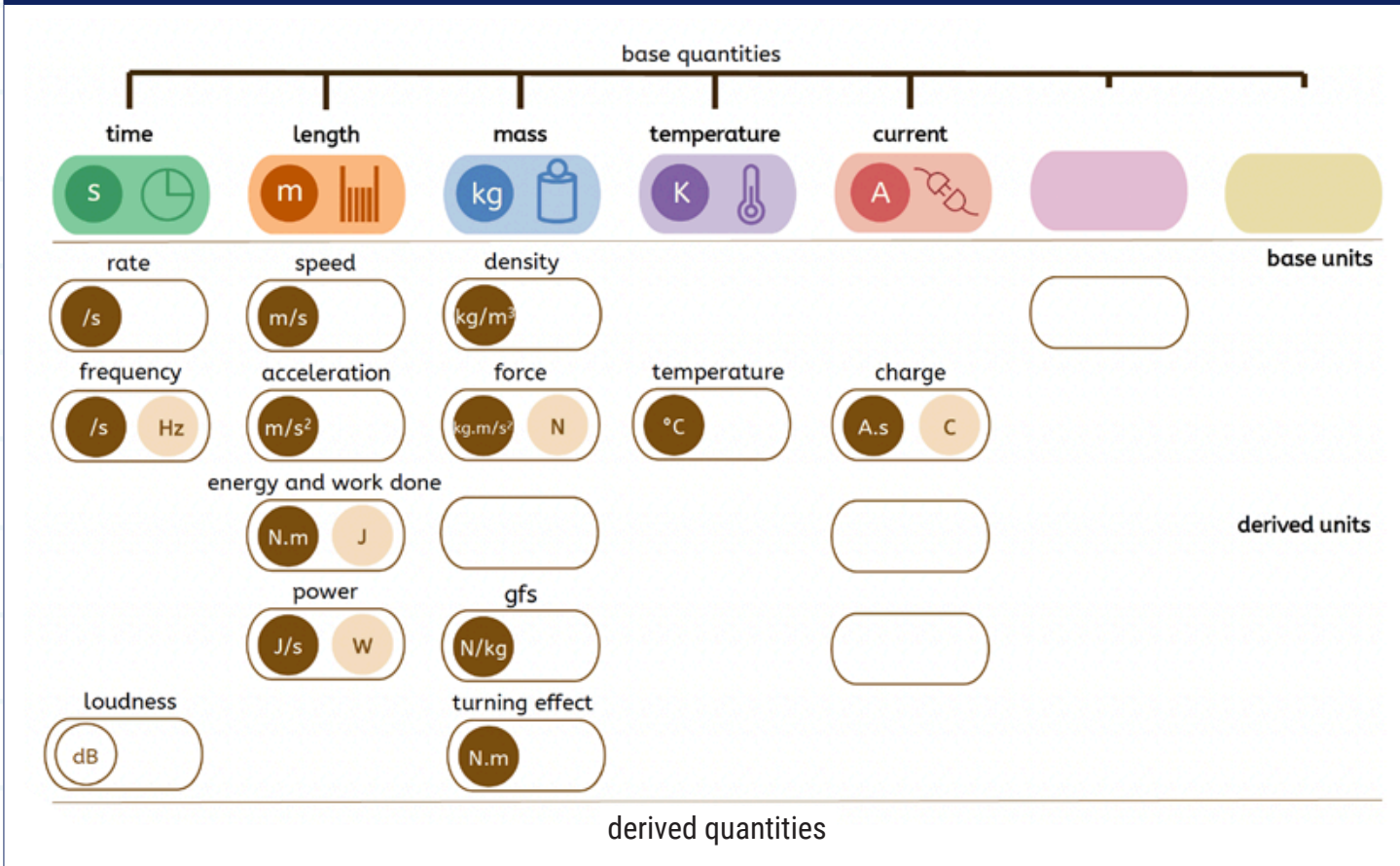
- Researchers check if data is within expected boundaries, e.g. when weighing a person, the measurement is the same as for a mouse.
- Researchers consider the measurement bias for an experiment, e.g. the force measured to pull a brick up a ramp could be 0.2 N more or less than it should be as it stops and starts.

Measurement Error

The difference between the measured value and the true value of the quantity being measured



Measurement Values



Questions

1. What is compression?
2. What is tension?
3. What is static equilibrium?
4. What is Hooke’s Law?
5. What is elastic behaviour?
6. What is the elastic limit?
7. What is work done?
8. What is the unit of work?
9. What is efficiency?
10. What is the turning effect of a force?

Questions

11. What is the equation for moments?
12. What is a pivot?
13. What is rotational equilibrium?
14. What is a lever?
15. What is the effect of using a longer lever?
16. What is the function of a pulley?
17. What is the function of gears?
18. Where does wasted energy go?
19. What factors affect work done?
20. When work is done on an object what is transferred to the object?

Acids, Bases, and Alkalis

Term	Definition	Properties
Acid	a family of chemicals that react in similar ways and have a pH less than 7	• some are edible and found in foods (e.g. citrus fruits) but lab acids may be harmful • taste sour (never tasted in lab) • can be corrosive and cause chemical burns • concentrated acids are more corrosive
Base	a family of chemicals that react in similar ways and have a pH greater than 7	• taste bitter (never tasted in lab) • some are soluble in water (called alkalis)
Alkali	a soluble base; has a pH greater than 7	• many cleaning products are alkalis e.g. bleach • taste bitter (never tasted in lab) • can feel slippery or soapy • can be corrosive and cause chemical burns • concentrated alkalis are more corrosive

All alkalis are bases, but not all bases are alkalis because some bases are insoluble

Hazard signs to be aware of when dealing with acids and alkalis:



corrosive



moderate health hazard (irritant)

Other chemical hazard symbols:



oxidising



flammable



serious health hazard



toxic



environmental hazard

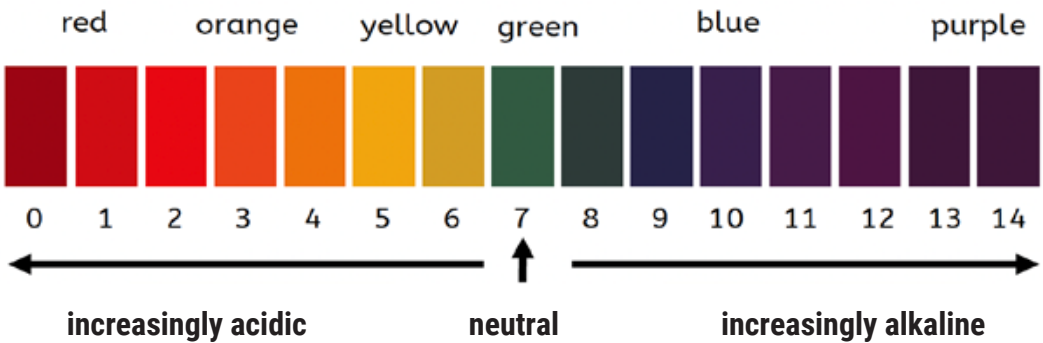
Risks of Working With Acids and Alkalis	Control Measures
Splashes of acids or alkalis can damage eyes.	Wear eye protection.
People may not know how to work with acids and alkalis.	Educate people how to work with acids and alkalis.
Strong acid or alkali fumes can irritate the lungs.	Use in a well-ventilated area.
Some acids and alkalis can react with other chemicals.	Store away from reactive chemicals, in labelled, corrosion-resistant containers.
Acids or alkali spills can harm wildlife or the environment.	Dispose of acids and alkalis carefully and follow instructions.

Indicators and pH Scale

- Solutions can be acidic, alkaline or neutral.
- Acidic solutions form when acids dissolve in water.
- Alkaline solutions form when alkalis dissolve in water.
- Solutions that are neither acidic nor alkaline are neutral.
- Pure water is neutral.

An indicator changes colour to show whether a solution is acidic, neutral or alkaline. Many flowers, fruits and vegetables (plants) contain chemicals called pigments that change colour in acids or alkalis. These can be extracted and made into a solution that acts as a simple indicator.

- Universal indicator can tell us how acidic or how alkaline a solution is.
- This is measured using the pH scale, which runs from pH 0 to pH 14.
- Neutral solutions are exactly pH 7.
- Acidic solutions have a pH less than 7. The closer to pH 0, the more acidic a solution is.
- Alkaline solutions have a pH more than 7. The closer to pH 14, the more alkaline a solution is.



	Acidic Solution	Alkaline Solution	Neutral Solution
Blue litmus	turns red	stays blue	stays blue
Red litmus	stays red	turns blue	stays red

- Simple indicators like litmus paper do not tell you the pH of an acid or alkali - only if it is acid or alkali.
- They can't tell how acidic or how alkaline a solution is.

A pH meter is an electric device which measures pH and provides a specific pH value. It provides a more accurate and precise measurement of pH, rather than a colour that is then compared to a reference.



Acids and Metals

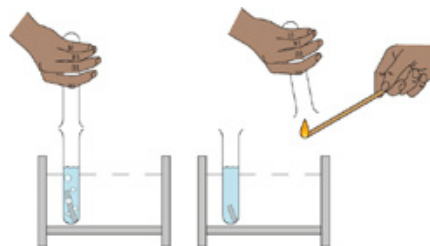
Reacting Metals With Acids metal + acid → metal salt + hydrogen
e.g. zinc + hydrochloric acid → zinc chloride + hydrogen

- When an acid reacts with a metal, bubbles of hydrogen gas can be observed.
- The metal will get smaller as it reacts with the acid (corrosion of the metal).
- The reaction is usually exothermic, indicated by an increase in temperature.

- first name of salt = metal
- surname of salt = from the name of the acid

Name of Acid	Chemical Formula	Type of Salt
hydrochloric acid	HCL	chloride
sulfuric acid	H ₂ SO ₄	sulfate
nitric acid	HNO ₃	nitrate

The presence of hydrogen can be tested for using a lit splint.
Hold the lit splint to the gas and listen for a squeaky pop sound.
This indicates the presence of hydrogen.



Neutralisation

The pH of a solution can be changed by adding an acid or base/ alkali.

- Adding an acid to water will decrease the pH from 7.
- Adding a base/ alkali to water will increase the pH from 7.

- When acids and bases or alkalis are mixed in the correct quantities, a neutral solution is made.
- When bases/ alkalis are added to acids, the pH increases, becoming less acidic and more neutral.
- When acids are added to bases, the pH decreases, becoming less alkaline and more neutral.

When an acid reacts with an alkali (or base) in the correct quantities, a neutral salt solution is formed. This is called **neutralisation**.

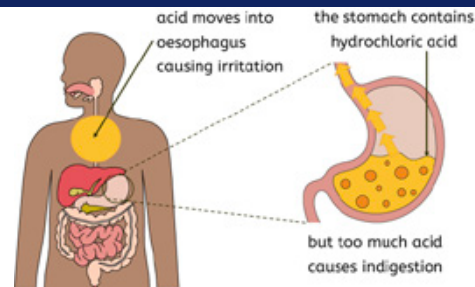
acid + alkali → salt + water

e.g. sodium + hydrochloric → sodium chloride + water
hydroxide acid

The salt formed is named after the metal in the alkali (base) and the name of the acid in the reaction.

Neutralisation (Continued)

Indigestion is caused by excess hydrochloric acid in the stomach. The acid moves into the oesophagus causing irritation and a burning sensation. Indigestion remedies, called antacids, are bases that alleviate symptoms by reacting with stomach acid and neutralise it. It is possible to test different antacids by reacting them with acid to see which one is the most effective at neutralising it.



If a different group or a different method gives the same results, the data is reproducible. This shows that when compared to data from other enquiries, the results are still consistent and therefore trustworthy.

Metal Oxides and Non-Metal Oxides

- A metal oxide is a compound that consists of metal atoms chemically joined to oxygen atoms.
- A non-metal oxide is a compound that consists of non-metal atoms chemically joined to oxygen atoms.

Metal Oxides	Non-Metal Oxides
usually solids at room temperature	often gases at room temperature e.g. sulfur dioxide
act as bases, with a pH greater than 7	most are soluble in water and react with water to form acidic solutions e.g. carbonic acid
some react with water to form an alkali (e.g. sodium hydroxide)	

- Metal oxides are bases and can react with acids to neutralise them.
- The general equation for the neutralisation reaction between a metal oxide and acid is:

acid + metal oxide → salt + water

e.g. hydrochloric + Copper → copper chloride + water
acid oxide

The salt formed is named after the metal in the metal oxide (base) and the name of the acid in the reaction.

Acid Rain

- All rain is naturally slightly acidic (around pH 5.5) because carbon dioxide dissolves in it.
- Acid rain has a pH below 5 and is caused by pollutant gases such as:
 - sulfur dioxide - released when fossil fuels that contain sulfur are burned.
 - nitrogen oxides - form when nitrogen and oxygen in the air react at high temperatures in vehicle engines and power stations
- These gases react with water vapour, oxygen, and other chemicals to form sulfuric acid and nitric acid, which dissolve in rain.
- Acid rain reacts with metals (causing corrosion) and rocks (chemical weathering), damaging buildings, statues and metal structures. It makes lakes and rivers more acidic, which can kill fish and other aquatic organisms. It damages the waxy cuticle of leaves, reducing photosynthesis, and removes minerals from soil, slowing plant growth.

Pollutants travel. Acid rain can fall far from where pollutants were released.

Questions

1. What is an acid?
2. What is a base?
3. What is an alkali?
4. What is the range of the pH scale?
5. What is a neutral pH?
6. What is the purpose of an indicator?
7. What does a universal indicator show?
8. What happens to blue litmus paper in acid?
9. What happens to red litmus paper in an alkali?
10. What are the products of a metal reacting with an acid?

Questions

11. How do you test for hydrogen gas?
12. What is neutralisation?
13. What is the pH of a neutralised solution?
14. What type of oxide is a metal oxide?
15. What type of oxide is a non-metal oxide?
16. What is acid rain?
17. What causes acid rain?
18. What is one effect of acid rain?
19. What are antacids used for?
20. What causes corrosion in this context?

Diet

Components of a healthy, balanced diet.

Nutrient	Examples of foods	Function
carbohydrates	Simple: sugar, fruits, sweet foods Complex: bread ,rice, pasta, potatoes	Energy is released quickly from simple carbohydrates (sugars) and released more slowly from complex carbohydrates (starches). • provides energy
lipids	whole milk, butter, vegetable oils, nuts and seeds	• provides energy • provides insulation for the body • helps to build cell membranes
proteins	eggs, fish, meat, beans	• growth and repair of cells and tissues
vitamins	fruit and vegetables	• cell and body processes and for general health
minerals	fruit and vegetables	• make red blood cells, bones and teeth
dietary fibre	wholegrains, vegetables, fruit	• adds bulk to food to help it pass through the digestive system easily
water	water and other water-based drinks	• chemical reactions in cells (in cytoplasm) • maintain the level of water in the blood

Food labels provide information on the mass of each nutrient in the food and the energy the food provides.

- Energy needs vary by age, sex, muscle-to-fat ratio, exercise, external conditions, pregnancy and genetics.
- To maintain body mass, energy intake must equal energy use.
- Taking in more energy than is used leads to increase in body mass.
- Taking in less energy than is used leads to decrease in body mass.

Time to burn calories depends on the activity's energy expenditure rate
e.g. Energy of meal = 762 kcal
Activity: Walking (180 kcal/hr)
Time to burn one kcal: $60 \div 180 = 0.33333$ min

Multiply this value by the meal's energy:
 $0.33333 \times 762 = 253.9$ rounded to 254 minutes to burn the energy of the meal.

Nutrition		
Typical values	Per 100g	2 biscuits (38g)
Energy kJ	1514	136
Energy kcal	358	575
Fat	2.0g	0.8g
Carbohydrate	68g	25.8g
of which sugars	4.4g	1.7g

Food labels usually give the nutrition per 100 g or 100 ml. They also show a per-serving value e.g. 2 biscuits (38 g).

Diet (Continued)

A **balanced diet** contains the right energy intake and the correct amounts of necessary nutrients. An **imbalanced diet** contains too much or too little of a particular nutrient and/or energy.

Imbalanced energy intake diseases:
Starvation happens if you take in less energy than you use. Your body mass decreases.
Obesity happens when you take in more energy than you use. Your body mass increases. Diseases linked with obesity include heart disease, type 2 diabetes and arthritis.

Body Mass Index (BMI) values can be used to find out if a person has a healthy weight for their height.

Body mass index (kg/m²) = body mass (kg) ÷ (height)² (m²)

For example, if a person has a mass of 60 kg and a height of 1.65 m:

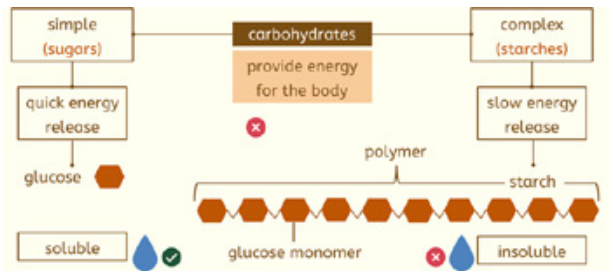
BMI = $60 \text{ kg} \div 1.65 \text{ m}^2$

BMI = 22 kg/m^2

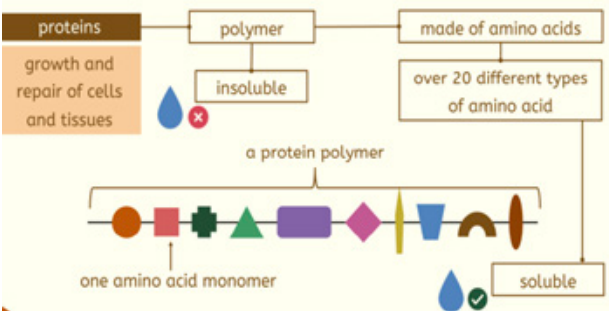
BMI has limitations because it does not show how much of the body is muscle or fat. BMI alone doesn't determine health and it should be used alongside other health information to judge whether someone's weight is healthy.

Biological Molecules

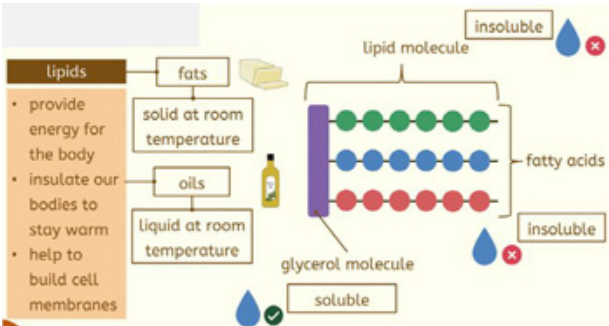
Carbohydrate structure



Protein structure



Lipid structure



Biological Molecules Continued

Chemical food tests		
Nutrient	Chemical test	Positive result
Starch	Iodine solution	Iodine solution turns from orange/brown → blue black
Sugar	Benedict's solution & heat	Benedict's solution turns from: blue → green /yellow, orange, brick red
Fat	Ethanol & shake, then water & shake	Ethanol turns cloudy white
Protein	Biuret reagent	Biuret reagent changes from blue to purple

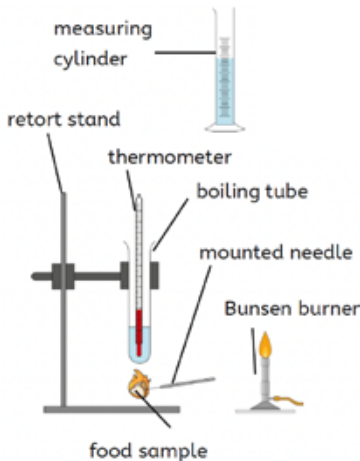
Energy in Food

Different foods store different amounts of energy.
It is possible to carry out an investigation to measure the amount of energy released from different foods by burning them.

When the food is burned under a boiling tube containing water, some energy is transferred from the food's chemical energy store to the thermal energy store of the water, and the water's temperature increases.

The temperature change of the water can be measured.

A large increase in temperature indicates the food contains a lot of energy.



The measured value is usually much lower than the nutritional label value because lots of the energy is dissipated into the thermal store of the surroundings, for example by warming the air and the equipment. This means that only a small amount of the chemical energy from the burning food is transferred to the thermal store of the water.

- Respiration is a chemical reaction that takes place in cells to release the energy in food.
 $\text{glucose} + \text{oxygen} \rightarrow \text{carbon dioxide} + \text{water}$.
- Respiration happens in mitochondria in cells. Glucose (from digested carbohydrates) and oxygen enter the blood and diffuse into cells, where glucose is oxidised to release energy, producing carbon dioxide and water as waste products.

Energy released from food by respiration is used for:

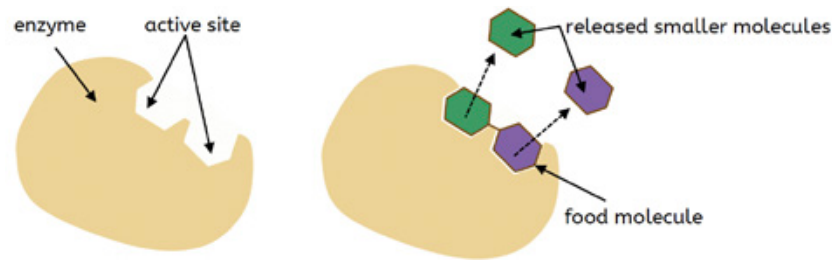
- maintaining body temperature
- muscle contractions
- making new molecules and cells for growth and repair.

Models of respiration can help us visualise the reactants, products and energy release, but every model has limitations because it simplifies what happens in cells.

Digestion and Enzymes

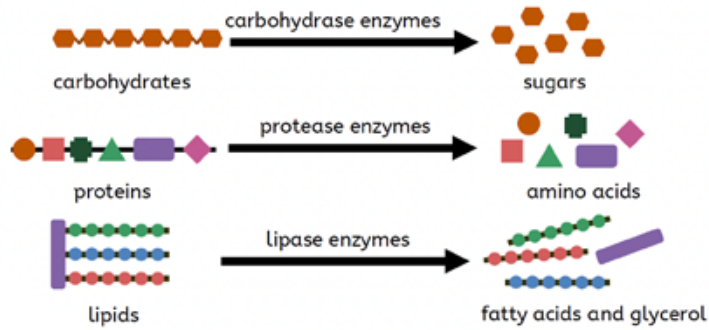
Mechanical digestion breaks food into smaller pieces (chewing in the mouth and churning in the stomach). **Chemical digestion** uses enzymes in saliva, the stomach and the small intestine to break large, insoluble molecules into small, soluble molecules.

Enzymes are biological catalysts: they speed up digestion without being used up, so reactions happen fast enough to keep cells alive.



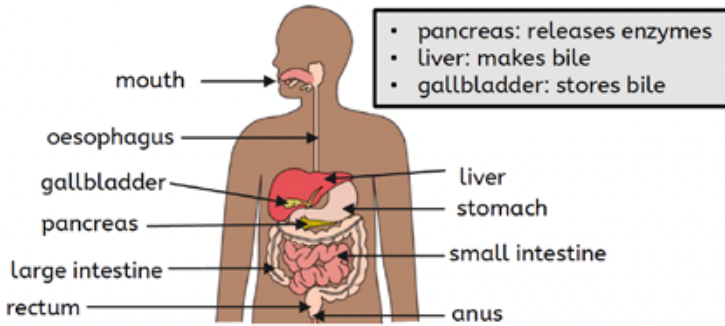
- Diagrams of enzymes are models: they show shape and function, not real size or full complexity (real enzymes are 3D and microscopic).
- The active site is where the food molecule binds.
- Enzymes attach to a large molecule, breaks bonds between smaller molecules making up the large molecule and releases smaller molecules.
- Enzymes are not used up, so they can be reused.

- Enzymes are specific: each enzyme binds only certain molecules because different enzymes have different active site shapes.
- The active site shape matches the molecule it can bind with (so they fit together).

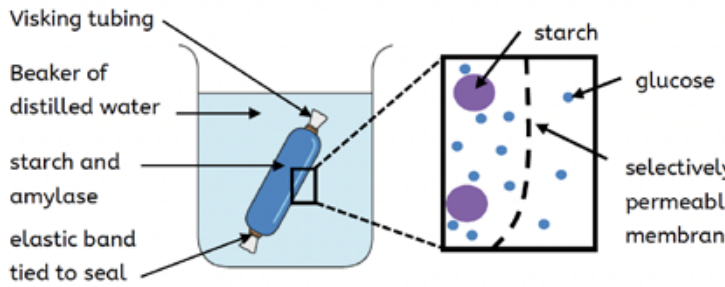


Bile and emulsification

- lipids reach the small intestine as large droplets
- bile emulsifies lipids → smaller droplets
- more surface area → lipase works faster
- emulsification: breaking large lipid droplets into smaller droplets to increase surface area



- Visking tubing models the small intestine wall (selectively permeable).
- Digestion makes molecules small enough for absorption.
- No starch outside tubing → starch molecules are too large to diffuse.
- Sugar outside tubing → sugars are small and soluble and diffuse out.
- This shows that food must be digested into small, soluble molecules before absorption by diffusion into blood.



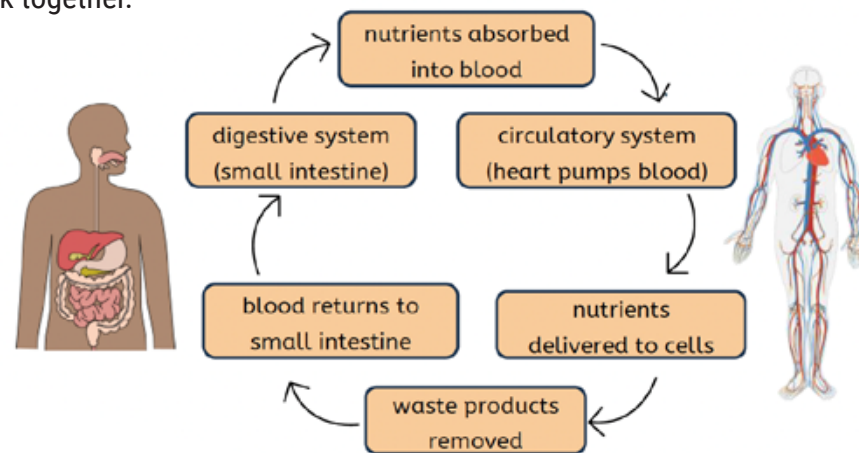
Absorption and Transport of Nutrients

Digestion breaks food into small, soluble nutrients (e.g. glucose, amino acids, fatty acids, glycerol).

- Nutrients are absorbed into the bloodstream from the small intestine.
- Vitamins and minerals are already small enough to be absorbed without digestion.
- Every cell in the body need nutrients to stay alive.
- Nutrients must be transported to cells throughout the body.
- If transport is ineffective → low energy, poor growth/repair, deficiency disease.

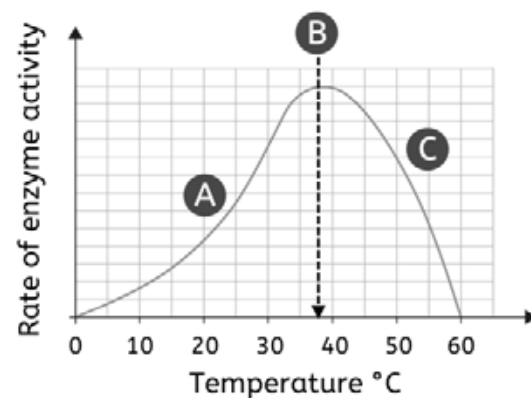
The digestive and circulatory systems work together. Nutrients are absorbed from the small intestine into the blood.

The heart pumps blood to deliver nutrients to cells and remove wastes, so blood is continually replenished with new nutrients.

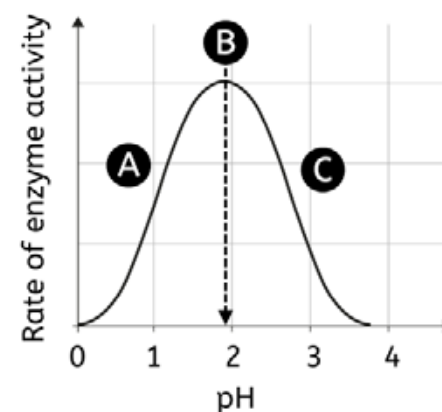


Factors Affecting Enzymes

The optimal temperature and pH is when enzymes work at their fastest rate. Different enzymes have different optimal temperatures and pH, e.g. human body temperature is 37 °C, the average temperature at which the enzymes in the body work fastest.



A - enzyme activity increasing
B - optimal temperature
C - enzyme activity decreases

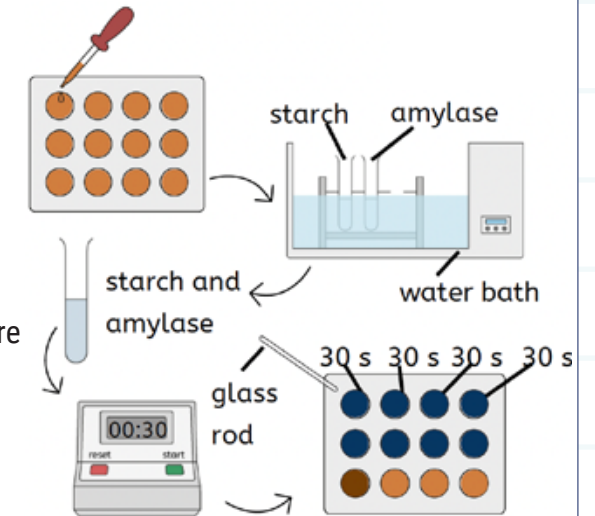


A and C - pH moving away from the optimal pH and enzyme activity decreases
B - optimal pH

Factors Affecting Enzymes (Continued)

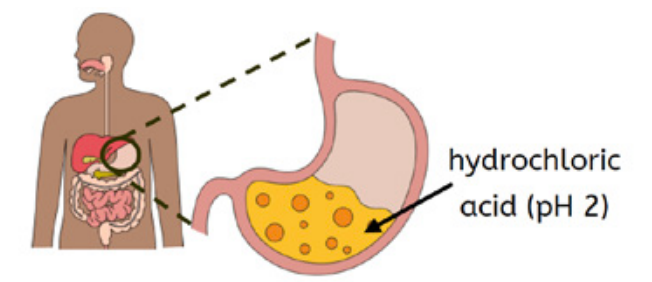
The effect of temperature on the rate of reaction of amylase

1. Place two drops of iodine solution into each well of a spotting tile.
2. Use a pipette to add 2 cm³ of starch solution from the water bath into a clean test tube.
3. Add 2 cm³ of amylase solution from the same water bath to the starch.
4. Start the timer immediately and gently swirl the test tube to mix.
5. After 30 seconds, use a glass rod to place one drop of the mixture onto a clean drop of iodine on the spotting tile.
6. Observe the colour change: blue-black = starch still present, orange-brown = no starch present.
7. Wipe the glass rod clean with a paper towel.
8. Repeat the test every 30 seconds, using a new iodine well each time.
9. Stop timing when the iodine stays orange-brown.
10. Record the time taken for starch digestion.

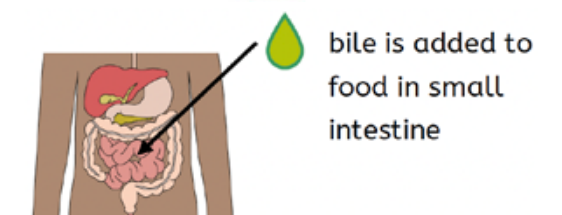


Making digestion efficient

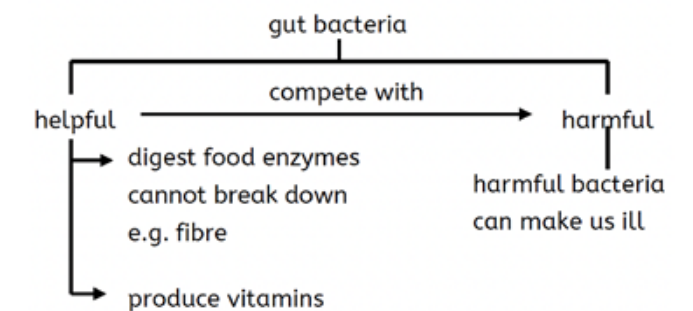
- Stomach glands release hydrochloric acid (pH ~2) → creates acidic conditions so enzymes in the stomach work effectively.
- Hydrochloric acid also helps protect the body: the acidic environment kills many pathogens (harmful microorganisms that cause disease).



- Small intestine enzymes work best in alkaline conditions.
- Bile (made in the liver, stored in the gallbladder) neutralises stomach acid to raise pH to about pH 8, so enzymes in the small intestine can work effectively.



Gut bacteria live in the intestines. Helpful bacteria help digest food enzymes can't break down, produce vitamins and compete with pathogens.



Scientific Thinking and Peer Review

- New scientific claims (results or explanations) that are to be published must be reviewed by other expert scientists.
- Research often impacts peoples' everyday lives and, if not founded on evidence, could have negative consequences.

Hypotheses and Variables

- When no hypothesis is being tested, systematic data collection is planned so that patterns in results can be identified and may lead to new knowledge.
- For example, in the energy in foods practical, different foods are burned and the temperature change of the water is measured each time under the same conditions, so results can be compared fairly and patterns in energy release can be observed.

Managing Specific Hazards

- Substances which are hazardous are labelled with a hazard symbol on the container including: moderate health hazard, serious health hazard, toxic, corrosive, flammable, oxidising and harmful to the environment.
- The risks associated with using heating apparatus are burns, fire, damage to eyes, and damage to equipment.
- The risks associated with using biological matter include potential allergic reactions or harm from the ingestion of contaminated food.

Random Error

The likelihood of random errors can be reduced by:

- the same experimenter completing each measurement
- using the same apparatus
- using the same technique

Derived quantities

- Mass can be measured in different units. The standard unit that appears on food labels is usually grams (g), but milligrams (mg) are used when the amount is very small.
- On nutrition labels, big amounts like carbohydrate, fat and protein are usually in g, while smaller amounts like vitamins and minerals are often in mg.

Questions

1. What is the role of carbohydrates in the diet?
2. What is the role of lipids in the diet?
3. What is the role of proteins in the diet?
4. What is the role of vitamins in the diet?
5. What is the role of minerals in the diet?
6. What is the role of fibre in the diet?
7. What is the formula for calculating BMI?
8. What is a balanced diet?
9. What causes starvation?
10. What causes obesity?

Questions

11. What is mechanical digestion?
12. What is chemical digestion?
13. What is an enzyme?
14. What is an active site?
15. What does amylase break down?
16. What does protease break down?
17. What does lipase break down?
18. Where does absorption of nutrients occur?
19. What is the function of bile?
20. What is respiration?

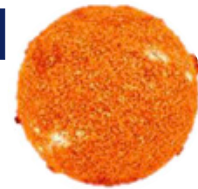
Space

Earth



- a large, solid sphere
- has layers and an atmosphere
- a planet

Sun (Sol)



- a very large, gaseous sphere
- huge mass
- very hot, so luminous
- a star

Moon (Luna)



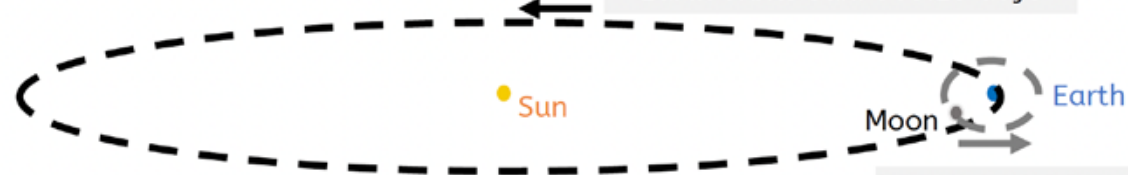
- a large, solid sphere
- rocky, cratered surface
- a moon

Sun-Earth-Moon System

not to scale

Sun at centre

Earth orbits Sun: 365.25 days



Moon orbits Earth: 28 days

The Solar System

Sun	Mercury	Venus	Earth	Mars	Jupiter	Saturn	Uranus	Neptune
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inner planets

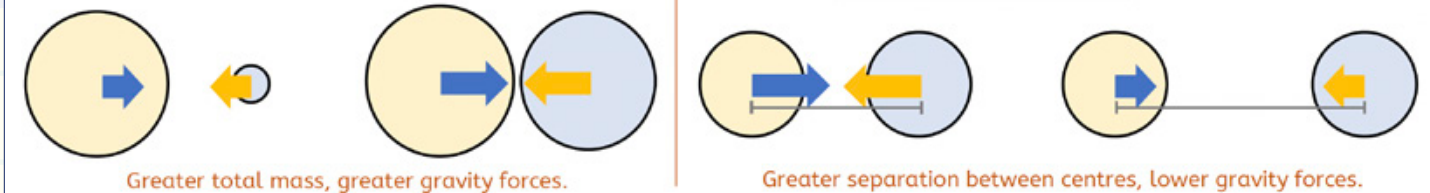
outer planets

- Star at centre
- Planets orbit star
- Moons orbit planets
- Dwarf planets, asteroids, meteoroids and comets orbit star

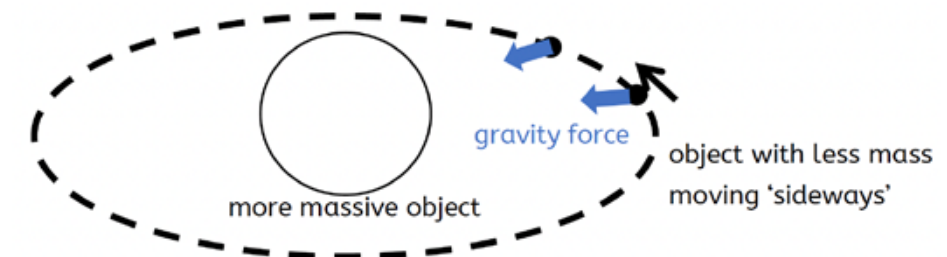
Gravity Force

Non-contact interaction between two objects with mass.

- Same size
- Opposite direction
- Never stop



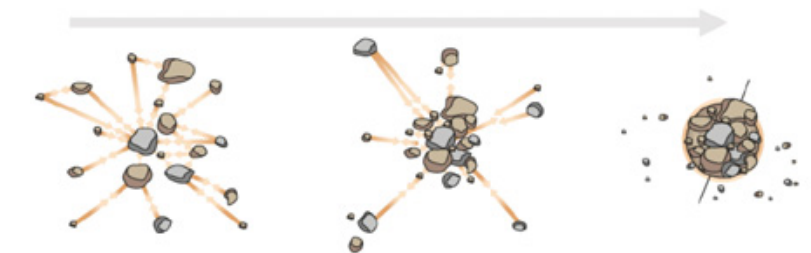
Orbits



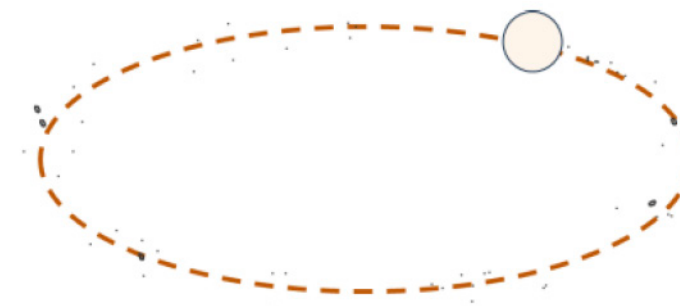
- When resultant force acts towards massive object
- And smaller object has 'momentum'
- Object orbits

Shape

- Regions of many small masses
- Form single large, spherical mass



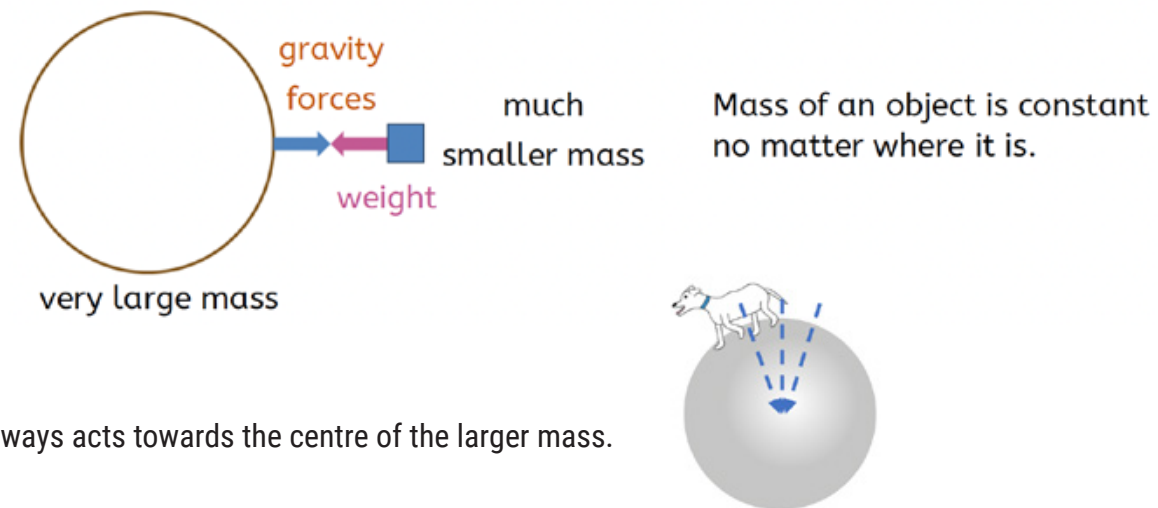
Orbital Path



- Planets have large enough mass to clear path

Weight

Name of a special case of the gravity force:
force experienced by an object because it is near a 'large' body, e.g. Earth.



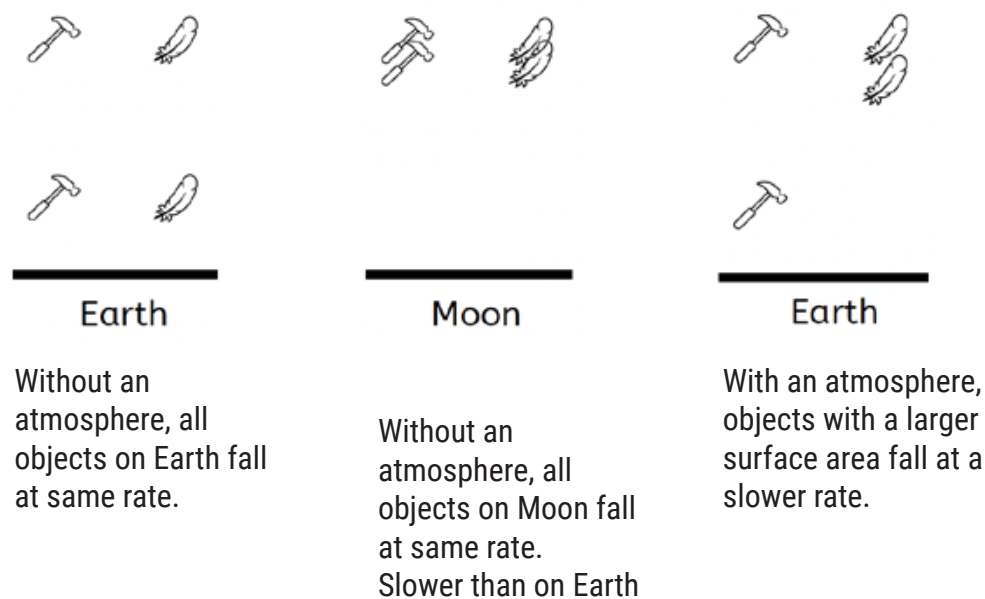
Weight always acts towards the centre of the larger mass.

- Greater mass of object on or near Earth → greater weight.
- Mass of larger body (Earth) causes gravity force on object, g .

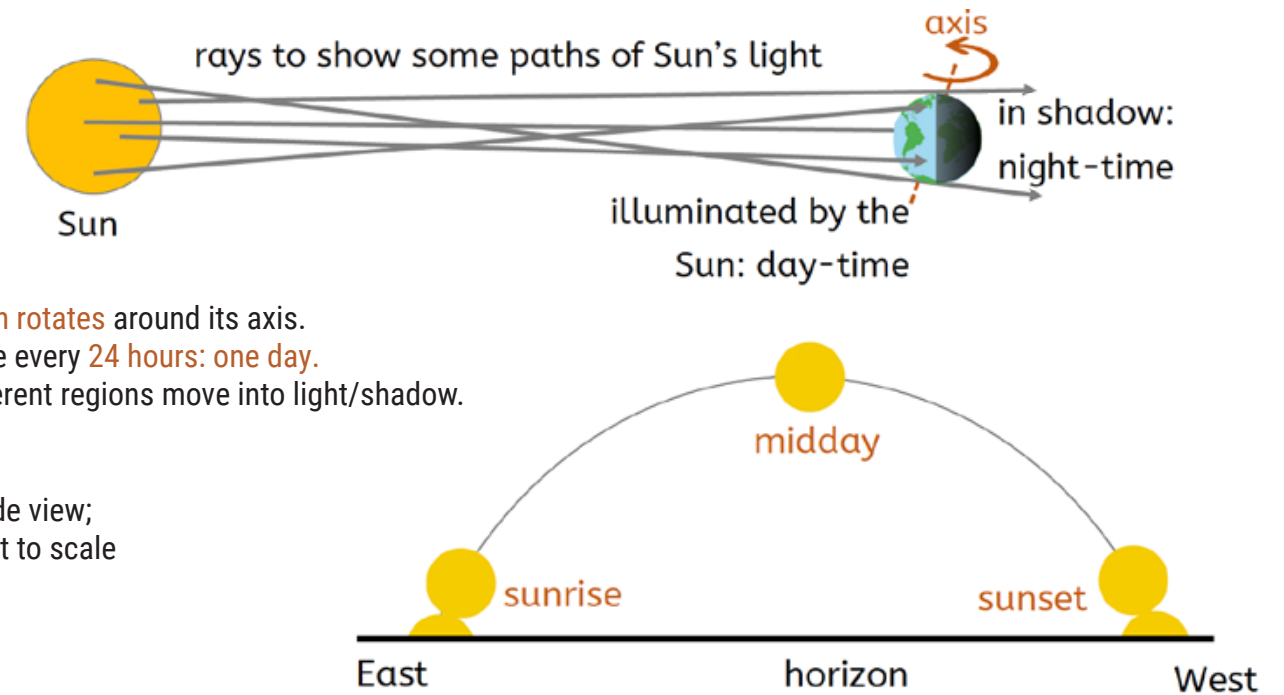
$$\text{weight (N)} = \text{mass (kg)} \times \text{gravitational field strength (N/kg)}$$

Earth's gravitational field strength, g , is $\sim 10 \text{ N/kg}$ (more accurately 9.8 N/kg).

Falling



Day and Night



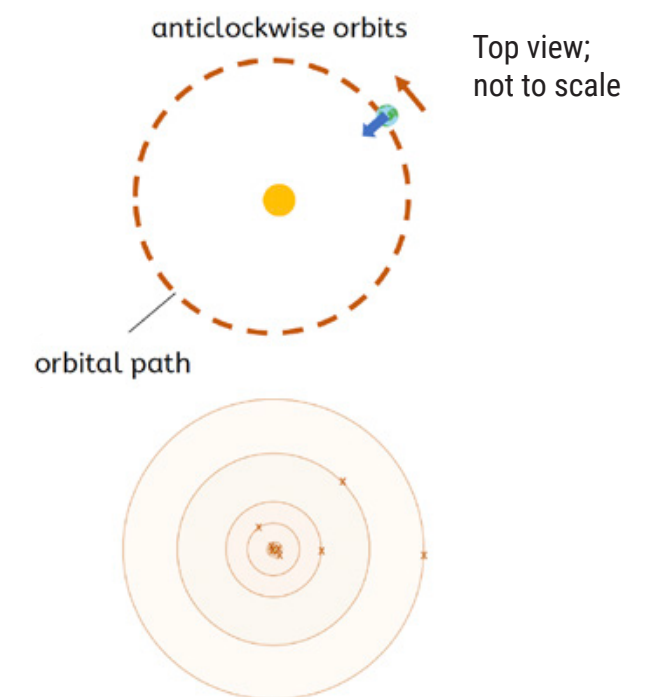
- Earth rotates around its axis.
- Once every 24 hours: one day.
- Different regions move into light/shadow.

side view;
not to scale

- Sun appears to move in arc across sky during day-time
- In UK through South
- Due to rotation of Earth

Years

The time for one orbit of Earth is 365.25 days: one year.



- Planets have elliptical orbits (squashed circles).
More distant planets have longer years.
- Travel greater distance
 - More slowly

Seasons

Occur because rotational **axis is tilted** at a constant angle (23°).

When northern hemisphere is in summertime, the southern hemisphere is in wintertime.

Northern hemisphere is **tilted towards** the Sun.

June
Summer in UK

March

September

December
Winter in UK

Northern hemisphere is **tilted away** from the Sun.

The arc of the Sun's path is lower in winter and higher in summer.

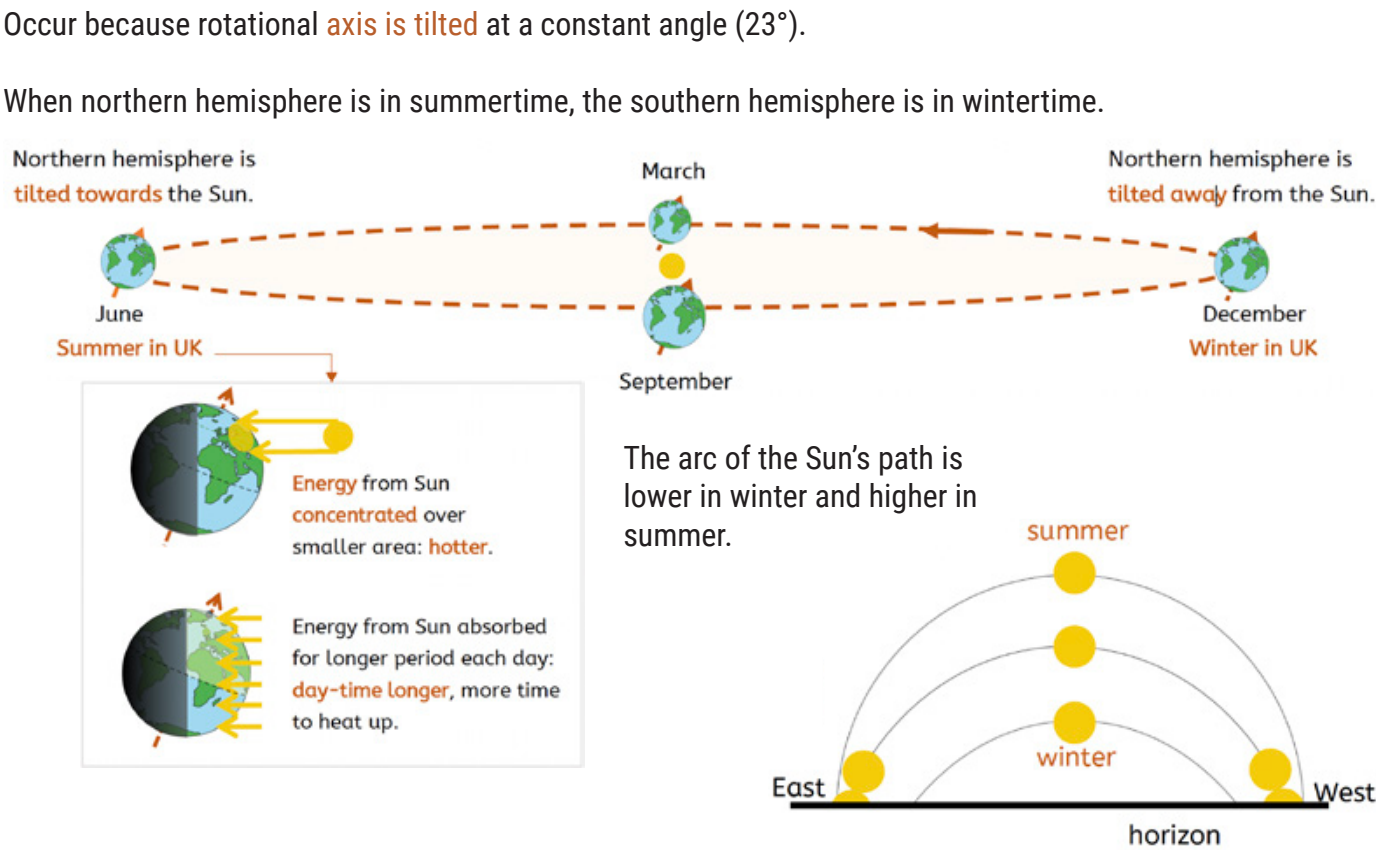
East horizon West

summer

winter

Energy from Sun concentrated over smaller area: **hotter**.

Energy from Sun absorbed for longer period each day: **day-time longer**, more time to heat up.



Stars

Huge balls of luminous gas, held together by gravity forces (powered by nuclear reactions).

- Observed brightness (intensity) decreases with distance.
- Colour remains same.
- Bigger stars have greater true brightness (luminosity).

Stars change over time:

- begin as clouds of dust
- most eventually become cold, dense masses.

The Sun is a star



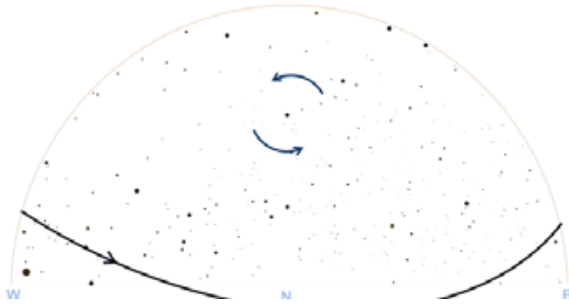
The Night Sky

The northern hemisphere's night sky appears to rotate about the North Star.

- Once every 24 hours.

The planets and Moon appear to move along the same path (rising in East, setting in West).

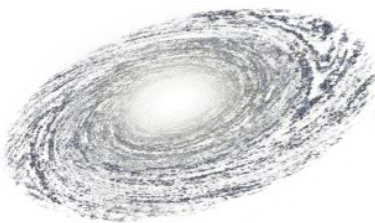
Like the Sun, the **apparent motion** of other bodies around Earth is due to **Earth's rotation**.



Galaxies

Systems of **millions or billions of stars**, together with gas and dust, held together by gravity forces.

The Solar System is one of many in the Milky Way galaxy. There are many other galaxies.



The Universe

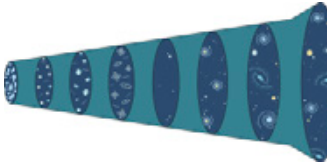
Everything: all of space and all the matter and energy it contains.

the Universe

- not yet observed
- dust, gas and energy
- galaxies
 - alone
 - group
 - solar systems
 - nebulae (star nurseries)
 - established

The Universe has **changed** over time:

- began as a very small, extremely hot and dense region
- expanded, forming collections of matter under gravity forces
- distance between galaxies is increasing



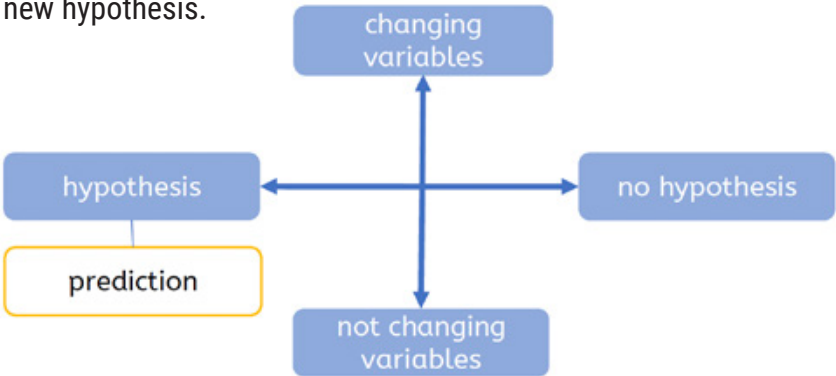
Changing Methods

Develop as earlier explanations are modified to take account of new evidence and ideas.

Example: geocentric model developed into heliocentric model
Methods: planned collect data to confirm new hypothesis.

Selecting a scientific method

Scientists select the category of scientific method most appropriate to investigate a line of enquiry, considering available data, knowledge, technology, cost and time.



When variables cannot be manipulated, parameters are described.

Example EQ:

What is the appearance of the Moon over time?

Systematically observed when at the same position above the horizon, from the same location, by the same observer.

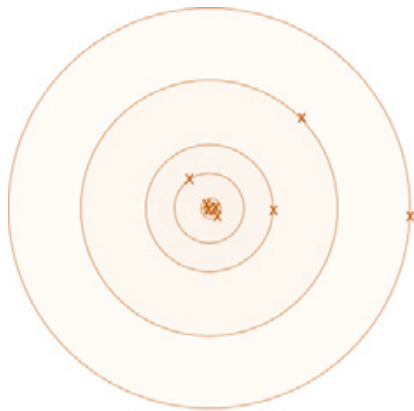
Bias
An observation can be biased either by an instrument or a person; scientists seek to check any assumptions or pre-conceptions.

Example: the naked eye is biased as it relies on low light levels of the surroundings.
The absence of a specific celestial object may be due to the instrument bias.

Scientific Models

Represent reality but show some aspects of a theory and hide others.

Example: heliocentric model explains planets orbiting Sun along elliptical paths.
Represents the Solar System with Sun at the centre; however, the Sun is not the centre of the Universe (not shown by model).



Recording data

Qualitative data cannot always be tabulated.

Example of astronomical observations include time, location, observer, and labelled drawings.



Applications of Technology on Science

Technological advances have increased the body of scientific knowledge.
Examples from astronomy

Technology	
Optical telescopes	More sensitive to less light; more can be observed. Can increase consistency of observation.
Reflecting telescopes	Can increase accuracy and precision, e.g. clearer images with greater detail.
Photography	Allows permanent record of observation which can be more easily used for measurement.
Non-visible light detection	Reveals previously unobservable data, e.g. high frequency radiation from stars shows star structures.
Space telescopes	Remote automatic observation outside of Earth's atmosphere, reduces 'noise' of measurements.

Measurement Values

Distances in space are so large as to be meaningless for humans.

Different units are used to help people manage these huge numbers:

- astronomical unit (au) – average Sun-Earth distance (used for distances within Solar System)
- light-year (ly) distance travelled by light in one year (used for interstellar distances).

Questions

1. What type of object is Earth?
2. What type of object is the Sun?
3. What type of object is the Moon?
4. What does Earth orbit?
5. What does the Moon orbit?
6. What is gravity?
7. What factors does gravity depend on?
8. What is the equation for calculating weight?
9. What is the unit of weight?
10. What is the gravitational field strength on Earth?

Questions

11. What causes orbits?
12. What causes day and night?
13. What is the length of a day on Earth?
14. What is the length of a year on Earth?
15. What causes the seasons?
16. What is a galaxy?
17. What is the universe?
18. What is a light-year?
19. What is a star?
20. What is happening to the universe over time?



YEAR 8

History



- 8.01 | THE TUDORS
- 8.02 | ENGLAND: A WORLD TURNED UPSIDE DOWN
- 8.03 | TRANSATLANTIC SLAVE TRADE
- 8.04 | TIME OF REVOLUTIONARY CHANGE
- 8.05 | THE BRITISH EMPIRE



Key Vocabulary

1. annulment	(n) to declare that a marriage never actually existed
2. armada	(n) fleet of Spanish warships
3. counter-reformation	(n) the Catholic fights against the spread of Protestantism
4. dissolution	(n) the ending of an organisation
5. heretic	(n) someone with religious views that disagree with official Church teaching
6. indulgences	(n) a payment to the Catholic Church to forgive a person's sins
7. papal bull	(n) an official order from the Pope
8. plot	(n) secret plan or scheme, often to do something harmful or illegal
9. reformation	(n) a movement which led to a break with the Catholic Church and the beginning of the Protestant Church
10. vestments	(n) robes worn by priests

Key Individuals

Henry VII	founder of the Tudor dynasty
Henry VIII	Tudor King 1509–47 who started the Protestant Reformation
Katherine of Aragon	first wife of Henry VIII and mother of Mary I
Mary I	Catholic Queen of England 1553–1558
Anne Boleyn	second wife of Henry VIII and mother of Elizabeth I
Edward VI	Protestant successor of Henry VIII 1547–1553
Elizabeth I	Protestant Queen of England 1558–1603
Mary Queen of Scots	Catholic cousin of Elizabeth I executed in 1587
Francis Drake	first Englishman to circumnavigate the globe
Walter Raleigh	established the first English colony of Roanoke
Walsingham	Elizabeth I ‘spymaster’

Power

The control a person or group has in a country.
For example, Henry VIII disliked the power of the pope and his refusal to grant an annulment.

This includes threads such as succession.

Identity

The qualities and characteristics that make a person who they are and what they value as important.
For example, Mary I was a devout Catholic.

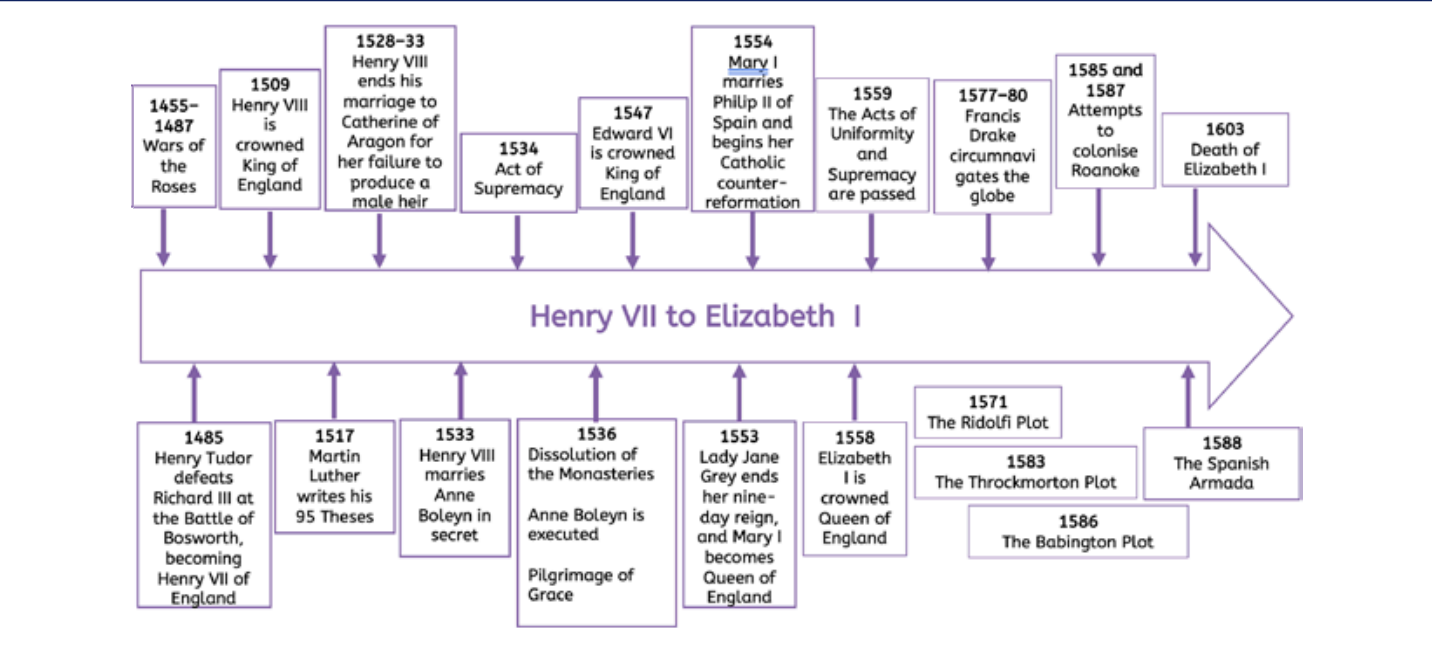
This includes threads such as the role of women.

Connectivity

The act of joining or being linked to somewhere, someone or something else.
For example, we have evidence of African Tudors in the court of Henry VIII.

This includes threads such as medicine.

Chronology



Questions

1. What is an annulment?

2. What is an armada?

3. What was the Counter-Reformation?

4. What is dissolution?

5. What is a heretic?

6. What are indulgences?

7. What is a papal bull?

8. What is a plot?

9. What was the Reformation?

10. What are vestments?

Questions

11. Who was Henry VII?

12. Who was Henry VIII?

13. Who was Mary I?

14. Who was Elizabeth I?

15. Who was Mary, Queen of Scots?

16. What does 'power' mean in this topic?

17. Why did Henry VIII challenge the Pope's authority?

18. What does 'identity' mean?

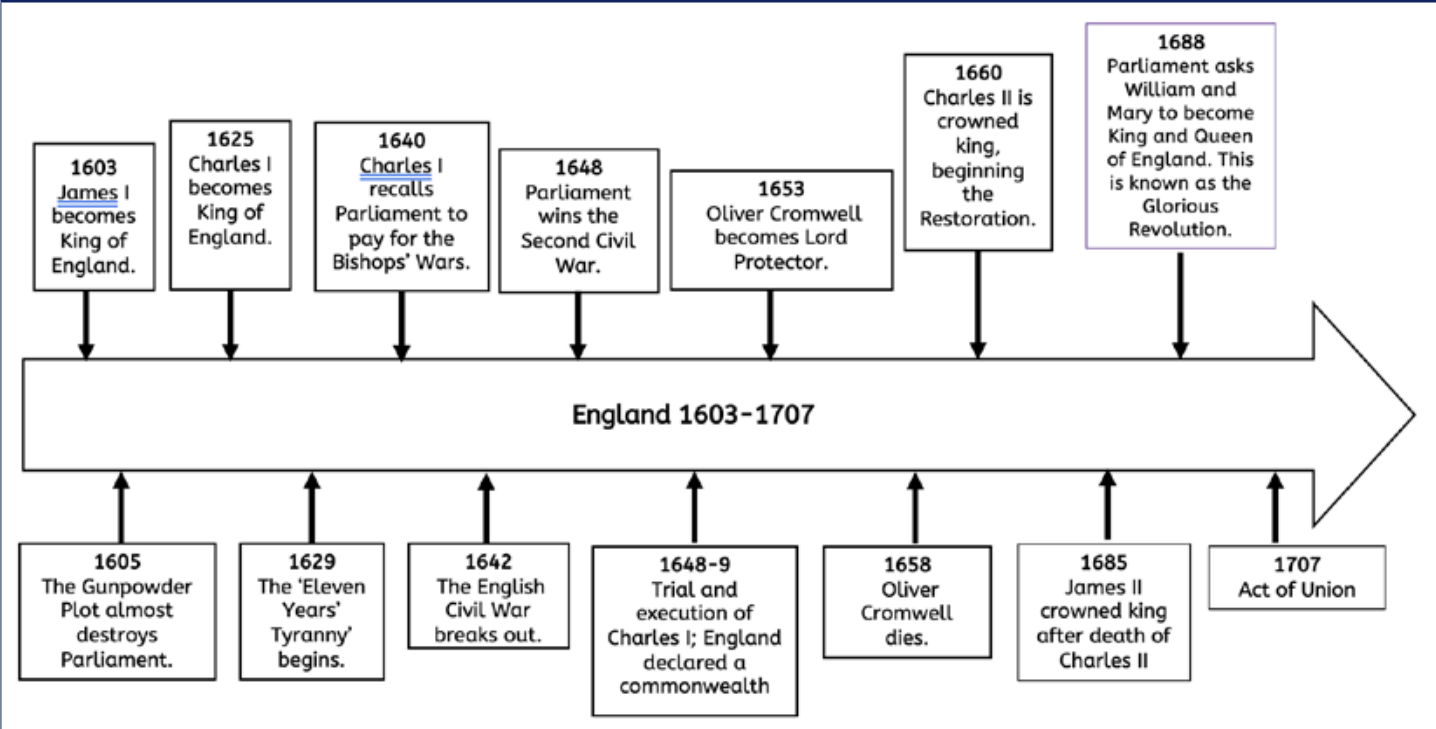
19. What religion did Mary I follow?

20. What major event happened in 1588?

Key Vocabulary

1. army	(n) an organised force for fighting
2. commonwealth	(n) a group of people organised under a single government
3. dissenters	(n) people who disagree with or oppose something, especially a religious or political authority
4. flank	(n) side
5. interregnum	(n) a period between reign
6. regicide	(n) the deliberate killing of a monarch, or the person responsible for doing so
7. republic	(n) a form of government where power is held by elected individuals and not a monarch
8. restoration	(n) the return of a monarch to the throne
9. treason	(n) a crime against the monarch or state
10. union	(n) the joining together
11. witch	(n) a person believed to have magic powers used for evil

Chronology



Key Individuals

Charles I	King of England 1625-1649 executed for treason.
Oliver Cromwell	Leader of the New Model Army who became Lord Protector in 1653.
Thomas Fairfax	Commander of the New Model Army
Prince Rupert	Nephew of Charles I who led the Cavalier cavalry.
Richard Cromwell	Son of Oliver Cromwell who succeeded his father as Lord Protector in 1658.
Charles II	Eldest son of Charles II and heir to the throne.
James II	Catholic younger brother of Charles II, crowned king in 1685
William III and Mary II	Protestant daughter of James II and her husband, who were invited by Parliament to take the throne

Themes and Threads

Power	The control a person or group has in a country. For example, a cause of the Civil War was the struggle for power between Parliament and the king Charles I. <i>This includes threads such as warfare and protest.</i>
Identity	The qualities and characteristics that make a person who they are and what they value as important. The gunpowder plotters disliked the attitude of James I towards Catholics. <i>This includes threads such as the role of women.</i>
Identity	The act of joining or being linked to somewhere, someone or something else. For example, the Act of Union in 1707 created the United Kingdom. <i>This includes threads such migration.</i>

Questions

1. What is an army?

2. What is a commonwealth?

3. Who are dissenters?

4. What does flank mean?

5. What is an interregnum?

6. What is regicide?

7. What is a republic?

8. What is restoration?

9. What is treason?

10. What is a union?

Questions

11. What is a witch?

12. Who was Charles I?

13. Who was Oliver Cromwell?

14. Who was Thomas Fairfax?

15. Who was Prince Rupert?

16. Who became king in 1660?

17. What caused the English Civil War?

18. What happened to Charles I in 1649?

19. What was the Restoration?

20. What happened in 1688?

Key Vocabulary	
Act	(n) a law or formal decision made by parliament or leaders of a country.
Abolish	(v) to formally put an end to something.
Auction	(n) public or private sale where goods, property, or services are sold to the highest bidder.
Enslave	(v) to force someone to remain in conditions such as slavery.
Resistance	(n) refusal to accept or obey something.
Oppression	(n) denying individuals or groups their rights, freedom, or dignity.
Trade	(n) the exchange of good, services or resources between people, businesses or countries.
Transatlantic Slave Trade	the forced migration of 12 million Africans to European colonies in the Americas.

Key Individuals	
William Wilberforce	MP who introduced bills in Parliament to abolish slavery.
Olaudah Equiano	Former enslaved person and a member of the Sons of Africa group.
Thomas Clarkson	One of the first men to join the Abolition Committee. Collected evidence in the horrors of the slave trade.
Mary Prince	The first black women to publish her experiences of slavery in her autobiography.

Themes and Threads	
Power	The control a person or group has in a country. For example, the Americas and Europe had the power of enslaved people who worked on plantations <i>This includes threads such as warfare and protest.</i>
Identity	The qualities and characteristics that make a person who they are and what they value as important. For example, the beliefs of the Quakers were used as an argument to abolish slavery. <i>This includes threads such as beliefs.</i>
Identity	The act of joining or being linked to somewhere, someone or something else. For example, the slave trade involved the forced migration of enslaved people from Africa to the Americas. <i>This includes threads such migration and trade</i>

Questions

- 1. What is an Act?
- 2. What does abolish mean?
- 3. What is an auction?
- 4. What does enslave mean?
- 5. What is resistance?
- 6. What is oppression?
- 7. What is trade?
- 8. What was the Transatlantic Slave Trade?
- 9. Who was William Wilberforce?
- 10. Who was Olaudah Equiano?

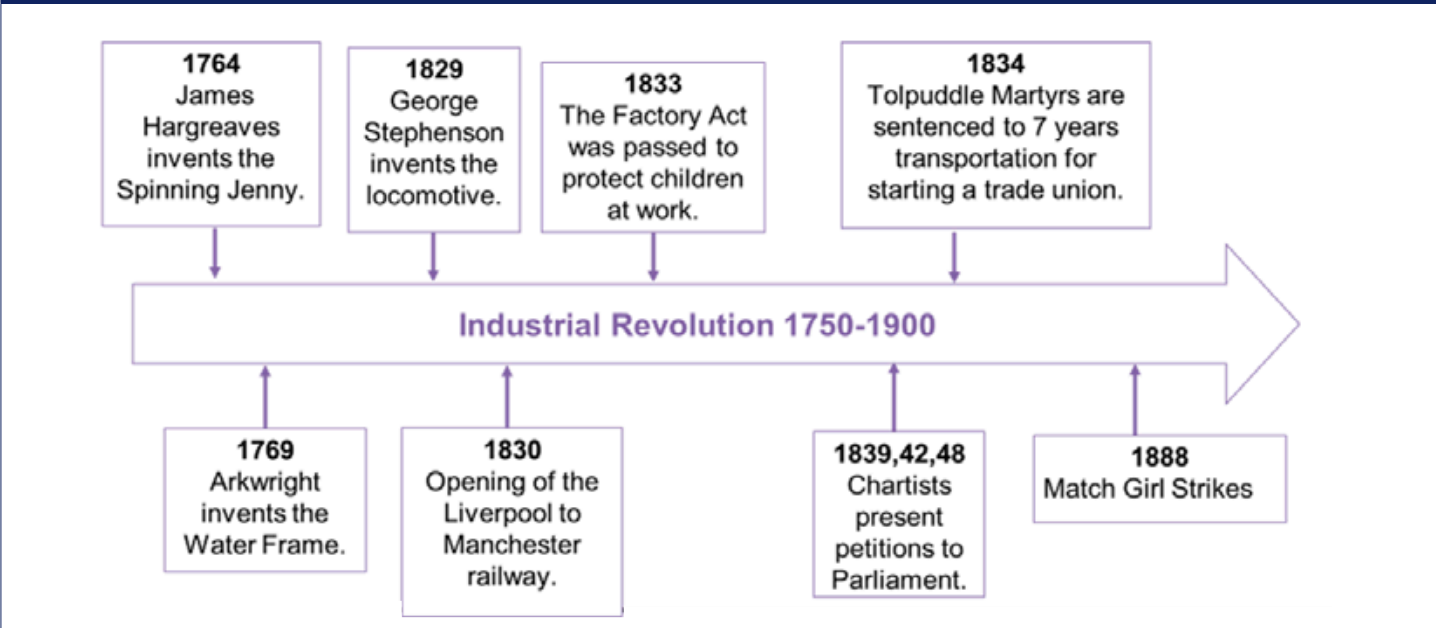
Questions

- 11. Who was Thomas Clarkson?
- 12. Who was Mary Prince?
- 13. What does 'power' mean in this topic?
- 14. Who held power during the slave trade?
- 15. What does 'identity' mean?
- 16. How did beliefs influence the abolition of slavery?
- 17. What does 'connectivity' mean?
- 18. How were continents connected during the slave trade?
- 19. What role did resistance play in slavery?
- 20. Why is the Transatlantic Slave Trade historically important?

Key Vocabulary

Agriculture	(n) farming animals and crops.
Domestic	(n) work in the home.
Dual burden	(n) when a person (typically women) have responsibility in paid employment as well as unpaid work in the home.
Enclosure	(v) land surrounded by a barrier.
Exhibition	(n) an event at which objects are put out in a public space for people to look at.
Industrial Revolution	(n)The shift from farming societies to factory-based production using new technology and transport.
Innovation	(n) improving something or creating something that is a new technology.
Progress	(n) an improvement or change in a positive direction.
Rural	(n) countryside
Urban	(n) towns and cities

Chronology



Key Vocabulary

Extent of change	major/significant/continuity
Rate of change	rapid/gradual/slow
Impact of change	Long term, short-term, turning point

Themes and Threads

Power	The control a person or group has in a country. For example, factory owners had control over their workers. <i>This includes threads such as class systems and protest.</i>
Identity	The qualities and characteristics that make a person who they are and what they value as important. For example, the industrial revolution created a ‘dual burden’ for working class women. <i>This includes threads such as women.</i>
Identity	The act of joining or being linked to somewhere, someone or something else. For example, goods produced in factories were traded across the UK and wider world. <i>This includes threads such as migration and trade.</i>

Questions

1. What is agriculture?

2. What does domestic work mean?

3. What is a dual burden?

4. What is enclosure?

5. What is an exhibition?

6. What was the Industrial Revolution?

7. What is innovation?

8. What does progress mean?

9. What does rural mean?

10. What does urban mean?

Questions

11. What does 'power' mean?

12. Who had power during the Industrial Revolution?

13. What does 'identity' mean?

14. How did the Industrial Revolution affect women's identity?

15. What does 'connectivity' mean?

16. How did factories increase connectivity?

17. What does 'extent of change' mean?

18. What does 'rate of change' mean?

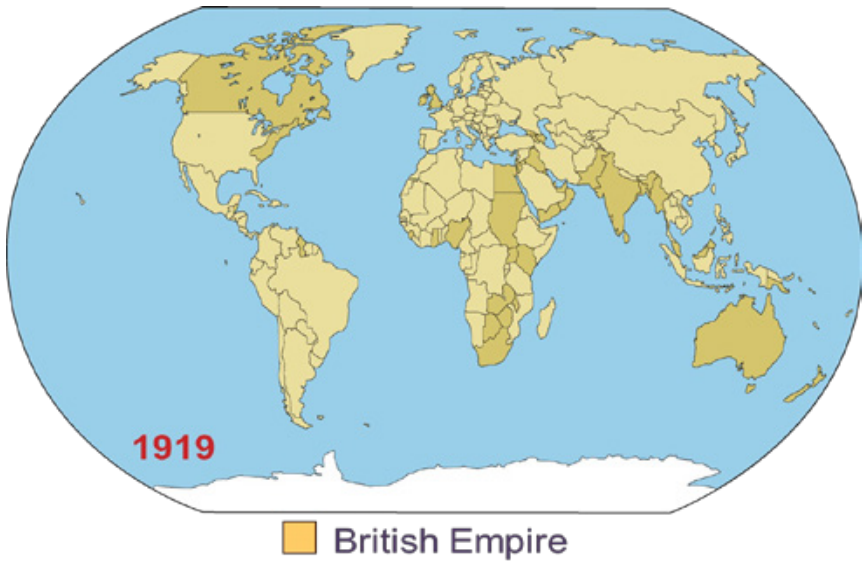
19. What does 'impact of change' mean?

20. Give one example of progress during this period.

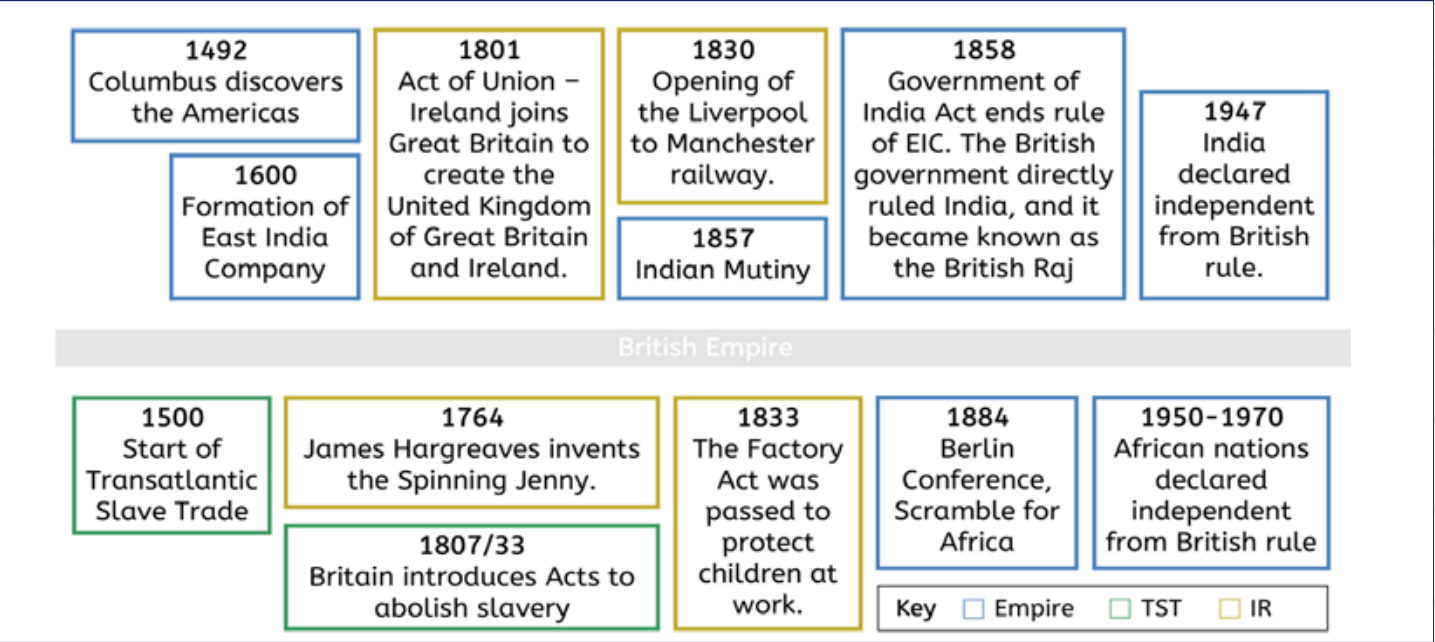
Key Vocabulary

colony	(n) country or area ruled over by another country
empire	(n) a group of countries ruled by a single ruler
imperialism	(n) a policy of extending a country's power and influence through colonisation, using military force or other methods
massacre	(n) brutal killing of many people
mutiny	(n) rebellion against authorities, especially by soldiers or sailors
territory	(n) an area of land

British Empire c.1919



Chronology



Themes and Threads

Power	The control a person or group has in a country. For example, factory owners had control over their workers. <i>This includes threads such as class systems and protest.</i>
Identity	The qualities and characteristics that make a person who they are and what they value as important. For example, the industrial revolution created a 'dual burden' for working class women. <i>This includes threads such as women.</i>
Identity	The act of joining or being linked to somewhere, someone or something else. For example, goods produced in factories were traded across the UK and wider world. <i>This includes threads such as migration and trade.</i>

Questions

1. What is a colony?
2. What is an empire?
3. What is imperialism?
4. What is a massacre?
5. What is a mutiny?
6. What is territory?
7. What does 'power' mean?
8. Give an example of British power in the Empire.
9. What does 'identity' mean?
10. How did British rule affect identity?

Questions

11. What does 'connectivity' mean?
12. How did the British Empire increase connectivity?
13. Why did countries build empires?
14. What is colonisation?
15. How could imperialism lead to conflict?
16. What might cause a mutiny?
17. What is an example of violence in the Empire?
18. How did the British Empire affect trade?
19. What impact did the Empire have on people?
20. What was one major global impact of the British Empire?



YEAR 8

Geography



COASTS
POPULATION
TECTONICS
ECOSYSTEMS
WEATHER & CLIMATE
AFRICA



Background

- 1. Coastlines are dynamic changing landscapes, which are affected by the action of the waves.
- 2. Waves can have differing features; these features can influence the processes and landforms which may develop. **(A)**
- 3. Destructive waves can erode the coastline. **(B)**
- 4. Through erosion a number of distinctive coastal features can form. **(D, E, F)**
- 5. Further processes act on the coastline, leading to material being transported along the coastline. **(C)**
- 6. This material will eventually be deposited leading to the formation of landforms such as spits. **(G)**
- 7. Coastal erosion can impact the landscape and people.
- 8. Different strategies are used to reduce erosion. **(H)**
- 9. Often these strategies can be controversial. **(I)**

A - The Three Types Of Rock (5)

Swash	Movement of a wave up the beach. The direction is dependent upon the prevailing (common) wind direction.
Backwash	Movement of a wave back down the beach, this happens at 900 due to gravity.
Constructive Wave	Have a strong swash and weak backwash; they cause deposition.
Destructive Wave	Have a weak swash and strong backwash; they cause erosion.
Fetch	The distance a wave has travelled.

B - Types Of Erosion - Wearing Away Of Rock (4)

Hydraulic Action	Waves compress pockets of air in cracks in a cliff, causing the crack to widen, breaking off rock.
Abrasion	Eroded material is hurled or scraped against the cliff, breaking off rock
Attrition	Eroded material in the sea hits into each other, breaking down into smaller pieces.
Solution	The water dissolves certain types of rocks e.g. limestone.

C - Other Coastal Processes (4)

Transportation	The movement of sediment e.g. traction, saltation, suspension and solution.
Deposition	When waves drop the sediment they are transporting, either due to a loss of energy or change in direction of coastline.
Longshore Drift	The movement of sediment along the coastline in a zig-zag motion, due to the wind.
Weathering	Breaking down of rocks by physical and chemical processes.

D - Headlands And Bays (3)

Geology	Different rock types e.g. resistant rock (granite) and less resistant rock (clay).
Headland	Resistant hard rock which is slowly eroded so sticks out to sea.
Bay	Less resistant soft rock which is quickly eroded, retreating to form a bay.

E - Wave Cut Platforms (2)

Wave Cut Notch	These form at the foot of a cliff due to erosion. This undercuts the cliff above leaving it unsupported.
Wave Cut Platform	When the unsupported cliff collapses, the process repeats and the cliff retreats leaving a sloping wave cut platform

F - Cave Stacks And Arches (3)

Crack	A weakness in the headland is eroded by hydraulic pressure, forming a cave.
Cave	This is eroded further, until the cave erodes all the way through the headland forming an arch.
Arch	The roof of the arch has no support, so collapses to form a stack.

G- Spits (3)

Change In Coastline	Leads to material transported by longshore drift being deposited into the sea, forming a spit.
Hooked Ends	A hooked end forms on a spit due to a change in the prevailing wind direction.
Salt Marsh	An area of sally marshland found behind a spit, which has dried out as the sea can no longer reach this area.

H - Coastal Management (2)

Hard Engineering	Human-made structures that help to deal with coastal erosion, such as: 1. Sea walls, which reflect the waves' energy back out to sea 2. Groynes, which trap longshore drift
Soft Engineering	Adaptations which work with nature, such as managed retreat, where the coastline is allowed to erode, and people are moved away.

I - Case study example: Holderness coast, Mablethorpe

Where: The Fastest eroding coastline in Europe, in East Yorkshire

Reasons to protect (2)	Management strategies (2)	Success (2)
1. Rocks are made of soft rock (till), eroding at 2m per year. 2. The B1242 runs through Mablethorpe and would be expensive to re-route.	1. Rock groyne put in place to trap sediment being transported by longshore drift, creating a wider beach to absorb the power of the waves. 2. Rip-rap has been placed in front of the cliffs to absorb the wave energy.	1. Good - erosion in front of Mablethorpe has reduced, so the road has been saved. 2. Bad - beaches further south have been starved of sediment so erosion has increased e.g. at Great Cowden.

Coastal Processes - Questions

- 1. What is hydraulic action?
- 2. What is abrasion?
- 3. What is attrition?
- 4. What is solution?
- 5. What is longshore drift?
- 6. What is deposition?

Waves and Erosion - Questions

- 7. What is swash?
- 8. What is backwash?
- 9. What are constructive waves?
- 10. What are destructive waves?
- 11. What is fetch?

Coastal Landforms - Questions

- 12. How is a wave-cut notch formed?
- 13. What is a wave-cut platform?
- 14. What is a headland?
- 15. What is a bay?
- 16. How is a cave formed?
- 17. How is an arch formed?
- 18. How is a stack formed?

Depositional Landforms - Questions

- 19. What is a spit?
- 20. What causes a spit to have a hooked end?
- 21. What is a salt marsh?

Coastal Management - Questions

- 22. What is hard engineering?
- 23. What is soft engineering?
- 24. What is managed retreat?
- 25. What is the purpose of a sea wall?
- 26. What is the purpose of a groyne?

Case Study: Holderness Coast - Questions

- 27. Where is the Holderness Coast?
- 28. Why is the Holderness Coast eroding quickly?
- 29. What management strategy is used at Mablethorpe?
- 30. What is a negative impact of the Mablethorpe

Background

- 1. The world's population is not spread evenly. (A)
- 2. There are many factors that influence where we live. These factors have caused some places to be densely populated. whilst others are sparsely populated. (B)
- 3. Total population is constantly changing. both within countries and world-wide. (C)
- 4. We can look at changes in population by comparing past and predicted population structures. (D)
- 5. The level of development within a country will influence its population structure. However, as countries develop economically, these structures will change. (E)
- 6. In many developed countries the population is ageing. This process brings many impacts. (F)
- 7. Migration is also an important population process world-wide and is one of the biggest drivers of population change. (G, H)

A - Population Distribution (4)

Population Density	The number of people who live Density within 1 km².
Population Distribution	How people are spread out over an area.
Densely Populated	Places which contain many people per km²
Sparsely Populated	Places which contain few Populated people per km².

B - Factors Influencing Population

Physical	1. The relief of the land (flat or steep). 2. Natural resource availability. 3. Climate. 4. Fertility of the soil.
Human	1. Transport links. 2. The availability of jobs. 3. The availability of local services e.g. hospitals. education.

C - Population Change (5)

Birth Rate	The number of births per 1000.
Death Rate	The number of deaths per 1000.
Population Explosion	A sudden rapid rise in the number of Explosion people.
Demographic Transition Model	A model which shows the changes a population is likely to go through over time.

D - Population Structure (4)

Population Structure	The number/proportion of people in each age Structure range, for each gender.
Population Pyramid	A graph showing population structure. by age and sex.
Economically Active	Those people who work. receive a wage and pay tax.
Dependant Population	Those who rely on the economically active for support e.g. the young and elderly

E - Population Structure Differences

Developing Countries (2)	1. High birth rates. so a large young dependent population. 2. A lower life expectancy. so a small elderly dependent population.
Developed Countries (2)	1. A declining birth rate. so a small young dependent population. 2. A rising life expectancy. so a large elderly dependent population.

F - An Ageing Population (4)

Life Expectancy	The average age you are expected to live to in a country.
Possible Problems (3)	1. Pressure on the NHS. waiting times could increase. 2. The government may have to support the funding of pensions. 3. Government investment into more care homes and carers might be costly.
Possible Benefits (2)	1. Grandparents can help look after their grandchildren. reducing the cost of childcare for parents. 2. Some elderly have more disposable income so spend more in shops.
Solutions (3)	1 . Increase the retirement age. 2. Raise taxes. 3. Offer incentives for couples to have children e.g. longer maternity pay.

G - Migration (5)

Economic Migrant	A person who leaves one area or country to go to another. to seek better job opportunities.
Push Factor	Things that make people want to leave an area.
Pull Factor	Things that attract people to live in an area.
Host Country	The destination country for a migrant.
Source Country	The home country of a migrant.

H - Impacts Of Migration

Positives For The Source	1. Money sent home (remittances) can support families. 2. Potential for increased trade between host country and source country.
Negatives For The Source	1. Fewer economically active citizens. 2. Less tax. as fewer working people in the country.
Positives For The Host	1. Migrants can work in jobs that are difficult tofill. therefore contribute tax 2. New shops and restaurants open, which is positive for the economy.
Negatives For The Host	1. Potential pressure on public services e.g. health care.

Population distribution - Questions

- 1. What is population density?
- 2. What does "sparsely populated" mean?
- 3. What does "densely populated" mean?
- 4. What is population distribution?

Factors influencing population - Questions

- 5. Name one physical factor that affects population distribution.
- 6. Name one human factor that affects population distribution.
- 7. Why might flat land attract more people?
- 8. How does climate affect population

Population change - Questions

- 9. What is birth rate?
- 10. What is death rate?
- 11. What is natural increase?
- 12. What is a population explosion?
- 13. What model shows how population changes over time?

Population structure - Questions

- 14. What is population structure?
- 15. What is a population pyramid?
- 16. Who are the dependent population?
- 17. Who are the economically active?

Population structure differences - Questions

- 18. What is a key feature of developing countries' population structure?
- 19. What is a key feature of developed countries' population structure?

Ageing population - Questions

- 20. What is life expectancy?
- 21. Name one problem caused by an ageing population.
- 22. Name one benefit of an ageing population.
- 23. Name one solution to an ageing population

Migration - Questions

- 24. What is an economic migrant?
- 25. What is a push factor?
- 26. What is a pull factor?
- 27. What is a host country?
- 28. What is a source country?

Impacts of migration - Questions

- 29. Name one positive impact of migration on the host country
- 30. Name one negative impact of migration on the source country

Background

- 1. The Earth's structure is made up of layers. (A)
- 2. The characteristics of these layers fuel tectonic plate theory. (B)
- 3. There are four different plate boundaries, each with their own characteristic and resulting hazards. (C)
- 4. Volcanoes can be found along constructive and destructive boundaries, although the volcanoes found at these boundaries are different. (D)
- 5. Earthquakes take place along all of the boundaries, but are often most significant at conservative boundaries. Earthquakes have key features and are measured using the Richter scale. (E)
- 6. People continue to live in tectonic areas for a number of reasons. (F)
- 7. Some of these reasons relate to how we monitor, protect and plan for such hazards. (G)
- 8. However, the impacts of these hazards can still be significant; although they can vary based upon a country's level of development. (H, I)

A - The layers of the Earth (3)

Crust	The thin outer layer of the Earth which is divided into plates called tectonic plates.
Mantle	Middle layer of the earth, between the crust and the core, approx. 2900km thick.
Core	The centre, hottest layer of the Earth, broken into the inner (solid) and outer core (liquid).

B - Theory (4)

Plate Boundaries	The place where plates meet.
Convection Currents	Currents in the Earth's mantle which rise from the Earth's core and are strong enough to move tectonic plates.
Oceanic Crust	The part of the Earth's crust under the oceans, usually 6-8km thick.
Continental Crust	The part of the Earth's crust which contains land and is 30-50km thick.

C - Different Plate Boundaries (4)

Birth Rate	Where two tectonic plates move apart and Boundaries new crust is created.
Destructive	Where two tectonic plates come together. The denser oceanic plate is subducted, leading to violent volcanic eruptions.
Conservative	Where tectonic plates move alongside, or past each other.
Collision	Where two continental plates collide, forcing the land upwards and forming mountains.

D - Volcanoes (3)

Shield Volcano	A gently sloping volcano formed by runny lava (low viscosity), usually at constructive boundaries.
Composite Volcano	A steep volcano formed by alternating layers Volcano of lava and ash, on destructive boundaries.

D - Volcanoes (3)

Pyroclastic Flow	Torrent of hot ash, rock, gas and steam from a volcano.
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E - Earthquakes (4)

Epicentre	The point on the Earth's surface directly above the focus of an earthquake.
Focus	The source of an earthquake beneath the Earth's surface.
Seismic Waves	Fast waves of energy generated from the focus.
Richter scale	A scale that measures the energy released by an earthquake.

F - Why People Live In Tectonic Danger Zones

Volcanoes	1. Jobs in tourism. 2. Geothermal energy created. 3. Ash makes the ground fertile, which is good for farming. 4. Diamonds and gold from previous eruptions can be mined.
Earthquakes	1. Friends and family live in the area. 2. It has not happened in such a long time, so people take the risk. 3. Employment in the area.

G

Volcanoes

Earthquakes

Monitoring (2)	1. The shape may change. 2. Increase in gases given off e.g. sulphur dioxide.	1. Irregular tremors measured. 2. Radon gas levels increase as rocks crack.
Protect	Lava diversion channels.	Earthquake proof buildings.
Planning (2)	1. Evacuation. 2. Emergency services trained.	1. Earthquake drills. 2. Emergency services on-call.

H - Effects Of Tectonic Hazards (2)

Primary Effects	Direct impacts of an event e.g. people killed, injured, or buildings collapse.
Secondary Effects	The indirect impacts of an event, usually occurring in the weeks, hours, months after the event e.g. the outbreak of disease from contaminated water.

I - Examples

Developing Haiti Port Au Prince	1. 318,000 dead. 2. 1.5 million homeless. 3. Cholera outbreak killed 8,000.
Developed New Zealand Christchurch	1. 181 dead. 2. 80% of the city without electricity. 3. The Rugby World Cup was cancelled. 4. Schools closed for 2 weeks.

Earths Structure - Questions

- | |
|---|
| 1. What are the three main layers of the Earth? |
| 2. Which layer of the Earth is the thinnest? |
| 3. What is the mantle made of? |
| 4. What is the core divided into? |

Plate Theory- Questions

- | |
|--|
| 5. What causes tectonic plates to move? |
| 6. What is the difference between oceanic and continental crust? |
| 7. What is a plate boundary? |

Plate Boundaries - Questions

- | |
|---|
| 8. What happens at a constructive plate boundary? |
| 9. What happens at a destructive plate boundary? |
| 10. What is a conservative plate boundary? |
| 11. What forms at a collision boundary? |

Volcanoes - Questions

- | |
|---|
| 12.What type of volcano has gentle slopes and runny lava? |
| 13.What type of volcano has steep sides and layers of ash and lava? |
| 14. What is a pyroclastic flow? |

Earthquakes - Questions

- | |
|--|
| 15. What is the epicentre of an earthquake? |
| 16. What is the focus of an earthquake? |
| 17. What are seismic waves? |
| 18. What scale is used to measure earthquake strength? |

Living in tectonic zones - Questions

- | |
|---|
| 19. Name one reason people live near volcanoes. |
| 20. Why might people live in earthquake zones? |

Monitoring and planning - Questions

- | |
|---|
| 21. How can volcanoes be monitored? |
| 22. What is one way to protect against earthquakes? |
| 23. What is an earthquake drill? |
| 24. What is a lava diversion channel? |

Effects of hazards - Questions

- | |
|--|
| 25. What is a primary effect of a tectonic hazard? |
| 26. What is a secondary effect of a tectonic hazard? |

Case studies - Questions

- | |
|--|
| 27. How many people died in the Haiti earthquake? |
| 28. What disease outbreak followed the Haiti earthquake? |
| 29. How many people died in the Christchurch earthquake? |
| 30. What major event was cancelled due to the Christchurch earthquake? |

Background

- 1. An ecosystem is a community of things that are linked together to make up a type of environment. (A, B)
- 2. An ecosystem contains biotic (living) and abiotic (non-living) parts. (B)
- 3. The climate of an ecosystem is very important as it influences what you will find there. (C)
- 4. The main world biomes can be found in specific parts of the world, they have very different climatic conditions & features. (C, D)
- 5. The rainforest biome has some distinctive features. (F)
- 6. However, deforestation is a major challenge facing rainforests worldwide. (E)
- 7. The deserts worldwide also have some key characteristics. (G)
- 8. The Sahara Desert is a place with opportunities for people, but there are also challenges which need to be overcome. (H)

A - Classification Of Ecosystem (4)

Ecosystem	A community of things linked together in an environment.
Biome	An ecosystem on a large scale that covers parts of continents and whole countries.
Habitat	A place where plants and animals live. Example: a pond, or hedgerow.
Biodiversity	The amount of variety of life there is in a place.

B - Features Of An Ecosystem (3)

Biotic	The living parts of an ecosystem. Examples: plants, animals, humans.
Abiotic	The non-living parts of an ecosystem. Examples: soil, climate, river.
Food Chain	A diagram that shows what is eating what in an ecosystem.

C - Climatic Features (4)

Climate Graph	A graph showing rainfall and temperature in a place over a whole year.
Precipitation	Any form of water falling from the sky.
Convictional Rainfall	Rain that is produced when warm air rises, cools and condenses, forming clouds and then rainfall.
High Pressure	Areas where air is sinking, this air has little High Pressure moisture, thus condensation can not happen.

D - Major Global Biomes (4)

Tundra	1. Found at the far north and south of the planet. 2. A cold ecosystem, little rainfall.
Hot Desert	1. Found along the Tropic of Cancer and the Tropic of (2) Capricorn. 2. Hot environments with little rain.

D - Major Global Biomes (4)

Tropical Rainforest	1. Found in places along the Equator. 2. Hot and humid environments with huge amounts of rainfall.
Temperate Forest	1. The main biome of the UK and other places along the same lines of latitude. 2. Warm summers, mild winters. No extremes of temperature, rainfall.

E - Deforestation In The Rainforest (6)

Deforestation	The cutting down and removal of forest. This happens due to many factors.
Logging	Cutting down trees to sell the wood for a profit, sometimes this is done illegally.
Cattle Ranching	Removing trees from a large part of the rainforest and keeping cows on the land. These are sold for meat.
Slash and Burn	A type of farming where you cut down a small area of trees, burn the vegetation and then grow crops on this land.
Soil Erosion	When the soil in an area loses its minerals (water or wind erosion) so that it becomes difficult to grow crops there.
Indigenous Tribes	A group of people who live traditional lives in places (like the rainforest).

F - Rainforest Features (3)

Rainforest Layers	Forest floor, understorey, canopy, emergent layer
Nutrient Cycle	Nutrients move from living things to litter and the soil in a continuous cycle, keeping both plants and soil healthy.
Drip Tip Leaves	A plant adaptation that lets excess water drip off leaves quickly.

G - Desert Characteristics (4)

Diurnal Range	Differences between the highest day and lowest night time temperature.
Nocturnal	Animals only come out at night.
Cactus	Long root systems to get as much water as possible from dry ground.
Camel	A plant adaptation that lets excess water drip off leaves quickly.

H - Opportunities And Challenges For Development In The Sahara Desert

Where	The Sahara is found in Northern Africa.	
Opportunities (2)		Challenges (2)
1. In Algeria, oil extraction accounts for 60% of the GDP. 2. Farming in Egypt happens because the Aswan Dam provides water all year round to grow crops, providing an income to farmers.		1. Extreme temperatures can cause illness or death because of dehydration. 2. Water is scarce and so farming can be unreliable meaning an unreliable income for farmers.

Features of ecosystems - Questions

- 1. What is an ecosystem?
- 2. What is a biome?
- 3. What is a habitat?
- 4. What does biodiversity mean?
- 5. What are biotic components?
- 6. What are abiotic components?
- 7. What is a food chain?

Global Biomes - Questions

- 8. Where are tundra biomes found?
- 9. What are the climatic conditions of tundra biomes?
- 10. Where are hot deserts located?
- 11. What are the conditions in hot deserts?
- 12. Where are tropical rainforests found?
- 13. What are the conditions in tropical rainforests?
- 14. What is the main biome of the UK?
- 15. What are the conditions in temperate forests?

Rainforest features and deforestation - Questions

- 16. Name the layers of the rainforest.
- 17. What is the nutrient cycle?
- 18. What are drip tip leaves?
- 19. What is deforestation?
- 20. Why is logging done in rainforests?
- 21. What is cattle ranching?
- 22. What is slash and burn farming?
- 23. What is soil erosion?
- 24. Who are indigenous tribes?

Desert features and the Sahara Desert Case Study - Questions

- 25. What is diurnal range?
- 26. What does nocturnal mean?
- 27. How are cactus roots adapted?
- 28. How are camels adapted to deserts?
- 29. What is one opportunity for development in the Sahara?
- 30. What is one challenge of living in the Sahara?

Background

- 1. Weather and climate are different. However both are influenced, measured and described by a few factors. (A)
- 2. The climatic conditions of an area are determined by several factors. (B)
- 3. There are four distinct climatic zones in the UK, which are determined by the direction of the prevailing wind. (C)
- 4. Precipitation is caused when warm air rises. There are three ways that this can happen. (B, D)
- 5. High pressure air systems bring warm, settled weather conditions. (E)
- 6. Low pressure air systems bring wet, changeable weather conditions. (F)
- 7. Tropical storms (an example of a low pressure climatic hazard) need certain conditions to form. (G)
- 8. Hurricane Katrina is a famous tropical storm that affected the USA in 2005. (H)

A - Weather And Climate (5)

Weather	The day-to-day conditions of the atmosphere which change quickly.
Climate	The average weather conditions over longer periods of time.
Precipitation	Any form of water falling from the sky.
Humidity	The amount of moisture in the air.
Air Pressure	The force exerted onto the Earth's surface by the weight of the air.

B - Factors Affecting Weather And Climate (4)

Latitude	Higher latitudes are colder. Lower latitudes (nearer the equator) are hotter
Winds	Wind can bring different weather conditions depending on where it comes from.
Altitude	Higher areas get more rainfall and are colder than low land.
Urban Areas	Can be 2.2°C warmer than the surrounding rural areas.

C - The UK's Air Masses (4)

Tropical Maritime	Wind from the south-west brings wet weather, with warm Maritime temperatures in the summer, but mild in the winter.
Tropical Continental	Wind from the south-east brings dry weather with hot temperatures in the summer. but mild in the winter.
Polar Continental	Wind from the north-east brings dry weather with Continental cold temperatures in the summer. and often freezing conditions in the winter.
Polar Maritime	Wind from the north-west brings wet weather with cold Maritime temperatures.

D - The Types Of Precipitation (3)

Convictional	Produced when warm air rises, cools and condenses, forming clouds and then rainfall.
Frontal	Warm air meets cold air and rises because it is less dense. It cools, condenses forming clouds, then precipitation.
Relief	Warm air is forced to rise as it meets a hill or mountain. It cools at high altitude, condenses and forms clouds, then precipitation.

E - High Pressure Systems

How is the air moving?	Areas where air is sinking, this air has little moisture.	
Conditions (3)	Positive impacts (2)	Negative impacts (2)
1. Calm weather with a cloudless sky. 2. Hot weather in summer. cold weather in winter. 3. Morning frost is common.	1. Lots of sunlight means farmers can grow more crops. 2. Increase in tourism. which boosts the local economy.	1 . Places such as Spain and Portugal are at high risk of forest fires during prolonged dry periods. 2. Can cause fog in the winter. which can lead to traffic accidents.

F - Low Pressure System

How is the air moving?	Air is rising, it cools and condenses causing high levels of precipitation.	
Conditions (3)	Positive impacts (2)	Negative impacts (3)
1. Unsettled weather which can change quickly. 2. High winds and high cloud cover. 3. Precipitation occurs as rising air cools and condenses.	1. Rainfall refills stores of water, such as reservoirs. 2. Wind farms will generate more energy.	1. Low pressure systems can cause large, destructive storms. 2. Bad weather can harm the tourist industry as tourists are put off. 3. Areas can be flooded.

G - Causes Of Tropical Storms (3)

High Temperatures	Oceans have to be 26.5°C or higher.
Weather Systems	A low pressure system means air rushes in and causes high winds.
Deep Ocean	Warm water is the power source for a tropical storm and should be 60 metres deep or more.

H - Case Study Example: Hurricane Katrina 2005

Where	New Orleans, south coast of the USA.	
Effects (3)	Responses (2)	
1. 1.836 died. 2. 10,000 people homeless 3. Floods were up to 3 metres deep in places.	1. \$105 billion was spent on rebuilding. 2. 10.000 people evacuated to the Superdome for shelter.	

Weather and climate introduction - Questions

- 1. What is weather?
- 2. What is climate?
- 3. What is precipitation?
- 4. What is humidity?
- 5. What is air pressure?

Factors affecting weather and climate - Questions

- 6. How does latitude affect climate?
- 7. How does altitude affect climate?
- 8. How do winds affect weather?
- 9. How do urban areas affect temperature?

UK air masses - Questions

- 10. What weather does a tropical maritime air mass bring?
- 11. What weather does a tropical continental air mass bring?
- 12. What weather does a polar continental air mass bring?
- 13. What weather does a polar maritime air mass bring?

Types of precipitation - Questions

- 14. What causes convectional rainfall?

Types of precipitation - Questions

- 15. What causes frontal rainfall?
- 16. What causes relief rainfall?

High pressure systems - Questions

- 17. What is the air movement in a high-pressure system?
- 18. What weather is associated with high pressure?
- 19. Name one positive impact of high pressure.
- 20. Name one negative impact of high pressure.

Low pressure systems - Questions

- 21. What is the air movement in a low-pressure system?
- 22. What weather is associated with low pressure?
- 23. Name one positive impact of low pressure.
- 24. Name one negative impact of low pressure.

Tropical Storms - Questions

- 25. What temperature must ocean water be for a tropical storm to form?
- 26. What depth must the ocean be for a tropical storm to form?
- 27. What type of pressure system causes tropical storms?

Case study: Hurricane Katrina (2005) - Questions

- 28. Where did Hurricane Katrina strike?
- 29. How many people died in Hurricane Katrina?
- 30. Name one response to Hurricane Katrina.

Background
1. Africa is a continent with spectacular human and physical features. Some of these features have influenced Africa's population distribution. (A, B) 2. Africa is home to some very large and important rivers, such as the amazing Nile. (C, D) 3. Kenya is a country with amazing physical features. (E) 4. Kenya has distinct climatic zones, which have influenced the activities which take place across the country. (F) 5. Kenya is an important country due to its trade links with countries around the world. (G) 6. Tourism is an important industry for the Kenyan economy. (H) 7. The capital city of Kenya, Nairobi, is a city of opportunities and challenges. (I)

A - Africa's Human And Physical Features (4)	
Human Geography	Studying what people do to the Earth.
Physical Geography	Studying what is naturally occurring on Earth.
Relief	The shape of the land surface and its height above sea level.
Megacity	A very large city with a population of over 10 million people.

B - Africa's Population (4)	
Population Density	The number of people who live within 1km².
Physical Geography	How people are spread out over an area.
Densely Populated	Places which contain many people per km².
Sparsely Populated	Places which contain few Populated people per km².

C - The Amazing Nile (5)	
Deposition	When a river loses energy so drops its load.
River load	The material which the river is transporting.
Delta	Formed where layers of sediment are deposited at river mouths.
Distributaries	A smaller river channel created where a river splits, often to form a delta.
Silt	The fertile, eroded material transported by a river.

D - Human Use Of The Nile (3)	
Irrigation	Addition of water lo farmland by artificial means.
Agriculture	Farming.
Hydro-electric power	The use of fast flowing water to turn turbines which produce electricity.

E - Kenya's Physical Features (3)	
Constructive Margin	Where tectonic plates move apart and Margin new land is created.
Fertile	Rich in nutrients.
Rift Valley	Steep-sided valley formed by the sinking of land between two faults or cracks caused by plate movements.

F - Kenya's Climate (3)	
Climate	The average weather conditions over longer periods of time.
Precipitation	Any form of water falling from the sky.
Altitude	Higher areas get more rainfall and are colder than low land areas.

G - Kenya's Trade Links With The World (6)	
Trade	The exchange of goods and materials between countries.
Trade Deficit	Cost of imports is greater than the money obtained from exports.
Trade Surplus	Money from exports is greater than the money made from imports.
Imports	Goods brought into a country.
Exports	Sending goods to another country for sale.
Colony	An area, or country, ruled by another country.

H - Tourism In Kenya (3)	
Tertiary Sector	Industries which provide a service such as: teaching, accounting, health care, sales etc.
Coral Reef	A marine ecosystem formed by the growth of coral that protects the coast from erosion and provides a habitat for marine plants and animals.
Mass Tourism	A form of tourism that involves tens of thousands of people going to the same resort often at the same time of year.

H - Opportunities And Challenges In Nairobi		
Where	The capital and the largest city of Kenya, situated in the south central highlands.	
Opportunities (3)		Challenges (3)
1. There are many global companies in Nairobi such as Shell, General Motors, Barclays, and many others. 2. Nairobi has beautiful natural parks and gardens such as Uhuru Park. 3. Nairobi is home to the Kenyan parliament.		1. Estimates suggest that over 1 million people live in shanty settlements such as Kibera. 2. In Kibera there is poor sanitation, with sewage running through the streets. Water must be purchased from pumps. 3. Unemployment in Kibera is estimated to be 50%.

Africa’s human and physical features - Questions

- 1. What is human geography?
- 2. What is physical geography?
- 3. What is relief?
- 4. What is a megacity?

Africa’s population - Questions

- 5. What is population density?
- 6. What does “densely populated” mean?
- 7. What does “sparsely populated” mean?
- 8. What is physical geography in terms of population?

The Amazing Nile - Questions

- 9. What is river load?
- 10. What is deposition?
- 11. What is a delta?
- 12. What are distributaries?
- 13. What is silt?

Human uses of the Nile - Questions

- 14. What is irrigation?

Human uses of the Nile - Questions

- 15. What is agriculture?
- 16. What is hydro-electric power?

Kenya’s physical features - Questions

- 17. What is a constructive margin?
- 18. What does fertile mean?
- 19. What is a rift valley?

Kenya’s climate - Questions

- 20. What is climate?
- 21. What is precipitation?
- 22. How does altitude affect climate?

Kenya’s trade links - Questions

- 23. What is trade?
- 24. What is a trade deficit?
- 25. What is a trade surplus?
- 26. What are imports?
- 27. What are exports?
- 28. What is a colony?

Tourism in Kenya - Questions

- 29. What is the tertiary sector?
- 30. What is mass tourism?



YEAR 8

Spanish



SPANISH GRAMMAR
SPANISH VOCABULARY



A – Position

In Spanish, unlike in English, most adjectives come after the noun they are describing.

For example:

- Una **casa** blanca – a white **house** (the adjective blanca comes after the **noun casa**)
- El **pelo** negro – black **hair** (the adjective black comes after the **noun hair**)
- Un **profesor** irritante – an irritating **teacher** (the adjective irritating comes after the **noun teacher**)

B – Agreement

Adjectives describe nouns. Adjective endings change according to whether the noun is masculine or feminine and singular or plural. There are different patterns of agreement, as follows:

	singular		plural	
	masculine	feminine	masculine	feminine
ending in -o	creativo	creativa	creativos	creativas
ending in -e	sociable	sociable	sociables	sociables
ending in a consonant	fácil	fácil	fáciles	fáciles
ending in -dor	trabajador	trabajadora	trabajadores	trabajadoras

Mi hermano es creativo – Masculine, singular
Mi hermana es creativa – Feminine, singular
Mis hermanos son creativos – Masculine, plural
Mis hermanas son creativas – Feminine, plural

Mi Hermano/hermana es sociable – Masculine/feminine singular
Mis hermanos/hermanas son sociables – Masculine/feminine plural

El inglés/la informática es fácil – Maculine/feminine singular
Los idiomas/las matemáticas son fáciles – Masculine/feminine plural

El camarero es trabajador – Masculine singular
La camarera es trabajadora – Feminine singular
Los camareros son trabajadores – Masculine plural
Las camareras son trabajadoras – Feminine plural

A – Position – Self-quizzing

1. Choose the correct word to complete the sentence:
Most adjectives come **before/after** the noun
2. Correct the errors in these phrases:
La blanca casa B. El negro pelo C. Un irritante profesor
3. Correct the errors in these phrases:
A. El negro perro B. Una difícil asignatura C. Mi favorito programa

B – Agreement – Self-quizzing

1. Adjective endings change depending on whether the noun is m_____ or f_____ and s_____ or p_____.
2. Choose the correct adjective:

Mi hermano es alto/alta El dibujo es interesante/interesante La chica es fiel/fiele
Mi prima es bajo/baja La tecnología es excelente/excelenta Las personas son tristes/tristas
Los gatos son pequeños/pequeñas Los museos son grande/grandes La mujer es hablador/habladora
Las cobayas son listos/listas Las piscinas son importante/importantes Los niños son habladores/habladores

A – Regular verbs

In the present tense, -ar, -er and -ir verbs follow different patterns of endings:

	-ar	-er	-ir
	bailar (to dance)	comer (to eat)	escribir (to write)
yo	bailo	como	escribo
tú	bailas	comes	escribes
él/ella / usted	baila	come	escribe
nosotros/as	bailamos	comemos	escribimos
vosotros/as	bailáis	coméis	escribís
ellos/as / ustedes	bailan	comen	escriben

To conjugate a verb (change an infinitive verb) in the present tense, you usually remove the AR/ER/IR endings to be left with the stem. You then add on the appropriate ending.

Infinitive	Stem	Present tense
Cantar	Cant	Canto (I sing)
Comer	Com	Como (I eat)
Describir	Describ	Describo (I describe)

B – Irregular verbs

Some verbs don't follow the usual patterns. Learn each verb by heart.

ir (to go)	ser (to be)	tener (to have)	ver (to see)
voy	soy	tengo	veo
vas	eres	tienes	ves
va	es	tiene	ve
vamos	somos	tenemos	vemos
vais	sois	tenéis	veis
van	son	tienen	ven

Some verbs are irregular in the 'I' form only:
hacer (to do / to make) → hago **salir** (to go out) → salgo

Irregular verbs don't follow the same pattern, and you just need to learn the differences.

C – Reflexive verbs

Reflexive verbs describe actions you do to yourself. They include a reflexive pronoun, e.g. **me, te, se**, which means 'myself', 'yourself', 'his/herself', etc..

ducharse (to have a shower)

me ducho
te duchas
se ducha
nos duchamos
os ducháis
se duchan

Some reflexive verbs are stem-changing in the present tense:

acostarse (to go to bed) → me acuesto (I go to bed)
despertarse (to wake up) → me despierto (I wake up)
vestirse (to get dressed) → me visto (I get dressed)

Reflexive verbs are mostly used to describe daily routine actions or family relationships. You conjugate them in the same way as regular verbs, but you just include the reflexive pronoun.

A – Regular Verbs – Self-quizzing

- 1. Conjugate the following verbs into first person singular (I form):
A. Visitar B. Beber C. Vivir
- 2. Conjugate the following verbs into first person plural (we form):
A. Hablar B. Leer C. Vivir
- 3. Translate these phrases into Spanish:
A. I talk B. We drink C. I write D. We eat E. I read F. We visit

B – Irregular verbs – Self-quizzing

- 1. Conjugate the following verbs into first person singular (I form):
A. Ir B. Tener C. Ser D. Ver
- 2. Conjugate the following verbs into first person plural (we form):
A. Ir B. Tener C. Ser D. Ver

C – Reflexive verbs – Self-quizzing

- 1. Translate these phrases into Spanish:
A. I get up B. I have a shower C. I get dressed D. We have a shower E. We get up

A – Regular verbs

In the preterite, regular -ar verbs follow one pattern of endings and -er and -ir verbs follow another:

	-ar	-er	-ir
	bailar (to dance)	comer (to eat)	escribir (to write)
yo	bailé	comí	escribí
tú	bailaste	comiste	escribiste
él/ella / usted	bailó	comió	escribió
nosotros/as	bailamos	comimos	escribimos
vosotros/as	bailasteis	comisteis	escribisteis
ellos/as / ustedes	bailaron	comieron	escribieron

To conjugate a verb (change an infinitive verb) in the present tense, you usually remove the AR/ER/IR endings to be left with the stem. You then add on the appropriate ending.

Infinitive	Stem	Present tense
Cantar	Cant	Canté (I sang)
Comer	Com	Comí (I ate)
Describir	Describ	Describí (I described)

A – Regular Verbs – Self-quizzing

- Conjugate the following verbs into first person singular (I form):
A. Visitar B. Beber C. Vivir
- Conjugate the following verbs into first person plural (we form):
A. Hablar B. Leer C. Vivir
- Translate these phrases into Spanish:
A. I talked B. We drank C. I wrote D. We ate E. I read F. We visited

B – Irregular verbs

Some verbs don't follow the usual patterns in the preterite. Learn each verb by heart.

ir (to go)	ser (to be)	hacer (to do / make)	tener (to have)	ver (to see)
fui	fui	hice	tuve	vi
fuiste	fuiste	hiciste	tuviste	viste
fue	fue	hizo	tuvo	vio
fuimos	fuimos	hicimos	tuvimos	vimos
fuisteis	fuisteis	hicisteis	tuvisteis	visteis
fueron	fueron	hicieron	tuvieron	vieron

The verbs ir and ser are identical in the preterite, but the context makes it clear which verb is meant. In the preterite, the following verbs are irregular in the 'I' form only:
sacar (to take) - saqué (I took) **jugar** (to play) - jugué (I played) **tocar** (to play) - toqué (I played)

Irregular verbs don't follow the same pattern, and you just need to learn the differences.

B – Irregular verbs – Self-quizzing

- Conjugate the following verbs into first person singular (I form):
A. Sacar B. Jugar C. Tocar
- Conjugate the following verbs into first person plural (we form):
A. Ir B. Ser C. Hacer
- Translate these phrases into Spanish:
A. I had B. We saw C. I went D. We had E. I was F. I did/I

A – Near future - Ir a + infinitive

The near future tense is used to talk about what you are going to do. Use the present tense of the verb ir followed by a plus the infinitive.

voy a salir con mis amigos	I am going to go out with my friends
vas a ver la television	you are going to watch TV
va a ir de paseo	he/she is going to go for a walk
vamos a jugar al voleibol	we are going to play volleyball
vais a chatear	you (plural) are going to chat online
van a hacer los deberes	they are going to do their homework

A – Use the present tense of the verb ‘ir’, the letter ‘a’ and then an infinitive.

Voy a jugar = I am going to play
Voy a beber = I am going to drink
Voy a visitar = I am going to visit
Voy a ir = I am going to go

B – Future time frame

Use a conjugated verb followed by the infinitive.

Quiero salir con mis amigos	I want to go out
Espero ver la television	I hope to watch TV
Me gustaría ir de paseo	I would like to go for a walk
Quisiera hacer los deberes	I would like to do my homework

A – Simple Future – Self-quizzing

1. Translate these phrases into Spanish:
- | | | |
|------------------------|-----------------------------|---------------------------------|
| A. I am going to talk | B. I am going to drink | C. I am going to write |
| D. We are going to eat | E. I am going to read | F. We are going to visit |
| G. I am going to play | H. We are going to watch TV | I. I am going to do my homework |

B – Future Time Frame – Self-quizzing

1. Translate these phrases into Spanish:
- | | | |
|---------------------------------|-------------------------------------|--------------------------|
| A. I want to talk to my friends | B. I hope to go for a walk | C. I would like to write |
| D. I want to eat | E. I hope to go out with my friends | |
| F. I would like to watch TV | G. I want to play videogames | |

A / B – Future – Self-quizzing

1. Choose the correct answer
- | | |
|--|--|
| A. Voy a hablar/hablo con mis amigos | B. Espero como/comer patatas |
| C. Quiero visitar/visito mis abuelos | D. Me gustaría veo/ver una película |
| E. Quisiera jugar/juego al baloncesto | F. Vamos a escribo/escribir |

A – Opinion + infinitive

You can use infinitives after opinion verbs such as me gusta (I like), no me gusta (I don't like), me encanta (I love), detesto/odio (I hate) and prefiero (I prefer).

For example:

Me gusta <u>leer</u> libros	I like to <u>read</u> books / I like <u>reading</u> books.
No me gusta <u>nadar</u>	I don't like to <u>swim</u> / I don't like <u>swimming</u> .
Me encanta <u>comer</u> chocolate	I love to <u>eat</u> chocolate / I love <u>eating</u> chocolate.
Odio <u>ver</u> el telediario	I hate to <u>watch</u> the news / I hate <u>watching</u> the news
Prefiero <u>salir</u> con mis amigos	I prefer <u>to go out</u> with my friends / I prefer <u>going out</u> with my friends

B – Plural opinions

If the noun that you are giving an opinion about is plural (starts with 'los' or 'las'), opinion phrases that use 'me', such as 'me gusta', 'me encanta', 'me chifla', 'no me gusta' need to end in an 'n'.

Me gustan las matemáticas	I like Maths
Me encantan los animals	I love animals
No me gustan las montañas	I don't like the mountains

A – Opinion + Infinitive – Self-quizzing

1. Choose the correct answer:
- | | |
|---|---|
| A. Me gusta salir/salgo con mis amigos | B. Me encanta como/comer en un restaurante |
| C. No me gusta chatear/chateo | D. Me gustaría veo/ver la tele |
| E. Odio hago/hacer mis deberes | |
2. Translate these sentences into Spanish:
- | | | |
|------------------------------------|---------------------------|----------------------------------|
| A. I like to visit my grandparents | B. I prefer to read books | C. I don't like eating chocolate |
|------------------------------------|---------------------------|----------------------------------|

B – Plural Opinions – Self-quizzing

1. Choose the correct answer:
- | | | |
|---|---|---|
| A. Me gusta/gustan las ciencias | B. Me gusta/gustan el chocolate | C. Me encanta/encantan el fútbol |
| D. Me gusta/gustan los caramelos | E. Me encanta/encantan los fines de semana | |
2. Translate these sentences into Spanish:
- | | | |
|------------------|-----------------|-----------------------|
| A. I like sports | B. I love books | C. I don't like pasta |
|------------------|-----------------|-----------------------|

A / B – Future – Self-quizzing

1. Choose the correct answer
- | | |
|--|--|
| A. Voy a hablar/hablo con mis amigos | B. Espero como/comer patatas |
| C. Quiero visitar/visito mis abuelos | D. Me gustaría veo/ver una película |
| E. Quisiera jugar/juego al baloncesto | F. Vamos a escribo/escribir |

A – Opinion + infinitive

Modal verbs are used to express ideas like possibility, ability, permission or necessity. Modal verbs must be followed by an infinitive.

Key modal verbs		+	Key infinitives
Se puede	You can		
Se debe	You must		Visitar – to visit
Suelo	I usually		Ir – to go
Tengo que	I have to		Comer – to eat
			Ver – to watch/see
			Ser – to be
			Hacer – to do
			Hablar – to talk
			Salir – to go out

Modal verb + infinitive
You can visit = **Se puede** visitar
You must watch = **Se debe** ver
I usually go = **Suelo** ir
I have to eat = **Tengo que** comer

A – Understanding – Self-quizzing

1. What is a modal verb and what must it be followed by in Spanish?
2. Translate the following into Spanish: “You must go.”
3. What does “Tengo que” mean in English?
4. Which Spanish modal verb means “I usually”?
5. Identify the infinitive in the sentence: “Suelo hablar”

B – Practice – Self-quizzing

1. Translate into English:
a. Se puede salir b. Se debe ser c. Tengo que hablar d. Suelo ver
2. Translate these sentences into Spanish:
a. I usually eat b. You can go c. You must talk d. I have to do

Time

		Examples
A la/las	At	
Es la/son las	It is	At one o'clock – A la una
Y cuarto	Quarter past	At two o'clock - A las dos
Y media	Half past	At quarter past three – A las tres y cuarto
Menos cuarto	Quarter to	At half past four – A las cuatro y media
Y cinco	Five past	At quarter to five – A las cinco menos cuarto
Y diez	Ten past	It is one o'clock – Es la una
Y veinte	Twenty past	It is six o'clock – Son las seis
Menos veinte	Twenty to	It is five past seven – Son las siete y cinco
Menos diez	Ten to	It is ten past eight – Son las ocho y diez
Menos cinco	Five to	It is ten to nine – Son las nueve menos diez
		It is five to ten – Son las diez menos cinco

A – Match up – Self-quizzing

English	Spanish
a. It is quarter past 3	1. Son las ocho y diez
b. It is 10 past 8	2. Son las tres y cuarto
c. At quarter to 5	3. A las cinco menos cuarto
d. It is 5 to 10	4. Son las diez menos cinco
e. It is 6 o'clock	5. Son las seis

B – Fill in the gaps – Self-quizzing

1. Son las ocho y _____ (20)
2. A las cinco menos _____ (15)
3. Es la _____ (1)
4. Son las siete y _____ (25)
5. A las cuatro y _____ (30)

C – Translate – Self-quizzing

1. Translate into Spanish:
a. It is one o'clock b. It is ten past eight c. At quarter past three d. At five to ten
2. Translate into English:
a. Son las seis b. A la una c. Son las nueve menos diez d. A las tres y cuarto

Vocabulary			
Spanish	English	Spanish	English
Fui	I went	Compró recuerdos	He/She bought souvenirs
Fuimos	We went	Vi sitios históricos	I saw the historical sites
Me alojé	I stayed	Fue	It was...
En la costa	By the sea	Genial	Great
En el campo	In the countryside	Divertido	Fun
Viajé	I travelled	Aburrido	Boring
Viajamos	We travelled	Emocionante	Exciting
En avión	By plane	El año pasado	Last year
En coche	By car	El primer/segundo día	On the first/second day
Peligroso	Dangerous	Por la mañana	In the morning
Barato	Cheap	Por la tarde	In the afternoon
Caro	Expensive	Por la noche	In the evening
Nadé en la piscina	I swam in the pool	Después	After
Visité los sitios turísticos	I visited the tourist sites	Más tarde	Later
Saqué muchas fotos	I took lots of photos	Normalmente	Normally
Comí	I ate	Voy	I go
Fui de compras	I went shopping	Vamos	We go
Compré recuerdos	I bought souvenirs	Visito los sitios turísticos	I visit the tourist sites

Vocabulary	
Spanish	English
Nado en el mar	I swim in the sea
Como en un restaurante	I eat at a restaurant
Hago deportes acuáticos	I do water sports
Compro recuerdos	I buy souvenirs
Juego	I play
Este verano	This summer
Este año	This year
Voy a + infinitive	I'm going...
Vamos a + infinitive	We're going...
Quiero + infinitive	I want...
Me gustaría / quisiera (+ infinitive)	I would like...
Ir a	To go to
Visitar	To visit
Ver los monumentos	To see the monuments
Nadar en el mar	To swim in the sea

Vocabulary

Look		Write	Check
Fui	I went		
Fuimos	We went		
Viajé	I travelled		
En avión	By plane		
En coche	By car		
Nadé en la piscina	I swam in the pool		
Fui de compras	I went shopping		
Fue	It was...		
El año pasado	Last year		
Normalmente	Normally		
Voy	I go		
Vamos	We go		
Nado en el mar	I swim in the sea		
Compro recuerdos	I buy souvenirs		
Juego	I play		
Este verano	This summer		
Voy a + infinitive	I'm going...		
Vamos a + infinitive	We're going...		
Quiero + infinitive	I want...		
Ir a	To go to		
Visitar	To visit		

Vocabulary

Spanish	English	Spanish	English
Todos los días	Everyday	Jugar en el parque	To play in the park
Juego al baloncesto	I play basketball	Visitar a mis abuelos	To visit my grandparents
Toco el piano	I play (an instrument)	Jugar un partido de fútbol	To play in a football match
Hago natación	I do swimming	Ver un partido de fútbol	To watch a football match
Veo la tele	I watch TV	Voy a comprar	I'm going to buy
Escucho música	I listen to music	Voy a llevar	I'm going to wear
Salgo	I go out	Prefiero ver	I prefer to watch
Leo libros	I read books	Me gustan	I like (plural)
En mi tiempo libre	In my free time	Las noticias	The news
Me gusta / Me encanta / Detesto	I like / I love / I hate	Las telenovelas	Soap operas
El deporte / cine	Sport / Cinema	Los concursos	Game shows
Hacer natación	Swimming	Las películas de acción	Action films
Hacer equitación	Horse riding	Las comedias	Comedies
Jugar a los videojuegos	Playing video games	Son...	They are...
Ver películas	Watching films	Entretenidos	Entertaining
Ir de compras	Shopping	Emocionantes	Exciting
Salir con mis amigos	Going out with friends	Escucho	I listen to
Este fin de semana	This weekend	Me gusta escuchar	I like listening to
Voy a (+ infinitive)	I'm going (to)	Mi cantante favorito	My favourite singer
Vamos a (+ infinitive)	We are going (to)	Vi	I saw...
Ir al centro	To go into town	Leí	I read...

Vocabulary

Spanish	English
La semana pasada	Last week
Ayer	Yesterday
¿Quieres + infinitive?	Do you want (to)...?
Salir conmigo	To go out with me
Ir de tiendas	To go to the shops
Ir al centro	To go into town
Ir a una fiesta	To go to a party
Ver una película	To watch a film
¿A qué hora?	At what time?
A las ocho / a las ocho y media	At eight o'clock / at half past eight
Me gustaría	I'd like to
Quisiera	I would like
Una talla más grande / pequeña	A bigger size / smaller size
¿Cuánto es?	How much does that cost?
Son... euros	It costs...
Una mesa para dos personas	A table for two people
La cuenta, por favor	The bill, please
¿Tiene menú?	Do you have a menu?
Hay un problema	There is a problem
Detesto	I hate

Vocabulary			
Look		Write	Check
Todos los días	Everyday		
Veo la tele	I watch TV		
Escucho música	I listen to music		
En mi tiempo libre	In my free time		
Me gusta / Me encanta / Detesto	I like / I love / I hate		
Salir con mis amigos	Going out with friends		
Este fin de semana	This weekend		
Voy a (+ infinitive)	I'm going (to)		
Vamos a (+ infinitive)	We are going (to)		
Jugar en el parque	To play in the park		
Visitar a mis abuelos	To visit my grandparents		
Voy a comprar	I'm going to buy		
Voy a llevar	I'm going to wear		
Prefiero ver	I prefer to watch		
Las comedias	Comedies		
Son...	They are...		
Entretenidos	Entertaining		
Emocionantes	Exciting		
Escucho	I listen to		
Me gusta escuchar	I like listening to		
Vi	I saw...		
Leí	I read...		
¿Quieres + infinitive?	Do you want (to)...?		
¿A qué hora?	At what time?		
A las ocho / a las ocho y media	At eight o'clock / at half past eight		
¿Cuánto es?	How much does that cost?		

Vocabulary

Spanish	English	Spanish	English
Me levanto	I get up	Levantarme	To get up
Me lavo los dientes	I brush my teeth	Comer	To eat
Desayuno	I have breakfast	Ir al instituto	To go to school
Voy al instituto a pie	I go to school by foot	Tarde	Late
Hago los deberes	I do my homework	Más pronto	Earlier
Después	Afterwards / then	Llevo una vida sana	I lead a healthy life
Más tarde	Later	Bebo	I drink
A las...	At ... o'clock	Como sano	I eat healthily
Me levanté a las...	I got up at...	Todos los días	Every day
Desayuné	I had breakfast	Casi nunca	Rarely / hardly ever
Fui al instituto	I went to school	Hago ejercicio	I exercise
Jugué en mi móvil	I played on my phone	Soy activo	I am active
Vi la tele	I watched television	Voy a (+ infinitive)	I'm going to...
Escuché música	I listened to music	Debemos (+ infinitive)	We should...
Hice mis deberes	I did my homework	Se debe (+ infinitive)	One / you should...
Fue...	It was...	Comer más / menos	To eat more / less
Me gustaría (+ infinitive)	I would like...	Beber más	To drink more

Vocabulary

Spanish	English
Hacer deporte	To do / play sport
Hacer ejercicio	To exercise
Dormir más	To sleep more
Ayer	Yesterday
Comí	I ate
Bebí	I drank
Jugué al baloncesto	I played basketball
Hice natación	I went swimming
Fui al instituto en bici	I cycled to school
Fue...	It was...
Bueno para la salud	Healthy
Malo para la salud	Unhealthy
Me duele ...	My ... hurts
La cabeza	Head
Estómago	Stomach
He vomitado	I've been sick

Vocabulary			
Look		Write	Check
Me levanto	I get up		
Desayuno	I have breakfast		
Voy al instituto a pie	I go to school by foot		
Hago los deberes	I do my homework		
A las...	At ... o'clock		
Me levanté a las...	I got up at...		
Fui al instituto	I went to school		
Hice mis deberes	I did my homework		
Fue...	It was...		
Me gustaría (+ infinitive)	I would like...		
Levantarme	To get up		
Ir al instituto	To go to school		
Tarde	Late		
Llevo una vida sana	I lead a healthy life		
Bebo	I drink		

Vocabulary			
Look		Write	Check
Como sano	I eat healthily		
Hago ejercicio	I exercise		
Voy a (+ infinitive)	I'm going to...		
Se debe (+ infinitive)	One / you should...		
Comer más / menos	To eat more / less		
Beber más	To drink more		
Hacer ejercicio	To exercise		
Ayer	Yesterday		
Comí	I ate		
Bebí	I drank		
Jugué al baloncesto	I played basketball		
Bueno para la salud	Healthy		
Malo para la salud	Unhealthy		
Me duele ...	My ... hurts		

Vocabulary			
Spanish	English	Spanish	English
Hay... edificios	There are ... buildings	Llevar vaqueros	To wear jeans
Llevamos uniforme	We wear a school uniform	Mi madre es...	My mum is...
Chaqueta	Blazer	Enfermero	Nurse
Pantalón	Trousers	Camarero	Waiter / waitress
Zapatos	Shoes	Médico	Doctor
El día empieza a las...	The day starts at...	Trabaja en...	He / she works...
El día termina a las...	The day finishes at...	Una fábrica	A factory
Después del instituto	After school	Me gustaría ser	I would like to be
Se puede	You can	Espero ser	I hope to be
Un viaje escolar	A school trip	Bailarín	A dancer
Al extranjero	Abroad	Viajar por todo el mundo	Travel the world
Pienso que	I think that	Sería...	That would be...
Se debe	You must	Mi sueño	My dream
Fumar	Smoke	Voy a (+ infinitive)	I'm going to...
Escuchar al profe	Listen to the teacher	Quiero (+ infinitive)	I want to...
Las normas / reglas	Rules	Casarme	To get married
No es justo	It's unfair	Estudiar en la universidad	To study at university
Cambiaría mucho	I would change a lot	Ser feliz	To be happy



YEAR 8

Religion



8.01 | ISLAM

8.02 | DHARMIC FAITHS

8.03 | HINDU DHARMA



Key Vocabulary	
Abu Bakr	The first Caliph chosen by Sunni Muslims after Muhammad's death
Ali	Muhammad's cousin and son-in-law, considered by Shia Muslims as his rightful successor
Allah	The Arabic word for God in Islam
burqa	A full-body covering worn by some Muslim women for reasons of modesty
caliph	A leader in Sunni Islam who succeeded Muhammad in leading the Muslim community
charity	Giving to those in need, especially through zakat
Constitution of Medina	A document created by Muhammad to establish peace and cooperation in Medina
Eid-al-Fitr	A festival marking the end of Ramadan
Fatima	Muhammad's daughter, especially respected in Shia Islam
Hadith	Recorded sayings and actions of Muhammad
Hajj	A pilgrimage to Makkah that Muslims aim to complete once in their lifetime
hijab	A headscarf worn by some Muslim women as a sign of modesty
Hijrah	The migration of Muhammad and his followers from Makkah to Medina
imam	A leader in Shia Islam or someone who leads prayer in Sunni Islam
Islam	A monotheistic religion revealed to the Prophet Muhammad
Jahannam	Hell; a place of punishment after death for those who reject faith or do wrong
Jannah	Paradise; a place of reward after death for the righteous
Kaaba	The sacred cube-shaped structure in Makkah that Muslims face during prayer
Khadija	Muhammad's first wife and the first person to accept Islam
Makkah	The birthplace of Muhammad and the holiest city in Islam

Key Vocabulary	
Medina	The city where Muhammad established the first Muslim community
modesty	A principle in Islam often expressed through clothing and behaviour
Muhammad	The final prophet in Islam, believed to have received the Qur'an
niqab	A face veil worn by some Muslim women as part of modest dress
prophet	A messenger chosen by God to deliver His message
Qur'an	The holy book of Islam, believed to be the literal word of God
Ramadan	The ninth month of the Islamic calendar, observed with fasting
salah	Ritual prayer performed five times a day
sawm	Fasting from dawn to dusk during Ramadan
Seal of the Prophets	A title for Muhammad, indicating he is the final prophet
shahada	The Islamic declaration of faith
Sharia	Islamic law derived from the Qur'an and Sunnah
Shia	A branch of Islam that believes Ali was Muhammad's rightful successor
shirk	The sin of associating partners with Allah
Sunnah	The example of Muhammad's life used as a guide by Muslims
Sunni	The largest branch of Islam, following the elected caliphs
Surah	A chapter of the Qur'an
tawhid	The belief in the oneness of Allah
ummah	The global Muslim community
wudu	Ritual washing before prayer
zakat	Compulsory act of charity, for those who can afford it

Questions

1. Muslims believe in one God, Allah. What is the Arabic term for the Muslim belief in the oneness of Allah?
2. What is the Arabic term for paradise; a place of reward after death for the righteous?
3. What is the Arabic term for hell; a place of punishment after death for those who reject faith or do wrong?
4. What is the holy book of Islam, believed to be the literal word of God?
5. Who is the final prophet in Islam, believed to have received the Qur'an?
6. What is a title for Prophet Muhammad, indicating he is the final prophet?
7. What are the recorded sayings and actions of Prophet Muhammad known as?
8. What is the key term for the example of Muhammad's life used as a guide by Muslims?
9. What is the holiest city in Islam, which is also the birthplace of Prophet Muhammad?
10. What is the sacred cube-shaped structure in Makkah (Mecca) that Muslims face during prayer?

Questions

11. In which city did Prophet Muhammad establish the first Muslim community?
12. What is the Arabic term for the global Muslim community?
13. Abu Bakr was the first Caliph (leader) chosen by Sunni Muslims after Prophet Muhammad's death, but who is Muhammad's cousin and son-in-law, considered by Shia Muslims as his rightful successor?
14. What is the largest branch of Islam, following the elected caliphs?
15. What is the Arabic term for the Islamic declaration of faith, stating "there is no God but Allah and Muhammad is his messenger"?
16. What is the Arabic term for ritual prayer performed five times a day?
17. What is the Arabic term for the compulsory act of charity, for those who can afford it?
18. Sawm means fasting during daylight hours in which Islamic month?
19. What is the Arabic term for the annual pilgrimage to Makkah (Mecca) that Muslims aim to complete once in their lifetime?
20. What is a headscarf worn by some Muslim women as a sign of modesty?

Key Vocabulary	
atman	The Hindu idea of the soul, the true self, which is reincarnated through a cycle of many lifetimes.
Bhakti Yoga	Hindu spiritual path of devotion focusing on loving and worshipping the divine.
Brahman	(In Hindu Dharma) the one, divine ultimate reality.
Buddha	A title meaning “Enlightened One.” It refers to Siddhartha Gautama.
Buddhism	Dharmic faith that teaches people how to end suffering by following the Buddha’s teachings.
dastar	A turban worn by some Sikhs to show respect for their faith and identity.
dharma	Often translated as ‘duty’, it includes human behaviour, justice and living in harmony with the world.
Diwali	Hindu festival of lights celebrating the victory of good over evil in the Ramayana.
gurdwara	A Sikh place of worship where people pray, sing and share food.
Guru	A spiritual teacher. In Sikhi, there were ten human Gurus who taught important lessons.
Hindu	A person who follows Hindu Dharma.
Hindu Dharma	A Dharmic faith that teaches people how to live well by following their duty (dharma), seeking truth and aiming for spiritual freedom (moksha) .
Jnana Yoga	A spiritual path in Hindu Dharma that focuses on learning about God through study, thinking and wisdom.
karma	In Hindu Dharma, the idea that actions and choices have consequences; good actions lead to positive outcomes in future lives and bad actions lead to suffering.
Karma Yoga	A spiritual path in Hindu Dharma that focuses on doing your duty and helping others without being selfish.
Krishna	Hindu deity known for his wisdom, kindness and playful nature (an avatar of Vishnu). He taught Arjuna in the Bhagavad Gita.

Religious Authority	
Bhagavad Gita	(One of many Hindu sacred texts) narrative in which Lord Krishna teaches Arjuna about life, duty, and making good choices.
Vedas	Oldest and most important texts in Hindu tradition. Ancient scriptures including hymns, prayers and teachings.
Siddhartha Gautama (The Buddha)	A man who became the Buddha after discovering how to overcome suffering.
Guru Nanak	The first Sikh Guru and the founder of Sikhi.

Key Vocabulary	
mandir (or temple)	Hindu place of worship where people go to pray and take part in religious ceremonies.
moksha	Freedom from the cycle of birth, death and rebirth (the ultimate goal in Hindu Dharma), where the soul (atman) becomes one with ultimate reality.
mukti	Freedom from the cycle of birth and death; a goal in Sikhi.
nirvana	A peaceful state of mind in Buddhism where there is no more suffering or desire.
Raja Yoga	A spiritual path in Hindu Dharma that focuses on controlling your mind (meditation) and connecting with your inner self.
samsara	Cycle of birth, life, death and rebirth in Hindu belief.
sari (or saree)	A traditional piece of clothing worn by many women in South Asia, often wrapped around the body.
Sikh	A follower of Sikhi, a dharmic faith that teaches equality, honesty and helping others.
Sikhi	A dharmic faith that teaches equality, honesty and helping others. Started by Guru Nanak.
Vaisakhi	Sikh festival celebrating the start of the Khalsa (the Sikh community) in 1699. It’s also a harvest festival in parts of India, especially the Punjab.

Questions

1. What is a dharmic faith that teaches people how to live well by following their duty (dharma), seeking truth and aiming for spiritual freedom (moksha)?
2. What is a Hindu place of worship where people go to pray and take part in religious ceremonies?
3. What are the oldest and most important texts in Hindu tradition?
4. What is the name of one of many Hindu sacred texts, which is a narrative in which Lord Krishna teaches Arjuna about life, duty, and making good choices?
5. What is the Hindu festival of lights celebrating the victory of good over evil in the Ramayana?
6. In Hindu Dharma, what is the name for the one, divine ultimate reality?
7. In Hindu Dharma, what is the key term for the idea that actions and choices have consequences; good actions lead to positive outcomes in future lives and bad actions lead to suffering?
8. What is the key term for the Hindu idea of the soul, the true self, which is reincarnated through a cycle of many lifetimes?
9. In Hindu belief, what is the key term for the cycle of birth, life, death and rebirth?
10. In Hindu Dharma, what is the key term for freedom from the cycle of birth, death and rebirth (the ultimate goal of a Hindu), where the soul (atman) becomes one with ultimate reality?

Questions

11. Which key term is often translated as ‘duty’, it includes human behaviour, justice and living in harmony with the world?
12. Which dharmic faith teaches people how to end suffering by following the Buddha’s teachings?
13. What is a title meaning “Enlightened One”?
14. Which man became the Buddha after discovering how to overcome suffering?
15. What is a peaceful state of mind in Buddhism where there is no more suffering or desire?
16. Which dharmic faith, started by Guru Nanak, teaches equality, honesty and helping others?
17. What is the key term for a spiritual teacher?
18. Who is the first of the ten human Sikh gurus and the founder of Sikhi?
19. What is a Sikh place of worship where people pray, sing and share food?
20. What do Sikhs call the freedom from the cycle of birth and death?

Key Vocabulary	
Brahman	The one, divine ultimate reality. Everything comes from Brahman and returns to it.
Atman	The Hindu idea of the soul – the true self that lives on after the body dies.
Moksha	Freedom (liberation) from the cycle of birth, death and rebirth (the ultimate goal in Hindu Dharma), where the soul becomes one with the divine.
Deity	Preferred term for a god or goddess. In Hindu Dharma, there are many deities, each representing aspects of Brahman.
Monotheism	Belief in one God. Some followers of Hindu Dharma include monotheistic ideas, even though there are many deities.
Polytheism	The belief in many gods.
Pantheism	The belief that God is present in everything; in nature, people, and the universe.
Brahma	Hindu deity of creation, part of the Trimurti (Brahma, Vishnu, and Shiva).
Vishnu	Hindu deity known as the protector of the universe (one of the Trimurti). He appears in many forms (avatars) to help restore balance in the world.
Shiva	Hindu destroyer deity. He helps make way for the new and brings balance (one of the Trimurti).
Trimurti	Three main deities in Hindu Dharma (Brahma the creator, Vishnu the protector, and Shiva the destroyer), who together keep the universe in balance.
Avatar	A deity appearing on Earth in human or animal form to help restore balance and protect good.
Vedas	Oldest and most important texts in Hindu tradition. Ancient scriptures including hymns, prayers, and teachings.

Key Vocabulary	
Bhagavad Gita	Sacred Hindu text where Lord Krishna teaches Arjuna about life, duty, and making good choices.
Dharma	(In Hindu Dharma) a person's duty; doing what is right for you, your role, and your community.
Sanatana Dharma	A name many Hindus use for their traditions, meaning "eternal (or universal) duty". Universal values that are believed to be true for all people.
Varnashrama Dharma	Hindu idea that people should follow their individual duties based on their stage of life (ashrama) and their role in society (varna).
Varna	The four traditional groups in Hindu society (Brahmins, Kshatriyas, Vaishyas, and Shudras), each with different roles and duties.
Ashrama	The four stages of life in Hindu Dharma (student, householder, retiree, and spiritual seeker) each with its own duties.
Mandir	(or temple) A place where many Hindus go to pray, worship and take part in religious ceremonies.
Murti	Statue or image of a deity used in Hindu worship to help people focus.
Puja	Hindu act of worship that includes offering prayers, flowers, food and light to a deity.
Ramayana	Ancient Hindu story about Prince Rama, his wife Sita, and his battle against the demon king Ravana.
Diwali	Festival of lights celebrating the victory of good over evil in the Ramayana. Many Hindus light lamps, share sweets and enjoy fireworks.
Namakarana	Hindu baby naming ceremony, where the child's name is chosen and blessings are given.
Samsara	Cycle of birth, death, and rebirth in Hindu belief. People aim to break free from this cycle by living a good life.
Karma	Idea that actions and choices have consequences; good actions bring good results, and bad actions bring bad results, this follows the atman (soul) into the next life.
Ahimsa	Hindu principle of non-violence: not hurting others in actions, words or thoughts.
Caste	Traditional system in Hindu society that grouped people into different roles (Varna), like teachers, protectors, or traders, based on birth.
Dalit	People who were traditionally outside the caste system in India. Many Dalits have faced unfair treatment, but today the term is used with pride by those working for equality.

Questions

1. What is the preferred term for a god or goddess?
2. What do Hindus call the one, divine ultimate reality, which everything comes from and returns to?
3. Which deity of the Trimurti is the Hindu deity of creation?
4. Which deity of the Trimurti is the protector or preserver of the universe, who appears in many forms and helps to restore balance in the world?
5. Which deity of the Trimurti is the destroyer, who helps make way for the new and brings balance?
6. What is the key term for a deity appearing on Earth in human or animal form to help restore balance and protect good?
7. What word is used to describe a person’s duty; doing what is right for you, your role, and your community?
8. What word is used to describe the Hindu idea of the soul - the true self that lives on after the body dies?
9. What is the key term for the idea that actions and choices have consequences; good actions bring good results, and bad actions bring bad results, this follows the soul into the next life?
10. What is samsara?

Questions

11. What word describes the freedom (liberation) from the cycle of birth, death and rebirth (the ultimate goal in Hindu Dharma), where the soul becomes one with the divine?
12. What are the oldest and most important texts in Hindu tradition?
13. What is a Hindu place of worship where many Hindus go to pray, worship and take part in religious ceremonies?
14. What is the key term for a statue or image of a deity used in Hindu worship to help people focus?
15. What is a Hindu act of worship that includes offering prayers, flowers, food and light to a deity?
16. The Ramayana is an ancient Hindu story about a prince, his wife, and his battle against the demon king Ravana. What is the name of the prince and his wife?
17. Diwali is a festival celebrating the victory of good over evil in the Ramayana. What is Diwali also known as?
18. What is the Hindu principle of non-violence: not hurting others in actions, words or thoughts?
19. What is the traditional system in Hindu society that grouped people into different roles (Varna), like teachers, protectors, or traders, based on birth?
20. Some followers of Hindu Dharma include ideas of monotheism (belief in one god), even though there are many deities. What is the key term for the belief in many gods?



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