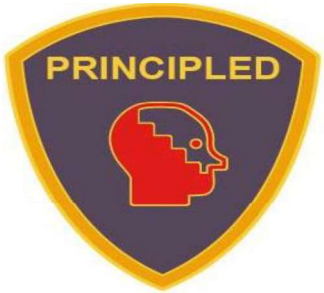
YEAR 9 KNOWLEDGE ORGANISER

TRINITY TERM 2021/22

Name:

Family Group:



LEARNING - LOVING - LIVING

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LEARNING – LOVING – LIVING

GENERAL INFORMATION

The knowledge organiser is a book that sets out the **important**, **useful** and **powerful knowledge** of a single topic on one page.

When used effectively, Knowledge Organisers are useful in:

- Helping build a foundation of **factual knowledge.**
- Embedding **revision techniques** for now and future studies (A-Level, College, University)
- Allowing knowledge to become stored in **long term memory** which frees up working memory for more complex ideas. It also allows you to connect concepts together, even across subjects

HOME LEARNING EXPECTATIONS

EACH NIGHT pupils should spend *at least* **1 hour** per night on homework.
3 subjects per night x 20 minutes per subject= 1 hour.

The homework timetable is to be filled out as a guide to what subjects to complete each night.

Subject teachers will use Microsoft **TEAMS** to set home work activities which will contain an element of knowledge retrieval practise and will relate to knowledge organiser content revised throughout the week.

In Family Group Time, retrieval practice techniques will be modelled by family group leaders.

All retrieval practice work in your **KNOWLEDGE ORGANISER exercise book** and make sure you bring your knowledge organiser to school EVERYDAY (these can slide into your coloured folder).

Knowledge Organiser **BADGES** will be given out in Family Group time to the student who has made progress on Knowledge Recall tests or has shown an exemplary effort in KO retrieval practice throughout the week.

MICROSOFT TEAMS

Remember to check TEAMS **regularly** for updates and additional home learning files including copies of your mastery booklets.

You can also ask your teachers questions on teams and view videos of 'how to use your knowledge organiser'.

HOMEWORK TIMETABLE

Year 9	Subject 1	Subject 2	Subject 3
Monday			
Tuesday			
Wednesday			
Thursday			
Friday			

ADDITIONAL HOMEWORK

Students will also be assigned **ENGLISH** reading activities on www.CommonLit.org with each assignment taking 20-30 minutes to complete and **MATHS** activities with short explanatory videos on the online platform https://mathswatch.co.uk.

It is also recommended to take advantage of FREE online revision tools such as www.senecalearning.com or the recently updated BBC BITESIZE.

It is also recommended that students regularly **READ** a variety of **fiction and non fiction books** of their choosing. This extra reading will develop and broaden general understanding and context in all subjects.

EQUIPMENT CHECKLIST

Pencil case	Knowledge Organiser	2 Black or Blue pens
2 pencils and Eraser	Green Pen	Pencil Sharpener
Mini whiteboard and pen	Calculator	Ruler
Maths geometry set	Class book	

Here are some activities that you can try at home with your knowledge organiser to help revise. There are even more strategies on page 3.

4 Methods of Retrieval Practice

@ImpactWales

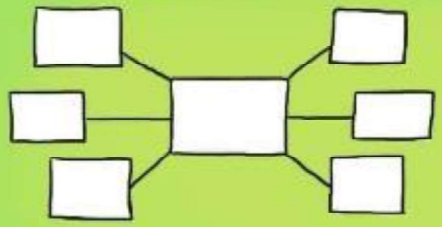
Before you start put away all your books & classroom materials.

Retrieval Practice Examples

- Exit Tickets
- Starter quizzes
- Multiple choice quizzes
- Short answer tests
- Free write
- Think, pair, share
- Ranking & sorting
- Challenge grids

BRAIN DUMP

Write, draw a picture, create a mind-map on everything you know about a topic.



Give yourself a time limit, say 3 minutes, then have a look at your books & add a few things you forgot.

QUIZZING

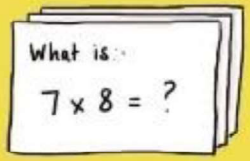
Create practice questions on a topic. Swap your questions with a partner & answer.

Question – What is a metaphor?

- ☐ A comparison using 'like, as, than'.
- ☐ A comparison where one thing is another.
- ☐ A comparison with a human attribute.

FLASHCARDS

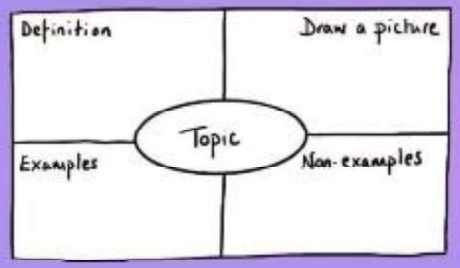
Create your own flashcards, question on one side answer on the other. Can you make links between the cards?



You need to repeat the Q & A process for flashcards you fail on more frequently & less frequently for those you answer correctly

KNOWLEDGE ORGANISERS

Complete a knowledge organiser template for key information about a topic.



You can use knowledge organisers to learn new vocab & make links in between subjects or ideas.

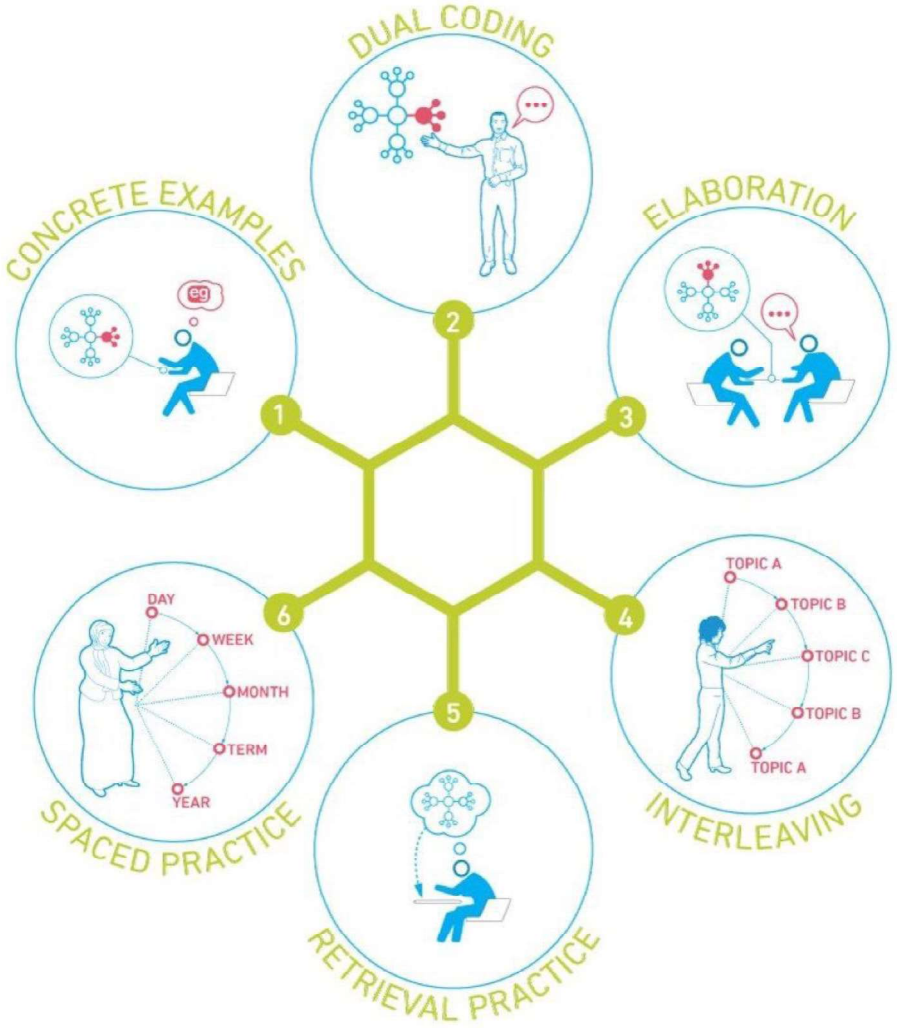
After you have retrieved as much as you can go back to your books & check what you've missed. Next time focus on that missing information

DUAL CODING

Dual coding is the process of combining visual and written materials. You can visually represent materials using methods such as info graphics, timelines, cartoon/comic strips, diagrams and graphic organisers. Combing images with words or explaining an image makes it more likely to 'stick'.

CONCRETE EXAMPLES

When you're studying, try to think about how you can turn ideas you're learning into concrete examples. Making a link between the idea you're studying and a real life example, concrete example, can help students understand abstract ideas and make it 'stick'.



ELABORATION

When talking about studying, elaboration involves explaining and describing ideas with many details. Elaboration also involves making connections among ideas you are trying to learn. Ask yourself questions about a topic to delve deeper. The more information you have about a specific topic the stronger your grasp and ability to recall.

SPACED PRACTISE

Divide up your revision into short manageable chunks of time . When revising aim for 20 - 30 minutes per session. Five hours spread out over two weeks is better than the same five hours all at once. This is **spaced practice** and it is regarded as one of the most effective revision strategies.

INTERLEAVING

Interleaving is a process where you combine multiple subjects and topics while you study in order to improve learning. Switch between ideas and make links between them during a study session. Interleaving has been shown to lead to better long-term retention

RETRIEVAL PRACTICE

Through the act of retrieval, or calling information to mind, our memory for that information is strengthened and forgetting is less likely to occur. Retrieval practice ideas include: Read, cover, write, check, flashcards and brain dumps.

	Term	Definition		Term	Definition
1	**Sardonic (adj)**	grimly mocking in tone	23	**Scathing (adj)**	severely critical and scornful
2	**Personification (n) personify (v)**	giving human qualities to something not human	24	**Visceral (adj)**	something you feel in your gut
3	**Symbolise (v) Symbolic (adj)**	when something represents something else	25	**Abhorrent (adj) Abhorrent (n)**	inspiring disgust or hatred
4	**Incongruity (n) incongruous (adj)**	when things don't fit or lack harmony	26	**Despondent (adj) Despondence (n)**	in low spirits, desperate
5	**Jingoism (n) Jingoistic (adj)**	Extreme or aggressive patriotism	27	**Baleful (adj)**	dangerous and threatening
6	**Demotic (adj)**	denoting or relating to the kind of language used by ordinary people; colloquial.	28	**Disconcerting (adj)**	causing one to feel unsettled
7	**Epizeuxis (n)**	repetition of a word in immediate succession	30	**Sombre (adj)**	having or conveying a feeling of deep seriousness and sadness.
8	**1776-1783**	American Revolution (America fights Britain)	31	**Sanctimonious (adj)**	thinking you are morally superior to others
9	**1860**	Abraham Lincoln elected President of USA	32	**Mundane (adj)**	boring and tedious
10	**1863**	Gettysburg Address	33	**Elated (adj) Elation (n)**	extremely happy
11	**1861-1865**	American Civil War	34	**Macabre (adj)**	disturbing because concerned with death or fear of death
12	**1899-1902**	Boer War (South Africa)	35	**Inevitable (adj) inevitability (n)**	certain to happen, unavoidable
13	**1914-1918**	World War One	36	**Insurrection**	a violent uprising against a government or King
14	**1939-1940**	World War Two	37	**Denounce (v) denunciation (n)**	to publicly criticise
15	**Repugnant (adj) Repugnance (n)**	Disgusting and offensive	38	**Tenacious (adj) tenacity (n)**	determined
16	**Motif (n)**	Common idea repeated across a text	39	**Significant (adj) significance (n)**	important or worthy of attention
17	**Ubiquity (n) Ubiquitous (adj)**	Found everywhere, commonplace	40	**Resolute (adj)**	determined
18	**Parody (n)**	Copying in a hyperbolic or mocking fashion for comic effect	41`	**Ostracise (v) ostracisation (n)**	Exclude from society or group
19	**Frivolous (adj) frivolity (n)**	not having any serious value or purpose	42	**Ignominy (n) ignominious (adj)**	Public shame and humiliation
20	**Apathy (n) Apathetic (adj)**	lack of interest, concern or care	43	**Dehumanise (v) dehumanization (n0**	Treat someone like an object
21	**Profound (n) Profundity (n)**	very great, intense or important	44	**Grotesque (adj)**	Repulsive and ugly, perhaps comically ugly

	Term	Definition		Term	Definition
45	**Poignant (adj) Poignancy (n)**	Evoking a keen sense of sadness or regret	62	**Judicious (adj) Judiciously (adj)**	Really carefully
46	**Nihilistic (adj) Nihilism (n)**	Thinking that life is meaningless and pointless	63	**Shrewd (adj)**	Having sharp powers of judgment
47	**Deride (v) derision (n) derisive (adj)**	Expressing contempt or ridicule	64	**Paean (n)**	A song of praise or triumph
48	**Indignance (n) Indignant (adj)**	Angered or appalled by something unjust or cruel	65	**Illicit (adj)**	Against the law, illegal
49	**Disconcert (v) disconcerting (adj)**	Causing one to feel unsettled or on edge	66	**Impediment (n) Impede (v)**	To delay or prevent or obstruct something from happening
50	**Inhumane (adj) Inhumanity (n)**	Cruel or brutal behavior	67	**Bathos (n)**	An effect of anticlimax when the mood of a text changes from serious to silly or vice versa
51	**Serene (adj) serenity (n)**	Calm, peaceful, tranquil	68	**Colloquialism (n) colloquial (adj)**	Familiar or everyday language: slang
52	**Emancipate (v) emancipation (n)**	Set free, especially from legal, political or social restrictions	69	**Forlorn (adj)**	Pitifully sad or lonely
53	**Benign (adj)**	Gentle and kind	70	**Dank (adj)**	Unpleasantly damp and cold
54	**Demagogue (n)**	A political leader who appeals to popular desires and prejudices	71	**Triviality (n) Trivial (adj)**	Of little value or importance
55	**Zeal (n) Zealous (adj)**	Great enthusiasm and enjoyment and commitment to doing something	72	**Condemn (v) condemnation (n)**	Very strong disapproval
56	**Magnitude (n)**	The size and scale of something	73	**Pay homage to (v)**	To show respect to someone
57	**Momentous (adj)**	Of great importance or significance	74	**Secular (adj)**	Not religious
58	**Sanguine (adj)**	Optimistic and positive, especially in a bad situation	75	**Apprehensive (adj) Apprehension (n)**	anxious or fearful that something bad or unpleasant will happen.
59	**Unequivocal (adj)**	Leaving no doubt, unambiguous	76	**Repress (v) Repression (n) repressive (adj)**	Using force to control people in a cruel manner
60	**Subjugate (v) Subjugation (n)**	To bring under control or dominate someone in an unfair or cruel manner	77	**Odious (adj)**	Unpleasant
61	**Scourge (n)**	A person or thing that causes great suffering	78	**Elaborate (adj)**	Complicated in design and planning

Solving by factorisation

If the product of two numbers is 0 then at least one of the numbers must be 0

Solve $x^2 - 9x + 20 = 0$

$(x - 4)(x - 5) = 0$
$x - 4 = 0$ or $x - 5 = 0$
$x = 4$ or $x = 5$

Factorise $x^2 - 9x + 20$

Solve $y^2 + 8y = 0$

$y(y + 8) = 0$
$y = 0$ or $y + 8 = 0$
$y = 0$ or $y = -8$

Factorise $y^2 + 8y$

Increases and decreases

increase an amount by 9% $\quad 100\% + 9\% = 109\%$

$$109\% = \frac{109}{100} = 1.09$$

The multiplier that can be used to increase an amount by 9% is 1.09

decrease an amount by 12% $\quad 100\% - 12\% = 88\%$

$$88\% = \frac{88}{100} = 0.88$$

The multiplier that can be used to decrease an amount by 12% is 0.88

The balance method for solving equations

Solve the equation $5(3y + 2) = 13y + 4$

$5(3y + 2) = 13y + 4$

$15y + 10 = 13y + 4$ — Expand the brackets.

$2y + 10 = 4$ — Subtract $13y$ from both sides.

$2y = 4 - 10$ — Subtract 10 from both sides.

$2y = -6$

$y = -3$ — Divide both sides by 2

Key Facts & Formulae

Expand & Simplify	$2(4m + 3) + 3(5m + 2)$ $8m + 6 + 15m + 6$ $23m + 12$
Factorise	To express a number or an expression as the product of its factors. Factorise $6x^2 - 9x$ The factorised expression is $3x(2x - 3)$.
Substitute	The velocity of a car is given by **v = u + at**, find value of v when u=10, a= -2 and t=4 v = u + a x t v = 10 + -2 x 4 v = 10 - 8 v = 2

Vocabulary

Equivalent fractions	Fractions which are equal in value
Reciprocal of a number	1 divided by that number. In other words when you swap the numerator for the denominator.
Variable or unknown	A letter or symbol used to represent a number; it can take any value
Like terms	Separate parts of an expression which have exactly the same variable and same powers
Expression	Made up of numbers and/or letters but no equals sign
Equation	A mathematical statement showing that two expressions are equal. The expressions are linked with the symbol =

MathsWatch References

70-74	The four operations with fractions
111. 164	Simple & compound interest
95	Substitution
135,137	Forming and solving equations
94, 157	Factorising & Solving Quadratics

Percentage	Fraction	Decimal
1%	$\frac{1}{100}$	$\frac{1}{100} = 0.01$
10%	$\frac{10}{100} = \frac{1}{10}$	$\frac{10}{100} = 0.1$
20%	$\frac{20}{100} = \frac{1}{5}$	$\frac{20}{100} = 0.2$
25%	$\frac{25}{100} = \frac{1}{4}$	$\frac{25}{100} = 0.25$
50%	$\frac{50}{100} = \frac{1}{2}$	$\frac{50}{100} = 0.5$
75%	$\frac{75}{100} = \frac{3}{4}$	$\frac{75}{100} = 0.75$
100%	$\frac{100}{100} = 1$	$\frac{100}{100} = 1$

Application of Methods

Convert a mixed number into an improper fraction.

Mixed Number

$$4\frac{3}{5} = \frac{4 \times 5 + 3}{5} = \frac{23}{5}$$

$$\frac{\text{Whole number} \times \text{denominator} + \text{numerator}}{\text{Original denominator}}$$

Convert an improper fraction into a mixed number.

Improper Fraction

$\frac{13}{3}$ 13 ÷ 3 = 4 remainder 1 over 3 = $4\frac{1}{3}$

Step 1: Work out how many denominators fit into the numerator exactly
Step 2: Leave the remainder over the original denominator.

Reciprocal

Step 1: Turn the number into a fraction
Step 2: Turn the fraction upside down.

$0.5 = \frac{1}{2}$ **Reciprocal =** $\frac{2}{1}$

$$4\frac{2}{3} \times 1\frac{1}{4} = \frac{16}{3} \times \frac{5}{4} = \frac{90}{12}$$

To add/ subtract/ multiply or divide mixed numbers you…

Step 1: Change both fractions into improper fractions
Step 2: Calculate a normal.

To change a recurring decimal to a fraction you….

Step 1: Name the decimal X.
Step 2: Eliminate the recurring element by subtraction.
Step 3: Make X the subject of the remaining elements to find the fractional equivalent of the original decimal.

$$\begin{array}{l} 10X = 3.3\dot{} \\ -\ X = 0.3\dot{} \\ \hline \div 9 \quad 9X = 3 \div 9 \end{array} \qquad X = \frac{3}{9} = \frac{1}{3}$$

Application of Methods

To calculate a percentage of any amount you…

Step 1: Turn the percentage into a decimal.
Step 2: Multiply the decimal by the original amount.

5.6% of £200 = 0.056 x 200 = £11.20

To calculate compound interest you…

Step 1: Turn the percentage increase into a decimal and add this to one.
Step 2: The number of times you compound the interest becomes the power

Increase £200 by 6% for 4 years using compound interest.

200×1.06^4

To calculate compound decay you…

Step 1: Turn the percentage decrease into a decimal and subtract this from one.
Step 2: The number of times you compound the interest becomes the power.

Decrease £300 by 12% for 5 years using compound decay.

300×0.88^5

To find an original value given a percentage change you..

Step 1: Write the new value with the percentage change taken into account.
Step 2: Work backwards to 100% (the original value) using proportional reasoning.

The price of a car is increased by 20% and now costs £2400. Calculate the original price

120% = 2400
÷ 120 ↓ ↓ ÷ 120
1% = 20
× 100 ↓ ↓ × 100
100% = 2000

To work out value for money…

Step 1: Find out the value per unit in order to compare two deals directly using proportional reasoning..
Step 2: Write a conclusion in words using numbers as evidence to support your conclusion.

Deal 1: £3 for 4kg (÷ 4) → £0.75 : 1kg (÷ 4)

Deal 2: £5 for 8kg (÷ 8) → £0.625 : 1kg (÷ 8)

Deal 2 is better value for money as it is cheaper per kg since 0.625 < 0.75

To work out the speed of an object you…

Step 1: Set up a ratio of distance versus time taken.
Step 2: Use proportional reasoning in order to make the time equal to 60 minutes.
Step 3: Remember speed is the distance travelled in one hour.

Work out the speed if you travel 24km in 80 minutes

÷ 4 ↓ 24km : 80 minutes ↓ ÷ 4
6km : 20 mins
× 3 ↓ 18km : 60mins ↓ × 3

Answer = 18kmph

Vocabulary

Speed kmph	The distance in km travelled in 60 minutes.
Density g/cm^3	The weight of an object in grams per cubic centimeter.
Pressure N/m^2	The force in Newton's per meter squared.
Proportional	There exists a multiplier between two linked values. E.g. as one triples so does the other so that they remain in proportion.

MathsWatch References

25	Equivalent Fractions
26	Simplifying Fractions
38 – 42	Ratio and Proportion
70-74	+/-/x/÷ Fractions
86-89	Basic percentages
106-111	Percentage change
156	Mathematical reasoning
164	Compound interest

Substituting negative numbers into expressions involving powers

Work out the value of the expression $4b^3$ when $b = -2$

$$\begin{aligned} 4b^3 &= 4 \times b \times b \times b \\ &= 4 \times (-2) \times (-2) \times (-2) \\ &= 4 \times (-8) \\ 4b^3 &= -32 \end{aligned}$$

Work out the value of the expression $5x^2 - 4x$ when $x = -3$

$$\begin{aligned} 5x^2 - 4x &= 5 \times x^2 - 4 \times x \\ &= 5 \times (-3)^2 - 4 \times (-3) \\ &= 5 \times (+9) - 4 \times (-3) \\ &= 45 + 12 \\ 5x^2 - 4x &= 57 \end{aligned}$$

Metric units

Kilo- meaning one thousand
Centi- meaning one hundredth
Milli- meaning one thousandth
Micro- meaning one millionth

The base unit for length is **metre.**
The base unit for mass is **gram.**
The base unit for capacity is **litre.**

Length
1 km = 1000 m
1 m = 100 cm
1 m = 1000 mm
1 cm = 10 mm

Mass
1 tonne = 1000 kg
1 kg = 1000 g
1 g = 1000 mg

Vocabulary	
Variable	(or an unknown) is a letter used to represent a number, these can take any values
Terms	the separate parts of expressions. For example, in 5x + 3y – 4, there are three terms 5x, +3y and -4
Expressions	is made up numbers and/or letters representing unknown values where there is no equals symbol. For example, 4a + 6 or a + b
Equations	A mathematical statement showing that two expressions are equal. The expressions are linked with the symbol =
Formula	An equation linking sets of physical variables.

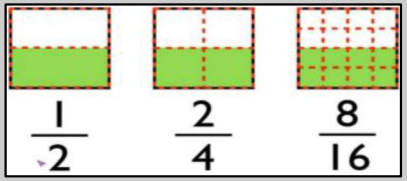
MathsWatch References	
30, 59	Number machines, BIDMAS
7,	Introduction to algebraic convention
66	Substitution
34, 35	Simplifying expressions
102	Algebraic simplification
136, 190	Rearranging Formulae

KEY FACTS AND FORMULA

Simplifying	Simplify the following 1) x + x + x + x + x = 5x 2) 5e - 2e + e = 4e 3) 4x + 2y – x + 5y + 6 = 3x + 7y + 6 4) $3x^2 + 5x + 2x^2 - 4x = 5x^2 + x$ 5) 5 × 4g = 20g 6) 3b × 4c = 12bc
Substitution	Evaluate $3a^2$ when a = 5 $3 \times 5^2 = 3 \times 25 = 75$ (Don't forget BIDMAS!)
Expanding Brackets – single brackets	1) Expand 2(3m + 5) = 6m + 10 2) Expand 4r(2r – 3) = $8r^2 - 12r$
Expanding Two or More Brackets: multiply every term in each bracket by each term in every other bracket	Expand and Simplify: $(2x + 1)(3x - 3)$ $= 6x^2 - 6x + 3x - 3$ $= 6x^2 - 3x - 3$
Rearranging Formula	Make x the subject of $y = \frac{x}{5} + 3$. To isolate x, start by subtracting 3 from both sides $y - 3 = \frac{x}{5}$ Then Multiply both sides of the equation by 5 $5(y - 3) = x$

Important Ideas

Equivalent Fractions



Dividing by a fraction: multiply by the reciprocal of the divisor

$$\frac{4}{7} \div \frac{2}{5}$$

$$\frac{4}{7} \times \frac{5}{2} = \frac{10}{7} = 1\frac{3}{7}$$

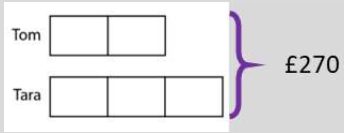
Vocabulary

Fraction	A **fraction** represents a part of a whole or, more generally, any number of equal parts.
Ratio	A **ratio** is a numerical comparison of 2 or more quantities.
Metrics Units of Measurement	The **metric system** is a **system** of measuring based on the metre, litre, kilogram and second.
Imperial Units of Measurement	In the past, **imperial units of measurement** were used in the UK. The imperial system has gradually been replaced by the metric system, which is easier to understand as it deals with tens, hundreds and thousands.

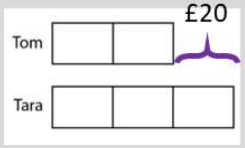
Percentage	Fraction	Decimal
1%	$\frac{1}{100}$	$\frac{1}{100} = 0.01$
10%	$\frac{10}{100} = \frac{1}{10}$	$\frac{10}{100} = 0.1$
20%	$\frac{20}{100} = \frac{1}{5}$	$\frac{20}{100} = 0.2$
25%	$\frac{25}{100} = \frac{1}{4}$	$\frac{25}{100} = 0.25$
50%	$\frac{50}{100} = \frac{1}{2}$	$\frac{50}{100} = 0.5$
75%	$\frac{75}{100} = \frac{3}{4}$	$\frac{75}{100} = 0.75$
100%	$\frac{100}{100} = 1$	$\frac{100}{100} = 1$

Ratio

Tom and Tara share £270 between them in the ratio 2:3. What else can you find out?



Tom and Tara share some money between them in the ratio 2:3. Tara gets £20 more than Tom. What else can you find out?



MathsWatch References

Fractions	24, 25, 26, 70, 71a, 71b, 72, 73, 74, 84, 85
Percentage	85, 86, 87, 88, 89
Decimal	3, 17, 18, 66, 67, 84, 85
Conversion of Units	112

Key Facts

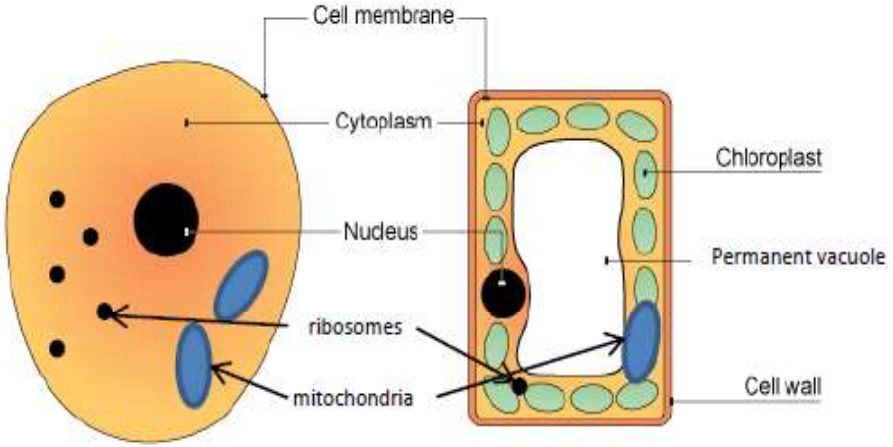
Units of Measurement

	Metric	Imperial
Length	millimetre, centimetre, metre, kilometre	inch, foot, yard, mile
Mass	milligram, gram, kilogram	ounce, pound, stone
Capacity	millilitre, centilitre, litre	pint, gallon

To find this % of an amount	Do this:
50%	÷2 (halve it)
25%	÷2 then ÷2 again
10%	÷10
75%	Find the sum of the 50% and 25% values

Eukaryotic Cells

Eukaryotic cells include all plant, animal and fungus cells. Their most important feature is that they have a nucleus, unlike prokaryotic cells. Learn how to identify the general cell structures shown below.

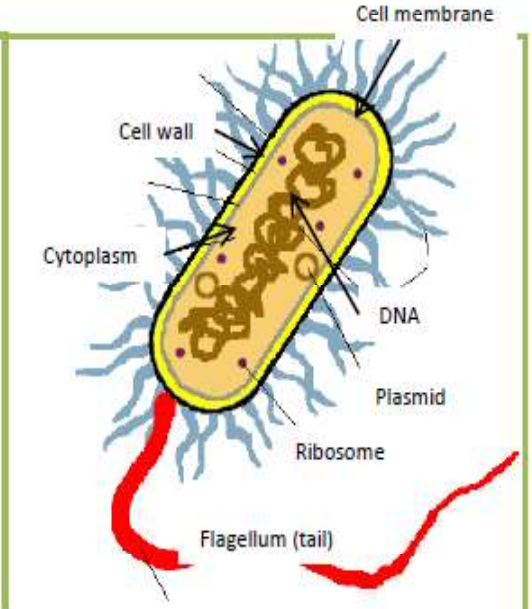


Prokaryotic Cells

Bacteria are prokaryotic cells (all bacteria are single-celled organisms). The most important differences to eukaryotic cells are that they are smaller and their genetic material (DNA) is not enclosed in a nucleus.

Prokaryotic cells have DNA in a loop, and, in addition to the main loop of DNA, they have small loops of DNA called plasmids.

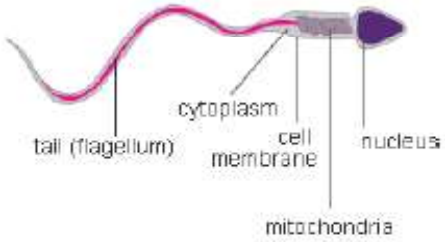
Plasmids allow bacteria to swap genetic information between them.

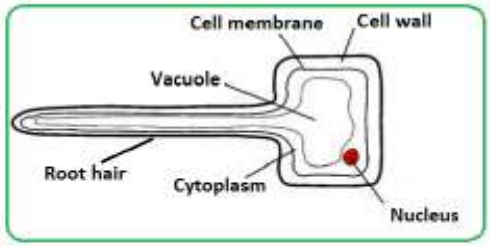


Key Terms	Definitions
cell	The basic unit of all forms of life. (All living organisms are made of a least one cell.)
eukaryotic cells	Cells with a nucleus – e.g. plant and animal cells.
prokaryotic cells	Bacterial cells; these don't have a nucleus to enclose their genetic material.
cell membrane	The border of all types of cell. The cell membrane separates the inside of the cell from the environment. It controls the movement of substances into and out of the cell.
sub-cellular structure	A part of a cell. (Sub- means less than – so these are the component parts of cells.)
nucleus	The enclosure for genetic material found in plant and animal cells.
cytoplasm	The interior of a cell, where most of the chemical reactions needed for life take place.
mitochondria	The sub-cellular structure where aerobic respiration takes place.
ribosome	The sub-cellular structure where proteins are made (synthesised)
chloroplast	A sub-cellular structure responsible for photosynthesis – only found in plant cells and algal cells.
permanent vacuole	A sub-cellular structure only found in plant and algal cells – it is filled with cell sap (a store of nutrients for the cell).
cell wall	A sub-cellular structure that is never found in animal cells. It is made of cellulose, it is outside the cell membrane and it strengthens the cell.
DNA	The molecule that holds the genetic information in a cell. In eukaryotic cells, it is one linear strand. In prokaryotic cells, the DNA forms a loop.
plasmid	A small loop of DNA, only found in prokaryotic cells.

Multicellular Organisms

You are a multicellular organism, just like all animals, plants and many types of fungus. But, not all your cells are the same. Cells become specialised by **differentiation**, which means they develop new features to help them perform a specific function. E.g. sperm cells and root hair cells.





Tissues are formed when cells with similar structures and functions work together. For example: muscle tissue in animals; phloem tissue in plants.

Organs are formed from multiple tissues working together. For example: the stomach in animals; the leaf in plants.

Organ systems are formed when multiple organs work together. For example: the digestive system in animals; the vascular (transport) system in plants.

Microscopy

Use of a microscope is called microscopy. Microscopes allowed scientists to discover cells and find all the sub-cellular structures.
Because cells and their parts are very small, it is not useful to measure them in metres. Instead, we use small divisions of the metre as follows:

Centimetre = 1/100 metre (10^{-2} m). A centimetre is 1 one hundredth of a metre. (cm)
Millimetre = 1/1000 metre (10^{-3} m). A millimetre is 1 one thousandth of a metre. (mm)
Micrometre = 1/1 000 000 (10^{-6} m). A micrometre is 1 one millionth of a metre. (µm)
Nanometre = 1/1 000 000 000 (10^{-9} m) A nanometre is 1 one billionth of a metre. (nm)

Electron microscopes were a vital invention for understanding cells. They have higher magnification and more resolving power than light microscopes, so they let you see smaller structures.

Key Terms	Definitions
organism	Any living thing: can be made of one cell or be multicellular. An organism has many organ systems, all contributing to its survival.
multicellular	This describes an organism that is made of lots of cells – such as animals or plants.
specialised cell	Almost all cells in multicellular organisms have a particular job, or function. While they usually have all the parts labelled on your cell diagrams, they change to suit their functions. This may include developing different sub-cellular structures (e.g. the tail of a sperm cell).
tissue	A group of cells with similar structures and functions – i.e. a group of specialised cells.
organ	An organ is a collection (or aggregation) of tissues performing a specific function.
organ system	Organs don't operate alone: they work together to form organ systems.
light microscope	A usual school microscope is a light microscope. You can see large sub-cellular structures like a nucleus with it, but not a lot more detail than that.
magnification	This is the measure of how much a microscope can enlarge the object you are viewing through it.
resolution	This is the measure of the level of detail you can see with a microscope.
electron microscope	A type of microscope with much high magnification and resolution than a light microscope. Essential for discovering the smaller sub-cellular structures.

Equation	Meanings of terms in equation
$magnification = \frac{size\ of\ image}{size\ of\ real\ object}$	*The image Is how it looks through the microscope. The real object is what you are looking at. The image and object must be measured with the same unit, e.g. both in nm.*

Equipment List

- a small piece of onion
- a knife or scalpel
- a white tile
- forceps
- a microscope slide
- a coverslip
- a microscope
- iodine solution in a dropping bottle.

Method

To make the slide

1. Use a dropping pipette to put one drop of water onto a microscope slide.
2. Separate one of the thin layers of the onion.
3. Peel off a thin layer of epidermal tissue from the inner surface.
4. Use forceps to put this thin layer on to the drop of water that you have placed on the microscope slide.
5. Make sure that the layer of onion cells is flat on the slide.
6. Put two drops of iodine solution onto the onion tissue.
7. Carefully lower a coverslip onto the slide. Do this by placing one edge of the coverslip on the slide and then using a mounted needle to lower the other edge onto the slide.
8. Use a piece of filter paper to soak up any liquid from around the edge of the coverslip.

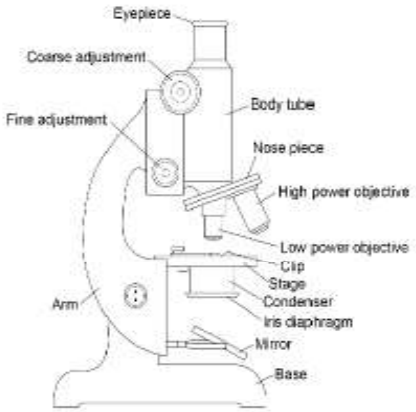
To view the cells

1. Put the slide on the microscope stage.
2. Turn the nosepiece to the lowest power objective lens.
3. Looking from the side (**not** through the eyepiece) turn the coarse adjustment knob so that the end of the objective lens is almost touching the slide.
4. Now looking through the eyepiece, turn the coarse adjustment knob in the direction to increase the distance between the objective lens and the slide. Do this until the cells come into focus
5. Now rotate the nosepiece to use a higher power objective lens.
6. Slightly rotate the fine adjustment knob to bring the cells into a clear focus and use the low-power objective (x40 magnification) to look at the cells.
7. When you have found some cells, switch to a higher power (x100 or x400 magnification).
8. Draw a clear, labelled drawing of some of these cells. Make sure that you draw and label any component parts of the cell.
9. Use an eyepiece graticule to measure the length of one of the l cells that you have drawn. Remember to include the units. Now measure the same cell in your drawing.
10. Calculate the magnification of your drawing, using the formula:

magnification = length of drawing of cell/actual length of cell

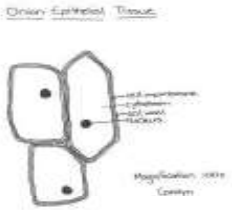
Key Terms	Definitions
Coarse adjustment	Moves the stage up and down to bring the cells into focus.
Fine Adjustment	Adjusts the focus so you can get a clear image of the cells
Cover slip	A piece of transparent plastic or glass placed on top of the specimen you are magnifying
Objective lens	This is the lens used to magnify objects
Stage	The flat plate where the slides are placed for observation.
Eyepiece	The lens at the top of the microscope that you look into.

Diagram



Expected Results

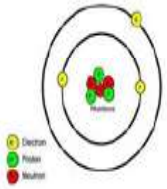
You should draw your results neatly, with a pencil and should be drawn with clear, unbroken lines. All organelles should be drawn in proportion, you should also include a title and the magnification. After you have calculated the actual length of the cell, this should also be included in the diagram.



9

The Structure of the Atom

- All matter is made from atoms. Atoms are very small. The radius of atom is about $1x10^{-10}$ m (this is also known as 0.1 nanometres).
- The central part of the atom is known as the nucleus. It is only $1x10^{-14}$m across, which is 10,000 times smaller than the total atom.
- An atom is made up of three subatomic particles: **protons**, **neutrons** and **electrons**.
- Protons and neutrons are found in the **nucleus**
- Electrons are found orbiting the nucleus in shells (also known as *energy levels*).

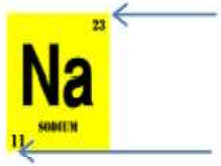


- The mass and charges of the sub atomic particles is shown below:

	Mass	Charge
Proton	1	+1
Neutron	1	0
Electron	0	-1

- Atoms have **no overall charge** because they have the same number of positive protons as negative electrons.

Atomic Number and Mass Number



Mass number: This is the total protons+neutrons

Atomic number: This is the number of protons

Therefore sodium has 11 protons, 11 electrons and 23 – 11 = 12 neutrons

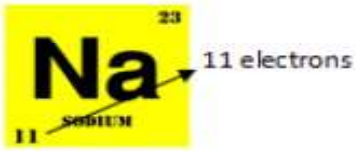
Key Terms	Definitions
atom	The particles that make up all substances with mass; they are made of protons, neutrons and electrons.
nucleus	The centre of an atom; it is made of protons and neutrons.
nanometre	A unit of measurement: $1x10^{-9}$m
proton	A sub atomic particle found in the nucleus, it has an electric charge of +1 and a relative mass of 1.
electron	A sub atomic particle found in the shells of an atom, it has an electric charge of -1 and a negligible mass
subatomic	Describes particles smaller than an atom (protons, neutrons, electrons)
neutron	A subatomic particle found in the nucleus of an atom, it has a charge of 0 and a mass of 1
atomic number	The number of protons in an atom.
mass number	The total of protons and neutrons in an atom.

Electron Configuration/Electronic Structure

There are very strict rules about how electron fill up the electron shells, the inner shell is always filled first. Each shell has a maximum number of electrons it can take.

Shell 1: maximum 2 electrons
Shell 2: maximum 8 electrons
Shell 3: maximum 8 electrons

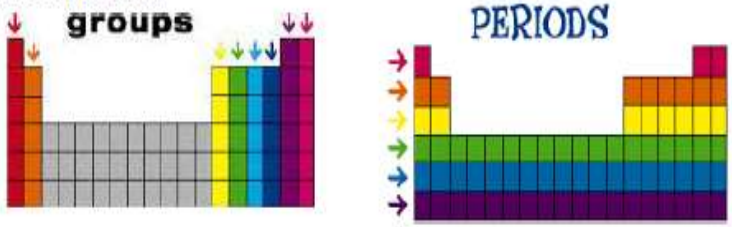
Example:



The electronic configuration of Sodium (Na) can also be written like this: 2,8,1. This shows there is 2 electrons in the 1st shell, 8 electrons in the second shell and 1 electron in the 3rd shell.

Elements

- An ***element*** is a substance made from only one type of atom. All elements are given a symbol and are found on the periodic table. You need to learn the symbols for the first 20.
- The Periodic Table is arranged into groups (columns) and periods (rows), as shown below.



Elements in the same group have:

- The same number of electrons in their outer shell
- Similar properties

Elements in the same period have:

- The same number of electron shells

Compounds

- Compounds are made of 2 or more elements that are chemically bonded
- These are made in chemical reactions.
- Compounds are given a formula. For example, carbon dioxide is CO_2 means 1 carbon atom and 2 oxygen atoms.
- Another example is calcium hydroxide $Ca(OH)_2$ which means 1 calcium, 2 oxygen atoms and 2 hydrogen atoms

Chemical Reactions always Conserve Mass

- In some chemical reactions it may appear that there are less products than there were reactants; however, this is often because a gas has been made and this has escaped into the atmosphere.

Key Terms	Definitions
element	A substance that contains only one type of atoms
mixture	A mixture is two or more different atoms which are not chemically bonded
compound	Two or more elements that are chemically bonded
group	The columns on the periodic table
period	The rows on the periodic table
reactant	Chemicals you start with in a chemical reaction
product	Chemicals made in a chemical reaction

The Conservation of Mass

- In a chemical reaction, chemical bonds in the reactants are broken, the atoms are rearranged and new chemical bonds are made to form the products.
- In a chemical reaction, ***mass is never lost;*** you must start and finish with the same mass.

Balancing Equations

- We need to write balanced chemical equations represent chemical reactions and the conservation of mass.
- For example: The equation below shows hydrogen and oxygen making water but there are more oxygen atoms on the right than the left.

$$H_2 + O_2 \rightarrow H_2O$$

- In the equation below there are 4 hydrogen atoms on the left and right of the equation and 2 oxygen atoms on each side

$$2H_2 + O_2 \rightarrow 2H_2O$$

7. The periodic table

Mass number	*The sum of the protons and neutrons in the nucleus*	
Atomic number	*The number of protons in the atom*	Number of electrons = number of protons
Elements arranged in order of atomic number	*Elements with similar properties are in columns called groups*	Elements in the same group have the same number of outer shell electrons and elements in the same period (row) have the same number of electron shells.

8. Development of the periodic table

Before discovery of protons, neutrons and electrons	*Elements arranged in order of atomic weight*	Early periodic tables were incomplete, some elements were placed in inappropriate groups if the strict order atomic weights was followed.
Mendeleev	*Left gaps for elements that hadn't been discovered yet*	Elements with properties predicted by Mendeleev were discovered and filled in the gaps. Knowledge of isotopes explained why order based on atomic weights was not always correct.

9. Group 1 – Alkali metals

Alkali metals	*Very reactive with oxygen, water and chlorine*	Only have one electron in their outer shell. Form +1 ions.
	Reactivity increases down the group	Negative outer electron is further away from the positive nucleus so is more easily lost.

10. Group 7 – Halogens

Halogens	*Consist of molecules made of a pair of atoms*	Have seven electrons in their outer shell. Form -1 ions.
	Melting and boiling points increase down the group (gas → liquid → solid)	Increasing atomic mass number.
	Reactivity decreases down the group	Increasing proton number means an electron is more easily gained

11. Group 0 – Noble gases

Noble gases	*Unreactive, do not form molecules*	This is due to having full outer shells of electrons.
	Boiling points increase down the group	Increasing atomic number.

12. Transition metals (CHEMISTRY ONLY)

Compared to group 1	• *Less reactive* • *Harder* • *Denser* • *Higher melting points*
Typical properties	• *Many have different ion possibilities with different charges* • *Used as catalysts* • *Form coloured compounds*

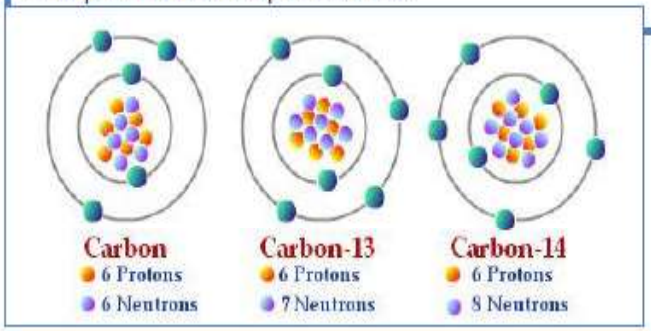
The structure of the atom and isotopes

You've already studied the structure of the atom – the small central nucleus surrounded by electrons – in the first chemistry topic. Go back and recap that first.

An important point about the shells, or energy levels, where electrons are found is that the energy level of an electron can *change*:

- Electrons move *up* an energy level with the **absorption** of a specific wavelength of EM radiation
- Electrons move *down* an energy level by **emitting** a specific wavelength of EM radiation.

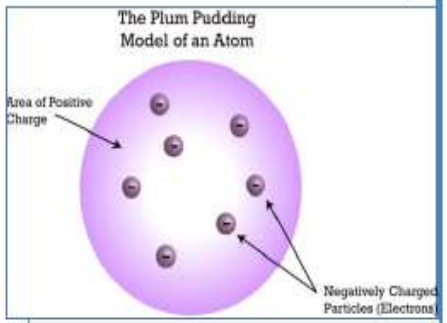
Atoms of a particular element always have the same number of protons (the atomic number in the periodic table). However, they don't all have to have the same number of *neutrons* to be the same element. If the number of neutrons varies between atoms of an element (but number of protons stays the same), we call the atoms **isotopes** of the element. Look at the diagram for the example of three isotopes of carbon.

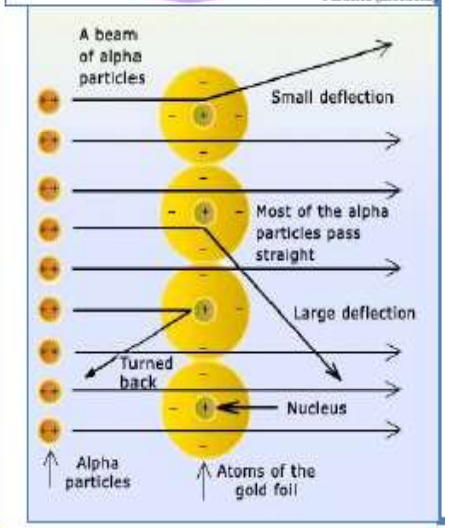


Radioactive decay

Some atomic nuclei are **unstable**. For instance, carbon-14 above is unstable. The nucleus will spontaneously and randomly change to become more stable. When the nucleus does this, it gives out nuclear radiation.

Since it is a random process, it is impossible to predict which particular nucleus will decay next. However, with a huge number of them, it is possible to measure the rate at which the whole source of radiation is decaying. This rate is measured in number of decays per second: the unit is the **becquerel (Bq)**. One Bq = 1 decay per second. This can be measured with a detector called a Geiger-Muller tube – in this case, 1 Bq = 1 count per second.





Key Terms	Definitions
isotopes	Isotopes of an element have the same number of protons but different numbers of neutrons in the nucleus.
energy level	The other name for electron 'shells'. Each energy level is a specific distance from the nucleus and holds a limited number of electrons.
radioactive decay	The process of an unstable nucleus becoming stable and giving out nuclear radiation in the process.
nuclear radiation	Types of radiation that come from the nucleus of atoms during decay. Four types: alpha, beta, gamma, and neutrons.

How the modern model of the atom was developed

The model of the atom that you know all about has changed over time. Here's a brief timeline:

1. Before electrons were discovered, atoms were thought of as simply **tiny, hard spheres** that couldn't be divided into smaller particles.
2. **Electrons** were discovered (which are smaller than atoms!), so the model was modified. The **plum pudding** model of the atom was described: the atom as a ball of positive charge with negative electrons embedded in it like pieces of fruit in a pudding (see diagram).
3. A famous experiment by the scientists **Rutherford** and **Marsden** showed that the plum pudding model was wrong. Particles named **alpha particles** (more on these later) were fired at a sheet of atoms and some rebounded, some were deflected and others went straight through (see diagram). This showed that atoms have a hard, very small concentration of mass in the centre – which was named the **nucleus**. It also showed that the nucleus was charged, and we now know that is due to the protons in the nucleus. This model, that you use, is sensibly called the **nuclear model** of the atom.
4. The nuclear model was further developed to include the idea that electrons orbit at specific distances from the nucleus: in energy levels. The key scientist presenting this model was **Niels Bohr**.
5. Next, the nucleus was investigated further. It was found that the nucleus can be split up, producing particles with an equally-sized positive charge. These particles are named 'protons' – of course!
6. Then, in 1932, a scientist named **James Chadwick** proved that there were also uncharged particles in the nucleus. He called these particles 'neutrons' as they are neutral: no charge. This was about 20 years after the nucleus had already been accepted as the right idea about atoms.

Types of nuclear radiation

As you've seen, the rate of decay is measured in Bq, or can be measured as the count rate in Bq. What it actually 'counts' is the amount of radiation hitting the detector each second. The radiation emitted from the nucleus thanks to radioactive decay can be:

- An **alpha particle** (symbol: α). An alpha particle is made of two protons and two neutrons (making it identical to the nucleus of helium atoms). Since there are four subatomic particles in one alpha particle, it has a mass number of 4. Since there are two protons in an alpha particle, it has a proton number of 2.
- A **beta particle** (symbol: β). A beta particle is a high speed electron. Beta particles are emitted during a type of radioactive decay where a neutron turns into a proton. This process also makes an electron, and electrons aren't 'allowed' in nuclei, so it gets fired out.
- A **gamma ray** (symbol: γ). Yes, the same wave as in the electromagnetic spectrum. It has a very high frequency and very short wavelength.
- A **neutron** (symbol: n). An uncharged particle – you know all about them already.

Alpha, beta and gamma

As well as being different in form, alpha, beta and gamma are also different in terms of how they behave after emission from a nucleus.

Type of nuclear radiation	Range in air	Penetrating power	Ionising power
Alpha	A few centimet-res	Not very penetrating at all: absorbed by a thin sheet of paper.	Strongly ionising (as alpha particles are large and have a +2 charge)
Beta	A few metres	Fairly penetrating: completely absorbed by a sheet of aluminium 5mm thick.	Moderately ionising (as not as big as alpha particles and their charge is smaller, -1)
Gamma	Enormous distances	Penetrates most materials. Absorbed only by several metres of concrete or a thick sheet of lead.	Only weakly ionising.

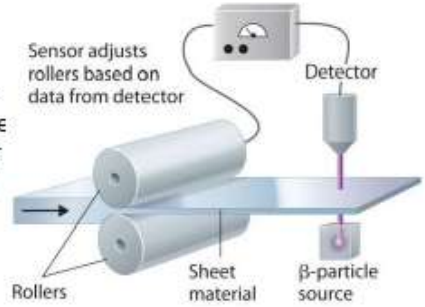
Key Terms	Definitions
emission	Releasing or giving out. Nuclear radiation is **emitted** during radioactive decay.
penetration	Passing through a material. Different types of nuclear radiation can penetrate different materials, and are absorbed by certain materials.
ionisation	The process of making an ion by 'knocking off' electrons. Ionising radiation causes this, and can break up molecules into ions which go on to react with other chemicals. This is very dangerous in living organisms.

Using nuclear radiation

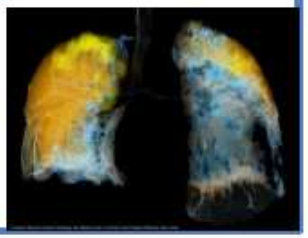
Nuclear radiation can be very useful. Here are some examples to know; notice that the type of nuclear radiation used depends on exactly what you need it for, so it links to the properties in the table opposite.

Radiotherapy: this is a treatment for cancer, using gamma rays. Gamma rays easily penetrate body tissues, so they can reach a tumour e.g. in the brain. The gamma rays can kill the cancer cells. However, since gamma rays are dangerous to healthy tissue, they use beams of gamma rays from many angles to the tumour, so healthy cells between source and tumour are not affected too badly.

Monitoring thickness of paper in a factory: As the diagram shows, a beta source is used. This is because beta will pass through materials such as paper. The detector on the other side of the sheet will measure a lower count rate if the sheet gets too thick, and a higher count rate if it gets too thin. The rollers can be automatically adjusted to fix this.



Medical diagnosis: sources of radiation can be taken into the body and the nuclear radiation monitored from the outside to give information about body function. Obviously, alpha is NOT suitable for this as it won't penetrate body tissues to get to the detector! For example, a radioactive xenon isotope can be inhaled to check lung function. On the image, the left lung isn't getting much air to the bottom parts.



Nuclear equations

To show what happens to an atom when it radioactively decays, we use nuclear equations. In these equations, we represent alpha and beta particles as shown in the key terms table.

Recalling what an alpha particle actually is (2 protons and 2 neutrons), it is clear that a nucleus going through alpha decay loses 4 subatomic particles (so the mass number has to **decrease** by *four*). Two of those are *protons*, so the *atomic number* must decrease by 2. Here's an example:

$$^{219}_{86}\text{radon} \longrightarrow {}^{215}_{84}\text{polonium} + {}^{4}_{2}\text{He}$$

This shows that a radon nucleus decays to produce a polonium nucleus and an alpha particle.

Beta decay results in a beta particle, and happens because a neutron turns into a proton and an electron. The electron is ejected from the nucleus. Since neutrons and protons have the same mass, the mass number does not change. However, there is an *extra proton*, so the atomic number must increase by one (therefore the charge of the nucleus increases by 1). Here's an example:

$$^{14}_{6}\text{carbon} \longrightarrow {}^{14}_{7}\text{nitrogen} + {}^{0}_{-1}\text{e}$$

This shows that the carbon nucleus decays to produce a nitrogen nucleus and a beta particle.

NB: emission of a gamma ray DOES NOT cause any change to the mass or atomic number.

Radioactive contamination

It is vital to realise that being exposed to nuclear radiation DOES NOT make something radioactive! (Despite what comic books show.) We say the exposed material/object is **irradiated**, and it is dangerous for living cells, as you know.

So, **radioactive contamination** is NOT being exposed to nuclear radiation. It means getting unwanted radioactive materials onto other materials. For instance, spilling a powdered radioactive source onto clothes. This is dangerous because the radioactive material keeps on emitting nuclear radiation through nuclear decay, so it can keep on irradiating the thing its on.

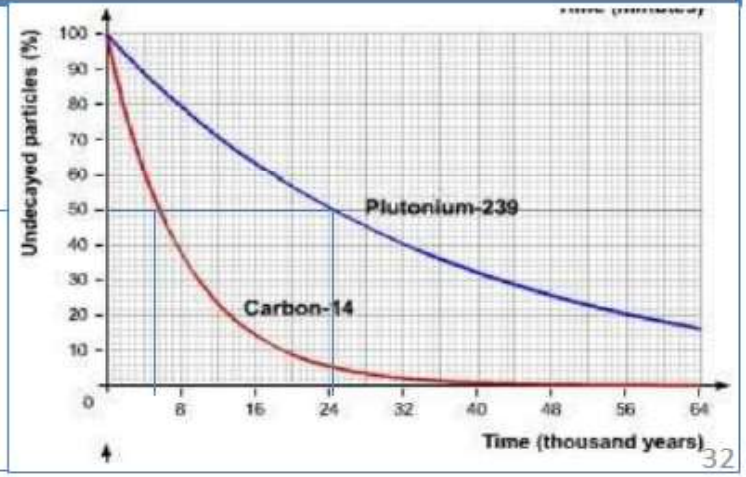
The hazards due to irradiation or contamination mean that *precautions* must be taken. For instance, the radioactive materials (e.g. uranium) used in nuclear power plant is only transferred, stored and used in containers that nuclear radiation can't penetrate. There is ongoing research by scientists into the effects of nuclear radiation on human health. Like all scientific findings, this research should be **published** and receive **peer review** – where other scientists check the methods and analysis performed, to make sure it is right!

Key Terms	Definitions
mass number	The total number of subatomic particles in the nucleus of an atom (protons + neutrons).
atomic number	The number of protons in the nucleus of an atom. In other words, the number of positive (+1) charges in the nucleus.
alpha particle	Can be represented with the symbol: $^{4}_{2}\text{He}$
beta particle	Can be represented with the symbol: $^{0}_{-1}\text{e}$
half-life	The half-life of a radioactive isotope is the average time it takes for the number of radioactive nuclei to halve. It can be also be measured as the time it takes for the count rate of the sample to decrease to half its starting count rate.

Half life

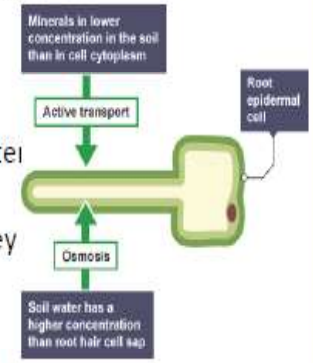
Radioactive decay is **random** – so you don't know which nucleus will decay next. However, with a large number of radioactive nuclei, the time it takes for HALF of them to decay *is* predicable. This differs depending on the particular isotope involved. This length of time is called a **half-life** (see definitions too). Plotting the number of radioactive nuclei OR the count rate against time makes half-life easy to find. Read off the time it takes for the number on the y-axis to decrease by a half. So, in this example, we can see that the half-life of carbon-14 is 5.5 thousand years, whereas the half-life of plutonium-239 is 24 thousand years.

The y-axis could also show count rate (Bq) – the shape of the graph would be identical



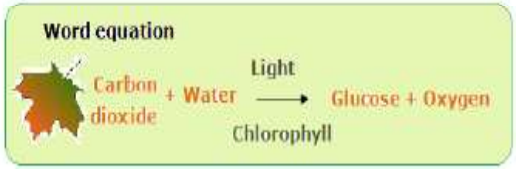
Roots

- Plants absorb **all** their water in the roots by osmosis and keep water moving constantly through the plant by losing water as vapour from the leaves – transpiration
- Root hair cells increase the surface area for absorption of water.
- Root hair cells have a thin cell wall to allow water to pass through by osmosis easily
- Root hair cells don't contain chloroplasts as they are not performing photosynthesis
- Root hair cells absorb minerals through active transport. This requires an input of energy from the cell



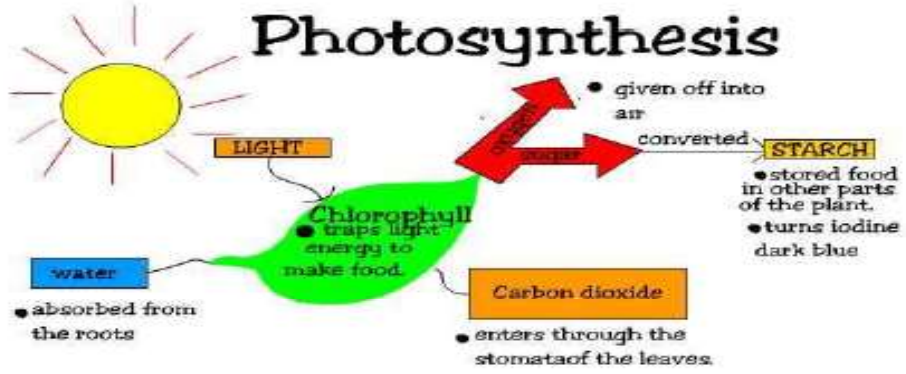
Photosynthesis

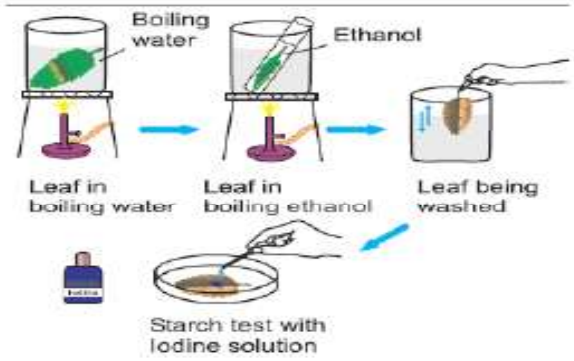
- Plants use **photosynthesis** to make food (glucose) using **energy** from the sun



- The plant takes in **water** through the roots and **carbon dioxide** through the leaves via stomata
- Photosynthesis takes place in the **chloroplasts** which contain **chlorophyll** to absorb the light from the sun
- The glucose made in photosynthesis is stored as **starch**
- We can use **iodine** to test for starch; if starch is present the iodine will turn black
- Limiting factors for photosynthesis are light, temperature & CO_2 concentration

	Key Terms	Definitions
1	Osmosis	Movement of water from a high concentration to a low concentration through a partially permeable membrane
2	Diffusion	Movement of particles from a high concentration to a low concentration until they are evenly spread out
3	Active transport	Movement of particles against a concentration gradient
4	Transpiration	The process by which plants lose water, as vapour, from their leaves through the stomata.
5	Chlorophyll	Green pigment in leaves, needed for photosynthesis, kept inside chloroplast

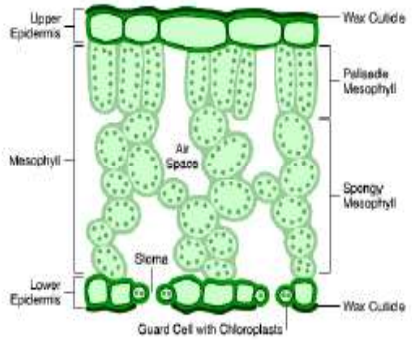


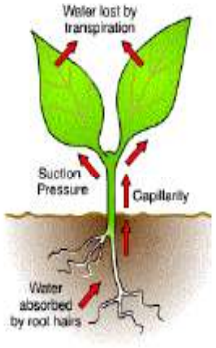


Leaves can be tested for starch using iodine
The leaf is boiled to break open cells and then boiled in ethanol to remove the chlorophyll before testing with iodine.
Blue/black is a positive result.

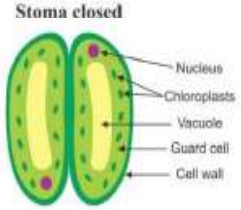
Leaf adaptations

- Large **surface area** to absorb lots of light
- The upper layer has a **waxy coating** to prevent water loss and damage
- The **palisade cells** are towards the top of the leaf and which contain lots of chloroplasts. They are long & thin to use all the light up.
- There are small holes on the bottom of the leaf called **stomata**, these allow carbon dioxide into the leaf and oxygen out of the leaf
- The stomata are opened and closed by the **guard cells**

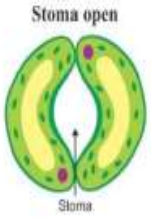




Stomata, guard cells and transpiration



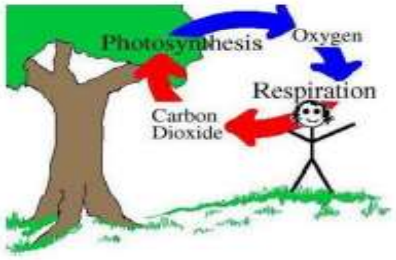
- Stomata allow the gases of photosynthesis to enter or leave the leaf. They need to be open to allow photosynthesis to take place. They also allow water to leave through transpiration
- Transpiration is the upward flow of water up from the roots and out of the leaf. It causes more water to be drawn up from the roots
- Guard cells control the opening and closing of stomata. This is useful in dry conditions, because the plant can conserve water instead of losing lots of it through transpiration.
- Factors that speed up transpiration will also increase the rate of water uptake from the soil e.g light, temperature, wind, humidity



Key Terms	Definitions
Epidermis	Type of plant tissue that covers the surface of a plant
Palisade mesophyll	Tissue in the leaf where photosynthesis takes place
Spongy mesophyll	Tissue in the leaf with air spaces between cells – specialised for gas exchange
Xylem	Narrow tubes in the roots, stem and leaves, which transport water and mineral ions up the plant from the roots
Phloem	Living vessel that carries food from the leaves to the rest of the plant
Guard cell	In pairs, guard cells form the stomata on leaves – the holes through which gases are exchanged. They can open and close the stomata as required by the plant.
Transpiration	The process by which plants lose water, as vapour, from their leaves through the stomata.
Stomata	Pores on the underside of leaves. Open and close.

Carbon dioxide and oxygen

- The balance of oxygen and carbon dioxide in the atmosphere is maintained through respiration in plants and animals and by photosynthesis in plants .
- Plants produce oxygen during respiration. They produce much more oxygen during photosynthesis than they consume in respiration, this is how the oxygen consumed by plants and animals is replenished in the air



- Recently the balance of oxygen & CO2 has been upset, CO2 levels are rising due to deforestation & burning fossil fuels leading to global warming

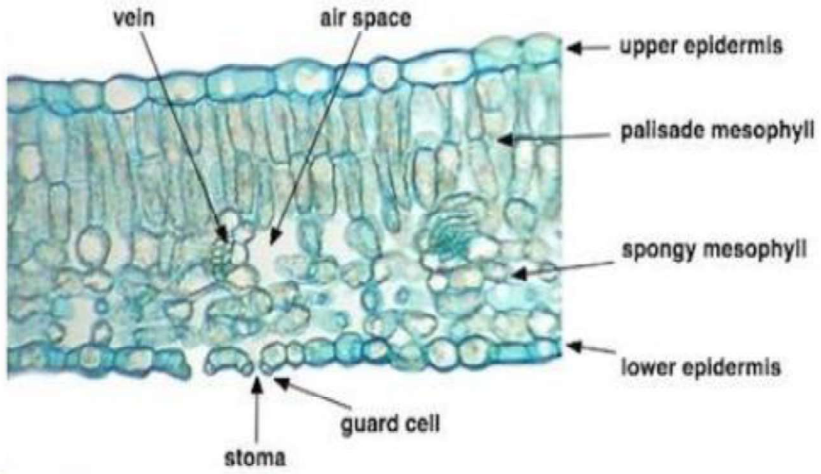
Plant tissues in the leaf and transpiration

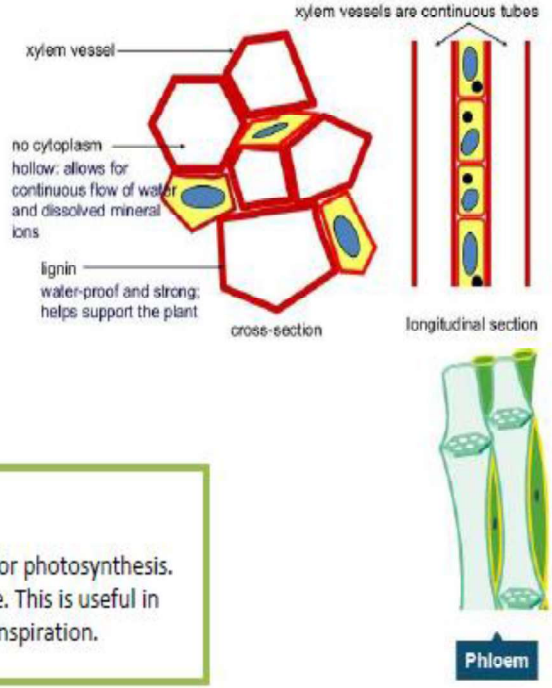
Look at the key terms and definitions for the key types of plant tissue. Leaves are **organs** in plants that contain many of those types of tissue. Together with the stem and roots, they form an **organ system** for transport of substances around the plant. The photograph shows the **transverse section** of a leaf – a thin slice through the leaf, looking edge-on.

The **vein** contains the xylem and phloem vessels. The **stomata** (singular: stoma) are the holes through which gases are exchanged. This includes water vapour. Plants absorb **all** their water in the roots (you've already looked at root hair cells), and keep water moving constantly through by losing water as vapour from the leaves. The constant flow of water up the plant is called the transpiration stream. This loss of water vapour from the leaves is called **transpiration**. Transpiration is sped up by:

- a *higher temperature*, since water molecules have more kinetic energy so diffusion out of stomata is faster
- *Lower humidity* (drier air), since there is a steeper concentration gradient if the air outside the plant is relatively drier than the air in the air spaces
- *Higher air flow* (being windier!), since this refreshes the concentration gradient all the time, as water vapour is blown away from the leaves
- *Higher light intensity*: this increases the rate of photosynthesis, which uses water, so water flows more rapidly up through the plant.

Key Terms	Definitions
epidermal	Type of plant tissue that covers the surface of a plant
palisade mesophyll	Tissue in the leaf where photosynthesis takes place
spongy mesophyll	Tissue in the leaf with air spaces between cells – specialised for gas exchange
xylem	Narrow tubes in the roots, stem and leaves, which transport water and mineral ions up the plant from the roots
phloem	Other tubes that run alongside xylem, but transport sugars dissolved in water instead – a process called **translocation**
meristem	Type of tissue found at growing tips of roots and shoots, containing stem cells so they can differentiate into different sorts of plant cell
guard cell	In pairs, guard cells form the stomata on leaves – the holes through which gases are exchanged. They can open and close the stomata as required by the plant.
transpiration	The process by which plants lose water, as vapour, from their leaves through the stomata.





Stomata, guard cells and transpiration

Stomata must be open at least some of the time, to allow carbon dioxide to enter the leaf for photosynthesis. However, guard cells can control how many stomata are open, and how wide open they are. This is useful in dry conditions, because the plant can conserve water instead of losing lots of it through transpiration.

Xylem and Phloem

Xylem tissue is made of hollow tubes, formed from the cell walls of dead cells, and strengthened by a substance called **lignin**. The diagram shows their adaptations to the function of transporting water and minerals.

Phloem, on the other hand, is a tissue made of living cells. They are elongated and stacked to form tubes. Phloem tubes transport food – dissolved sugars – made in the leaves to other parts of the plant, for use in respiration or for storage. The sugary substance they transport is called cell sap, and its transport is called **translocation**. Cell sap flows from one phloem cell to the next through **pores** (holes) in the ends of the cells.

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Equipment List

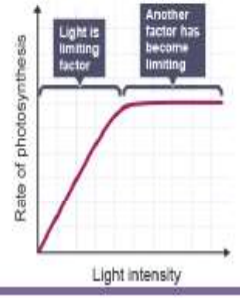
- a boiling tube
- freshly cut 10 cm piece of pondweed (*Cabomba* or *Elodea*)
- a light source
- a ruler
- a test tube rack
- a stop watch
- 0.2% solution of sodium hydrogen carbonate solution
- a glass rod

Method

1. Set up a test tube rack containing a boiling tube at a distance of 10 cm away from the light source
2. Fill the boiling tube with the sodium hydrogen carbonate solution.
3. Place the piece of pondweed into the boiling tube with the cut end uppermost. Gently push the pondweed down with the glass rod.
4. Leave the boiling tube for 5 minutes.
5. Start the stop watch and count the number of bubbles produced in one minute.
6. Record results in a table
7. Repeat the count twice more so that the mean number of bubbles per minute can be calculated.
8. Move the test tube rack to a distance of 20 cm from the light source and repeat steps 4–6.
9. Repeat using distances of 30 cm, 40 cm and 50cm between the test tube rack and the light source.

Expected Results

As the lamp gets closer to the pondweed the number of bubbles should increase as more oxygen is being produced. However, when the lamp gets very close, there will no longer be an increase in bubbles as something else (temperature or carbon dioxide concentration) becomes the limiting factor. A graph should look like this:

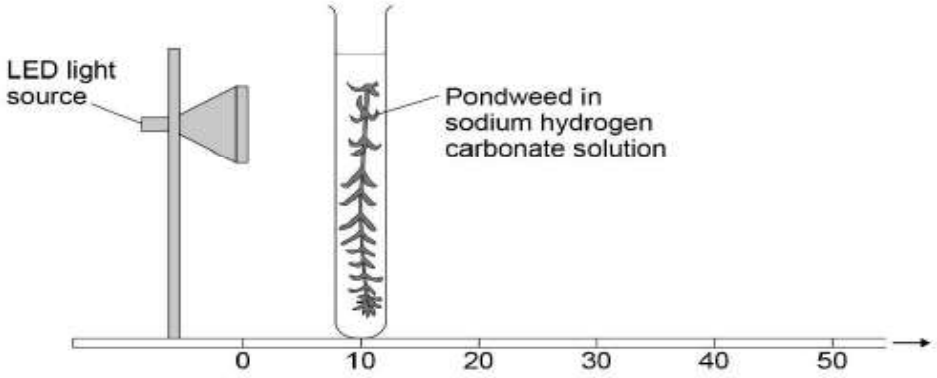


Experiment: Photosynthesis

Variables

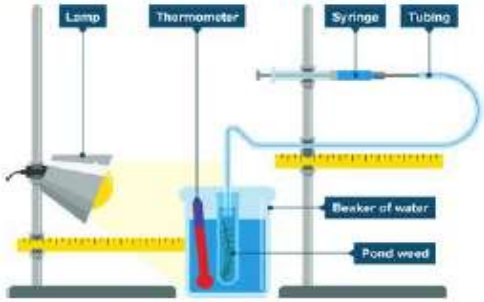
I.V Distance between lamp and plant (light intensity)
D.V Number of bubbles given off in one minute
C.Vs Type and mass of pondweed, time in which bubbles are counted, volume of solution, temperature of solution.

Diagram



Increasing Accuracy

A syringe could be used to increase the accuracy of the volume of gas given off.



Respiration

Respiration is a chemical reaction that occurs in plant and animal cells and releases energy from food molecules. The organism can then use this energy in several different ways including:

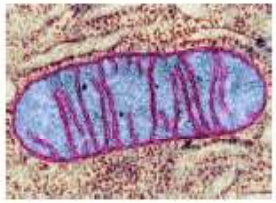
1. To build large molecules from smaller ones
2. To move
3. To keep warm

There are two types of respiration: aerobic and anaerobic.

Key Terms	Definition
Respiration	A chemical reaction that releases energy from food molecules.
Aerobic	With oxygen.
Anaerobic	Without oxygen.
Fermentation	Anaerobic respiration that occurs in yeast.
Mitochondria	Cell organelle where aerobic respiration occurs.
Fatigue	When muscle cells become tired and no longer contract efficiently.

Aerobic respiration

Aerobic respiration occurs in the presence of oxygen and takes place in the mitochondria. Cells that require a lot of energy (e.g. muscle cells, sperm cells) will have higher numbers of mitochondria so they can release more energy.



Aerobic respiration is shown by the following equation:

glucose + oxygen → carbon dioxide + water

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

Respiration can use different food molecules as the reactant but it is generally shown as glucose. Oxygen and glucose travel to the cells through the circulatory system and the waste products are removed from cells in the same way.

Anaerobic respiration

Anaerobic respiration occurs when there is not enough oxygen present and takes place in the cytoplasm. Much less energy is released from anaerobic respiration than from aerobic respiration.

In animals the equation for anaerobic respiration is:

glucose → lactic acid

If lactic acid builds up in muscle cells it causes fatigue. We continue to have an elevated heart rate and breathing rate after exercise so that more oxygen enters the cells. This oxygen reacts with the lactic acid removing it from our muscles allowing them to work efficiently again.

In plants and yeast the equation for anaerobic respiration is:

glucose → ethanol and carbon dioxide

This process can also be called fermentation and is useful as the ethanol can be used to make alcoholic drinks and the carbon dioxide is what makes bread rise.

Volcanic Hazards

Ash cloud	Small pieces of pulverised rock and glass which are thrown into the atmosphere.
Gas	Sulphur dioxide, water vapour and carbon dioxide come out of the volcano.
Lahar	A volcanic mudflow which usually runs down a valley side on the volcano.
Pyroclastic flow	A fast moving current of super-heated gas and ash (1000°C). They travel at 450mph.
Volcanic bomb	A thick (viscous) lava fragment that is ejected from the volcano.

Convection Currents

The crust is divided into tectonic plates which are moving due to convection currents in the mantle.

1	Radioactive decay of some of the elements in the core and mantle generate a lot of heat.
2	When lower parts of the mantle molten rock (Magma) heat up they become **less dense** and **slowly rise**.
3	As they move towards the top they cool down, become **more dense** and **slowly sink**.
4	These **circular movements** of semi-molten rock are **convection currents**
5	Convection currents create **drag** on the base of the tectonic plates and this causes them to move.

Types of Plate Margins

Destructive Plate Margin

When the denser plate subducts beneath the other, friction causes it to **melt and become molten magma**. The magma forces its ways up to the surface to form a volcano. This margin is also responsible for **devastating earthquakes**.

Constructive Plate Margin

Here two plates are **moving apart** causing new magma to reach the surface through the gap. Volcanoes formed along this crack cause a submarine mountain range such as those in the **Mid Atlantic Ridge**.

Conservative Plate Margin

A conservative plate boundary occurs where plates **slide past each other** in opposite directions, or in the same direction but at different speeds. This is responsible for earthquakes such as the ones happening along the San Andreas Fault, USA.

The structure of the Earth

The Crust	Varies in thickness (5-10km) beneath the ocean. Made up of several large plates.
The Mantle	Widest layer (2900km thick). The heat and pressure means the rock is in a liquid state that is in a state of convection.
The Inner and outer Core	Hottest section (5000 degrees). Mostly made of iron and nickel and is 4x denser than the crust. Inner section is solid whereas outer layer is liquid.

LIC -CS: Haiti Earthquake 2010

Causes
On a conservative plate margin, involving the Caribbean & North American plates.
The magnitude 7.0 earthquake was only 15 miles from the capital Port au Prince. With a very shallow focus of 13km deep.

Effects
230,000 people died and 3 million affected.
Many **emotionally affected**.
250,000 homes collapsed or were damaged.
Millions homeless.
Rubble blocked roads and shut down ports.

Management
Individuals tried to recover people.
Many countries **responded with appeals** or **rescue teams**.
Heavily relied on **international aid**, e.g. **$330 million** from the EU.
98% of rubble remained after **6 months**.

What is a Natural Hazard

A natural hazard is a natural process which could cause death, injury or disruption to humans, property and possessions.

Geological Hazard	Meteorological Hazard
These are hazards caused by land and tectonic processes.	**These are hazards caused by weather and climate.**

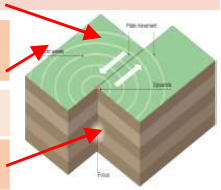
Causes of Earthquakes

Earthquakes are caused when two plates become **locked** causing **friction** to build up. From this **stress**, the **pressure** will eventually be released, triggering the plates to move into a new position. This movement causes energy in the form of **seismic waves**, to travel from the **focus** towards the **epicentre**. As a result, the crust vibrates triggering an earthquake.

The point directly above the focus, where the seismic waves reach first, is called the **EPICENTRE**.

SEISMIC WAVES (energy waves) travel out from the focus.

The point at which pressure is released is called the **FOCUS**.



Managing Volcanic Eruptions

Warning signs	Monitoring techniques
Small earthquakes are caused as magma rises up.	Seismometers are used to detect earthquakes.
Temperatures around the volcano rise as activity increases.	Thermal imaging and satellite cameras can be used to detect heat around a volcano.
When a volcano is close to erupting it starts to release gases.	Gas samples may be taken and chemical sensors used to measure sulphur levels.

Preparation	
Creating an exclusion zone around the volcano.	Being ready and able to evacuate residents.
Having an emergency supply of basic provisions, such as food	Trained emergency services and a good communication system.

Earthquake Management

PREDICTING

Methods include:
- Satellite surveying (tracks changes in the earth's surface)
- Laser reflector (surveys movement across fault lines)
- Radon gas sensor (radon gas is released when plates move so this finds that)
- Seismometer
- Water table level (water levels fluctuate before an earthquake).
- Scientists also use seismic records to predict when the next event will occur.

PROTECTION

You can't stop earthquakes, so earthquake-prone regions follow these three methods to reduce potential damage:
- Building earthquake-resistant buildings
- Raising public awareness
- Improving earthquake prediction

HIC - CS: Eyjafjallajokull (E15) Eruption, Iceland 2010

Causes
The North-American and Eurasian plates move apart on a constructive plates.
The disruption caused by Eyjafjallajökull was the result of a series of small volcanic eruptions from March to October.

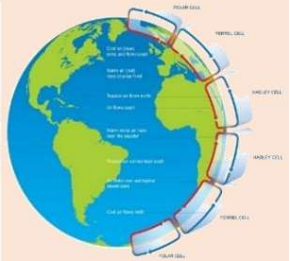
Effects
The **thick ice cap m**elted which caused major flooding.
No reported deaths.
Airspace closed across Europe, with at least **17,000** flights cancelled
Costed insurers **£65m** to cancelled flights.

Management
Iceland had a good warning system with **texts being sent** to residents within **30 minutes**.
Large sections of **European airspace were closed** down due ash spread over the continent.
Airlines developed **ash monitoring equipment**.

Global pattern of air circulation

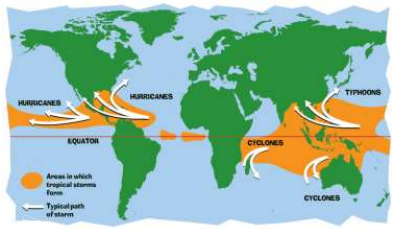
Atmospheric circulation is the large-scale movement of air by which heat is distributed on the surface of the Earth.

Hadley cell	Largest cell which extends from the **Equator** to between **30° to 40° north & south**.
Ferrel cell	Middle cell where air flows **poleward** between **60° & 70°** latitude.
Polar cell	**Smallest & weakness** cell that occurs from the poles to the Ferrel cell.



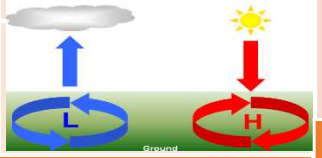
Distribution of Tropical Storms.

They are known by many names, including hurricanes (North America), cyclones (India) and typhoons (Japan and East Asia). They all occur in a band that lies roughly 5-15° either side of the Equator.



High and Low Pressure

Low Pressure	High Pressure
Caused by hot air rising. Causes stormy, cloudy weather.	Caused by cold air sinking. Causes clear and calm weather.



Formation of Tropical Storms

1	The sun's rays heats large areas of ocean in the summer and autumn. This causes **warm, moist air** to rise over the particular spots
2	Once the **temperature is 27°**, the rising warm moist air leads to a **low pressure**. This eventually turns into a thunderstorm. This causes air to be sucked in from the **trade winds**.
3	With trade winds blowing in the opposite direction and the rotation of earth involved (Coriolis effect), the thunderstorm will eventually start to **spin**.
4	When the storm begins to **spin faster than 74mph**, a tropical storm (such as a hurricane) is officially born.
5	With the tropical storm growing in power, **more cool air sinks** in the centre of the storm, creating calm, clear condition called the **eye of the storm**.
6	When the tropical storm hits land, it **loses its energy source** (the warm ocean) and it begins to lose strength. Eventually it will 'blow itself out'.

Changing pattern of Tropical Storms

Scientist believe that global warming is having an impact on the frequency and strength of tropical storms. This may be due to an increase in ocean temperatures.

Management of Tropical Storms

Protection
Preparing for a tropical storm may involve construction projects that will improve protection.

Aid
Aid involves assisting after the storm, commonly in LIDs.

Development
The scale of the impacts depends on the whether the country has the resources cope with the storm.

Planning
Involves getting people and the emergency services ready to deal with the impacts.

Prediction
Constant monitoring can help to give advanced warning of a tropical storm

Education
Teaching people about what to do in a tropical storm.

Primary Effects of Tropical Storms

- The intense winds of tropical storms can destroy whole **communities, buildings** and **communication networks**.
- As well as their own destructive energy, the winds can generate abnormally high waves called **storm surges**.
- Sometimes the most destructive elements of a storm are these subsequent **high seas and flooding** they cause to coastal areas.

Secondary Effects of Tropical Storms

- People are **left homeless**, which can cause distress, poverty and ill health due to lack of shelter.
- **Shortage of clean water** and **lack of proper sanitation** makes it easier for diseases to spread.
- **Businesses are damaged** or destroyed causing employment.
- Shortage of food as **crops are damaged**.

Case Study: Typhoon Haiyan 2013

Causes
Started as a tropical depression on **2rd November 2013** and gained strength. Became a Category 5 **"super typhoon"** and made landfall on the Pacific islands of the Philippines.

Effects
- Almost **6,500 deaths**.
- **130,000 homes destroyed.**
- Water and sewage systems destroyed had caused **diseases**.
- **Emotional grief** for dead.

Management
- The UN raised **£190m in aid**.
- USA & UK **sent helicopter carrier ships** deliver aid remote areas.
- **Education** on typhoon preparedness.

Case Study: UK Heat Wave 2003

Causes
The heat wave was caused by an anticyclone (areas of high pressure) that stayed in the area for most of August. This blocked any low pressure systems that normally brings cooler and rainier conditions.

Effect
- People suffered from heat strokes and dehydration.
- 2000 people died from causes linked to heatwave.
- Rail network disrupted and crop yields were low.

Management
- The NHS and media gave guidance to the public.
- Limitations placed on water use (hose pipe ban).
- Speed limits imposed on trains and government created 'heatwave plan'.

What is Climate Change?

Climate change is a large-scale, long-term shift in the planet's weather patterns or average temperatures. Earth has had tropical climates and ice ages many times in its 4.5 billion years.

Recent Evidence for climate change.

Global temperature	Average global temperatures have increased by more than **0.6°C since 1950**.
Ice sheets & glaciers	Many of the world's glaciers and ice sheets are melting. E.g. the Arctic sea ice has declined by **10% in 30 years**.
Sea Level Change	Average global **sea level has risen by 10-20cms** in the past 100 years. This is due to the additional water from ice and thermal expansion.

Enhanced Greenhouse Effect

Recently there has been an increase in **humans burning fossil fuels** for energy. These fuels (gas, coal and oil) emit **greenhouse gases**. This is making the Earth's atmosphere thicker, therefore trapping more solar radiation and causing **less to be reflected**. As a result, the Earth is becoming warmer.

Evidence of natural change

Orbital Changes	Some argue that climate change is linked to how the Earth orbits the Sun, and the way it wobbles and tilts as it does it.
Sun Spots	Dark spots on the Sun are called Sun spots. They increase the **amount of energy Earth receives** from the Sun.
Volcanic Eruptions	Volcanoes release large amounts of **dust containing gases**. These can **block sunlight** and results in cooler temperatures.

Managing Climate Change

Carbon Capture
This involves new technology designed to reduce climate change.

Planting Trees
Planting trees increase the amount of carbon is absorbed from atmosphere.

International Agreements
Countries aim to cut emissions by signing international deals and by setting targets.

Renewable Energy
Replacing fossil fuels based energy with clean/natural sources of energy.

Context	
1	There was much religious change under the Tudors and Elizabeth had to find a way of dealing with these issues. Many people objected to Elizabeth's coronation in 1558 and she faced questions over her legitimacy, with many preferring Mary Queen of Scots, and whether a woman could rule effectively.
Key events	
2	**1532** Start of the English Reformation.
3	**1556-58** Dutch Revolt against Spanish.
4	**1558** Elizabeth's accession.
5	**1559** Mary Queen of Scots became Queen of France.
6	**1559** Treaty of Cateau-Cambresis – England had to return Calais to France.
7	**1559** Religious Settlement and visitations commenced.
8	**1556** Pope issued an instruction that English Catholics should not attend Church of England services.
9	**1560** Elizabeth helped Scottish Protestant lords defeat Mary of Guise. Treaty of Edinburgh.
10	**1562** Religious war in France.
11	**1563** Philip II banned import of English cloth into Netherlands.
12	**1567** Elizabeth allows Dutch Sea Beggars to shelter in English harbours.
13	**1568** Genoese Loan
14	**1568** Mary Queen of Scots fled to Scotland and then arrives in England.
15	**1569** Revolt of the Northern Earls,
Key Concepts	
16	**Society and Government** was very structured and hierarchical. The monarch had much power.
17	**Elizabeth's accession** caused controversy as her gender, legitimacy and religion were questioned.
18	**Religion –** Elizabeth imposed her Religious Settlement but this upset many English and foreign Catholics and some wanted Mary Queen of Scots to replace Elizabeth**.**
19	**Financial problems** – When Elizabeth took the throne the Crown was £300,000 in debt.
20	**Foreign powers** opposed to Protestantism remained an issue for Elizabeth, especially Scotland, France and Spain.

Key Words		
20	**Nobility**	Belonging to the aristocracy.
21	**Gentry**	People of a high social class.
22	**Yeomen**	Men who held a small amount of land or an estate.
23	**Tenant farmers**	Farmed rented land usually owned by yeomen or gentry.
24	**Merchants**	Traders.
25	**Professionals**	Lawyers and doctors.
26	**Craftsmen**	Skilled employees.
27	**Extraordinary taxation**	Occasional, additional taxation to pay for unexpected expenses, especially war.
28	**Militia**	A military force of ordinary people, rather than soldiers, raised in an emergency.
29	**Privy council**	Advisors to Elizabeth.
30	**Justices of the Peace**	Large landowners who kept law and order.
31	**Patronage**	To provide someone with an important job or position.
32	**Secretary of State**	Elizabeth's most important Privy Counsellor.
33	**Crown**	Refers to the monarch and their government.
34	**Divine Right**	Belief that the monarch's right to rule came from God.
35	**Royal Prerogative**	Elizabeth could insist that Parliament did not talk about certain issues.
36	**Succession**	The issue of who was going to succeed the throne after the existing monarch died.
37	**Legitimate**	Being born in wedlock when the existing king and queen were married.
38	**Customs duties**	Taxes from trade.
39	**Auld Alliance**	A Friendship between France and Scotland.
40	**Puritans**	Radical Protestants.

41	**Ecclesiastical**	An adjective used to describe things to do with the Church.
42	**Act of Supremacy**	Made Elizabeth supreme governor of the Church of England.
43	**Act of Uniformity**	Established the appearance of churches and the form of services they held.
44	**Royal Injunctions**	A set of instructions to reinforce the acts of Supremacy and Uniformity.
45	**Recusants**	Catholics who were unwilling to attend church services laid down by the Elizabethan religious settlement.
46	**Visitations**	Inspections of churches and clergy by bishops to ensure that the Act of Supremacy was being followed.
47	**Papacy**	The system of church government ruled by the Pope.
48	**Heretics**	People who refused to follow the religion of the monarch.
49	**Martyr**	Someone who dies for their religious beliefs.
50	**Counter Reformation**	The campaign against Protestantism.
51	**Philip II**	Catholic King of Spain.
52	**Trade embargo**	When governments ban trade with another country.
53	**Excommunicated**	Expulsion from the Catholic Church.
54	**Sea Beggars**	Dutch rebels who fled to the water.
55	**Genoese Loan**	When Elizabeth took gold loaned to Philip II by the bankers of Genoa.

Early Challenges	
56	**Legitimacy-** Her father Henry VIII divorced his first wife without permission of the Pope. This meant his marriage to Elizabeth's mother Anne Boleyn was invalid. This meant Elizabeth was illegitimate.
57	**Marriage-** Elizabeth was expected to marry quickly because women were thought not strong enough to rule alone, she would need a husband to help control the nobles and she needed to produce an heir to provide stability after she died.
58	**Invasion-** Danger of invasion from powerful foreign countries… •*France*–England was already at war with Catholic France. France had close ties with Mary, Queen of Scots. •*Scotland,* •*Spain* –Wealthy & powerful, strongly Catholic.

Challenges to Elizabeth at Home and Abroad 1569-88	
1	Elizabeth faced many serious threats both within England and from aboard. Many still wanted Mary Queen of Scots on the throne. Philip II of Spain also wanted to remove Elizabeth from the throne. Spain and England were religious and political rivals. There was particular tension when Drake tried to challenge Spanish dominance in the New World.
Key events	
2	**1492** Discovery of the New World
3	**1567** Spanish travel to Netherlands to crush Protestant revolt.
4	**1568** Mary Queen of Scots arrives in England
5	**1569** Revolt of the Northern Earls
6	**1570** Elizabeth excommunicated
7	**1571** The Ridolfi Plot
8	**1572** Elizabeth hired Drake as a privateer
9	**1576** Spanish Fury and Pacification of Ghent
10	**1577-80** Drake circumnavigated the globe.
11	**1583** Throckmorton Plot
12	**1584** Treaty of Joinville
13	**1585** Act of Preservation of the Queen's Safety/Treaty of Nonsuch
14	**1586** Babington Plot
15	**1587** Mary Queen of Scots executed
16	**1587** Attack on Cadiz
17	**1588 Spanish Armada**

Key Words		
21	**New World**	North and South America.
22	**Revolt of the Northern Earls**	When northern earls encouraged Catholics to rebel.
23	**Ann Percy**	Wife of Thomas Percy.
24	**Jane Neville**	Wife of James Neville and Duke of Norfolk's sister.
25	**Mary Queen of Scots**	Supported the plan to marry the Duke of Norfolk.
26	**Thomas Howard, Duke of Norfolk**	One of England's most senior nobles and a Protestant.
27	**Charles Neville, Earl of Westmorland**	Duke of Norfolk's brother in law and from an important Catholic family.
28	**Thomas Percy, Earl of Northumberland**	Had been important under previous monarchs, but as a Catholic he had been side-lined.
29	**James Pilkington**	Appointed Archbishop of Durham.
30	**Civil War**	A war between people in the same country.
31	**Conspiracy**	A secret plan with the aim of doing something illegal.
32	**Papal Bull**	A written order by the Pope.
33	**Council of the North**	Used to implement Elizabeth's laws and authority in the North of England.
34	**Ridolfi Plot**	Plan to murder Elizabeth, launch a Spanish attack and put Mary Queen of Scots on the throne.
35	**Priest holes**	Secret hiding places for Catholic priests.
36	**Hanged, drawn and quartered**	A type of punishment used when the accused was found guilty of high treason. The accused would be hanged until near dead, cut open, have their intestines removed and were finally chopped into four pieces.
37	**Throckmorton Plot**	Plan for the French Duke of Guise to invade England, free Mary , overthrow Elizabeth and restore Catholicism in England.
38	**Sir Francis Walsingham**	Elizabeth's Secretary of State.
39	**Babington Plot**	The Duke of Guise would invade England and put Mary on the throne.
40	**Act of Preservation of the Queen's Safety**	In the event of Elizabeth's assassination, Mary would be banned from the succession.
41	**Agents provocateurs**	Agents who become part of groups suspected of wrongdoing and encourage other members to break the law so that potential threats can be identified and arrested.
42	**Foreign Policy**	The aims or objectives that guide a nation's relations with other states.
43	**Privateer**	Individuals with their own armed ships that capture other ships for their cargo, often with the support and authorisation of the government.
44	**Francis Drake**	Elizabeth hired him as a privateer.
45	**Circumnavigate**	To travel all the way around the world.
46	**Autonomy**	The right to self government, so people of one country can manage its own affairs.
47	**Spanish Fury**	The Spanish rampaged through Dutch provinces as they left.
48	**Pacification of Ghent**	Spanish troops expelled from Netherlands, political autonomy to be returned and end of religious persecution.
49	**Mercenary**	A soldier who fights for money rather than a nation or a cause.
50	**Treaty of Joinville**	The King of France and the King of Spain became allies against Protestantism.
51	**Treaty of Nonsuch**	Effectively put England and Spain at war.
52	**Singeing of the King of Spain's beard**	Drake sailed into Cadiz harbour, Spain's most important Atlantic port, and over 3 days destroyed 30 ships.
53	**Tilbury Speech**	Elizabeth's famous speech to her troops before the Armada.

Elizabethan Society in the Age of Exploration 1558-88	
1	Elizabeth's I's reign was a time of expansion with growth in many different areas of society and life.
Key events	
2	1563 Statute of Artificers
3	**1570** Norwich Survey
4	**1572** Vagabonds Act
5	**1576** Poor Relief Act
6	**1580** Drake returns from circumnavigating the globe with spices, treasure and tales of Nova Albion.
7	**1584** Raleigh begins planning new colonisation attempt by sending a fact finding mission to Virginia.
8	**1585** Colonists set sail for North America and begin the English colonisation of Virginia.
9	**1586** Surviving colonists abandon Virginia and return to England
10	**1587** New group of colonists arrive in Virginia and establish colony at Roanoke
11	**1590** English sailors arrive at Roanoke only to find it abandoned
Key Concepts	
12	**Education –** Expanded during Elizabeth's reign but it was expensive and mostly for boys. The large majority of people were illiterate.
13	**Pastimes –** Theatre thrived. Elizabethan leisure was similar to modern day but sport was much more violent.
14	**Population Growth –** During the reign of Elizabeth, population grew by as much as 35%. Food prices rose, wages fell and enclosure brought problems. The urban poor grew and poverty was a real problem.
15	**Exploration** by Drake led to conflict with Spain over the New World.
16	**Attitudes** – Unemployment was recognised as a genuine issue.
17	Poverty was an issue that Elizabeth wanted to address.

Key Words		
18	**Social mobility**	Being able to change your position in society.
19	**Humanists**	Believed that learning was important in its own right and not for just practical reasons.
20	**Grammar schools**	Private schools set up for boys considered bright who largely came from well off families in towns.
21	**Corporal punishment**	Punishment which causes physical pain.
22	**Apprentice**	Someone learning a trade or a skill.
23	**Petty schools**	Set up in a teacher's home. For boys.
24	**Dame schools**	Set up in a teacher's home. For girls.
25	**Pastimes**	Activities for leisure.
26	**Mystery plays**	Plays base on the Bible and saints' stories.
27	**Globe**	Shakespeare's theatre.
28	**Alms**	Charity
29	**Poor relief**	Financial help.
30	**Itinerants**	People who had moved from their home parishes looking for work.
31	**Enclosure**	The process of replacing large, open fields that were farmed by villages with individual fields belonging to one person.
32	**Rural depopulation**	When the population of the countryside falls as people move away in search of a better life.
33	**Subsistence farming**	Growing just enough to feed the family bit not to sell.
34	**Vagabonds**	Homeless people without jobs who roamed the countryside begging for money or perhaps committing crimes in order to survive.
35	**Economic recession**	When a fall in demand leads to falling prices and businesses losing money.
36	**Deserving poor**	People unable to work because of illness or old age.
37	**Idle poor**	People who were fit to work but didn't.
38	**Triangular trade**	Route from Europe to Africa to the Americas.
39	**Quadrant/ Astrolabe**	Used by sailors to help with navigation at sea.
40	**Cartographer**	Map maker.
41	**Galleons**	Ships that were much larger than traditional trading ships.
42	**Colonies**	Land under the control or influence of another country.
43	**Monopoly**	When one person or company controls the supply of something.
44	**Nova Albion**	Region named by Drake, probably north of modern day San Francisco.
45	**Walter Raleigh**	Explorer who encouraged colonists to Virginia.
46	**Barter**	To exchange goods for other goods.
47	**Manteo and Wanchese**	Two native American Indians who came back to England.
48	**Native Americans**	People who lived in the New World before the colonists.

Key teachings	
Sermon on the mount	When Jesus first started preaching, he spoke from a mountainside in front of a large crowd. This speech is known as the Sermon on the Mount. In this sermon, Jesus taught his followers the **Lord's Prayer** and told them the **Parable** of the Good Samaritan. The sermon also contained the **Beatitudes** and Jesus' teachings about God's laws, which he expected his followers to uphold.
	In the Sermon on the Mount, Jesus summed up almost all of his teachings. Christians find the following important lessons in this sermon: • Possessions on Earth are not important. Meaningful spiritual 'treasures' will be found by good people in Heaven. • People should not worry because God will take care of them. • People should not judge each other. It is **hypocritical** to do so, and only God can sit in **judgment**. • God will help people who seek his help. • The way to **Heaven** is difficult to pass through – like a narrow gate – but getting to **Hell** is easy, like a wide gateway.
The Beatitudes	In the Sermon on the Mount, Jesus explains to his followers what kinds of human lives are blessed by God. The statements he made are known as the Beatitudes. According to Jesus, God gives his blessing to: • the meek – meaning humble people • those who make peace • those who show mercy to others Jesus also mentioned that people who are persecuted because of their faith will be blessed and find reward in Heaven (Matthew 5:3–11).
Jesus' teachings about agape	Christians believe that God has unconditional and enduring love for all human beings, known as agape. They believe that he showed this love by sacrificing his son, **Jesus**, to **atone** for human sin. In this sense, agape is also a self-sacrificing kind of love. Jesus' mission was based on agape. The **gospels** tell how Jesus encouraged people to love others unconditionally, even when it was difficult to do so. **Examples of agape in the Bible - the greatest commandment (Matthew 22:36–9)**
Key quotes	
	"Do for others what you would want them to do for you" Golden Rule Matthew 7:12
	"It doesn't matter if you are a Jew or a Greek, a slave or a free, male or female. You are all the same in Christ Jesus" Galatians 3:28
	"So God created mankind in his own image, in the image of God he created them; male and female he created them" – Genesis 1:27
	"For God so loved the world that he gave his one and only Son, that whoever believes in him shall not perish but have eternal life" – John 3:16
	"For I was hungry and you gave me something to eat, I was thirsty and you gave me something to drink, I was a stranger and you invited me in, 36 I needed clothes and you clothed me, I was sick and you looked after me, I was in prison and you came to visit me" – Matthew 25: 35-36

Key Words	
Catholic	The tradition within the Christian Church which is led by the Pope; also called the Roman Catholic Church.
Denominations	A distinct group within the Christian faith, with its own organization and traditions
Christ	Literally means 'Anointed One' in Greek; the Hebrew equivalent is Messiah. The leader promised by God to the Jews; Christians believe Jesus to be the Christ.
Trinity	The belief that there are three persons in One God; the Father, the Son and the Holy Spirit are separate, but are also one being
Grace	The unconditional and generous love that God shows to people who do not deserve it.
Holy Spirit	The third Person of the Trinity; believed to be present with believers since Pentecost and active on earth.
Incarnation	Literally 'in flesh', belief that God took on human form in the person of Jesus
Jesus	Believed by Christians to be the Son of God, he was a first century Jewish teacher living and travelling in Palestine/Israel.
Protestant	Christian denominations in which authority is generally based on the Bible, rather than Church tradition/teaching. (eg Anglican, Methodist, Baptist).

Key Ideas		
Nature of God 	- Christians believe in **one God** who is the creator and the sustainer of all that exists - God is **omnipotent** which means they are almighty and have unlimited power - God is **benevolent** which means they are all-loving and all-good - God is **just** which means they are a perfect and fair judge - **The Problem of Suffering** asks: if God is all these things why do they allow bad things to happen to good and innocent people?	
The Trinity 	- Christians believe God is three persons in one. This idea is called the **Trinity**. - Each person of the Trinity is fully God but the three persons of the Trinity are not the same. - The **Father** is the creator of all life - The **Son** is Jesus Christ who is both fully human and fully God - The **Holy Spirit** is the unseen power of God at work in the world, especially answering prayers *"We believe in one God, Father, Son and Holy Spirit"* – The Nicene Creed	
Incarnation and Crucifixion 	**Crucifixion** - Jesus travelled to Jerusalem to preach and he was sentenced to death by Pontius Pilate - Jesus was then nailed to a **cross** where he died. - In his last moments Jesus was able to forgive those who were killing him showing Christians how important **forgiveness** is - This event is remembered on Good Friday *"Forgive them father, they know not what they do"* – Luke 23:34	**Incarnation** - Christians believe that God was **incarnated** (born) in human form as **Jesus Christ** - **Mary** was impregnated by the Holy Spirit and gave birth as a virgin – for Christians this is proof of Jesus' status as the son of God - **Christmas** is the festival that celebrates the incarnation *"The word became flesh"* – John 1:14
Resurrection and Ascension 	**Resurrection** - After Jesus was dead and buried Christians believe he **rose from the dead** – this is the **resurrection** - Early on the Sunday three women visited his tomb expecting to find his body but it was not there - After his resurrection Jesus appeared to his disciples and told them to spread the word of him - This event is celebrated on **Easter Sunday** *"He is risen"* – Christians say this to each other on Easter Sunday	**Ascension** - Forty days after he rose from the dead Jesus **ascended** (went up) into heaven **A belief in resurrection and ascension …** - Shows **life after death** is real - Assures Christians they will rise again after death and live on in the afterlife - Leads Christians to try and lead a **good life**
Sin and Salvation 	- Christians believe you are **judged** after you die (see Religion and Life) and how well or badly you have lived and treated others decides if you go to **heaven** or **hell** - **Sin** is any action or thought that goes against God's will, Christians can look in the Bible for advice on what is a sin e.g. murder (you shall not kill) and adultery (cheating, you shall not commit adultery) - God gave humans **free will** but they should use that freedom to make good choices and not sin - **Salvation** is the idea that Jesus's crucifixion saves human beings from eternal damnation - The death of Jesus made up for **original sin** – the idea that we were all damned by Eve's choice to disobey God – it allows us to atone for sins and reach eternal life in heaven	

Key Words	
Ascension	Jesus returning to be with God in heaven after the crucifixion
Atonement	Making things better after sinning, asking for forgiveness from God
Benevolent	God's nature as all-loving
Crucifixion	Jesus' execution by the Romans on the cross
Incarnation	God becoming flesh in the form of Jesus Christ
Just	God's nature as fair
Omnipotent	God's nature as all-powerful
Original Sin	The built-in tendency to do wrong which comes from Eve's disobedience
Resurrection	Jesus returning from the dead after he was crucified
Salvation	Being saved from sin and given eternal life in heaven by God
Sin	Any thought or action which goes against God's will
Trinity	God's nature as three-parts-in-one, the Father, Son and Holy Spirit

Muscular system

Name of muscle	Function	Example in sport
Triceps	Extend the arm at the elbow	Press-up, throwing a javelin
Biceps	Flex the arm at the elbow	Pull-up, drawing a bow in archery
Deltoids	Move the arm in all directions at the shoulder	Bowling a cricket ball
Pectorals	Adduct the arm at the shoulder	Forehand drive in tennis
Trapezius	Hold the shoulders in place, move head back and sideways	Holding head up in rugby scrum
Gluteals	Adduct and extend leg at the hips	Pulling back leg before kicking a ball
Quadriceps	Extend the leg at the knee	Kicking a ball jumping upwards
Hamstrings	Flex the leg at the knee	Bending knee before kicking a ball
Gastrocnemius	Pointing the toes, help to flex the knee	Running
Latissimus dorsi	Adduct and extend the arm at the shoulder	Butterfly stroke in swimming
Abdominals	Flex the trunk across the stomach	Pulling the body down when hurdling

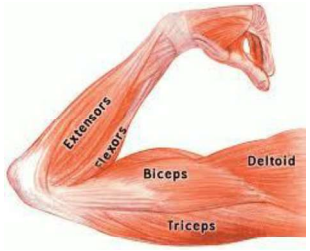
Exam Questions

1. To cause movement muscles and bones must work together. Explain this process, using an example. (*4 marks)*

2. Adduction is one of the range of movements that occurs at joints in the body. Which of the following describes adduction at the shoulder joint?

A. The movement of a limb away from the midline of the body
B. The movement of a limb towards the midline of the body
C. The movement of a limb in a complete circle
D. The movement of a limb which increases the angle of a joint

3. There are a range of movements that occur at different joints in the body. The elbow is a hinge joint. What types of movement can occur here? **2 marks]**



Muscle Contractions

Muscles contract when they work. If a muscle contracts to create movement, it is called an ***isotonic contraction***.
An ***isotonic*** contraction can be ***concentric***, which is where the muscle shortens as the fibres contract or ***eccentric***, where the fibres contract as the muscle lengthens.
When a muscle contracts with no resulting movement, it is an ***isometric*** contraction.

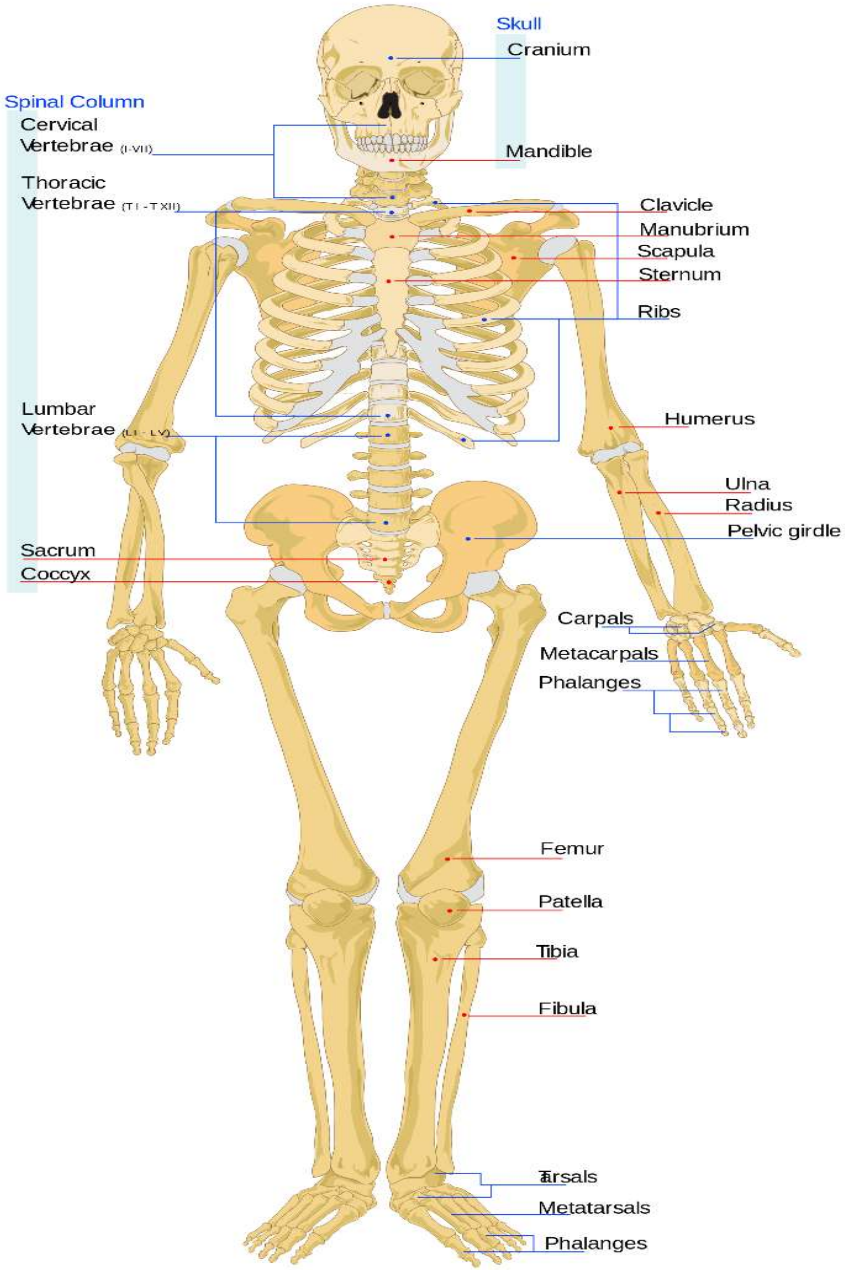
Movement	Description
Abduction	Movement away from the mid-line of the body
Adduction	Movement towards the mid-line of the body
Extension	Straightening limbs at a joint
Flexion	Bending the limbs at a joint.
Rotation	A circular movement around a fixed point

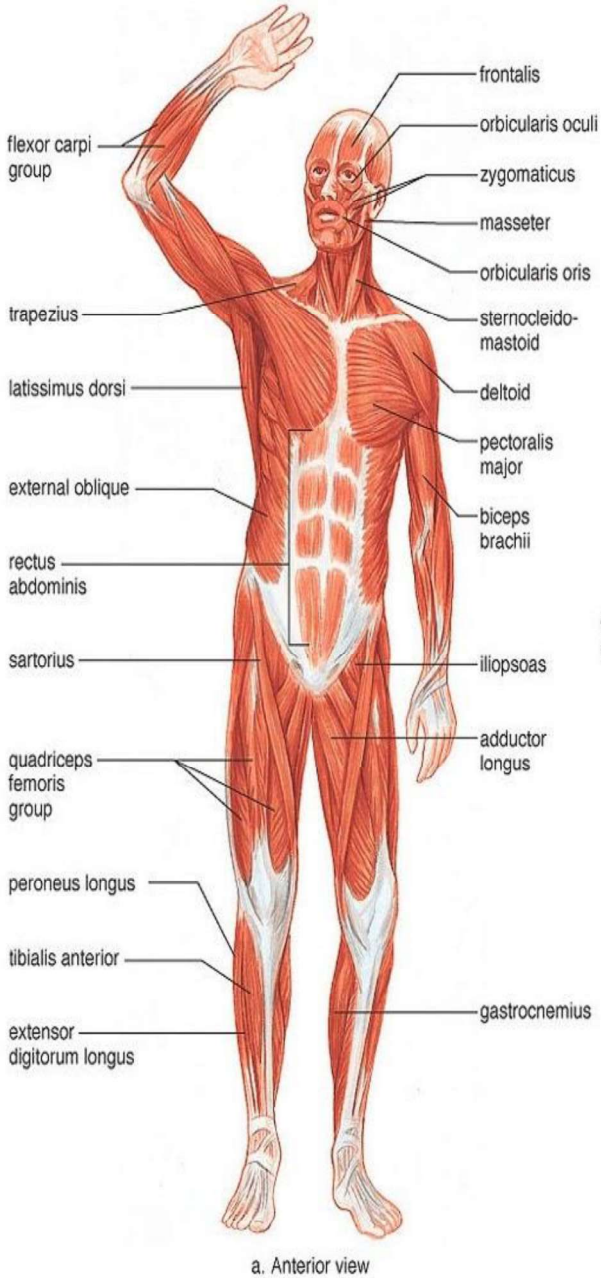
Muscles and Movement:

Muscles only provide one type of movement as they can only pull and not push. All muscles work in pairs, with one muscle pulling while the other relaxes, and then vice versa. These are called an ***'Antagonistic Pair'.***

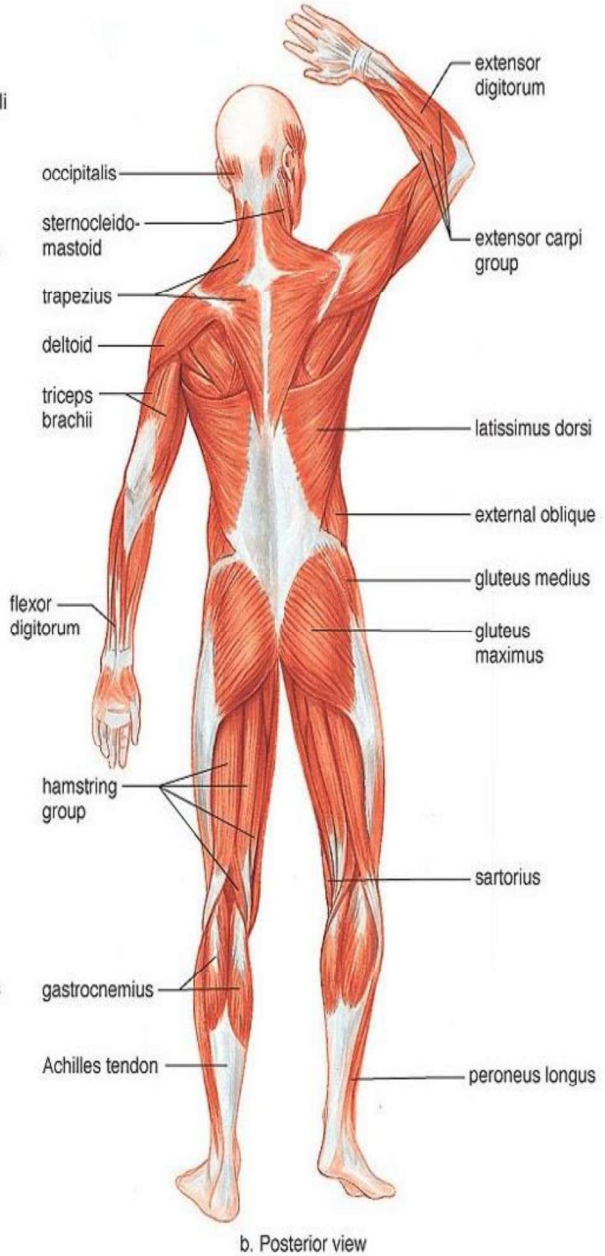
The ***Prime mover*** muscle contracts to start a movement. It is also known as the ***'agonist'.***
The ***Antagonist*** muscle relaxes to allow movement to take place.

Origin: the end of the muscle attached to the fixed bone.
Insertion: the end of the muscle attached to the bone that moves.





a. Anterior view



b. Posterior view

What is the aim of a rugby game? - The aim of the game is very simple.

- Use the ball to score more points than the other team.
- You can run with the ball, kick it and pass it, but passing forwards is not allowed.
- Rugby is a contact sport, so you can tackle an opponent in order to get the ball, as long as you stay within the rules.

Can you tackle in rugby?

- Tackling is the only way of legally bringing down your opponent in rugby union.
- There are certain laws on how to tackle and if these are not adhered to, penalties will follow.

What is a maul in rugby?

The maul is about physical strength and power.

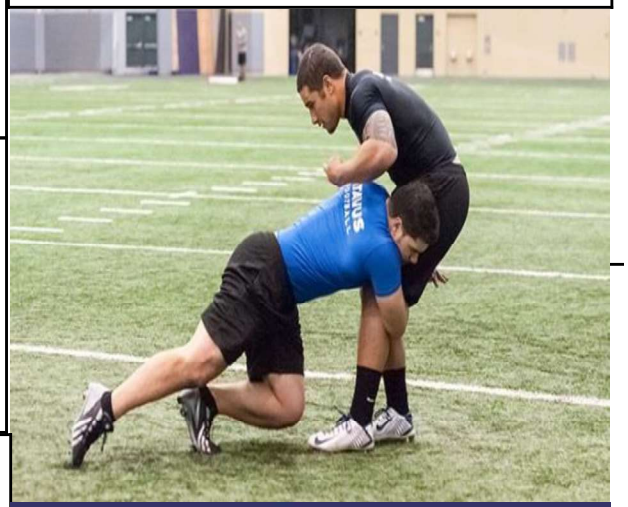
The maul is when at least three players from either side are in contact together, challenging the player with the ball, moving towards a goal line. But what makes the maul different to the ruck is the ball is not on the ground but in hand.

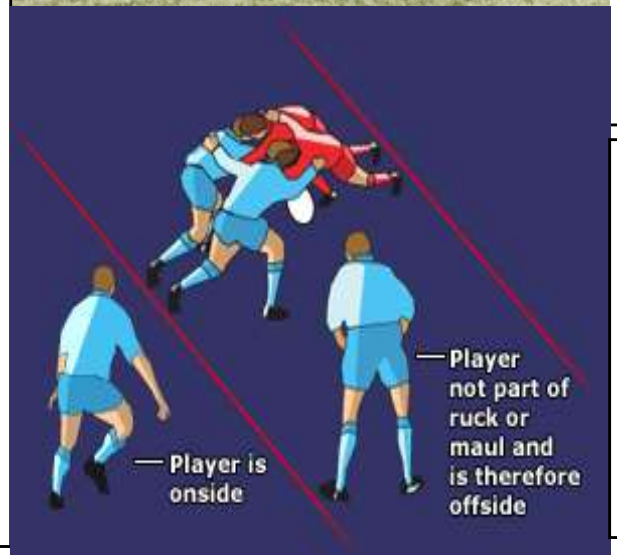
What is the job of the wing?

Like in football or netball the wing Plays out wide on the side of the pitch, the winger is a team's finisher in attack. A winger is also often the last line of defence when they don't have the ball and as such, pace is their major resource.

How can you score points? - There are several ways to score points.

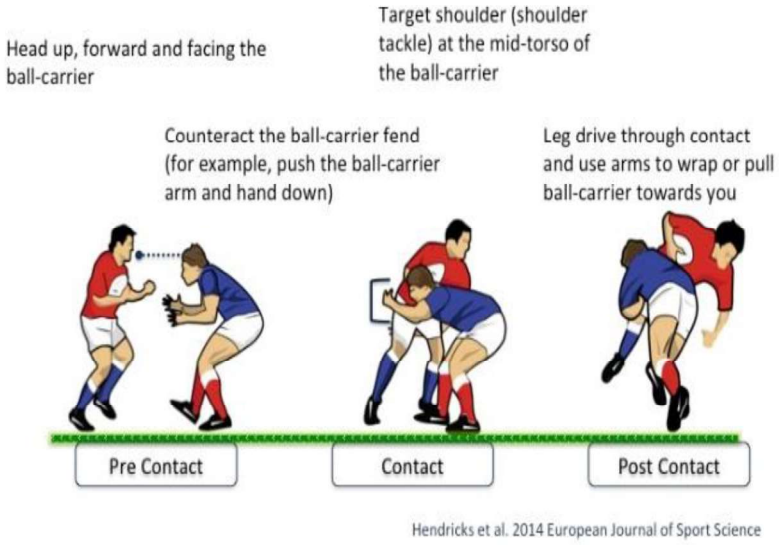
- A try - five points are awarded for touching the ball down in your opponent's goal area.
- A conversion - two points are added for a successful kick through the goalposts after a try





. How long does a rugby match take? - A game of rugby has two periods of 40 minutes each.

- The game is started by a place kick or a drop kick from the middle of the halfway line.



What is the role of a flanker in rugby?

Each team of 15 players includes two **flankers**, who play in the forwards, and are generally classified as either blindside or open side **flankers**, numbers 6 and 7 respectively. The name comes from their position in a scrum in which they 'flank' each set of forwards.

How do you dropkick a Rugby ball?

Hold the ball in two hands, pointing downwards.

As you step forward with your non-kicking foot, strike the ball on the bounce.

BASIC RULES

1. How do you start a football match? The football game is started by a kick off in the centre of the pitch.

2. What's the number of players on each side during a professional match? In a full sided game each team consists of 11 players.

3. What happen when the ball goes off at the side of the pitch? If the ball goes off the side of the pitch it is a throw in to the team that didn't touch the ball last.

4. What happen if the ball goes off at the end of the pitch?
If the ball goes off the end of the pitch it is a corner or a goal kick depending who the ball touched last.

KEY TERMINOLOGY

4. What is meant by the term offside?
If a player is past the opponent's last defender and in the opposition half when the ball is passed they are offside and an indirect free kick is awarded to the opposition team.

5. What is meant by the term corner kick?
A free kick taken from the corner of the field by an attacker. The corner kick is awarded when the ball has passed over the goal line after last touching a defensive player. The shot is taken from the corner nearest to where the ball went out.

6. Description of the term individual defence:
- Man to man marking – to be beside to the attacking player
- try to slow attacking player down
- show attacker to their weaker foot
- time tackle effectively to increase chances of winning the ball back.

7. What is meant by the term VAR?
The video assistant referee (VAR) is a match official in association football who reviews decisions made by the head referee with the use of video footage and a headset for communication.

TEACHING POINTS & STRATEGIES

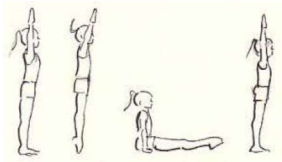
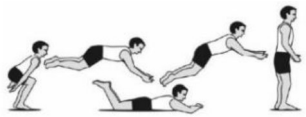
8. What are the teaching points for the SHORT PASS?
- Non kicking foot next to the ball
- Use the side of the kicking foot to contact the ball following a short back swing
- Keep head over the ball to improve accuracy and ensure ball stays on the ground
- Follow foot through to generate more power

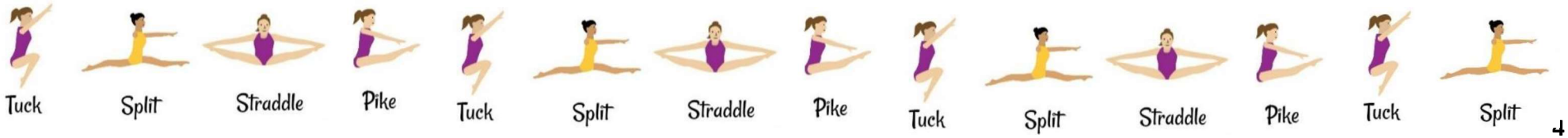
9. What is POSSESION FOOTBALL?
Possession football is when teams attempt to hold onto the ball for as long as possible, at all times choosing the easiest possible pass (hence the many times you see defenders passing the ball along the defensive line).

10. What is TEAM FORMATION?
The team formation describes how the players in a team generally position themselves on the pitch. It is a fluid and fast-moving game, and (with the exception of the goalkeeper) a player's position in a formation does not define their role as rigidly.
Formations are typically described by three or four numbers, which denote how many players are in each row of the formation from the most defensive to the most forward. For example, the popular "4–5–1" formation has four defenders, five midfielders, and a single forward. Different formations can be used depending on whether a team wishes to play more attacking or defensive football, and a team may switch formations between or during games for tactical reasons..

FULL FOOTBALL POSITIONS

Goalkeeper	Winger
Wing-back	Central-midfielder
Full-back	Striker
Sweeper	Attacking midfielder
Centre-back	Forward
Defensive midfielder	

Straddle jump: **Keep upper body and head as still as possible **Point your toes.	As you take off, legs apart and extend to your sides at 90 degrees and horizontal. Your arms follow your legs, straight. Upper body and head stay as still as possible. Toes pointed and eyes forward.	**How to be safe and successful:** - Stay on the cross (center of trampoline), - Keep body tension, - Gain maximum height in the air – this makes it easier to perform the skills, - Point toes when jumping, - Keep head and eyes forward focusing on a point in front of you.	**Routine 1**: Full twist Tuck jump Swivel hips to feet Pike jump Straddle jump Half twist
Tuck jump: **Keep upper body and head as still as possible **Point your toes.	As you take off, bring your arms away from your sides and extend in front of you to elevate quickly. As you reach max height bring your knees in tight to your chest. Bring arms down to touch shins.		**Routine 2**: Tuck jump Straddle jump Seatdrop to feet Half twist Seat drop to feet Pike jump Full twist
Pike jump: **Keep upper body and head as still as possible **Point your toes.	As you take off, keep your legs together and straight and extend in front of you. Knees should be straight with both knees and feet together. Straighten arms out forward towards knees.		**Routine 3:** Half twist Straddle jump Swivel hips to feet Tuck jump Seatdrop to feet Pike jump Full twist
Seat drop: **Keep upper body and head as still as possible **Point your toes.	As you take off, bring your arms away form your sides and extend them out in front of you and elevate them quickly above your head. Tilt your pelvis up slightly and legs straight. As you begin to loose height, bring your arms down to make contact with the bed just behind your bottom and extend feet forward.		
Swivel hips: **Keep upper body and head as still as possible **Point your toes.	Seat drop as above – except you do a half twist in the air and complete another seat drop before returning to feet.		**Routine 4:** Straddle jump Swivel hips to feet Pike jump Front drop to feet Full twist Tuck jump Straddle jump
Front drop: **Keep upper body and head as still as possible **Keep your eyes focused towards wall in front – do not look down.	As you take off, bring your arms away from your sides and tem in front of you and elevate arms quickly above head. Hold this position and push hips back as you gain height. As you begin to loose height bend arms down to form a diamond shape with hands overlapping in front of face. Legs slightly bent at knees. Bounce back up.		

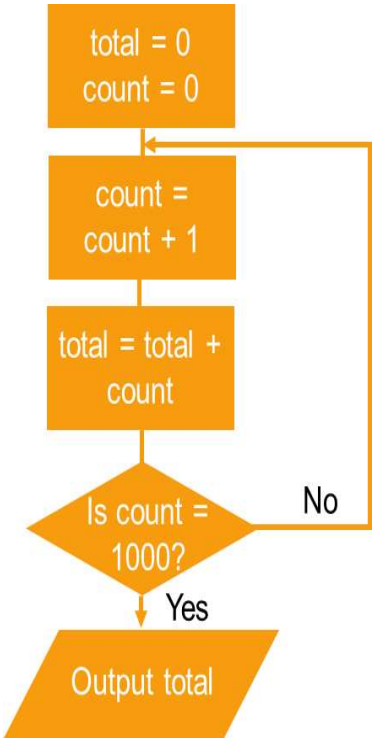


1	Algorithms	Understand what an algorithm is, what algorithms are used for and be able to interpret algorithms (flowcharts, Pseudo-code, written descriptions, program code)
2	Flowcharts	Understand how to create an algorithm to solve a particular problem, making use of programming constructs (sequence, selection, iteration) and using appropriate conventions (flowchart, pseudo-code, written description, draft program code)
3	Pseudo code	Understand the purpose of a given algorithm and how an algorithm works
4	Interpreting Algorithms	Understand how to determine the correct output of an algorithm for a given set of data
5	Errors in algorithms	Understand how to identify and correct errors in algorithms
6	Python	Understand how to code an algorithm in a high-level language

Interpreting Algorithms

```
turns = 0
X = 3
while turns < 22
    X = X * 3
    turns = turns + 3
endwhile
print (X)
print (turns)
```

Turns	X	Output
0	—	—
0	3	—
0	9	—
3	9	—
3	27	—
6	27	—
6	81	—



Algorithms (Structures)

Sequencing: This means that the computer will run your code in order, one line at a time from the top to the bottom of your program. It will start at line 1, then execute line 2 then line 3 and so on till it reaches the last line of your program

Selection: Sometimes you only want some lines of code to be run only if a condition is met, otherwise you want the computer to ignore these lines and jump over them. This is achieved using IF statements. e.g. If a condition is met then lines 4, 5, 6 are executed otherwise the computer jumps to line 7 without even looking at line 4,5 and 6.

Iteration: Sometimes you want the computer to execute the same lines of code several times. This is done using a loop. There are three types of loops: For loops, while loops and repeat until loops. That's handy as it enables you not to have to copy the same lines of code many times.

	**Process or action** **May perform a calculation**
	Decision, a condition has to be met, may use =>< etc Has a yes and no coming out of it on an arrow
	Terminator: Start always used, end maybe used
	Represent = Data to be input or output
	Denotes a sub-process that may be defined in a separate flowchart. A chunk of code that does a separate job

Variables and arrays		
Syntax	**Explanation of syntax**	**Example**
SET Variable TO <value>	Assigns a value to a variable.	SET Counter TO 0 SET MyString TO 'Hello world'
SET Variable TO <expression>	Computes the value of an expression and assigns to a variable.	SET Sum TO Score + 10 SET Size to LENGTH(Word)
SET Array[index] TO <value>	Assigns a value to an element of a one-dimensional array.	SET ArrayClass[1] TO 'Ann' SET ArrayMarks[3]TO 56
SET Array TO [<value>, ...]	Initialises a one-dimensional array with a set of values.	SET ArrayValues TO [1, 2, 3, 4, 5]
SET Array [RowIndex, ColumnIndex] TO <value>	Assigns a value to an element of a two dimensional array.	SET ArrayClassMarks[2,4] TO 92

Selection		
Syntax	**Explanation of syntax**	**Example**

IF <expression> THEN
  <command>
END IF
	If <expression> is true then command is executed.	IF Answer = 10 THEN
		  SET Score TO Score + 1
		END IF

IF <expression> THEN
  <command>
ELSE
  <command>
END IF
	If <expression> is true then first <command> is executed, otherwise second <command> is executed.	IF Answer = 'correct' THEN
		  SEND 'Well done' TO DISPLAY
		ELSE
		  SEND 'Try again' TO DISPLAY
		END IF

Python Functions – see next page for example

A function is a subroutine that returns a value. This means that it outputs a value from the instructions it carries out. Like a procedure, a function groups together a number of instructions under one name.

Repetition		
Syntax	**Explanation of syntax**	**Example**

WHILE <condition> DO
  <command>
END WHILE
	Pre-conditioned loop. Executes <command> whilst <condition> is true.	WHILE Flag = 0 DO
		  SEND 'All well' TO DISPLAY
		END WHILE

REPEAT <command> UNTIL <expression>	Post-conditioned loop. Executes <command> until <condition> is true. The loop must execute at least once.	REPEAT SET Go TO Go + 1 UNTIL Go = 10
REPEAT <expression> TIMES <command> END REPEAT	Count controlled loop. The number of times <command> is executed is determined by the expression.	REPEAT 100-Number TIMES SEND '*' TO DISPLAY END REPEAT

FOR <id> FROM <expression> TO <expression> DO
  <command>
END FOR
	Count controlled loop. Executes <command> a fixed number of times.	FOR Index FROM 1 TO 10 DO
		  SEND ArrayNumbers[Index] TO DISPLAY
		END FOR

FOR <id> FROM <expression> TO <expression> STEP <expression> DO
  <command>
END FOR
	Count controlled loop using a step.	FOR Index FROM 1 TO 500 STEP 25 DO
		  SEND Index TO DISPLAY
		END FOR

FOR EACH <id> FROM <expression> DO <command> END FOREACH	Count controlled loop. Executes for each element of an array.	SET WordsArray TO ['The', 'Sky', 'is', 'grey'] SET Sentence to '' FOR EACH Word FROM WordsUArray DO SET Sentence TO Sentence & Word & ' ' END FOREACH

Syntax	Explanation of syntax	Example
SEND <expression> TO DISPLAY	Sends output to the screen.	SEND 'Have a good day.' TO DISPLAY
RECEIVE <identifier> FROM (type) <device>	Reads input of specified type.	RECEIVE Name FROM (STRING) KEYBOARD RECEIVE LengthOfJourney FROM (INTEGER) CARD_READER RECEIVE YesNo FROM (CHARACTER) CARD_READER

File handling		
Syntax	**Explanation of syntax**	**Example**
READ <File> <record>	Reads in a record from a <file> and assigns to a <variable>. Each READ statement reads a record from the file.	READ MyFile.doc Record
WRITE <File> <record>	Writes a record to a file. Each WRITE statement writes a record to the file.	WRITE MyFile.doc Answer1, Answer2, 'xyz 01'

Function example

```
def userName(fname, sname, year):
        uname = str(fname[0] + sname + year[-2:])
        return uname
forename = "Joe"
surname = "Bloggs"
yearOfBirth = "2001"
```

A procedure is a way of giving a sequence of instructions a named identifier which can then be called from anywhere in the program. Procedures can also take inputs – these are known as **arguments**.

ERRORS IN CODE

Bugs, which can prevent computer programs from working in the way they should.
Run-Time Errors: Runtime errors are errors which will cause the program or computer to crash even if there appears to be nothing wrong with the program code. Running out of **memory** will often cause a runtime error. This could be because **instructions** have been written in the wrong order.
Syntax errors include spelling mistakes, incorrect use of punctuation and the use of capital letters.
Semantic errors, or logical errors, are those where the program works but produces different results from what you designed or expected. A program with semantic errors will **execute** without any errors being reported.

```
def hello(name):
        print("Hello " + name + " nice to meet you")

hello("Alice")
hello("Bob")
hello("Sue")
```

Python -> English	
`print("hello!")`	Prints a value on screen (in this case, hello!)
`input("")`	Inputs a value into the computer.
`x = input("")`	Inputs a value and stores it into the variable x.
`x = int(input(""))`	Inputs a value into x, whilst also making it into an integer.
`answer = x + y`	Saves the result of x and y added together in a variable named answer.
`print(str(x))`	Prints the variable x, but converts it into a string first.
`print("Hello", "World")`	Prints the two strings concatenated with a space between. This code would output "Hello World".
`age = 12` `print("Age: " + str(age))`	The + joins together two variables when printing. Str has to be used to cast age to be a string. This code will output "Age: 12".
`if name == "Fred":`	Decides whether the variable 'name' ha a value which is equal to 'Fred'.
`else:`	The other option if the conditions for an if statement are not met (eg. name = 'Bob' when it should be Fred)
`elif name == "Tim":`	elif (short for else if) is for when the first if condition is not met, but you want to specify another option.
`# COMMENT`	# is used to make comments in code – any line which starts with a # will be ignored when the program runs. They are used to describe the code to a programmer.
`for i in range(0,10):` `  # WRITE CODE HERE`	Repeats any code indented after this line a set number of times, in this case, 10.
`while x < 10:` `  # WRITE CODE HERE`	Repeats any code indented after this line until a condition is met, in this case x becoming equal to or greater than 10.
`list = ["",""]`	Creates a variable and makes it an array – a list which can store many values.

1	Algorithm interpretation	Understand what an algorithm is, what algorithms are used for and be able to interpret algorithms (flowcharts, pseudo-code, written descriptions, program code)
2	Sequence, Selection and Iteration	Understand how to create an algorithm to solve a particular problem, making use of programming constructs (sequence, selection, iteration) and using appropriate conventions (flowchart, pseudo-code, written description, draft program code)
3	Algorithm Purpose	Understand the purpose of a given algorithm and how an algorithm works
4	Algorithm Outputs	Understand how to determine the correct output of an algorithm for a given set of data
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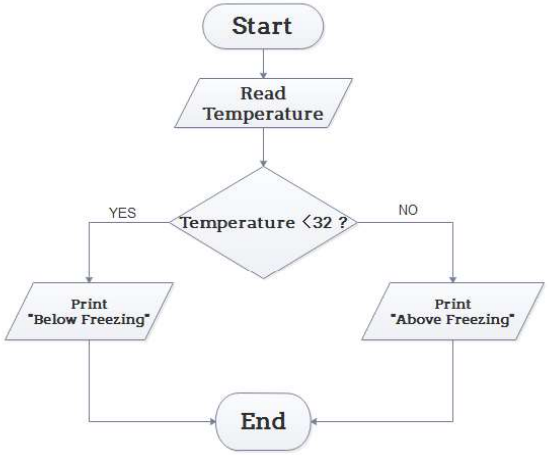
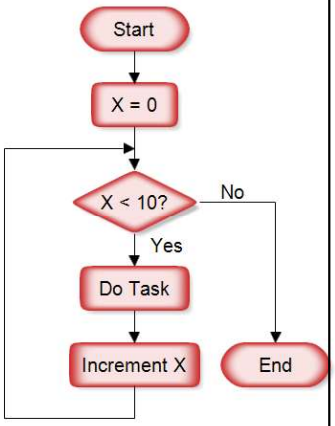
Flowchart Showing Selection

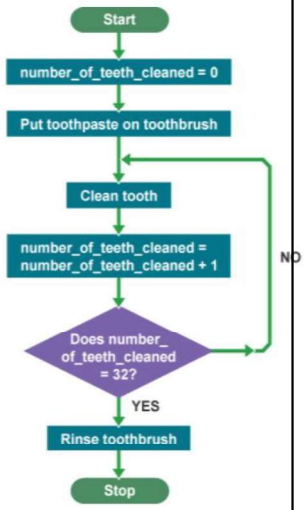


Flowchart Showing Sequence



When designing algorithms, there are many steps where decisions must be made.
draw a 3 cm line
turn left 90 degrees
draw a 3 cm line
turn left 90 degrees
draw a 3 cm line
turn left 90 degrees
draw a 3 cm line

Flowchart Showing Iteration



Iteration Pseudo-code

When designing algorithms, there may be some steps that need repeating.
INPUT – indicates a user will be inputting something
OUTPUT – indicates that an output will appear on the screen
WHILE –
a **loop** (**iteration** that has a **condition** at the beginning)
FOR – a counting loop (iteration)
REPEAT – UNTIL – a loop (iteration) that has a condition at the end

Selection Pseudo-code

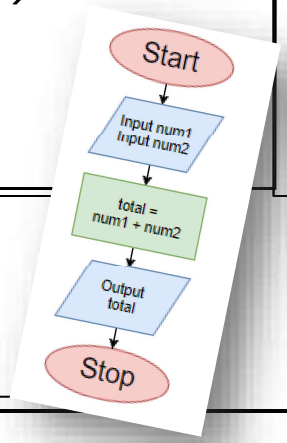
When designing algorithms, it is important to make sure that all the steps are presented in the correct order.
IF represents the **question**
THEN points to what to do if the answer to the question is **true**
ELSE points to what to do if the answer to the question is **false**

https://www.youtube.com/watch?v=e_WfC8HwVB8

https://www.programiz.com/python-programming/examples

Algorithms

- Sequence, Selection, Iteration→
- Flowcharts
  - Interpreting
  - Creating your own
  - Using symbols correctly



Interpreting Algorithms

- Purpose of a given algorithm
- Explain how it works
- Determine output for given inputs
- Write a Trace Table
- Identify Logic Errors
- Discuss efficiency

Pseudo-code

- Written Description
- Write an Algorithm
- Complete an unfinished Algorithm
- Code in a HLL (e.g. Python)

Evaluating Algorithms

- Importance of data structure
- Fitness for purpose
- Efficiency (Big "O" Notation)

```
for passes in range(count-1):
  for num in range(count-1):
    if a[num+1] < a[num]:
        temp = a[num]
        a[num] = a[num + 1]
        a[num+1] = temp
```

Designing Solutions

- Analyse a Problem
- Decompose it
- Abstract the Data Structure
- Identify inputs, process, outputs
- Design an Algorithm

SET <var> TO <expression> SEND <expression> TO DISPLAY RECEIVE <var> FROM (<type>) KEYBOARD	FOR <counter> FROM <a> TO <b> code that repeats END FOR

IF <expression> THEN
code to run if true
ELSE
code to run if false
END IF
	WHILE <condition> DO
	code that repeats
	END WHILE
	or
	REPEAT code UNTIL …

```
a="Alan "
b="Devonshire"

c=a+b

print c
```

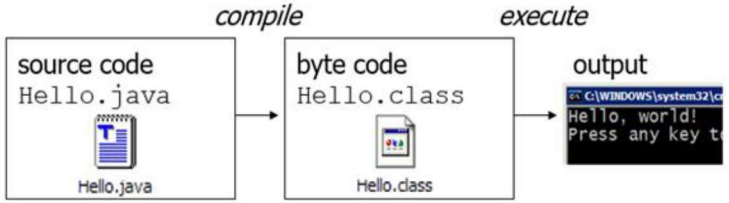
Example string

```
count = 0
while (count < 9):
    print 'The count is:', count
    count = count + 1

print "Good bye!"
```

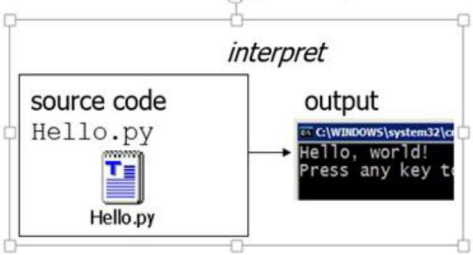
```
a=raw_input("enter the first number")
b=raw_input("enter the last number")
c=a+b

print c
```

Example loop

Many languages require you to *compile* (translate) your program into a form that the machine understands.



Python is instead directly *interpreted* into machine instructions.



Devised: Explanation

Devising is a way of creating a drama without starting with a script. It usually begins with an idea and a stimulus. Actors and designers research, improvise, develop and shape scenes until they have a drama ready for an audience. The play you create will use either the techniques from a theatre practitioner (e.g. Brecht or Stanislavski) or in the style of a theatre genre (e.g. Physical Theatre or Theatre in Education). You will research your chosen topic, create a performance and document the development in a devising log portfolio. You will then write an evaluation of the final performance. This knowledge organiser will focus on Theatre in Education.

Higher Level Challenge

In order to gain the most marks in your performance exam and your portfolio remember to consider and refer to the following contexts:

- **Social Context**: A social setting or environment which people live.
- **Historical Context**: A part of history which has happened (this could be when the play was set)
- **Political Context**: The political party in power at the time and how this impacted on society.
- **Cultural Context**: How culture can effect behaviour, choices and decisions for characters.

Devised: How Assessed

Performance

A performance live on stage which is designed to realise your original intentions.

Devising Log : Portfolio

A record of the creation and development of your ideas to communicate meaning through and the development of your play.

Devising Log: Evaluation

An analysis and evaluation of your individual contribution to the devising process and the final devised piece.

Theatre in Education: A Brief History

After the Second World War, people became aware that drama or theatre techniques might be useful as a way of fostering effective learning in schools. This is known as Theatre in education or 'TIE' for short. Brian Way, who founded the Theatre Centre in 1953, was an early practitioner, and influenced the team, including Gordon Vallins, who established TIE at the Belgrade Theatre, Coventry in 1965. Their work was so influential that it spread nationwide.

The idea of a high impact performance for a specifically targeted school audience became hugely popular. Because the audiences are small, they can be encouraged to participate through work in role and through debate. Projects can be supported with resource materials and training or support for the students' teachers.

Originally, a Theatre in education project would probably be centrally funded. These days, companies have to seek their funding from individual schools so they have to provide the product the schools want.

Theatre in Education: Definition

Theatre in Education (also called T.I.E.) is a play with an educational focus designed to teach school audiences (or other groups) about a certain issue or topic.

You may have seen a Theatre in Education play in your school. They cover topics such like the following:

- Stranger Danger
- Road Safety
- Internet Safety
- How to tackle bullying

The main elements

It's important for you to remember the following characteristics that typify T.I.E.:

- There is a clear aim and educational objective running throughout.
- A small cast so actors must be versatile and often have to multi-role.
- A low budget so actors often play instruments too.
- The production must be portable so the design is simple and representational.
- They explore issues from various viewpoints, so we can see the effect of an action upon a range of people.
- There is some level of audience involvement.
- They are rarely wholly naturalistic because direct address or narration is used to engage the audience.
- The costumes are simple and representational, especially if actors have to multi-role.
- They may include facts and figures to educate the audience.
- They may have a strong message or moral running throughout.

Have you got an important message to teach an audience? Turn over to find out how to make your own Theatre in Education Play.

Planning a T.I.E. Performance

When planning a Theatre in education piece companies must take into account:

The **age** and **size** of the **audience**. The performance needs to suit the audience.

The **venue**, its **size** and **facilities** such as lighting and whether there are any particular restrictions, eg they might not be allowed to tap dance as taps would damage the floor.

Health and Safety issues. They'll probably have to complete paperwork for this. It could cover anything from risk assessment for the journey to the venue, to checking there are no asthmatics in the audience if they plan to use dry ice.

Teaching and Learning Objectives. What they have been asked to do and how they can deliver what's required.

Ideas for Engaging a Young Audience

A Quest

A quest is a concept all will recognise and is familiar from superhero stories and fairy tales. Somebody needs to be rescued, evil must be defeated or there is treasure to discover. If you're going to involve a large group of children it's probably best to have a number of mini missions that they can be a part of, leading up to the final triumph. You could set a challenge involving number tasks for five-year-olds to solve. It's a good idea to include a little art work with this age group, if the size of the group and the time available allow this. Art work would sustain engagement and help them see where their imagination is taking them.

A modern fairy story for 7 to 11-year-olds

Children in this age range will be familiar with most of the well-known fairy tales and many of them will have come across the idea of adaptation. Your task will be to take them a little further with the story so that they see its structure and the ideas it contains. Cinderella is a story about bullying being punished. That's readily transferable, as is the ball or party idea. Maybe the prince took a photo of Cinderella on his mobile phone and is trying to find her on social media networks. The ugly sisters could go online and pretend that they are Cinderella which could serve as a warning to children that online interaction can be dangerous.

Theatre in Education Skills

Target Audience

It is important that the creators and performers in a T.I.E. play know exactly who their audience are so that the materials they produce are appropriate and beneficial for the specific audience.

Specific Message

T.I.E. plays must have a specific message that they are teaching the audience.

Facts

T.I.E. plays are designed to educate the audience about a specific topic. It is therefore essential that the information given out is accurate. Facts can be used to help devise the play and they should also be included within the performance

Communal Voice/Chorus

Chorus is when the performer use the same movement and say the same lines. Communal voice is a variation of Chorus used in T.I.E. The performers speak with 'one voice' and usually reinforce the message of the play.

Where to get help.

At the end of watching a T.I.E. play, the audience should know what to do if they face a similar situation to the characters in the play. Where do they go for help/support?

Directly Engaging the Audience:

1. **Direct Address** – The actor or character breaks the forth wall and speaks directly to the audience.
2. **Forum Theatre** – The audience are given tasks to do which involve them within the performance.

Episodes

A series of scenes which can be related or unrelated.

Placards/PowerPoints

A placard is a sign presented onstage. Using placards might be as simple as holding up a card or banner. Multimedia or a PowerPoint slideshow can also be used for this effect. For example Scene One – The Bad News

Narration

Narration is used in T.I.E. to guide the audience through the plot. There are two types of narration as follows:

1. **In role**
   The character narrates in first person For example "My name is Little Red Riding Hood. I live in the forest".
2. **Third Person/Out of role/All Knowing**
   Commenting upon a character as an actor is a clear way of reminding the audience of theatricality. The narrator speaks in third person. For example "This is Little Red Riding Hood.. She lives in the forest".

Stereotypical characters

These are easily recognisable stock characters. They are often exaggerated and represent a type of character rather than a specific individual. For example, the mum, the teenager, the teacher.

Multi-roling

Multi-roling is when an actor plays more than one character onstage. The differences in character are marked by changing voice, movement, gesture and body language but the audience can clearly see that the same actor has taken on more than one role. This means the audience are more aware of the fact that they are watching a presentation of events. Cross-sex casting is also possible in Epic theatre as we don't need to suspend our disbelief.

Split-role

This is where more than one actor plays the same character. For instance, the actor playing the main character might rotate from scene to scene. This keeps that character representational and inhibits emotional involvement and attachment on the part of the audience.

Basic Set, Props, Lighting and sound

T.I.E. has to travel to a variety of performance venues. Therefore actors use minimal set and props. They usually carry their own sound equipment with them and rarely use stage lighting.

Song /Dance/Movement

Song, dance and movement are often used in T.I.E. plays to engage the audience and make the performances more visually/orally interesting.

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A record of the creation and development of your ideas to communicate meaning through and the development of your play.

Devising Log: Evaluation
An analysis and evaluation of your individual contribution to the devising process and the final devised piece.

Physical Theatre: Explanation

The Nature of Physical Theatre
At its simplest, you could define Physical Theatre as a form of theatre that puts emphasis on movement rather than dialogue. But remember there are a huge number of variations as the genre covers a broad range of work. But essentially Physical theatre is anything that puts the human body at the centre of the storytelling process. As a result it's often abstract in style, using movement in a stylised and representational way. With the expression of ideas choreographed through movement, such performers use very little or no dialogue at all.

Combining Art Forms
Physical theatre has a focus on movement but can be separate from the spoken word or united with it to expand and explore its meaning. It may well be devised or contain substantial elements of work beyond the printed script. These elements could be other art forms such as music, dance, the use of media or visual images. So you could use a combination of elements that may also be combined with script, for instance. You could reach out to the audience in a way that challenges the so-called fourth wall, making the audience a collaborator in the action.

Explore Physical Theatre

The easiest way to understand Physical Theatre is to see it. Watch performances by the following companies on YouTube

DV8 **Frantic Assembly** **Complicite**

Physical Theatre: Famous Companies

DV8

DV8 are arguably among the main practitioners of Physical theatre as a 'full' art form. They focus on looking at the dramatic potential that can be unlocked from movement. Their work is often described as existing at a crossroads where dance, sound and drama meet. DV8 are well known for using Physical theatre to explore complex aspects of human relationships and social or cultural issues.
In DV8's production, Can We Talk About This? the director and performers used Physical theatre to express extremely complicated and delicate political and social issues. The main theme of the production looked at multiculturalism, separatism and militant Islam. Words and bodywork were combined to express what's sometimes difficult to put into words alone.

Frantic Assembly

Another major company in Physical theatre is Frantic Assembly. The company's production of *Lovesong* by well-known playwright and author, Abi Morgan, illustrates another level of Physical theatre. There's a substantial dialogue script for the play but much of its impact in production comes from the movement work representing the relationship of a couple over the years. This clip shows a group of actors from Frantic Assembly working with director, Scott Graham on the play.

Physical Theatre: Performance Skills

General Skills

Motif: Short phrase of movement
Canon: Motif A performed then Motif B one after the other
Unison: Moving together in time
Mirroring: Copying someone (don't have to face each other)
Opposition: Mirroring but the other side moves
Formations: Shapes line, triangle, square etc
Proxemics: Distance between characters suggests meaning
Character: Physicality and actions to create person
Contact work: Holding or making physical contact with others
Counter balances: Holding each other's weight
Lifts: Picking up partners in a controlled way (not in studio)
Dynamics: Speed and energy of the movement
Focus: Where your eyes should be focused during play
Power of the Hand: Symbolic fight

Frantic Assembly Techniques

- Push hands
- Round by through
- Chairs
- Hymns Hands
- Jet Pack
- Connect, Effect, Disconnect

1950s – Rock 'n' Roll	Late 1960s - Rock	1970s – Rock's Diversification
Artists: Elvis Presley; Bill Haley & The Comets; Buddy Holly **Musical features**: 12-bar Blues; walking bassline; guitar-driven; fast pace; swung rhythms. R&B/Blues combined with Country Music appealing to the newly-developed 'teenage' audience.	**Artists:** Rolling Stones; Jimi Hendrix; The Who **Musical features:** slide guitar, harmonica, solos for guitar and drums, barre chords, distortion. Rock that was heavily influenced by black R&B/Blues music set the scene for many heavy metal bands in the futures. Music then went in 2 opposing directions – optimistic utopian hippy-influenced or disillusioned cynicism full of life & destruction.	**Heavy Rock – Progressive Rock – Latin Rock – Glam Rock – Soft Rock – Country Rock – Punk Rock – New Wave** **Artists:** Led Zepplin; Deep Purple; Pink Floyd; T-Rex; Queen; Sex Pistols **Musical features:** effects added; world influences; electric guitar; wailing vocals; modal; intricate melodies/solos; theatrical. Music became increasingly diverse, with bands building on experiments of the 60s into long studio-conceived albums, whereas the introduction of stadium rock concerts focused songs into live versions.
Early 1960s – Beat Music		
Artists: The Beatles; Rolling Stones; Bob Dylan; **Musical features:** Strong rhythms of un-swung quavers; catchy tunes; guitar-dominated; close harmonies. British Beat Music/Mersey Beat combined rock 'n' roll, R&B and soul, appealing to the rock 'n' roll teenagers and developing into a British dominance of the charts.		
1980s – Heavy Metal	**1990s – Grunge/Alternative/Britpop**	**2000s – Indie/Alternative**
Artists: Motorhead; Iron Maiden; Guns 'n' Roses; The Smiths **Musical features**: fast tempi; driven by powerful bass lines & large drum kits; power chords; extended solos; minor modes; mythological themes. As political moods settled, so music calmed, reflecting this change in direction, becoming more focused on image and commercial acceptance. A combination of psychedelic & blues rock, starting from Punk, but getting progressively darker.	**Artists:** Nirvana; Red Hot Chilli Peppers; Oasis; Blur; Radiohead **Musical features:** Fast tempos; scruffy sound & visuals; guitar-based; non-conventional harmonies; easy chords; nasal vocals. Back-to-basics post punk reaction to the commercialization of music spawned the grunge movement in the USA. In the UK grew a cleaner, less distorted version from the working class viewpoint with an amateur musician feel. This later developed into the more progressive alternative rock.	**Artists:** Arctic Monkeys; Kaiser Chiefs; The Killers; Coldplay **Musical features:** Medium tempo; high bass melodic phrases; short melodic licks; sing along choruses; orchestral influences. Technology and the internet meant that styles popped up and fused overnight and artists could be heard and known far quicker, before even playing a gig.

KEYWORDS

1-12-bar blues - A chord structure of 12-bars using chords I, IV and V.

2-Walking bassline – a bassline that moves by step.

3-Swung rhythm – a rhythm that emphasizes the first pair of quavers.

4-Close harmonies – harmony where notes of the hocrds are close together, typically in vocal music.

5-Slide guitar – a sliding effect across the strings of a guitar, often used in blues.

6-Barre chords – a type of **chord** on a guitar played by using one or more fingers to press down multiple strings across a single fret of the fingerboard.

7-Distortion– altering the tone of electric instruments to make them sound gritty, growly or fuzzy.

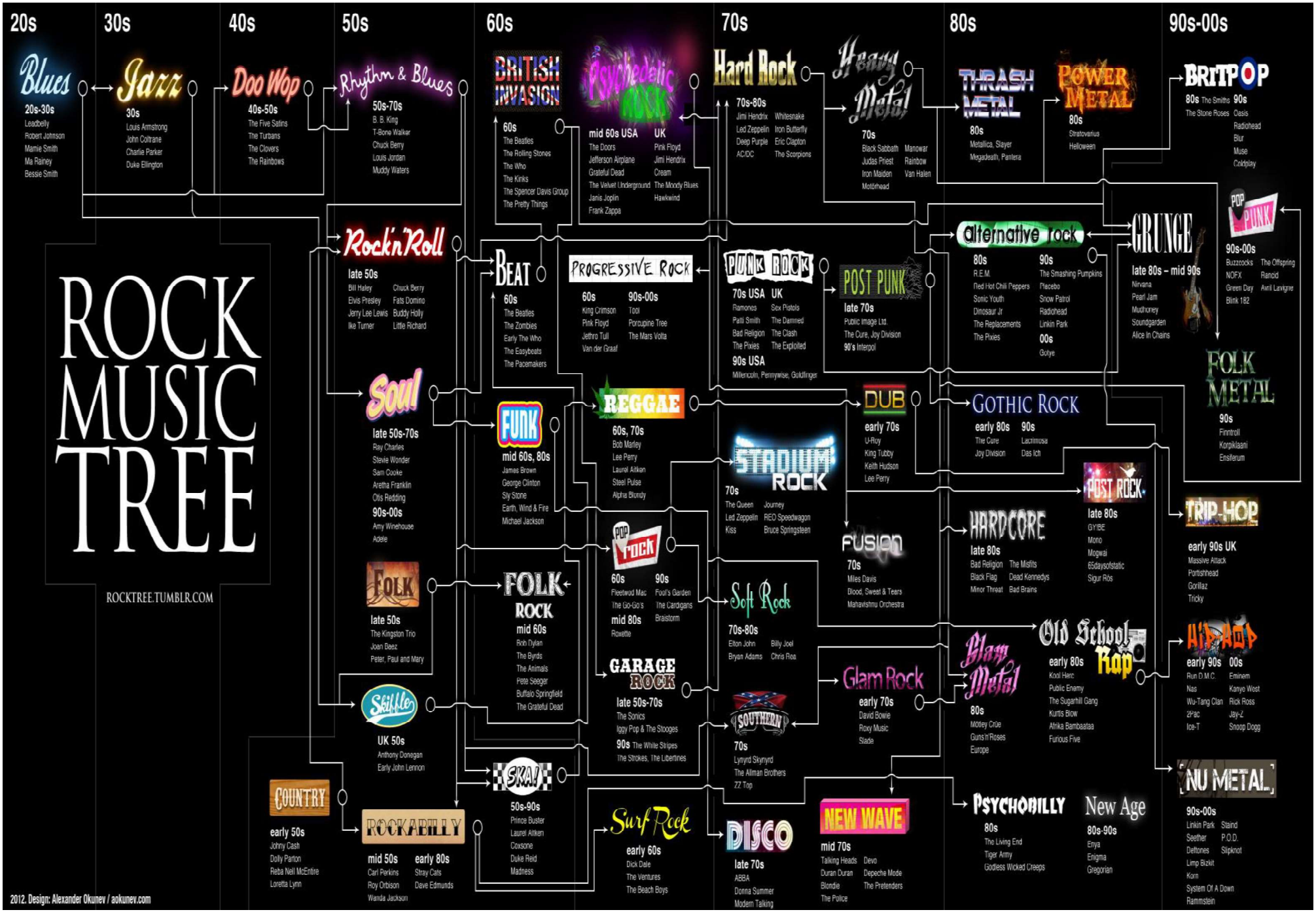
8-Modal – system of scales from medieval period, pre major/minor system.

9-Power chords – a chord using just the 1st & 5th notes (omitting the 3rd).

10-Riff – short repeated phrase in popular music.

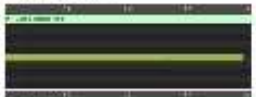
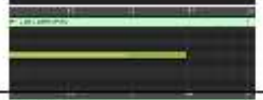
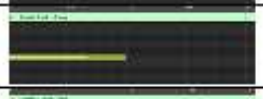
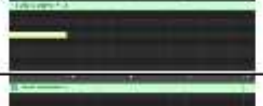
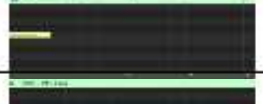
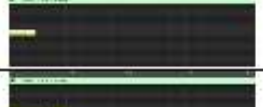
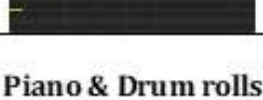
11-Lick – stock pattern or phrase, usually played on the guitar, similar to a riff.

12-Chord – 2 or more notes played simultaneously.

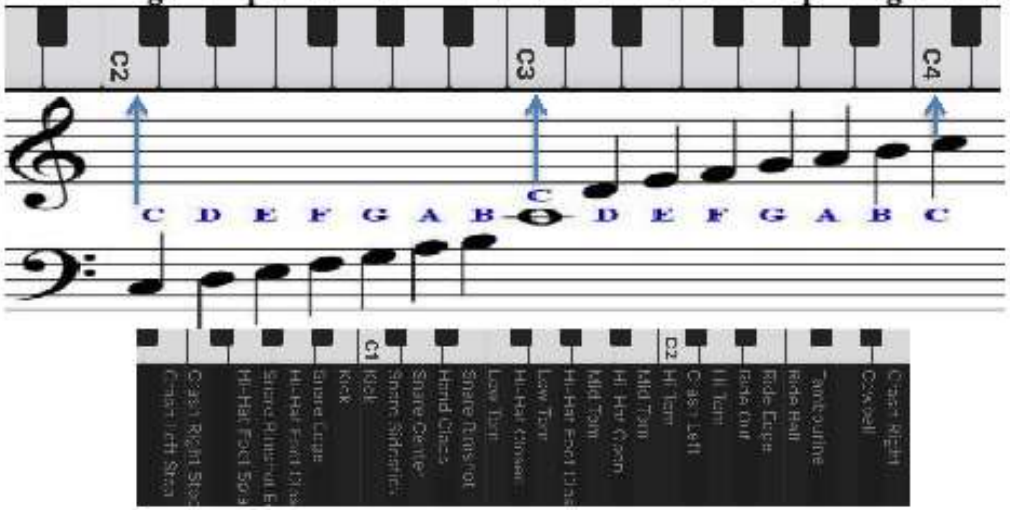

20s
30s
40s
50s
60s
70s
80s
90s-00s
Blues
20s-30s
Leadbelly
Robert Johnson
Mamie Smith
Ma Rainey
Bessie Smith
Jazz
30s
Louis Armstrong
John Coltrane
Charlie Parker
Duke Ellington
Doo Wop
40s-50s
The Five Satins
The Turbans
The Clovers
The Rainbows
Rhythm & Blues
50s-70s
B. B. King
T-Bone Walker
Chuck Berry
Louis Jordan
Muddy Waters
BRITISH INVASION
60s
The Beatles
The Rolling Stones
The Who
The Kinks
The Spencer Davis Group
The Pretty Things
Psychedelic Rock
mid 60s USA
The Doors
Jefferson Airplane
Grateful Dead
The Velvet Underground
Janis Joplin
Frank Zappa
UK
Pink Floyd
Jimi Hendrix
Cream
The Moody Blues
Hawkwind
Hard Rock
70s-80s
Jimi Hendrix
Led Zeppelin
Deep Purple
AC/DC
Whitesnake
Iron Butterfly
Eric Clapton
The Scorpions
Heavy Metal
70s
Black Sabbath
Judas Priest
Iron Maiden
Motörhead
Manowar
Rainbow
Van Halen
THRASH METAL
80s
Metallica, Slayer
MegaDeath, Pantera
POWER METAL
80s
Stratovarius
Helloween
BRITPOP
80s The Smiths
The Stone Roses
90s
Oasis
Radiohead
Blur
Muse
Coldplay
ROCK MUSIC TREE
ROCKTREE.TUMBLR.COM
Rock'n'Roll
late 50s
Bill Haley
Elvis Presley
Jerry Lee Lewis
Ike Turner
Chuck Berry
Fats Domino
Buddy Holly
Little Richard
BEAT
60s
The Beatles
The Zombies
Early The Who
The Easybeats
The Pacemakers
PROGRESSIVE ROCK
60s
King Crimson
Pink Floyd
Jethro Tull
Van der Graaf
90s-00s
Tool
Porcupine Tree
The Mars Volta
PUNK ROCK
70s USA
Ramones
Patti Smith
Bad Religion
The Pixies
UK
Sex Pistols
The Damned
The Clash
The Exploited
90s USA
Millencolin, Pennywise, Goldfinger
POST PUNK
late 70s
Public Image Ltd.
The Cure, Joy Division
90's Interpol
alternative rock
80s
R.E.M.
Red Hot Chili Peppers
Sonic Youth
Dinosaur Jr
The Replacements
The Pixies
90s
The Smashing Pumpkins
Placebo
Snow Patrol
Radiohead
Linkin Park
00s
Gotye
GRUNGE
late 80s – mid 90s
Nirvana
Pearl Jam
Mudhoney
Soundgarden
Alice In Chains
POP PUNK
90s-00s
Buzzcocks
NOFX
Green Day
Blink 182
The Offspring
Rancid
Avril Lavigne
Soul
late 50s-70s
Ray Charles
Stevie Wonder
Sam Cooke
Aretha Franklin
Otis Redding
90s-00s
Amy Winehouse
Adele
FUNK
mid 60s, 80s
James Brown
George Clinton
Sly Stone
Earth, Wind & Fire
Michael Jackson
REGGAE
60s, 70s
Bob Marley
Lee Perry
Laurel Aitken
Steel Pulse
Alpha Blondy
STADIUM ROCK
70s
The Queen
Journey
Led Zeppelin
REO Speedwagon
Kiss
Bruce Springsteen
DUB
early 70s
U-Roy
King Tubby
Keith Hudson
Lee Perry
GOTHIC ROCK
early 80s
The Cure
Joy Division
90s
Lacrimosa
Das Ich
FOLK METAL
90s
Finntroll
Korpiklaani
Ensiferum
FOLK
late 50s
The Kingston Trio
Joan Baez
Peter, Paul and Mary
FOLK-ROCK
mid 60s
Bob Dylan
The Byrds
The Animals
Pete Seeger
Buffalo Springfield
The Grateful Dead
POP ROCK
60s
Fleetwod Mac
The Go-Go's
mid 80s
Roxette
90s
Fool's Garden
The Cardigans
Braistorm
Soft Rock
70s-80s
Elton John
Bryan Adams
Billy Joel
Chris Rea
FUSION
70s
Miles Davis
Blood, Sweat & Tears
Mahavishnu Orchestra
HARDCORE
late 80s
Bad Religion
Black Flag
Minor Threat
The Misfits
Dead Kennedys
Bad Brains
POST ROCK
late 80s
GY!BE
Mono
Mogwai
65daysofstatic
Sigur Rós
TRIP-HOP
early 90s UK
Massive Attack
Portishhead
Gorillaz
Tricky
Skiffle
UK 50s
Anthony Donegan
Early John Lennon
GARAGE ROCK
late 50s-70s
The Sonics
Iggy Pop & The Stooges
90s The White Stripes
The Strokes, The Libertines
SOUTHERN
70s
Lynyrd Skynyrd
The Allman Brothers
ZZ Top
Glam Rock
early 70s
David Bowie
Roxy Music
Slade
Glam Metal
80s
Motley Crüe
Guns N'Roses
Europe
Old School Rap
early 80s
Kool Herc
Public Enemy
The Sugarhill Gang
Kurtis Blow
Afrika Bambaataa
Furious Five
HIP-HOP
early 90s
Run D.M.C.
Nas
Wu-Tang Clan
2Pac
Ice-T
00s
Eminem
Kanye West
Rick Ross
Jay-Z
Snoop Dogg
COUNTRY
early 50s
Johnny Cash
Dolly Parton
Reba Nell McEntire
Loretta Lynn
ROCKABILLY
mid 50s
Carl Perkins
Roy Orbison
Wanda Jackson
early 80s
Stray Cats
Dave Edmunds
SKA
50s-90s
Prince Buster
Laurel Aitken
Coxsone
Duke Reid
Madness
Surf Rock
early 60s
Dick Dale
The Ventures
The Beach Boys
DISCO
late 70s
ABBA
Donna Summer
Modern Talking
NEW WAVE
mid 70s
Talking Heads
Duran Duran
Blondie
The Police
Devo
Depeche Mode
The Pretenders
PSYCHOBILLY
80s
The Living End
Tiger Army
Godless Wicked Creeps
New Age
80s-90s
Enya
Enigma
Gregorian
NU METAL
90s-00s
Linkin Park
Seether
Deftones
Limp Bizkit
Korn
System Of A Down
Rammstein
Staind
P.O.D.
Slipknot
2012. Design: Alexander Okunev / aokunev.com

MR TIGHTS	Features	KEYWORDS
Melody	• **Syllabic** – throughout, mainly. • **Vocalisation** - backing vocals mix words and **vocalisation** (e.g. bars 8–9) to the sound 'ooh' and bar 18 to the sound 'ba'. • **Conjunct** - starts mostly stepwise with small leaps of a third or fourth. • **Sequence** – descending & slightly altered in bars 7 and 8. • **Angular leaps** - combine **conjunct** and wide leaps in the melodic line. B.6-7: Leap of rising major sixth; b.62 – an octave.	1- **Syllabic** - when one note is sung per syllable. 2- **Vocalisation** - wordless singing using a vowel syllable such as 'ah'. 3- **Sequence** - the repetition of a musical phrase at a higher or lower pitch than the original. 4- **Conjunct** - movement by step. 5- **Moderato** – tempo marking, at a moderate pace. 6- **Swung** - music that has a triplet feel, even when notated with straight quavers.
Rhythm (incl. tempo & metre)	• **Moderato** tempo - with a dotted crotchet pulse of 112 beats per minute. • 12/8 - **compound** quadruple time signature; occasional 6/8 bar - has the effect of extending the phrase length. • **Swung** feel. • Anacrusis (upbeat) – starts every verse and chorus. • **Syncopation** - frequent throughout (e.g. bars 44–46). • **Triplets** - bar 18.	7- **Anacrusis** - one or more unstressed notes before the first bar line of a piece or passage. 8- **Compound time signature** - when the bar feels like it needs to be split into groups of three (having a group of three 'mini' beats in a 'big' beat). 9- **Triplets** - a horizontal square bracket that lets the performer know that the three notes should be played in the time it normally takes to play two. 10- **Homophonic** - a texture comprising a melody part and an accompaniment.
Texture	• **Homophonic** – predominant texture. • **Imitation**. • **Layering** - Three-part texture during guitar solo. • **Panning** - (e.g. bars 42-43 backing vocals). • **Antiphonal** - (e.g. bars 67-68).	11- **Imitation** - the repetition of a phrase or melody in another part or voice, usually at a different pitch. 12- **Panning** - giving sounds different levels in the left and right speakers so that it sounds as if they are coming from a new direction. 13- **Antiphonal** - music performed alternately by two groups, which are often physically separated.
Instrument (sonority)	• **Tenor** – high male voice, performed by Freddie Mercury. • **Instruments** - lead and backing vocals, piano, overdubbed with a honky-tonk (jangle) piano, four electric guitars, bass guitar and drum kit. • **Overdubbing** - Guitars and vocals, creating a richer colour. • **Guitar techniques** - slides, **bends, pull-offs** and **vibrato**. • **Recording techniques & effects - multi-tracking, EQ, flanger, distortion, reverb, wah-wah, panning** and **overdubbing**.	14- **Overdubbing** - recording an instrumental or vocal part over previously recorded music. 15- **Pull-off** - when a note is sounded on the guitar by plucking the string with the fretting hand. 16- **Bend** - push a string across or over the fingerboard with your left hand fingers so that the string gets tighter and the pitch goes up. 17- **Vibrato** - a technique used to cause rapid variations in pitch. The term 'vibrato' is Italian and is the past participle of the verb 'vibrare', which means to vibrate.
Genre	• ***Sheer Heart Attack*** - Queen's third studio album released in November 1974. 'Killer Queen' was written by Freddie Mercury and featured on • **Queen** - formed in London in 1970: singer Freddie Mercury, guitarist Brian May, drummer Roger Taylor and bassist John Deacon. ' • **First single** from the album - one of the few songs where Freddie Mercury wrote the lyrics first, which are about an upper-class prostitute.	18- **Multi-track** - a recording of a performance (or performances) on separate tracks in which each track can be edited individually to change levels, add effects, etc. 19- **EQ** - the levels of frequency response of an audio signal, or controls, which allow their adjustment. 20- **Flanger** - an effect creating a swirling or swooshing sound. 21- **Distortion** - an effect that increases the volume and sustain on an electric guitar as well as making the timbre more gritty or smooth depending on the settings. 22- **Reverb** - an effect, which creates the impression of being in a physical space.
Harmony	• Mainly **root position** chords. • **Inversions** - Some chords in **first** or **second inversion**. • **Dissonance** - some used (e.g. bar 30). • **Seventh chords** - (e.g. bar 4). • **Circle of fifths** - (e.g. bars 20–21). • **Altered** and **extended chords** - (e.g. F^{11} bar 47).	23- **Wah-wah** - a filter effect in which the peak of the filter is swept up and down the frequency range in response to the player's foot movement on a rocker pedal. 24- **Circle of fifths** - a series of chords in which the root note of each chord is a fifth lower or a fourth higher than that of the previous one. 25- **Extended Chord** - a chord with at least one added note, such as the ninth.
Tonality	• **Pedal** - bars 27–30. • **Eb Major** • **Ambiguity** - Opening in C minor and closing on an E♭ major chord, not always clear. • **Passing modulations** - many are used, strengthened by **perfect cadences** but often followed by parallel shifts, moving to a new key.	26- **Perfect cadence** - a cadence comprising two chords. A perfect cadence is chord V followed by chord I. 27- **Inversions** - major or minor triads with either the third (first inversion) or the fifth (second inversion) in the bass. 28- **Altered Chord** - notes in a chord that have been sharpened or flattened by a semitone, such as a flattened fifth.
Structure	• **Verse–chorus form**: Intro-Verse 1-Chorus 1-Instrumental–Verse 2-Chorus 2-Guitar solo-Verse 3-Chorus 3-Outro.	29- **Pedal** - a sustained or repeated note in the bass. Pedals are usually on the tonic or dominant notes, so would be called either a tonic or a dominant pedal.

Relating Notation durations to MIDI sequencer note lengths

Note	Name	Duration	Piano roll	Snap/Quantise
𝅝	Semibreve	4		1/1
𝅗𝅥.	Dotted Minim	3		-
𝅗𝅥	Minim	2		1/2
♩.	Dotted Crotchet	1 ½		-
♩	Crotchet	1		1/4
♪.	Dotted Quaver	¾		-
♪	Quaver	½		1/8
♫	Triplet quavers	1/3 each		1/8 triplet (1/12)
𝅘𝅥𝅯	Semiquaver	¼		1/16

Relating stave pitches to DAW Piano & Drum rolls for inputting notes



KEYWORDS

1-DAW (Digital Audio Workstation): a digital system designed for recording and editing digital audio. It may refer to audio hardware, audio software, or both.

2-MIDI (Musical Instrument Digital Interface): the interchange of musical information between musical instruments, synthesizers and computers.

3-MIDI controller: any hardware or software that generates and transmits MIDI data to electronic or digital MIDI-enabled devices, typically to trigger sounds and control parameters of an electronic music performance.

4-Sequencer: a software application or a digital electronic device that can record, save, play and edit audio files.

5-Arrange Window: the main window of Logic Pro. It incorporates other Logic Pro editors and it's where you do most of your work.

6-Drum Machine: An electronic device containing a sequencer that can be programmed to arrange and alter digitally stored drum sounds.

7-Tempo: the pace or speed at which a section of music is played.

8-BPM (beats per minute): how many beats in some song appear in a minute, and it describes the tempo of the song.

9-Rhythm: the arrangement of sounds as they move through time.

11-Snap: A function that causes audio, MIDI, or other events in a DAW to automatically " snap" or jump to the nearest division in a time "grid" in the DAW.

12-Quantise/Quantisation: the rhythmic correction of audio or MIDI regions to a specific time grid.

13-Velocity: the force with which a note is played, and it is vitally important in making MIDI performances sound human - or if you use a fixed velocity, making them sound mechanical.

14-Pitch: how high or low a note is.

15-Pitch Bend: an electronic device that enables a player to bend the pitch of a note being sounded on a synthesizer, usually with a pitch wheel, strip, or lever.

16-Scale: any set of musical notes ordered by fundamental frequency or pitch. A scale ordered by increasing pitch is an ascending scale, and a scale ordered by decreasing pitch is a descending scale.

17-Fader: a device for gradually increasing or decreasing the level of an audio signal.

18-Master fader: The fader, which controls the main output(s) of the console during mixdown.

KEY QUESTIONS

Q1: Each box in the editing window is worth what note & duration length?

Semiquaver (1/4 beat)

Q2: On the Piano roll, which C is the same pitch as 'Middle C'?

C3

Q3: What is the name of the DAW that we use?

Logic Pro X

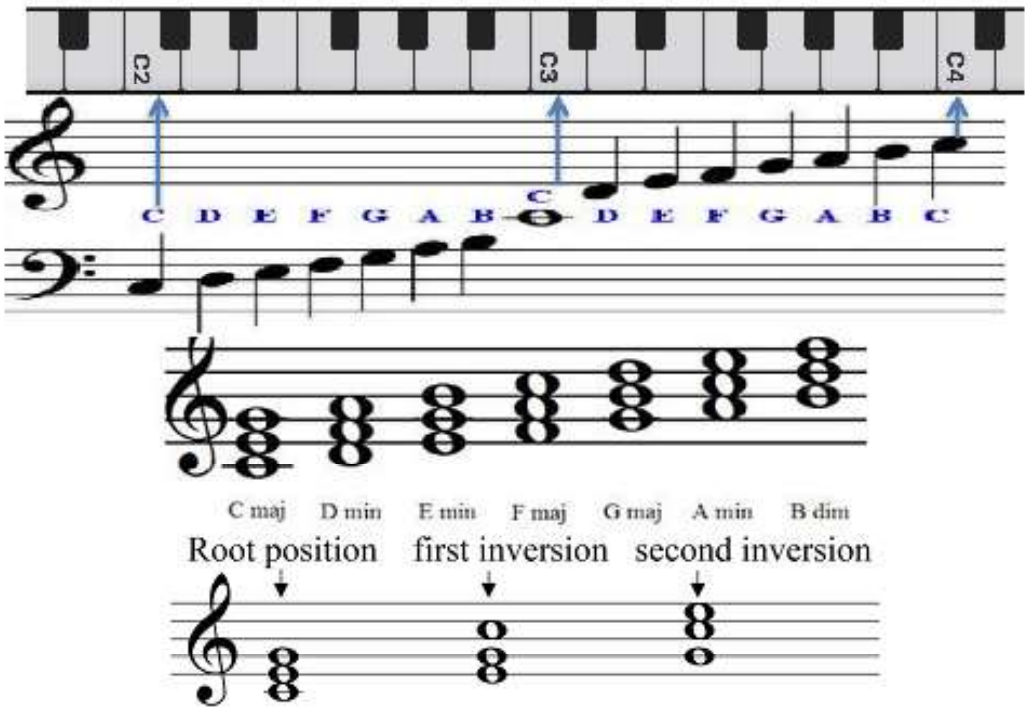
Q4: If I want to edit a note to be perfectly in time to the beat, I would use what function?

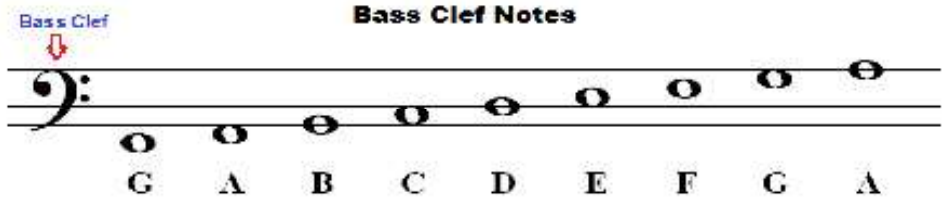
Quantisation

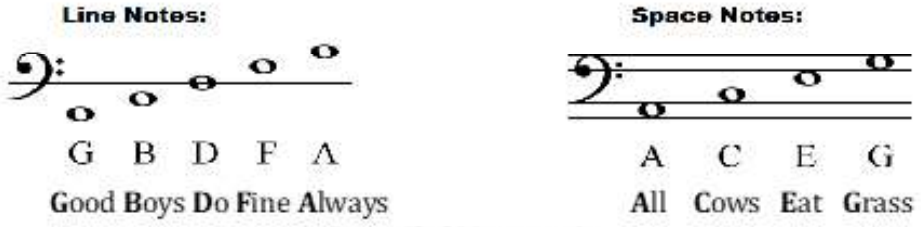
Q5: The Kick on a drum machine/drum kit is on which key of the drum roll?

C1 and/or B1

Relating stave pitches to DAW Piano & Drum rolls for inputting notes







Bass Clef Mnemonic

KEYWORDS

1- Sequencer: a software application or a digital electronic device that can record, save, play and edit audio files.

2- Snap: A function that causes audio, MIDI, or other events in a DAW to automatically " snap" or jump to the nearest division in a time "grid" in the DAW.

3- Quantise/Quantisation (pitch): the correction of audio or MIDI regions to a specific scale/key.

4- Velocity: the force with which a note is played, and it is vitally important in making MIDI performances sound human - or if you use a fixed velocity, making them sound mechanical.

5- Pitch: how high or low a note is.

6- Pitch Bend: an electronic device that enables a player to bend the pitch of a note being sounded on a synthesizer, usually with a pitch wheel, strip, or lever.

7- Scale: any set of musical notes ordered by fundamental frequency or pitch. A scale ordered by increasing pitch is an ascending scale, and a scale ordered by decreasing pitch is a descending scale.

8- Treble Clef: Used to signal the high-pitched notes in music.

9- Bass Clef: Used to signal the low-pitched notes in music.

11- Chord:2+ notes played together, typically notes 1, 3, 5 of a scale.

12- Inversion: putting the 3rd (1st inversion) or 5th i(2nd inversion) n the bass of a chord.

13-Key: the group of notes or scale that forms the basis of the piece.

14-Modulate: Changing the key of a piece.

16- Fader: a device for gradually increasing or decreasing the level of an audio signal.

17- Master fader: The fader, which controls the main output(s) of the console during mix down.

KEY QUESTIONS

Q1: On the Piano roll, which C is the same pitch as 'Middle C'?

C3

Q2: What is the mnemonic to remember the LINES on the bass clef?

Good Boys Do Fine Always

Q3: What is the mnemonic to remember the SPACES on the bass clef?

All Cows Eat Grass

Q4: If I want to edit notes to make sure they are in the right scale, I would use which function?

Quantisation (pitch/scale)

Q5: A 1st inversion chord has which note in the bass? (e.g: in a C chors?)

3rd (E)

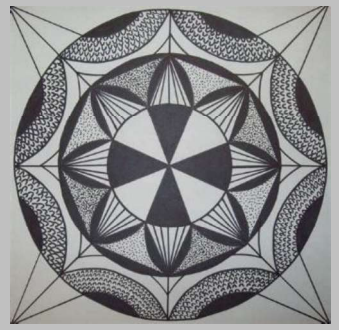
Q5: A 2nd inversion chord has which note in the bass? (e.g: in a C chors?)

5th (G)

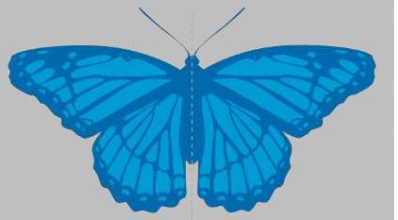
A. Key Terms

Keyword	Description
7. Pattern	A design that is created by repeating lines, shapes, tones or colours. The design used to create a pattern is often referred to as a motif. Motifs can be simple shapes or complex arrangements
2. Weight	**T**he thickness of a mark or brushstroke
3. To **Block in**	**to BLOCK IN**: to fill in an empty area in an image with a certain colour before adding fine details such as shadows and highlights.
4. Composition	how objects or figures are arranged in the frame of an image
5. Contemporary	Living or occurring at the same time.
6. Negative Space	When drawing shapes, you must consider the size and position as well as the shape of the area around it. The shapes created in the spaces between shapes are referred to as **negative space**.
7. Geometric	characterized by or decorated with regular lines and shapes. "a geometric pattern"

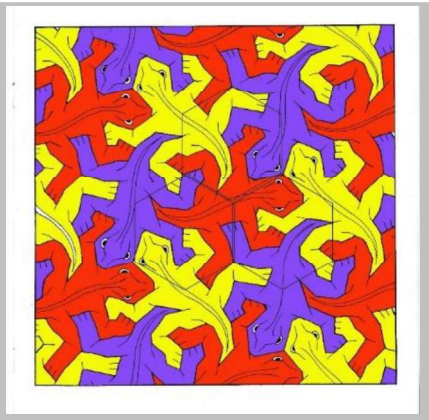
B. Pattern



B1: Radial Symmetry
A pattern that rotates around a central axis.



B2: Symmetry
the quality of being made up of exactly similar parts facing each other or around an axis.



B3: Tessellation
A tessellation of a flat surface is the tiling of a plane using one or more geometric shapes, called tiles, with no overlaps and no gaps.

C. Painting techniques

	Key Words: Painting Techniques and Equipment	
C1	Flat painting	The use of flat colours (no tints or tones blended in) to give each shape a clear bold finish.
C2	Layers	Additional layers of paint are added to make the painted shapes flatter in colour (no brush marks showing)
C3	Palette	A flat container with wells to mix different coloured paint in.
C4	Paint brush	A hand held painting tool to apply paint to any surface.
C5	Water pot	A plastic container to hold water for cleaning brushes.

Temperature control — Week 1

Keyword	Definition
1. Food spoilage	When food deteriorates so that its quality is reduced or it can no longer be eaten.
2. Food poisoning	An illness caused by eating contaminated food
3. high-risk foods	Food that contains a lot of moisture and nutrient (e.g. milk, cream eggs meat, fish), and easily support the growth of pathogenic microorganisms particularly bacteria.
4. bacteria	Microscopic living organisms, which are single-celled and can be found everywhere
5. reproduce	When animals and plants make more of their own kind
6. Binary fission	How each bacterium reproduces by splitting in two
7. Temperature danger zone	Temperatures between 5°C and 63°C where most bacteria can multiply
8. dormant	When bacteria are inactive and cannot grow at all
9. Temperature probe	A device with a metal spike that takes the temperature of food

Key Points — Week 3

1. Bacteria are found everywhere and need the right temperature, warmth, time, nutrients, pH level and oxygen to grow and multiply.
2. Microorganisms (bacteria) are used to make a wide range of food products.
3. Bacteria are used to make cheese, yogurt and bread.
4. The most important bacteria in food manufacturing are Lactobacillus species.
5. Bacterial contamination is the presence of harmful bacteria in our food, which can lead to food poisoning and illness.
6. As a food handler you must do everything possible to prevent this contamination.
7. What are the main symptoms of food poisoning?
8. Name three bacteria responsible for food poisoning?
9. Which groups of people are more at risk of food poisoning?
10. When handling food at any stage care must be taken to prevent contamination.
11. Everything possible must be done to control the conditions that allow bacteria to multiply causing food poisoning.

Where do bacteria come from? — Week 5

Keyword	Definition
1. Micro organisms	Tiny forms of life, both plant and animal. They can only be seen under a microscope. Bacteria are just one type of microorganism.
2. pathogenic	Something that is capable of causing illness
3. contaminate	To make a food unsafe to eat by allowing it to come into contact with microorganisms that will grow and multiply in it.
4. mould	A micro-organism related to mushrooms. Some types of mould contaminate food by growing in it and spoiling the appearance, taste, smell and texture of the food.
5. Enzymes	Natural substances (mostly proteins) that speed up chemical reactions. They cause fruit and vegetables that have been harvested to ripen and the flesh of animals to break down once they have been killed
6. moisture	Needed for bacterial growth. Micro-organisms need water for all their biological processes.
7. time	It takes micro organisms time to grow and multiply. Most micro organisms multiply every 10-20 minutes
8. nutrients	Micro-organisms need nutrients and energy from food to enable them to grow and multiply
9. pH level	If foods re too acidic or too alkaline, this will affect whether microorganisms can grow and multiply
10. oxidation	When substances combine with oxygen

Food poisoning (pathogenic) bacteria — Week 7

Salmonella	Found in raw and undercooked poultry, eggs and meat, raw milk. Incubation 12-36 hours
Staphylococcus aureus	Found in People! Especially hands, nose, mouth and on the skin, in cuts and skin infections, cold cooked meats, raw milk, dairy products. Incubation 1-6 hours
Bacillus Cereus	Found in soil and plants that grow in the soil such as rice. Incubation 6-15 hours
Campylobacter	Found in raw meat and poultry, milk and untreated dirty water. Incubations 48-60 hours
Listeria	Found in chilled ready-to-eat foods that do not require further cooking or reheating, such as: cooked sliced meats, cured meats, smoked fish, pre-prepared sandwiches and salads. Incubation 5-14 days
E. coli	Found in beef (especially minced beef) and other meat, raw milk, untreated dirty water. Incubation 12-24 hours

Raising agents — Week 9

Keyword	Definition
1. Raising agent	An ingredient or process that introduces a gas into a mixture so that it rises when cooked
2. Physical raising agent	Processes such as whisking, beating, folding, lamination , These incorporate air or steam to make mixtures rise.
3. Chemical raising agent	Raising agents that produce carbon dioxide when they are heated with a liquid. E.g. baking powder, and bicarbonate of soda. Self raising flour has baking powder added to it.
4. Biological raising agent	A micro-organism used as a raising agent: yeast
5. aeration	The adding of air during the combining of different ingredients.
6. whisking	Eggs or egg whites are whisked to trap air bubbles
7. steam	Moisture/water in the product produces steam when heated causing it to act as a raising agent
8. lamination	
9. Baking powder	A chemical raising agent consisting of bicarbonate of soda and cream of tartar. This raising agent does not produce an after taste. It is used in cakes.
10. Bicarbonate of soda	A chemical raising agent used in making cakes with a strong flavour (e.g. gingerbread) due to the after taste produced.
11. Carbon dioxide	The gas produced by chemical and biological raising agents
12. Yeast	Yeast A microscopic fungus consisting of single oval cells that reproduce by budding, and capable of converting sugar into alcohol and CO2 gas. Also ferments in the correct conditions to make bread rise.
13. fermentation	The process in which yeast produces the gas carbon dioxide.

Quick Test

1. What are microorganisms?
2. What is the ideal temperature for bacterial growth?
3. What is the most important bacteria used in food manufacturing?
4. What are the two date marks you need to check when buying food?
5. What is the recommended temperature for chilled food?
6. What is the temperature range of the danger zone?
7. Explain the term cross contamination.
8. List four occasions during food preparation when you must wash your hands.

Food preparation skills (cake and pastry) Week 11	
Keyword	**Definition**
1. Creaming method	• Fat and sugar are creamed together. • Eggs added slowly • Flour folded in • *Aeration: SR flour, sieving, creaming fat and sugar*
2. rubbing in method	• Fat rubbed into flour • Additional ingredients added • Liquid added • Knead, then shape • *Aeration: SR flour, sieving, rubbing in*
3. whisking method	• Eggs and sugar whisked together • Flour gently folded in • *Aeration: steam from the eggs, sieving, whisking*
4. melting method	• Fat is melted with treacle, syrup or sugar • Dry ingredients stirred in • Eggs and milk added • *Aeration: bicarbonate of soda*
5. shortening	The ability of a fat to produce a characteristic crumbly texture to baked products (when flour is coated with fat to prevent gluten formation e.g. in short crust pastry)
6. Gluten formation	Formed from the two wheat proteins gliadin and glutenin, in presence of water. Gluten is developed by kneading
7. Shortcrust pastry	A short crumb, light, crisply textured pastry used to make pies and tarts • Fat rubbed into flour to fine breadcrumbs • Water added gradually • Knead, chill • Roll out
8. Choux pastry	A light, crisp, hollow pastry used to make profiteroles, éclairs and gougères • Fat and water melted in saucepan, c • Flour added, cooled • Eggs added • shaped
9. Puff pastry	A light and layered pastry • Fat rubbed into flour • Water added to form a dough • Roll the dough, fold into three • Repeat four times • chill
10. Sweet pastry	As short crust pastry with the addition of egg or egg yolk and sugar
11. Filo pastry	A thin crispy pastry usually baked in many layers to make baked dishes • Oil and warm water added to flour • Kneaded until smooth • Rested for 2 hours • Rolled out until paper thin

Sensory evaluation Week 13	
Keyword	**Definition**
1. senses	The ability of the body to react to things through sight, taste, hearing, smell,(aroma) and touch
2. Taste buds	Special cells on the tongue that pick up flavours
3. Olfactory receptors	Special cells in the nose that pick up aromas(smells)
4. Sensory descriptors	Words used to describe that characteristics of food
5. Sensory analysis	Identifying the sensory characteristics of products, i.e. taste, texture, appearance , mouth feel, colour. A way of measuring sensory characteristics.
Sensory testing methods	
1. Rating test	People are asked to rate a food sample for a specific characteristic.
2. Ranking test	People are asked to rank order samples of food according to a criteria.
3. Star profile	People are asked to rate the intensity of a food product from 1–5 against a set of sensory descriptors.
4. Triangle test	People are given three samples of a food product to try. Two samples are identical, the third something is different; they need to discriminate between the samples.
5. Paired preference test	People are given two similar samples of food and they have to say which one they prefer.

Quick test

1. Name two methods of holding food when cutting it
2. What glaze would you use on enriched dough?
3. What type of flour is used to make most cakes?
4. What gas does yeast produce?
5. Why is it important to use codes when tasting food?
6. List the stages used to carry out a controlled sensory analysis
7. What term describes how fat makes a short texture product?
8. Which basic cake making process traps air into the mixture by beating fat with sugar?
9. How does egg white trap air?
10. How does fat trap air?
11. Which type of pastry uses steam to help it to rise?

Key points – knife skills

1. Specific types of knives are designed for specific cutting and shaping tasks.
2. Knives are dangerous and if not handled correctly and care should be taken at all times.
3. A flat and stable cutting surface is essential to avoid injury when cutting food
4. There are specific terms used for vegetable cuts relating to the size and shape of the outcome

Materials – Ferrous metals - containing IRON

			
Cast iron	High carbon steel	Low carbon steel	Stainless steel
Good compressive strength, good for casting.	Strong and hard but difficult to form.	Tough and low cost.	Strong and hard, good corrosion resistance.

Materials – NON Ferrous metals / alloys – containing NO iron

					
Aluminium	Copper (pure metal)	Brass (alloy of 65% copper 35% zinc)	Bronze (alloy of 90% copper 10% tin)	Lead (pure metal)	Zinc (pure metal)
Light, strong, ductile, good conductor, corrosion resistant.	Malleable, ductile, tough, good conductor, easily joined, corrosion resistant.	corrosion resistant, good conductor, easily joined, casts well.	Tough and hardwearing, corrosion resistant.	Very soft and malleable, heaviest common metal, corrosion resistant.	Low melting point, extremely corrosion resistant, easily worked.

Materials – Polymers – Thermoplastics – shaped when hot – can be reheated

			
ABS	Acrylic	Polycarbonate	Polystyrene
Strong and ridged, hard and tough, expensive.	Good optical properties, transparent, good colour, hard wearing, shatter proof.	High strength and toughness, heat resistant, good colour stability.	Good toughness and impact strength, good for vacuum forming and injection moulding.

Materials – Polymers – Thermosetting plastic – can be moulded – non recycleable

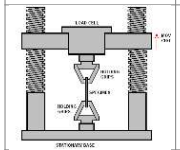
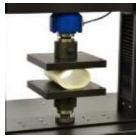
			
Polyester resin	Melamine resin	Polyurethane	Vulcanised rubber
Good strength but brittle	Stiff hard and strong	Hard with high strength, flexible and tough	Highest tensile strength, elastic, resistant to abrasion

Properties and characteristics of materials

	Absorbency	To be able to soak up liquid easily.
	Strength	The capacity of an object or substance to withstand great force or pressure.
	Elasticity	The ability of an object or material to resume its normal shape after being stretched or compressed; stretchiness.
	Plasticity	The quality of being easily shaped or moulded.
	Malleability	To be able to be hammered or pressed into shape without breaking or cracking.
	Density	The quantity of mass per unit volume of a substance
	Effectiveness	The degree to which something is successful in producing a desired result; success.
	Durability	The ability to withstand wear, pressure, or damage.

Testing materials

Materials testing is used to check the suitability of a material.	Testing can be non-destructive or destructive.	Most Non destructive testing will be visual.	Tensile testing, compressive strength tests and hardness testing are destructive.

Tensile test	Compressive test	Hardness test
		
- Used to find the strength under tension. - The maximum pulling or stretching force before failure. - Used by applying a load and observing the changes.	- The resistance of a material under a compressive force. - A material is placed under compression to see its resistance. - concrete is a good example of material with compressive strength.	- Used to find out how hard a material is. - In a work shop a hammer and dot punch is used to create an indentation in the material.

SI Base Units

unit	abb	physical quantity	Smallest - - - - - - - Largest
metre	m	length	Micrometer, millimeter, centimeter, meter
second	s	time	Microsecond, millisecond, seconds
kilogram	kg	mass	Milligram, gram, kilogram
ampere	A	electric current	Micro amp, milliamp, amp, kiloamp
kelvin	K	thermodynamic temperature	Kelvin, degrees Celsius
candela	cd	luminous intensity	Microcandela, millicandela, candela
mole	mol	amount of substance	Nanomole, micromole, millimole, mole

Engineering Disciplines

Mechanical	Hydraulics, gears, pulleys.
Electrical	Power station, household appliances, integrated circuits
Aerospace	Aircraft, space vehicles, missiles
Communications	Telephone, radio, fibre optic
Chemical	Pharmaceuticals, fossil fuels, food and drink
Civil	Bridges, roads, rail
Automotive	Cars, motorcycles, trains
Biomedical	Prosthetics, medical devices, radiotherapy
Software	Applications, systems, programming

Understand the making Process

1	Preparation	Drawing, CAD, sketches, plans.
2	Marking Out	Pencil, scribe, steel rule, tri square, marking gauge, calipers, centre punch.
3	Modification	Saw, jigsaw, scroll saw, laser cutter, pliers, hammer, drill, file, glass paper.
4	Joining	Riveting gun, spanner, screwdriver, hot glue, gun , soldering iron, nail gun.
5	Finishing	Hand sander, glass paper, disc sander, buffing wheel, polish, spray paint, varnish.

Health & Safety Legislation

Health and Safety at work Act – an agreement to keep us safe.	Personal Protective Equipment – to protect your body.	Manual Handling Operations – lifting and carrying.	Control of Substances Hazardous to Health – chemicals.	Reporting of Injuries RIDDOR – keeping a log of accidents.

M1

Desconéctate

Vocabulario de GCSE Vale Higher

Semana 1

¿Dónde vives?	Where do you live?		
Vivo en el…	I live in the…	este/oeste/centro…	east/west/centre…
norte/noreste/noroeste…	north/northeast/northwest…	de Inglaterra/Escocia	of England/Scotland
sur/sureste/suroeste…	south/southeast/southwest…	de Gales/Irlanda (del Norte)	of Wales/(Northern) Ireland

¿Qué haces en verano?	What do you do in summer?		
En verano/invierno…	In summer/winter…	monto a caballo/en bici	I go horseriding/cycling
chateo en la red	I chat online	nado en el mar	I swim in the sea
cocino para mi familia	I cook for my family	salgo con mis amigos/as	I go out with my friends
descargo canciones	I download songs	toco la guitarra	I play the guitar
escribo correos	I write emails	trabajo como voluntario/a	I work as a volunteer
hago natación/esquí/windsurf	I go swimming/skiing/windsurfing	veo la tele	I watch TV
hago una barbacoa	I have a barbecue	voy al polideportivo/al parque/ a un centro comercial	I go to the sports centre/to the park/ to a shopping centre
juego al baloncesto/fútbol	I play basketball/football	voy de paseo	I go for a walk

Semana 2

¿Con qué frecuencia?	How often?		
siempre	always	de vez en cuando	from time to time
a menudo	often	una vez a la semana	once a week
todos los días	every day	dos o tres veces al año	two or three times a year
a veces	sometimes	(casi) nunca	(almost) never

¿Qué tiempo hace?	What's the weather like?		
Hace buen/mal tiempo.	It's good/bad weather.	El clima es caluroso/soleado.	The climate is hot/sunny.
Hace calor/frío/sol/viento.	It's hot/cold/sunny/windy.	Hay niebla/tormenta.	It's foggy/stormy.
Llueve/Nieva.	It's raining/snowing.	Hay chubascos.	There are showers.
El tiempo es variable.	The weather is changeable.	Está nublado.	It's cloudy.

¿Qué te gusta hacer?	What do you like doing?		
Soy adicto/a a…	I'm addicted to…	estar en contacto con los amigos	being in touch with friends
Soy un(a) fanático/a de…	I'm a … fan/fanatic.	hacer artes marciales	doing martial arts
ya que/dado que/puesto que	given that/since	hacer deportes acuáticos	doing water sports
Prefiero…	I prefer…	ir al cine/a la pista de hielo	going to the cinema/ice rink
Me gusta…	I like…	ir de compras	going shopping
Me encanta/Me mola/Me chifla/		leer (un montón de revistas)	reading (loads of magazines)
Me flipa/Me apasiona…	I love…	usar el ordenador	using the computer
No me gusta (nada)…	I don't like… (at all)	ver películas	watching films
Odio…	I hate…	Prefiero veranear…	I prefer to spend the summer…
A (mi padre) le gusta…	(My dad) likes…	en el extranjero/en España	abroad/in Spain
Nos encanta…	We love…	en la costa/en el campo	on the coast/in the country
bucear	diving	en la montaña/en la ciudad	in the mountains/in the city
estar al aire libre	being outdoors		

Semana 3

¿Adónde fuiste de vacaciones?	Where did you go on holiday?		
hace una semana/un mes/un año	a week/month/year ago	con mi mejor amigo/a	with my best friend
hace dos semanas/meses/años	two weeks/months/years ago	solo/a	alone
fui de vacaciones a…	I went on holiday to…	¿Cómo viajaste?	How did you travel?
Francia/Italia/Turquía	France/Italy/Turkey	Viajé…	I travelled…
¿Con quién fuiste?	Who did you go with?	en autocar/avión	by coach/plane
Fui…	I went…	en barco/coche/tren	by boat/car/train
con mi familia/insti	with my family/school		

¿Qué hiciste?	What did you do?		
primero	first	llegué tarde al aeropuerto	I arrived at the airport late
luego	then	perdí mi móvil	I lost my mobile
más tarde	later	saqué fotos	I took photos
después	after	tomé el sol	I sunbathed
finalmente	finally	tuve un accidente en la playa	I had an accident on the beach
Lo mejor fue cuando…	The best thing was when…	vi un partido	I saw/watched a match
Lo peor fue cuando…	The worst thing was when…	visité el Park Güell	I visited Park Güell
aprendí a hacer vela	I learned to sail	vomité en una montaña rusa	I was sick on a roller coaster
comí muchos helados	I ate lots of ice creams	Puedes…	You can…
compré recuerdos	I bought souvenirs	descubrir el Museo Picasso	discover the Picasso Museum
descansé	I rested	disfrutar del Barrio Gótico	enjoy the gothic quarter
fui al acuario	I went to the aquarium	pasear por las Ramblas	walk along Las Ramblas
hice turismo	I went sightseeing	subir al Monumento a Colón	go up the Columbus Monument
		ver los barcos en el puerto	see the boats in the port

Semana 4

¿Qué tal lo pasaste?	How was it?		
Me gustó/Me encantó.	I liked it/I loved it.	un desastre	a disaster
Lo pasé bomba/fenomenal.	I had a great time.	¿Qué tiempo hizo?	What was the weather like?
Lo pasé bien/mal/fatal.	I had a good/bad/awful time.	Hizo buen/mal tiempo.	It was good/bad weather.
Fue…	It was…	Hizo calor/frío/sol/viento.	It was hot/cold/sunny/windy.
inolvidable/increíble	unforgettable/incredible	Hubo niebla/tormenta.	It was foggy/stormy.
impresionante/flipante	impressive/awesome	Llovió/Nevó.	It rained/snowed.
horroroso	awful		

M2

Semana 4 Parte 2

¿Cómo era el hotel?	What was the hotel like?		
Me alojé/Me quedé…	*I stayed…*	grande	*big*
Nos alojamos/Nos quedamos…	*We stayed…*	lujoso/a	*luxurious*
en un albergue juvenil	*in a youth hostel*	moderno/a	*modern*
en un apartamento	*in an apartment*	pequeño/a	*small*
en un camping	*on a campsite*	ruidoso/a	*noisy*
en un hotel de cinco estrellas	*in a five-star hotel*	tranquilo/a	*quiet*
en un parador	*in a state-run luxury hotel*	Tenía/Había…	*It had/There was/were…*
en una casa rural	*in a house in the country*	No tenía ni… ni…	*It had neither… nor…*
en una pensión	*in a guest house*	No había ni… ni…	*There was neither… nor…*
Fui de crucero.	*I went on a cruise.*	Tampoco tenía…	*Nor did it have…*
Estaba…	*It was…*	(un) aparcamiento	*a car park*
cerca de la playa	*near the beach*	(un) bar	*a bar*
en el centro de la ciudad	*in the city centre*	(un) gimnasio	*a gym*
en las afueras	*on the outskirts*	(un) restaurante	*a restaurant*
Era…	*It was…*	(una) cafetería	*a café*
acogedor(a)	*welcoming*	(una) lavandería	*a launderette*
antiguo/a	*old*	(una) piscina cubierta	*an indoor pool*
barato/a	*cheap*	mucho espacio para mi tienda	*lots of space for my tent*
caro/a	*expensive*		

Semana 5

¿Cómo era el pueblo?	What was the town/village like?		
Lo bueno/Lo malo…	*The good thing/The bad thing…*	turístico/a	*touristic*
del pueblo…	*about the town/village…*	Tenía…	*It had…*
de la ciudad…	*about the city…*	mucho ambiente/tráfico	*lots of atmosphere/traffic*
era que era…	*was that it was…*	mucho que hacer	*lots to do*
demasiado/muy/bastante…	*too/very/quite…*	mucha contaminación/gente	*lots of pollution/people*
animado/a	*lively*	muchos espacios verdes	*lots of green spaces*
bonito/a	*pretty*	muchos lugares de interés	*lots of places of interest*
histórico/a	*historic*	muchas discotecas	*lots of discos*
pintoresco/a	*picturesque*		

Semana 6

Quisiera reservar…	I would like to book…		
¿Hay…	*Is/Are there…*	con bañera/ducha	*with a bath/shower*
wifi gratis…	*free wifi…*	con cama de matrimonio	*with double bed*
aire acondicionado…	*air conditioning…*	con desayuno incluido	*with breakfast included*
en el hotel/las habitaciones?	*in the hotel/the rooms?*	con media pensión	*with half board*
¿Cuánto cuesta una habitación…?	*How much does a… room cost?*	con pensión completa	*with full board*
¿A qué hora se sirve el desayuno?	*What time is breakfast served?*	con vistas al mar	*with sea view*
¿Cuándo está abierto/a el/la…?	*When is the… open?*	¿Para cuántas noches?	*For how many nights?*
¿Cuánto es el suplemento por…?	*How much is the supplement for…?*	Para… noches	*For… nights*
¿Se admiten perros?	*Are dogs allowed?*	del… al… de…	*from the… to the… of…*
Quisiera reservar…	*I would like to book…*	¿Puede repetir, por favor?	*Can you repeat, please?*
una habitación individual/doble	*a single/double room*	¿Puede hablar más despacio?	*Can you speak more slowly?*
con/sin balcón	*with/without balcony*		

Quiero quejarme	I want to complain		
Quiero hablar con el director.	*I want to speak to the manager.*	No hay…	*There is no…*
Quiero cambiar de habitación.	*I want to change rooms.*	Necesito…	*I need…*
El aire acondicionado…	*The air conditioning…*	papel higiénico	*toilet paper*
El ascensor…	*The lift…*	jabón/champú	*soap/shampoo*
La ducha…	*The shower…*	toallas/(un) secador	*towels/a hairdryer*
La habitación…	*The room…*	¡Socorro!	*Help!*
está sucio/a	*is dirty*	Es inaceptable.	*It's unacceptable.*
La luz…	*The light…*	Lo siento/Perdone.	*I'm sorry.*
no funciona	*doesn't work*	El hotel está completo.	*The hotel is full.*
Hay ratas en la cama.	*There are rats in the bed.*		

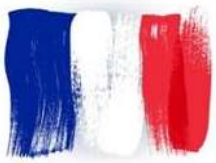
Semana 7

Quiero quejarme	I want to complain		
Quiero hablar con el director.	*I want to speak to the manager.*	No hay…	*There is no…*
Quiero cambiar de habitación.	*I want to change rooms.*	Necesito…	*I need…*
El aire acondicionado…	*The air conditioning…*	papel higiénico	*toilet paper*
El ascensor…	*The lift…*	jabón/champú	*soap/shampoo*
La ducha…	*The shower…*	toallas/(un) secador	*towels/a hairdryer*
La habitación…	*The room…*	¡Socorro!	*Help!*
está sucio/a	*is dirty*	Es inaceptable.	*It's unacceptable.*
La luz…	*The light…*	Lo siento/Perdone.	*I'm sorry.*
no funciona	*doesn't work*	El hotel está completo.	*The hotel is full.*
Hay ratas en la cama.	*There are rats in the bed.*		

Mis vacaciones desastrosas	My disastrous holiday		
Por desgracia	*Unfortunately*	Cuando llegamos…	*When we arrived…*
Por un lado… por otro lado…	*On the one hand… on the other hand…*	era muy tarde	*it was very late*
El primer/último día	*(On) the first/last day*	estaba cansado/a	*I was tired*
Al día siguiente	*On the following day*	la recepción ya estaba cerrada	*the reception was already closed*
Tuve/Tuvimos…	*I had/We had…*	acampar	*to camp*
un accidente/un pinchazo	*an accident/a puncture*	decidir	*to decide (to)*
un retraso/una avería	*a delay/a breakdown*	alquilar bicicletas	*to hire bicycles*
Tuve/Tuvimos que…	*I had to/We had to…*	coger el teleférico	*to catch/take the cable car*
esperar mucho tiempo	*wait a long time*	chocar con	*to crash into*
ir al hospital/a la comisaría	*go to the hospital/to the police station*	hacer alpinismo	*to go mountain climbing*
llamar a un mecánico	*call a mechanic*	volver	*to return*
Perdí/Perdimos…	*I lost/We lost…*	el paisaje	*the landscape*
el equipaje/la cartera	*the luggage/the wallet*	la autopista	*the motorway*
la maleta/las llaves	*the suitcase/the keys*	precioso/a	*beautiful*

M1

Qui suis-je?



Theme: Identity and culture

M1 Semaine 1

La famille	Family members		
le beau-père	*stepfather/father-in-law*	la fille	*daughter*
la belle-mère	*stepmother/mother-in-law*	le fils	*son*
le beau-frère	*brother-in-law*	l'enfant/le petit-enfant	*(grand)child*
la belle-sœur	*sister-in-law*	le mari/l'ex-mari (m)	*(ex)husband*
le demi-frère	*half-brother/stepbrother*	la femme/l'ex-femme (f)	*(ex)wife*
la demi-sœur	*half-sister/stepsister*		

M1 Semaine 2

Les adjectifs de personnalité	Personality adjectives		
Il/Elle est …	*He/She is …*		
agaçant(e)	*annoying*	impatient(e)	*impatient*
aimable	*likeable*	jaloux/-ouse	*jealous*
amusant(e)	*amusing/funny*	méchant(e)	*nasty/mean*
arrogant(e)	*arrogant*	paresseux/-euse	*lazy*
bavard(e)	*talkative/chatty*	poli(e)	*polite*
charmant(e)	*charming*	sage	*well-behaved, wise*
drôle	*funny*	sensible	*sensitive*
égoïste	*selfish*	sérieux/-euse	*serious*
fidèle	*loyal*	sympa(thique)	*nice*
fort(e)	*strong*	têtu(e)	*stubborn/pig-headed*
généreux/-euse	*generous*	travailleur/-euse	*hard-working*
gentil(le)	*kind*	triste	*sad*

M1 Semaine 3

Ma description physique	My physical description		
J'ai les cheveux …	*I have … hair*	une barbe/une moustache	*a beard/a moustache*
courts/longs/mi-longs	*short/long/mid-length*	Je suis …	*I am …*
raides/bouclés/frisés	*straight/curly*	petit(e)/grand(e)	*short/tall*
noirs/bruns/châtains	*black/brown/chestnut*	de taille moyenne	*of average height*
blonds/roux/gris/blancs	*blond/red/grey/white*	mince/gros(se)	*slim/fat*
J'ai les yeux …	*I have … eyes*	beau/belle	*beautiful*
bleus/verts	*blue/green*	joli(e)	*pretty*
gris/marron	*grey/brown*	moche	*ugly*
J'ai …	*I have …*	Je porte des lunettes.	*I wear glasses.*
des boutons	*spots*		

M1 Semaine 4

En ville	In town		
la boîte de nuit	*night club*	le théâtre	*theatre*
le bowling	*bowling alley*	dans	*in*
le café	*cafe*	derrière	*behind*
le centre commercial	*shopping centre*	devant	*in front of*
le cinéma	*cinema*	entre	*between*
les magasins (m)	*shops*	en face de	*opposite*
la patinoire	*ice rink*	à côté de	*next to*
la piscine	*swimming pool*	près de	*near*
la plage	*beach*		

M1 Semaine 5

Quand?	When?		
aujourd'hui	*today*	ce matin	*this morning*
demain	*tomorrow*	cet après-midi	*this afternoon*
après-demain	*the day after tomorrow*	ce soir	*tonight*

M1 Semaine 6

L'amitié	Friendship		
Un(e) bon(ne) ami(e) est …	*A good friend is …*	Un(e) bon(ne) ami(e) n'est pas …	*A good friend is/is not …*
de bonne humeur	*in a good mood*	de mauvaise humeur	*in a bad mood*
compréhensif/-ive	*understanding*	déprimé(e)	*depressed*
équilibré(e)	*balanced/level-headed*	pessimiste	*pessimistic*
honnête	*honest*	prétentieux/-euse	*pretentious*
indépendant(e)	*independent*	vaniteux/-euse	*conceited*
modeste	*modest*	Il/Elle …	*He/She …*
patient(e)	*patient*	croit en moi	*believes in me*
sûr(e) de lui/d'elle	*self-confident*	dit toujours la vérité	*always tells the truth*
		me fait rire	*makes me laugh*
		prend soin de moi	*takes care of me*
		voit le bon côté des choses	*sees the positive side of things*

M2

M1 Semaine 7

Les traits de personnalité	Qualities		
le sens de l'humour	*a sense of humour*	la fidélité	*loyalty*
la patience	*patience*	la modestie	*modesty*
la générosité	*generosity*	l'honnêteté (f)	*honesty*
la gentillesse	*kindness*	l'optimisme (m)	*optimism*

M2 Semaine 1

Les rapports en famille	Family relationships		
se confier à	*to confide in*	s'occuper de	*to look after*
se disputer avec	*to argue with*	s'aimer	*to love each other*
s'entendre bien avec	*to get on well with*	se chamailler	*to bicker with each other*
se fâcher contre	*to get angry with*	mort(e)/décédé(e)	*dead*
s'intéresser à	*to be interested in*	divorcé(e)(s)	*divorced*
		séparé(e)(s)	*separated*

M2 Semaine 2

On décrit sa famille	Describing family members		
adorable	*adorable*	extraverti(e)	*outgoing*
débrouillard(e)	*resourceful*	fragile	*fragile*
dynamique	*lively*	instable	*unstable*
énergique/plein(e) d'énergie	*energetic*	introverti(e)	*introverted*

M2 Semaine 3

On va sortir	Going out		
Je vais/Tu vas/On va…	*I'm going/You're going/We're going…*	Tu veux venir?	*Do you want to come?*
aller au match	*to go to the match*	Tu peux venir?	*Can you come?*
faire les magasins	*to go shopping*	On se retrouve quand?	*When will we meet?*
faire du patin à glace/du patinage	*to go ice-skating*	… où?	*Where …?*
manger au fast-food	*to eat in a fast-food restaurant*	… à quelle heure?	*At what time …?*
aller au cinéma	*to go to the cinema*	Tu y vas avec qui?	*Who are you going there with?*
faire du skate	*to go skateboarding*	… comment?	*How …?*
voir un spectacle	*to see a show*	D'accord.	*OK.*
jouer à des jeux vidéo	*to play video games*	À plus!/À plus tard!	*See you later!*
venir chez moi	*to come to my house*		

M2 Semaine 4

On décrit une sortie	Describing a night out		
hier soir	*last night*	dit «au revoir»	*said 'good-bye'*
à 20 heures	*at 8 p.m.*	embrassé …	*kissed …*
d'abord	*first of all*	Je suis …/Il/Elle est …/Nous sommes …	*I …/He/She …/We …*
après	*afterwards*	allé(e)(s) à un pub	*went to a pub*
puis/ensuite	*then*	resté(e)(s) dehors sur la terrasse	*stayed outside on the terrace*
J'ai …/Il/Elle a …/Nous avons …	*I …/He/She …/We …*	entré(e)(s) dans un restaurant	*went into a restaurant*
visité le musée	*visited the museum*	sorti(e)(s)	*went out*
vu un match/une exposition	*saw a match/an exhibition*	parti(e)(s)	*left*
mangé dans un restaurant	*ate in a restaurant*	monté(e)(s) dans le bus	*got on the bus*
refusé de manger	*refused to eat*	rentré(e)(s) à la maison	*went home*
bu un coca	*drank a cola*	tombé(e)(s) amoureux/-euse(s)	*fell in love*

M2 Semaine 5

Parler de son enfance	Talking about your childhood		
Quand j'étais plus jeune, …	*When I was younger, …*	je jouais (à «cache-cache»)	*I played ('hide and seek')*
j'habitais avec (mon papa et ma maman)	*I lived with (my mum and dad)*	j'aimais (les bonbons)	*I liked (sweets)*
j'allais à l'école primaire	*I went to primary school*	je détestais (les épinards)	*I hated (spinach)*
j'avais (les cheveux blonds)	*I had (blond hair)*	je portais (un maillot du PSG)	*I wore (a PSG shirt)*
j'étais (mignon(ne))	*I was (cute)*	je rêvais d'être …	*my dream was to be a …*

M2 Semaine 6

Qui est-ce que tu admires?	Who do you admire?		
Mon modèle s'appelle …	*My role model is called …*	aide/a aidé …	*helps/helped …*
Moi, j'admire …	*Personally I admire …*	a/avait du courage/de la détermination	*has/had courage/determination*
Mon héros/mon héroïne, c'est …	*My hero/heroine is …*	est/était courageux/-euse face à des dangers terribles	*is/was brave when faced with terrible danger*
J'aimerais bien être comme lui/elle.	*I would like to be like him/her.*	lutte/a lutté pour …	*fights/fought for …*
J'admire sa créativité.	*I admire his/her creativity.*	a obtenu …	*obtained/got …*
Il/Elle …	*He/She …*	a sauvé la vie de…	*saved the life of …*
m'impressionne énormément	*impresses me a lot*	C'est un enfant adopté, comme moi.	*He/She is adopted, like me.*
a travaillé très dur pour devenir …	*worked very hard to become …*		
est devenu(e) …	*became …*		

M2 Semaine 7

Les mots essentiels	High-frequency words		
très	*very*	d'abord	*first of all*
assez	*quite*	puis	*then*
mais	*but*	ensuite	*next*
ou	*or*	après	*afterwards*
où	*where*	plus tard	*later*
hier	*yesterday*	le soir	*in the evening*

Y9 AIM: Develop skills and tactics in competitive situations.

Reference: https://tabletennisengland.co.uk/

Key skills:

1. What is the aim of table tennis? The aim of table tennis is to score more points than your opponent by volleying the ball across the net and landing on the table.

2. When is a point won? A point is won by you if your opponent is unable to return the ball to your side of the table (e.g. they miss the ball, they hit the ball but it misses your side of the table, or the ball hits the net), or if they hit the ball before it bounces on their side of the table.

3. How is table tennis scored? The winner of a game is the first to 11 points. There must be a gap of at least two points between opponents at the end of the game though, so if the score is 10-10, the game goes in to extra play until one of the players has gained a lead of 2 points. The point goes to the player who successfully ends a rally, regardless of who has served.
A match can consist of the number of games you like, just make sure you agree this in advance!

4. How big is the ball? The ball has a diameter of 40mm and weighs only 2.7g.

5. What is a rally? The period where the ball is in play.

6. What is a let? A rally of which the point is not scored.

7. What is a point? A rally of which the result is scored.

8. Who is the server and who is the receiver? The server is the player due to strike the all first in the rally while the receiver is the player due to strike the ball second.

9. How many players are on the table during a game? A game of table tennis is played in either singles or doubles.

10. How is the serve made? The serve is made from the end of the table with the server tossing the ball upward from the palm of the free hand and striking it as it descends so that it first bounces on the servers own court and then passing over the net bounces on the opponents court. There are no second serves.

Extension skills:

11. Do you have to serve diagonally in table tennis? The ball must bounce once on your side of the table and once on your opponents side of the table. In doubles the ball must be played diagonally for example within the right half of the court only however in singles you can serve to and from any part of the table.

12. How high do you have to throw the ball when you are serving? 6 inches

13. What happens if the ball hits the net? The ball must pass 'cleanly' over the net. If the ball 'clips' the net and goes over it is a 'let' and the point is retaken. If the ball hits the net and doesn't go over the point goes to the other player / team. There are no second serves.

14. How do you get spin on the ball? One of the biggest differences between recreational and competitive table tennis players is the ability to execute a spin shot. The advantage of executing a spin is that it makes it more difficult for your opponent to return.

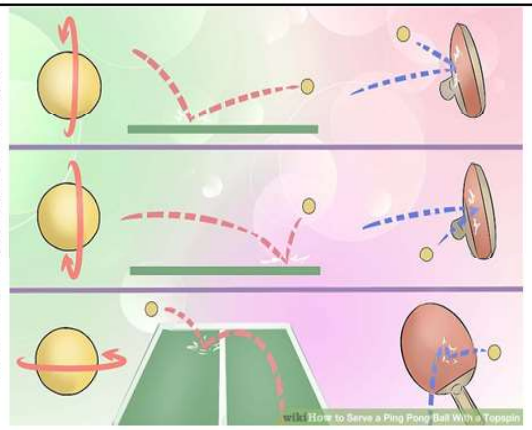
To generate a spin:
1. Start your stroke below and behind the ball.
2. Wait for the ball to bounce off your table upwards.
3. Move your arm forward and upwards, brushing the ball at a "'/" angle from a high position.
4. The ball's trajectory will arch downwards, picking up speed after it bounces off the table.

If returned incorrectly, the resulting return by your opponent will fly off the table, earning you a point!

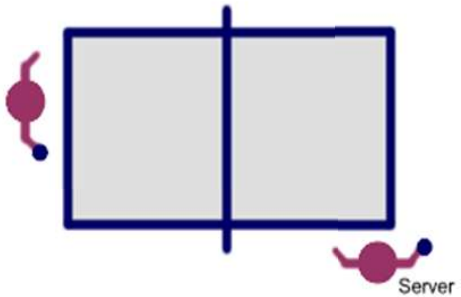
15. Where is table tennis most popular? Many Asian countries are crazy about table tennis particularly China and South Korea. China are currently number one in the world but South Korea provide fierce competition and are currently second.

16. When did table tennis start in England? Table tennis as we know it today started in England in the late 1880's. Game makers were trying to emulate the popularity of lawn tennis by developing indoor versions of it. As we can see it is still played in England both competitively and recreationally.

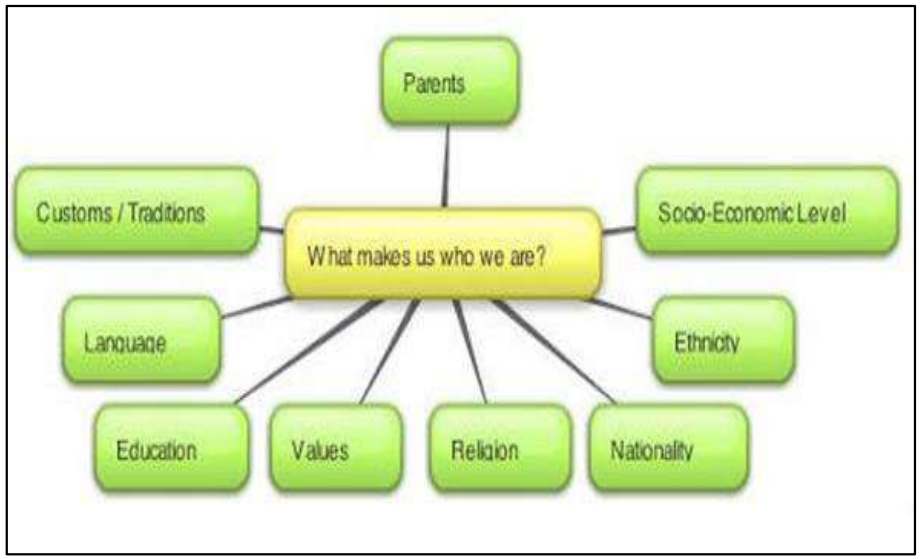
How to get top spin on the ball.

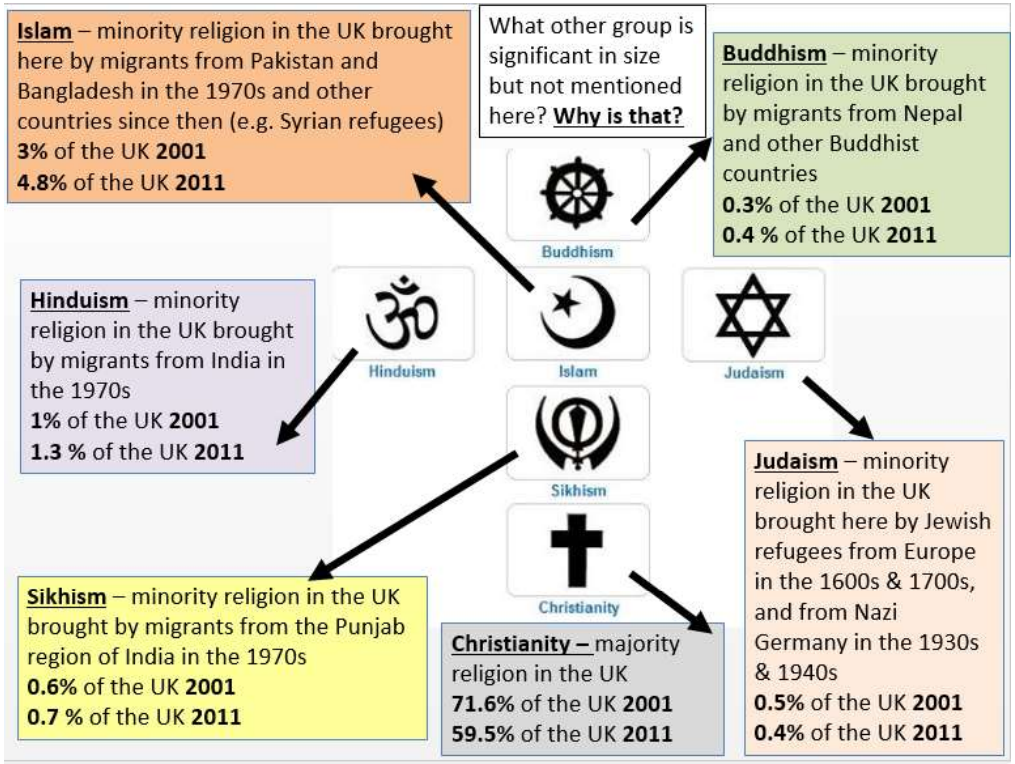


Where to position yourself for the serves.



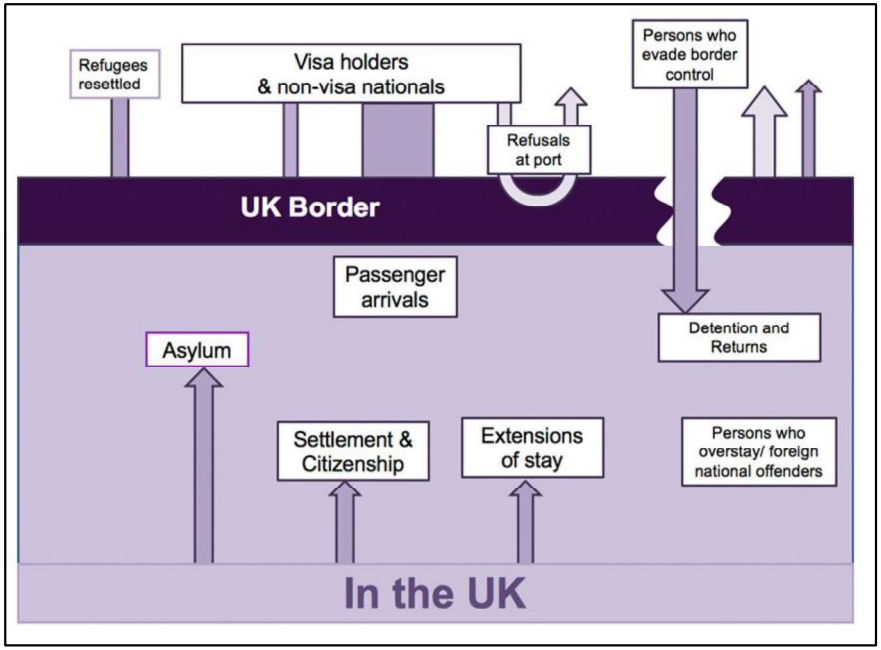
Key words	Definition
1. Multicultural Society	A society that is made up of people from a range of cultural and religious backgrounds.
2. National identity	An identity associated with being a citizen of a particular country.
3. Identity	Characteristics/qualities that make a person who they are e.g. age, gender, religion, regional location, job etc.
4. Multiple Identities	An individual assumes a range of identities i.e. part of a family, the area they come from' linked to a school or a supporter of a football team etc.
5. Britishness	The state of being British, or qualities that are considered typical of British people.
6. National Identity	Identity associated with being a citizen of a specific country e.g. English identity or Scottish identity.
7. Discrimination	Unfair treatment of others based on their race, gender, sexuality, age, disability, religion etc.
8. Prejudice	To pre-judge, have an unreasonable dislike for a person or group of people, view not based on experience.
9. Stereotyping	A generalized view about a group of people linked to a personal characteristic e.g. hair colour, where they live, their way of life etc.
10. Equality Act (2010)	Law which legally protects people from discrimination in the workplace and in wider society.
11. Immigration	The act of someone moving into another country.
12. Immigrant	A person who moves into another country to live, with the intention of staying there permanently.
13. Migration	The movement of people from one country to another – some moving in and others moving out.
14. Net Migration	The difference between the total number of people in and out of an area over a given period of time. If more people in the figure is a plus and if more people leave the figure is a minus.
15. Community Cohesion	Working towards a society where everyone shares a sense of belonging and common values – people live together peacefully and everyone feels valued.





Changing patterns in the UK: Ethnic groups 2001 and 2011 in England & Wales.

Ethnicity		% of UK population		
		2001	2011	% change + or -
White		91.3	86.0	
Asian / Asian British	Indian	2.0	2.5	
	Pakistani	1.4	2.0	
	Bangladeshi	0.5	0.8	
	Chinese	0.4	0.7	
	Other Asian	0.5	1.5	
Black / African / Caribbean / Black British	African	0.9	1.8	
	Caribbean	1.1	1.1	
	Other Black	0.2	0.5	
Mixed ethnic groups		1.4	2.2	
Other Ethnic groups	Arab		0.4	
	Any other Ethnic group	0.4	0.6	



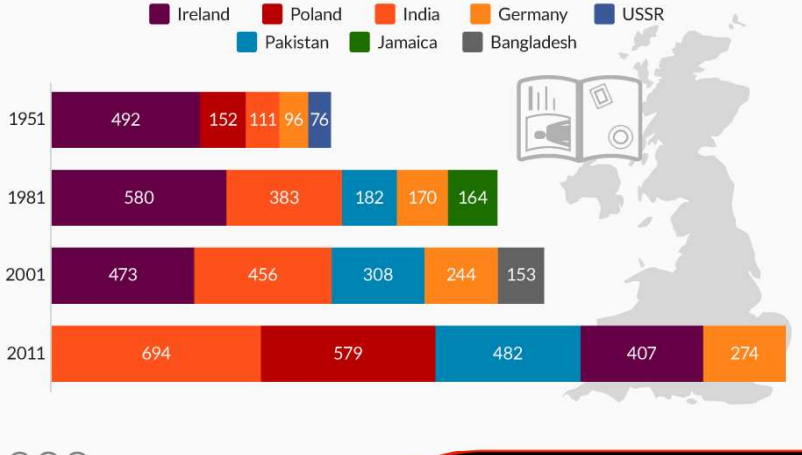
OVER 6 DECADES, WHERE MIGRANTS CAME FROM

Top ten non-UK countries of origin

1951		1981		2001		2011	
Ireland	492,000	Ireland	580,000	Ireland	473,000	India	694,000
Poland	152,000	India	383,000	India	456,000	Poland	579,000
India	111,000	Pakistan	182,000	Pakistan	308,000	Pakistan	482,000
Germany	96,000	Germany	170,000	Germany	244,000	Ireland	407,000
Russia	76,000	Jamaica	164,000	Bangladesh	153,000	Germany	274,000
USA	59,000	USA	106,000	Jamaica	146,000	Bangladesh	212,000
Canada	46,000	Kenya	100,000	USA	144,000	Nigeria	191,000
Italy	33,000	Italy	93,000	S Africa	132,000	S Africa	191,000
Australia	31,000	Poland	88,000	Kenya	127,000	USA	177,000
France	30,000	Cyprus	83,000	Italy	102,000	Jamaica	160,000
Top ten total	1,126,000	Top ten total	1,949,000	Top ten total	2,285,000	Top ten total	3,367,000
Others	774,000	Others	1,251,000	Others	2,315,000	Others	4,133,000
Total	1.9m	Total	3.2m	Total	4.6m	Total	7.5m

Where Britain's immigrants historically come from

Top five origin countries of British immigrants from 1951 to 2011 (in thousands)

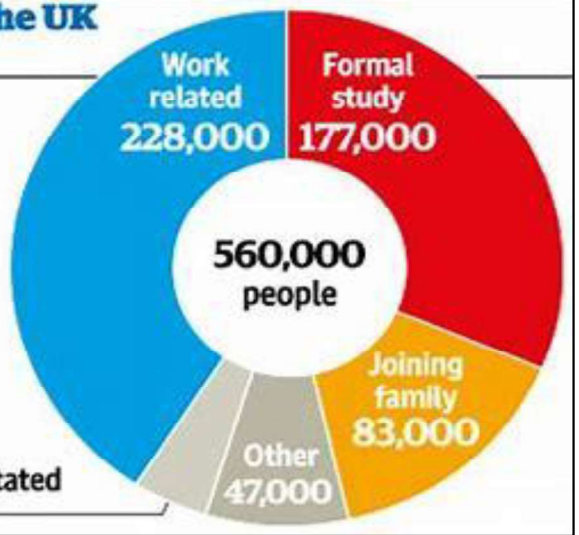


@StatistaCharts Source: ONS

i100 from The INDEPENDENT statista

Why people come to the UK

Main reasons for long term immigration, 12 months to end of March 2014



SOURCE: ONS

Box 1. **Being an Entrepreneur**

What is an entrepreneur? - It doesn't mean you have to be setting up new business ventures every day; **an entrepreneur is someone with the foresight, drive and ambition to take a risk and solve business or consumer problems.**

Examples of entrepreneurs are:
Sir Alan Sugar
Jamie Oliver
Nadiya Hussain
Victoria Beckham
Joe Wicks

Box 2. **Entrepreneur Motivators**

1. Financial	The desire to make a profit
2. Personal	The desire to control their life
3. Social	The desire to pursue interest or hobbies

Box 3. **Entrepreneur Characteristics and Skills**

1. Confidence	The ability to present their idea to the public
2. Motivation	Being passionate about their ideas
3. Determination	Not giving up when things get tough
4. Result-focused	Be focus on the end goal
5. Initiative	Able to think "outside the box"
6. Decision-making ability	Able to make decisions
7. Analytical ability	Able to gather and review information

Box 4. **Financial Aims**

1. Break- even	The point where the business is covering it costs but not making a profit
2. Profitability	Ensuring the business makes a profit
3. Increasing revenue	Taking actions to increase sale
4. Profit maximisation	Taking actions to make the most profit as possible – e.g. cutting costs

Box 5. **Non Financial Aims**

1. Customer satisfaction	Making sure customers are happy so they will come back
2. Employee engagement	Making employees happy so they will stay with the business
3. Diversification and expansion	Expanding the range of products or services offered or where the business sells its products and services
4. Ethical responsibility	Aware of their responsibility to the society and community e.g. not employing child labour

Box 6. **Liability**

1. Unlimited	The owner have to pay business debits so could risk losing their house or car
2. Limited	Owners only have to pay debts up to the amount they invest in the business

Box 7. **Business ownership**

Sole trader	Own by one person - **Unlimited liability**
Partnership	Own by two or more people - **Unlimited liability**
Private limited company LTD	Has family and friends Shareholder - **Limited liability**
Public limited company PLC	Sells shares on stock market - **Limited liability**
Franchise	Copy cat business ltd
Co-operative	Own by staff

Box 8.	Organisational structure
1. Flat	Only a few layers of authority in the organisation
2. Tall	Many layers of authority in the organisation

Box 9.	Restructuring
1. Delaying	Removing line of authority
2. Redundancy	when a business eliminates a certain job role

Box 10. Stakeholders engagement

All businesses and enterprises have stakeholders. A stakeholder is an individual, group or organisation who has an interest in the business or enterprise, and may be affected by the business.

Internal: - Stakeholders can be… **internal** - within a business.
Internal stakeholders of a business including:

1. **Employee –** want job security
2. **Managers –** want information so they can plan
3. **Owners –** want to know how the business is doing

External: - Stakeholders can be… **external** - outside a business.
External stakeholders of a business including:

1. **Shareholders –** want dividend and high share price
2. **Customers –** want good service and value for money
3. **Suppliers –** want to be paid by the business
4. **Government –** want business to obey the law
5. **Finance providers –** want loans to be paid on time

Stakeholder's Influence:

- Each stakeholder can also have an impact on the business.
- Employees/ Workers provide the labour for the company if they are on satisfied they could go on strike or involve a trade union. Without employs the business will not be able to run
- Managers make the strategic decisions for the business that has a direct impact on the financial performance
- Owners are in charge of the business they have the final say over the direction and goals at the business sets out to achieve
- Customers can stop purchasing from a business, this is called boycotting
- Suppliers can increase prices or can stop supplying a business
- Shareholders have invested in the company. If shareholders are unsatisfied with the businesses' performance they may sell their shares
- Local community can share information about the business by word-of-mouth all on social media this has a direct impact on the reputation of the business local community may also organise protests which can have an impact on the business
- Government sets legislation and rules that the business must follow, the government also sets taxation rates this has a direct impact on the profit of the business
- Finance providers lend the business money if they stop lending the business money the business may experience cash flow problems if they charge more interest this will have an impact on the businesses profit

Key words:

- **A hierarchy:** -- shows the layers of management and authority in a business or enterprise.
- **Tall organisations**: - have many layers of management is its organisational hierarchy.
- **Flat Organisations:** - have few layers of management in its organisation hierarchy.
- **Chain of Command:** - is the route/line of communication and authority within a business, it shows the route an order takes to get to its intended recipient.
- **Layers:** - are the different levels of employees or management in the organisation.
- **Span of Control**: - is the amount of people a manager is responsible for.
- **Characteristic:** — A quality or trait that belongs to someone, such as being creative.
- **Skill:**— The ability to do something well. For example, problem solving. Skills can also be learnt, such as languages.
- **A sole trader: -** is when a business is owned and operated by one person.
- **Unlimited liability: -** means that the owners of a business are personally liable for the debts of the business. The owner can lose their personal belongings such as their house or car.
- **Limited liability:** - is when the owners personal belongings are not at risk if the business cannot pay its debts — the owner can only lose what they invest.
- **A partnership: -** is a business owned and operated by 2-20 people.
- **A franchise**: - is a legal agreement with another business to sell their products.
- **Franchisor: –** the brand that owns the business plan.
- **Franchisee:** – a seperate entity that pays for the business plan and to trade under their name.
- **A Private Limited Company:** - is a business owned by shareholders that are family and friends.
- **A Public Limited Company:** - is a business owned by shareholders that have bought shares on the open stock market, that is open to the general public.

- **A cooperative:** - is a business owned by the community closest to the business, for example its employees or customers – these are known as the members.

There are 3 types of cooperatives:

Type of Cooperative: **Example:**

1. Consumer cooperative — owned by the customers. **The Coop Food**_____

2. Worker cooperative — owned by the employees. **John Lewis** _____

3. Producer cooperative — owned by the makers of products. **The Green Pea Company** _____

Entrepreneurs may be inventive or innovative.

- **Invention:** – the creation of new ideas.
- **Innovation**: – the application of new inventions into marketable products or services.
- **Invention:** - means creating new products or designs that people want to purchase. Innovation means introducing them to a marketplace.

Example: Apple innovates each year with a new iPhone, whereas Thomas Edison invented the light bulb!

Define:
Platonic Relationship

A friendship or relationship where there is no romantic, intimate or sexual feelings.

Friends and Colleagues.

Define:
Intimate Relationship

A relationship which can include a sexual attraction and sexual activity.

Boyfriend. Girlfriend, Married Couples

Define:
Familial Relationship

A relationships with someone who has a blood, kinship or legal tie to you.

Parents, Siblings etc.

Define:
Toxic Relationship

A relationship that has a negative impact on your mental health and self esteem.

What makes a good friend?

Good friends make you feel good	Good friends say and do things that make you feel good, giving compliments and congratulations and being happy for you.
Good friends listen	A good friend allows you to talk and doesn't interrupt you. They're interested in what you have to say.
Good friends support each other	If you're feeling down, a good friend will support you. If you need help, a good friend will try to help you out.
Good friends are trustworthy	If you tell a good friend something private, they won't share it. You can trust a good friend not to be judgmental.
Good friends handle conflict respectfully and respect boundaries	A good friend will tell you if you've done something to hurt them. If you tell a good friend they've hurt you, they'll be sorry and won't do it again.
Friends not followers	In the digital world you can feel under pressure to have a lot of friends and followers. Remember that you only need a small circle of friends to be happy.

Good friendships go both ways

Signs of a Toxic Friendship

Sometimes people who claim to be your friends can show bullying behaviour. This is sometimes called a 'frenemy' but is a type of toxic relationship. You can spot them by:

- They might say "brutally honest" things to you which are unkind or hurtful
- Put pressure on you to do things you don't want to do
- Be manipulative (e.g. 'If you were my friend you would...')
- Put you down
- Laugh at you, or encourage others to laugh at you
- Talk about you behind your back
- Deliberately exclude you from group chat and activities
- Take the "banter" too far
- Share things about you online
- Make you feel bad about yourself

What to do if you are in a toxic friendship

- **Remember: the problem isn't you:** Hold on to that thought. Their behaviour might make you feel bad, but they need to change, not you.
- **Talk to them about how their behaviour makes you feel:** Explain calmly and without accusation. Be specific, Tell them what you'd like to happen moving forward. Their response will tell you a lot, sometimes our behaviour hurts others without us realising.
- **If they apologise, give them another chance:** If they mean it, they'll change their behaviour and stop making you feel bad. However, sometimes frenemies might apologise insincerely, and their behaviour afterwards won't change. If they're still making you feel bad despite what you've told them, it's time to move on.
- **Make new friends:** Moving on can be scary, but you deserve people in your life who support you and make you feel good about yourself. See our guide to making new friends for help.
- **Don't retaliate:** It can be tempting to encourage others to exclude your former frenemy, or to put them down behind their back. Don't do this: you're only showing the same behaviour you found difficult in them.