Year 10 Knowledge Organisers

Half Term 3

Tuesday 7th January – Friday 14th February 2025

BLESSED TRINITY RC COLLEGE

Topic Overviews for Half Term 3

English	An Inspector Calls	
Maths	**Foundation (F) =** Angles and bearings Working with circles Vectors Ratio Percentages and interest Probability	**Higher (H) =** Angles and bearings Working with circles Vectors Ratios and fractions Percentages and interest Probability
Biology	Cell biology Bioenergetics Infection and response Organisation	
Chemistry	Atomic structure and the periodic table Bonding, structure and the properties of matter Energy changes Quantitative chemistry	
Physics	Electricity Atomic structure	
RE	Good and Evil	
History	Germany 1890-1945 – Democracy and Dictatorship	
Geography	Changing Economic World Nigeria	
Spanish	School	
Computing	Computers	
ICT	Data and Testing	
Music	Musical terms and signs	
DT	Graphics Product Design Textiles – Hospitality and Catering – Nutrition	
Art	Metamorphism	
Photography	Natural form	
Sociology	Families	
PE	Cardiovascular system	
Sports and Coaching	Improving sporting performance	

‘An Inspector Calls’ Knowledge Organiser- KS4- Autumn 2.

Characters	Themes	Language / Structure	Context
Mr Birling	Class	Realism	**1912**
Sheila	Socialism	Irony	1945
Gerald	**Capitalism**	One evening narration	NHS
Mrs Birling	**Young vs old**	Cliff-hangers	**WWI**
Eric	Position of women	Order of questioning	WWII
Inspector Goole	Time	Stage directions	**Titanic**
	Responsibility	Lighting	
	Morality	Symbolism	Suffragettes
	Survival of the fittest	**Dramatic irony**	Patriarchal society
	Guilt / change	Climax	
		Twist	
		Repetition	
		Interruptions	
		Speech	

English

Y10 Working with circles

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Parts of a circle

Fractional parts of a circle

30° represents $\frac{30}{360}$ of a full circle

$\frac{30}{360} = \frac{1}{12}$

$\frac{270}{360}$ of a full circle (in degrees)

$\frac{6}{8}$ of a full circle (in equal parts)

$\frac{3}{4}$ of a full circle

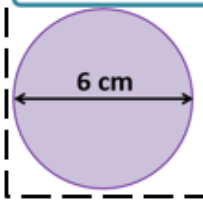
Formula to remember:
Area of a circle = πr^2
Circumference of a circle = πd

A circle is made up of 360°

The fraction of the circle is as $\frac{\theta}{360}$

θ represents the degrees in the sector

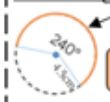
Circumference = πd



$C = \pi d$
$= \pi \times 6$
$= 18.85\ cm$

Arc length

Remember an arc is part of the circumference
Circumference of the whole circle
$= \pi d = \pi \times 9 = 9\pi$



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

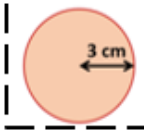
$= \frac{240}{360} \times 9\pi$
$= \frac{2}{3} \times 9\pi = 6\pi$

Perimeter

Perimeter is the length around the outside of the shape
This includes the arc length and the radii that encloses the shape

Perimeter = $\frac{\theta}{360} \times \pi d + 2r$ $= 6\pi + 9$

Area of circle = πr^2



$A = \pi r^2 = \pi \times 3^2$
$= 9\pi\ cm^2$
$= 28.27\ cm^2$

Sector

Remember a sector is part of a circle
Area of the whole circle = πr^2
$= \pi \times 6^2 = 36\pi$

Sector area = $\frac{\theta}{360} \times \pi r^2$

$= \frac{120}{360} \times 36\pi$ $= \frac{1}{3} \times 36\pi$ $= 12\pi$

Volume of a cylinder

Volume Cylinder = $\pi r^2 h$

A cylinder is a prism – cross section is a circle

$V = \pi r^2 h$
$= \pi \times 42 \times 10$
$= \pi \times 160$
$= 160\pi\ cm^2$

Give your answer in terms of π

$= 502.7 cm^2$ Answer as a decimal

Surface area of cylinders

Surface area cylinder = $2\pi r^2 + \pi dh$

The length of shape B is the circumference of the circles. The width of shape B is the height of the cylinder.

The area of two circles (top and bottom face) + the area of the curved face

Y10 Angles and bearings

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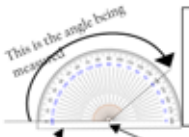
Measure angles to 180°



Read from 0° on the base line. Remember to use estimation. This is an obtuse angle so between 90° and 180°

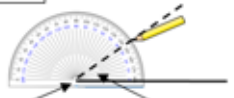
The base line follows the line segment

Make sure the cross is at the point the two lines meet

Draw angles up to 180°

Draw a 35° angle

Make a mark at 35° and join to the angle point (use a ruler)

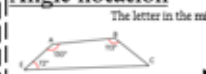


Make sure the cross is at the end of the line (where you want the angle)

The angle

Angle notation

The letter in the middle is the angle



Angle Notation: three letters **ABC** This is the angle at B = 113°

$\angle ABC$ is also used to represent the angle at B.

Scale drawings

1 : 20

For every 1cm on the model there are 20cm in real life

Remember: Scale drawings ONLY change lengths and distances.
Angles remain the same

Understand and represent bearings

- A bearing is always measured from NORTH
- It is always given as three figures

The angle indicated starts from the North line at A and joins the path connecting A to B.

This angle shows the bearing of B from A

The bearing of B from A is calculated by measuring the highlighted angle

Using estimation it is clear this angle is between 090° and 180°

The sentence... "Bearing of ___ from ___" is really important in identifying the bearing being represented.

Directions

Clockwise Anti-Clockwise

Measure bearings

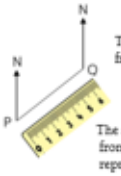
The bearing of the cow to the barn.

This angle is measured from NORTH
It is measured in a clockwise direction
Estimation indicates this angle is between 180° and 270°
Use a protractor to measure accurately
Remember: bearings are written as three figures.

The auxiliary line is drawn to help you measure and draw the angle that is measured to represent the bearing.

Scale drawings & bearings

Remember – angles DO NOT change size in scaled drawings



The bearing measurements do not change from "real life" to images

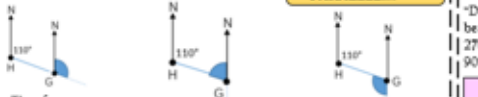
The units in the ratio scale are the same

The scale may need to be calculated from the image. This represents 30km from P to Q.

6cm : 30km
6 : 3000000

Bearing with parallel lines

TWO North lines are PARALLEL....



They form corresponding angles and therefore are the same size

They form co-interior angles and add up to 180°

They form alternate angles and therefore are the same size

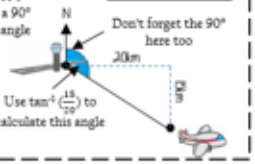
Bearings with right-angles

Look for Right-angles: Pythagoras and/or SOHCAHTOA

"Due West" bearing of 270° makes a 90° angle

"Due East" bearing of 090° makes a 90° angle

A plane flies East for 20km then turns South for 15km. Find the bearing of the plane from where it took off.



Don't forget the 90° here too

Use $\tan^{-1}\left(\frac{15}{20}\right)$ to calculate this angle

Maths (Foundation)

Y10 Ratio

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Compare with ratio

"For every dog there are 2 cats"

Dogs: Cats

1 : 2

The ratio has to be written in the same order as the information is given.
e.g. 2:1 would represent 2 dogs for every 1 cat.

Units have the be of the same value to compare ratios

Ratios and fractions

Trees: Flowers

3 : 7

Fraction of trees

Number of parts of in group / Total number of parts = 3/10

Trees

Flowers

Ratio

Fraction

Sharing a whole into a given ratio

James and Lucy share £350 in the ratio 3 : 4

Work out how much each person earns

James: Lucy

3 : 4

James

Lucy

£350

Find the value of one part

Whole: £350

7 parts to share between

(3 James, 4 Lucy)

£350 ÷ 7 = £50

□ × one part = £50

Put back into the question

James: Lucy

× 50 3 : 4 × 50

£150 : £200

James = 3 x £50 = £150

Lucy = 4 x £50 = £200

£350

Ratio and graphs

Graphs with a constant ratio are directly proportional

- Form a straight line
- Pass through (0,0)

The gradient is the constant ratio

Ratio and scale

A picture of a car is drawn with a scale of 1 : 30

The car image is 10cm

Image : Real life

1cm : 30cm

10cm : 300cm

× 10

× 10

Conversion between currencies

£1 = 90 Rupees

For every £1 I have 90 Rupees

£1 = 90 Rupees

× 10 / × 10

£10 = 900 Rupees

Currency is directly proportional

Currency can be converted using a conversion graph

Rupees

900

10 Pounds

Convert 630 Rupees into Pounds

£1 = 90 Rupees

÷ / ×

630 ÷ 90 = 7

£7 = 630 Rupees

Ratios in 1:n and n:1

Show the ratio 4:20 in the ratio of 1:n

The question states that this part has to be 1 unit. Therefore Divide by 4

4 : 20

1 : 5

This side has to be divided by 4 too – to keep in proportion

This is asking you to cancel down until the part indicated represents 1.

the n part does not have to be an integer for this type of question

Best buys

4 pens costs £2.60

10 pens costs £6.00

"1 pen costs..."

£2.60 ÷ 4 = £0.65

£6.00 ÷ 10 = £0.60

You could work out how much 40 pens are and then compare

The best value has the lowest cost "per pen"

Combining ratios

The ratio of Blue counters to Red counters is 5:5

The ratio of Red counters to Green counters is 2:1

Ratio of Blue to Red to Green

B R G

10 : 6 : 3

Use equivalent ratios to allow comparison of the group that is common to both statements

Lowest common multiple of the ratio both statements share

Y10 Vectors

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Understand and represent vectors

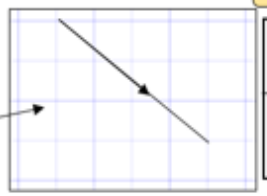
Vectors show both direction and magnitude

Column vectors have been seen in translations to describe the movement of one image onto another

Movement along the x-axis.

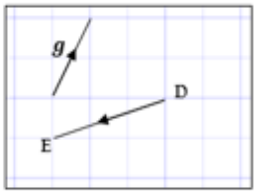
Movement along the y-axis.

$\begin{pmatrix} 4 \\ -3 \end{pmatrix}$



The arrow is pointing in the direction from starting point to end point of the vector.	The direction is important to correctly write the vector
The magnitude is the length of the vector (This is calculated using Pythagoras	The magnitude stays the same even if the direction changes

Understand and represent vectors



Vector notation $\overrightarrow{DE}$ is another way to represent the vector joining the point D to the point E.

$\overrightarrow{DE} = \begin{pmatrix} -3 \\ -1 \end{pmatrix}$

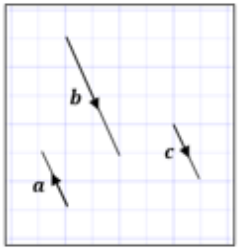
The arrow also indicates the direction from point D to point E

Vectors can also be written in bold lower case so $\boldsymbol{g}$ represents the vector

$\boldsymbol{g} = \begin{pmatrix} 1 \\ 2 \end{pmatrix}$

Vectors multiplied by a scalar

Parallel vectors are scalar multiples of each other



$\boldsymbol{b} = 2 \times \boldsymbol{c} = 2\boldsymbol{c}$

Multiply $\boldsymbol{c}$ by 2 this becomes $\boldsymbol{b}$. The two lines are parallel

$\boldsymbol{a} = -1 \times \boldsymbol{c} = -\boldsymbol{c}$

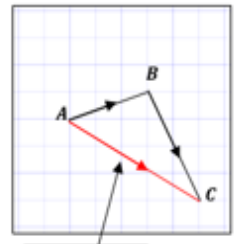
The vectors $\boldsymbol{a}$ and $\boldsymbol{c}$ are also parallel. A negative scalar causes the vector to reverse direction.

$\boldsymbol{b} = -2 \times \boldsymbol{a} = -2\boldsymbol{a}$

$\boldsymbol{a} = \begin{pmatrix} -1 \\ 2 \end{pmatrix}$ $\boldsymbol{b} = \begin{pmatrix} 2 \\ -4 \end{pmatrix}$ $\boldsymbol{c} = \begin{pmatrix} 1 \\ -2 \end{pmatrix}$

Addition of vectors

$\overrightarrow{AB} = \begin{pmatrix} 3 \\ 1 \end{pmatrix}$ $\overrightarrow{BC} = \begin{pmatrix} 2 \\ -4 \end{pmatrix}$



The resultant

$\overrightarrow{AB} + \overrightarrow{BC}$

$= \begin{pmatrix} 3 \\ 1 \end{pmatrix} + \begin{pmatrix} 2 \\ -4 \end{pmatrix}$

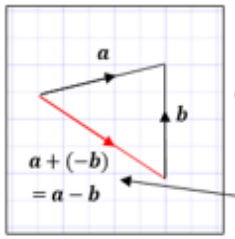
$= \begin{pmatrix} 3+2 \\ 1+-4 \end{pmatrix}$

$\overrightarrow{AC} = \begin{pmatrix} 5 \\ -3 \end{pmatrix}$

Look how this addition compares to the vector $\overrightarrow{AC}$

$\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AC} = \begin{pmatrix} 5 \\ -3 \end{pmatrix}$

Addition and subtraction of vectors



$\boldsymbol{a} = \begin{pmatrix} 5 \\ 1 \end{pmatrix}$ $\boldsymbol{b} = \begin{pmatrix} 0 \\ 4 \end{pmatrix}$

$\boldsymbol{a} + (-\boldsymbol{b}) = \begin{pmatrix} 5 + -0 \\ 1 + -4 \end{pmatrix} = \begin{pmatrix} 5 \\ -4 \end{pmatrix}$

The resultant is $\boldsymbol{a} - \boldsymbol{b}$ because the vector is in the opposite direction to b which needs a scalar of −1

Y10 – Probability

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Add, Subtract and multiply fractions

Addition and Subtraction

$\frac{4}{5} - \frac{2}{3}$

$\frac{12}{15} - \frac{10}{15} = \frac{2}{15}$

Use equivalent fractions to find a common multiple for both denominators

Multiplication

$\frac{3}{4} \times \frac{2}{3}$

$\frac{3}{4} \times \frac{2}{3} = \frac{6}{12}$ ← Parts shaded

Modelled:

3 × 4

Total number of parts in the diagram

Probability Scale

Impossible 0 or 0% | Even chance 0.5, $\frac{1}{2}$ or 50% | Certain 1 or 100%

Probability is always a value between 0 and 1

Sum to 1

The probability of getting a blue ball is $\frac{1}{5}$

∴ The probability of NOT getting a blue ball is $\frac{4}{5}$

The sum of the probabilities is 1

Experimental data

Theoretical probability - what we expect to happen

Experimental probability - What actually happens when we try it out

The more trials that are completed the closer experimental probability and theoretical probability become

Sample space

The possible outcomes from rolling a dice

For possible outcomes from tossing a coin	1	2	3	4	5	6
H	1,H	2,H	3,H	4,H	5,H	6,H
T	1,T	2,T	3,T	4,T	5,T	6,T

P (Even number and tails) = $\frac{3}{12}$

Tables, Venn diagrams, Frequency trees

60 people visited the zoo one Saturday morning.
26 of them were adults. 13 of the adult's favourite animal was an elephant. 24 of the children's favourite animal was an elephant.

Frequency trees

Two-way table

	Adult	Child	Total
Elephant	13	24	37
Other	13	10	23
Total	26	34	60

Venn diagram

in set A AND set B $P(A \cap B)$ | in set A OR set B $P(A \cup B)$ | in set A $P(A)$ | NOT in set A $P(A')$

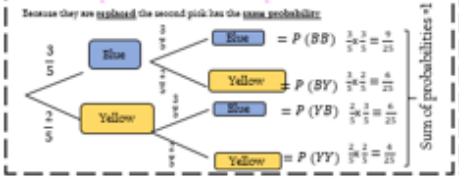
Independent events

The outcome of two events happening. The outcome of the first event has no bearing on the outcome of the other

$P(A \text{ and } B) = P(A) \times P(B)$

Isobel has a bag with 3 blue counters and 2 yellow. She picks a counter and replaces it before the second pick.

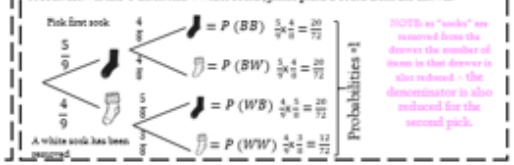
Because they are replaced the second pick has the same probability



Dependent events

The outcome of the first event has an impact on the second event

A sock drawer has 5 black and 4 white socks. Jamie picks 2 socks from the drawer.



A white sock has been removed

NOTE as "socks" are removed from the drawer the number of items in that drawer is also reduced - the denominator is also reduced for the second pick.

Y10 Percentages and interest

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Compare FDP

$\frac{70}{100}$ → This also means 70 ÷ 100 → 70 out of 100 squares → 70 "hundredths" = 7 "tenths" 0.7 → 70 hundredths = 70%

Using a calculator

S-D → Convert to a decimal

This will give you the answer in the simplest form

× 100 converts to a %

Recurring decimals

e.g. $\frac{1}{3}$ = 0.3333333 = 0. 3

Fraction/ Percentage of amount

Find $\frac{3}{5}$ of £60

£60 | £12 £12 £12 £12 £12 | £36

Remember $\frac{3}{5}$ = 60%

10% of £60 = £6

50% of £60 = £30

60% of £60 = £36

Remember $\frac{3}{5}$ = 60% = 0.6

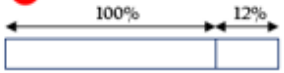
60% of £60 = 0.6 × 60 = £36

Percentage increase/decrease

Decrease by 58%

100% − 58% = 42%

1.00 − 0.58 = 0.42 ← Multiplier Less than 1



Increase by 12%

100% + 12% = 112%

1.00 + 0.12 = 1.12 ← Multiplier More than 1

Express as a percentage

27 per every 50 shaded → $\frac{27}{50}$ → 54 per every 100 shaded → $\frac{54}{100}$ → 54%

$\frac{13}{30}$ → $\frac{13}{30} \times 100$ = 43.3333....%

Can't use equivalence easily to find 'per hundred'

43%

Decimal percentages are still a percentage.

Calculating interest

Simple Interest

James invests £2000 at 5% simple interest

The original value increases by this amount every year

Compound Interest

Tess invests £100 at 10% compound interest for 3 years

Compound Interest

Tess invests £100 at 10% compound interest for 3 years

£100 × 1.10 × 1.10 × 1.10 = £100 × 1.10 (3)

Original amount | Repeated multiplier | Number of occurrences

Depreciation

Depreciation use multipliers less than 1

e.g. Increase of 10% then a reduction of 10%

× 1.10 × 0.9 = × 0.99

The multiplier

Find the original value

Original amount × Multiplier = Final Value

In a test Lucy scored 60% of her questions correctly. Her score was 24. How many questions were on the test.

Original × 0.6 = 24

24 ÷ 0.6 = 40 marks

10% = 6

100% = 40

Total questions on test

A car sold for a profit £3000 with a profit of 20%. How much was the car originally?

Original × 1.2 = 3000

120% = £3000

10% = £250

100% = £2500

Growth and decay

Growth | Decay

Compound growth and compound decay are exponential graphs

Decay – the values get closer to 0

The constant multiplier is less than one

Growth – the values increase exponentially

The constant multiplier is more than one

Y10 (H) – Working with circles

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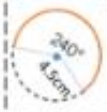
Arc length



Arc length = $\frac{\theta}{360} \times$ circumference

$= \frac{240}{360} \times 9\pi = \frac{2}{3} \times 9\pi = 6\pi$ cm

Area of sectors

Sector area = $\frac{\theta}{360} \times$ area of circle

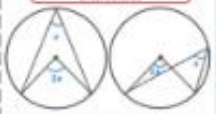
$= \frac{120}{360} \times 36\pi = \frac{1}{3} \times 36\pi = 12\pi$ cm^2

Circle Theorems

1) The angle in a semi-circle is a right angle

2) Angles in the same segment are equal

3) The angle at the centre of a circle is double the angle at the circumference



4) Opposite angles of a cyclic quadrilateral add up to 180°

5) Tangents from a point outside the circle are equal in length

6) The angle between the tangent and radius is 90°

7) The perpendicular from the centre of a circle to a chord bisects the chord

8) Alternate segment theorem

Surface area - cylinders

Area = πr^2

Area = $\pi d \times h$

Area = πr^2

$SA = \pi r^2 + \pi r^2 + \pi dh$

Surface area - spheres

$SA = 4\pi r^2$

$SA = 4 \times \pi \times 3^2$

$SA = 36\pi$ cm^2

πr^2 + $2\pi r^2$

Bottom circle: $= \pi \times 3^2 = 9\pi$

Round surface: $2 \times \pi \times 3^2 = 18\pi$

$= 27\pi$ cm^2

Surface area - cones

Curved SA = πrl

$SA = \pi r^2 + \pi rl$

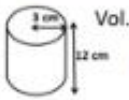
Bottom circle: $= \pi \times 4^2 = 16\pi$

Round surface: $\pi \times 4 \times 10 = 40\pi$

$= 56\pi$ cm^2

Volume - cylinders

Volume = $\pi r^2 h$



Vol. $= \pi \times 3^2 \times 12$

$= 9\pi \times 12$

$= 108\pi$ cm^3

Volume – compound shapes

Volume = Cylinder + hemisphere

$\pi \times 9^2 \times 10$ + $\frac{2}{3} \times \pi \times 9^3$

810π + $\frac{1458}{3}\pi$

810π + 486π

$= 1296\pi$ cm^3

Volume - spheres

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

Vol. $= \frac{4}{3} \times \pi \times 2^3$

$= \frac{4}{3} \times \pi \times 8 = \frac{32}{3}\pi$ cm^3

Volume - cones

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

$= \frac{1}{3} \times \pi \times 4^2 \times 10$

$= \frac{160}{3}\pi$ cm^3

Y10 (H) – Angles and bearings

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Measure and read bearings

What is the bearing of B from A?

2) Measure bearings in a clockwise direction

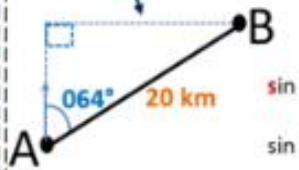
1) Always draw the north line at the point you are going FROM

B from A = 068°

3) Always write bearings in 3 digits

Bearings and trigonometry

The beach(B) is on a bearing of 064° from the Airport (A), at a distance of 20km.
How far east is the beach from the Airport?



$\sin\theta = \frac{\text{Opposite}}{\text{Hypotenuse}}$

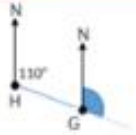
$\sin 64 = \frac{x}{20}$

$x = 20 \times \sin 64$

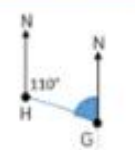
$x = 17.98$ km (2dp)

Bearings with angle rules

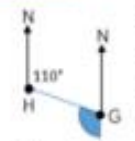
Because two North lines are PARALLEL .....



They form corresponding angles and therefore are the same size

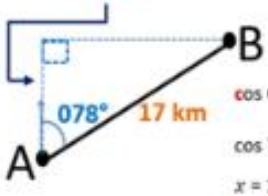


They form co-interior angles and add up to 180°



They form alternate angles and therefore are the same size

The beach(B) is on a bearing of 078° from the Airport (A), at a distance of 17 km.
How far north is the beach from the Airport?



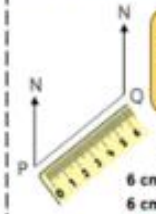
$\cos\theta = \frac{\text{Adjacent}}{\text{Hypotenuse}}$

$\cos 78 = \frac{x}{17}$

$x = 17 \times \cos 78$

$x = 3.53$ km (2dp)

Scale drawings using bearings



Remember – angles DO NOT change size in scaled drawings

6 : 3 000 000

6 cm = 3 000 000 cm

6 cm = 30 000 m

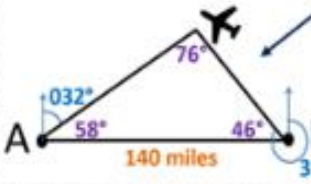
6 cm = 30 km

This represents 30km from P to Q.

Bearings using the sine rule

Alpha is 140 miles west of Beta.
The bearing of a airplane from Alpha is 032° and from Beta it is 316°.
How far is the airplane from Beta?

Angles in a triangle add to 180°



$\frac{a}{\sin 58} = \frac{140}{\sin 76}$

$a = \frac{140}{\sin 76} \times \sin 58$

$a = 122.36$ miles

Maths (Higher)

Y10 (H) – Ratio and fractions

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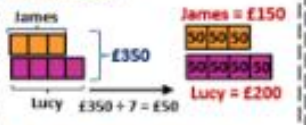
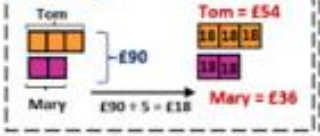
Sharing into a given ratio

E.g. James and Lucy share £350 in the ratio 3:4



E.g. Tom and Mary share £90 in the ratio 3:2



Finding a value given 1:n (or n:1)

Write the ratios in the form 1 : n

a) 7 : 21 ÷7 → 1 : 3 ÷7

b) 5 : 30 ÷5 → 1 : 6 ÷5

c) 3 : 4 ÷3 → 1 : $\frac{4}{3}$ ÷3

d) 7 : 2 ÷7 → 1 : $\frac{2}{7}$ ÷7

Write the ratios in the form n : 1

e) 24 : 8 ÷8 → 3 : 1 ÷8

f) 5 : 6 ÷5 → $\frac{5}{6}$: 1 ÷6

Best Buys

Compare the cost of one unit or units of equal amounts

Cost per item

Shop A: 4 cans for £1.20 ÷4 → 1 can is £0.30

Shop B: 3 cans for 93p ÷3 → 1 can is 31p

Shop A is the best value as it is 1p cheaper per can of pop

Cost per pound

Shop A: 4 cans for £1.20 ÷4 → £1 buys 3.333 cans of pop

Shop B: 3 cans for 93p ÷3 → £1 buys 3.23 cans of pop

Shop A is the best value as £1 buys more cans of pop

Best value is the most product for the lowest price per unit

Ratio and scale

A picture of a car is drawn with a scale of 1:30

1cm on image = 30 cm in real-life

The car image is 10cm:

Image : Real life

1cm : 30cm (x 10)

10cm : 300cm (x 10)

Ratio and fractions

There are blue and red shapes. $\frac{5}{6}$ are red. Write the ratio of blue to red.

Red : Blue

$\frac{5}{6} : \frac{1}{6} = 5 : 1$

There are yellow and green shapes. $\frac{7}{10}$ are yellow. Write the ratio of yellow to green.

Yellow : Green

$\frac{7}{10} : \frac{3}{10} = 7 : 3$

Ratio with area and volume

1) In two similar prisms, the surface area of prism A and the surface area of prism B are in the ratio 25:4

What is the ratio of the volume of prism A to the volume of prism B

	A	:	B	
Length	5	:	2	$\sqrt{}$
Area	25	:	4	$\sqrt{}$
Volume	125	:	8	cube

2) In two similar cubes A and B, the volumes are in the ratio 27 : 343

What is the ratio of the area of cube A to cube B.

	A	:	B	
Length	3	:	7	square
Area	9	:	49	$\sqrt{}$
Volume	27	:	343	$\sqrt[3]{}$

Y10 (H) – Vectors

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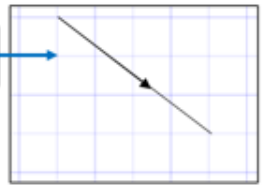
Understand and represent vectors

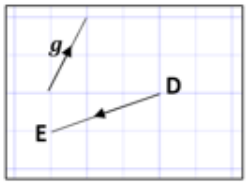
Movement along the x-axis.

Movement along the y-axis.

$\begin{pmatrix} 4 \\ -3 \end{pmatrix}$

Vectors show both direction and magnitude





$\overrightarrow{DE} = \begin{pmatrix} -3 \\ -1 \end{pmatrix}$

The arrow also indicates the direction from point D to point E

$g = \begin{pmatrix} 1 \\ 2 \end{pmatrix}$

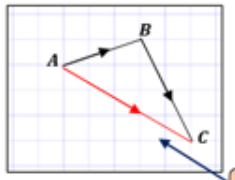
Vectors can also be written in bold lower case so $\boldsymbol{g}$ represents the vector

Addition of vectors

$\overrightarrow{AB} = \begin{pmatrix} 3 \\ 1 \end{pmatrix}$ $\overrightarrow{BC} = \begin{pmatrix} 2 \\ -4 \end{pmatrix}$

$\overrightarrow{AB} + \overrightarrow{BC} = \begin{pmatrix} 3 \\ 1 \end{pmatrix} + \begin{pmatrix} 2 \\ -4 \end{pmatrix}$

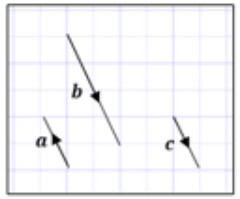
$\overrightarrow{AC} = \begin{pmatrix} 5 \\ -3 \end{pmatrix}$



Resultant vector

Vectors multiplied by a scalar

Parallel vectors are scalar multiples of each other



$b = 2 \times c = 2c$

The two lines are parallel

$a = -1 \times c = -c$

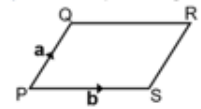
The vectors a and c are parallel. A negative scalar causes the vector to reverse direction.

$b = -2 \times a = -2a$

$a = \begin{pmatrix} -1 \\ 2 \end{pmatrix}$ $b = \begin{pmatrix} 2 \\ -4 \end{pmatrix}$ $c = \begin{pmatrix} 1 \\ -2 \end{pmatrix}$

Vector journeys

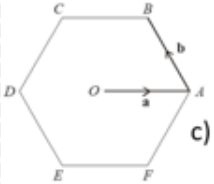
1) PQRS is a parallelogram.



a) $\overrightarrow{PR} = \mathbf{a + b}$

b) $\overrightarrow{QS} = \mathbf{-a + b} = \mathbf{b - a}$

2) *ABCDEF* is a regular hexagon.

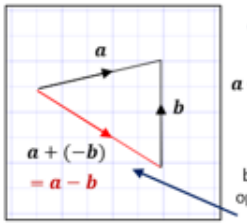


a) $\overrightarrow{OB} = \mathbf{a + b}$

b) $\overrightarrow{AC} = \mathbf{b - a}$

c) $\overrightarrow{EC} = \mathbf{b + a + a + b - a} = \mathbf{a + 2b}$

Addition and subtraction of vectors



$a = \begin{pmatrix} 5 \\ 1 \end{pmatrix}$ $b = \begin{pmatrix} 0 \\ 4 \end{pmatrix}$

$a + (-b) = \begin{pmatrix} 5 + & -0 \\ 1 + & -4 \end{pmatrix} = \begin{pmatrix} 5 \\ -4 \end{pmatrix}$

The resultant is $a - b$ because the vector is in the opposite direction to b which needs a scalar of -1

Y10 (H) – Probability

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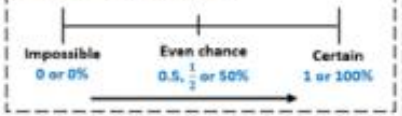
Likeliness of a probability



Sample space diagrams

I roll two dice and add the scores together:

+						
	2	3	4	5	6	7
	3	4	5	6	7	8
	4	5	6	7	8	9
	5	6	7	8	9	10
	6	7	8	9	10	11
	7	8	9	10	11	12

36 outcomes

a) Probability of getting a score of 7? $\frac{6}{36}$

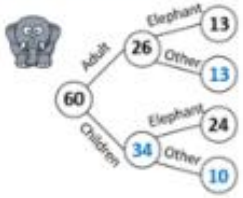
b) P(9) = $\frac{4}{36}$ c) P(3 or 11) = $\frac{4}{36}$

d) P(multiple of 4) = $\frac{9}{36}$

Tables, Venn diagrams, frequency trees

Frequency trees

60 people visited the zoo.
26 of them were adults.
13 of the adult's favourite animal was an elephant.
24 of the children's favourite animal was an elephant.



Two-way table

	Adult	Child	Total
Elephant	13	24	37
Other	13	10	23
Total	26	34	60

P(adult) = $\frac{26}{60}$

P[Child with favourite animal as elephant] = $\frac{13}{37}$

Venn diagram

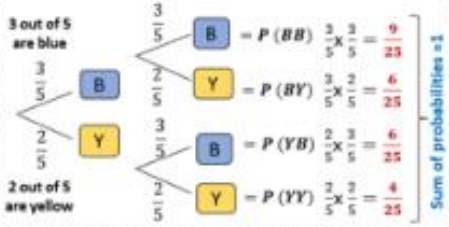
Independent events

The outcome of the first event has no bearing on the outcome of the other

$P(A \text{ and } B) = P(A) \times P(B)$

Tree diagram for independent event

Isobel has a bag with 3 blue counters and 2 yellow. She picks a counter and replaces it before the second pick.



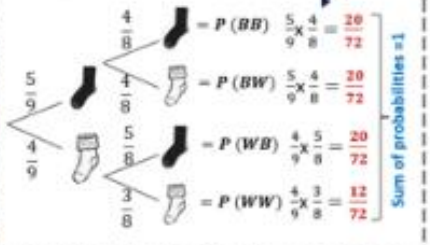
Dependent events

The outcome of the first event has an impact on the second event

When 1 sock is removed, the denominator reduces

Tree diagram for dependent event

A sock drawer has 5 black and 4 white socks. Jamie picks 2 socks from the drawer.



Y10 (H) – Percentages and interest

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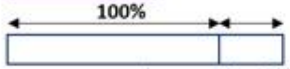
Percentage Increase/ Decrease

Decrease by 58%

1.00 – 0.58 = **0.42**

Multiplier

Increase by 12%



100% + 12% = 112%

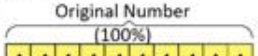
1.00 + 0.12 = **1.12**

Multiplier

Reverse Percentages

"40% of my number is 16. What am I thinking of?"

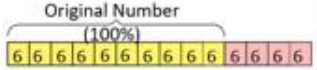
Original Number (100%)



40% = 16
10% = 4
100% = 40

"140% of my number is 84. What is the original number?"

Original Number (100%)

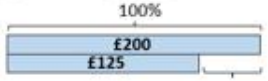


140% = 84
10% - 6
100% = 60

Try to scale down to 10% or 1% and then scale back up to 100%

Percentage change

"I bought a phone for £200. A year later sold it for £125."

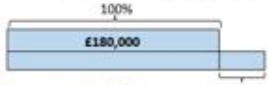


Percentage loss:

difference → 75, original → 200 $\times 100 = 37.5\%$

$$\frac{\text{Difference in values}}{\text{Original value}} \times 100$$

"I bought a house for £180,000. I later sold it for £216,000."



Percentage profit:

difference → 36000, original → 180000 $\times 100 = 20\%$

Simple Interest

For each year of investment the interest remains the same

E.g. Invest £100 at 30% simple interest for 4 years

100 x 0.3 (30%) x 4 (4 years) = **£120**

E.g. Invest £500 at 2.5% simple interest for 3 years

500 x 0.025 (2.5%) x 3 (3 years) = **£37.50**

Compound Interest

Interest charged on the original amount and additional interest payments.

Interest = £38.45

E.g. Invest £500 at 2.5% compound interest for 3 years

$500 \times 1.025^3 = £538.45$ (3 years)

Increase by 2.5%

Repeated percentage change

E.g. A television is priced at £800

The price is **reduced by 35%** and then **increases by 12%**

Calculate the price now.

800 x 0.65 x 1.12 = **£582.40**

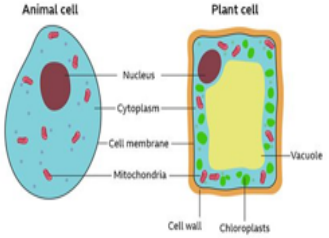
Reduce 35% ↑ Increase 12% ↑

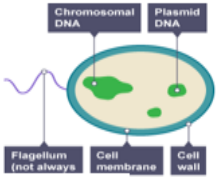
Cell Biology

Science

1. Prokaryotic and Eukaryotic Cells

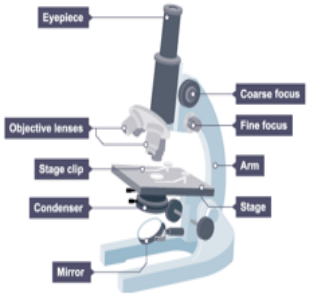
Organisms are made up of cells. Most organisms are multicellular and have cells that are specialised to do a particular job. Eukaryotic cells contain a nucleus (animal and plant) whilst prokaryotic cells do not (bacteria).





2. Microscopes

Microscopes are needed to study cells in detail. Magnification means the amount by which the image of an object is scaled up whilst resolution refers to how clear the image is. There are two main types of microscope; light microscope and electron microscope.



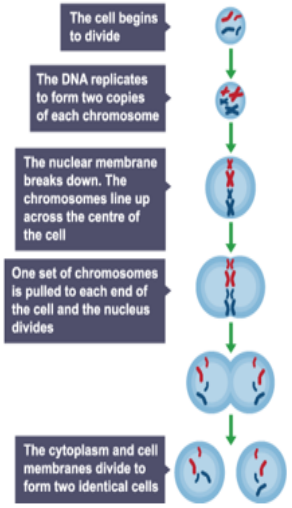
Magnification = Image size ÷ actual size

3. Specialised Cells

Specialised cells include;
Sperm and Egg cells
Muscle cells
Nerve cells
Red blood cells
Root hair cells

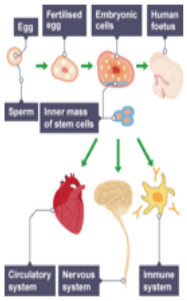
4. DNA and Mitosis

Chromosomes carry genetic information in a molecule called DNA. A type of cell division called mitosis ensures that when a cell divides it produces two identical daughter cells. Mitosis is important for growth and replacement of damaged cells.



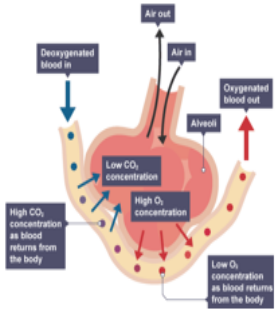
5. Stem Cells

Stem cells are undifferentiated cells. They can be obtained from embryos or from *bone marrow*. There are ethical issues around using stem cells and therapeutic cloning.



6. Diffusion

Diffusion is the movement of particles from an area of high concentration to low concentration.



7. Rate of Diffusion

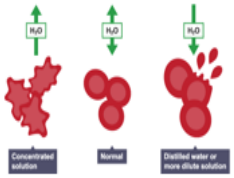
The rate of diffusion can be affected by the concentration gradient, the surface area and the temperature.

7. Diffusion in the Lungs

Diffusion is the process by which oxygen moves into the lungs and carbon dioxide moves out of the lungs.

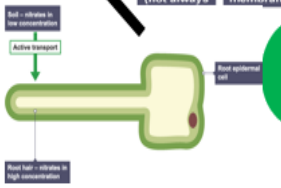
8. Osmosis

Osmosis is the movement of water from an area of high concentration to low concentration through a semi-permeable membrane.



9. Active Transport

Active transport is the movement of particles from an area of low concentration to an area of high concentration against the concentration gradient. This requires energy.



10. Surface Area and Volume

Volume of a cube = length X width X height

Surface area = number of sides X (height X width of one face)

Bioenergetics

1. Photosynthesis is where plants use carbon dioxide from the atmosphere, water and sunlight to make Glucose and oxygen.

Photosynthesis

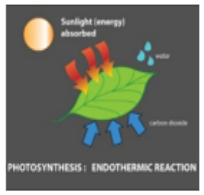
Word equation

Carbon dioxide + Water —(Light, Chlorophyll)→ Glucose + Oxygen

Symbol equation

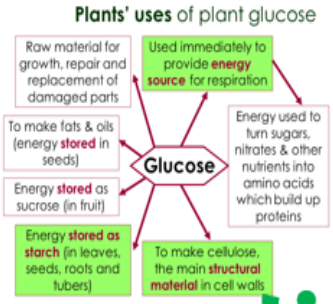
$6CO_2 + 6H_2O \xrightarrow{\text{Light, Chlorophyll}} C_6H_{12}O_6 + 6O_2$

Photosynthesis is an **Endothermic** reaction. It takes heat energy in from its surrounding to happen. It gets the heat energy from the sunlight.



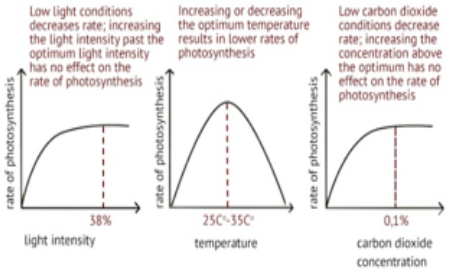
2. Uses of Glucose

During photosynthesis, plants make glucose. The glucose is uses in many ways in the plant.



3. Factors affecting Photosynthesis

The rate (speed) of photosynthesis is affected by light intensity, carbon dioxide concentration, temperature and the amount of chlorophyll in the leaf.



Higher tier only

Key factors can interact to limit photosynthesis.

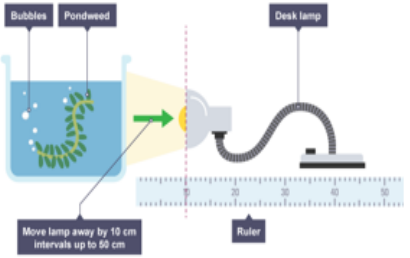
Higher tier only

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

$$\text{light intensity} \propto \frac{1}{(\text{distance from light source})^2}$$

4. Photosynthesis Required Practical

Photosynthesis can be affected by how much light there is. This is called a Limiting Factor. The greater the distance of the light from the plant, the less the plant will photosynthesise.



5. Aerobic Respiration

Respiration is a chemical reaction that requires oxygen to release ENERGY to the CELLS.

Aerobic respiration occurs in the mitochondria of cells and is an Exothermic Reaction.

glucose + oxygen ⟶ carbon dioxide + water

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

6. Anaerobic Respiration

Anaerobic Respiration is a chemical reaction that does NOT require oxygen to release ENERGY to the CELLS.

glucose ⟶ lactic acid + energy

In plants & fungi

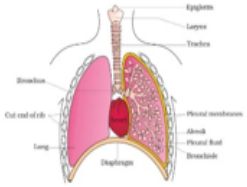
Glucose ⟶ Ethanol + Carbon Dioxide

Higher tier only

Blood takes **Lactic acid** to the Liver. During exercise the body develops an OXYGEN DEBT.

Anaerobic respiration in yeast cells is called **fermentation**.

7. Response to Exercise



The response to Exercise. The body needs more oxygen during exercise, heart rate, breathing rate and breath volume increase.

8. Metabolism is the sum of all the reactions in a cell or the body. The energy transferred by respiration in cells is used for the processes of metabolism that synthesise new molecules.

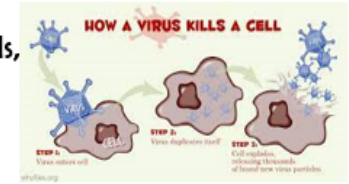
Infection and Response

1. Communicable Disease

Diseases caused by pathogens are called communicable diseases. This means they can be transferred from one person to another.

A pathogen is a microorganism that causes a disease. There are four main types of pathogen.

2. Viruses



Viruses live and reproduce inside cells, causing cell damage.
Examples: measles, HIV, AIDS, Tobacco mosaic (plants)
Treatment: Antibiotics can not kill a virus because they're inside body cells.

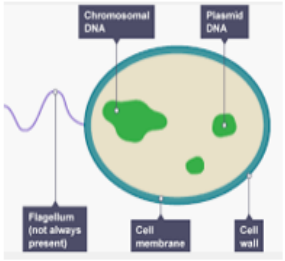
3. Protists

Protists are a group of microorganisms that have features that belong to animals, plants and fungi.
Examples: Malaria, which is spread by mosquitos (vector)
Prevention: mosquito nets, repellent, antimalarial drugs

3. Fungal Disease

Fungal diseases
Not all fungi cause disease, e.g yeast.
Examples: athletes foot, rose black spot (plants)
Transmission: contact
Treatment: antifungal medication, removing infected leaves

4. Bacterial Diseases



Bacteria reproduce rapidly inside the body and may produce toxins that make us feel unwell.
Examples: salmonella, Gonorrhoea.
Prevention: good hygiene, barrier – condoms
Treatment: Antibiotics

5. Antibiotics

Commonly prescribed antibiotics are becoming less effective due to overuse and failing to complete the full course.
Antibiotic resistance increasing.
These bacteria are commonly known as superbugs.

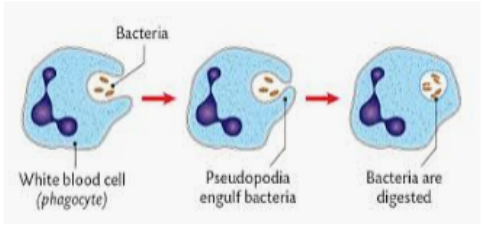
6. Human Immune System

Humans have an immune system, which can defend them from pathogens.

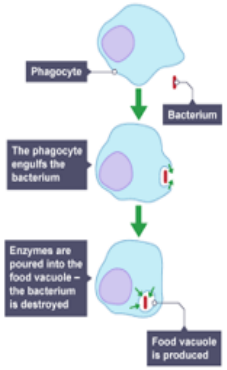
Non-specific defence

The specific defence (immune system)

There are two types of white blood cell called phagocytes and lymphocytes.



Phagocytes engulf pathogens and destroy them.



Lymphocytes:
Release antibodies and destroy pathogens
Produce antitoxins that neutralise the toxins released by pathogens

6. Vaccines

Vaccines allow a dead or altered forms of the disease causing pathogen to be introduced into the body, which contain a specific antigen. This causes the immune system, to produce complementary antibodies, which target and attach to the antigen.

7. Drug Development

New **drugs** are being developed all the time. New medical drugs have to be trialed to ensure safety, effectiveness and correct dosage

Organisation

1.Multicellular Organisms

In order of increasing complexity, multicellular organisms are made of:
cells → tissues → organs → organ systems

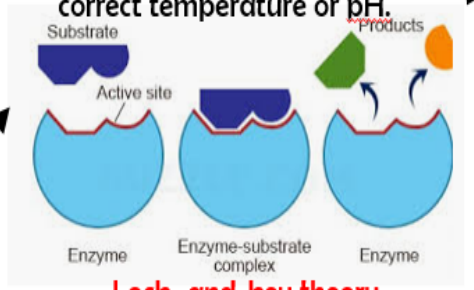
2. Human Digestive System

The human digestive system has two functions:
•breaks down complex food substances
•provides the very large surface area for maximum absorption of food

3.Enzymes

Most of the food we eat is complex carbohydrates, proteins and lipids. These must be broken down to be absorbed into the body.
Enzymes are biological catalysts– they speed up chemical reactions (e.g. breaking down large fool molecules)

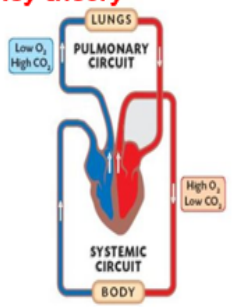
Enzymes can denature if not at the correct temperature or pH.



Lock–and-key theory

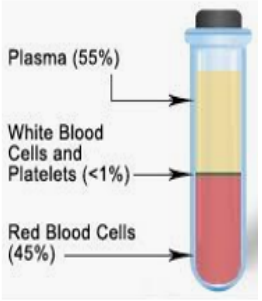
4.Circulatory System

Humans have a double circulatory system.
The heart pumps blood through two circuits:
1.the pulmonary circulation
2.the systemic circulation



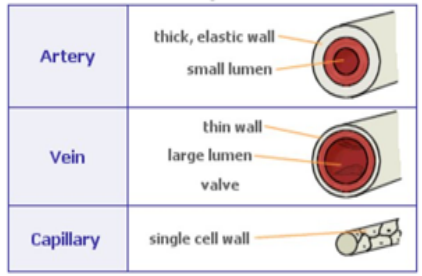
5. Blood

Blood is made up of 4 components:



6. Blood Vessels

Blood is transported in **arteries**, **veins** and **capillaries**.



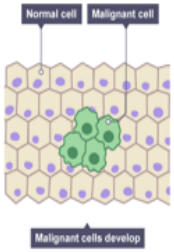
7. Coronary Arteries

The coronary arteries may become blocked by a build-up of fatty material, caused by certain kinds of 'bad' cholesterol. This can lead to coronary artery disease.

8. Risk Factors

Something that increases the likelihood of developing a disease is called a risk factor, e.g. lifestyle choices; smoking, alcohol, drugs, diet.

When a cell becomes cancerous, it begins to grow and divide uncontrollably. A group of cancerous cells produces a growth called a tumour.

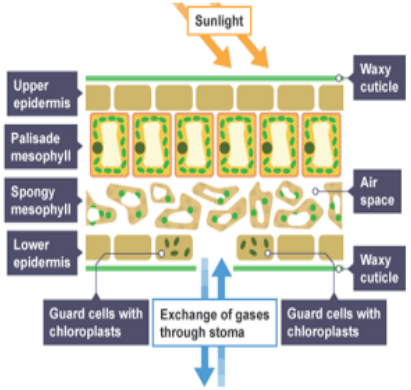


9. Non Communicable Disease and Cancer

Non-communicable, which are not transferred between people or other organisms e.g. cancer

10. Plant Leaves

Plant leaves are adapted for photosynthesis

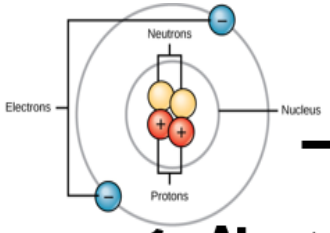


11. Plant Organisation

The plant transport system include the tissues – xylem and phloem

	Xylem	Phloem
Type of transport	Physical process	Requires energy
Substances transported	Water and minerals	Products of photosynthesis; includes sugars and amino acids dissolved in water
Direction of transport	Upwards	Upwards and downwards

ATOMIC STRUCTURE AND THE PERIODIC TABLE



1. Atoms

Everything is made up of tiny things called atoms. They have a radius of around 0.1nm. Their nucleus is about 1/10,000 the size of the atom.

2. Subatomic Particles

Protons and neutrons are around the same size, we say they have a mass of 1. Electrons have almost no mass. Protons have a positive electrical charge, neutrons are neutral and electrons have a negative charge.

ATOMIC PARTICLE	CHARGE	MASS
PROTON	+1	1
NEUTRON	0	1
ELECTRON	-1	1/2000

3. Mass Number and Proton Number

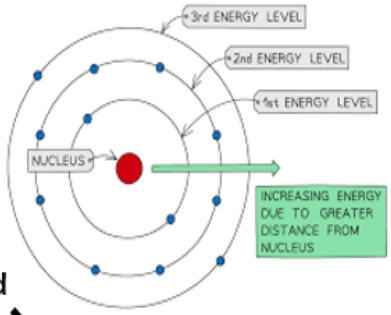
4. Electrons

Electrons fill the shell closest to the nucleus

When a shell becomes full of electrons, additional electrons have to be added to the next shell

The first shell can hold 2 electrons

The second shell can hold 8 electrons

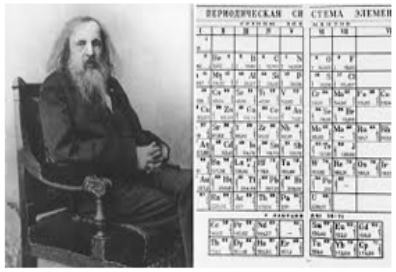


5. Why are atoms neutral?

The number of protons (positively charged) and electrons (negatively charged) are equal in an atom. Therefore the opposite charges are balanced and thus there is no net charge on the atom.

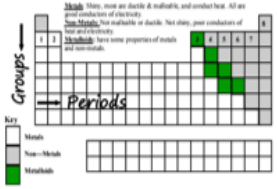
6. Mendeleev

For years, scientists tried to put the elements into some kind of order based on their mass and their properties. A Russian scientist named Dmitri Mendeleev is credited with developing the periodic table. He left gaps for elements that hadn't yet been discovered.



7. Modern Periodic Table

The modern periodic table is ordered according to atomic number (the number of protons in an atom), not atomic mass. The columns are called groups and the rows are called periods.



8. Metals and Non-Metals

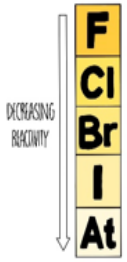
Property	Metals	Non-metals
Electron arrangement	1 – 3 outer shell electrons	4 – 7 outer shell electrons
Bonding	Metallic bonding due to loss of outer shell electrons	Covalent by sharing of outer shell electrons
Electrical conductivity	Good conductors of electricity	Poor conductors of electricity
Type of oxide	Basic oxides (a few are amphoteric)	Acidic oxides (some are neutral)
Reaction with acids	Many react with acids	Usually do not react with acids
Physical characteristics	• Usually lustrous (shiny) • Solid at room temperature (excluding mercury) • Malleable, can be bent and shaped • High melting and boiling points	• Dull, non-reflective • Different states at room temperature • Flaky, brittle • Low melting and boiling points

9. Group 1- Alkali metals

Soft metals, all very reactive. React with water to produce an alkali and hydrogen gas. React easily with group 7 elements. Get more reactive as you go down the group.

10. Group 7- Halogens

Colourful non-metals, all very reactive. All very poisonous. Get le reactive as you go down the group. Melting point and boiling point increase as you go down the group.



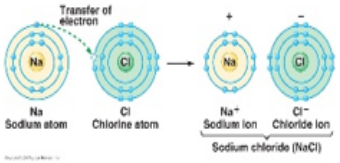
11. Group 0- Noble gases

All very unreactive. Melting points and boiling points increase as you go down the group.

BONDING, STRUCTURE and PROPERTIES OF MATTER

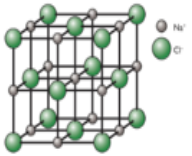
1. Chemical bonds

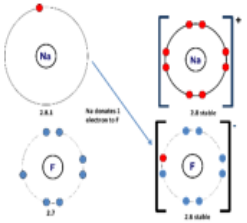
There are 3 main types of bonds; ionic, covalent and metallic. They involve the transfer or sharing of electrons. Ions are charged particles, made when electrons are lost or gained.



2. Ionic bonding

Between a metal and n on-metal non-metals. Metal atoms lose electrons to become positively charged ions. Non-metal atoms gain electrons to become negatively charged ions.



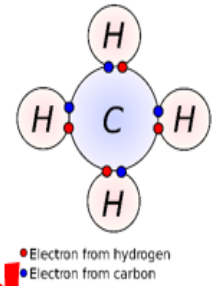


3. Properties of Ionic Compounds

An ionic compound is a giant lattice of oppositely charged ions.
High melting and boiling points. Conduct electricity when molten or dissolved.

4. Covalent bonding

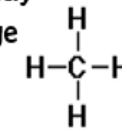
Between 2 non-metals. When atoms share pairs of electrons, they form covalent bonds. These bonds between atoms are strong.



5. Small covalent molecules

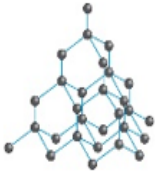
These have weak forces between the molecules and are usually gases or liquids that have relatively low melting points and boiling points.

Covalently bonded substances may consist of small molecules. Some covalently bonded substances have very large molecules, such as polymers..



6. Giant Covalent Structures

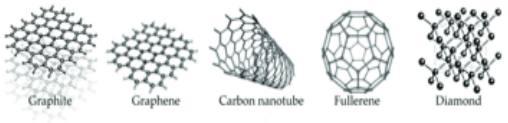
Are solids with very high melting points. Contains lots of covalent bonds with need lots of energy to overcome. Examples are Diamond, Graphite and Silicon dioxide.



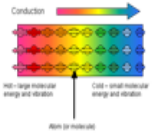
7. Bonding of Carbon

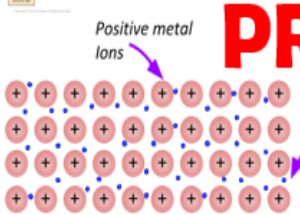
Diamond
Graphite
Graphene

All made from carbon. Each have a different number of carbon atoms.



8. Metallic bonding





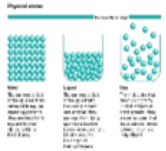
Metallic bonding occurs in metallic elements and alloys.
Metals consist of giant structures of atoms arranged in a regular pattern. The electrons in the outer shell of metal atoms are delocalised and so are free to move through the whole structure.

Properties of Metals

Conduct heat and electricity because of the delocalised

9. States of matter

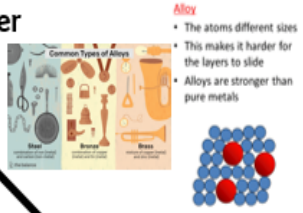
The three states of matter are solid, liquid and gas.



State Symbols

Solid (s)
Liquid (l)
Gas (g)
Aqueous solution (aq)

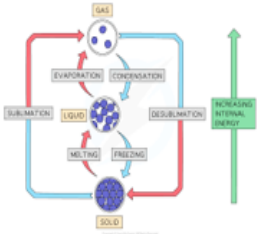
Alloys



These are combinations of metals, the mixture of metals changes the atom structure and so alloys are

10. Changing state

Changes of state are physical changes. Can be explained using the particle model.



ENERGY CHANGES

1. Energy in Reaction

Energy is conserved in chemical reactions.

There are two types of reaction:

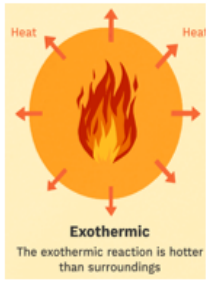
Exothermic

Endothermic

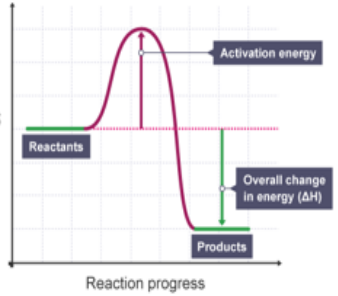
Each bond requires a different amount of energy to break/make.

2. EXOTHERMIC REACTIONS

An exothermic reaction is a chemical reaction that releases energy through light or heat.



Exothermic reactions include combustion, many oxidation reactions and neutralisation. Everyday uses of exothermic reactions include self-heating cans and hand warmers.



The energy level decreases in an exothermic reaction. This is because energy is given out to the surroundings.

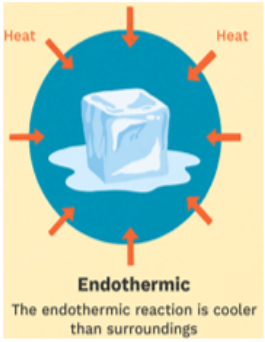
Higher tier only

In an exothermic reaction, the energy released from forming new bonds is greater than the energy needed to break existing bonds.

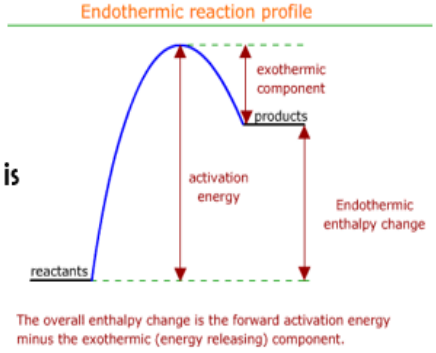
3. ENDOTHERMIC REACTIONS

An endothermic reaction is a chemical reaction that absorbs energy rom the surroundings.

Endothermic reactions include some sports injury packs.



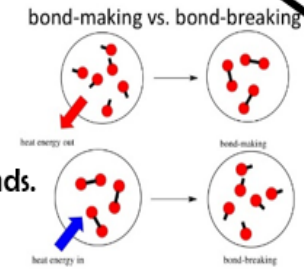
The energy level increases in an endothermic reaction. This is because energy is absorbed from the surroundings.



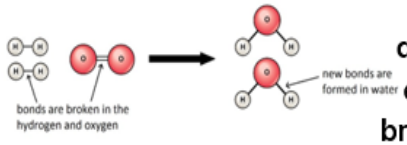
Higher tier only

In an endothermic reaction, the energy needed to break existing bonds is greater than the energy released from forming new bonds.

4. Making and Breaking Bonds

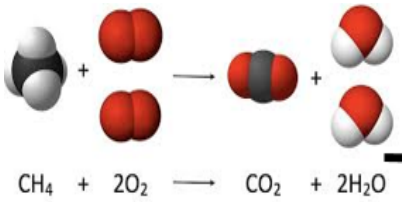


Energy is absorbed to break bonds. **Bond-breaking** is an **endothermic** process. Energy is released when new bonds form. **Bond-making** is an **exothermic** process. Whether a reaction is endothermic or exothermic depends on the difference between the energy needed to break bonds and the energy released when new bonds form.



Each bond requires a different amount of energy to break/make.

QUANTITATIVE CHEMISTRY



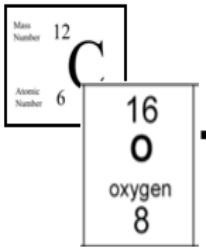
1. Conservation of Mass

The law of conservation of mass states **that no atoms are lost or made during a chemical reaction.**

So the mass of the products equals the mass of reactants.

2. Relative Formula Mass

Relative formula mass (M_r) **is the sum of relative atomic masses** (A_r) in the numbers shown in the formula.



A_r of C=12, O=16.

M_r of CO_2 = 12 + (16x2) = 44

Balancing equations: The total M_r of the reactants must equal the total M_r of the products.

$2H_2 + O_2 \rightarrow 2H_2O$

3. Mass when a product is a Gas

Some reactions can appear to see a change in mass but this is usually because a gas is made. **This gas may escape during the reaction.**

Higher tier only

A **mole** (mol) is 6.02×10^{23}

This number is also known as Avogadro's constant.

If you have the formula mass of a substance in grams, you have one mole of that substance. So;

- 44g of CO_2 = 1 mol = 6.02×10^{23} molecules
- 4g of He = 1 mol = 6.02×10^{23} atoms

You can practice this here:

Higher tier only

4. Calculating Moles

Number of moles = mass / M_r

You are expected to use moles to calculate the amount of a reactant or product and to balance equations.

5. The masses of reactants and products can be calculated from balanced symbol equations.

$Mg + 2HCl \rightarrow MgCl_2 + H_2$

This shows that 1 mole of magnesium reacts with 2 moles of hydrochloric acid to make 1 mole of magnesium chloride and 1 mole of hydrogen.

6. Limiting reactants

Higher tier only

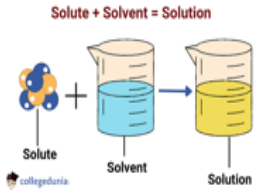
In a chemical reaction using two reactants, it is usual that one of the reactants is in **excess** and the other is used up. The one that is used up is known as the **limiting reactant**.

Higher tier only

7. Concentration of Solutions

The concentration of a solution is measured in g/dm^3

Concentration = Mass (g) / Volume (dm^3)



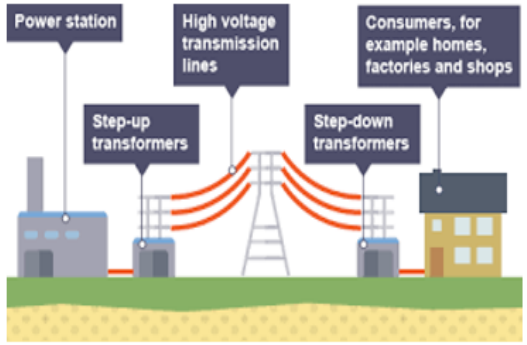
Solute = solid to be dissolved

Solvent = the liquid usually water

Solution = the solid dissolved in the liquid

Electricity

7. NATIONAL GRID



The National Grid is a system of CABLES and TRANSFORMERS supplying electrical power.

In a step up transformer:

-Potential difference is increased
-Current is decreased
-This means less power is lost as heat energy from the cables.

In a step down transformer:

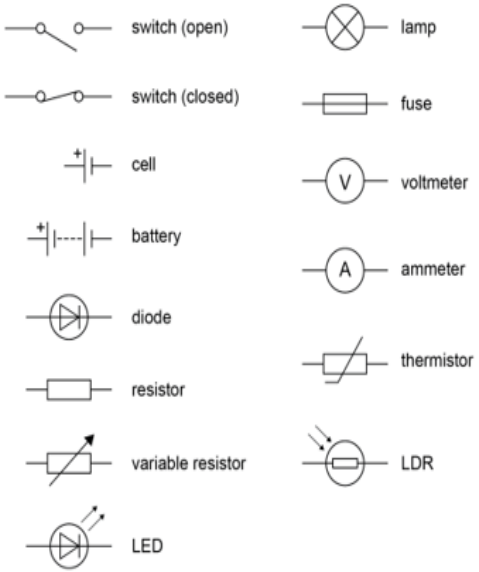
-Potential difference is decreased
-Current is increased
-This makes it safer for domestic use.

6. POWER & ENERGY

Electrical appliances convert energy from one store to another. The amount of work they do can be calculated by using the equation:

Energy transferred = power x time

1. CIRCUIT SYMBOLS

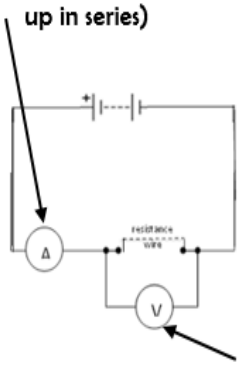


2. CURRENT, P.D. and RESISTANCE

Current is the **rate** that charge flows at.

Charge flow = current x time

Measured with ammeter (set up in series)



Potential difference (voltage) is measured with a voltmeter (set up in parallel)

	Current	Potential Difference	Resistance
Series	Same everywhere	Source p.d. is shared out among components	Add up resistors
Parallel	Splits at junctions (and rejoins)	Each branch gets the same as source p.d.	Less than lowest individual resistor

$V = IR$

V = Potential Difference (Voltage)
I = Current
R = Resistance

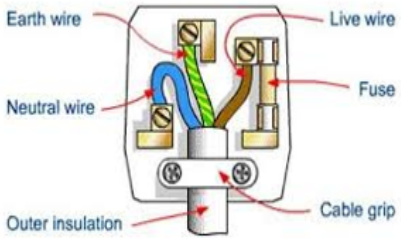
Increasing the resistance (Ω) in a circuit will decrease the current (A) (inversely proportional).

Increasing the potential difference (V) across a resistor will increase the current (A) (directly proportional).

5.PLUGS

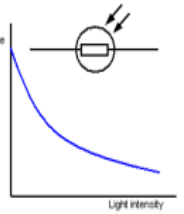
In the UK, the electrical supply is 230V a.c. frequency = 50Hz

The 230V a.c. arrives along the LIVE wire and returns along the 0v NEUTRAL wire. The EARTH wire does nothing unless there is a fault where it protects you from the live wire!

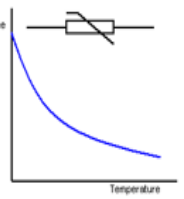


4. LDRS and THERMISTORS

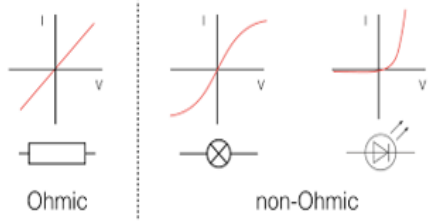
LDR: If the light intensity increases, resistance decreases.
e.g.- street lights



Thermistor: If the temperature increases, resistance decreases
e.g. - thermostat



3. RESISTORS



I-V graphs show how the resistance (gradient) of a component changes.

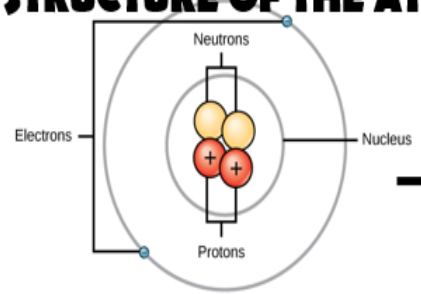
Ohmic resistor = current α potential difference

Bulb = Resistance increases as the filament heats up.

Diode = Current only flows one way

ATOMIC STRUCTURE

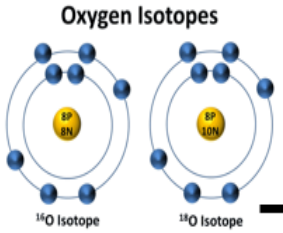
1. STRUCTURE OF THE ATOM



Atoms are very small, having a radius of about 1 × 10-10 metres. The radius of a nucleus is less than 1/10 000 of the radius of an atom. Most of the mass of an atom is concentrated in the nucleus.

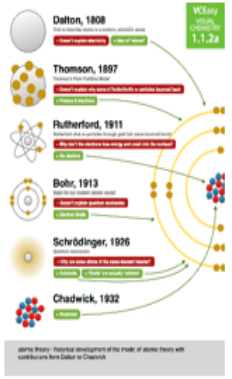
The mass number is the number of neutrons and protons, The atomic number is the number or protons or electrons.

$^{12}_{6}C$ — 12 ← Mass Number; 6 ← Atomic Number



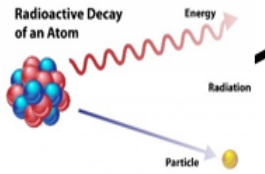
Isotopes are elements that have the same number of protons but a different number of **NEUTRONS.**

2. HISTORY OF THE ATOM



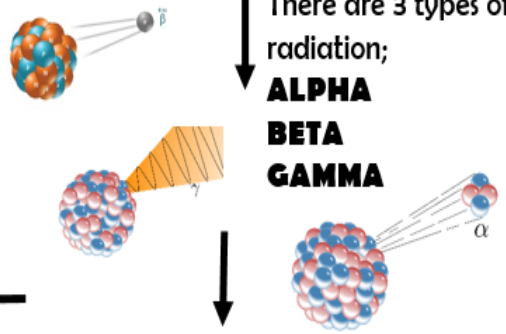
The structure of the atom has developed over many years and lots of scientists have developed theories of the structure of the atom.

3. RADIOACTIVITY

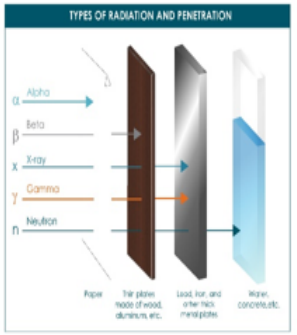


Some atomic nuclei are unstable. The nucleus gives out radiation as it changes to become more stable. This is a random process called radioactive decay.

There are 3 types of radiation;
ALPHA
BETA
GAMMA



Each type of radiation has different penetrating abilities. Alpha stopped by paper, beta stopped by aluminium and gamma stopped by lead.



Each type of radiation has different ionising abilities.

Nuclear equations are used to represent radioactive decay.

$^{4}_{2}He$ $^{0}_{-1}\beta$

Alpha decay causes both the mass and charge of the nucleus to decrease.

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

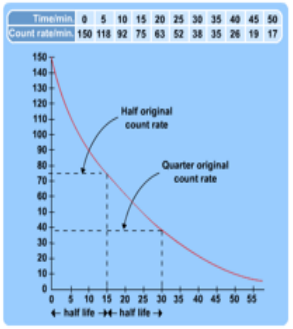
Beta decay does not cause the mass of the nucleus to change but does cause the charge of the nucleus to increase.

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

The emission of a gamma ray does not cause the mass or the charge of the nucleus to change.

4. HALF-LIFE

Radioactive decay is random. The half-life of a radioactive isotope is the time it takes for the number of nuclei of the isotope in a sample to halve.



5. IRRADIATION AND CONTAMINATION

Radioactive contamination is the unwanted presence of materials containing radioactive atoms on other materials. Irradiation is the process of exposing an object to nuclear radiation. The irradiated object does not become radioactive.

GOOD & EVIL: If God exists why is there so much suffering in the world?

Key ideas	Essential knowledge
1 Catholic beliefs about the origin of evil 	➢ ***FREE WILL*** – *humans choose to do wrong and cause most suffering.* ➢ ***ORIGINAL SIN*** – *God created a perfect world but Adam and Eve went against God & so brought pain and suffering into the world.* ➢ ***AUGUSTINE'S VIEW*** - *God made a perfect world. Fallen angels caused chaos in nature which caused natural evil and Adam & Eve brought moral evil.* • *Evil helps us to appreciate good.* • *Evil is a privation of good.* • *God can bring good out of any suffering*
2. Catholic responses to evil and suffering 	• *We can't understand God so shouldn't try to (Job);* • *We suffer because we love 'grief is the price we pay for love';* • *Discipleship involves suffering.* • *Suffering gives us an opportunity to help others* • *We deserve our suffering when we misuse free will;* • *We can offer up our suffering to be closer to Jesus and we will grow stronger (Pope John Paul Salvifici Doloris).*
3 Jewish beliefs 	• *Don't believe in original sin- humans are born with the ability to do good and evil.* • *Torah teaches that they must struggle against evil - Rosh Hashanah and Yom Kippur give them new start with God when they fail.* • *Some suffering is a test or punishment from God and we shouldn't question God.*
4 Other Christians 	• *John Hick developed St. Irenaeus' ideas.* • *humans were made in the image of God, but were not made perfect.* • *Suffering and evil is the best way for humans to grow to become spiritually perfect.* • *God allows evil and suffering, so that people can grow to be more like God.* • *Hick calls this the process of 'soul making'.*
5 Atheist responses (Hume and Mackie) 	➢ *Suffering proves God does not exist: 'inconsistent triad'* ➢ *Mackie said:* • *We don't need bad to appreciate good.* • *Why does God need to make us better people through suffering? Why not just make us perfect to begin with?* • *Why does God allow us to choose evil?.*

Useful terms	Definition
Discipleship	*A disciple is a 'learner'. Jesus' disciples learn from Jesus' example how to grow to even better people by putting love into action*
Evil	*The absence of good that results in suffering.*
The Fall 	*The biblical story of Adam and Eve, explaining how human beings 'fell' from grace and so live with suffering*
Free Will	*The God given ability to choose right from wrong freely and without being controlled.*
Goodness	*The quality of being like God. Putting the needs of others first.*
Incarnation 	*Means 'made flesh'. The belief that God became human in the person of Jesus.*
Original sin 	*The tendency to go against God. All humans are born with original sin*
Privation	*The absence of something. Catholics believe evil is an absence of good.*
Suffering	*The pain or loss that harms human beings.*

Sources of authority

A. 'the inconsistent triad'
David Hume

B.
"we enjoy and value the good more when we compare it with the evil."
St Augustine, Enchiridion

C.
"For what is that which we call evil but the absence of good?"
St Augustine, Enchiridion

D.
"Greater love has no one than this: to lay down one's life for one's friends."
John 15:13

E.
"Whoever wants to be my disciple must deny themselves and take up their cross and follow me."
Mark 8:34


RE

Germany 1890-1945: Democracy and Dictatorship—Unit 1.

Timeline

1888	Kaiser Wilhelm II becomes Emperor of Germany
1898	The Naval Race: Germany begins to expand its navy to compete with Britain.
1914	The First World War begins.
1918	Nov 9th—Kaiser Wilhelm abdicates. Nov 11th—The First World War ends.
1919	Jan—Spartacus League revolt. June—Treaty of Versailles is signed. Aug—Weimar Constitution is established.
1920	Feb—Founding of the Nazi Party. March—Kapp Putsch.
1923	Jan—French and Belgian troops occupy the Ruhr. Nov—The Munich Putsch.
1924	Aug—Stresemann becomes Foreign Minister and negotiates the Dawes Plan with USA.
1926	Jan—Germany joins the League of Nations.
1929	Feb—The Young Plan is proposed Oct—The Wall Street Crash

Key People

Kaiser Wilhelm II	The ruler of Germany, who had absolute power over the country. His main ambition was to build Germany's empire, which was much smaller than the empires of the other European powers. His desire that Germany should be a world power with an empire was known as 'Weltpolitik'. He began to involve Germany in world affairs, including opposing France's takeover of Morocco in 1905. He began to build up Germany's military from 1898 and threatened Britain's position as the most powerful country in Europe. He wanted Germany to have a large navy to rival Britain's and help him build an empire.
Gustav Stresemann	Stresemann had been a member of Germany's parliament since 1907. After Germany's defeat in WW1, he felt that the only way Germany could be accepted by other European countries was to agree to the Treaty of Versailles' terms. Stresemann was briefly the Chancellor in 1923, but is best known for his work as Germany's Foreign Minister from 1924 until his death in 1929.

Key Terms

Abdicate	To give up the throne of a country.
Article 48	Gave the President of the Weimar Republic the right to rule in a time of crisis without the support of the Reichstag.
Armistice	Agreement, or truce, to stop fighting.
Coalition	Government where two or more political parties combine to rule.
Chancellor	The chief minister of the German government.
Constitution.	A set of rules by which a country is governed.
Dawes Plan	Agreement between USA and Germany in which American loans would be given to Germany to help build their economy.
Diktat	Given by Germans who hated the Treaty of Versailles' terms—'dictated peace'.
Free Corps	A right-wing German paramilitary group that was active in the early years of the Weimar Republic.
Hyperinflation	Sudden, dramatic rise in prices.
Foreign policy	The action and strategy taken by a leader or government in dealing with other nations.
Majority	Over half the votes or politicians in Parliament.
Proportional representation	The amount of votes a political party receives in an election determines how many members of that party sit in the Reichstag.
Putsch	An attempt to seize power or take control using force.
Radical	Very different or extreme idea or approach
Reichstag	The German parliament.
Rentenmark	German currency, introduced in 1924.
Reparations	Payments made by Germany to some of the winning nations for WW1 to pay for the damages of the war
Spartacus League	Group of German communists who wanted a revolution in Germany similar to the Russian Revolution in 1917.
SPD	The Social Democratic Party.
Weimar Republic	The name given to Germany's democratic system between 1913-1933.

Key themes.

The Kaiser's rule and the impact of WW1.

- Kaiser Wilhelm II was extremely powerful and could make his own decisions. By 1914, Germany was a world economic power after it industrialised during the late 1800s. The German working class grew but their pay and conditions were poor.
- The Kaiser introduced Navy laws (1898-1912) to expand the German Empire.
- Many Germans were initially very patriotic towards WW1 in 1914. However, the war made Germany bankrupt, it divided German society and made the country politically unstable. By 11th November 1918, Germany had surrendered and the War was over.

The Treaty of Versailles and the Weimar Republic.

- The Treaty of Versailles was a list of punishments, instructions and orders that Germany had to follow because it lost the war. This included the German military being restricted, Germany had to pay massive reparations and was also forced to take full blame of the war.
- The German people hated the Versailles treaty as they felt it was too harsh and the terms were dictated too them.
- Germany soon established a new government in the form of the Weimar Republic. This new constitution was a set of rules by which Germany was governed where all Germans had equal rights, including the right to vote.
- The Weimar Republic was met with many different forms of opposition. Many saw the leaders of the Weimar Republic as traitors, leading to the creation of the 'stab in the back' myth.
- There was some attempts to overthrow the Weimar Republic too. Some examples are the Spartacus League Revolt, The Kapp Putsch and the Munich Putsch.
- The reparations demand as part of the Versailles treaty crippled Germany. The demands of the payments directly led to the Hyperinflation crisis in 1923.

Stresemann and the Golden Age.

- In 1924, the Weimar politician Gustav Stresemann began to successfully tackle some of the economic, social and political problems.
- Stresemann stopped the hyperinflation crisis and created a stable new currency. He also established new foreign policy which would help German pay off reparations and improved foreign relations by helping Germany join the League of Nations in 1926.
- The 1920s became known as a 'golden age' for German culture with key developments in the arts, literature and design.

History

Paper 2: Changing economic world knowledge organiser

Causes of uneven development:

Development is globally uneven with most HICs located in Europe, North America and Oceania. Most NEEs are in Asia and South America, whilst most LICs are in Africa. Remember, development can also vary within countries too.

Physical causes

Landlocked: Countries struggle to trade without access to ports.

Lack of water: Droughts can lead to crop failure, famine and starvation. Also affects trade and productivity (workers are weaker).

Pests and diseases: These can destroy crops - affects food supplies and exports. Also affects ability to work and tourism (therefore income).

Extreme weather: Too hot or too cold affects what can be grown, and floods can destroy crops/property.

Terrain: Mountainous areas are remote and inaccessible so hard to develop - limits economic activity.

Natural disasters: Cause huge amounts of damage to houses, businesses and infrastructure - affects the economy and takes a long time to recover from.

Historical causes

Colonialism: Countries were part of empires, which took raw materials and sent them back to Europe. These countries struggled after independence.

Economic causes

Trade: Some countries have a lack of resources to trade and haven't got enough money to set up industries - end up exporting low value goods.

↑$↓ Fluctuating prices: If prices go up and down all the time countries are not guaranteed a decent income.

Debt: LICs took out loans to fund development projects - must pay back interest too, so less money to spend on important services, e.g. schools and healthcare

Political causes

Conflict: Money is spent on warfare than important services. Other countries don't want to trade, and tourists do not visit as it's too unsafe.

Corrupt governments: Governments mismanage the economy - often leaders live lavish lifestyles whilst their population lives in poverty.

Consequences of Uneven Development:

Levels of development are different in different countries. This uneven development has consequences for countries, especially in wealth, health and migration.

Wealth	Health	migration
People in more developed countries have higher incomes than less developed countries.	Better healthcare means that people in more developed countries live longer than those in less developed countries.	If nearby countries have higher levels of development or are secure, people will move to seek better opportunities and standard of living.

Strategies to reduce the development gap:

Fair trade:
Farmers are guaranteed a minimum price for their produce, and a fair-trade premium goes to the community to spend on projects, e.g. clinics and schools.

Aid:
Money that comes from other countries or NGOs to spend on developmental projects to improve quality of life, e.g. improving water supply or healthcare.

Debt relief:
Countries have their debts written off so they can spend the money on poverty reduction.

Microfinance loans:
Small loans given to people to improve their lives, e.g. to start businesses or make home improvements.

Appropriate technology:
Projects that use cheap and simple technology that is easy to set and maintain by the local community (also called intermediate technology).

TNC investment:
Creates jobs and leads to a multiplier effect in the local area - increased spending and profits, further job creation, more future investment.

Tourism:
Creates jobs directly and indirectly, e.g. hotel staff, tour guides, airport staff, etc - also leads to multiplier effect.

Positives of tourism through the multiplier effect
- **Jobs from tourism** have meant **more money** has been spent in shops and other businesses.
- Government has invested in **infrastructure** to support tourism.
- **New sewage treatment** plants have reduced pollution.

Negatives of tourism
- Tourists do not always **spend much money** outside their resorts.
- Infrastructure improvements **have not spread** to the whole island.
- Many people (the locals) still live in **poor quality housing** and **lack basic services** such as healthcare.

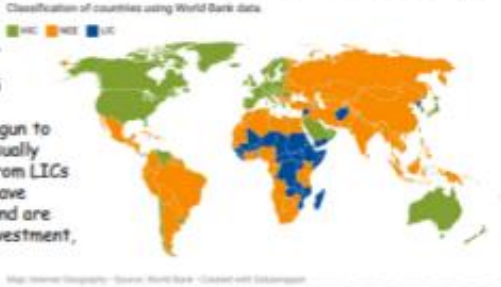
Paper 2: Changing economic world knowledge organiser

Economic status across the globe:

HICs: High-income countries - GNI per capita of above $13,205.

LICs: Low-income countries - GNI per capita of less than $1, 085

NEEs: Newly emerging economies - Countries that have begun to experience higher rates of economic development, usually with higher levels of industrialisation. They differ from LICs in that they no longer rely primarily on agriculture, have made gains in infrastructure and industrial growth, and are experiencing increasing incomes and high levels of investment, for example, Brazil, Russia, China and South Africa (the so-called BRICS countries)



Development is an improvement in living standards through better use of resources.

Social: This is an improvement in people's standard of living. For example, clean water and electricity

Economic: This is an improvement in people's standard of living. For example, clean water and electricity.

Environmental: This involves advances in the management and protection of the environment.

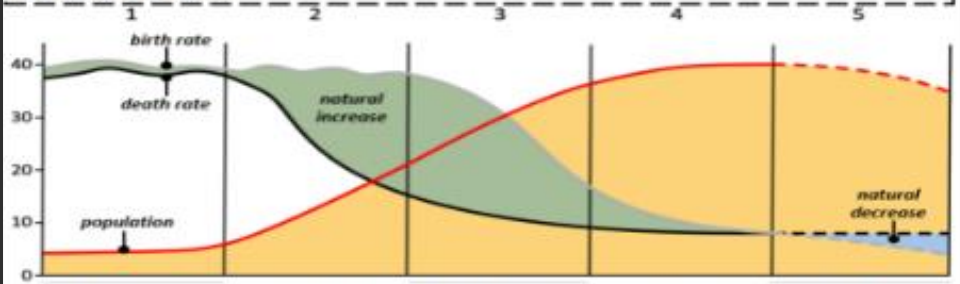
Human development index (HDI):
Composite measure of development - indicators combined to generate a figure of 0-1 (1 = highest development). Includes:
- Wealth: Using Gross National Income (GNI) per capita
- Health: Using life expectancy at birth
- Education: Using expected years of schooling for children of school entering age, and mean years of schooling for adults aged 25 and over

Development indicators:

Social indicators and definitions	
Infant mortality	The number of children who die before reaching 1 per 1000 babies born.
Literacy rate	The percentage of population over the age of 15 who can read and write.
Life expectancy	The average lifespan of someone born in that country.

Economic indicators and definitions	
Gross Domestic Product per capita (GDP)	This is the total value of goods and services produced in a country per person, per year.
Gross National Income per capita (GNI)	An average of gross national income per person, per year in US dollars.

The demographic transition model:
(DTM) shows population change over time. It studies how birth rate and death rate affect the total population of a country.



1	2	3	4	5
Birth Rate - High **Death rate** - High **Population** - Stable **Example** - Isolated tropical rainforest tribal groups.	**Birth Rate** - High **Death rate** - Falling **Population** - Increasing **Example** - Afghanistan	**Birth Rate** - Falling **Death rate** - Falling **Population** - Increasing rapidly **Example** - Many NEEs e.g. Brazil	**Birth Rate** - Low **Death rate** - Low **Population** - Growth slows **Example** - Many HICs e.g. UK	**Birth Rate** - Very low **Death rate** - Low **Population** - Declines **Example** - Japan

Geography

Paper 2 - Changing economic world: Nigeria case study

Introduction:
Location: In West Africa - bordered by Niger, Chad, Cameroon and Benin.
It has an Atlantic coastline in the south.
The capital city is Abuja. Population: 218.5 million (est. 411m by 2050).
GNI per capita: $2,160 ($5,700 PPP).
Culture: Nollywood is the 2nd biggest film industry in the world.

Statistic	1990	2020
Life expectancy	46	54
Secondary school enrolment	25%	42%
Internet users	0%	47%
% with safe drinking water	46	71
Infant mortality rate (per 1000)	126	59

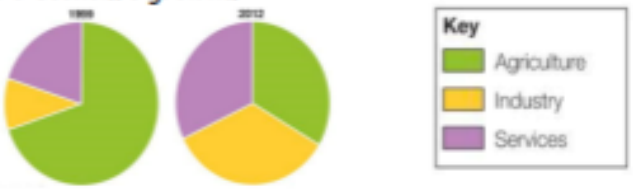
Wider political, social, cultural and environmental context
- **1960** Gained independence from the UK • 1967 - 1970 Civil war followed by 28 years of military government.
- **1998** - Now stable democratic government • 00 ethnic groups - South is Christian (Igbo and Yuroba), North is Muslim (Hausa). Some ethnic boundaries broken by rapid urbanisation
- **Now:** Many countries are starting to invest in Nigeria, e.g. China - huge construction projects
- South is Tropical Rainforest (Cocoa and oil palm crops) and North is Savanna (Peanuts grown)
- Issues in the north with extremist group Boko Haram - want Sharia law and own government. 17,000 dead.

North-south divide:
The north is the Sahel, which is drier. The south is better for farming and has good port links for transport. Boko Harem (extremist group) operate in the north - puts of trade and tourists.

Environmental impacts of industry
- fast/unregulated economic growth has caused environmental issues.
- **Deforestation:** 70-80% of forests lost for farming (cash crops), logging and development of infrastructure and Industry.
- **Desertification (in the north):** From HEP dams - reduces water flow downstream.
- **Contamination of water/soil/air:** From oil spills and burning gas (e.g. Niger Delta)

Aid in Nigeria:
Nigeria receives 4% of aid sent to Africa, but corruption means aid isn't always effective.
WaterAid: Working to improve access to sanitation and reduce disease risk (only 30% have access to a 'decent' toilet).
Nets for Life: Mosquito nets to reduce malaria deaths.

Changing industry:
- Farming has declined, manufacturing and services, e.g. finance and retail, have increased (TNC investment).
- Discovery of oil has fuelled economic growth and huge investment into industry. MINT country (with Mexico, Indonesia and Turkey - rapid economic growth.



Nigeria has moved towards a balanced economy- agriculture, industry and services are now balanced.

TNCs in Nigeria
E.g. Shell Oil (Anglo-Dutch TNC) - huge investment in extracting oil in the Niger Delta.

Benefits of Shell Oil in the Niger Delta:
- Pay taxes and increase export revenue
- Employ 65,000 Nigerians directly and another 250,000 indirectly
- Create a multiplier effect by giving contracts to Nigerian companies

Disadvantages of Shell Oil in the Niger Delta:
- Oil spills cause pollution of water and soil, causing problems for farming and fishing
- Gas flares pollute the air
- Security issues related to oil theft and disruption of supplies by military groups

Advantages of TNCs	Disadvantages of TNCs
Economic Growth and Development - TNCs contribute to economic growth by providing jobs, creating wealth, and improving infrastructure. For example, oil companies like Shell have invested heavily in Nigeria's economy.	**Exploitation of Labour** - Some TNCs pay low wages and provide poor working conditions, often exploiting local workers and not offering significant job security.
Job Creation - TNCs provide employment opportunities for Nigerians, especially in urban areas. For instance, multinational companies in the oil and manufacturing sectors create numerous jobs.	**Uneven development within Nigeria** - TNCs may concentrate their activities in a few areas (e.g. oil-rich regions), leading to regional inequalities and neglect of rural areas.
Investment in infrastructure - Investment by TNCs can lead to the development of infrastructure like roads, schools, and hospitals, which benefits local communities.	**Environmental degrading** TNC activities can lead to environmental pollution, such as oil spills and deforestation, harming local ecosystems and biodiversity.

		Examples:
9	Subjunctive verbs or Subjunctive expressions	**Cuando sea mayor** me gustaría ir a la universidad y **ojalá que sea** guay. **Ojalá pueda aprobar** mis exámenes.
	Idioms	**Trabajo como un burro. Fumarme una clase.**
	Direct object pronouns	No estudio francés. **Lo** estudiaba antes pero ahora no. No me gusta alemán y nunca **lo** estudiado.
	If clauses + the future or conditional	**Si** saco buenas notas, **iré** a la universidad **Si** fuera el/la directora(a) **se debería** llevar maquillaje.
8	Subordinate clauses	Cuando tengo tiempo, voy al club de baloncesto.
7	Si tuviera + conditional Si pudiera + conditional	**Si tuviera** la oportunidad, **cambiaría** las normas. **Si pudiera, llevaría** piercings.
	Future tense	En el porvenir, **estudiaré** mucho y **sacaré** buenas notas porque **tendré** un buen trabajo.
	Infinitive structures	**Quiero estudiar** matemáticas en la universidad **No se debe** comer chicle.
	Imperfect tense	Antes **estudiaba** el francés pero ahora no. Mi escuela primeria **tenía** menos profesores.
6	Reflexive verbs	Mi profesora de educación física **me hace reír** y nunca **se enfada**.
	Complex opinion phrases	**Debo admitir** que **no aguanto** la historia. **Me fastidian**, los deberes son una pérdida de tiempo.
	Conditional tense verbs	**Estudiaría** comercio y ciencias. **Se debería** escuchar música en clase.
5	Superlatives	Mi profesora de matemáticas es **la más** severa. Mi profesor de geografía es **el más** cómico.
	Comparatives	Pienso que el inglés es **más** interesante **que** el teatro. La historia es **menos** divertida **que** el español.
	Preterite tense verbs (irregular)	El año pasado **fui** a un club de fútbol y **fui** a un club de baile. **Toqué** un solo y **fue** un éxito.
	Correct use of ser/estar	La biblioteca **está** al lado de la cafetería pero **es** pequeña.
4	Me gustaría + infinitive	**Me gustaría participar** en el coro. **Me gustaría llevar** mi propia ropa.
	Negative structures	**No** hay **nadie** que le gusta música. El colegio **no** tiene **ni** una piscina **ni** un teatro.
	Preterite tense verbs (regular)	Ayer, **estudié** historia y **jugué** al fútbol después de la escuela.
3	Near future tense verbs	**Voy a ir** al colegio y **voy a estudiar** teatro.
	Time phrases	**A las nueve** tengo ciencias y **luego** tengo la religión.
	Justified opinions	Me gustan las matemáticas **porque tengo buenas notas.**
2	Intensifiers	Pienso que el inglés es **muy** útil y **bastante** fácil.
	Connectives	Me gusta la historia **pero** no me gusta la geografía.
1	Adjectival agreement	Llevo **una** chaqueta negra, **una** camisa blanca y zapatos negros
	Present tense (regular)	**Estudio** español y no **uso** mi móvil en clase.

		Examples:
9	Subjunctive verbs or Subjunctive expressions	When I am older I would like to go to university and I hope that it would be cool. I hope that I can pass my exams.
	Idioms	I work really hard. I skip classes.
	Direct object pronouns	I don't study French. I studied it before but now I don't. I don't like German and I have never studied it.
	If clauses + the future or conditional	If I get good grades, I will go to university. If I were the Head Teacher, you would be allowed to wear makeup.
8	Subordinate clauses	When I have time, I go to basketball club.
7	Si tuviera + conditional Si pudiera + conditional	If I had the opportunity, I would change the rules. If I could, I would wear earrings.
	Future tense	In the future, I will study a lot and I will get good grades because I will have a good job.
	Infinitive structures	I want to study maths at university. You can't each gum.
	Imperfect tense	Before I used to study French but now I don't. My primary school had less teachers.
6	Reflexive verbs	My PE teacher makes me laugh and never gets angry.
	Complex opinion phrases	I have to admit that I can't stand history. Homework angers me because it is a waste of time.
	Conditional tense verbs	I would study business and science. You would be able to listen to music in class.
5	Superlatives	My Maths teacher is the most strict. My Geography teacher is the most funny.
	Comparatives	I think English is more interesting than Drama. History is less fun than Spanish.
	Preterite tense verbs (irregular)	Last year I went to a football club and I went to a dance club. I had a solo and it was a success.
	Correct use of ser/estar	The library is next to the café but it is small.
4	Me gustaría + infinitive	I would like to participate in the choir. I would like to wear my own clothes.
	Negative structures	There is nobody who likes music. School doesn't have a pool or a theatre.
	Preterite tense verbs (regular)	Yesterday I studied history and I played football after school.
3	Near future tense verbs	I am going to go to college and I am going to study drama.
	Time phrases	At 9am I have science and then I have RE.
	Justified opinions	I like maths because I get good grades.
2	Intensifiers	I think English is very useful and quite easy.
	Connectives	I like history but I don't like geography.
1	Adjectival agreement	I wear a black blazer, a white shirt and black shoes.
	Present tense (regular)	I study Spanish and I don't use my phone in class.

Spanish

RAM – Random Access Memory

- Volatile memory – data is lost when the computer is turned off.
- Called random access because data can be directly written to or read from any location.
- Used to hold data and instructions that are currently in use.
- The more RAM a computer has, the more data it can hold simultaneously.

Von Neumann Architecture

Key elements:

- Data and instructions are stored in binary.
- Data and instructions are stored together in **RAM**.
- Instructions are fetched from **RAM** one at a time in order
- The **CPU** decodes and executes an instruction, before fetching the next instruction
- The cycle continues until no more instructions are available

A CPU using Von Neumann architecture have five special registers

- **Program counter** - holds the memory address of the next instruction to be fetched.
- **Memory address register (MAR)** - holds the address of the current instruction.
- **Memory data register (MDR)** - holds the content at the address held in the MAR.
- **Current instruction register (CIR)** - holds the instruction that is currently being decoded and executed
- **Accumulator (ACC)** - holds the results of processing

The fetch-decode-execute Cycle

1. The memory address held in the program counter is copied into the MAR.
2. The address in the program counter is then incremented - or increased - by one. The program counter now holds the address of the next instruction to be fetched.
3. The processor sends a signal containing the address of the instruction to be fetched along the address bus to the computer's memory.
4. The instruction held in that memory address is sent along the data bus to the MDR.
5. The instruction held in the MDR is copied into the CIR.
6. The instruction held in the CIR is decoded and then executed. The results of processing are stored in the ACC.
7. The cycle then returns to step one.

Programming Languages

Low Level Languages – *very close to computer language, hard for humans to understand*

Machine code

CPUs understands machine code can directly execute it.
Consists of 0s and 1s only.
Very difficult to learn, write and debug.

Assembly Language

Also known as Assembly Code
Uses mnemonics (abbreviations)
Easier for humans to understand and program but still difficult
Must be translated into Machine Code for execution
Commonly used to program device drivers

High Level Languages – *easier for humans to understand, using English like words and phrases.*

Much easier to learn, write and debug.
Examples include Python, Java and C

Developing Robust Software

- What threats will the code face?
- Are security features like usernames and passwords needed?
- How will patches be installed and the code updated?
- Is encryption needed?
- Does the code need to create an audit trail?

Audit Trail - a record of what has been done and who or what did it.

Code Review – a check of code by other programmers.

Topic 3 – Computers

	Compilers	Interpreters
Advantages	▪ Translates the whole code in one go into Machine Code. ▪ Optimise the code ▪ Used at the end of development when code is finished ▪ Create error reports and object code	▪ Translate and execute source code ▪ Work line by line. ▪ Syntax is checked ▪ If code is correct it is executed ▪ If code is incorrect interpreting is stopped.
Advantages	▪ Compiled programs run quickly and without needing additional software. ▪ Programs are supplied as executables which cannot be modified. ▪ Optimise code so it runs quickly and uses less memory.	▪ Instructions are executed as soon as they are translated. ▪ Instructions are not stored for later so less memory is needed. ▪ Errors can be quickly spotted.
Disadvantages	▪ Because the source code is translated as a whole, more memory is needed. ▪ Requires a working space for the compiler to perform the translation. ▪ Do not spot errors. ▪ Code must be re-compiled if changed. ▪ Code compiled on one platform will not run on another.	▪ The CPU must wait for each instruction to be translated so execution is slower. ▪ Code is translated each time it is run. ▪ Do not produce an executable file that can be distributed ▪ Do not optimise code.

Embedded Systems

- A small computer which includes hardware and software, designed to control a specific device.
- Forms a part of a larger device such as a washing machine.
- Can perform only a limited number of tasks.
- Have several advantages:
  - Cheaper to design and build.
  - Require less power.
  - Do not need much processing power.

Operating Systems

File management

- Allows users to find and manage data stored by the computer.
- Data is stored in files, within folders, within drives.
- Assigns metadata to files including date created, date modified, last date accessed

Process management

- Allows users to run applications such as web browsers or word processors.
- Multiprogramming enables several programs to run at the same time.
- Each program is made up of instructions. When running, they are called a process.
- Allocates use of the main memory and the CPU between processes.
- A scheduler is used to time the different processes.

Peripheral Management

- Manages input and output between peripherals and a process.
- Data is transferred between input devices, the CPU, and output devices.
- Uses device drivers to communicate with devices.

User Management

- Individual users can be created and deleted.
- Allows more than one person to use a computer with their own files and settings.
- Access levels control user access to systems for security.

Secondary Storage

- Used to store programs and data for longer term when the computer is switched off
- Non-volatile – data is retained with the computer is switched off.
- Not all computers require secondary storage.
- Embedded computers such as a watch do not need to store data when power is turned off.

Magnetic devices

- Use magnetic fields to magnetise individual sections of a spinning disk.
- Each section represents one bit.
- A read/write head moves across its surface.
- Fairly cheap, high in capacity and durable.
- Susceptible to damage if dropped.
- Vulnerable to magnetic fields.

Optical Devices

- Use a laser to scan the surface of a spinning disc.
- The disc surface is divided into tracks, with each track containing flats and hollows.
- The flat areas are known as lands and the hollows as pits.
- Lands reflects the laser light back; pits scatter the beam.
- ROM (Read Only Media) cannot be overwritten. Used for music, films, software and games.
- Read (R) media is blank, can only be written to once, but read many times.
- Read/write (RW) media can be written to more than once.

Solid State Devices

- Use flash memory to store data indefinitely.
- Have faster access times than other devices
- Because they have no moving parts, are more durable.
- More expensive so tend to be smaller in capacity.
- Require little power, so used where battery life is a consideration.
- Portable due to their small size and durability.

Utility Software

File Repair

- Corrupt files can sometimes be repaired.
- Can detect and recover physical errors on the disk and mark damaged sections as unavailable.

Backups

- A copy of data is known as a backup.
- These allow damaged or deleted data to be restored.
- Full backups include every file. This requires a lot of storage and time.
- Incremental backups include new and changed files since the last backup.

Data Compression

- Reduces the size of a file using algorithms.
- Smaller files are easier to transmit.
- Allows more files to be stored in the same space.

Defragmentation

- Files on a disk are broken down into a series of segments.
- When files are deleted, the segments where they were stored are made available for new files.
- The new file may need more segments than the old, and so the segments allocated to it are not together on the disk. This is known as fragmentation.
- A fragmented disk takes longer to read from and write to, making the computer slower.
- Defragmentation software rearranges the segments so that they are stored next to each other.

Anti-Malware

- Protects against viruses, spyware, and other unwanted software.
- Scans the system to identifies potential viruses.
- Will attempt to delete or fix potential threats once they have been identified.
- Runs either when activated or automatically at a specified date and time.

CPU – Central Processing Unit

Control Unit (CU)

Fetches, decodes, and manages the execution of instructions
Issues control signals to control hardware
Moves data around the system

Arithmetic Logic Unit (ALU)

Performs arithmetic and logical operations.
Where calculations are done and where decisions are made.

Registers

Small amounts of high speed memory in the CPU.
Used to store small amounts of data that are needed during processing.

Cache

A small amount of high speed memory In the CPU.
Used to temporarily hold data the CPU will reuse.
Allows for faster processing since as the CPU need not wait for data to be fetched from RAM.

Clock

Used to coordinate all the computer's components.
Sends out a regular electrical pulse to do this.
The frequency of the pulses = clock speed, measured in hertz.
Higher clock speed = greater number of instructions which can be performed at a time.

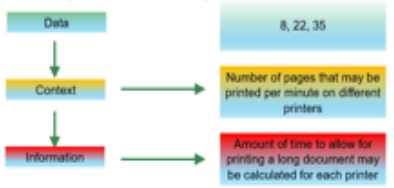
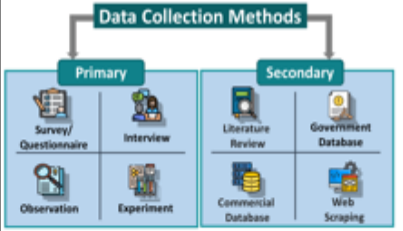
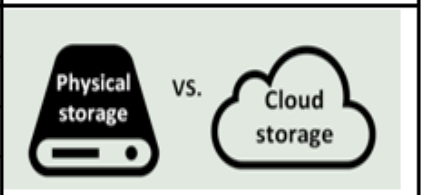
Buses

High speed internal connections.
Used to send control signals and data between the processor and other components.

- Address bus - carries memory addresses from the CPU to other components.
- Data bus - carries data between the CPU and other components.
- Control bus - carries control signals from the CPU to other components.

Computing

TA3 - Data & Testing

What I am Learning	I can	Diagram	Essential Vocab	Links
Information & Data	What is Data		Data, Information, Data Types (Alphanumeric, Numeric, Booleon, Text), Physical, Logical, testing, Validation, Verification	RO60
	What is Information			
	Relationship between data and information			
	How data is converted into information			
Data Use	Identify each data types			
	Know the characteristics of each data type and how it can be used			
Validation & Verification	Explain what validation is and its purpose			
	Explain what verification is and its purpose			
	Different validation tools and purpose of each tool			
	Different verifcation tools and purpose of each tool			
Data Collection methods	What is meant by primary data collection and secondary data collection			
	Aware of primary and secondary collection methods			
	Advantages and disadvantages of each type of primary and secondary collection methods			
	Be able to justify the use of data collection methods to given context			
Storage of Collected data	Aware of the difference between Logical and Physical storage			
	Know the idfferenceb etween the different internal and external storage devices			
	Know the advantages and disadvantages of each storage type			
	Know the characteristics of storage device			
Application of testing	Know why testing is needed			
	Advantages and disadvantages of testing			
	3 different types of test data and its role			
	Know what technical testing and user testing testnig			
	What tests can be used in user testing			

Music terms and signs

Glossary - Eduqas GCSE Music

eduqas

Dynamics

pp	*p*	*mp*	*mf*	*f*	*ff*
PIANISSIMO	PIANO	MEZZO PIANO	MEZZO FORTE	FORTE	FORTISSIMO
very soft (v.quiet)	soft (quiet)	moderately soft	moderately loud	loud	very loud

	
crescendo (cresc.)	diminuendo (dim.)
gradually getting louder	gradually getting quieter

Tempo

LARGO	LENTO/ ADAGIO	ANDANTE/ MODERATO	ALLGRETTO	ALLEGRO/ VIVACE	PRESTO
v.slow	slow	walking pace/ moderate	quite fast	quick/lively	very quick

- **Accelerando:** gradually getting faster
- **Rallentando/ritardando:** gradually getting slower
- **A tempo:** return to the original speed
- **Ritenuto:** in slower time
- **Rubato:** rhythms are played in a more free/flexible way ('robbed time').

Time values

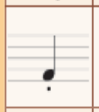
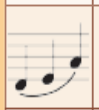
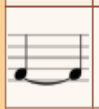
NOTE	NAME	LENGTH (duration)	REST
	Semibreve	4 beats	
	Minim	2 beats	
	Crotchet	1 beats	
	Quaver	½ beats	
	Semiquaver	¼ beats	

A dot after the note increases its length by half:

	Dotted minim	
	Dotted crotchet	

Groups of quavers/semiquavers are usually beamed together:

Terms and signs

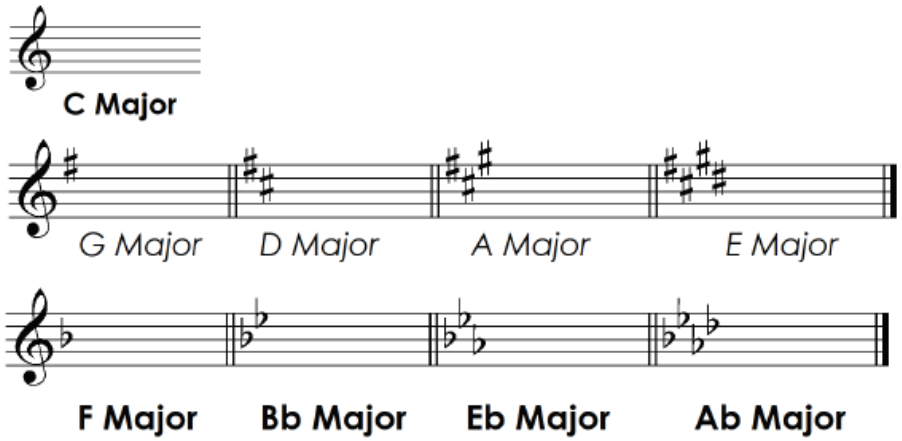
#	Sharp	Raises a note by a semitone.
	Flat	Lowers a note by a semitone.
	Natural	Cancels a previous sharp or flat for a note.
	Staccato	Detached.
	Slur	Play smoothly.
	Tie	Hold the notes for the full value of the tied notes.
	Accent	Emphasize the note (play forcefully).
	Pause	Hold the note longer.
sfz	Sforzando	Sudden stress/ accent.

Music

Music terms and signs

Glossary - Eduqas GCSE Music

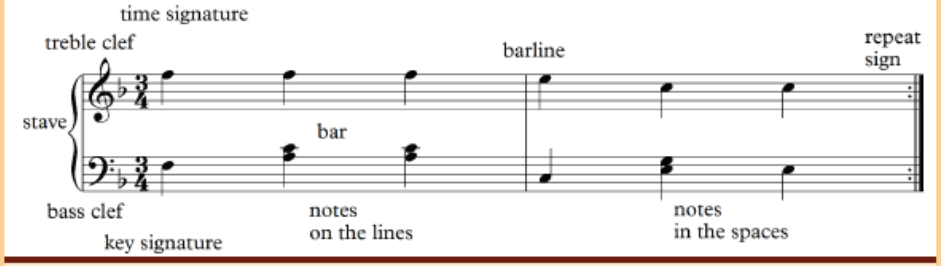
Key signatures



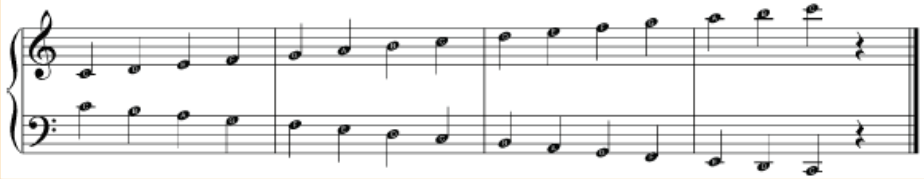
F C G D A E B

Order of sharps # →

← Order of flats *b*

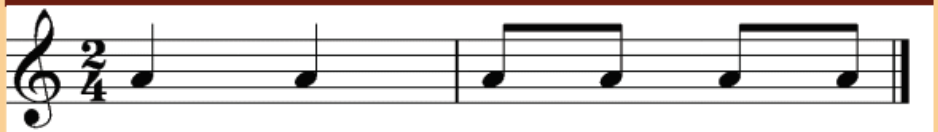


Treble clef notes

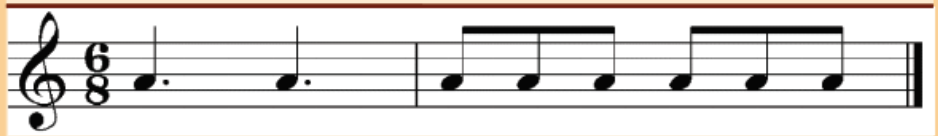


Bass clef notes

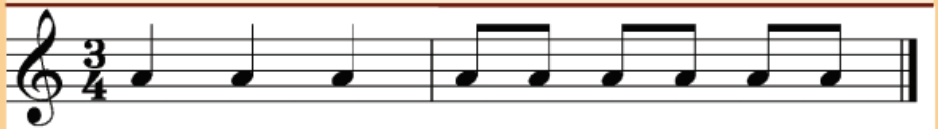
Time signatures



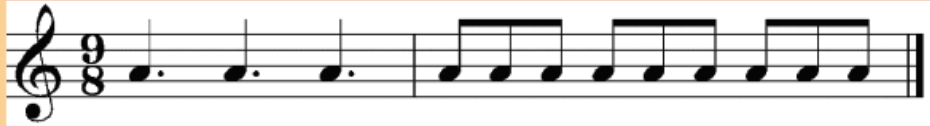
Two crotchet beats per bar: simple duple



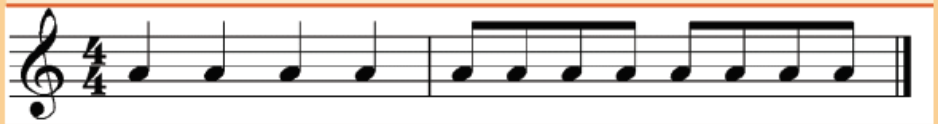
Two dotted crotchet beats per bar: compound duple



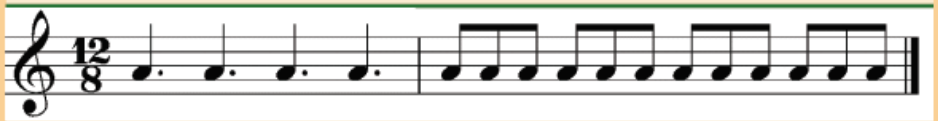
Three crotchet beats per bar: simple triple



Three dotted crotchet beats per bar: compound triple



Four crotchet beats per bar: simple quadruple

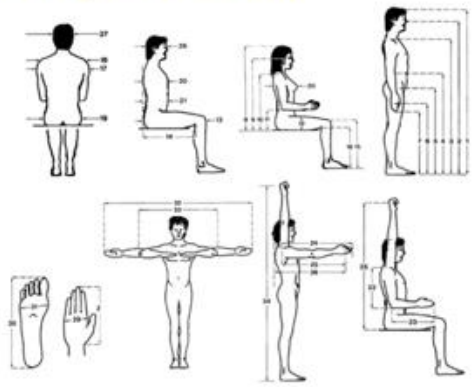


Four dotted crotchet beats per bar: compound quadruple

A triplet is when three notes are played in the time of two.

Knowledge Organiser Y10 Term 2: Graphics

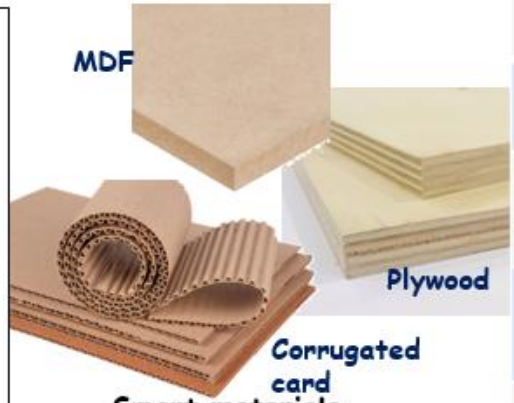
Anthropometric data



Ergonomics

Safe
Comfortable
Efficient

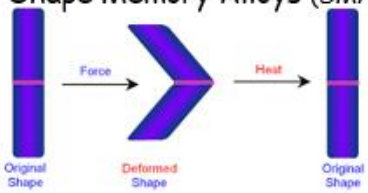
Smart materials

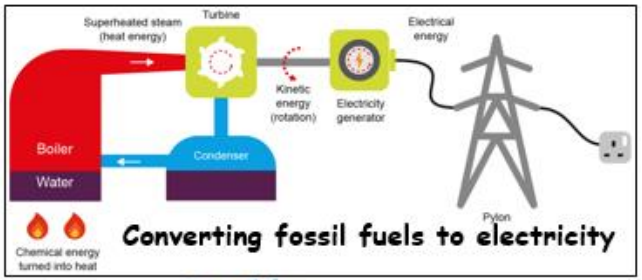


Photochromic

Thermochromic

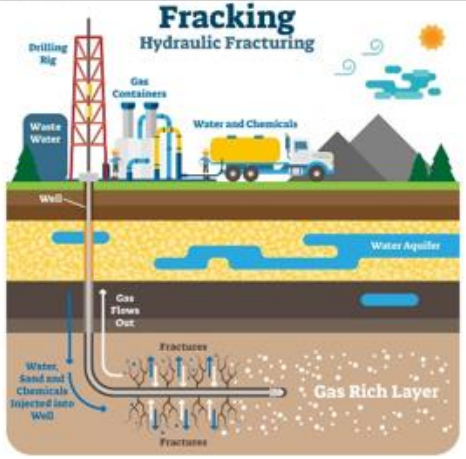
Shape Memory Alloys (SMAs)





Fracking

Hydraulic Fracturing



Design companies

1921-present
Founder: Giovanni Alessi (now run by Alberto)
Homeware "Making the ordinary extraordinary."
Form over function

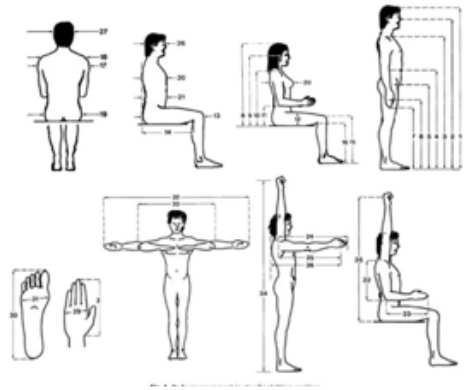
1976-present. Founders: Steve Jobs, Steve Wozniak, Ronald Wayne. Sir Jonathan Ive (Designer)
Tech products that are simple in form but sophisticated in function
Form follows function

Anthropometric data	Human body measurements to design products e.g. hand span, height, weight, wrist.
Ergonomic design	Creating products that are safe, comfortable and easy/ efficient to use.
Manufactured board	Man-made large sheets of wood made using offcuts of natural timbers e.g. MDF, plywood, chipboard etc.
Corrugated card	A card fluted inner core is sandwiched between two outer layers, which can be printed on, Strong, rigid & insulates.
Stock forms	The different shapes that materials can be bought in. Paper/ board are bought in sheets & rolls. Sizes range from A0 to A10
Paper production	Trees are cut down, bark stripped off, wood then cut into small pieces. Chemical or mechanical pulping turns this into pulp. Pulp then bleached & pressed flat between rollers.
Smart material	A material that changes in response to external stimuli & reverts back to its original state once the stimuli are removed.
Thermochromic	Changes colour in response to heat.
Photochromic	Changes colour in response to UV light.
Shape Memory Alloy	An alloy (mix of metals) that can be misshapen when cold but returns to its original shape when heated.
Renewable energy	Energy that is sustainable & will not run out e.g. wind, solar, biomass, tidal.
Non-renewable energy	Energy that is not sustainable & will run out e.g. coal, oil, gas.
Nuclear power	Use of nuclear reactions (nuclear fission of uranium & plutonium) to produce electricity.

Graphics

Knowledge Organiser Y10 Term 2

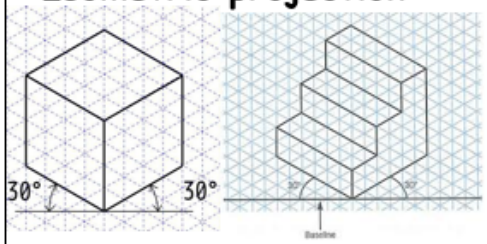
Anthropometric data



Ergonomics

Safe
Comfortable
Efficient

Isometric projection

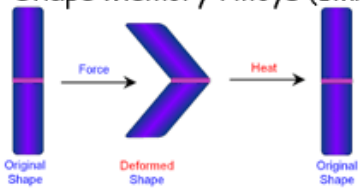


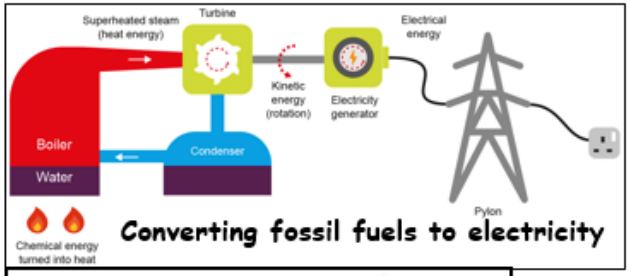
Smart materials

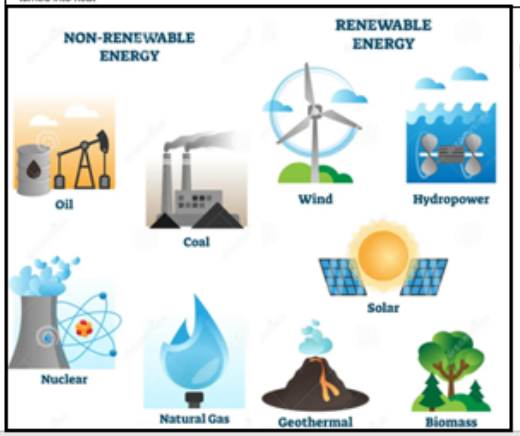
Photochromic

Thermochromic

Shape Memory Alloys (SMAs)







Design companies

1921-present
Founder: Giovanni Alessi (now run by Alberto Alessi)
Homeware "Making the ordinary extraordinary."

1976-present
Founder: Steve Jobs & Steve Wozniak
Tech products that are simple in form but sophisticated in function

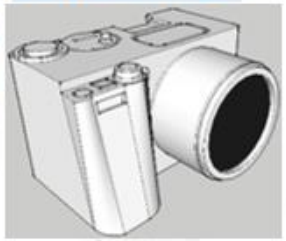
Key word	Definition
Anthropometric data	Human body measurements e.g. hand span, height, weight, wrist circumference etc.
Ergonomic design	The use of average anthropometric data when designing to create products that are safe, comfortable and efficient to use.
Timber	Natural wood e.g. pine, oak, cedar, teak, maple, spruce etc.
Manufactured boards	Man-made large sheets of wood made using offcuts of natural timbers e.g. MDF, plywood, chipboard etc.
Felling	Trees are felled (cut down) using logging machinery. The tress are cut down, stripped of branches and sliced into manageable lengths to send to the saw mill to be converted to planks and boards.
Seasoning	Seasoning timber reduces its moisture content. New timber contains a lot of moisture and is know as green timber. It will twist, warp and split if left in this wet state. It is also open to rotting. The two methods of seasoning are air or kiln drying.
Smart material	A material that changes in response to external stimuli and reverts back to its original state once the stimuli are removed.
Thermo-chromic	Changes colour in response to heat.
Photochromic	Changes colour in response to UV light.
Shape Memory Alloy	An alloy (mix of metals) that can be misshapen when cold but returns to its original shape when heated.
Renewable energy	Energy that is suatainable and will not run out e.g. wind, solar, biomass etc.
Non-renewable energy	Energy that is not sustainable and will run out e.g. coal, oil, gas
Nuclear power	Nuclear power is the use of nuclear reactions (nuclear fission of uranium and plutonium) to produce electricity.

Product Design

Knowledge Organiser Y10 Autumn part 2: Textiles

Physical card prototyping

CAD prototyping



Isometric projection

Exploded drawing

1 Point Perspective

2 Point Perspective

Mass production

Batch production

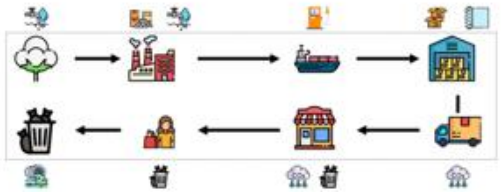
Continuous production

Designer Dame Barbara Mary Quant was a British fashion designer and icon. She became an instrumental figure in the 1960s London-based Mod and youth fashion movements, and played a prominent role in London's Swinging Sixties culture. She was one of the designers who took credit for the miniskirt and hotpants

These buildings are all one-offs!

What is a Life Cycle Assessment?

Use Data Analytics to evaluate the environmental impacts of a fast-fashion retail product over its entire life cycle from production to disposal

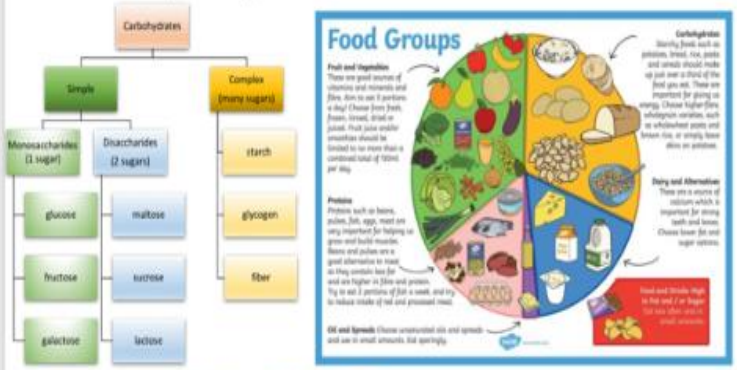


Perspective drawing	Objects get smaller the closer they are to the vanishing points.
Isometric projection	Horizontal lines are at 30°. Most common way of realistically presenting ideas.
Exploded drawing	Drawing showing parts of an object taken apart e.g. IKEA instruction manual
Prototype/ One-off production	Only 1 item is made e.g. bespoke wedding dress. High level of skill & expensive per unit.
Batch production	Set of identical items made. Design can be adapted after each batch e.g . Cupcakes.
Mass production	Popular products made in large quantities. Automation, specialised machines & assembly lines used e.g. cars.
Continuous production	Never stops 24/7. High in demand every day items, little human input e.g. petrol.
JIT production	Items are made to order. No need to store parts in factory. Just In Time.
Automation	Use of machines & computers that can operate without humans (AI…)
CAD/CAM/ CNC	Computer Aided Design/ Manufacture/ Computer Numerical Control. (LASER cutter, 3D printer)
Image manipulation	Editing pictures (resize, filters) using a software such as Photoshop,
6Rs/ Sustainability	Refuse, Reduce, Recycle, Repair, Rethink, Reuse. Creating products with minimal negative impact on the environment.
Life Cycle Assessment	Evaluate the environmental impact of a product, from materials/ production-packaging/transport – usage – disposal.
Planned obsolescence	Design a product to fail (stop working, go out of fashion) e.g. lightbulbs, tights.
Design for	Design a product to last a long time/ be easy

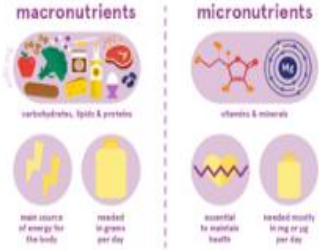
Textiles

Y11 Knowledge Organiser Hospitality and Catering 2.1.1

Understanding the importance of nutrition



Macro and micro nutrients



Special dietary requirements

Knowledge of nutrition at different life stages

Presentation challenges

Fresh pasta

Setting

Key word	Definition
Macronutrient	Macronutrients are the nutrients we need in larger quantities that provide us with energy: in other words, fat, protein and carbohydrate.
Micronutrient	Micronutrients are vitamins and minerals needed by the body in very small amounts. However, their impact on a body's health are critical, and deficiency in any of them can cause severe and even life-threatening conditions.
Carbohydrates	Your body breaks down carbohydrates into glucose. Glucose, or blood sugar, is the main source of energy for your body's cells, tissues, and organs.
Protein	Protein is a nutrient your body needs to grow and repair cells, and to work properly.
Fat	Fats are nutrients in food that the body uses to build cell membranes, nerve tissue (including the brain), and hormones. The body also uses fat as fuel. If fats eaten aren't burned as energy or used as building blocks, they're stored by the body in fat cells.
Vitamins and Minerals	Vitamins and minerals are nutrients your body needs in small amounts to work properly and stay healthy. Most people should get all the nutrients they need by having a varied and balanced diet.
Dietary requirements	The needs of someone who only eats certain types of food, or who needs to avoid certain foods e.g. Vegetarian, lactose intolerant, halal.

Hospitality and Catering

Photography Knowledge Organiser
Project 3: Natural Forms

Key Artists/Photographers:

Karl Blossfeldt

Vanitas Photography

Aneta Ivanova

Jim Swallows

Nikolai Tolstyh

Techniques explored linking to the artists and photographers

Assessment criteria

AO1: Develop ideas through investigations, demonstrating critical understanding of sources.
AO2: Refine work by exploring ideas, selecting and experimenting with appropriate media, materials, techniques and processes.
AO3: Record ideas, observations and insights relevant to intentions as work progresses.
AO4: Present a personal and meaningful response that realises intentions and demonstrates understanding of visual language.

Monochrome:
Photograph single natural forms inspired by Karl Blossfeldt.
Assessment piece: tested on the use of the camera settings changing the ISO, Shutter speed, composition, Photoshop adjustments.

Vanitas Still Life:
Using old objects and flowers a still life composition is set up. Change the ISO and Shutter speed to change the light effect inspired by the 17th Century Vanitas paintings

Double exposure:
Photograph trees and paint various washed of colour using Brusho paints. Photographs are layered using the Opacity and Blending modes in Photo shop.

Colour selection:
Photograph Flowers focusing on compositional elements. Duplicate the image in Photoshop and select the colour using the rubber tool in Photo shop. Hue/Saturation enhancements made

Critical studies/on location photography:
Queen's Park Photoshoot. Use the animal templates to create a set of Photographs inspired by Nikolai Tolstyh

Key vocabulary

Monochrome
Sepia
Still LIfe
Layers
Depth
Focal point
Double exposure
Colour selection
Contrast
Framing
Hue
Saturation
Exposure
Tone
Viewpoints

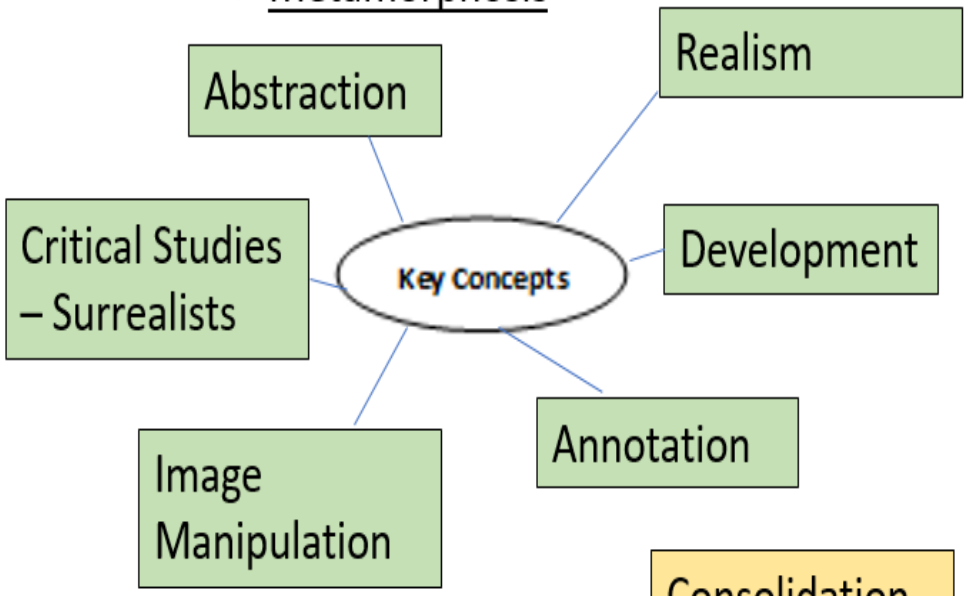
Photography

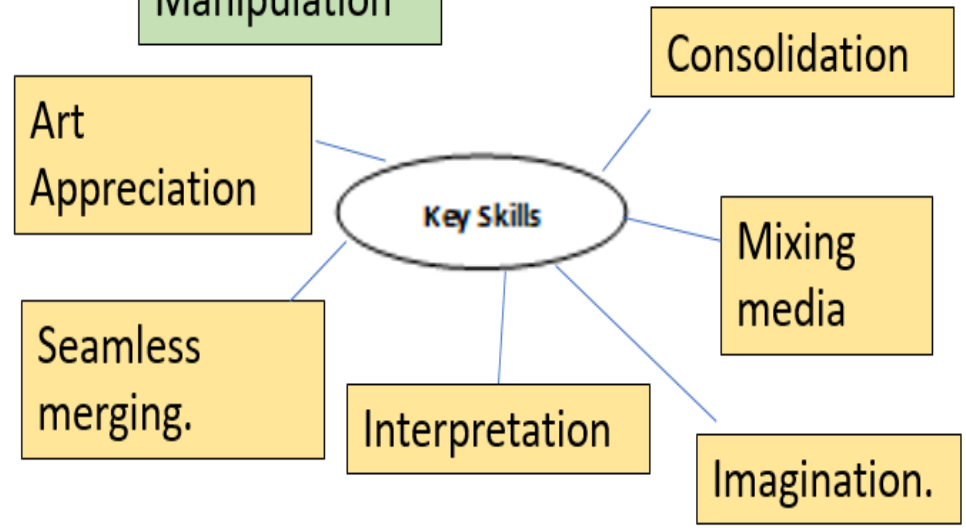
D&T/Art Knowledge Organiser

Name:

Year: 10 Subject: GCSE Fine Art

Period of learning: Metamorphosis





Key vocabulary

Word	Definition	
Metamorphosis	Changing from one state to another	
Abstraction	Expressing thoughts and feelings through art	
Proportion	Dimensions of objects in relation to other objects	
Surrealism	Strange, dream-like images produced by surrealists, e.g Dali	
Contemporary	Art produced by artists alive today	
Anatomical drawings	Detailed sketches of the human form	
Superimpose	To lay an image over another	

Art

Families Knowledge Organiser

Functionalist

The family is a key social structure as it performs several essential functions for individuals and society. Murdock (1949) argues four vital functions:

1. Sexual Function: regulates sexual behaviour that is approved by society.
2. Reproductive function: New family members- procreation & childrearing.
3. Economic function: providing shelter, food & clothes. Economic cooperation between husband & wife.
4. Educational function: primary socialisation and discipling.

Marxist

The family is one of the key institutions that social inequalities are passed on through the generations.

- The bourgeoise pass on their wealth to family members
- Educational advantages are passed down as people from wealthy backgrounds can afford to send their children to private schools
- Through the socialisation process people learn to accept their position.

Feminist

Families have a negative impact on the lives of women. Families socially construct gender differences- canalisation. Children also learn gender expectations through the division of domestic labour e.g. Mum cleaning up.

Segregated conjugal roles:
Clear division of tasks divided into male and female tasks. Husband & wife spend little time together.

Joint conjugal roles:
Do not have a rigid division of household tasks. Husband & wife spend time together.

Household:
Consists of one person who lives alone or a group of people living at the same address.

Reasons for increase in one-person households:

- Remain single and childless
- Divorced
- International migrants
- Living alone through choice
- Cohabiting (potentially before marriage)
- Choosing to live apart from partner.

How have families changed?:

- Smaller (less children)
- Marriage is less likely
- Parents are older
- Joint Conjugal roles
- Family diversity
- Increase in divorce, rise in reconstituted.

Why have families changed?:

- Laws (gay rights, divorce is easier.)
- Rise of feminism
- Diversity
- Technology (contraception, fertility)
- Changing norms & values
- Secularisation- religion is less of an influence.

Parent & child relationship change

Parents are now less **authoritarian**

Families used to rely on children's income until the **Education Act** of 1918 and childhood began

Boomerang children: Young people who leave home (for university or travelling) & return to living with their parent(s)

Children are seen as important members of the family and their opinions are listened to.

Contemporary social issues:

- The quality of parenting
- Relationships between teenagers & adults
- Care of the elderly.

Patterns of marriage:

- Decline
- Later in life
- Civil partnership/same-sex
- Increase in cohabitation
- Increase in births outside of marriage

Patterns of divorce:

- Changes in the law
- Changing social attitudes & values
- Impact of secularisation
- Changes in the status of women
- Influence of media

Consequences of divorce:

- Emotional distress
- Financial hardship
- Remarriage

Nuclear Family (cereal packet)
Father, Mother & Children

Same-Sex Family
Gay or lesbian couple living in a house, possibly with children.

Extended family
Includes relatives beyond the nuclear family

Beanpole Families
Multiple generations of older people and few children

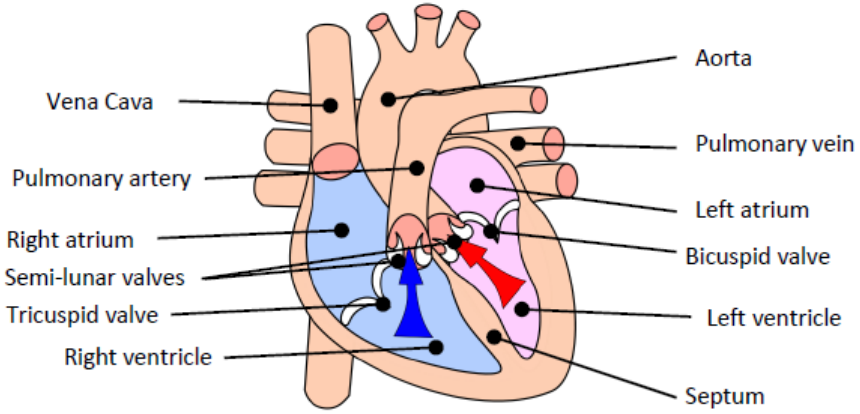
Lone-Parent Families
One parent and child(ren) who live together

Reconstituted Families
Sometimes referred to as a step family. Children from a previous relationship so one adult is a biological parent, the other is a step-

Sociology

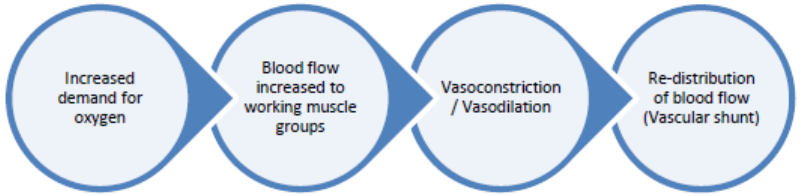
GCSE Physical Education – The structure and functions of the cardiovascular system

Structure of the cardiovascular system

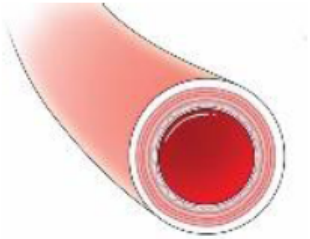


Deoxygenated blood = **BLUE** (Right side)
Oxygenated = **RED** (Left side)

Vascular Shunting



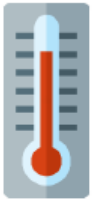
Vasoconstriction – NARROWING



Vasodilation - EXPANDING

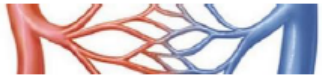
Function of the cardiovascular system

- Transport of oxygen, carbon dioxide and nutrients
- Clotting of open wounds
- Regulation of body temperature



Blood vessels

Arteries	Veins	Capillaries
1. Away from the heart 2. Oxygenated blood (except pulmonary artery) 3. Thick/elastic walls 4. High pressure 5. Small lumen	1. Back to the heart 2. Deoxygenated blood (except pulmonary vein) 3. Thin walls + larger lumen 4. Lower pressure 5. Valves	1. In the tissue 2. Site of gaseous exchange 3. Very thin walls



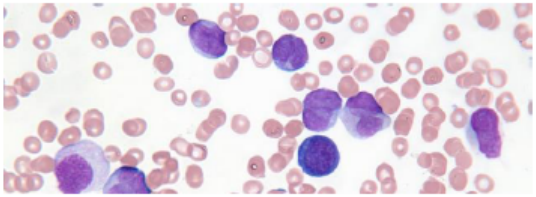
Components of blood - Red blood cells

Carry oxygen from the lungs to the working muscles + Removes CO_2.

Haemoglobin binds the oxygen

White blood cells

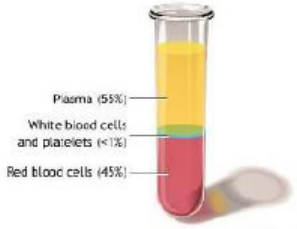
Are part of the immune system and **fight disease** and infection.



Platelets & Plasma

Platelets **clot blood** and form a scab around the site of injury.

Plasma is the **liquid/fluid** part of blood that allows it to flow.



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PE

BLESSED TRINITY RC COLLEGE

Cardio - Respiratory System

Sport and Coaching
Physical Education

Sports and Coaching

Why this ?

Develop knowledge of the **Cardio-Respiratory System** and how it impacts on health, fitness and performance in physical activity and sport.

Why now ?

Examination Paper Foundation blocks. Builds on prior knowledge of body systems from science.

What next ?

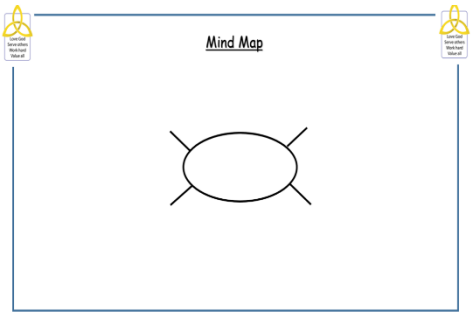
Physical Training: Develop knowledge of the principles of training and different training methods.

1. Check Prior Knowledge
2. Structure & Function Cardio-vascular system
3. Structure of the heart
4. The route blood takes through the heart
5. Blood Vessels
6. Blood
7. Progress Check Cardiovascular System
8. Structure & Function Respiratory system
9. Composition of air
10. Mechanics of breathing
11. Gaseous Exchange
12. How the Cardio – Respiratory System work together
13. Aerobic Anaerobic
14. Short and long term effects of exercise on the body systems
15. Progress Check Cardio- Respiratory System

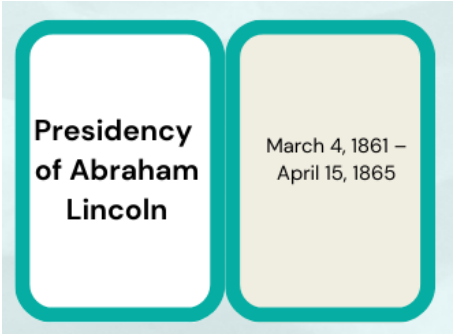
Top Tips!

How to use these KO's to revise

- Highlight the key words
- ***Make a mind map***



- ***Make some flash cards*** – Put the key word on one side and the facts/ important information on the back (just the key info!) – use the Leitner system shown to you in forms.



- ***Self-test*** – memorise the KO organiser, turn it over and then see how much you can remember
- ***Peer test*** – memorise the KO organiser then get someone else to test you (friend, family etc)

- gcsepod.com – this is a great resource with short videos, revision activities and low stakes quizzes all directly linked to your exam board content.