HERMITAGE ACADEMY

YEAR 10

KNOWLEDGE ORGANISER

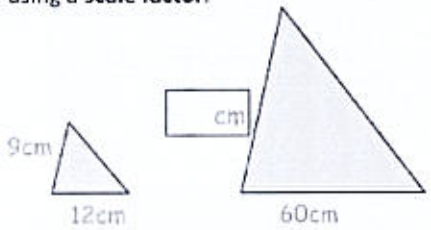
Area and Volume

Key words and definitions

Volume: The amount of 3Dimensional space an object takes up.
Surface area – The sum of the areas of all the faces of a 3D object.
Similar : Two or more shapes are **similar** if they have the same shape, but are not necessarily the same size. The corresponding sides are in proportion and the corresponding angles are equal.
Scale factor – The size of an enlargement/reduction.
Sphere – A round 3Dimensional shape like a ball.
Pyramid – A 3D shape with triangular sides and a polygon base.
Cone – A 3D shape with a circular base joined to a point by a curved side.
Frustum – What is remaining of a cone or pyramid after its upper part has been cut off flat.
Convert – change the units of measurement.

Similar Lengths

Two shapes are similar if one is an enlargement of the other using a **scale factor**.



Scale factor $=60 \div 12 = 5$

Missing length = corresponding length × scale factor

$= 9cm \times 5$

$= 45cm$

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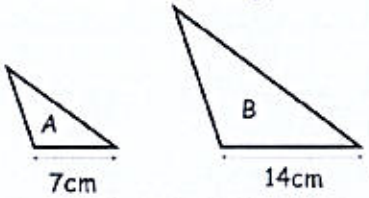
Similar Area

$$Area\ scale\ factor = (scale\ factor)^2$$

Below are two similar triangles



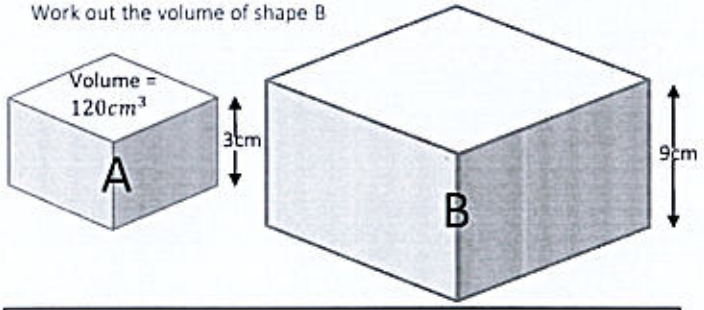
The area of triangle A is $20cm^2$. Work out the area of triangle B.

Scale factor = $14 \div 7 = 2$
Area scale factor = $2^2 = 4$
Larger area = smaller area × area scale factor
$= 20cm^2 \times 4$
$= 80cm^2$

Similar Volume

$$Volume\ scale\ factor = (scale\ factor)^3$$

Work out the volume of shape B



Scale factor = $9 \div 3 = 3$
Volume scale factor = $3^3 = 27$
$Larger\ volume = smaller\ volume \times volume\ scale\ factor$
$= 120cm^3 \times 27$
$= 3240cm^3$

Volume of non-prisms

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

Find the Volume of a Sphere with a radius of 3.2m

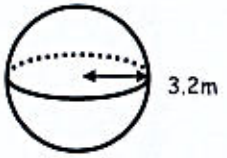
$Volume = \frac{4\pi r^3}{3}$

Sub in the value of r

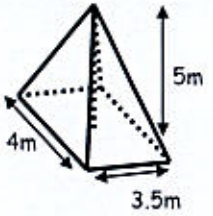
$Volume = \frac{4 \times \pi \times 3.2^3}{3}$

Calculate

$Volume = 137.26cm^3$



$$Volume\ of\ cone/pyramid = \frac{area\ of\ base \times height}{3}$$



$Volume = \frac{Area\ of\ Base \times Height}{3}$

Sub in values

$Volume = \frac{4 \times 3.5 \times 5}{3}$

Calculate

$Volume = 23.3cm^3$

Hegarty Maths Links

Area of Shapes: 539 – 543, 553 - 559
Volume of 3D Shapes: 567 - 583
Surface Area of 3D Shapes: 584 - 591
Similar Shapes: 608 - 621

Area and Volume

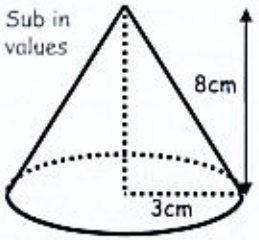
$$Volume = \frac{Area\ of\ Base \times Height}{3}$$

Sub in values

$$Volume = \frac{\pi \times 3^2 \times 8}{3}$$

Calculate

$$Volume = 75.4cm^3\ (24\pi)$$



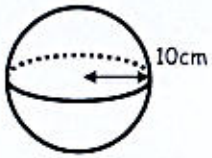
Surface area of non-prisms

$$Surface\ area\ of\ sphere = 4\pi r^2$$

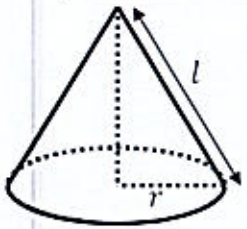
Calculate the surface area of a sphere with radius 10cm.

Surface area $= 4\pi \times 10^2$

$= 400\pi cm^2$



$$Surface\ area\ of\ cone = \pi rl + \pi r^2 = \pi r(l + r)$$

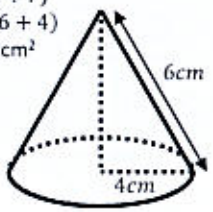


Calculate the surface area of a cone with radius 4cm and slant height 6cm.

Surface area $= \pi r(l + r)$

$= 4\pi(6 + 4)$

$= 40\pi cm^2$



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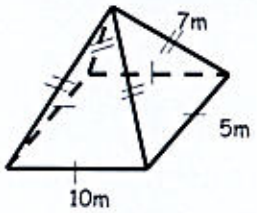
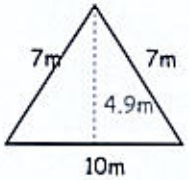
Find the Surface Area of this Pyramid



A square based pyramid has 5 faces, 4 of which are identical triangles and a base which is a square. To find the surface area, we need to find the area of each of the faces and add them all together.



$c^2 - b^2 = a^2$

$7^2 - 5^2 = a^2$ — Sub in c and b

$24 = a^2$ — Work out the left side

$4.9 = a$ — Square root

$base \times height \div 2$

$(10 \times 4.9) \div 2$ — Sub in the base and height

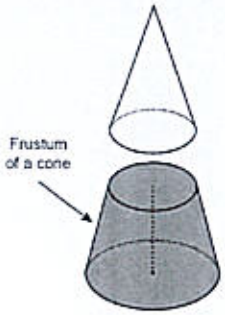
$= 24.49m^2$

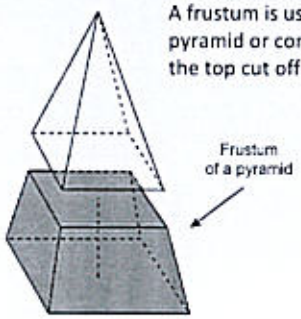
$= 97.98m^2$ — Multiply by 4 as there are 4 triangular sides

$10 \times 10 = 100m^2$ ← Don't forget the base

$100m^2 + 97.98 = 197.98m^2$

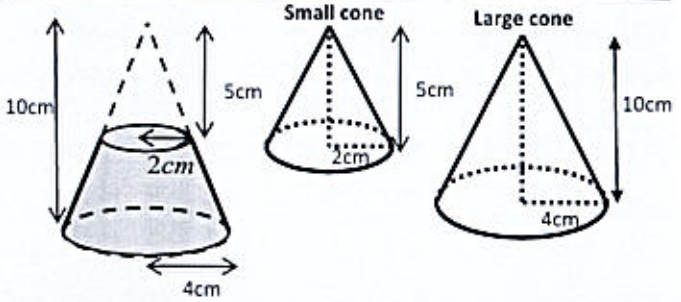
Frustums





A frustum is usually a pyramid or cone with the top cut off flat

$$Volume = Volume_{of\ large\ cone/pyramid} - Volume_{of\ small\ cone/pyramid}$$



Volume of large cone	$\frac{1}{3} \times \pi \times 4^2 \times 10 = 167.6cm^3$
Volume of small cone	$\frac{1}{3} \times \pi \times 2^2 \times 5 = 20.9cm^3$
Volume =	$167.6 - 20.9 = 147cm^3$

We use this method for pyramid shaped frustums as well.

Sometimes we may have to use similarity or Pythagoras to find missing lengths or heights.

Hegarty Maths Links

Area of Shapes: 539 – 543, 553 - 559
Volume of 3D Shapes: 567 - 583
Surface Area of 3D Shapes: 584 - 591
Similar Shapes: 608 - 621

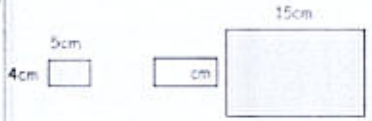
Area and Volume

Similar Lengths

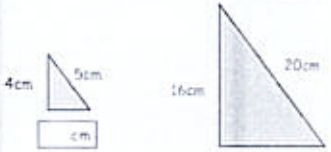
Question 1: Below are pairs of similar shapes. Find the missing lengths.

(a)

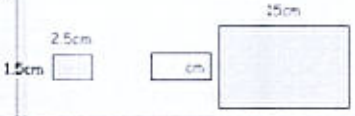
(b)



(c)

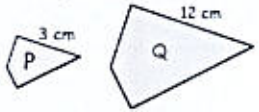


(d)

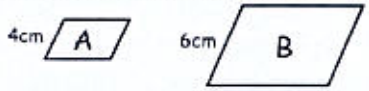


Similar Areas

Question 1:
Quadrilaterals P and Q are similar.
The area of quadrilateral P is 10cm².
Calculate the area of quadrilateral Q



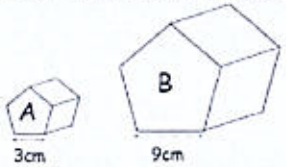
Question 2:
Below are to similar parallelograms.



The area of parallelogram A is 28cm².
Work out the area of parallelogram B.

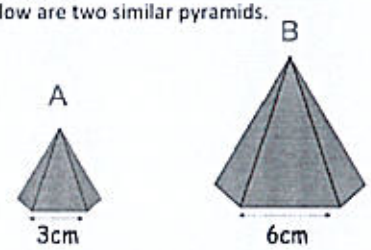
Similar Volumes

Question 1:
Below are two similar pentagonal prisms



The volume of prism A is 15cm³.
Work out the volume of prism B

Question 2:
Below are two similar pyramids.



Pyramid A has a volume of 26cm³
Work out the volume of pyramid B.

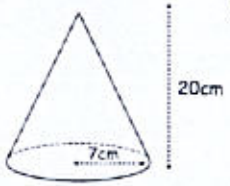
Volumes of non-prisms

Find the volume of the following objects, leave your answer to 1 decimal place

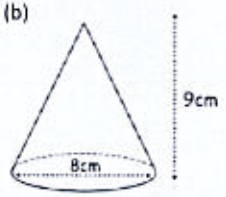
(a)

(b)

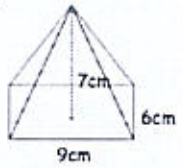
(a)



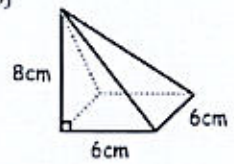
(b)



(a)



(b)



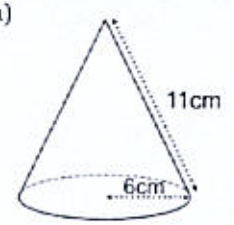
Surface areas of non-prisms

Work out the surface areas of the following objects, leave your answer to 1 decimal place

(a)

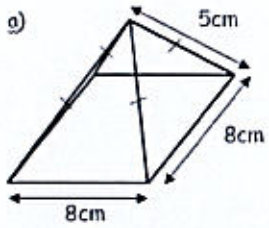
(b)

(a)

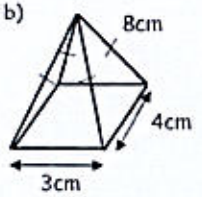


(b)

a)



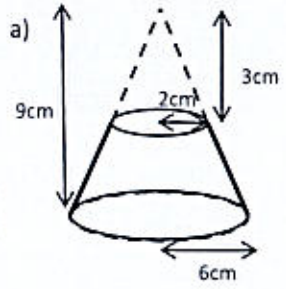
b)



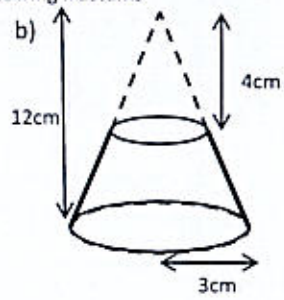
Frustums

Work out the volume of the following frustums

a)



b)



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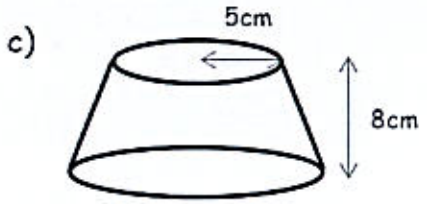

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Linear Graphs

Key words and definitions

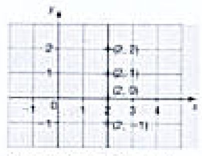
Parallel: Lines that have the same gradient and never meet.
Perpendicular: Lines that meet at a 90 degree angle.
Gradient: Steepness of a line.
y-intercept: Where a line crosses the y-axis.
Coordinate: How far along an axis a point is. In 2D space, a point will have two coordinates written as (x, y).
Plot: Draw points on a coordinate grid. When asked to plot a graph, you need to plot the points from the table of values and then join them together with a straight line.

Horizontal and Vertical Lines

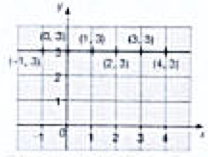
A straight line can be **diagonal**, **vertical** or **horizontal**

The x-coordinate of every point on this vertical line is 2.

The y-coordinate can have any value.



The equation of the line is $x = 2$.



The equation of the line is $y = 3$.

The y-coordinate of every point on this horizontal line is 3.

The x-coordinate can have any value.

- Horizontal lines have equations of the form $y = c$.
- Vertical lines have equations of the form $x = c$.

c stands for a number.

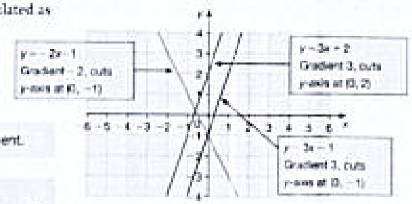
Equation of a Straight Line

- The equation of a straight line is of the form $y = mx + c$, where m is the **gradient** and c is the **y-intercept**.

The y-intercept is the y-value where the graph cuts the y-axis.

The **gradient** of a line segment is calculated as

$$\frac{\text{Change in the } y\text{-direction}}{\text{Change in the } x\text{-direction}}$$



- **Parallel** lines have the same gradient.
- If line A has gradient m, any line perpendicular to line A has gradient $-\frac{1}{m}$.

Plotting Straight Line Graphs

- The graphs of linear equations such as $y = 2x + 3$ are straight lines.

To plot a graph of a function:

- Draw up a table of values
- Calculate the value of y for each value of x
- Draw a suitable grid
- Plot the (x, y) pairs and join them with a straight line

If you plot three points, you can tell if you have made a mistake.

One point must be wrong.

EXAMPLE

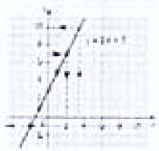
a Draw the graph of $y = 2x + 3$.

b Use the graph to find i the value of x when $y = 7$ ii the value of y when $x = 1\frac{1}{2}$

Construct a table of values.

a

x	−2	−1	0	1	2
y	[illegible]	1	3	5	7

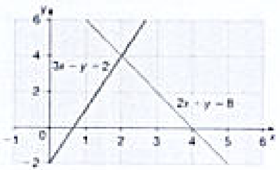


Solving Simultaneous Equations

You can solve **simultaneous** equations graphically.
A solution is at a point of **intersection**.
For example, for the equations $3x - y = 2$ and $2x + y = 8$, the lines intersect at (2, 4) so the solution is $x = 2$ and $y = 4$.

HOW TO

1. Use the information in the question to form a pair of simultaneous equations.
2. Solve the simultaneous equations using elimination, substitution or by drawing a graph.
3. Give your answers and check that they make sense.



Equation of a Straight Line Example

EXAMPLE

Find the equation of the line perpendicular to $y = 2x - 1$ that passes through (4, 5).

$y = 2x - 1$ has gradient 2, so a line perpendicular to it has gradient $-\frac{1}{2}$

$y = -\frac{1}{2}x + c$

At (4, 5) $5 = \left(-\frac{1}{2}\right) \times 4 + c$

$c = 7$

The equation is $y = -\frac{1}{2}x + 7$

If the equation is not in the form $y = \ldots$ rearrange it first, for example

$$3x + 2y = 12 \Rightarrow 2y = -3x + 12 \Rightarrow y = -\frac{3}{2}x + 6$$

Now you can see that the gradient is $-\frac{3}{2}$ and the intercept is 6.

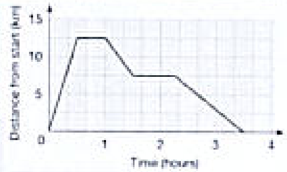
Distance-Time Graphs and Velocity-Time Graphs

A distance–time graph shows information about a journey.

The gradient of a straight line in a distance–time graph is the speed of the object.

Velocity–time graphs also give information about a journey.

- The gradient of a straight line in a velocity-time graph is the **acceleration** of the object.
- The area under a line in a velocity-time graph is the distance travelled by the object.



Velocity is speed in a certain direction.

Hegarty Maths Links

Straight line Graphs: 205 - 216
Solving Simultaneous Equations with Lines: 218, 219
Distance-Time Graphs: 874 – 879
Speed-Time Graphs: 880 - 886

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Linear Graphs

Solving Simultaneous Equations with Lines

Two lines intersect. One has gradient 4 and y-axis intercept 3. The other has gradient 6 and cuts the y-axis at (0, 1).

Find the point of intersection of the lines.

Drawing Straight Line Graphs from the Equation

Draw the graphs of these functions.

a $y = 3x - 2$ **b** $y = -2x + 4$

c $y = \frac{1}{2}x + 3$ **d** $y = 5 - x$

Drawing Vertical and Horizontal Lines

a $y = 4$ **b** $x = 5$ **c** $y = -2$

d $x = -2$ **e** $x = -4$

Finding the Equation of a Line

Find the equations of these lines.

a Gradient 6, passes through (0, 2)

b Gradient -2, passes through (0, 5)

c Gradient -1, passes through $(0, \frac{1}{2})$

d Gradient -3, passes through (0, -4)

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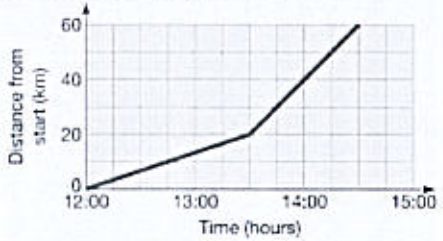
Distance-Time Graphs

The distance-time graph shows information about Lisa's coach journey.



a How far does she travel between

i 12:00 and 13:30

ii 13:30 and 14:30?

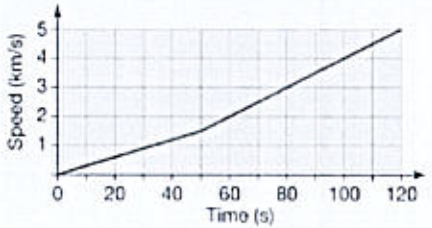
b How long does it take to travel

i 10 km from the start

ii 50 km from the start?

Speed-Time Graphs

A rocket accelerates in two stages as shown in the speed-time graph.



a Calculate the acceleration, in km/s^2, for

i stage 1 ii stage 2.

b Calculate the average acceleration for the whole journey.

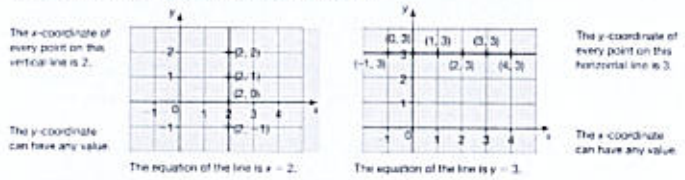
Linear Graphs

Key words and definitions

Parallel: Lines that have the same gradient and never meet.
Perpendicular: Lines that meet at a 90 degree angle.
Gradient: Steepness of a line.
***y*-intercept:** Where a line crosses the y-axis.
Coordinate: How far along an axis a point is. In 2D space, a point will have two coordinates written as (x, y).
Plot: Draw points on a coordinate grid. When asked to plot a graph, you need to plot the points from the table of values and then join them together with a straight line.

Horizontal and Vertical Lines

A straight line can be **diagonal**, **vertical** or **horizontal**.



- Horizontal lines have equations of the form $y = c$.
- Vertical lines have equations of the form $x = c$.

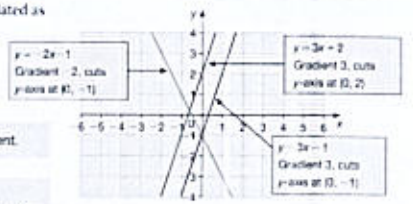
c stands for a number.

Equation of a Straight Line

- The equation of a straight line is of the form $y = mx + c$, where m is the **gradient** and c is the **y-intercept**.

The *y*-intercept is the *y*-value where the graph cuts the *y*-axis.

The **gradient** of a line segment is calculated as
$$\frac{\text{Change in the } y\text{-direction}}{\text{Change in the } x\text{-direction}}$$



- **Parallel** lines have the same gradient.
- If line A has gradient m, any line perpendicular to line A has gradient $-\frac{1}{m}$.

Plotting Straight Line Graphs

- The graphs of linear equations such as $y = 2x + 3$ are straight lines.

To plot a graph of a function:
- Draw up a table of values.
- Calculate the value of y for each value of x.
- Draw a suitable grid.
- Plot the (x, y) pairs and join them with a straight line.

If you plot three points, you can tell if you have made a mistake.

EXAMPLE

a Draw the graph of $y = 2x + 3$

b Use the graph to find: i the value of x when $y = 7$ ii the value of y when $x = -\frac{1}{2}$

Construct a table of values.

Choose two of the values, including negative values, and use:

x	−2	−1	0	1	2
y	−1	1	3	5	7

(−2, −1) (−1, 1) (0, 3) (1, 5) (2, 7)

Then plot the points and draw the line.

Make sure that your line includes the smallest and largest values.

b i Find −1 on the y-axis. Draw a horizontal line to the graph line. Draw a vertical line to the x-axis. Read off the value of x.

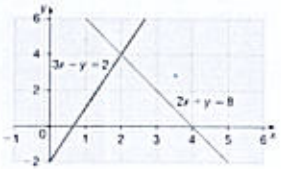
$x = 2$

ii Find $-\frac{1}{2}$ on the x-axis. Draw a vertical line to the graph line. Draw a horizontal line to the y-axis. Read off the value of y.

$y = 2$

Solving Simultaneous Equations

You can solve **simultaneous** equations graphically.
A solution is at a point of **intersection**.
For example, for the equations $3x - y = 2$ and $2x + y = 8$, the lines intersect at $(2, 4)$ so the solution is $x = 2$ and $y = 4$.



HOW TO

1. Use the information in the question to form a pair of simultaneous equations.
2. Solve the simultaneous equations using elimination, substitution or by drawing a graph.
3. Give your answers and check that they make sense.

Equation of a Straight Line Example

EXAMPLE

Find the equation of the line perpendicular to $y = 2x - 1$ that passes through $(4, 5)$.

$y = 2x - 1$ has gradient 2, so a line perpendicular to it has gradient $-\frac{1}{2}$.

$y = -\frac{1}{2}x + c$

At $(4, 5)$: $5 = \left(-\frac{1}{2}\right) \times 4 + c$

$c = 7$

The equation is $y = -\frac{1}{2}x + 7$.

If the equation is not in the form $y = \ldots$, rearrange it first, for example

$$3x + 2y = 12 \Rightarrow 2y = -3x + 12 \Rightarrow y = -\frac{3}{2}x + 6$$

Now you can see that the gradient is $-\frac{3}{2}$ and the intercept is 6.

Distance-Time Graphs and Velocity-Time Graphs

A distance–time graph shows information about a journey.
The gradient of a straight line in a distance–time graph is the speed of the object.
Velocity–time graphs also give information about a journey.

- The gradient of a straight line in a velocity–time graph is the **acceleration** of the object.
- The area under a line in a velocity–time graph is the distance travelled by the object.

Velocity is speed in a certain direction.

Hegarty Maths Links

Straight line Graphs: 205 - 216
Solving Simultaneous Equations with Lines: 218, 219
Distance-Time Graphs: 874 – 879
Speed-Time Graphs: 880 - 886

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Linear Graphs

Solving Simultaneous Equations with Lines

Two lines intersect. One has gradient 4 and y-axis intercept 3. The other has gradient 6 and cuts the y-axis at (0, 1).

Find the point of intersection of the lines.

Drawing Straight Line Graphs from the Equation

Draw the graphs of these functions.

a $y = 3x - 2$ **b** $y = -2x + 4$

c $y = \frac{1}{2}x + 3$ **d** $y = 5 - x$

Drawing Vertical and Horizontal Lines

a $y = 4$ **b** $x = 5$ **c** $y = -2$

d $x = -2$ **e** $x = -4$

Finding the Equation of a Line

Find the equations of these lines.

a Gradient 6, passes through (0, 2)

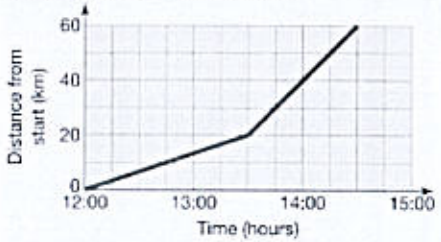
b Gradient -2, passes through (0, 5)

c Gradient -1, passes through $(0, \frac{1}{2})$

d Gradient -3, passes through $(0, -4)$

Distance-Time Graphs

The distance-time graph shows information about Lisa's coach journey.



a How far does she travel between

i 12:00 and 13:30

ii 13:30 and 14:30?

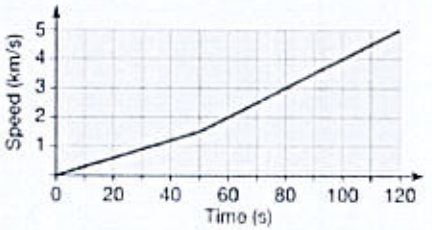
b How long does it take to travel

i 10 km from the start

ii 50 km from the start?

Speed-Time Graphs

A rocket accelerates in two stages as shown in the speed-time graph.



a Calculate the acceleration, in km/s², for

i stage 1 **ii** stage 2.

b Calculate the average acceleration for the whole journey.

Constructions

Key words and definitions

Construct: Draw accurately with mathematical equipment.

Arc: A curved line, often drawn with a pair of compasses.

Perpendicular: Meeting at a 90 degree (right) angle.

Bisector: Dividing into two equal pieces.

Loci: Potential positions for an object on a diagram.

Region: A 2D space that satisfies certain criteria.

Equidistant: The same distance away.

Perpendicular Bisector

- The **perpendicular** bisector of a line bisects the line at right angles.
- To construct the perpendicular bisector of line AB

- All points on the perpendicular bisector of AB are equidistant from A and B.

Perpendicular From a Point

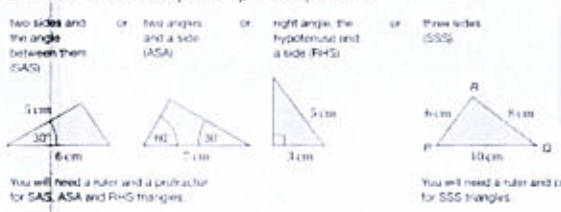
- To construct the perpendicular from a point X to a line YZ.

Start at the red dots.

Keep the same compass radius throughout the construction.

Constructing Triangles

You **can construct** a unique **triangle** when you know



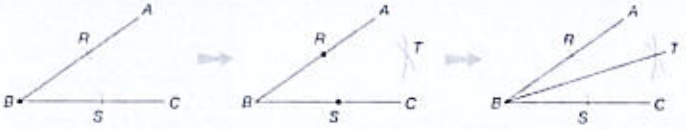
You will need a ruler and a protractor for SAS, ASA and RHS triangles.

You will need a ruler and compasses for SSS triangles.

Angle Bisector

You can use a straight edge and compasses to construct an angle bisector.

- To bisect angle ABC



- All points on the angle bisector are **equidistant** from the arms of the angle.

Loci Example

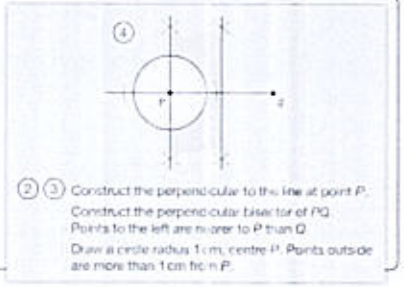
EXAMPLE

P and Q are two points 2.5 cm apart on a line.

P Q

Shade in the region that satisfies all these conditions:

- Right of the perpendicular to the line PQ at point P.
- Closer to P than to Q.
- More than 1 cm from P.



Loci

- The locus of a point which is a constant distance from another point is a circle.
- The locus of a point that is **equidistant** from two other fixed points is the **perpendicular bisector** of the line joining the fixed points.

- The locus of a point at a constant distance from a fixed line is a parallel line.
- The locus of a point equidistant from two intersecting lines is the angle bisector of the lines.

Hegarty Maths Links

Constructing Triangles: 683
Basic Constructions: 659 – 668
Loci: 674 - 679

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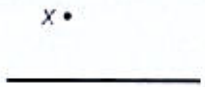
Constructions

Perpendicular Lines

a

b



c

d

Angle Bisectors

a

b

c

You will need to extend the lines.

Constructing Triangles

Use a straight edge and compasses or a protractor to construct these triangles.

a	Sides 8 cm, 4 cm, 7 cm	(SSS)
b	3 cm, 30°, 4 cm	(SAS)
c	Sides 10 cm, 7.5 cm, 6 cm	(SSS)
d	8 cm, 2 cm, 90°	(RHS)
e	Sides 6 cm, 9 cm, 5 cm	(SSS)
f	45°, 4 cm, 45°	(ASA)

It helps to draw a rough sketch first.

Loci Exam Style 1

The diagram shows the rectangular garden of a house.
There are two trees, *T*, in the garden.
A radio mast is to be placed in the garden.
It must be more than 5 m from the rear of the house.
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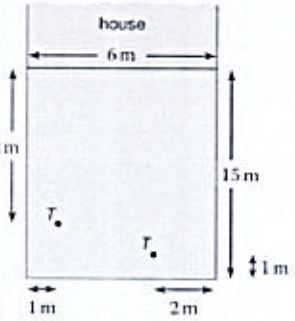
Using a scale of 1 cm : 2 m, draw a scale diagram and shade the possible site for the radio mast.



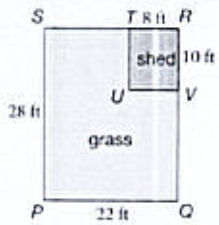
Loci Exam Style 2

A lifeboat *L* is 10 km from another lifeboat *K* on a bearing of 045°. They both receive a distress call from a ship. The ship is within 7 km of *K* and within 5 km of *L*.

Draw a scale drawing to show the positions of *K* and *L*. Shade on your diagram the area in which the ship could be.

Loci Exam Style 3

Pat wants to tether her goat on this grass using a 5 foot long chain. One end of the chain will be attached to the goat and the other end to a ring that can slide along an 18 foot long rail.



a Calculate the area of the grass that the goat can reach if Pat puts the rail along the sides *TU* and *UV* of the shed.

b Where on the perimeter of the grass should Pat put the rail to allow the goat to reach the greatest area of grass? Explain your answer.

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You **can construct** a unique **triangle** when you know

two sides and the angle between them (SAS)	or	two angles and a side (ASA)	or	right angle, the hypotenuse and a side (RHS)	or	three sides (SSS)

Any two triangles constructed using any one of these four sets of information will be congruent.

You will need a ruler and a protractor for SAS, ASA and RHS triangles.

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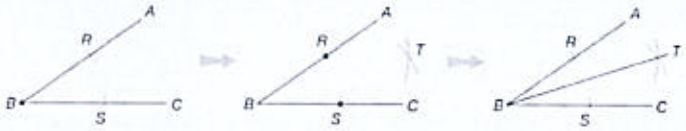

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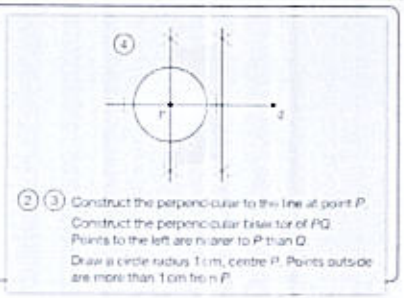

2 3 Construct the perpendicular to the line at point P.
Construct the perpendicular bisector of PQ.
Points to the left are nearer to P than Q.
Draw a circle radius 1 cm, centre P. Points outside are more than 1 cm from P.

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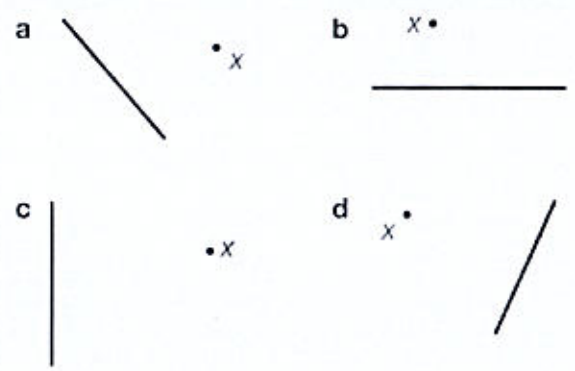
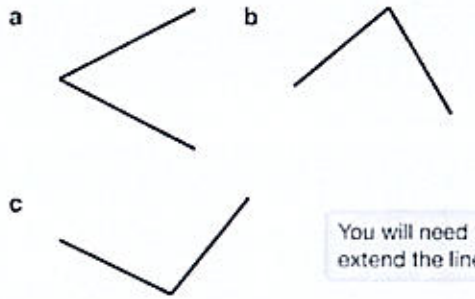


Angle Bisectors



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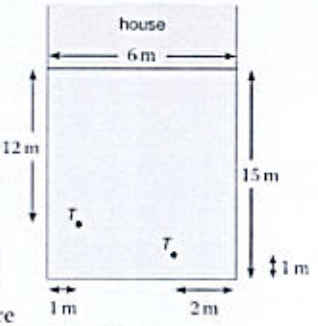

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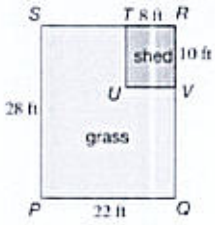

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b Where on the perimeter of the grass should Pat put the rail to allow the goat to reach the greatest area of grass? Explain your answer.

Graphs Student Knowledge Organiser

Key words and definitions

Graph – A diagram showing the relationship between two variables (letters), each measured along one of a pair of axes.
Equation – A statement that the values of two mathematical expressions are equal (indicated by the sign '=')
Plot – Mark out (points on) a graph.
Parallel – Describing two lines that never meet.
Perpendicular – Describing two lines that meet at right angles.
Gradient – The steepness of a graph
Intercept – The point at which a given line cuts an axis; the value of the coordinate at that point.

The Equation of a Straight Line

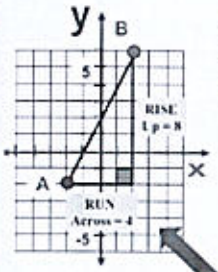
The Equation of a Line

$y = mx + c$

m is the gradient

c is the y-intercept

To find the equation of a line:
1) Find the gradient
2) Find the y-intercept
3) Write the equation of the line



The "Gradient" or "Slope" between two points is how far UP we have gone, DIVDED BY how far we have gone ACROSS.

$m = \frac{RISE}{RUN}$

$m = \frac{8}{4}$

$m = 2$ ✓

In this example:
$m = \frac{8}{4} = 2$
$c = 2$
So the equation is
$y = 2x + 2$

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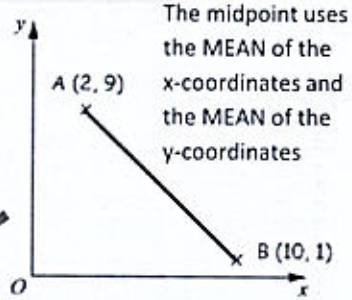
Midpoint and Length of a Line Segment

The Midpoint Formula
is used to find the exact center point between two defined points in a line segment.

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



The midpoint uses the MEAN of the x-coordinates and the MEAN of the y-coordinates

A is the point with coordinates (2, 9).
B is the point with coordinates (10, 1).

Work out the coordinates of the midpoint of the line AB.

x: (mean of 2 and 10)

$\frac{2 + 10}{2} = 6$

y: (mean of 1 and 9)

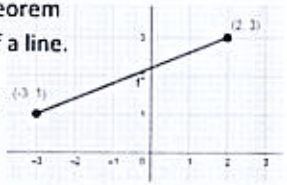
$\frac{1 + 9}{2} = 5$

Midpoint = (6, 5)

THE DISTANCE FORMULA

$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

Use Pythagoras' Theorem to find the length of a line.



Length $= \sqrt{(2 - -3)^2 + (3 - 1)^2}$

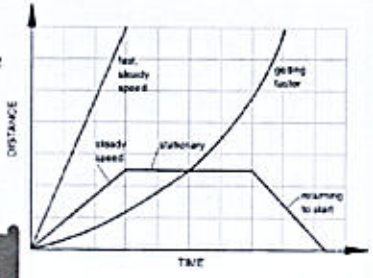
$= \sqrt{5^2 + 2^2} = \sqrt{29} = 5.39$

Real Life Graphs

Graphs can be used to model real life situations, for example a car journey.

When using a distance-time graph, the following parts of a graph have to be considered.

The gradient of the graph shows the speed of the car.



Drawing Straight Line Graphs

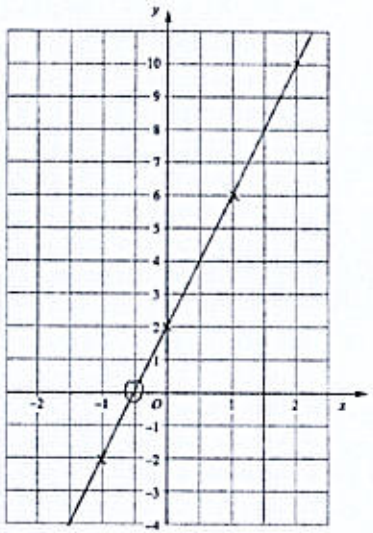
(a) Complete the table of values for $y = 4x + 2$.

To find y, multiply x by 4 and add 2.

x	-1	0	1	2
y	-2	2	6	10

2 x 4 + 2 = 10

(b) On the grid, draw the graph of $y = 4x + 2$.



Plot the points:
(-1, -2)
(0, 2)
(1, 6)
(2, 10)
And join with a straight line.

Hegarty Maths Links

Coordinates and Midpoint: 199-200
Gradient: 201-204
Drawing Graphs: 205-213
Parallel and Perpendicular Lines: 214-216
Distance/Speed – Time Graphs: 874-886

Graphs Student Knowledge Organiser

Drawing Graphs

(a) $y = 3x + 3$

x	-2	-1	0	1	2
y					

(b) $y = x + 9$

x	-2	-1	0	1	2
y					

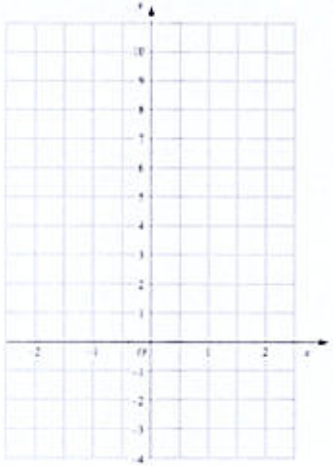
(c) $y = \frac{1}{2}x + 1$

x	-2	-1	0	1	2	3	4
y							

(d) $y = -2x + 5$

x	-1	0	1	2	3
y					

Complete the table of values for each equation, and plot the line on the axes below.



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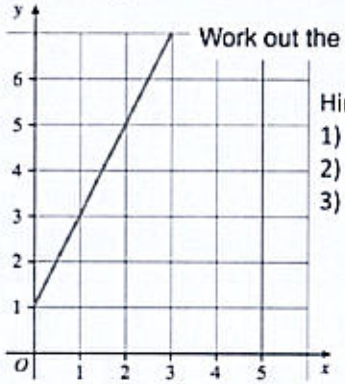
The Equation of a Straight Line

1. A line has equation $y = 3x + 4$

   (a) Write down the gradient of the line

   (b) Write down the y-intercept of the line

2. A straight line L is shown on the grid.

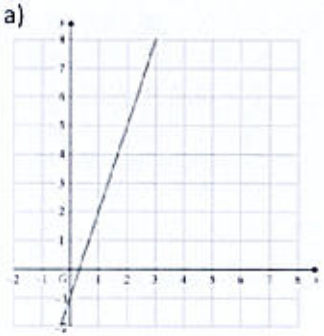


Work out the equation of line L

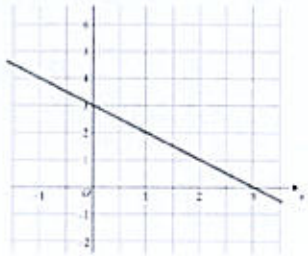
Hint:
1) Find the gradient
2) Find the y-intercept
3) Write out the equation of the line

3. Work out the equation of the following lines:

a)

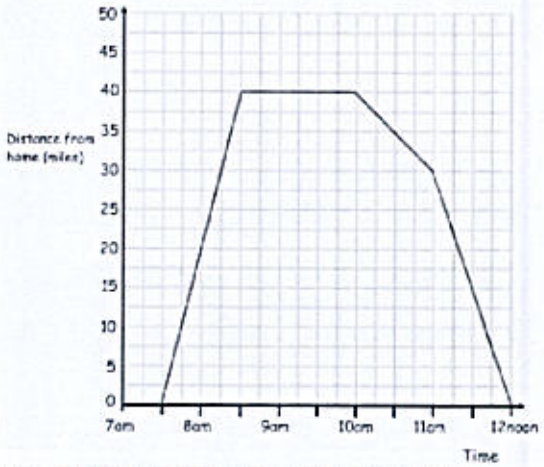


b)



Distance-Time Graphs

Emma travelled to her Grandmother's house and back.
The distance-time graph shows information about her journey.



(a) What time did Emma begin her journey?

(b) How far was Emma from home at 8am?

(c) How long did Emma stay at her Grandmother's house?

(d) What time did Emma leave her Grandmother's house?

(e) How far was Emma from home at 11:45?

(f) How far did Emma travel in total?

(g) What was Emma's speed from her house to her Grandmother's house?

Constructions Student Knowledge Organiser

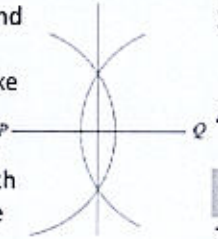
Key words and definitions

Constructions- Mathematical drawings that use only a pencil, ruler, compass and protractor.
Perpendicular- At a 90° angle from a line, surface or plane.
Bisector- Cuts somethings in half.
Congruent- Two shapes are congruent if they are mathematically identical
Parallel- Two lines that remain the same distance apart at all times.
Vertex- Point/Corner

Perpendicular bisectors

Start with a line segment

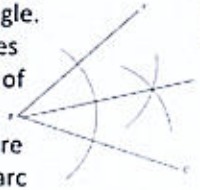
1) Place you compass on one end of the line and stretch it wider than half way across.
2) Without changing the compasses width make an arc across the line (red arcs on diagram).
3) Place your compass on the other end of the line segment and without changing the width of the compass make another arc across the line (red arcs on diagram).
4) Draw a line that crosses though where both arcs intersect. (Blue line of diagram)



Bisecting angles

Start with an angle

1) Place you compass on the vertex of your angle and draw an arc right the way across the angle.
2) Place your compass on where the arc crosses one of the line and draw another arc inside of the angle.
3) Place your compass on the other point where the arc crosses the line and draw a second arc inside the angle.
4) Draw a line from the vertex to where your arcs cross.



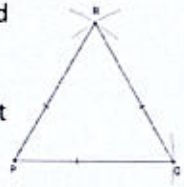
Constructing Angles

Constructions can be used to draw 30°, 45°, 60° and 90°. To remind yourself how to do these refer to the Hegarty Maths videos:
664- Construct a 90° or 45° angle.
665- Construct a 60°, 30° or 120° angle.

Constructing an equilateral triangle.

Start with a line segment that is the desired side length for your triangle.

1) Place you compass on one end of the line and stretch it to be the length of the line.
2) Make an arc above the line.
3) Keeping the compass the same length place it on the opposite side of the line and make another arc above.
4) Where the two arcs cross is the third corner of your triangle. Join it up with the other two.

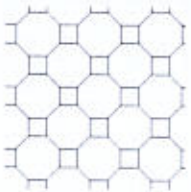


Constructing other triangles

There are many other ways to construct triangles. Including:
SSS- Using three side lengths.
SAS- Using an angle between two sides.
ASA- Using a side between two angles.
Please refer to the Hegarty video for instruction on drawing these:
683- Constructing triangles.

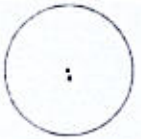
Tessellations

Shapes tessellate when they fit together to make a pattern without leaving any gaps. This is possible whenever the shape's angles add up to 360°.



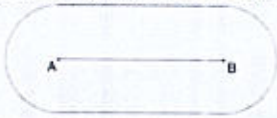
Loci

A locus (plural loci) is a set of points that satisfy a certain condition.



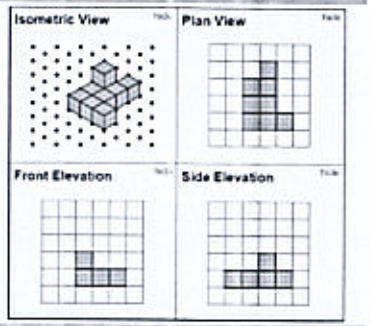
Example1: Draw the set of point that are 5cm away from a point.
To do this you would just draw a circle of radius 5cm around that point.

Example 2: Draw the set of points that are 2cm away from a line.
To do this you would draw two parallel lines above and below your that are 2cm away. At the end of those lines you would join them by a semi-circle that has its centre at the end of your original line



Plans and Elevations

Plans and elevations are 2D drawings of 2D shapes from different angles.
The **Plan** of a shape shows the shape from above.
The **Front Elevation** shows the shape from the front.
The **Side Elevation** shows the image from the side.

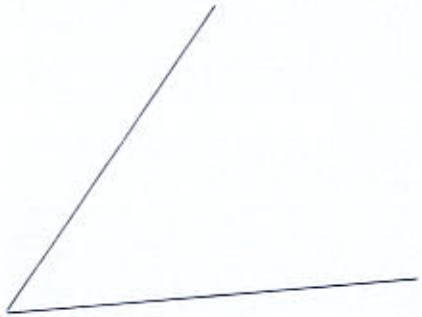


Hegarty Maths Links

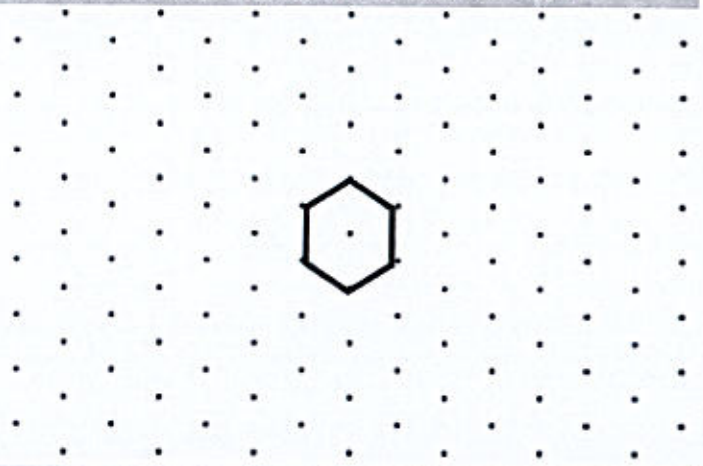
Constructions= 659-669
Constructing triangles= 683
Loci= 674-679
Congruent triangles= 682
Bearings= 492-495
Plans and Elevations= 837-844

Constructions Student Knowledge Organiser

Using a compass and ruler bisect the angle below:



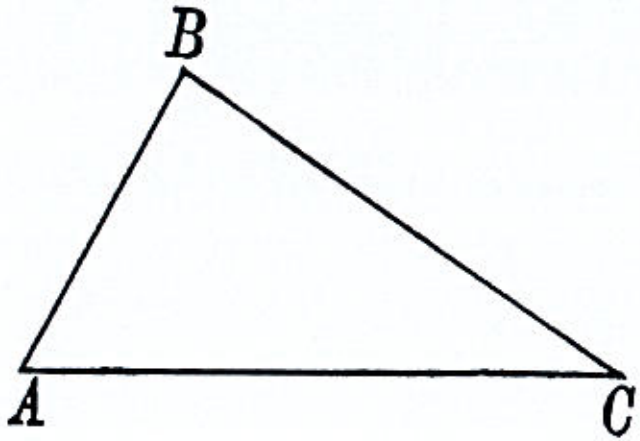
Tessellate the shape below, draw at least five shapes:



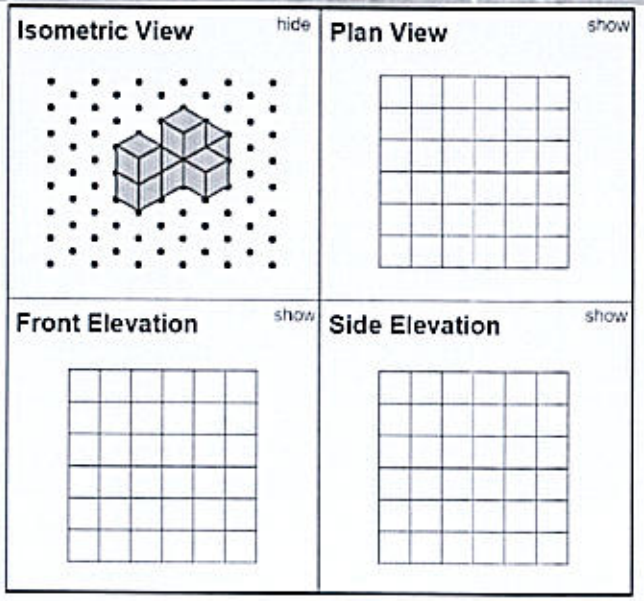
Draw all the points that are 2cm from the line below

Construct an equilateral triangle with side length 5cm:

Shade the area that's less that 2cm from A



Draw the plan and elevations for the shape below.



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Other Graphs Student Knowledge Organiser

Key words and definitions

Quadratic graph - The graph of a quadratic function is a parabola whose line of symmetry is parallel to the y –axis.
Parabola - a symmetrical curve.
Gradient - Another word for "slope". The higher the gradient of a graph at a point, the steeper the line is at that point. A negative gradient means that the line slopes downwards.
Y intercept- The point where a line crosses the y axis.
Roots of a quadratic graph- These are the x-intercepts. It is where $y = 0$ so, $ax^2 + bx + c = 0$.

Quadratic Expressions

$$ax^2 + bx + c$$

c = y intercept (where the parabola CUTS the y axis)
Parabolas are symmetrical

When a is positive

When a is negative

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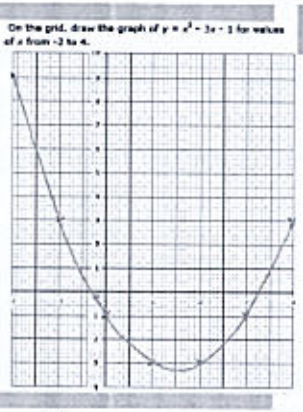
Plotting a quadratic graph

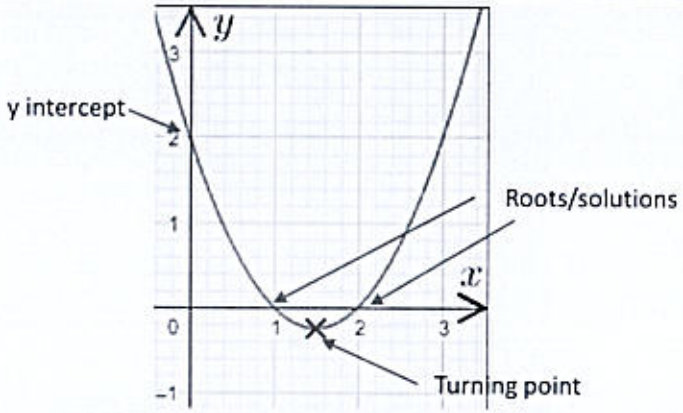
Complete the table of values for $y = x^2 - 3x - 1$

x	-2	-1	0	1	2	3	4
y	9	3	-1	-3	-3	-1	3

Substitute the x values into the equation to find the y coordinates. Be careful with negative numbers! Remember -3^2 is 9.



Key points on a quadratic graph



Equations of a straight line

The equation of a straight line graph is in the form:

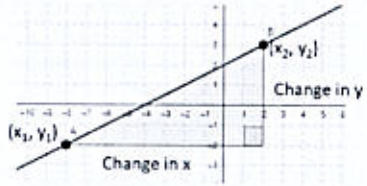
$$y = mx + c$$

where **m= gradient** **c = y intercept**

Example. For $y = 2x + 3$ the line has **a gradient of 2** and a **y intercept of +3**

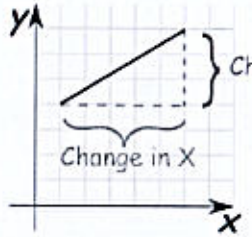
Finding the gradient

Gradient of a Straight Line



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

Example



Change in y = 3
Change in x = 5
Gradient = $\frac{3}{5}$

Parallel and perpendicular lines

Lines that have **the same gradient are parallel**
Eg. $y = 3x + 4$ is a parallel to the line $y = 3x - 4$
They both have a gradient **of 3** so are **parallel.**

If two lines **are perpendicular**, then **their gradients will multiply together to give -1**. Find the equation of a line perpendicular to $y = 3 - 5x$. This line has gradient -5. **A perpendicular line will have to have a gradient of 1/5, because then (-5) × (1/5) = -1.**

Other Graphs Student Knowledge Organiser

Gradients and Parallel lines

1. The equation of a straight line is **y = 4x + 5**, what is the gradient of the line and the y intercept?
2. The equation of a straight line is **y = 6x + 3**, give the equation of 2 lines that will be parallel with this line.
3. Which line would be steeper;
   y = 0.5x + 2 or y = 2x + 2 ?
4. The equation of a line is **y = 5x – 3** What is the equation of the line perpendicular to this line?

Exam questions

L is a straight line.

The gradient of **L** is 4

L passes through the point (0, 2)

Write down the equation of the straight line **L**.

The equation of the line L_1 is $y = 3x - 2$

The equation of the line L_2 is $3y - 9x + 5 = 0$

Show that these two lines are parallel.

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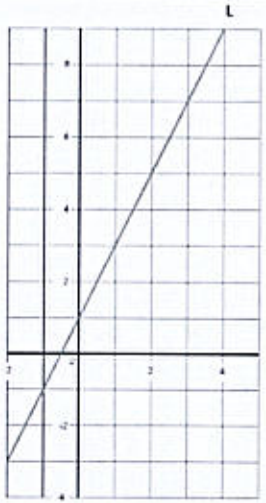
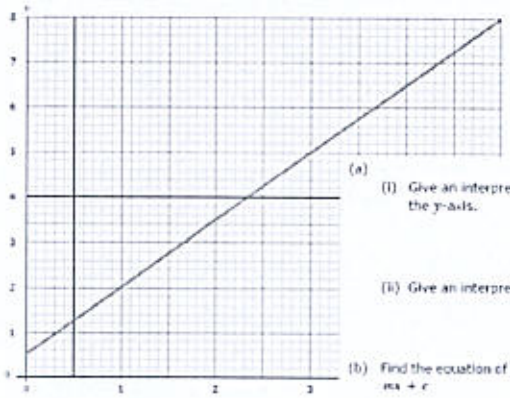
Y = mx + c



Find the equation for the straight line **L**.



(a) (i) Give an interpretation of the intercept of the graph on the y-axis.

(ii) Give an interpretation of the gradient of the graph.

(b) Find the equation of the straight line in the form $y = mx + c$

Phone calls cost £y for x minutes.

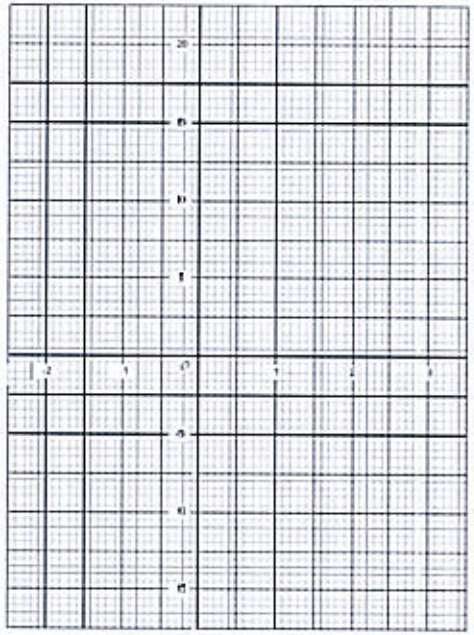
The graph gives the values of y for values of x from 0 to 5

Drawing quadratic and cubic graphs

Complete the table of values for $y = x^3 - 7$

x	-2	-1	0	1	2	3
Y		-8				20

On the grid, draw the graph of $y = x^3 - 7$ for values of x from -2 to 3.



Draw the graph $y = x^2 + 2x - 3$
For y values between -3 and 3.
Mark on your graph the turning point, the line of symmetry and the roots of the equation when $x^2 + 2x - 3 = 0$

GCSE Higher Surds Student Knowledge Organiser

Key words and definitions

Integer: a whole number (could be positive or negative)
Prime number: A prime number has only two factors - the number itself and 1. 1 is not a prime number
Rational Number: A number that can be whole or expressed as fraction $\frac{a}{b}$ where a and b are integers
Irrational Number : any number than cannot be expressed as fraction. Generally, means decimal values with no recurring/pattern
Square Number: the result of multiplying an integer by itself
Surd: An irrational number that is better expressed as a square root. If written as decimal they would continue forever with no pattern.

Surds are roots of numbers. Not every Root is a Surd

✓ $\sqrt{5}$ $5\sqrt{6}$ $\sqrt{2}$ $3\sqrt{2}$ $\sqrt{3}$ $\sqrt{11}$ $\sqrt{197}$

✗ $\sqrt{4}$ this can be simplified to 2, which is a rational number

✗ $\sqrt[3]{27}$ this can be simplified to 3, which is a rational number

✗ $(\sqrt{5})^2$ this can be simplified to 5, which is a rational number

Simplifying Surds – Method 2 is linked to Unit 1 work

Method 1

Simplify $\sqrt{24}$

Here we are looking for the largest square number which is also a factor of 24

Factors of 24: 1 x 24, 2 x 12, 3 x 8, 4 x 6

So $\sqrt{24} = \sqrt{4 \times 6}$
$= \sqrt{4} \times \sqrt{6}$
$= 2\sqrt{6}$

Simplify $\sqrt{96}$

Here we are looking for the largest square number which is also a factor of 96

Factors of 96: 1 x 96, 2 x 48, 3 x 32, 4 x 24, 6 x 16, 8 x 12

So $\sqrt{96} = \sqrt{6 \times 16}$
$= \sqrt{6} \times \sqrt{16}$
$= 4\sqrt{6}$

Method 2

Simplify $\sqrt{24}$

Using prime factor decomposition and our knowledge that $\sqrt{a} \times \sqrt{b} = \sqrt{a} \times \sqrt{b}$ we can say

$24 = 2 \times 2 \times 2 \times 3$
So $\sqrt{24} = \sqrt{2} \times \sqrt{2} \times \sqrt{2} \times \sqrt{3}$
$= 2 \times \sqrt{2} \times \sqrt{3}$
$= 2\sqrt{6}$

Simplify $\sqrt{96}$

$96 = 2 \times 2 \times 2 \times 3 \times 2 \times 2$
So $\sqrt{96} = \sqrt{2} \times \sqrt{2} \times \sqrt{2} \times \sqrt{3} \times \sqrt{2} \times \sqrt{2}$
$= 2 \times 2 \times \sqrt{2} \times \sqrt{3}$
$= 4\sqrt{6}$

Adding and Subtracting Surds

$\sqrt{5} + \sqrt{5} = 2\sqrt{5}$ ← think of this like $x + x$, or 2 lots of x

coefficients are dealt with just like they are in algebra

$4\sqrt{3} + 7\sqrt{3} = 11\sqrt{3}$

$8\sqrt{2} - 5\sqrt{2} = 3\sqrt{2}$

$2\sqrt{3} - 7\sqrt{5}$ ← $\sqrt{3}$ and $\sqrt{5}$ are UNLIKE TERMS so this cannot be simplified any further

$4\sqrt{7} + 3\sqrt{10} - \sqrt{7} - 2\sqrt{10} = 3\sqrt{7} + \sqrt{10}$

$\sqrt{12} + \sqrt{27} = 2\sqrt{3} + 3\sqrt{3} = 5\sqrt{3}$

$\sqrt{12} = \sqrt{4} \times \sqrt{3} = 2 \times \sqrt{3} = 2\sqrt{3}$

$\sqrt{27} = \sqrt{9} \times \sqrt{3} = 3 \times \sqrt{3} = 3\sqrt{3}$

It is important to try and simplify your surds before working with them so you don't miss things like this!

Multiplying and Dividing Surds

$\sqrt{2} \times \sqrt{5} = \sqrt{2 \times 5} = \sqrt{10}$

$\sqrt{3} \times \sqrt{7} = \sqrt{3 \times 7} = \sqrt{21}$

$\sqrt{a} \times \sqrt{b} = \sqrt{ab}$

$\sqrt{a} \times \sqrt{a} = a$

$\sqrt{2} \times \sqrt{2} = \sqrt{2 \times 2} = \sqrt{4} = 2$

$\sqrt{5} \times \sqrt{5} = \sqrt{5 \times 5} = \sqrt{25} = 5$

$\sqrt{10} \div \sqrt{2} = \sqrt{10 \div 2} = \sqrt{5}$

$\sqrt{12} \div \sqrt{3} = \sqrt{12 \div 3} = \sqrt{4} = 2$

$\frac{\sqrt{a}}{\sqrt{b}} = \sqrt{\frac{a}{b}}$

Expanding Single and Double Brackets

Example 1
Expand and simplify $\sqrt{3}(2 + \sqrt{6})$

x	2	$+\sqrt{6}$
$\sqrt{3}$	$2\sqrt{3}$	$\sqrt{18}$

$\sqrt{18} = \sqrt{9} \times \sqrt{2}$
$= 3\sqrt{2}$

$= 2\sqrt{3} + \sqrt{18}$
$= 2\sqrt{3} + 3\sqrt{2}$

Always remember to check if you can simplify your surds

Example 2
Expand and simplify $\sqrt{3}(3\sqrt{8} - 2\sqrt{2})$

x	$3\sqrt{8}$	$-2\sqrt{2}$
$\sqrt{3}$	$3\sqrt{24}$	$-2\sqrt{6}$

$24 = 2 \times 2 \times 2 \times 3$
So $\sqrt{24} = \sqrt{2} \times \sqrt{2} \times \sqrt{2} \times \sqrt{3}$
$= 2 \times \sqrt{2} \times \sqrt{3}$
$= 2\sqrt{6}$

$= 3\sqrt{24} - 2\sqrt{6}$
$= 6\sqrt{6} - 2\sqrt{6}$
$= 4\sqrt{6}$

Example 3
Expand and simplify $(1 + \sqrt{3})(\sqrt{2} - 1)$

We can treat this just like we do double brackets in algebra

x	1	$+\sqrt{3}$
$\sqrt{2}$	$\sqrt{2}$	$\sqrt{6}$
-1	-1	$-\sqrt{3}$

None of these are like terms, so we cannot simplify anymore

$= \sqrt{2} - \sqrt{3} + \sqrt{6} - 1$

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GCSE Higher Surds Student Knowledge Organiser

Surds are almost exclusively a non- Calculator Topic at GCSE. You can use a calculator to check your answers. Type your question into the calculator, type your answer in, compare them.

Simplifying Surds – Exam Questions

1) $\sqrt{12}$
2) $\sqrt{50}$
3) $\sqrt{72}$
4) $\sqrt{60}$
5) $\sqrt{28}$
6) $\sqrt{96}$
7) $\sqrt{108}$
8) $\sqrt{32}$

Adding and Subtracting Surds

1) $2\sqrt{3} + 3\sqrt{3}$
2) $7\sqrt{7} - 3\sqrt{7}$
3) $7\sqrt{5} - 3\sqrt{5}$
4) $2\sqrt{7} - 3\sqrt{7}$
5) $2\sqrt{32} + 3\sqrt{2}$
6) $2\sqrt{27} - 3\sqrt{3}$
7) $2\sqrt{125} - 3\sqrt{80}$
8) $3\sqrt{24} - 3\sqrt{6}$
9) $\sqrt{108} + 2\sqrt{300}$
10) $5\sqrt{7} + 3\sqrt{28}$
11) $5\sqrt{294} - 3\sqrt{216}$

Multiplying and Dividing Surds

1) $\sqrt{12} \times \sqrt{6}$
2) $\sqrt{50} \times \sqrt{8}$
3) $\sqrt{14} \times \sqrt{28}$
4) $\sqrt{30} \times \sqrt{10}$
5) $\sqrt{15} \times \sqrt{45}$
6) $\sqrt{18} \times \sqrt{15}$
7) $\sqrt{120} \times \sqrt{15}$
8) $\sqrt{32} \times \sqrt{8}$
9) $3\sqrt{2} \times \sqrt{2}$
10) $5\sqrt{5} \times \sqrt{5}$
11) $2\sqrt{3} \times 3\sqrt{3}$

Expanding Single and Double Brackets

1) $\sqrt{2}(1 + \sqrt{2})$
2) $\sqrt{3}(2 - \sqrt{3})$
3) $\sqrt{3}(2\sqrt{3} + 1)$
4) $\sqrt{2}(3\sqrt{2} - 2)$
5) $2\sqrt{2}(1 + 2\sqrt{2})$
6) $3\sqrt{2}(2 - 2\sqrt{2})$
7) $2\sqrt{5}(3 + 4\sqrt{5})$
8) $6\sqrt{2}(\sqrt{2} - 6)$
9) $(1 + \sqrt{2})(2 + \sqrt{2})$
10) $(2 - \sqrt{3})(2 + \sqrt{3})$
11) $(\sqrt{3} + 2)(2\sqrt{3} + 1)$

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Year 10 Foundation Topic 6 Fractions, decimals and percentages Student Knowledge Organiser

Key words and definitions

Denominator - The number below the line in a fraction. Denotes how many parts the whole is divided into.
Least Common Denominator - The least common multiple of the denominators of two or more fractions. That is, the lowest number which is a multiple of both denominators.
Lowest Terms - A fraction whose numerator and denominator have no common factors is in *lowest terms.*
Mixed Number - A number composed of a whole number and a fraction.

Fractions

Dividing

$$\frac{2}{5} \div \frac{2}{3} = \frac{2}{5} \times \frac{3}{2} = \frac{2 \times 3}{5 \times 2} = \frac{6}{10} = \frac{3}{5}$$

take the reciprocal of the divisor

Adding

$$\frac{1}{5} + \frac{3}{7} = \frac{1 \times 7}{5 \times 7} + \frac{3 \times 5}{7 \times 5} = \frac{7}{35} + \frac{15}{35}$$

Add the Numerators

$$\frac{7}{35} + \frac{15}{35} = \frac{22}{35}$$

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Multiplying

$$\frac{2}{5} \times \frac{6}{7} = \frac{2 \times 6}{5 \times 7} = \frac{12}{35}$$

$$1\frac{3}{4} \times 2\frac{1}{2} = ?$$

1x4 + 3 = 7

2x2 + 1 = 5

$$\frac{7}{4} \times \frac{5}{2} = \frac{35}{8} = 4\frac{3}{8}$$

Reverse Percentages

Example

A shop offers 30% off everything in a sale. The sale price of a pair of designer shoes is £84. Calculate the cost of the shoes before the sale.

Sale of 30% → (100% − 30% = 70%)

70% of the cost of the shoes = £84

1% → 84 ÷ 70 = £1.20

100% → £1.20 × 100 = £120

The cost of the shoes before the sale was £120.

Increase/Decrease by a percentage using a multiplier

Example
What is the **multiplier** for a 15% increase?
A 15% increase would mean that the overall percentage would be: 100% + 15% = 115%
115% as a decimal = 115÷100 = 1.15

Increase £48 by 15%
£48 x 1.15 = £55.20

Powers

$$\left(\frac{3}{4}\right)^2 = \frac{3}{4} \cdot \frac{3}{4} = \frac{3 \cdot 3}{4 \cdot 4} = \frac{9}{16}$$

$$\left(\frac{2}{3}\right)^3 = \frac{2}{3} \cdot \frac{2}{3} \cdot \frac{2}{3} = \frac{8}{27}$$

Standard Form

To convert a number into **standard form**, split the number into two parts - a number between 1 and 10 multiplied by a **power** of 10.
Example
Write 81 900 000 in standard form:
81 900 000 = 8.19 x 10 000 000 = 8.19×10^7
Check: It's 10^7 because the decimal point has been moved 7 places to the left to get the number to be 8.19
Example
Write 0.000 001 2 in standard form:
0.000 001 2 = 1.2 x 0.000 001 = 1.2×10^{-6}
It's 10^{-6} because the decimal point has been moved 6 places to the right to get the number to be 1.2

Hegarty Maths Links

Fractions: 65-70
Reverse Percentages: 96-97
Increase/Decrease by a percentage: 88-90
Powers: 102-110
Standard Form: 122-128

Year 10 Foundation Topic 6 Fractions, decimals and percentages Student Knowledge Organiser

Fractions

1) $3\frac{2}{5} + \frac{14}{15}$	2) $2\frac{1}{2} + 4\frac{4}{5}$
3) $5\frac{6}{7} - 2\frac{1}{5}$	4) $5 - 2\frac{3}{7}$
5) $2\frac{7}{9} - \frac{2}{5}$	6) $\frac{3}{10} \times \frac{14}{15}$
7) $1\frac{1}{4} \times 1\frac{2}{5}$	8) $1\frac{1}{4} \times 2\frac{2}{7} \times 1\frac{2}{5}$
9) $2\frac{3}{4} \times \frac{2}{5} \times 1\frac{4}{11}$	10) $18 \div \frac{1}{4}$
11) $\frac{9}{10} \div \frac{3}{5}$	12) $1\frac{2}{5} \div \frac{14}{15}$

Percentages

1. If Bobby went to the shop and there was a 20% sale. He was going to buy a top for £20.
   How much does Bobby save?
   What is the new price of the top?
2. Apple is having a 20% off sale. I bought my new Ipod for £40, how much was it originally?
3. A special bottle of coke contains 10% more than a normal bottle. The special bottle contains 660 ml. How much does the normal bottle contain?
4. Katie gets a 20% pay rise. Her new wage is £264 per week. What was her wage before the pay rise?

North East Learning Trust

Standard Form

1. Write the following numbers in standard form:
a)3560000
b) 258300
c) 3100000
d) 45000000
e) 7990000
g) 101000
h) 23450
i) 465600
j) 24500000

2. Write the following numbers in standard form
a)0.000432
b) 0.245
c) 0.00753
d) 0.0234
e) 0.00451
f) 0.00405
g) 0.005714
h)0.0004013
i) 0.004487
j) 0.0000012034

1. Work out $(8 \times 10^4) \times (8 \times 10^4)$
2. Work out $(2.7 \times 10^6) \div (3 \times 10^2)$
3. Work out $(3.2 \times 10^5) \div (4 \times 10)$
4. Work out $(1.8 \times 10^7) \div (3 \times 10^3)$
5. Work out $(4.8 \times 10^6) \div (8 \times 10^3)$
6. Work out $(1.8 \times 10^{10}) \div (9 \times 10^4)$
7. Work out $(9 \times 10^5) \times (6 \times 10^5)$
8. Work out $(9 \times 10^2) \times (8 \times 10^5)$

CM1: Media products

Description:

A media product is a platform used to communicate information to a specific audience. There are different formats that can be used for this purpose.

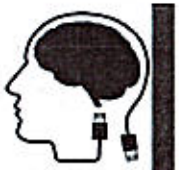
Digital imaging and graphics

Definition/Meaning:
A product that uses technology to create images in digital form. This may involve the use of graphic tablets, cameras or specific software such as Photoshop.

Digital games

Definition/Meaning:
A product that uses games consoles aswell as personal computers to entertain the audience. In particular, online gaming.

1.1 KS4 - Creative iMedia (ICT) - R093 – Media Products 1



Video

Definition/Meaning
A product that includes moving images and in most cases an auditory element. It's also referred to as an audio-visual product.

Audio

Definition/Meaning
A product that is recorded or transmitted in the form of sound. For example, sound effects.

Animation

Definition/Meaning:
A product that converts still images into moving elements to illustrate a sequence of events.

Music

Definition/Meaning:
A product that records audio as a way to express emotion.

Visual effects (VFX)

Definition/Meaning:
Technology is used to incorporate effects that may be too dangerous or impossible to add any other way. For example, a spaceship flying across the screen.

Special effects (SFX)

Definition/Meaning:
Special effects that can be created on set. This includes physical character creation, puppetry, animatronics or humans wearing prosthetic make-up and costumes.

CM1: Media products

Description:

A media product is a platform used to communicate information to a specific audience. There are different formats that can be used for this purpose.

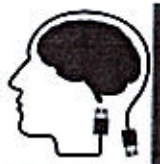
Social media

Definition/Meaning:
Websites and applications that enable users to create and share content or to participate in social networking.

Apps

Definition/Meaning:
A mobile application or app is a computer program or software application designed to run on a mobile device such as a phone, tablet, or watch.

1.1 OCR Cambridge National in Creative iMedia R093: Creative iMedia in the media industry



Comics and graphic novels

Definition/Meaning
A product that is designed to tell stories an in more visual way through illustrations and speech bubbles for dialogue.

Multimedia

Definition/Meaning:
A product that combines a range of assets such as text, images, video, animation and sound.

Virtual reality (VR)

Definition/Meaning:
Virtual reality is a computer-generated simulation in which a person can interact within an artificial three-dimensional environment.

Websites

Definition/Meaning
A product that combines a range of multimedia elements to create a webpage that can be accessed with an internet connection.

eBooks

Definition/Meaning:
A product that is available in electronic form and accessible via apps or e-readers (e.g. Kindle)

Augmented reality (AR)

Definition/Meaning:
Augmented reality allows the user experience the real world, which has been digitally augmented or enhanced in some way.

1.3 COMPUTER NETWORKS CONNECTIONS AND PROTOCOLS

NETWORKS

1	**Local Area Network (LAN)**	A LAN covers a small area located on a single site. For example a school or a business.
2	**Wide Area Network (WAN)**	A WAN connects LANs that are in different geographical locations. For example the internet.

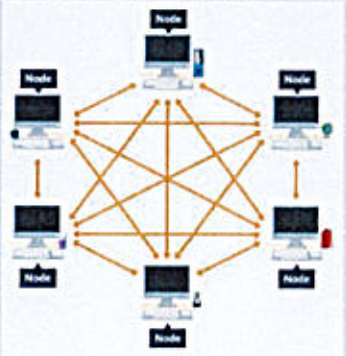
HARDWARE

3	**Wireless access points (WAP).**	Uses a radio transceiver to allow wireless connections to a network.
4	**Routers**	Transmits data between networks. Used to connect the LAN to the internet.
5	**Switches**	Connect devices on a LAN. Switches receive data from one device and transmit this data to another device on the network.
6	**Network Interface Controller (NIC)**	An internal piece of hardware that allows devices to connect to the internet.
7	**Transmission media**	Carries data signals from one computer to another. Either wired or wireless.

FACTORS THAT AFFECT NETWORK PEFORMANCE

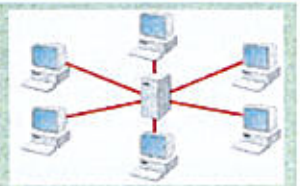
8	**Bandwidth**	The amount of data that can be transferred in a given time. The greater the bandwidth, the better.
9	**Number of users**	Available bandwidth is shared between users. Too many users may slow the network.
10	**Wired vs wireless**	Wired connections are faster and more reliable. Wireless can encounter interference e.g thick walls.
11	**Other**	Choice of hardware and choice of network topology (see below) can also affect network performance.

TOPOLOGIES

12	**Star network – all devices are connected to a central hub/switch.** Advantages: reliable- if one cable or device fails, the rest will still work. High performing as no data collisions can occur. Disadvantages: Expensive as uses a lot of cable and extra hardware is required. If hub or switch fails, all devices will lose connection.	
13	**Mesh network – each device is directly connected to all other devices.** Advantages: Data can be sent quickly as multiple routes to use. Can send and receive at the same time. New devices added easily. Disadvantages: Difficult to set up due to high number of connections. Need a lot of maintenance.	

1.3 COMPUTER NETWORKS CONNECTIONS AND PROTOCOLS

CLIENT SERVER AND PEER TO PEER NETWORKS

1	**Client server.** A network managed by a server. Computers are the clients. Pros - Files and software stored centrally so easier to keep track of and install updates. Easier to back up and manage security. Cons – expensive to set up. If server goes down, so do all devices. Can become overloaded if too many devices connect to it. 
2	**Peer to peer.** All computers are equal – no computer has control over the network. Pros – easy to maintain and cheap to set up. No dependence on server. Cons - Files stored on individual devices so could be lost/duplicated. Updates and security installed individually. Backups take longer. Less reliable and slow. 

THE INTERNET

3	**DNS**	Domain Name Server. Used to match website addresses (bbc.co.uk) to IP addresses.
4	**Hosting**	When a business uses its servers to store files of another organisation (e.g Dropbox).
5	**The Cloud**	Technology that allows you to store files on remote servers.
6	**IP addressing** *(layer 2)*	IP addresses aren't linked to hardware. They are assigned before a device connects to the internet. Different IP address each time you connect.
7	**MAC addressing**	Each device has it's own unique binary identifier so they can be identified on the network.
8	**Wired connection**	More expensive to set up but faster speeds. E.g Ethernet.
9	**Wireless connection**	Cheaper but more likely to be unreliable. For example if obscured by thick walls etc. E.g WiFi, Bluetooth

COMMON PROTOCOLS

10	**TCP/IP** *(layer 3)*	Transmission Control Protocol/Internet Protocol. Sets the rules for how devices connect on the network.
11	**HTTP** *(layer 4)*	Hyper Text Transfer Protocol. Used by web browsers to access websites and communicate with web servers.
12	**HTTPS** *(layer 4)*	Hyper Text Transfer Protocol Secure. A secure version of HTTP. Encrypts information.
13	**FTP** *(layer 4)*	File Transfer Protocol. Used to access, edit and move files between devices on a network.
14	**POP**	Post Office Protocol. Used to retrieve emails from a server. The server holds the email until you **download** it.
15	**IMAP**	Internet Message Access Protocol. Used to retrieve emails from a server. Holds the email until you **delete** it.
16	**SMTP** *(layer 4)*	Simple Mail Transfer Protocol. Used to send emails.

LAYERS – a group of protocols with similar functions

17	**Layer 1** Link Layer	Link layer. Passes data over a physical network. Responsible for how bits are sent. E.g Ethernet.
18	**Layer 2** Internet Layer	Makes connections between networks, directing data packets and handling traffic. E.g IP.
19	**Layer 3** Transport Layer	Controls data flow by splitting data into packets and checking they are sent / delivered. E.g TCP.
20	**Layer 4** Application Layer	Turns data into websites and other applications and vice versa. E.g HTTP, FTP, SMTP.

B5 & 6 Communicable disease, treatment and prevention
Knowledge Organiser

Communicable disease

A communicable disease is one caused by pathogens that can be passed from organism to organism. A pathogen is a microorganism that causes a disease. Examples of pathogens are: bacteria, fungi, viruses and protists.

Viruses live and reproduce rapidly inside an organism's cells. This can damage or destroy the cells.
Bacteria reproduce rapidly inside organisms and may produce toxins that damage tissues and cause illness.

Pathogens can be spread in the air, water or by direct contact.

Viruses

	Spread by	Symptoms	Prevention and treatment
measles	inhalation of droplets that are produced by infected people sneezing and coughing	• fever • red skin rash • complications can be fatal	• painkillers to treat the symptoms • young children are vaccinated to immunise them against measles
HIV	Exchange of body fluids such as: • sexual contact • blood when drug users share needles	• flu-like symptoms at first • virus attacks the body's immune cells, which can lead to AIDS - when the immune system is so damaged that it cannot fight off infections.	• antiretroviral drugs - are very damaging to the body • barrier methods of contraception, such as condoms • using clean needles
TMV	• direct contact of plants with infected plant material • animal and plant vectors • soil: the pathogen can remain in soil for decades	• mosaic pattern of discolouration on the leaves - where chlorophyll is destroyed • reduces plant's ability to photosynthesise, affecting growth	• removing infected plants

Bacteria

	Spread by	Symptoms	Prevention and treatment
Salmonella	bacteria in or on food being ingested	Salmonella bacteria and the toxins they produce cause • fever • abdominal pains • vomiting • diarrhoea	• poultry are vaccinated against Salmonella bacteria to control spread
Gonorrhoea	direct sexual contact - gonorrhoea is a sexually transmitted disease (STD)	• thick yellow or green discharge from the vagina or penis • pain when urinating	• treatment with antibiotics (many antibiotic-resistant strains have appeared) • barrier methods of contraception

Fungi

	Spread by	Symptoms	Prevention and treatment
Rose black spot	Water and wind	• purple or black spots on leaves, which turn yellow and drop early • reduces plant's ability to photosynthesise, affecting growth	• fungicides • affected leaves removed and destroyed

Protists

	Spread by	Symptoms	Prevention and treatment
Malaria	Mosquitos feed on the blood of infected people and spread the protist pathogen when they feed on another person - organisms that spread disease by carrying pathogens are known as vectors	• recurrent episodes of fever • can be fatal	• prevent mosquito vectors breeding • mosquito nets to prevent bites • anti-malarial medicine

Controlling the spread of communicable disease

There are a number of ways to prevent the spread of communicable diseases from one organism to another.

Hygiene
Hand washing, disinfecting surfaces and machinery, keeping raw meat separate, covering mouth when coughing/sneezing.

Isolation
Isolation of infected individuals - people, animals, and plants can be isolated to stop the spread of disease.

Controlling Vectors
If a vector spreads a disease, destroying or controlling the population of the vector can limit the spread of disease.

Vaccination
Vaccination can protect large numbers of individuals against diseases. It cannot be used in plants as they don't have an immune system.

Vaccination involves injecting small quantities of dead or inactive form of a pathogen into the body

This stimulates lymphocytes to produce the correct antibodies for that pathogen

If the same pathogen re-enters the body, the correct antibodies can be produced quickly to prevent infection.

Herd immunity

If a large proportion of a population is vaccinated against a disease, the disease is less likely to spread even if there are some unvaccinated individuals.

Key terms

Bacterium communicable disease fungicide fungus herd immunity pathogen protist sexually transmitted disease (STD) toxin vaccination vector virus

Communicable disease, treatment and prevention
Knowledge Organiser

Non-specific defences

Non-specific defences of the human body against all pathogens include:

Skin
- physical barrier to infection
- produces antimicrobial secretions
- Microorganisms that normally live on the skin prevent pathogens growing

Nose
Cilia and mucus trap particle in the air, preventing them from entering the lungs. Trachea and bronchi produce mucus, which is moved away from the lungs to the back of the throat by the cilia, where it is expelled.

Stomach
Produces strong acid (pH2) that destroys pathogens in mucus, food and drinks.

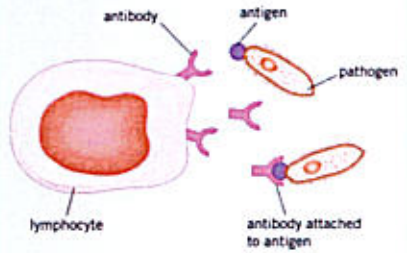
White blood cells

If a pathogen enters the body, the immune system tries to destroy the pathogen.
The function of white blood cells is to fight pathogens.
There are two main types of white blood cell - lymphocytes and phagocytes.

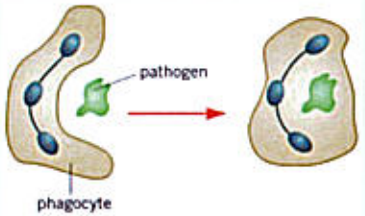
Lymphocytes fight pathogens in two ways:

Antitoxins
Lymphocytes produce antitoxins that bind to the toxins produced by some pathogen (usually bacteria). This *neutralises* the toxins.

Antibodies
Lymphocytes produce antibodies that target and help to destroy specific pathogens by binding to antigens (proteins) on the pathogen's surface's.



1. **Phagocytes** are attracted to areas of infection.
2. The phagocyte surrounds the pathogen and engulfs it.
3. Enzymes that digest and destroy the pathogen are released.



Treating diseases

Antibiotics

- **Antibiotics** are medicines that can kill *bacteria* in the body.
- Specific bacteria need to be treated by specific antibiotics
- Antibiotics have greatly reduced deaths from infectious bacterial diseases, but antibiotic-resistant strains of bacteria are emerging.

Treating viral diseases

- Antibiotics *do not* affect viruses.
- Drugs that kill viruses often damage the body's tissues.
- Painkillers treat the symptoms of viral diseases but do not kill pathogens.

Discovering and developing new drugs

Drugs were traditionally extracted from plants and microorganisms, for example

- The heart drug digitalis comes from foxglove plants
- The painkiller aspirin originates from willow trees
- Penicillin was discovered by Alexander Fleming from *Penicillium* mould.

Most modern are now synthesised by chemists in laboratories.

New drugs are extensively tested and trailed for

- Toxicity – is it harmful?
- Efficacy – does it work?
- Dose – what amount is safe and effective to give

Stages of clinical trials

Pre-clinical trials
Drug is tested in cells, tissues, and live animals.

Clinical trials
1. Healthy volunteers receive vary low doses to test whether the drugs is safe and effective.
2. If safe, large numbers of healthy volunteers and patients receive the drugs to find the optimum dose.

Peer review
Before being published, the results of clinical trials will be tested and checked by independent researchers. This is called **peer review.**

Double-blind trials
Some clinical trials give some of their patients a placebo drug - one that is known to have no effect.
Double-blind trials are when neither the patients nor the doctors know who has been given the real drug and who has been given the placebo. This reduces biases in the trail.

Key terms

Bacterium communicable disease fungicide fungus herd immunity pathogen protist sexually transmitted disease (STD) toxin vaccination vector virus

B7 Non-communicable disease
Knowledge Organiser

Health

Health is a state of physical and mental well-being.

The following factors can affect health:

- Communicable and non-communicable diseases
- Diet
- Stress
- Exercise
- Life situation

Different types of disease may interact, for example:

- Defects in the immune system make an individual more likely to suffer from infectious diseases
- Viral infection can trigger cancers
- Immune reactions initially caused by a pathogen can trigger allergies, for example skin rashes and asthma
- Severe physical ill health can lead to depression and other mental illnesses.

Cancer

Cancer is the result of changes in cells that lead to uncontrolled growth and division by mitosis.

Rapid division of abnormal cells can form a tumour.

Malignant tumours are cancerous tumours that invade neighbouring tissues and spread to other parts of the body in the blood, forming secondary tumours.

Benign tumours are non-cancerous tumours that do not spread in the body.

Risk factors and non-communicable diseases

Risk Factor	Disease	Effects of risk factor
Diet (obesity) and amount of exercise	Type 2 diabetes	Body does not respond properly to the production of insulin, so blood glucose levels can not be controlled
	Cardiovascular disease	Increased blood cholesterol can lead to CHD
Alcohol	Impaired liver function	Long-term alcohol use causes liver cirrhosis (scarring), meaning the liver cannot remove toxins from the body or produce sufficient bile
	Impaired brain function	Damages the brain and can cause anxiety and depression
	Affected development of unborn babies	Alcohol can pass through the placenta, risking miscarriages, premature births and birth defects
Smoking	Lung disease and cancers	Cigarettes contain carcinogens, which can cause cancers
	Affected development of unborn babies	Chemicals can pass through the placenta, risking premature births and birth. defects
Carcinogens, such as ionising radiation, and genetic risk factors	Cancers	For example, tar in cigarettes and ultraviolet rays from the Sun can cause cancers
		Some genetic factors make an individual more likely to develop certain cancers

Treatment of non-communicable diseases linked to lifestyle risk factors – such as poor diet, drinking alcohol, and smoking – can be very costly, both to individuals and to the Government.

A high incidence of these lifestyle risk factors can cause high rates of non-communicable diseases in a population.

Key terms artificial heart benign carcinogen cholesterol coronary heart disease health malignant risk factor statin stent transplant

B12 Inheritance
Knowledge Organiser

Types of reproduction

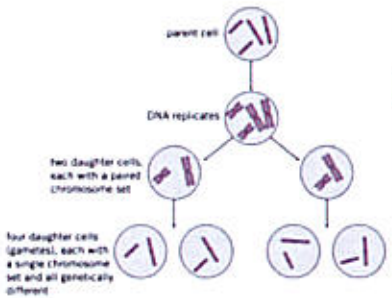
Sexual	Asexual
Two parents	One parent
Cell division thorough meiosis	Cell division by mitosis
Joining of male and female sex cells (gametes) - sperm and egg in animals, pollen and ovule in plants	No fusion of gametes
Produces non-identical offspring that are genetically different to parents	Produces offspring that are genetically identical to parent (clones)
Results in wide variation within offspring and species	No mixing of genetic information

Meiosis

Meiosis is a type of cell division that makes gametes in the reproductive organs.

Meiosis halves the number of chromosomes in gametes, and fertilisation (joining of two gametes) restores the full number of chromosomes.

The fertilised cell divides by mitosis, producing more cells. As the embryo develops, the cells differentiate.



DNA and the genome

Genetic material in the nucleus of a cell is composed of DNA.
DNA is made up of two strands forming a double helix.
DNA is contained in structures called chromosomes.
A gene is a small section of DNA on a chromosome that codes for a specific sequence of amino acids, to produce a specific protein.
The genome of an organism is the entire genetic material of that organism.
The whole human genome has been studied, and this has allowed scientists to:

- Search for genes linked to different diseases
- Understand and treat inherited disorders
- Trace human migration patterns from the past.

Inherited disorders

Some disorders are due to the inheritance of certain alleles:

- Polydactyly (extra finger or toe) is caused by a dominant allele.
- Cystic fibrosis (a disorder of cell membranes) is caused by a recessive allele.

Embryo screening and gene therapy may alleviate suffering from these disorders, but there are ethical issues surrounding their use.

Genetic inheritance

You need to be able to explain these terms about genetic inheritance:

gamete	Specialised sex cell formed by meiosis
chromosomes	Long molecule made from DNA found in the nucleus of cells
gene	Part of a chromosome that codes for a protein - some characteristics are controlled by a single gene (e.g. fur colour in mice and red-green colour blindness in humans), but most are controlled by multiple genes interacting
allele	Different forms of the same gene
dominant	Allele that only needs one copy present to be expressed
recessive	Allele that needs two copies to present to be expressed
homozygous	When an individual carries two copies of the same allele for a trait
heterozygous	When an individual carriers two alleles for a trait
genotype	Combination of alleles an individual has
phenotype	Physical expression of the genotype - the characteristic shown

Genetic crosses

A genetic cross is when you consider the offspring that might result from two known parents. Punnett squares can be used to predict the outcome of a genetic cross, for both the genotypes the offspring might have and their phenotypes.
For example, the cross bb (brown fur) x BB (black fur) in mice:

		mother	
		B	B
father	b	Bb	Bb
	b	Bb	Bb

Offspring genotype: 100% Bb
Offspring phenotype: all black fur

Sex determination

Normal human body cells contain 23 pairs of chromosomes-one of these pairs determines the sex of the offspring.
In human females the sex chromosomes are the same (XX) and in males there are different (XY).
A Punnett square can be used to determine the probability of offspring being male or female. The probability is always 50% in human as there are two XX and two XY outcomes.

		mother	
		X	X
father	X	XX	XX
	Y	XY	XY

Key terms: allele, chromosomes, clone, DNA, dominant, double helix, fertilisation, gamete, gene, genetic cross, genome, genotype, homozygous, heterozygous, meiosis, mitosis, phenotype, Punnett square, recessive

B14 Variation
Knowledge Organiser

Variation in populations

Differences in the characteristics of individuals in a population are called variation.
Variation may be due to differences in:

- the genes they have inherited, for example eye colour (genetic causes)
- the environment in which they have developed, for example, language (environmental causes)
- a combination of genes and the environment.

Mutation

There is usually a lot of genetic variation within a population of species – this variation arises from mutations.
A mutation is a change in a DNA sequence:

- mutations occur continuously
- very rarely a mutation will lead to a new phenotype
- some mutations may change an existing phenotype and most have no effect
- if a phenotype is suited to an environmental change, it can lead to a relatively rapid change in the species – this is the theory of evolution by natural selection.

Selective Breeding

Selective breeding (artificial selection) is the process by which humans breed plants and animals for particular genetic characteristics.
Humans have been using selective breeding for thousands of years, since breeding crops from wild plants and domesticating animals.

Process of selective breeding:

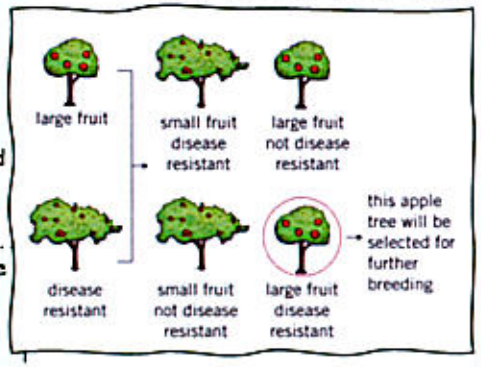
1. choose parents with the desired characteristics from a mixed population
2. breed them together
3. choose offspring with the desired characteristic and breed them together
4. continue over many generations until all offspring show the desired characteristic.

The characteristic targeted in selective breeding can be chosen for usefulness or appearance, for example

- disease resistance in food crops
- animals that produce more meat or milk
- domestic dogs with a gentle nature
- larger or unusual flowers.

Disadvantages of selective breeding:

- can lead to inbreeding, where some breeds are particularly prone to inherited defects or diseases
- reduces variation, meaning all members of a species could be susceptible to certain diseases.

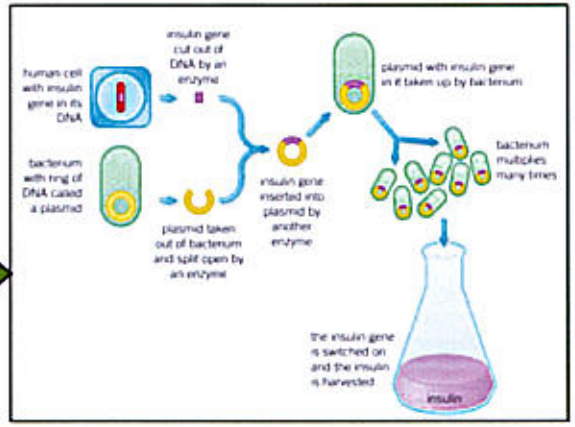


Genetic Engineering

Genetic engineering is a process that involves changing the genome of an organism by introducing a gene from another organism to produce a desired characteristic.

For example:

- Bacterial cells have been genetically engineered to produce useful substances, such as human insulin to treat diabetes.
- Plant crops have been genetically engineered to be resistant to diseases, insects, or herbicides, or to produce bigger and better fruits and higher crop yields. Crops that have undergone genetic engineering are called genetically modified (GM).



There are many benefits to genetic engineering in agriculture and medicine, but also some risks and moral objections.

Benefits	Risks
• Potential to overcome some inherited human diseases • Can lead to higher value of crops as GM crops have bigger yields than normal • Crops can be engineered to be resistant to herbicides, make their own pesticides, or be better adapted to environmental conditions.	• Genes from GM plants and animals may spread to other wildlife, which could have devastating effects on ecosystems • Potential negative impacts on populations of wild flowers and insects • Ethical concerns, for example, in the future people could manipulate the genes of foetuses to ensure certain characteristics • Some people believe the long-term effects on health of eating GM crops have not been fully explored.

Key terms genetically modified | genetic engineering | inbreeding | mutation | selective breeding | variation

B13 Evolution
Knowledge Organiser

Theory of evolution

Evolution is the gradual change in the inherited characteristics of a population over time.

Evolution occurs through the process of natural selection and may result in the formation of new species.

Process of natural selection

The theory of evolution by natural selection states that:

- Organisms within species show a wide variation in phenotype
- Individuals with characteristics most suited to the environment are more likely to survive and breed successfully
- These characteristics are then passed on to their offspring.

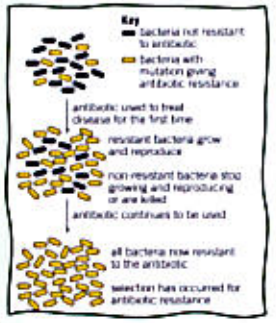
Resistant bacteria

Bacteria can evolve rapidly because the reproduce very quickly. This has lead to many strains of bacteria developing antibiotic resistance, such as MRSA. The development of antibiotic resistance is evidence for the theory of evolution by natural selection.

The development of new antibiotics is expensive and slow, so is unlikely to keep up with the emergence of new antibiotic-resistant bacteria strains.

To reduce the rise of antibiotic-resistant strains

- doctors should only prescribe antibiotics for serious bacterial infections
- patients should complete their courses of antibiotics so all bacteria are killed and non survive to form resistant strains.
- the use of antibiotics in farming and agriculture should be restricted.

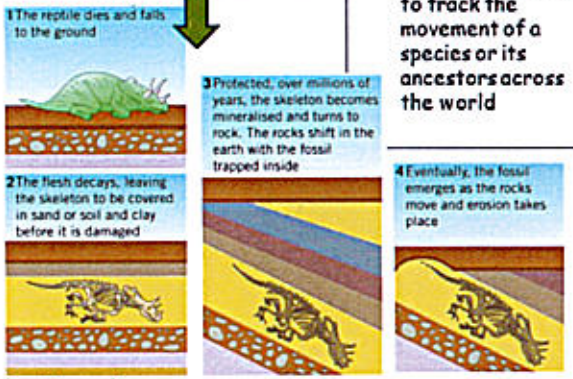


Fossils

Fossils are the remains of organisms from millions of years ago, which are found in rocks.

Fossils can be formed from:

- Parts of the organism that do not decay because one or more of the conditions needed for decay are absent
- Hard parts of an organism (e.g. bones) when replaced by minerals
- Preservation of the traces of organisms (e.g. burrows, footprints, and rootlet traces).



Evidence for evolution

The theory of evolution by natural selection is now widely accepted because there are lots of data to support it, such as

- It has been shown that characteristics are passed on to offspring in genes
- Evidence from the fossil record
- The evolution of antibiotic resistance in bacteria

Benefits of the fossil record	Problems with the fossil record
• Can tell scientists how individual species have changed over time • Fossils allow us to understand how life developed over the Earth's history • Fossils can be used to track the movement of a species or its ancestors across the world	• Many early organisms were soft-bodied, so most decayed before producing fossils • There are gaps in the fossil record as not all fossils have been found and others have been destroyed by geological or human activity – this means scientists cannot be certain about how life began on Earth.

Classification of living organisms

Kingdom
Phylum
Class
Order
Family
Genus
Species

Carl Linnaeus developed a system to classify living things into groups, based upon observable characteristics.

New models of classification were proposed as understanding of biochemical processes developed and improvements in microscopes led to discoveries of internal structures.

There is now a three-domain system developed by Carl Woese, dividing organisms into:

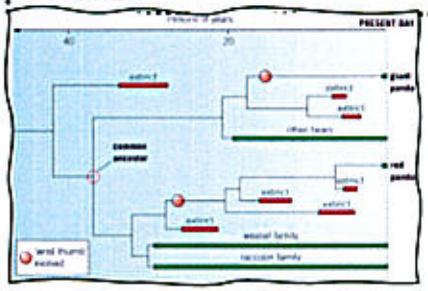
- Bacteria (true bacteria)
- Archea (primitive bacteria usually living in extreme conditions)
- Eukaryota (including protists, plants, fungi and animals).

Organisms are named by the binomial system of genus and species e.g. **Homo Sapiens**

Homo is our **Genus**
Sapien is our **Species**

Evolutionary Trees

Evolutionary trees use current classification data for living organisms and fossil data for extinct organisms to show how scientists believe organisms are related.



Extinction

Extinction is when there are no remaining individuals of a species still alive.

Factors that may contribute to a species' extinction include:

- new predators
- new diseases
- new competitors
- catastrophic events
- changes to the environment

Key terms: Antibiotic resistance | binomial system | evolution | evolutionary tree | extinction | fossil record | natural selection | three-domain system

Year 9,10,11 Knowledge Organiser Chemical reactions 1 - METALS H

Key words and ideas

When an element gains oxygen it has been OXIDISED

Adding oxygen is OXIDATION

When an element loses oxygen it has been REDUCED

Removing oxygen is REDUCTION

potassium	most reactive	K
sodium		Na
calcium		Ca
magnesium		Mg
aluminium		Al
carbon		C
zinc		Zn
iron		Fe
tin		Sn
lead		Pb
hydrogen		H
copper		Cu
silver		Ag
gold		Au
platinum	least reactive	Pt

In terms of electrons, oxidation is loss and reduction is gain

OILRIG

Metals with oxygen (air)

When metals react with oxygen metal oxides are formed

Remember that the formula for oxygen is O_2

Metal + oxygen -> metal oxide

Displacement reactions

Reactive metals can force the ions of less reactive metals to accept electrons

e.g.

$Mg + CuSO_4 \rightarrow Cu + MgSO_4$

$Mg + Cu^{2+} \rightarrow Cu + Mg^{2+}$

Extraction of metals

Most metals are present as compounds in rocks rich in the compound called ores

Gold is so unreactive is found in the ground as gold metal

Elements below C in the reactivity series can be extracted using carbon

Elements above carbon are extracted using electrolysis

Reactions with water

metal + water -> metal hydroxide + hydrogen

$2Li + 2H_2O \rightarrow 2LiOH + H_2$

When a group 1 metal atom loses an electron it becomes a +1 ion with a stable electronic structure

$Na \rightarrow Na^+ + e$

Metals can be arranged in a reactivity series. More reactive metals are better at losing electrons than less reactive metals

Only K, Na, Li, Ca react readily with cold water

Reaction with acids

Metals above hydrogen in the reactivity series react with metals:

metal + acid → salt + hydrogen

The test for hydrogen gas is that it burns with a POP!

Year 9,10,11 Knowledge Organiser Chemical reactions 1 - METALS F

Key words and ideas

When an element gains oxygen it has been OXIDISED

Adding oxygen is OXIDATION

When an element loses oxygen it has been REDUCED

Removing oxygen is REDUCTION

potassium	most reactive	K
sodium		Na
calcium		Ca
magnesium		Mg
aluminium		Al
carbon		C
zinc		Zn
iron		Fe
tin		Sn
lead		Pb
hydrogen		H
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gold		Au
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OILRIG

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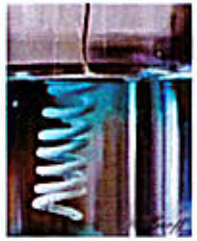

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Gold is so unreactive is found in the ground as gold metal

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Elements above carbon are extracted using electrolysis

Reactions with water

metal + water -> metal hydroxide + hydrogen

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Reaction with acids

Metals above hydrogen in the reactivity series react with metals:

metal + acid → salt + hydrogen

The test for hydrogen gas is that it burns with a POP!

Year 9,10,11 Knowledge Organiser Chemical reactions 2 - ACIDS, BASES and SALTS

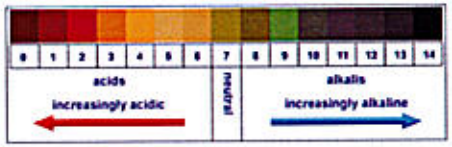
Key words and ideas

Sulphuric acid H_2SO_4
Nitric acid HNO_3
Hydrochloric acid HCl

Acids release H^+ ions in water

A **salt** is produced when the H atom(s) of an acid are replaced by either metal ions or an ammonium ion

Sulphuric acid gives sulphates
Nitric acid gives nitrates
Hydrochloric acid gives chlorides



Bases = substances that react with acids

Metal oxides	e.g. CaO
Metal hydroxide	e.g. $Ca(OH)_2$
Metal carbonates	e.g. $CaCO_3$

Alkalis = hydroxides that dissolve in water- give OH^- ions when added to water e.g NaOH

Reaction with metals

Metals above hydrogen in the reactivity series react with metals:

metal + acid → salt + hydrogen

The test for hydrogen gas is that it burns with a POP!

Reaction with bases

metal oxide + acid → salt + water

metal hydroxide + acid → salt + water

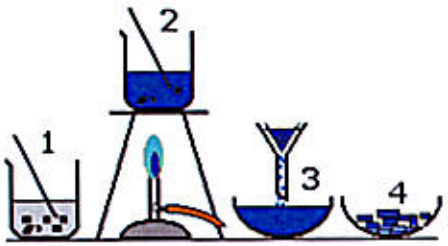
metal carbonate + acid → salt + water + CO_2

neutralisation

$H^+(aq) + OH^-(aq) \rightarrow H_2O(l)$

Making soluble salts

1. Measure out 25ml of acid in a beaker
2. Warm (if necessary)
3. Add the base until all the acid has been used up
4. Filter off the excess base
5. Evaporate off some of the water
6. Leave to crystallise



Strong and weak acids

Ethanoic acid is a weak acid which means it does not fully ionise in water

$CH_3COOH \rightleftharpoons H^+ + CH_3COO^-$

Hydrochloric acid is a strong acid and ionises fully.

$HCl \rightarrow H^+ + Cl^-$

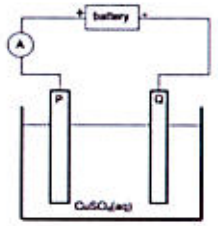
the concentration of H^+ ions in 0.4 M HCl is higher than that in 0.4 M ethanoic acid

- The pH of the HCl is lower
- The HCl reacts faster

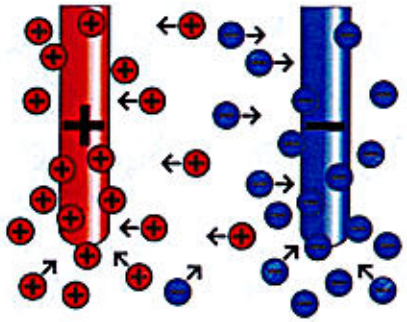
Year 9,10,11 Knowledge Organiser Chemical reactions 3 - ELECTROLYSIS

Key words and ideas

Electrolysis is splitting a compound using electricity



Positive electrode = anode
Negative electrode = cathode
PANIC!



Positive ions move to the negative electrode and GAIN ELECTRONS
Negative ions move to the positive electrode and LOSE ELECTRONS

Oxidation is loss
Reduction is Gain

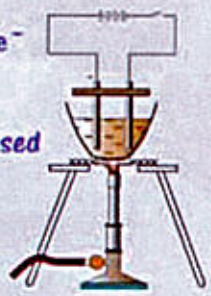
Electrolysis of molten compounds

Electrolysis of molten lead(II) bromide compound, $PbBr_2$

$2Br^-(l) \rightarrow Br_2(g) + 2e^-$

Observation :
Brownish gas are released

Product :
Bromine gas, Br_2



$Pb^{2+}(l) + e^- \rightarrow Pb(s)$

Observation :
Grey metal is formed

Product :
Lead metal, Pb

Current can only flow when the compound is molten because then the ions can move

Reactive metals are extracted from their ores using electrolysis
e.g aluminium is extracted from aluminium oxide by dissolving in molten cryolite and passing a current through it.

Electrolysis of aqueous solutions

Current can also flow when ionic compounds are dissolved in water.
Water dissociates to for H+ ions and OH- ions. These compete with the ions from the ionic compound at the electrodes.
We can predict the products of an electrolysis by applying simple rules:

Cathode: the positive ion LOWEST DOWN in the reactivity series wins

Anode: If Cl^-, Br^- or I^- are present then they win

Otherwise, OH^- wins and oxygen is produced

Year 9,10,11 Knowledge Organiser Chemical reactions 4 - Energy Changes H

SCIENCE

Activation energy is the minimum amount of energy required for particles to react on collision

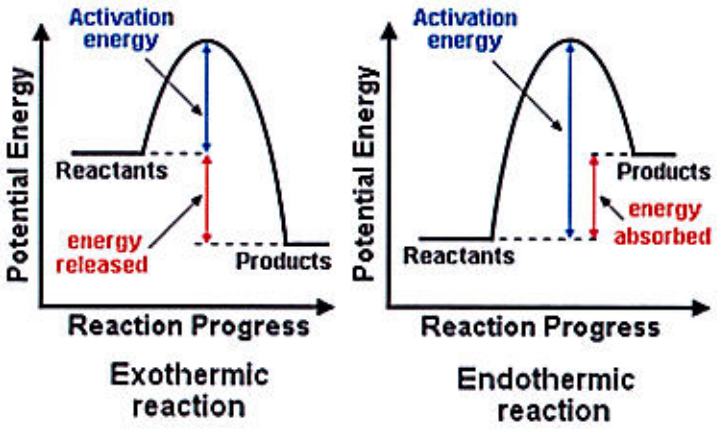
In an **exothermic** reaction: the temperature of the surroundings increases. The energy change (ΔH) is negative

In an **endothermic** reaction: the temperature of the surroundings decreases. The energy change (ΔH) is positive

Breaking bonds uses energy.
H–H → 2 H takes 436 kJ/mol to break the H–H bond

Making bonds releases energy.
2 H → H-H
436 kJ/mol is released making the H-H bond

Reaction profiles



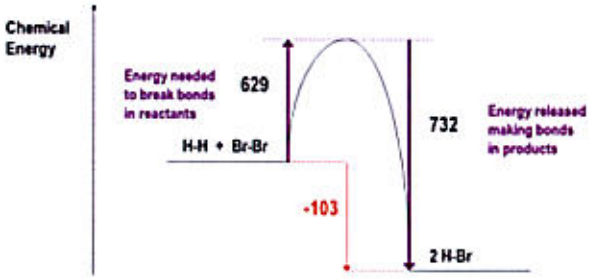
Bond energy

H—H + Br—Br ⟶ 2 H—Br

BREAK		MAKE	
H-H	= 436	2 (H-Br)	= 2(366)
Br-Br	= 193	MAKE	= 732
BREAK	= 629		

ENERGY CHANGE = BREAK – MAKE

Energy change = 629 – 732
= –103 kJ/mol



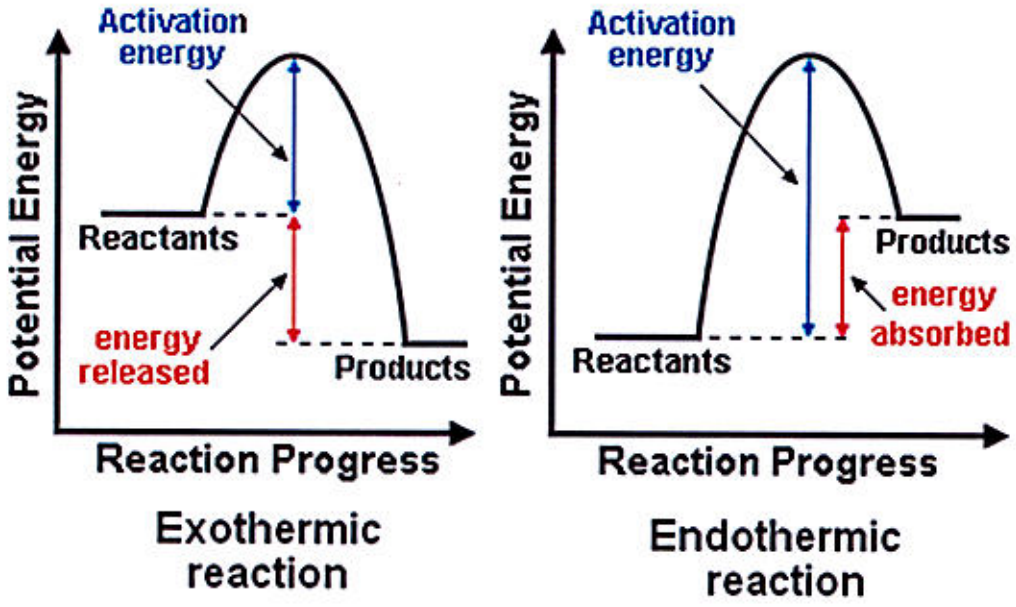
Reaction is EXOTHERMIC because
more energy is released making bonds than is needed to break bonds

Activation energy is the minimum amount of energy required for particles to react on collision

In an exothermic reaction: the temperature of the surroundings increases. The energy change (ΔH) is negative

In an endothermic reaction: the temperature of the surroundings decreases. The energy change (ΔH) is positive

Reaction profiles



Year 10,11 Knowledge Organiser Rates and equilibrium-Rates 1.

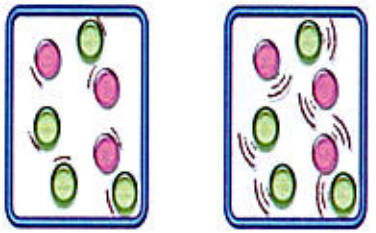
SCIENCE

Key words and ideas

The rate of a chemical reaction tells you how fast reactants turn into products.

Particles must collide, with a certain minimum amount of energy, before they can react. The minimum amount of energy is called the activation energy.

The rate of a chemical reaction can be increased by using a catalyst, increasing the temperature, concentration (pressure if it is a gas) and surface area of a substance.



Particles have less energy, less frequent and successful collision

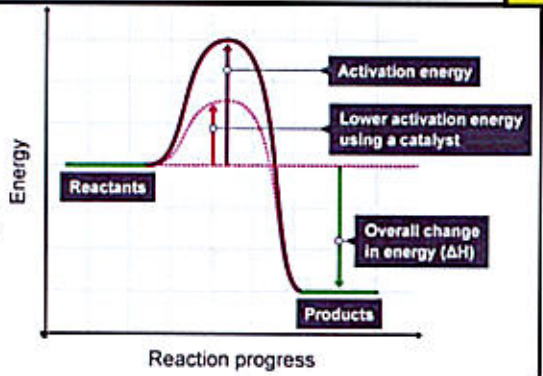
Particles have high energy, more frequent and successful collision

Catalyst

Catalysts are substances that increase the rate of a chemical reaction without any permanent chemical change.

Different reactions need different catalysts.

Catalysts increase the rate of reaction by providing a different pathway for the reaction that has a lower activation energy.



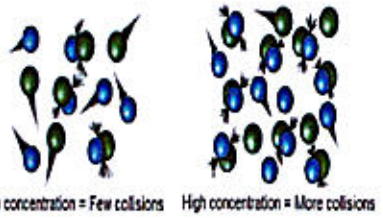
Uses of catalysts

Biological soap powder.

Plastics are made using a catalyst.

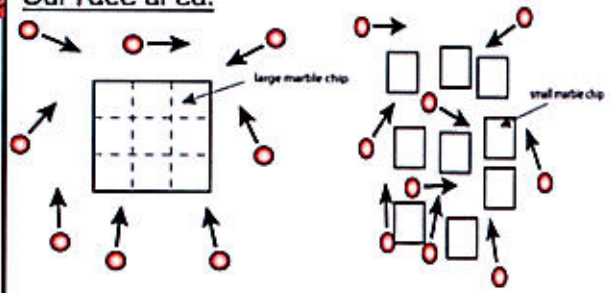
Enzymes in catalysts help cooked ham to be more tender.

Concentration/pressure.



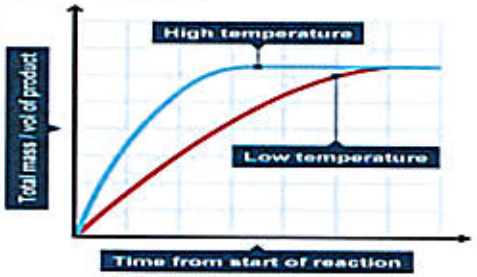
If the concentration of the reactants, or the pressure of a reacting gas increases then the frequency of collisions between particles increases. This increases the rate of reaction.

Surface area.



The smaller the size of the pieces of a solid the larger its surface area.
In tiny lumps, or in a powder, each tiny piece of solid is surrounded by solution.
This means the frequency of collisions between the solid and solution will increase. Increasing the rate of reaction.

Temperature.



If you increase the temperature of a solution the particles gain more energy. They move around more quickly increasing the frequency of collisions between them. This increases the rate of reaction.

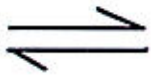
Year 10,11. **Knowledge Organiser Rates and equilibrium-Rates 2**

SCIENCE

Key words and ideas

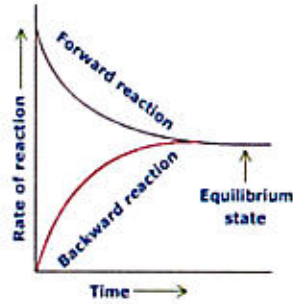
Reverse reactions

A reversible reaction can go in both directions so two half arrows are used in the equation. One arrow points in the forward direction and one in the backward direction.



Equilibrium

When a reversible reaction occurs in an apparatus which prevents the escape of reactants and products (closed system), equilibrium is reached when the forward and reverse reactions occur at exactly the same rate.

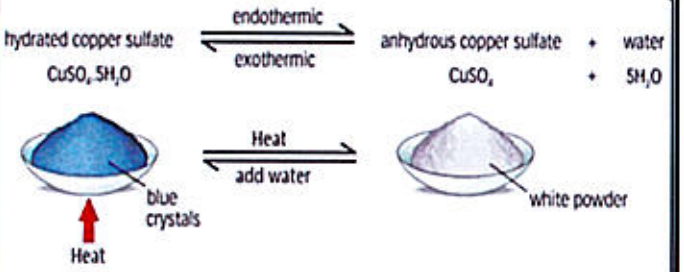


Attainment of equilibrium in a reversible reaction

Le Chateliers Principle (H)

$$N_2 + 3H_2 \rightleftharpoons 2NH_3$$

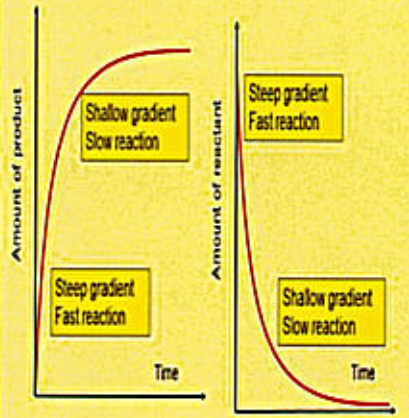
Haber process.
The forward reaction is exothermic and the backward reaction is endothermic. You can change the relative amounts of products formed by changing the temperature. Increasing the temperature favours the endothermic reaction. Decreasing the temperature favours the exothermic reaction.
The reactants contain 3 moles of gas and these produce 2 moles of product. Pressure can affect reversible reactions. Increasing the pressure favours the reaction the greater number of moles of gas.



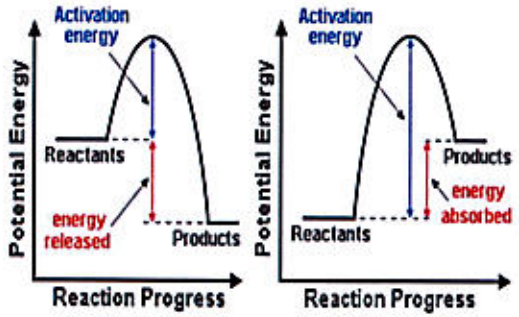
The above reaction is an example of a reversible reaction. This reaction can be used as a test for water. The anhydrous copper sulphate (white) will turn blue if reacted with water. If a reversible reaction is exothermic in one direction it is endothermic in the opposite direction. The same amount of energy is transferred in each case.

Rates and Graphs

- These show the increasing amount of product or the decreasing amount of reactant.



Exothermic and endothermic reactions



In an exothermic reaction the reactants contain more energy than the products. This is because thermal energy is given out to the surroundings.

Knowledge Organiser Electricity

SCIENCE

Key vocabulary:

Potential difference – the work done in moving one coulomb of charge from one point in the circuit to another.

Current – a flow of electrons.

Charge – the rate of flow of electrons.

Resistance – the opposing of a current.

Power – how much energy is transferred (work done) in a certain amount of time.

Series – all components in a circuit follow on directly from each other.

Parallel – the current has alternate pathways to possibly take in a circuit.

Free (or delocalised) electrons – electrons that are free to move through the conductor (eg metal).

Key equations:

Q = It (charge = current x time)

V=IR (potential difference= current x resistance)

Total resistance = R1 + R2

P = VI (power=potential difference x current)

P= I x I x R (power=current squared x resistance)

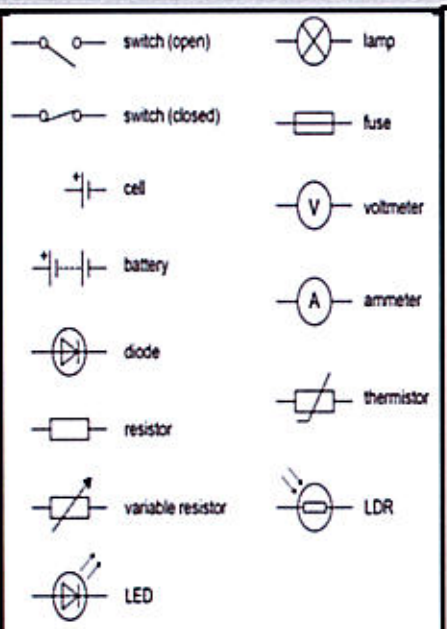
E=Pt (energy transferred=power x time)

E=QV (energy transferred=charge flow x potential difference)

Key Units:

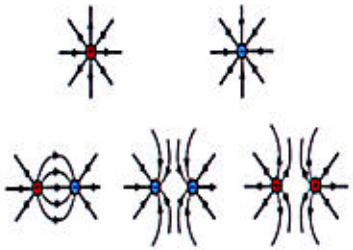
Current–Amps (A)
Potential difference–volts (V)
Charge–coulombs (C)
Resistance–ohms (Ω)
Power–watts (W)
Energy transferred–joules (J)

Energy transferred is the same as work done.



Electric fields

Electric fields will always run from positive to negative – shown by arrows. The greater the number of arrows, the stronger the electric field.
Like charges – the field lines show a gap in the electric field.
Unlike charges – filed lines move from + to –.



Series circuits – all components follow on directly from each other. The current only has one pathway to follow.
The current is the same all the way around a series circuit. The potential difference is shared between the components in the circuit.
Parallel circuit – the electricity has more than one pathway to take. The current will take the path of least resistance.
The current will be shared between the branches in the circuit. The potential difference will be the same across each component in the circuit.
Resistance – caused by the collision between free electrons and metal ions. The more collisions the greater the resistance.
Factors that can affect resistance are:

- Length – double length, double resistance: directly proportional
- Temperature – increase temperature, increase resistance
- Diameter – bigger diameter, less resistance
- Material – number of free electrons

Static

Static is caused because of friction between two insulators resulting in the transfer of electrons.

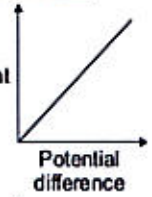
Object gains electrons – object is negatively charged.
Object loses electrons – object is positively charged.

If there is a build-up of charge and the potential difference between two objects is great enough, a spark will 'jump' – this is a discharge of electricity.

The objects do not have to be touching – no contact needed for attraction / repulsion.

The National Grid: a system of transformers (step up and step down) and cables.
Cables can be overhead or underground.
Electricity transmitted at high voltage, low current in order to reduce heat loss from the cables. Less energy is wasted therefore it makes the National Grid more efficient.

Fixed resistor at constant temperature – Ohm's Law. R=V/I. Directly proportional.



Diode – no current until certain potential difference. Current rapidly increases. Very high resistance in negative bias. Only allows current in one direction.

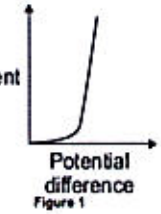
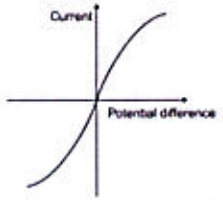
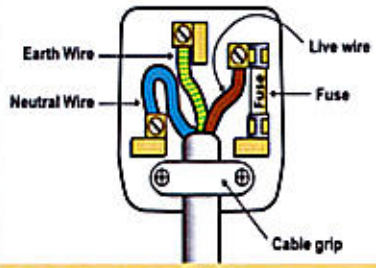


Figure 1

Filament bulb – bulb gets hotter, so line curves as resistance increases.





Plug case – plastic / rubber electrical insulators
Pins – brass hard wearing conductor of electricity
Wires – copper flexible conductor of electricity. Coated in coloured plastic (insulator of electricity) and identification.
Earth wire (green Yellow) – safety (pd=0v)
Live (brown) – carries current (pd=230V)
Neutral (blue) – completes circuit (p.d. = 0V)

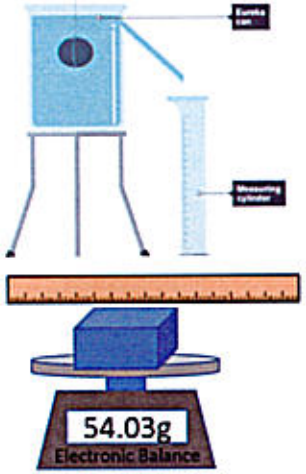
Knowledge Organiser Particle Model of Matter

SCIENCE

	Solid	Liquid	Gas
Arrangement of particles	Close together Regular pattern	Close together Random arrangement	Far apart Random arrangement
Movement of particles	Vibrate on the spot	Move around each other	Move quickly in all directions
Diagram			

States of matter – what form a substance can exist as.
Solid – regular arrangement of **vibrating** particles with strong forces of attraction. Fixed shape and volume.
Liquid – random arrangement of slowly moving particles which have weak forces of attraction. Takes the shape of the container. Fixed volume.
Gas – random arrangement of quickly moving particles which have negligible (no) forces of attraction. Volume can be changed (gases can be compressed). No fixed shape – fills container.
Melting – changing state from solid to liquid.
Evaporating / boiling / vaporisation – liquid to gas.
Condensation – gas to liquid.
Freezing / solidifying – liquid to solid.
Sublimation – solid to gas.
Meting point – the **temperature** at which a solid becomes a liquid.
Boiling point – the **temperature** at which a liquid becomes a gas.
Freezing point – the **temperature** at which a liquid becomes a solid.
Density – the amount of mass in a given volume. Density = mass ÷ volume.
Latent heat – the energy transferred to or from a substance when it changes state.
Specific latent heat – the energy required to change the state of 1kg of a substance without an increase in temperature.
Specific Heat Capacity – the energy required to change the temperature of 1kg of a substance by 1°C.

Density required practical
Density is the mass per unit volume of any object. It is calculated by dividing the mass of an object by its volume.

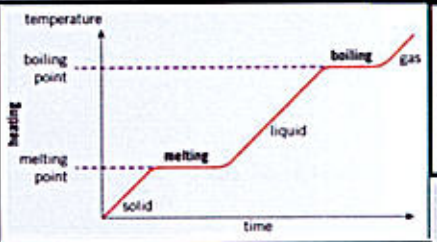


Density = mass / volume
(kg/m³) (kg) (m³)

Regular object (e.g. cube) – use a ruler to measure length, width, height. Multiply these 3 values together for volume. Use electronic scales to find mass. Use equation to calculate density.

Irregular object. – use electronic scales to find mass. Submerge object under water in a displacement can. The volume of the water displaced is the volume of the object (EUREKA!). Use equation to calculate density.

Liquid – Measure the volume of the liquid in a measuring cylinder. Use electronic scales to find the mass of the empty cylinder and then the cylinder and the liquid. Subtract to find the mass of the liquid. Use the density equation to calculate the density.



Changing state:
In the graph showing the change in temperature of a substance being heated or cooled, the flat horizontal section shows when the substance is changing state.
The energy transfers taking place during a change in state do not cause a change in temperature but do change the internal energy of the substance.

Specific Heat Capacity – the energy required to change the temperature of 1kg of a substance by 1°C.

Energy = mass X SHC X temperature change

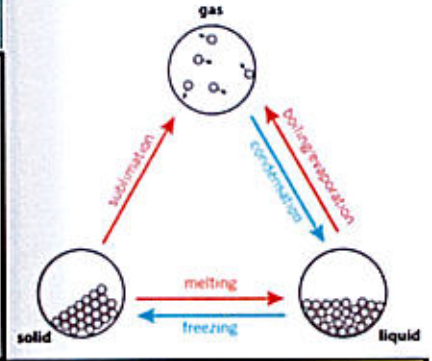
Energy	(J)
Mass	(kg)
SHC	(J/kg°C)
Temperature	(°C)

Specific latent heat – the energy required to change the state of 1kg of a substance without an increase in temperature.
Specific latent heat of fusion – solid to liquid
Specific latent heat of vaporisation – liquid to gas

Energy for change of state = mass x SLH

Energy	(J)
Mass	(kg)
SLH	(J/kg)

Changing state:
Red arrows – more energy (hotter).
Forces of attraction getting weaker.
Blue arrows – less energy (colder).
Forces of attraction getting stronger.



Gas Pressure – produces a force at right angles to the wall of the container.
For a fixed mass of gas at a constant temperature:

pressure X volume = constant

Pressure (Pa; pascals)
Volume (m^3)

Work is the transfer of energy by a force.
Internal energy is the total kinetic and potential energy of all the particles in a system.

Doing work on a gas increases the internal energy of a gas, so temperature increases.

Particle motion in a gas is random (i.e. particles move in different directions at a range of speeds)

The temperature of a gas is related to the average kinetic energy of the molecules.

Knowledge Organiser
Radioactivity

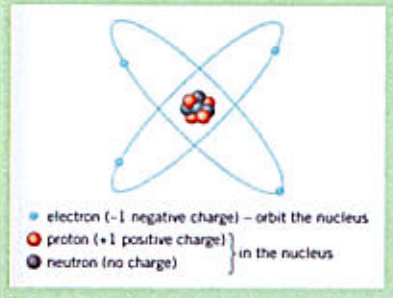
SCIENCE

Keywords

Alpha particle– composed of two protons and two neutrons.
Atomic number- the number of protons (which equals the number of electrons) in an atom. It is sometimes called the proton number.
Electron- tiny negative charged particles that move around the nucleus of an atom.
Energy level- specific energy values of electrons in an atom.
Ionisation- a process in which atoms become charged.
Irradiated- an object that has been exposed to ionising radiation.
Isotope- atoms with the same number of protons and different numbers of neutrons.
Mass number- the number of proton and neutrons in a nucleus.
Neutron- uncharged particles of the same mass as protons. The nucleus of an atom consists of protons and neutrons.
Nuclear model- Rutherford's model of the atom where the mass is in the centrally located positively charged nucleus.
Orbit- moving around in a circular path.
Plum pudding model- J. J. Thomson's model of the atom that had a positively charged cloud with negatively charged electrons spread throughout. The model was called the plum pudding model because the positive medium was like a pudding and the electrons were like the plums or fruit.
Proton- positively charged particles with an equal and opposite charge to that of an electron.

Modern model of an atom

The model of the atom we have today was developed over time with the help of evidence from experiments.



Future experiments may change our understanding and lead us to change this model.

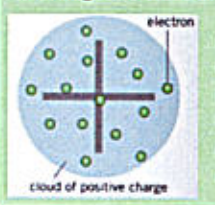
Dalton's model

John Dalton thought the atom as a solid sphere that could not be divided into smaller parts. His model did not include protons, neutrons and electrons.

Plum pudding model

Scientists' experiments resulted in the discovery of charged sub-atomic particle. The first to be discovered were electrons.

The discovery of electrons led to the plum pudding model. A cloud of positive charge with negative electrons embedded in it.

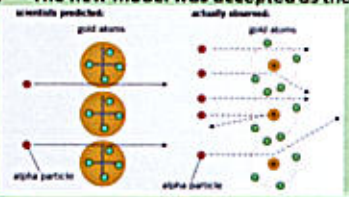


In the plum pudding model the electrons are the plums, and the positive charge is the rest of the cake.

The scattering experiment

Ernest Rutherford designed an experiment to test the plum pudding model.

1. Scientists fired small positively charged particles (alpha particles) at a piece of gold foil only a few atoms thick.
2. They expected the alpha particles to pass straight through the foil.
3. Instead a small number of alpha particles bounced ack and some were deflected.
4. This was evidence suggested that the positive charge and the mass of the atom must be concentrated in a very small space at the centre called the nucleus.
5. The new model was accepted as the old model was not supported by the evidence.



Nuclear model

Scientists replaced the plum pudding model with the nuclear model. They suggested that electrons orbit the nucleus, but not at set distances, and that the mass of the atom was concentrated in the charged nucleus.

Bohr's model

Niels Bohr improved the nuclear model and calculated that electrons must orbit the nucleus at fixed distances. The orbits are called shells o energy levels. These calculations agreed with experimental results.

Protons

Later experiments provided evidence that the positive charge of a nucleus could be split into smaller particles with the opposite charge to electrons. The positive charged particles are called **protons**.

Neutrons

James Chadwick carried out experiments that provided evidence for particles without a charge. This is the neutron and found in the nucleus.

Nucleus

- Has a radius about 10,000 times smaller that the radius of the atom.
- Contains protons and neutrons.
- Is where most of the mass of an atom is concentrated.

Electrons

- Orbit the nucleus at different fixed distances called energy levels.
- Can gain energy by absorbing electromagnetic radiation. This causes them to move into a higher energy level.
- Can lose energy by emitting electromagnetic radiation. This causes them to move to a lower energy level.

Element symbols

Mass number- number of protons and neutrons added together.
Atomic umber – number of protons.

Knowledge Organiser Radioactivity

SCIENCE

Ionisation

Atoms can become charged when they lose or gain electrons. This process is called ionisation.

- A positive ion is formed if an uncharged atom loses one or more electrons.
- A negative ion is formed if an atom gains one or more electrons.

Radioactive decay

Atoms with an unstable nucleus emit radiation. When nuclear radiation is given out the atomic nuclei become more stable. It is a random process. The radiation can knock electrons out of atoms in a process called ionisation.

Activity and count rate

The activity of a radioactive source is the rate of decay of an unstable nucleus, measured in becquerel (Bq).

1Bq= 1 decay per second

Detectors, e.g a Geiger- Muller tube, record a count rate (number of decays detected per second).

Half-life

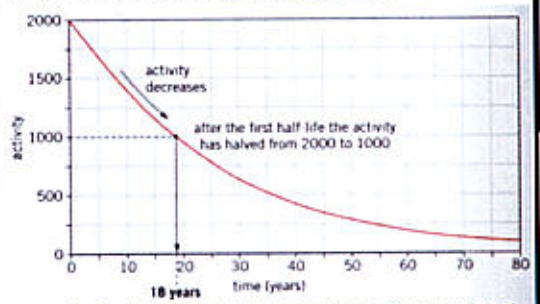
The half-life of a radioactive source is the time

- For half the number of unstable nuclei in a sample to decay

OR

- For the count rate or activity of a source to halve.

The half- life of a source can be found from a graph of its count rate or activity against time.



The time taken for the activity to halve is 18 years. This is the half-life of this substance.

Type of radiation	Change in the nucleus	Ionising power	Range in air	Stopped by
α **alpha** particle (two protons and two neutrons)	nucleus loses two protons and two neutrons	highest ionising power	travels a few centimetres in air	stopped by a sheet of paper
β **beta** particle (fast-moving electron)	a neutron changes into a proton and an electron	high ionising power	travels ≈ 1 m in air	stopped by a few millimetres of aluminium
γ **gamma** radiation (short-wavelength, high-frequency electromagnetic radiation)	some energy is transferred away from the nucleus	low ionising power	virtually unlimited range in air	stopped by several centimetres of thick lead or metres of concrete

Half-life

To find the reduction in activity after a given number of half –lives:

1. Calculate the activity after each half life.
2. Subtract the final activity from the original activity.

Net decline as a ratio = reduction in activity/ original activity

Ionising radiation

Living cells can be damaged or killed by ionising radiation.

The risk depends on the half life of the source.

Inside the body alpha radiation is very dangerous, it is the most ionising. Outside the body it affects only the skin and eyes as it is the least penetrating.

Background radiation- natural examples are rocks and cosmic rays. Man made examples are nuclear weapons and accidents.

Irradiation versus contamination

Irradiation- when an object is exposed to ionising radiation. Protect by shielding or moving away from the source.

Contamination- When atoms of a radioactive material are on an object. Object remains exposed to radiation as long as it is contaminated.

Nuclear equations

Alpha emission. An alpha particle is made of two protons and two neutrons. So when an unstable atom emits an alpha particle the atomic number decreases by 2 and the mass number goes down by 4. $^{228}_{90}Th \longrightarrow {}^{224}_{88}Ra + {}^{4}_{2}\alpha$

Beta emission. A beta particle is a high energy electron from the nucleus. A neutron changes into a proton and electron, which is instantly emitted, this is the beta particle. The atomic number goes up by 1 and the mass number is unchanged. The charge of the nucleus is increased, and the mass of the nucleus is unchanged. $^{40}_{19}K \longrightarrow {}^{40}_{20}Ca + {}^{0}_{-1}\beta$

PHYSICS SEPARATES ONLY

Nuclear radiation in medicine

Gamma emitting tracers are injected or swallowed by a patient. Gamma cameras can then create an image showing where the tracer has gone. The tracer must have a short half- life for safety, to limit the patients' dose.

Control or destruction of unwanted tissue. Narrow beams of gamma radiation can be focused on tumours. Gamma is used as it can penetrate the body.

PHYSICS SEPARATES ONLY

Nuclear fission- when a large unstable nucleus absorbs an extra neutron and splits into smaller nuclei of roughly equal size.

During fission gamma radiation and energy is released.

Two or three fission neutrons are released and go on to cause a chain reaction.

The reaction is controlled by control rods which can absorb neutrons.

Spontaneous fission is rare and occurs when the nucleus splits without absorbing a neutron.

Two fissionable isotopes Uranium 235 (most common fuel in nuclear reactors) and plutonium 239.

Nuclear Fusion- when two light nuclei join together and make a heavier one. Energy is released. This takes place in stars/ the sun.

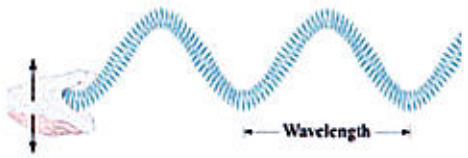
P12: Waves
Knowledge Organiser

The properties of waves

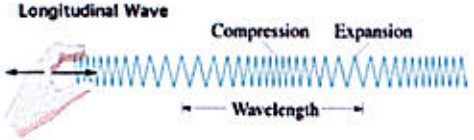
All waves, no matter what kind, transfer energy without the movement of matter. Waves can be mechanical, such as sound, waves on water, spring oscillations an earthquakes. These all require a medium to travel through, solid liquid or gas. Electromagnetic waves such as light, radio and microwaves can all travel through a vacuum.

There are 2 types of wave; transvers waves and longitudinal waves. We can show these on a stretched slinky spring:

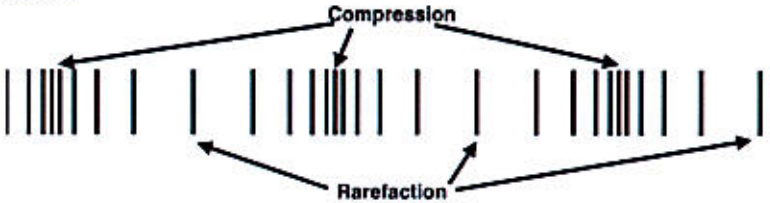
If the spring is shaken side to side or up and down, this produces a perpendicular oscillation. The movement is at right angles to the direction the waves travel. We call this kind of wave a transverse wave.



Examples of transverse waves are waves on water and electromagnetic waves.



Move your hand in and out and you produce an oscillation that is parallel to the movement of the wave. We call this a longitudinal wave, examples of which are sound and certain types of seismic (earthquake) waves.



Longitudinal waves travel as a series of squashes called compressions and stretches called rarefactions.

The wave equation

You must be able to use the wave equation, and rearrange if necessary.

- V => **Velocity** of the wave in m/s
- f => **Frequency** in Hertz (Hz)
- λ => **Wavelength** in metres (m)

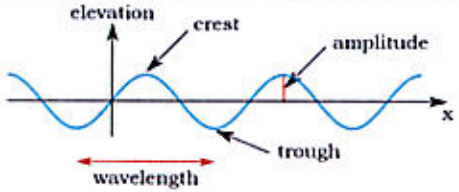
From the triangle:

$V = f \times \lambda$,

$f = V \div \lambda$

$\lambda = V \div f$

Measuring a wave

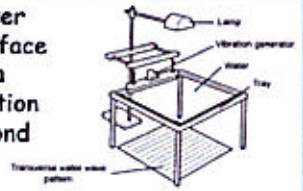


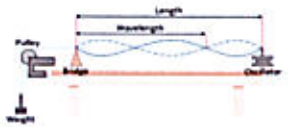
The wavelength of a wave is the distance between two like points on that wave, such as crest to crest, a trough to a trough or, in the case of longitudinal waves, compression to compression.

The amplitude of a wave is the distance between the rest point and the point of maximum displacement. Frequency is the number of waves that pass per second

Required practicals

A ripple tank can be used to project an image of water waves. A paddle vibrates to make ripples on the surface of the water. A photograph showing the waves and a ruler allows you measure the wavelength. A slow motion video clip will allow for waves to be counted per second and the speed calculated using the wave equation.





If a vibration generator is linked to a weighted string, the wavelength of the waves produced can be measured:

λ = length of sting x2 / number of half waves.

As the frequency is the independent variable, the speed can again be calculated.

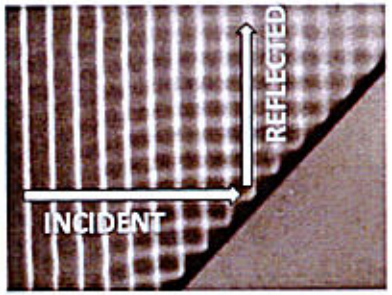
Key terms

Transverse, Longitudinal, Wavelength, Frequency, Amplitude, Compression, Rarefaction, Crest, Trough, Perpendicular, Parallel

P12: Waves 2
Knowledge Organiser

HIGHER Reflection of waves

We can investigate the wave property of reflection using a ripple tank. Waves on water will reflect off a barrier.



You can see from this photograph that the wavelength of the incident waves is the same as that of the reflected waves. This is because during reflection, neither the speed of the waves, nor their frequency changes

The waves reflect off the barrier at the same angle to the normal as they approach

LAW OF REFELCTION: **angle of incidence = angle of reflection**

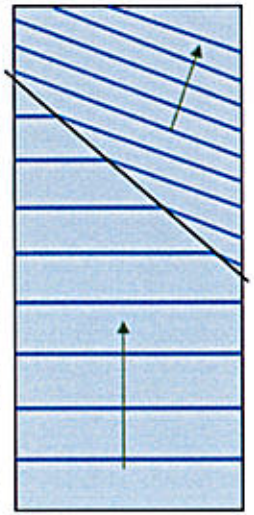
HIGHER Refraction of waves

We can also investigate the wave property of **refraction** using a ripple tank. Waves on water refract when they move into **shallower water**.

As the waves enter the shallower water they are slowed down in the same way as light waves are slowed down when they enter glass. If they approach along the **normal line** (perpendicular to the boundary) the waves reduce in speed and wavelength.

As we can consider each wave to be made up of **wavelets**, crossing a boundary at an angle will change the direction of the wave as wavelets which hit the boundary first will slow down first. So the waves direction is altered – refraction.

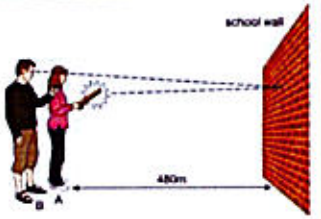
At a boundary, waves may be **transmitted**, **reflected refracted** or **absorbed**.



Sound Waves

Sound is caused by **vibration**. If you look as a working loudspeaker you can see it moving. Sound can travel in solids liquids and gases but **cannot travel through a vacuum** – no one in space can hear you scream!

We can measure the speed of sound by timing how long it takes for a sound to be made and then **echo** back to the observer.



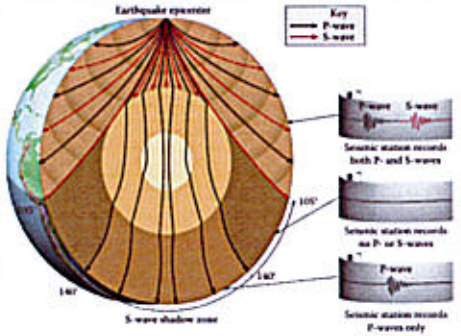
TRIPLE Ultrasound

Ultrasound is frequencies in **excess of 20,000Hz** – too high for human hearing to detect. It can be used to **detect the boundaries** deep within a material such as flaws in materials or the bones of an unborn child.

The distance to the boundary can be calculated by:

Distance to boundary$_{(m)}$ = ½ x speed of sound through medium$_{(m/s)}$ x time taken$_{(s)}$

TRIPLE Seismic waves



Seismic waves travel out from the epicentre of an earthquake:
Primary waves - the initial tremors which are **longitudinal**.
Secondary waves – slower moving **transverse** waves.
Long waves – last to arrive and **only travel through the crust**.

As transverse S-waves cannot pass through a liquid a **shadow zone** tells us the outer core is liquid.

By monitoring the passage of the P-waves through the Earth we have mapped the structure of the Earth as it **refracts the longitudinal waves** at medium boundaries.

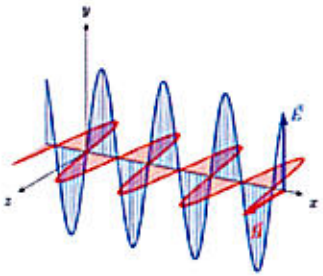
Key terms

Reflection, Refraction, Normal, Wavelet, Incidence, Transmitted, Absorbed, Vacuum, Crust, Mantle, Core

P13: Electromagnetic waves
Knowledge Organiser

A Family of waves

Radio waves, microwaves, infra red, visible light, ultraviolet, x-rays and **gamma waves** are all part of the **electromagnetic spectrum.** These are electric and magnetic disturbances that can transmit energy from a source to an absorber



All EM-Waves exhibit the same properties:

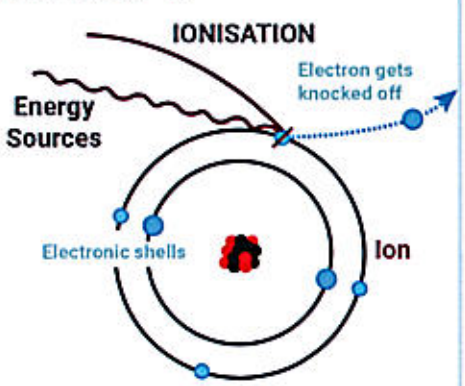
- **Transverse** waves (electric and magnetic components at right angles to each other
- Travel through a **vacuum**
- **Speed of 3 x 10^8m/s** in a vacuum
- May **reflect** off smooth surfaces
- May **refract** when slowed down by a medium other than free space

Waves from different parts of the spectrum have **different wavelengths.** Radio waves may have a wavelength of over 100,000m. Whereas gamma rays may be as short as 10^{-12}m.

The shorter the wavelength (the higher the frequency) the greater their energy and penetration capacity the waves have.

Shorter wavelengths like gamma, x-ray and ultraviolet are also more likely to cause **ionisation.**

Some EM-waves are emitted by electrons when they move down energy level.



Gamma rays are emitted by emitted due to **changes in the nucleus** of an unstable atom.

Speed of EM-waves

As all EM-wave travel at the **same speed** (the speed of light!!) we can link this to the wave speed equation

- **V** => **Velocity** of the wave in m/s
- **f** => **Frequency** in Hertz (Hz)
- **λ** => **Wavelength** in metres (m)

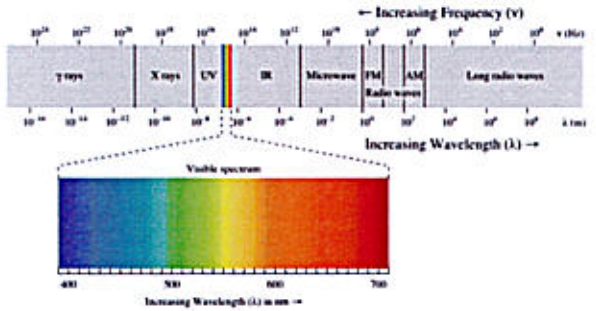
- V = 300,000,000 m/s

For example, a microwave with a wave length of 8cm:

- V = 3 x 10^8 m/s
- λ = 0.08m

$$f = \frac{300{,}000{,}000}{0.08} = 3.75 \times 10^9 \text{Hz} \text{ or } 3750\text{MHz}$$

Visible light



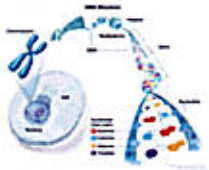
The visible spectrum is only a very narrow band of the wider EM-spectrum.
Wavelengths of **400nm** for **violet**, to **700nm** for **red** light

Remember **ROYGBIV**
Richard of York gave battle in vain

Dangers of Ionising EM waves

So gamma, x-ray and ultraviolet can cause problems if their energy is deposited inside a living cell. Gamma rays can kill cells. As with all ionising radiation, damage to the DNA could cause the cell to divide out of control - cancer

The level of danger is dependant on the radiation dose.



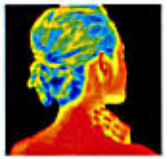
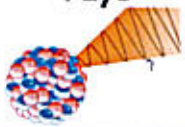
Key terms

Alternating, Transverse, Reflection, Spectrum, Refraction, Radiation dose, Wavelength, Wavelength, Frequency, Amplitude

P13: Electromagnetic waves 2

Knowledge Organiser

Looking at the entire spectrum

Type of wave	Radio waves	Microwaves	Infrared	Visible light	Ultraviolet	X-rays	Gamma rays
							
Average wavelength	10^{3}m	10^{-2}m	10^{-5}m	5^{-7}m	10^{-8}m	10^{-10}m	10^{-12}m
Uses	Used for radio and television signals as they can travel long distance in the air. Also used for Wi-Fi and Bluetooth as they will bend round objects so a line of sight is not needed. HT: Radio waves produced by oscillations in an electric circuit linked to a transmitter may create an alternating current in a receiver aerial of the same frequency.	Used in radar, satellite and mobile communications as they can pass easily through the Earth's atmosphere but tend not to spread out as much as radio (though their range is not as long.) Used in cooking food as they can penetrate the food and vibrate water and fat molecules within causing a heating effect in the food only, not the oven.	Used for heating and cooking as can transfer energy quickly to food etc. The Sun heats the planet through the transmission of infra red radiation. As all hot objects emit infrared, sensors to detect them can be used in alarm systems and thermal imaging cameras. Dull black surfaces are the best emitters and absorbers of infra red.	Visible light as its name suggests is used for our vision, the narrow band of EM frequencies that the human eye can detect. Are increasingly used in communication as the shorter wavelengths allow for the carriage of more information. Visible light is used in optic fibre communications. A light beam reflects off the inside of transparent / thin fibre of glass	Has an effect on the pigmentation in human skin so used in sun beds, but is also responsible for the synthesis of vitamin D in our bodies. Fluorescent lights use a coating that absorbs UV and emits visible light. UV is also used to detect forged notes, and fluorescent dyes and inks (which also absorb the UV and emit light.) Popular in night clubs	Use primarily for diagnostic imaging , mainly of the body as the rays pass easily through soft tissue but are absorbed by denser material such as bone. For this reason airport security screening also uses x-rays to see inside luggage. X-rays have become invaluable to the art world by detecting forged painting detection	As it passes easily through skin, gamma rays are used in radiation therapy to kill cancer cells. Several beams are focussed on the tumour to kill the cancer but not the surrounding tissue. Gamma rays are also used in the sterilisation of equipment and food as the rays will kill bacteria. Irradiated food also has a longer shelf life.
Hazards	Can penetrate the body and cause a heating effect.	Like radio, can have a heating effect on the body.	Can cause damage to skin - burns.	Excessive amounts can cause damage to the retina.	Can damage skin cells causing aging and risk of cancer	Ionising radiation. Can kill cells, cause mutation - cancer	Ionising radiation. Can kill cells, cause mutation - cancer

INCREASING FREQUENCY →

← INCREASING WAVELENGTH

Key terms

Absorption, Emission, Penetration, Ionising, Irradiation, Mutation, Sensors, Fluorescent, Atmosphere

Year 10 Knowledge Organiser – Forces in balance

SCIENCE

North East Learning Trust

Key vocabulary:

- Vector
- Scalar
- Magnitude
- Displacement
- Newton
- Driving force
- Braking force
- Friction
- Resultant force
- Balanced forces
- Unbalanced forces
- Weight
- Air resistance
- Stretching force (tension)
- Contact forces
- Non- contact forces
- Magnetic force
- Electrostatic force
- Gravity
- Free body force diagram
- Centre of mass
- Suspended equilibrium
- Symmetrical objects
- Parallelogram of forces

Physics only

- Moments
- Load
- Effort
- Force multiplier
- Pivot

Forces between objects

Newton's third law of motion:

When two objects interact with each other, they exert equal and opposite forces on each other.

Equal and opposite forces

Vector quantity has magnitude (size) and direction

Scalar quantity has magnitude only

Resultant forces

Resultant force is a single force that has the same effect as all the forces acting on the object.

Balanced forces, resultant force is zero:

- objects at rest remains stationary
- object moving keeps moving at a constant speed

Unbalanced forces

- Depends on the size and direction of the resultant force

Centre of mass

The centre of mass or the centre of gravity is if you think of the weight of an object as if it acts at a single point.

The centre of mass of an object is the point at which its mass can be thought of as being concentrated.

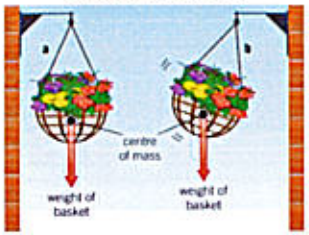


Figure 2 *Suspension* **a** *In equilibrium* **b** *Non-equilibrium*

Centre of mass

The centre of mass of a uniform ruler is at its midpoint.

When an object is freely suspended, it comes to rest with its centre of mass directly underneath the point of suspension.

For a flat object that is symmetrical, its centre of mass is along the axis of symmetry.
If the objects has more than one axis of symmetry , its centre of mass is where the axes of symmetry meet.

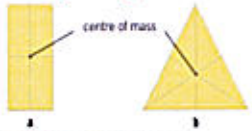


Figure 3 *Symmetrical objects*

Balanced forces

Same size and opposite direction

Figure 2 *Overcoming friction*

When the crate is pushed across the floor at a constant speed without changing direction, the push force on it is equal in size and opposite direction to the friction of the floor on the crate.

Unbalanced forces

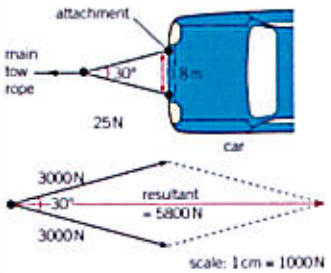
The movement depends on the size and direction of the resultant force.
When a jet plane takes off the thrust from the engine is greater than the air resistance or drag on it.
The plane is accelerating.

Figure 3 *A passenger jet on take-off*

A free body diagram show the forces acting on it.

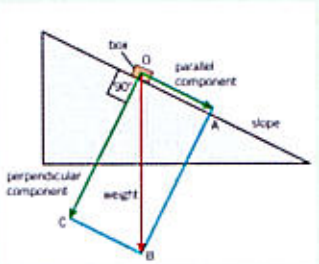
Parallelogram of forces

The parallelogram of forces is a scale diagram of two force vectors.
The parallelogram of forces is used to find the resultant of two forces that do not act along the same line.
The resultant is the diagonal of the parallelogram that starts at the origin of the two forces.



Resolution of forces (HT)

Resolving forces means finding perpendicular components that have a resultant force that is equal to the force.
To resolve a force in two perpendicular directions, draw a rectangle with adjacent sides along the two directions so that the diagonal represents the force vector.



Year 10 Knowledge Organiser - Motion

SCIENCE

North East Learning Trust

Key vocabulary:

- Vector-a quantity with direction and magnitude
- Scalar- a quantity with magnitude only
- Magnitude- size or amount of a physical quantity
- Displacement- distance in a given direction
- Velocity- speed in a given direction
- Speed- how fast something is moving
- Acceleration- change of velocity per second
- Deceleration- negative acceleration, used for any situation where an object slows down
- Gradient- (of a straight live graph) Change of the quantity plotted on the y-axis divide by the change of the quantity plotted on the x axis
- Tangent- a straight line drawn to touch a point on a curve, so it has the same gradient as the curve at that point
- Independent variable- the one you chose to vary in an investigation
- Dependent variable- used to judge the effect of varying the independent variable
- Continuous data- any numerical value
- Categoric data- one that is best described by a word or a label

Equations to remember:

$$v = \frac{s}{t} \qquad a = \frac{v - u}{t}$$

Equation you will be given and expected to use:

$$[\, v^2 - u^2 = 2as \,]$$

Speed, distance and time:

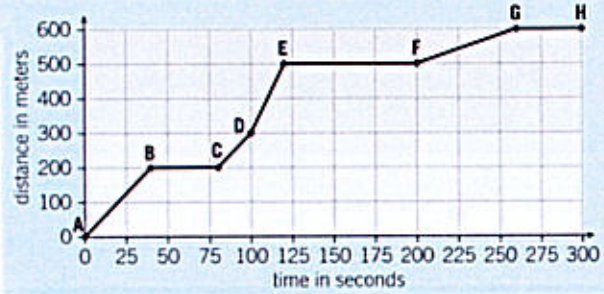
You can calculate the speed of an object by using the equation speed= distance/ time. If you have a distance time graph you can get the distance and the time for each section and therefore calculate the speed.

The gradient on a distance time graph represents the speed.

A-B shows constant speed as it is a straight line

B-C shows the object is stationary as the distance is not changing

C-D is also constant speed but as the gradient is steeper is a greater constant speed



Acceleration, change in velocity and time:

You can calculate the acceleration of an object if you know the change in velocity and the time it takes for the change in velocity. These can be taken from a velocity- time graph.

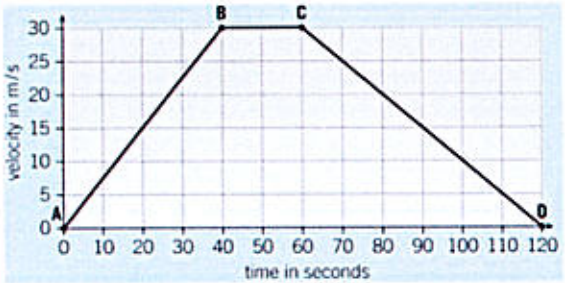
The gradient of the line on a velocity- time graph represents the acceleration.

A-B shows constant acceleration

B-C shows constant speed

C-D shows deceleration

A steeper gradient shows a greater constant acceleration



Higher tier

The area under the velocity-time graph represents the distance travelled in a direction (displacement).

Work out the area of regular shaped objects.

Key Information to remember:

Typical speeds of people:

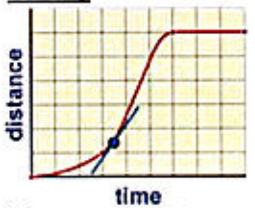
- **walking ~ 1.5 m/s**
- **running ~ 3 m/s**
- **cycling ~ 6 m/s**

Near the Earth's surface any object falling freely under gravity has an acceleration of about 9.8 m/s^2.

HT An object moving in a circle has a direction of motion that changes continuously as it goes round. So its velocity is not constant even if its speed is constant, this is because the direction is continuously changing direction.

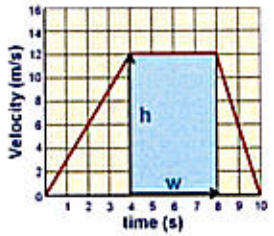
HT only

If the graph has curved sections, the motion is not uniform.



To find the speed for a curved part of the graph you need to draw a tangent. The would out the speed by doing $\Delta Y / \Delta X$

Work out the distance travelled, the area under the V-T graph. Calculate the area of the rectangles and the right-angled triangles.



Knowledge Organiser Forces and motion

Keywords

Braking distance– the distance a car travels while under the braking force or while the brakes have been applied
Inertia- an objects tendency to reman in a steady state
Momentum- mass x velocity
Reaction time- the time for you to react to a stimuli. It varies from person to person but ranges from 0.2-0.9s
Stopping distance- braking distance + thinking distance
Thinking distance- the distance the car travels while the driver reacts
Inertia- the tendency for an object to continue in its state of motion
Inertial mass-Is a measure of the difficulty of changing the object's velocity
Recoil- rebound or movement backwards
Directly proportional (∝)- There is a direct proportion between two values when one is a multiple of the other.

Remember from previous topics:

Velocity is *speed* in a given *direction*. It is a vector quantity.
A change in velocity means an object:

- *Starts to move*
- *Stopes moving*
- *Speed up*
- *Slows down*
- *Changes direction*

Balanced forces are the same size and opposite directions.

When the forces are balanced the resultant force is zero Newtons and an object at rest will remain at rest and if the object is moving it will continue to move at the same speed in the same direction.

Newton's Second law

Newton's Second Law states that:

- the acceleration of an object is proportional to the force on the object.

$$a \propto F$$

- Is inversely proportional to the mass of the object

$$a \propto \frac{1}{m}$$

- They are then linked in the equation:

F= m x a

Where
F= force in N
m= mass in kg
a= acceleration in m/s²

Stopping distance

The distance it takes for a car to stop is the stopping distance.

Stopping distance	=	thinking distance	+	braking distance

Thinking distance-the *distance* the car travels while the driver reacts.

Braking distance-the *distance* the car travels while the driver brakes.

Factors that affect:

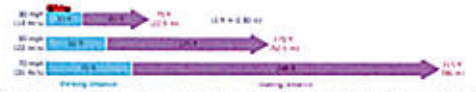
Braking distance	Thinking distance
Speed	Tiredness
Road conditions (ice, snow rain- must state this!)	Drugs and alcohol
Condition of brakes or tyres.	Distractions such as phones

Factors that reduce friction increase the braking distance. Less friction can increase skidding.
Drugs and alcohol slow the drivers reactions and so the car travels further while the driver reacts.

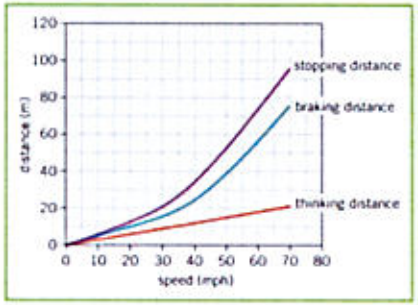
Newton's Second law Required practical

Force and acceleration experiment
Investigate the effect of varying the force on the acceleration of an object of constant mass
There are different ways to investigate the effect of varying the force on an object. In this required practical activity, it is important to:
•make and record measurements of length, mass and time accurately
•measure and observe the effect of force
•use appropriate apparatus and methods to measure motion
The diagram shows apparatus that can be used in this investigation. A constant stream of air reduces the friction between the glider and the air track.

Investigate the effect of varying the force on the acceleration of an object.
Method
Position an air track on a bench with a bench pulley at one end and two light gates above the track. Cut an interrupt card to a known length (such as 10 cm) and attach it to an air track glider. Connect the glider to a hanging mass by a string the length of the air track passing over the bench pulley. Make sure the air track is level and that the card will pass through both gates before the mass strikes the floor.
Set the data logging software to calculate acceleration.
Add 5 × 20 g slotted masses (0.98 N of force) to the end of the string.
Release the glider, then record the weight and acceleration.
Repeat steps 4 and 5 two more times, and calculate a mean value for the acceleration.
Repeat steps 4 to 6, removing one of the slotted masses each time (giving forces of 0.78 N, 0.59 N, 0.39 N and 0.20 N.



stopping distance = thinking distance + braking distance

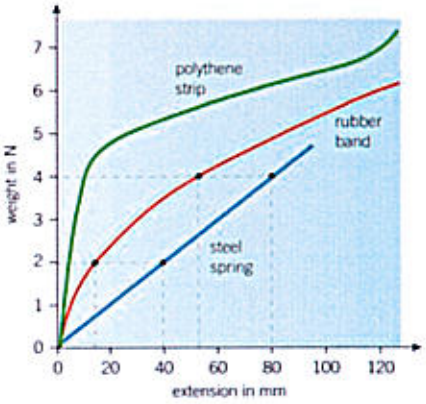


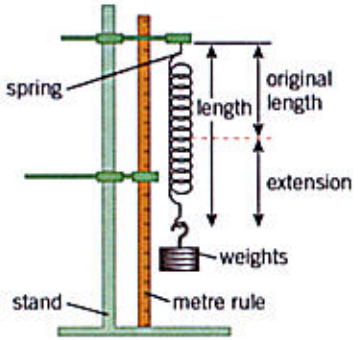
Knowledge Organiser Forces and motion

Forces and elasticity Required practical

Equipment	Safety glasses Spring Slotted masses 1m ruler Clamp stand
Method	1. Attach the spring to the clamp stand by hanging it off a clamp and let the spring hang freely over the side of the bench. 2. Use the two clamps to hold the ruler vertically, near but not touching the spring. You will use this to measure the length of the spring. 3. Measure the length of the spring with no force acting on it. 4. Hang the slotted masses from the spring and measure the new length of the spring. Record the length of the spring and the mass suspended from it. Work out the **extension** of the spring. 5. Continue adding slotted masses and record the new mass each time and work out the extension. 6. Plot the results on a graph. Extension v weight.
Safety	Safety glasses must be worn throughout Carefully place the slotted masses on the spring

Accurate means close to the true value. To increase accuracy you use a wooden split as a pointer to the ruler. The ruler is clamped in position so it is vertical.





F=k x e

Where:
F= force in N
k= spring constant in N/m
e=extension in m

HT Momentum

Momentum is the property of all moving objects. It is a vector quantity
Momentum depends on the mass and velocity of the object.

p = m x v

Where:
p= momentum in kg m/s
m= mass in kg
v= velocity on m/s

The law of conservation of momentum says that:
In a closed system, the total momentum before an event (e.g. a collision or an explosion) is equal to the total momentum after the event.

If two objects collide the law of conservation can be written as:

$$M1u1 + m2u2 = m1v1 + m2v2$$

m1= mass of object 1
u1= initial velocity of object 1
v1= final velocity of object 1

HT Inertia

The tendency for an object to remain at rest or to continue in uniform motion is called inertia.
The inertial mass of an object is the measure of the difficulty of changing the object's velocity.
Inertial mass= force/ acceleration

HT SUVAT

The deceleration of a vehicle can be calculated using the following equation:

$$v^2 = u^2 + 2as$$

You do not need to remember this equation it will be given to you. You will need to be able to re-arrange it, know units and know that the acceleration close to the surface of the Earth is 9.8ms^2

PHYSICS SEPARATES ONLY

Momentum

If an object is moving an unbalanced force acting on it will change its momentum.
Since F= ma and a= ΔV/t so we can write F= mΔv/t where mΔvis the change in momentum

The greater the time for the change in the momentum:
- The smaller the rate of change of momentum
- The smaller the force experienced

Vehicle safety features increase the time take for the change in momentum: Aire bags, seat belts, crumple zones, cycle helmets and crash mats for gymnastics.

C4: Chemical calculations
Knowledge Organiser

Conservation of mass

The conservation of mass states that atoms cannot be created or destroyed during a chemical reaction., so the mass of the reactants will equal the mass of the product. In other words, all the atoms you had in the reactants must be present in the products.. For some reactions, the mass appears to **decrease**. This typically occurs when a gas is produced and lost to the surroundings. For other reactions, the mass appears to **increase**. This typically occurs when a gas is a reactant.

Decrease in mass

Sodium carbonate (s) → sodium oxide (s) +carbon dioxide (g)

When sodium carbonate is thermally decomposed, carbon dioxide gas is produced and released into the surroundings.

Increase in mass

Magnesium (s) + Oxygen (g) → Magnesium oxide (s)

Oxygen from the air is added to the magnesium which will be heavier in mass.

Relative mass

The masses of atoms are compared by measuring them relative to atoms of carbon-12. You can work out the relative formula mass (M_r) of a compound by adding up the relative atomic masses (A_r) of the elements in it, in the ratio shown by its formula

Concentration

Concentration is the amount of solute in a volume of solvent. The more substance that is dissolved, then the more concentrated the solution is.
It is possible to calculate concentration using:

$$Concentration = \frac{Mass}{Volume}$$

With concentration measured in g/dm^3, mass in g and volume in dm^3.
Remember:

$$Volume(dm^3) = \frac{Volume(cm^3)}{1000}$$

Moles (HT)

The **Avogadro constant**, 6.02×10^{23}, is the number of molecules of a substance that make up one mole of that substance.
One mole of a substance has the same mass as the M_r of the substance. E.g. Oxygen (O_2) has an M_r of 32, so 1 mole of oxygen has a mass of 32g.

The number of moles can be determined using:

$$Moles = \frac{Mass\ (g)}{M_r}$$

Balanced equations (HT)

When writing symbol equations you need to ensure that the number of each atom on each side is equal.

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

There are 4 hydrogen and 2 oxygen atoms on each side.
You can deduce the balanced symbol equations from the masses (and hence the ration of the numbers of moles) of substances involved in a chemical reaction. On the other hand, balanced symbol equations tell you the number of moles of substances, and thus the masses of reactants and products.

Excess and limiting reactants (HT)

In a chemical reaction between two or more reactants, often one reactant will run out before the others.
The reactant that is left over is in **excess**.
The reactant that runs out is the **limiting reactant**.

Key terms

Avogadro constant, balanced, concentration, conservation, equation, formula mass, excess, limiting reactant, mass, mole, ratio, state

POP ART PRINT

YEAR 10

What will you learn?

In this exciting project, based on the colourful world of POP Art you will build on key skills such as drawing and painting as well as developing new skills in the process including lino printing. By learning this tactile process, you will be able to generate and develop your own ideas, using influence from modern and contemporary artists including the world famous Andy Warhol!

- Art Matters: Because Your Imagination Can Change the World – *Neil Gaiman*
- Steal Like An Artist: 10 Things Nobody Told You About Being Creative - *Austin Kleon*
- How Art Made POP – *Mike Roberts*

Key Words

- Shape
- Tone
- Texture
- Detail
- Colour
- Form
- Pattern
- Gradient
- Mark-making
- Blending
- Layering
- Shadows
- Highlights
- Carve
- Linocut
- Positive
- Negative
- POP Art
- Culture

EDUCATION & POST-16

- BA (Hons) ILLUSTRATION FOR COMMERCIAL APPLICATION
https://northernart.ac.uk/ba-hons-illustration-commercial-application-2/
- GRAPHIC BRANDING & IDENTITY
https://www.arts.ac.uk/subjects/communication-and-graphic-design/undergraduate/ba-hons-graphic-branding-and-identity-lcc

CAREERS

Careers http://www.creativejourneyuk.com

- Artist
- Illustrator
- Package designer
- Advertisement
- Graphic Design
- Product Design
- Printmaker

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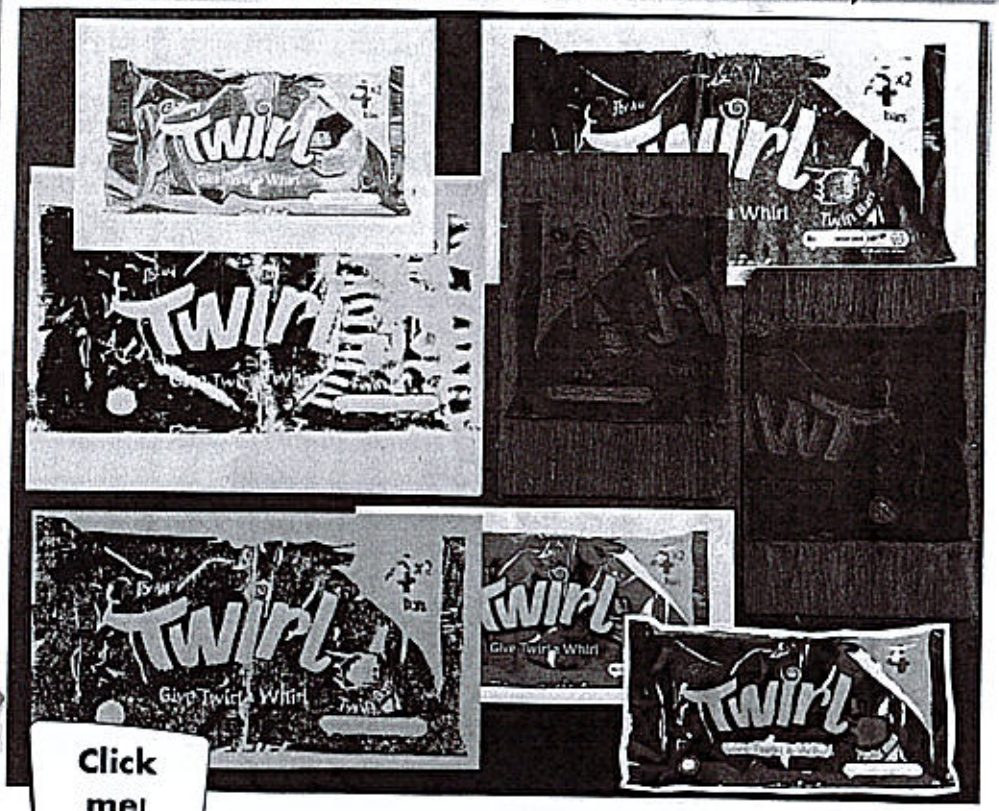

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How to carve lino.mp4

REMEMBER TO FOLLOW ALL HEALTH & SAFETY RULES WHEN CARVING LINO

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HOW TO APPLY YOUR INK.mp4

HERMITAGE STUDENT POD

Andy Warhol

Andy Warhol (August 6, 1928 – February 22, 1987) was an American artist, director and producer who was a leading figure in the visual art movement known as pop art. His works explore the relationship between artistic expression, celebrity culture, and advertising that flourished by the 1960s, and span a variety of media, including painting, silkscreening, photography, film, and sculpture.

In 1961 Andy came up with the concept of using mass-produced commercial goods in his art. He called it Pop Art. He would use commercial images and reproduce them over and over. One early example of this was a series on Campbell's Soup cans. In one painting he had two hundred Campbell's soup cans repeated over and over. Andy often used silkscreen and lithography to create his pictures.

https://www.tate.org.uk/whats-on/tate-modern/andy-warhol

"My fascination with letting images repeat and repeat – or in film's case 'run on' – manifests my belief that we spend much of our lives seeing without observing."

Click me!

DAIN

One of the most influential street artists to emerge from New York, DAIN combines the visual language of graffiti with collaged old portraits of Hollywood glamour stars. Crossing genres and often working single pieces back and forth between the street and studio, DAIN combines wheatpasting, silkscreening, spray paint, collage, and acrylic. His process begins with a black-and-white photo that he layers with old advertisements, printed fragments, logos, and miscellaneous smaller images. He then begins adding paint; his unmistakable trademark is the "circle and drip" around the eye of his subjects. DAIN views his work as a confrontation between the destructive gestures of graffiti and the femininity of his Hollywood subjects.

https://www.dainnyc.com

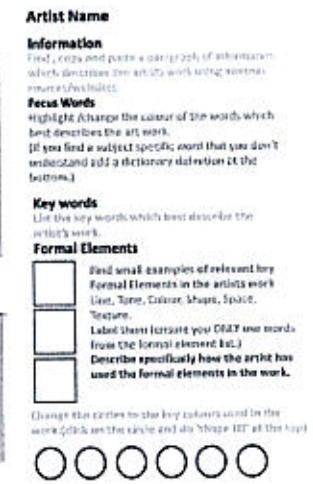
Click me!

"For me it is not so much who the celebrity is, but more about the expression of that person. The eyes can speak so much."

What is the subject of the work?
- The subject of the work is.....
- [Artist name] produces [media] based on the subject of.....

How is the work produced?
- The work is produced by....
- [Artist's name] produces their work by...

Why has the artist chosen to use these materials, techniques or processes?
- The artist has chosen to use these materials because...
- [Artist's name] has chosen to use these techniques and processes in order to...



CLICK ME TO OPEN THE ARTIST RESEARCH TEMPLATE

ARTIST RESEARCH TEMPLATE. pptx

Music terms and signs

Glossary - Eduqas GCSE Music

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

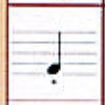
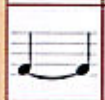
NOTE	NAME	LENGTH (duration)	REST
	Semibreve	4 beats	
	Minim	2 beats	
	Crotchet	1 beats	
	Quaver	½ beats	
	Semiquaver	¼ beats	

A dot after the note increases its length by half:

	Dotted minim	
	Dotted crotchet	

Groups of quavers/semiquavers are usually beamed together:

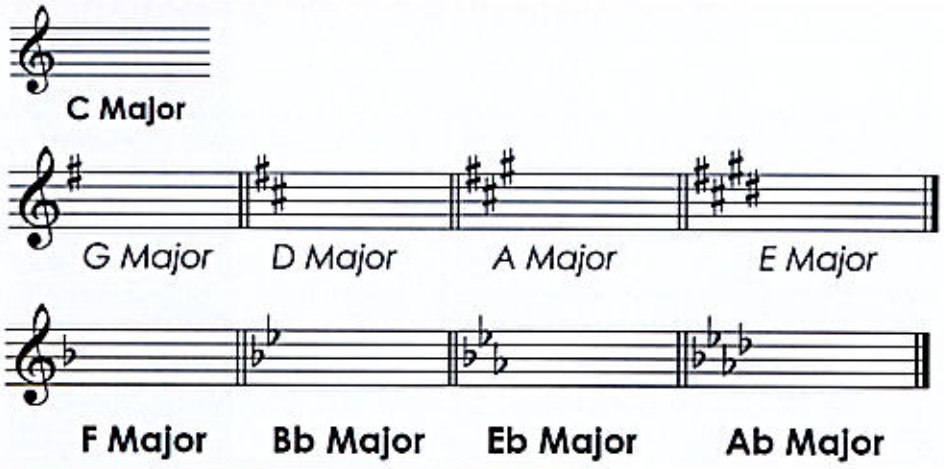
Terms and signs

#	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 terms and signs

Glossary - Eduqas GCSE Music

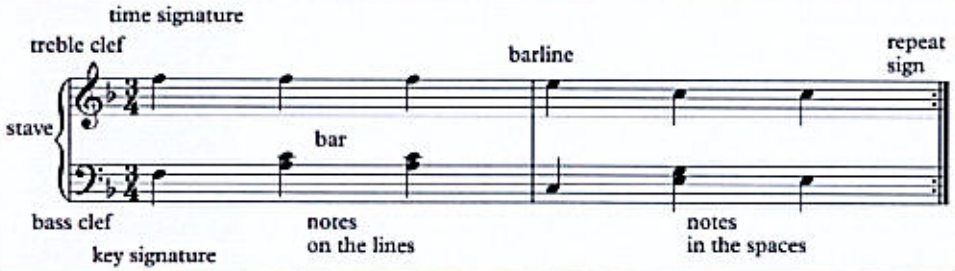
Key signatures



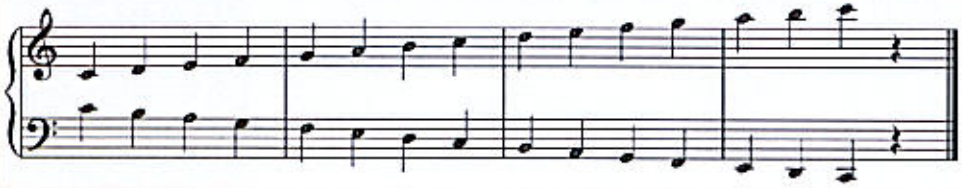
F C G D A E B

Order of sharps # →

← Order of flats *b*

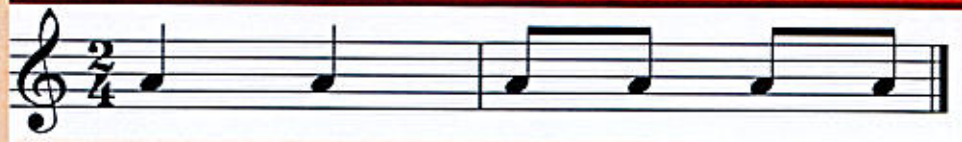


Treble clef notes

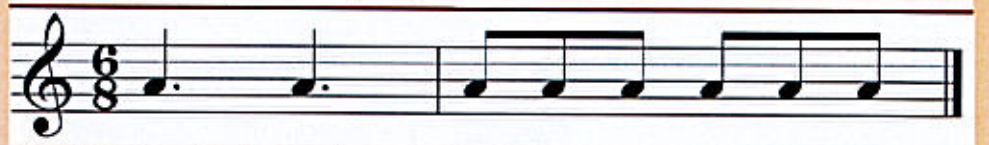


Bass clef notes

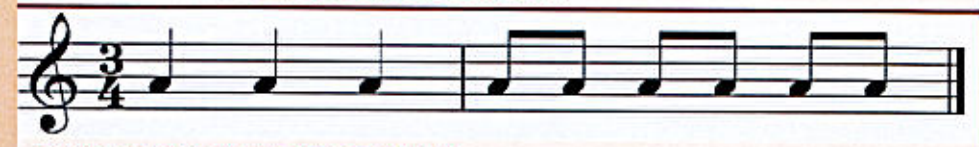
Time signatures



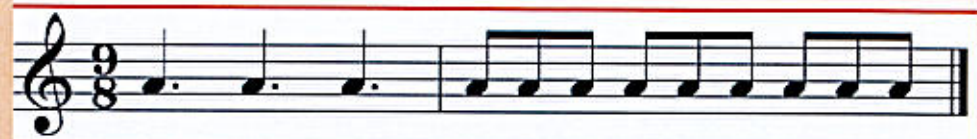
Two crotchet beats per bar: simple duple



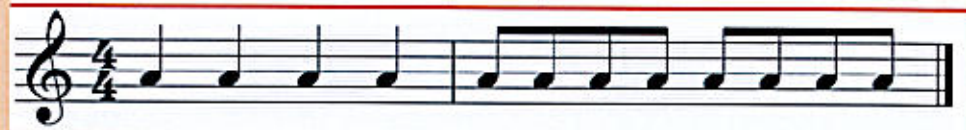
Two dotted crotchet beats per bar: compound duple



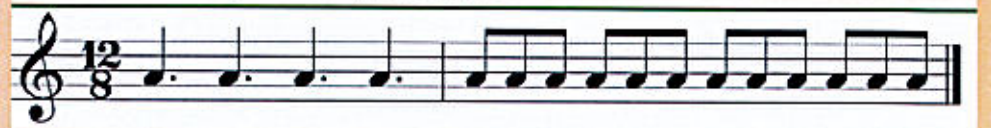
Three crotchet beats per bar: simple triple



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.

Musical forms and devices

Area of study 1 - Eduqas GCSE Music

Baroque era (1600-1750)

- Harpsichord
- Ornaments
- Terraced dynamics
- Basso continuo
- Small orchestra (mostly strings, plus some wind)
- Suite, sonata, oratorio, chorales, trio sonata
- **Bach, Handel, Vivaldi**

Classical era (1750-1810)

- Slightly larger orchestra
- Piano introduced
- Alberti bass
- String quartets
- Symphony, solo sonata, solo concerto
- Balanced, regular phrases
- **Haydn, Mozart, Beethoven**

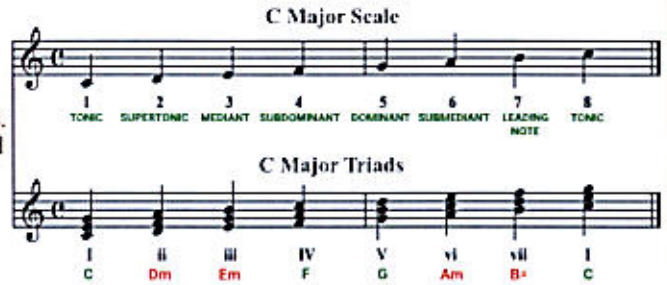
Romantic era (1810-1910)

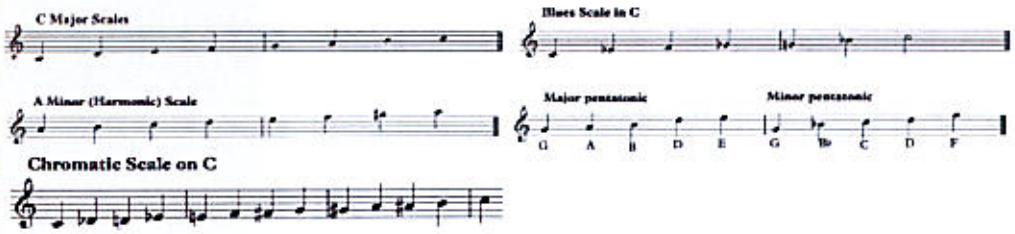
- Lyrical, expressive melodies
- Large orchestra
- Wider range of dynamics
- Richer harmonies and use of chromatic chords
- Programme music
- Opera symphony
- **Tchaikovsky, Grieg, Schumann, Dvorak, Brahms, Verdi, Wagner**

Scales and chords

A **CHORD** is a group of two or more notes played at the same time. A **TRIAD** has three notes. A **CHORD SEQUENCE/ PATTERN** is a series of chords. **DIATONIC HARMONY** is based on the chords of major/minor scales.

Primary chords I, IV, V
Secondary chords ii, iii, vi, vii





Form and structure

BINARY — A B
Two sections: A usually ends in a related key (e.g. dominant or relative minor), but B returns to the tonic. B will contain with some change/contrast.

TERNARY — A B A
Three sections: section B provides a contrast (e.g. new tune key change). A may return exactly or with some slight changes.

RONDO — A B A C A
A longer form: A returns throughout the piece, with contrasting sections called 'episodes', containing new ideas and using different keys.

MINUET AND TRIO — II: AB: II II:CD :II AB
The minuet was a type of graceful dance from the 17-18th century, and was often used as the 3rd movement in symphonies in the Classical era. The minuet had two repeated sections, the trio had two new repeated sections, with a return to the minuet at the end (no repeat).

VARIATIONS — A a A A 𝒜
The main theme (tune) is repeated and developed a number of times in a variety of different ways.

STROPHIC — A A A
A simple form where the song uses the same melody over and over.

Devices

Repetition	A musical idea is repeated exactly.
Imitation	An idea is copied in another part.
Sequence	Repetition of an idea in the same part at a higher/lower pitch.
Ostinato	A short, repeated pattern or phrase.
Drone	A long held or constantly repeated note(s).
Arpeggio/ broken chord	The notes of a chord played individually.
Alberti bass	A broken chord accompaniment (I,V,iii,V) common in the Classical era.
Anacrusis	An 'up-beat' or pick-up before the first strong beat.
Dotted rhythms	A rhythm using dotted notes (gives a 'jagged' or 'bouncy' type of effect).
Syncopation	Off beat accents.
Conjunct	Notes that move in steps.
Disjunct	Notes that move in leaps/ intervals.
Regular phrasing	Balanced parts of a melody (like the phrases in a sentence) e.g. four bar phrases.

Cadences

The two chords at the end of a phrase

Perfect	V-I	Strong ending – sounds 'finished'; a musical full stop.
Plagal	IV-I	Sounds finished but 'softer'; Amen.
Imperfect	I-V, ii-V, vi-V	Sounds unfinished.
Interrupted	V-vi	Moves to an unexpected chord; 'surprise'.

DESCRIBING MUSIC

When we describe the music that we hear, we have to use a lot of musical words. Music is another language, so we have to put a number of these words together to create a complete sentence.

DYNAMICS
Pianissimo – Very Quiet
Piano – Quiet
MezzoPiano – Kinda Quiet
MezzoForte – Kinda Loud
Forte – Loud
Fortissimo – Very Loud
Crescendo – Getting Louder
Diminuendo – Getting Quieter

TEXTURE
Monophonic – only 1 sound
Homophonic – more than 1 sound but all playing together
Polyphonic – more than 1 sound all playing differently
Melody – the tune
Harmony – the backing

RHYTHM
Long notes
Short notes
Repetitive rhythm
Jazzy Rhythm

The **FLUTE** plays the **MELODY** which is **SMOOTH** and in a **HAPPY, MAJOR KEY**. The **MELODY** starts off **PIANO** and gradually **CRESCENDO'S** to **FORTE**. The **KEYBOARD** then joins in accompanying the **FLUTE** playing the **HARMONY**. The **KEYBOARD** plays **CHORDS** underneath which makes the **TEXTURE HOMOPHONIC**. The **TEMPO** of the piece is **FAIRLY SLOW (ADAGIO)** and has lots of **LONG NOTES**.

MELODY
Smooth
Spikey
Wide range of …
Fragments
Mood

SONORITY
Strings
Brass
Woodwind
Percussion
Male singer
Female singer
What instruments/sounds can you hear?

HARMONY
Major – happy/peaceful
Minor – sad/uneasy
Uses chords
Long/short notes

MOOD
Happy
Sad
Cheerful
Playful
Cheeky
Uneasy
Sorrowful
Tense
Angry

TEMPO
Largo – very slow
Adagio – Slow
Andante – Walking pace
Allegro – Fast
Presto – very fast
Accelerando – Speeding up
Rallentando – Slowing down

JS Bach: Badinerie

eduqas

Form and structure:

The piece is in **Binary** form (**AB**).

Section A is 16 bars long.

Section B is 24 bars long.

Each section is repeated (**AABB**).

Harmony:

Diatonic; mixture of root position and inverted chords; uses V7 chords and a Neapolitan sixth chord.

Imperfect and perfect cadences are clearly presented throughout. Both sections end with a **perfect cadence**.

Dynamics:

Mostly ***forte*** throughout, although no markings appear on the score.

On some recordings, **terraced dynamics** (sudden changes) are included.

Metre and rhythm:

Simple duple time – 2/4 – with two crotchet beats in every bar.

Uses **ostinato rhythms** which form the basis of two short musical ideas (X and Y), consisting almost totally of **quavers and semi-quavers**.

Background details:

Composed by **Johann Sebastian Bach** (1685 – 1750), one of the main composers of the **Baroque** era in music.

Badinerie is the last of seven movements from a larger piece called **Orchestral Suite No.2**.

The piece was composed between **1738-1739**.

Instrumentation:

Flute, string orchestra and harpsichord.

The score has five parts (flute, violin 1, violin 2, viola and cello). The harpsichord player reads from the cello line and plays the notes with their left hand whilst filling in the chords with their right hand.

Tonality:

Section A begins in **B minor** (tonic) and ends in **F♯ minor** (dominant minor).

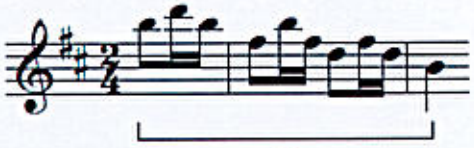
Section B begins in **F♯ minor** (dominant minor) and ends in **B minor** (tonic).

Section A modulates from B minor through **A major** before arriving at F♯ minor.

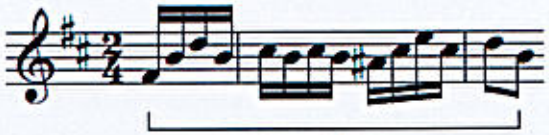
Section B modulates from F♯ minor through **E minor, D major, G major** and **D major** before arriving at B minor.

Melody:

The movement is based on **two musical motifs**.



X



Y

Both motifs begin with an **anacrusis**. Motif X is entirely **disjunct** whilst motif Y **combines disjunct and conjunct** movement.

Typical **ornaments and compositional devices** of the period are used including **trills, appoggiaturas** and **sequences**.

Texture:

Homophonic: melody and accompaniment.

The flute and cello provide the main musical material; however, the 1st violin participates occasionally.

The 2nd violin and viola provide harmony with less busy musical lines.

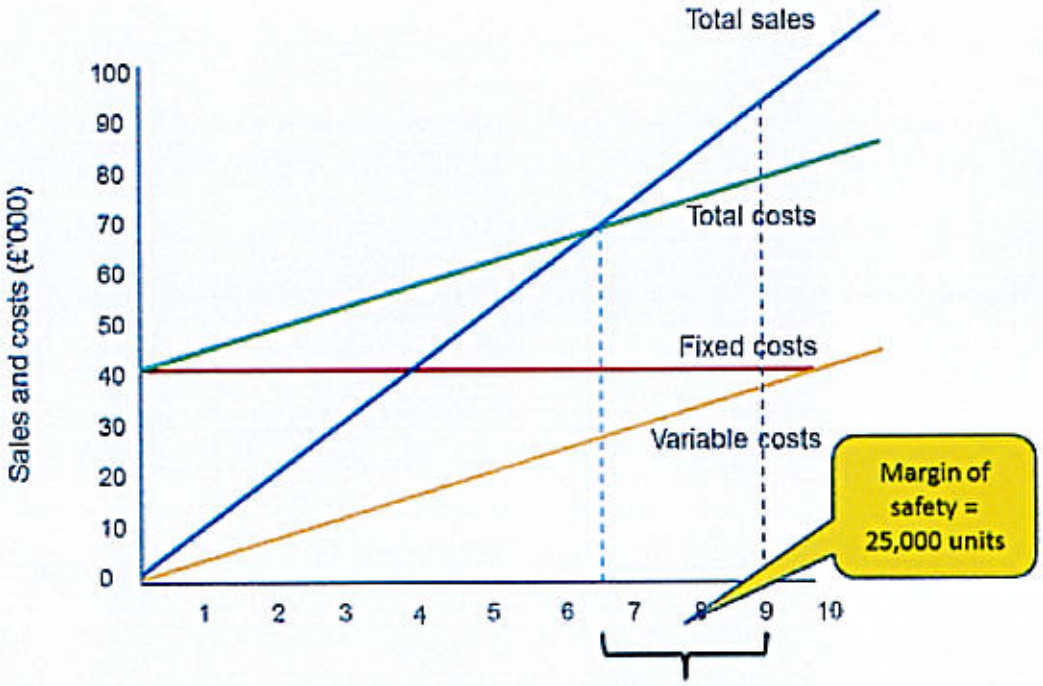
Tempo:

The tempo is **Allegro** (quick, lively, bright), although not marked on the score.

Subject Content	What students need to learn?
1.3.2 Business revenues, costs and profits	• break even level of output • margin of safety. Interpretation of break even diagrams: • the impact of changes in revenue and costs • break even level of output • margin of safety • profit and loss.

BREAK EVEN =

The point at which **sales revenue = total costs**. At this point the business is nether making a **profit** nor a **loss**.

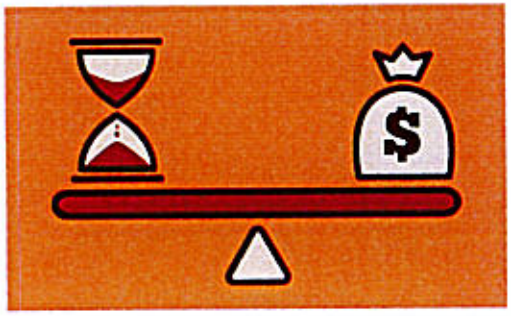


Calculating break even without using a graph.

Break even charts can be time consuming to make so often a formula is used instead:

BREAK EVEN = FIXED COSTS

(SELLING PRICE – VARIABLE COST PER UNIT)



MARGIN OF SAFETY =

The difference between the break even level of output and actual level output.

MOS = CURRENT OUTPUT – BREAK EVEN OUTPUT

In this example = 90,000 – 65,000 = **25,000 units**

Subject Content	What students need to learn?
1.4.2 Business location	Factors influencing business location: • proximity to: market, labour, materials and competitors • nature of the business activity • the impact of the internet on location decisions: e-commerce and/or fixed premises.

Location

This is where the business is based e.g. high street, shopping centre, online.

Fixed premises

Buildings that have to be where they are (for example, the high street, e-commerce buildings can be located anywhere.

Proximity

How near a business is to key factors that might influence their success. For example, suppliers and competitors.

Factors influencing business location, proximity to:

Market

How near are they to their customers? E.g. for a physical service like a shop, restaurant or hotel, customer convenience will be critical to revenue.

Labour

Are there staff nearby who are willing and able to work for you?

Competitors

Lots of a businesses want a location far away from competitors e.g. local corner shop. However, some businesses e.g. restaurant chains find it better to be on the busy high street where other competitors are.

Nature of activity

Depending on what the business is will influence what is the most important factor to consider. For example, a manufacturer would need to be near materials, whereas a shop will want to be near the market (consumers).

Impact of the internet

If the business is online, location is not as important as customers can access their products no matter where the head office is based. E.g. ASOS head office is in North London, while their distribution depot is in Barnsley.

Subject Content	What students need to learn?
1.4.3 The marketing mix	What the marketing mix is and the importance of each element: • price, product, promotion, place. How the elements of the marketing mix work together: • balancing the marketing mix based on the competitive environment • the impact of changing consumer needs on the marketing mix • the impact of technology on the marketing mix: e-commerce, digital communication.

Product

Targeting customers with a product that has the right blend of functional and aesthetic benefits without being too expensive to produce.

Price

Setting the price that retailers must pay, which in turn affects the consumer price.

Place

How and where the supplier is going to get the product or service to the consumer, it includes selling products to retailers and getting the products displayed in prominent positions.

Promotion

All the methods the business uses to persuade customers to buy for example branding, packaging, advertising to boost the long term image of the product and

A firm must make sure that its marketing mix is **co-ordinated and coherent**. E.g. a stylish product aimed at a stylish market should have a high price, be promoted in stylish magazines and stocked in stylish shops.

A firm will base their marketing mix on the **competitive environment** in which it operates. E.g. Rolls Royce is not in a very competitive environment as it is one of a kind. EasyJet, however will have to compete with Ryanair on their prices.

Changes to **consumer needs** affect the marketing mix. Firms will have to adapt them based on consumer needs. E.g. cooked breakfast gave way to cereals, cereals have given way to breakfast bars and other on the go foods.

Due to advances in **technology** firms are now changing certain parts of their marketing mix. E.g. Apps, promotions.

Subject Content	What students need to learn?
1.4.4 Business plans	The role and importance of a business plan: • to identify: the business idea; business aims and objectives; target market (market research); forecast revenue, cost and profit; cash-flow forecast; sources of finance; location; marketing mix. The purpose of planning business activity: • the role and importance of a business plan in minimising risk and obtaining finance.

A **business plan** is a detailed document setting out the business idea and showing **HOW** it is to be financed, marketed and put in place

It is a **CRUCIAL** part of getting finance from external sources e.g. a bank loan and helps **COORDINATE** all of the different tasks and strategies, so the business is more likely to be successful

Business plan sections	What is it?
Business idea	What have you decided to do? Product? Service?
Aims and Objectives	What are the aims/objectives for the business?
Target market	Who is your product aimed at and why?
Marketing plan	What promotional activities are you going to do? TV? Billboards? Online? Social media?
Forecasts of revenue, costs and profits	What are your predictions for sales revenue, costs and profits? When do you expect to reach them?
Cash flow forecast	Plan of the money coming in and going out of the business
Sources of finance	How will you raise finance, which methods are you going to use and why?
Location	Where will you be based? Physical store? Online? Both?
Marketing Mix	Product? Price? Promotion? Place?

A business plan allows a business to:

- Think carefully about each step of the process – maximise success
- May help them realise they are lacking in skills – hire specialist help
- Attract investors if plan is good
- Plan is written down if entrepreneur gets ill

A business plan can cause some problems:

- If entrepreneur not experienced the predictions may be wrong
- Can be too rigid, a new business can be unpredictable so a flexible approach is needed
- Time consuming to create when time could be better spent elsewhere

Subject Content	What students need to learn?
1.5.1 Business stakeholders	Who business stakeholders are and their different objectives: • shareholders (owners), employees, customers, managers, suppliers, local community, pressure groups, the government. Stakeholders and businesses: • how stakeholders are affected by business activity • how stakeholders impact business activity • possible conflicts between stakeholder groups.

Stakeholders
Individuals or groups of people who have an interest in a business
A stakeholder will be **affected** by the decisions and actions of a business.
Stakeholders are important to businesses as they can have a big **influence** on them.

CONFLICT
A disagreement or argument between people / groups.
As Stakeholders all have different objectives, businesses need to minimise the conflict between the groups.

Stakeholder	Objective
Shareholders	Private limited companies - long-term organic growth Public limited companies – high share price in short term, as much profit as possible for big dividends
Employees	Employment security, opportunities for promotion / career development, fair pay, good fringe benefits (e.g. pension, holiday, company car)
Customers	Consistently high quality, value for money, honesty, fairness, innovative products
Managers	Employment security, opportunities for promotion / career development, fair pay, good fringe benefits (e.g. pension, holiday, company car)
Suppliers	Honesty and fairness, especially on pricing and credit terms, good communication, regular orders, loyal customers
Local community	Honesty and fairness, especially on plans that affect local employment and the environment.
Pressure groups	Honesty and fairness, especially on plans that affect customers and the environment
The government	Honesty and fairness, especially on paying tax, high levels of employment

These stakeholders all have different objectives (expectations) of the organisation. It is important that organisations are aware of who their KEY stakeholders are, so they can meet their objectives.

Y10 Spanish Spring
El tiempo libre

Activities Music Sports

Activities

Suelo - I tend to **Me encanta** - I love **Me mola** - I like **Me chifla** - I'm crazy about **Prefiero** - I prefer **Mi pasión es** - my passion is	**descansar** - relaxing **escuchar música** - listening to music **hacer deporte** - doing sport **ir al cine** - going to the cinema **leer libros/revistas/periódicos** - reading books/magazines/papers **salir con mis amigos** - going out with friends **quedar con amigos** - meeting with friends **ir de compras** - going shopping **montar en bici/monopatín** - riding my bike/skateboard **usar el ordenador** - using the computer **ver la tele** - watching tv **jugar con los videojuegos** - playing video games **cocinar** - cooking	**porque** - because **ya que** - because **dado que** - because	**es** - it is	**divertido** - fun **entretenido** - entertaining **relajante** - relaxing **sano** - healthy **aburrido** - boring **malsano** - unhealthy **adictivo** - addictive
No aguanto - I can't stand **No soporto** - I can't stand **Odio** - I hate				**soy adicto/a...** - I'm addicted **me ayuda a relajarme** - it helps me to relax **me hace reír** - it makes me laugh **me ayuda a olvidarme de todo** - it helps me to forget everything **necesito comunicarme con otra gente** - I need to have contact with other people **me aburre como una ostra** - it bores me to death **no me interesa** - it doesn't interest me

Music

Me encanta escuchar - I love to listen to **Suelo escuchar** - I tend to listen to	**el soul/el rap/ el dance/ el hip-hop/el pop/el rock/el jazz/** **la música clásica/electrónica** **la música de...** - ...'s music	**porque** - because **ya que** - because **dado que** - because	**tiene ritmo** - it has rhythm **me encanta la letra** - I love the lyrics **...canta bien** - ...sings well
Toco - I play **Toca** - he/she plays **Tocan** - they play	**El teclado** - the keyboard **La batería** - the drums **La guitarra** - the guitar		**el piano** - the piano **la flauta** - the flute **la trompeta** - the trumpet
Asistir a un concierto - to attend a concert **Cantar** - to sing **Una canción** - a song **Un cantante** - a singer		**Mi cantante favorito/a es...** - my favourite singer is... **Mi grupo favorito es...** - my favourite band is... **un espectáculo** - a show **una gira mundial** - a world tour	

Sport

Soy - I am **Era** - I was	**aficionado/a de** - a fan of **hincha de** - a fan of **fanático/a de** - a ____ fanatic **miembro de un club de...** - a member of a _____ club	**Random**	**correr** - to run **entrenar** - to train **marcar un gol** - to score a goal **participar** - to participate **un partido** - a match **la temporada** - the season
Juego - I play	**al badminton/fútbol/rugby/tenis/hockey/croquet/béisbol** **al balonmano** - handball **al baloncesto** - basketball **al voleibol** - volleyball		
Hago - I do	**judo** - judo **karate** - karate **atletismo** - athletics **baile** - dance **boxeo** - boxing **ciclismo** - cycling **equitación** - horseriding **escalada** - climbing **gimnasia** - gymnastics **natación** - swimming **remo** - rowing **vela** - sailing **patinaje sobre hielo** - ice skating **tiro con arco** - archery **piragüismo** - canoeing		

En mi tiempo libre suelo descansar	In my free time I tend to relax
o, a veces, quedar con amigos en el centro	or, sometimes, meet my friends in town
para ir de compras ya que es entretenido.	to go shopping because it's entertaining.
En mi opinión, salir con mis amigos me hace reír	In my opinion, going out with my friends makes me laugh
y me ayuda olvidarme de todo	and helps me to forget everything
sin embargo nunca monto en bici	however I never ride my bike
ya que me aburre como una ostra	because it bores me to death
aunque sé que es sano.	although I know that it's healthy.
Además, me encanta escuchar música y	Moreover, I love listening to music and
suelo escuchar la música de Adele	I tend to listen to Adele's music
dado que canta bien y me encanta la letra.	because she sings well and I love the lyrics.
No toco un instrumento pero en el futuro	I don't play an instrument but in the future
voy a aprender tocar la batería.	I'm going to learn to play the drums.
Cuando era joven era hincha de FC Barcelona	When I was younger I was a fan of Barcelona FC
porque jugaba mucho el fútbol	because I played loads of football
pero ya no.	but I don't anymore.
Ahora prefiero ver un partido.	Now I prefer to watch a match.

A model text on hobbies

Y10 Spanish Spring
La tele y el cine

TV/film | Pros and cons of cinema | Role models

TV/film

Suelo ver - I tend to watch
Me encantan - I love
Me molan - I like
Me chiflan - I'm crazy about
Prefiero - I prefer

No aguanto - I can't stand
No soporto - I can't stand
Odio - I hate

los concursos -gameshows
los programas de deportes - sports programmes
los documentales -documentaries
las series policiaca - crime series
los realitys - reality TV shows
los culebrónes/las telenovelas - soaps
las comedias - a comedys
el telediario/las noticias - the news
los dibujo animados - cartoons
el meteo - the weather
los misterios - mysteries
las películas de amor - love films
las películas de terror - horror films
las películas de acción - action films
las películas de aventuras - adventure films
las películas de animación - animated films
las películas de ciencia - ficción - sci-fi films
las películas de fantasia - fantasy films
las películas extranjera - foreign films

porque son - because they are

divertidos/as - fun
entretenidos/as - entertaining
informativos/as - informative
emocionantes - exciting
interesantes - interesting
adictivos/as - addictive

aburridos/as - boring
tontos/a - silly
malos/as - bad/rubbish
infantiles - childish

Pros and cons of cinema

Me gusta ir al cine porque… - I love going to the cinema because…

el ambiente es mejor - the atmosphere is better
lc imagen es mejor en la gran pantalla - the picture is better on the big screen
las palomitas están ricas - the popcorn is tasty

Prefiero ver pelis en casa porque… - I prefer to watch film at home because…

en el cine - at the cinema

hay demasiadas personas - there are too many people
las entradas son muy caras - the tickets are very expensive
los asientos no son cómodos - the seats are uncomfortable
los otros espectadores me molestan - other spectators annoy me
si vas al baño te pierdes una parte - if you go to the toilet you miss a part
tienes que hacer cola - you have to queue

se puede hablar de la película - you can talk about the film
se puede pausar la película si quieres - you can pause the film if you want

Role models

Admiro a… - I admire

_____ es un buen modelo a seguir - ___ is a good role model

Mi inspiración es… - my inspiration is…

Un buen modelo a seguir es alguien que… - a good role model is someone who…

porque - because

apoya a organizaciones benéficas - supports charities
recauda fondos para… - raises money for…
tiene mucho talento - has a lot of talent
trabaja en defensa de los animales - works in defense of animals
usa su fama para ayudar a los demás - uses his/her fame to help others

lucha por/contra - he/she fights for

la pobreza - poverty
la homofobia - homophobia
los derechos de la mujer/los refugiados - women's/refugee rights

no - he/she doesn't

se comporta mal - behave badly
se emborracha - get drunk
se mete en problemas con la policia - get in trouble with the police

Suelo pasar al menos cinco horas enfrente de la tele cada día.	I tend to spend at least 5 hours a day in front of the TV.
Me encantan los realitys porque son emocionantes	I love reality shows because they're exciting
pero también son adictivos.	but they're also addictive.
Además me chiflan las comedias	Also, I'm crazy about comedies
sin embargo los que más me gustan son los documentales	however what I like the most are documentaries
dado que son informativos y educativos	given that they are informative and educational
y me encanta aprender nuevas cosas.	and I like to learn new things.
A veces voy al cine porque dicen que	Sometimes I go to the cinema because they say that
la imagen es mejor en la gran pantalla	the picture is better on the big screen
pero prefiero ver pelis en casa, porque en el cine	but I prefer to watch films at home, because at the cinema
hay demasiadas personas y los asientos no son cómodos	there are too many people and the seats aren't comfy
y en casa se puede pausar la película si quieres.	and at home you can pause the film if you want.
Hay muchos actores que me gustan pero mi actriz favorita	There are lots of actors that I like but my favourite actress
es Emma Watson ya que apoya a organizaciones benéficas	is Emma Watson because she supports charities
y lucha por los derechos de la mujer.	and fights for womens' rights.
Es un buen modelo a seguir.	She's a good role model.

A model text on TV preferences

Y10 Spanish Spring
Mis estudios

Subjects | Opinions | Teachers | Uniform

School subjects

Estudio – I study

Mi asignatura preferida es… - My favourite subject is…

Me chifla – I'm crazy about

Prefiero – I prefer

el arte dramático/el teatro – drama
el dibujo – art
el español – Spanish
el inglés - English
la biología – biology
la educación física – pe
la física – physics
el francés - French
el alemán - German
la geografía – geography
la historia – history
la informática - computing
la química – chemistry
la religión - RS
la tecnología – technology
la sociología – sociology
las matemáticas – maths
las ciencias – science
las empresariales – business
las lenguas/los idiomas – languages

porque – because

es - it is

son – they are

me interesa – interests me
me aburre - bores me
me fascina - fascinates me
me importa – is important to me
fácil – easy
difícil - difficult
duro – hard
útil – useful
inútil – useless
práctico – practical
creativo – creative
relevante – relevant
relajante – relaxing
exacto – precise
lógico – logical
exigente – demanding

me aburre como una ostra – it bores me to death
es pan comido – it's a piece of cake

mejor que… - better than
peor que… - worse than
tan…como… - as…as…

Teachers

El/la profesor/a de (ciencias) – My (science) teacher

es - is

paciente – patient
tolerante – tolerant
listo – clever
trabajador(a) – hardworking
simpático – nice
impaciente – impatient
severo/estricto – harsh/strict
tonto – silly/stupid
perezoso – lazy
antipático – mean/unpleasant

enseña bien – teaches well
explica bien -explains well
tiene buen sentido del humor - has a good sense of humor
tiene expectativas altas - has high expectations
crea un buen ambiente de trabajo – creates a good working atmosphere
nunca se enfada – never gets angry
me hace pensar – makes me think
nos da consejos/estrategias – gives us advice/strategies
nos pone muchos deberes – gives us a lot of homework

Uniform

Tengo/tenemos que llevar… - I/we have to wear
(No) llevo/llevamos - I/we (don't) wear
Es obligatorio llevar… - it's compulsory to wear
No me gusta llevar - I don't like wearing

un jersey – a jumper
un vestido – a dress
una camisa – a shirt
una corbata – a tie
una falda – a skirt
unos zapatos – shoes
unos calcetines – socks
unas medias – tights

blanco- white
negro – black
morado - purple

porque/ya que/ dado que - because

mejora la disciplina – improves discipline
limita la individualidad – limits individuality
da un imagen positiva del insti – gives a positive impression of the school
ahorra tiempo por la mañana – saves time in the morning

Ojalá pudiera llevar… - If only I could wear…

unos vaqueros – jeans
zapatillas de deporte – trainers
una sudadera – a hoody

Estudio **diez** asignaturas incluso	I study **10** subjects **including**
El **inglés**, las **matemáticas**, las **ciencias** y el **dibujo**.	**English**, **maths**, **science** and **art**.
Mi asignatura preferida es	My favourite subject is
La **biología** ya que **me fascina**	**biology because it fascinates me**
y me gustaría trabajar como **biólogo marino** en el futuro.	and I would like to work as a **marine biologist** in the future
aunque puede ser muy **difícil**	**although it can be very hard**.
Además me chifla **el dibujo** porque	Moreover I'm crazy about **art** because
soy una persona **creativa** y lo **encuentro relajante**	I'm a **creative** person and I **find it relaxing**
y la profe es **paciente**	and the teacher is **patient**
y **crea un buen ambiente de trabajo**	and **creates a good working atmosphere**
mientras que mi profe de **matemáticas se enfada mucho**	**whereas** my **maths** teacher **gets angry loads**
y **nos pone muchos deberes**.	and **gives us lots of homework**.
También, no aguanto **el inglés** dado que	Also I can't stand **English because**
me aburre como una ostra.	**it bores me to death.**
Cuando era más joven estudiaba **la tecnología**	When I was younger I used to study **technology**
pero **no me gustaba** ya que	but I **didn't like it** because
era **duro** y **inútil** y	it was **hard** and **useless** and
no me interesaba nada.	**it didn't interest** me at all.

A model text on school subjects

Y10 Spanish Spring
El colegio

School facilities

School rules

School facilities

En mi instituto hay… - in my school there is **mi insti tiene** - my school has **Mi escuela primaria tenía** - my primary school had **En mi escuela primaria había** - in my primary school there was…	**un salón de actos** - a hall **un comedor** - a canteen **un campo de fútbol** - a football pitch **un patio** - a yard/playground **un gimnasio** - a gym **una piscina** - a pool **una biblioteca** - a library **una pista de tenis** - a tennis court **unos laboratorios** - some science labs **muchas aulas** - lots of classrooms **menos/más exámenes** - more/less exams **más oportunidades para hacer deporte** - more sports opportunities
Mi insti es… - my school is…	**mixto** - mixed **masculino** - all boys **privado** -private **feminino** - all girls **público** - state school
Las clases comienzan a las _____ - classes start at ____ o'clock **Las clases terminan a las** _____ - classes end at____ o'clock **La hora de comer/el recreo dura** ____ **minutos** - lunch/break lasts ___ minutes **El día escolar es muy largo** - the school day is really long	

School rules

No se debe - you mustn't **Está prohibido** - it's not allowed **No se permite** - you're not allowed		**dañar las instalaciones** - damage the facilities **ser agresivo o grosero** - be aggressive or rude **correr en los pasillos** - run in the corridors **usar el móvil en clase** - use your phone in lessons **llevar zapatillas de deporte** - wear trainers **comer chicle** - chew gum **llevar joyas/maquillaje** - wear jewellery/make up
Se debe - you must **Hay que** - you have to **Tienes que** - you have to **Se permite** - you're allowed to		**ser puntual** - be on time **respetar el turno de palabra** - wait your turn to speak **respetar a los demás** - respect others **trabajar duro** - work hard **escuchar en clase** - listen in class **hacer los deberes** - do your homework
Las normas - the rules	**son** - are	**demasiado estrictas** - too strict **necesarias** - necessary **importantes** - important
	fomentan la buena disciplina - promote good discipline **limitan la individualidad** - limit individuality **fastidian a los alumnos** - annoy the pupils	

Random

Mi horario - my timetable
La educación infantil/primaria - pre-school/primary education
La educación secundaria - secondary education
El bachillerato - A-Level equivalent in Spain
La formación profesional - vocational training
El instituto - secondary school
Suspender/aprobar un examen - to fail/pass an exam

El bachillerato - this is the two final years of school. (English equivalent of 6th form) It is split into 4 different pathways: arts, sciences, humanities and social sciences. The subjects you study depend on which pathway you have chosen but every student has to study Spanish language and literature, PE and a foreign language.

Mi insti es mixto y está situado	My school is mixed and it's located
en Liverpool, en el noroeste de Inglaterra.	in Liverpool, in the Northwest of England.
Las clases comienzan a las nueve menos cuarto	Lessons start at quarter to 8
y terminan a las tres y cinco.	and finish at 5 past 3.
En mi opinión, el día escolar es muy largo	In my opinion, the school day is really long
y un poco aburrido	and a bit boring
pero trabajo como un burro.	but I work my socks off.
Me encanta mi insti porque tiene muchas instalaciones	I love my school because it has lots of facilities
como una biblioteca, una piscina y un campo de fútbol enorme.	such as a library, a pool and an enormous football pitch.
Mi escuela primaria era más pequeña	My primary school was smaller
y no tenía una piscina	and it didn't have a pool
pero había menos exámenes.	but there were fewer exams.
Hay muchas reglas en mi insti	There are lots of rules in my school
y pienso que formentan la buena disciplina	and I think that they promote good discipline
por ejemplo no se debe ser agresivo o dañar las instalaciones	for example you mustn't be aggressive or damage the facilities
pero lo que me fastidia es que	but the thing that annoys me is that
no se permite usar el móvil en clase,	you're not allowed to use your phone in lessons.
A mi parecer puede ser muy útil.	In my opinion, it can be really useful.

A model text on my school

Los trabajos

Jobs | Personality | Part time jobs | Applying for a job

Jobs

Soy - I am
es - he/she is
Me gustaría ser - I would like to be
Voy a ser - I'm going to be
Voy a trabajar como - I'm going to work as

abogado/a – lawyer
albañil – bricklayer
azafato/a – flight attendant
bailarín/a – dancer
bombero/a – firefighter
camarero/a – waiter/ess
cantante – singer
cocinero/a – cook
contable – accountant
dependiente/a – shop assistant
electricista – electrician
enfermero/a – nurse
escritor/a – writer
fontanero/c – plumber
fotógrafo/a – photographer
funcionario/a – civil servant
guía turístico/a – tour guide
ingeniero/a – engineer
jardinero/a – gardener
mecánico/a – mechanic
músico/a – musician
médico/a – doctor
peluquero/a – hairdresser
periodista – journalist
policía – police officer
profesor/a – teacher
recepcionista – receptionist
socorrista – lifeguard
soldado – lifeguard
veterinario/a – vet

(porque) es un trabajo... - (because) it is a ___ job

artístico – artistic
emocionante – exciting
exigente – demanding
importante – important
fácil – easy
difícil – hard
variado – varied
repetitivo – repetitive
con responsabilidad – with responsibility
con buenas perspectivas – with good prospects
con un buen sueldo – with a good salary

Tengo que... - I have to...
Suelo... - I usually

cuidar a los clientes/pacientes – look after clients/patients
contestar llamadas teléfonos – answer phone calls
enseñar/vigilar a los niños – teach/look after the children
reparar los coches – repair cars
servir comida y bebida – serve food and drinks
viajar por todo el mundo – travel the world

Personality

Creo que soy... - I think that I am...

Sería un(a) buen(a)... porque soy... - I would be a good... because I am...

ambicioso – ambicious
creativo – creative
fuerte – strong
organizado – organised
práctico – practical
trabajador – hardworking
comprensivo – understanding
extrovertido – extroverted/outgoing
inteligente – clever
paciente – patient
serio – serious
valiente – brave

Part time jobs

Tengo un trabajo a tiempo parcial – I have a part time job
Reparto periódicos – I deliver papers
Trabajo de cajero/a – I work as a cashier
Cocino – I cook
Paso la aspiradora – I hoover
Pongo y quito la mesa – I set and clear the table
Corto el césped – I cut the grass
Mi jefe es amable – my boss is nice
El horario es flexible – the hours are flexible
Hago de canguro – I babysit
Ayudo con las tareas domésticas – I help with the housework
Lavo los platos – I do the dishes
Plancho la ropa – I iron
Paseo al perro – I walk the dog

Applying for a job

Se busca... - required
Se requiere.... - required
Una entrevista – an interview
(No) hace falta experiencia – Experience (not) needed

Le escribo para solicitor el puesto de – I'm writing to apply for the post of...
Le adjunto mi CV – I attach my CV
(No) tengo experiencia previa – I (don't) have previous experience
He estudiado/trabajado – I've studied/worked
He hecho un curso de... - I've done a course in...
Tengo buenas capacidades en comunicación – I have good communication skills

Si saco buenas notas he decidido que	If I get good grades I have decided that
voy a trabajar como médico	I'm going to work as a doctor
ya que soy trabajador y comprensivo	because I am hardworking and understanding
y es un trabajo con responsabilidad y con buen sueldo	and it's a job with responsibility and a good salary
aunque puede ser muy exigente.	although it can be very demanding.
Ahora tengo un trabajo a tiempo parcial.	Now I have a part time job.
Trabajo en un restaurante como camarero y	I work in a restaurant as a waiter and
tengo que servir comida y bebida	I have to serve food and drink
y cuidar a los clientes.	and look after the clients.
Mi jefe es amable y el horario es flexible	My boss is nice and the hours are flexible
aunque no gano mucho.	although I don't earn much.
No tengo experiencia previa en medicina	I don't have any previous experience in medicine
pero he estudiado las ciencias	but I have studied science
y he hecho un curso de primeros auxilios.	and I have done a first aid course.
Mi madre es enfermera y le encanta su trabajo	My mum is a nurse and she loves her job
sin embargo dice que es un poco difícil.	however she says it is a bit difficult.

A model text on jobs

Y10 Spanish Spring
Los trabajos

Work experience | A gap year | The future

Work experience

Hice mis practicas laborales en… - I did my work experience in…	**un polideportivo** - a sports centre **una granja** - a farm **una agencia de viajes** - a travel agents **una escuela** - a school **una fábrica de juguetes** - a toy factory **una oficina** - an office **una tienda benéfica/solidaria** - a charity shop **la empresa de mi madre** - my mum's company
Cada día/todos los días… - every day	**cogía el autobús/el metro** - I got the bus/metro **empezaba/terminaba a…** - I started/finished at… **hacía una variedad de tareas**- I did a variety of tasks **llevaba ropa elegante** - I wore smart clothes **sacaba fotocopias** - I did photocopying **ponía folletos en los estantes** - I put leaflets on the shelves
Aprendí - I learned	**muchas nuevas habilidades** -lots of new skills **a trabajar en equipo** -to work in a team **a usar** - I to use

A gap year

Si pudiera tomarme un año sabático - If I could take a gap year… **Si tuviera bastante dinero** - If I had enough money…	**apoyaría un proyecto mediambiental** - I would support an environmental project **aprendería a esquiar** - I would learn to ski **ayudaría a construir un colegio** - I would help to build a school **buscaría un trabajo** - I would look for a job **enseñaría inglés** - I would teach English **ganaría mucho dinero** - I would earn a lot of money **iría a españa donde…** - I would go to Spain where… **mejoraría mi nivel de español** - I would improve my level of Spanish **nunca olvidaría la experiencia** - I would never forget the experience **trabajaría en un orfanato** - I would work in an orphanage **viajaría con mochila por todo el mundo** - I would go backpacking around the world.

The future

El desempleo/el paro - unemployment **El dinero** - money **El éxito** - success **El fracaso** - failure **El matrimonio** - marriage **La independencia** - independence	**me interesa** - interests me **me importa** - matters to me **me preocupa** - worries me
Espero… - I hope to… **me gustaría** - I would like to… **Pienso** - I plan to/intend to **quiero** - I want to **Tengo la intención de** - I intend to **Voy a** - I'm going to	**aprender a conducir** - learn to drive **aprobar mis exámenes** - pass my exams **casarme** - get married **conseguir un buen empleo** - get a good job **montar mi propio negocio** - set up my own business **tener hijos** - have children
Buscaré un trabajo - I will look for a job **Compartiré piso con…** - I will share a flat with **Me iré de casa** - I will leave home **Me casaré** - I will get married **Seguiré estudiando en mi insti** - I will carry on studying in my school **Trabajaré como…** - I will work as… **No sé que hacer en el futuro** - I don't know what to do in the future	

El año pasado hice mis practicas laborales en	**Last year** I did my work experience in
la empresa de mi tío.	**my uncle's company**.
Aprendí muchas nuevas habilidades porque	**I learned lots of new skills** because
cada día **hacía una variedad de tareas** y	every day **I did a variety of tasks** and
por eso yo sé que en el futuro,	therefore, I know that in the future
quiero **montar mi propio negocio**	I want **to open my own business**
porque **el éxito** y **el dinero** me importan mucho.	because **success** and **money** are really important to me.
Tengo la intención de **aprobar mis exámenes**	I intend to **pass my exams**
y ir a la universidad para estudiar **los empresariales**.	and go to uni to study **business**.
Antes, si pudiera, tomaría un año sabático y **buscaría un trabajo**	Before, if I could, I would take a gap year and **I would look for a job**
para **ganar mucho dinero**.	to **earn lots of money**.
Espero **casarme** y **tener hijos**	I hope to **get married** and **have children**
sin embargo voy a dedicarme a mi trabajo	however **I'm going to focus** on my job
porque **el paro** me preocupa mucho.	because **unemployment** really worries me.

A model text on the future

Year 10 British Medicine History KO.

Medieval 13th to 16th Centuries

Ideas on cause of disease

Four Humours: Idea by Hippocrates that body contained 4 humours (blood, black bile, yellow bile, phlegm) that when imbalanced, made you ill, for example nosebleed = too much blood, that needed to be got rid of

Church supported idea of 4 Humours and people thought it made sense

Physicians used Urine Charts, linked to humours to diagnose illness

Miasma: Bad air called Miasma causes disease, caused by dirt/waste

God: Church taught God caused disease to test faith or for punishment

Supernatural: Astrologists blamed stars & planets for illness. Movement of Mars/Jupiter caused Black Death. People also superstitious, e.g. witches

Treatment of Disease

Four Humours: Galen's *'Theory of Opposites'* used to treat humour with opposite, phlegm= have hot/spicy food Leeching, Cupping, to move bad blood Purging with herbs, draw out humours

Herbal Remedies: Wise women gave homemade remedies that did work e.g. honey for infection, mint for stomach

Religious: Prayers, pilgrimage to shrine

Surgery: Barber surgeons used trepanning to remove demons from skulls, basic antiseptic like wine, experienced in times but high chance of death due to dirty tools, high risk of infection and no anatomical knowledge

Supernatural: eg. crushed magpie beak

Prevention of disease

Most people thought ONLY god could prevent disease, so focus on prayer, fasting

Rich used *Regmin sanitis*: eat & live healthy

Wearing amulets/charms for protection

Herbs and ringing bells to remove miasma

Public Health

Poor public health, dirty towns, water supplies and a lack of waste. No government spending but some cities employed rakers (12 in London) and installed cesspits and water supply (York)

Care & Hospitals

Physicians: trained by church at university, no anatomical knowledge as dissection was banned. Took observation and diagnosed

Apothecaries: Chemists who made herbal remedies, experienced but no training

Wise Woman: Local woman with medical skills such as midwifery & making remedies

Hospitals: First in 1123, ran by the church. Offered 'care not cure' , thought God would do it. Turned away those with diseases.

Black Death 1348-9

Causes: blamed on God, Planets, Jews and Miasma but no one knew it was rats

Treatment: Popping buboes, praying, spells

Prevention: Flagellants whipped themselves

Public Health: Govt. introduced quarantine

Progress?

Very little progress overall, continuity!

Factors for/against progress

Church: Church controlled everything and people afraid of God, limited change. They controlled education and ideas on disease, which support Hippocrates/Galen's ideas so no one dared or wanted to challenge ideas as if you challenged Church, you were God!

Tradition: Many simply respected tradition, e.g. Hippocrates/Galen and saw ideas as rational and respected. Galen wrote 300 books, so why bother looking for change?

Government: King and government spent nothing, only during Black Death

Renaissance 16th to 18th Centuries

Ideas on cause of disease

Change: Fewer people believed in supernatural or religious causes (reducing power of the Church in Reformation). Scientific thinking spreads, idea seeds in air may spread disease. Less use of Urine Chart Thomas Sydenham promotes 'direct observation' of patients not using books

Continuity: Miasma theory continued and stayed popular whilst Four Humours continued, even used on King Charles II. People believed God caused Plague, 1666

Treatment of Disease

Change: Little change over the period

Alchemy: Over 122 chemical cures like Mercury to cure Smallpox but dangerous

Transference: Idea illness could be transferred to an object like an onion

New Remedies: New World (USA) brought herbs/spices like quinine for dysentery

Continuity: Large amounts of continuity

Herbal remedies remained popular

Bleeding and purging the Four Humours, even Charles II was and during Great Plague

Religious: People still believed God cured, 92,000 touched Charles II hand to cure scrofula. Many still prayed in Great Plague

Care & Hospitals

Change: Physicians had better access to medical books due to printing press, impact of Vesalius improved knowledge of anatomy. Dissection now allowed

Surgeons/Apothecaries could join guilds to get training to become masters : Over 122

Hospitals: More hospitals treating sick but Henry VIII closed monastery run hospitals

Pest house for contagious disease & some charity hospitals opened with physicians who focused on treatment not religion

Continuity: Large amounts of continuity

Physicians continued to be too expensive, most care done in the home by women

Most hospitals continued, no contagious

Prevention of Disease

Emphasis on removing Miasma: draining swamps & clearing rubbish. Closing bathhouses to stop Syphilis spread

The Scientific Revolution

Royal Society (1660) set up and given £ by Charles II, encouraged science printed scientific book *'Philosophical transactions'* e.g. Van Leeuwenhoek seeing of bacteria

Vesalius Italian professor who carried out dissection, improved understanding of anatomy and proved Galen wrong (Jaw) which encouraged others to challenge Galen/do dissections. Work printed in UK

William Harvey Royal physicians, did public dissections and recorded symptoms, not using books. Used Vesalius ideas to prove Galen wrong about blood circulation through arteries & veins. Ideas then taught in medical schools and encouraged further challenge of ideas

Thomas Sydenham Doctor, published *Observationes Medicae*, challenged four humours and suggested direct observation of patients symptoms. Part of Royal Society

Great Plague 1666-7

Causes: Most people blamed for Miasma, realised could be passed between people

Treatment: Similar to Black Death, many visited Quack Doctors & used transference

Prevention: Plague Doctors advised herbs

Public Health: Govt did much more, closed theatres, killed cats/dogs, burnt tar, carts collected the dad and quarantined houses

Factors for/against progress

Church: Decline of church power in reformation, allowed new ideas/dissection

Tech: Printing press allowed spread of ideas to challenge church and new scene ideas

Government: King supported scientific revolution, govt. action in Great Plague

Individuals: Sydenham, Vesalius, Harveru

BUT, little short term change as old ideas continued and new ones slow to spread

Industrial 18th to 20th Centuries

Ideas on cause of disease

Change: Considerable changes
Early scientists using microscopes so bacteria could be seen, led to theory of **Spontaneous Generation**, germs produced by decaying matter (waste)
Pasteur: Publishes Germ Theory 1861, proves SG wrong and that microbes in air cause decay and possibly disease
Koch: Proves Pasteur right that germs cause disease: TB 1882, Cholera 1883
Little impact at first, BUT eventually inspired Lister and other doctors
Continuity: Miasma theory remained

Treatment of Disease

Change: Significant change
Religious, supernatural, 4 humours gone
Surgery: Huge change in surgical treatment
Antiseptics: Using the Germ Theory, Joseph Lister developed first antiseptic: Carbolic Acid in 1867. Greatly reduced infection in surgery and help led to Aseptic Surgery (by 1900 Operating Theatres were sterilised: equipment, patients & clothing)
Anaesthetics: Before 1800 alcohol used, then tests with Ether, Laughing Gas until Simpson developed Chloroform in 1847. Worked well but incorrect dosage led to deaths (Surgery Black Period). Cocaine then developed as first local anaesthetic
However, many doctors reluctant to believe Germ Theory, so growth of antiseptics & anaesthetics was slow at first but long term there was huge impact as surgery became more complex (First heart surgery 1896)

Prevention of disease

Edward Jenner, English doctor focused on wiping out Smallpox and in 1798 proves vaccination could prevent it. Slow to be used and only from 1852 did government make it compulsory as doctors resistant
Pasteur/Koch then develops it using GT to find vaccinations for Cholera 1883

Care & Hospitals

Florence Nightingale: trained as nurse, led nurse team in Crimean war, encouraged hygiene, clean air and training for nurses. Wrote books & opened Royal College of Nursing to train nurses/midwives
Change: New hospitals opened by charities, small Cottage hospitals with Nurses & Doctors from 1859. Nurses given more training, hospitals cleaner (Aseptic) due to Germ Theory. Old, Sick or Poor still had to visit workhouses but eventually infirmaries opened for the poor. Specialist hospitals for mentally sick (Asylums)
Rich could pay doctors to visit at home.
Continuity: Still had to pay for treatment

Public Health

Government began to take steps to improve, end of the Laissez Faire policy
Public Health Act, 1975: authorities had to provide: clean water, sewers, public toilets, health officers and monitor buildings

Cholera, 1854

Causes: blamed on Miasma/Spont Gen but John Snow identified it was dirty water
Treatment: No treatment
Prevention: No immediate change but long term changes: sewage system, clean water
Public Health: Led to Public Health Act 1875

Progress?

Large amounts of progress (hospitals, surgery, cause of disease) but still low age expectancy (46) and most people did not experience changes to medicine/health yet especially the poor, as there was nothing

Factors for/against progress

Government: Government finally began to spend on health (Vaccinations/Public Health Act) which was first time in history
Individuals: Medieval & scientific Improvements pushed by Jenner, Lister, Pasteur, Koch and Simpson
Science/Tech: Development of microscopes, laboratories for discoveries

Modern 21st Century

Ideas on cause of disease

Change: Germ Theory only found bacteria cause, now improvements in genetic causes and diagnosis
Genetics: DNA identified by Crick/Watson in 1953, and then Human Genome Project allowed doctors to identify genetics diseases like Parkinson's and Alzheimer's. However, no treatment yet but can test/prevent Downs Syndrome in embryo
Diagnosis: Specific methods to diagnose e.g. CT Scans, Ultrasounds, Blood Tests, X Rays, MRI Scans, ECGs Scans could now test for; cancer, broken bones or diabetes. Huge improvement
Lifestyle: Understood impact of lifestyle on health; smoking, drinking and diet

Treatment of Disease

Change: More huge change in period
Antibiotics: Paul Ehrlich develops first **Magic Bullet (Salvarsan 606)** in 1914 to attack infections in body, chemical cure
Prontosil, 2nd Magic Bullet developed which helped post-natal infection drop from 20% to 5%. Still not widely used
Penicillin: huge breakthrough with accidental discovery of penicillin by Fleming, then developed by Florey and Chain in 1938 to create pure penicillin. America funded production, NHS then made it free for all to treat most bacteria infections like pneumonia – huge impact!
But, growth of penicillin resistant bugs
Surgery: Key hole surgery to limit impact of surgery, microsurgery to help transplants (heart 1967) and anaesthetics now perfected.
Modern Treatments: New drugs like Aspirin to cure painkillers/fever, X-Rays for radiotherapy, blood transfusions, dialysis machines and prosthetic limbs

Prevention of Disease

Vaccination: National vaccination campaign for Diphtheria 1942 and Polio eradicated by 1984 due to compulsory vaccinations.
Lifestyle Campaigns: Understanding of causes led to specific campaigns, e.g. Stoptober to stop smoking for a month and everyone gets a free health check over 40
Government Actions: New laws to to provide a healthy environment for UK, e.g. Clean Air Act 1956 & Smoking Ban 2007.

Care & Hospitals

In 1911, National Insurance Act gave some care for working class but not enough
The NHS set up 1948 huge change, essentially free health care for all people
At first, lack of money, hospitals and GP quality and waiting times but improvements GP's Charter 1966 to improve GPs, Quality Care Commission to monitor hospitals and more hospitals built, even specialists like Alder Hey for children. NHS played huge part in life expectancy growing to 83 due to free care and medical developments

Lung Cancer Study

Huge problem, almost 40,000 cases a year
Causes: CT Scan and Bronchoscope can identify type of cancer, but not early enough
Treatment: Improvements, surgery, radiotherapy and chemotherapy BUT at present there is NO CURE not cancer.
Prevention: Government slowly brought in Smoking Ban (2007), tobacco tax and encouraged advertising to stop smoking

Factors for/against progress

Science/Tech: Hugely important, led to rapid changes in causes and treatment
Government: NHS ad Vaccinations huge in put into improving public health
Individuals: Watson, Crick, Fleming, Florey and Chain all pushed huge discoveries
Massive change in Modern Age, 83 life expectancy and huge advances, but still genetics, cancer and superbug problems

Y10 Geography

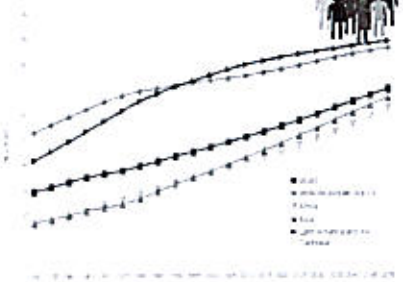
Urban Issues & Challenges

What is Urbanisation?

This is an increase in the amount of people living in urban areas such as towns or cities. In 2007, the UN announced that for the first time, more than 50 % of the world's population live in urban area

Where is Urbanisation happening?

Urbanisation is happening all over the word but in LICs and NEEs rates are much faster than HICs. This is mostly because of the rapid economic growth they are experiencing.



Causes of Urbanisation

Rural - urban migration (1)

The movement of people from rural to urban areas.

Push

- Natural disasters
- War and Conflict
- Mechanisation
- Drought
- Lack of employment

Pull

- More Jobs
- Better education & healthcare
- Increased quality of life.
- Following family members.

Natural Increase (2)

When the birth rate exceeds the death rate.

Increase in birth rate (BR)

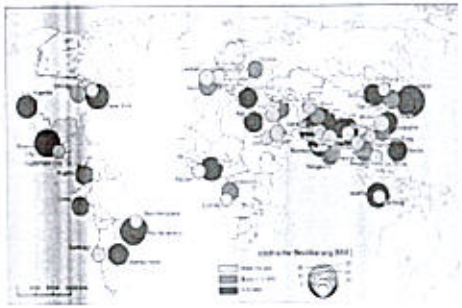
- High percentage of population are child-bearing age which leads to high fertility rate.
- Lack of contraception or education about family planning.

Lower death rate (DR)

- Higher life expectancy due to better living conditions and diet.
- Improved medical facilities helps lower infant mortality rate.

Types of Cities

Megacity An urban area with over **10 million people** living there.



More than two thirds of current megacities are located in either NEEs (Brazil) and LICs (Nigeria). The amount of megacities are predicted to increase from 28 to 41 by 2030.

Sustainable Urban Living

Sustainable urban living means being able to live in cities in ways that do not pollute the environment and using resources in ways that ensure future generations also can use then.

Water Conservation

This is about reducing the amount of water used.

- Collecting rainwater for gardens and flushing toilets.
- Installing water meters and toilets that flush less water.
- Educating people on using less water.

Energy Conservation

Using less fossil fuels can reduce the rate of climate change.

- Promoting renewable energy sources.
- Making homes more energy efficient.
- Encouraging people to use energy.

Creating Green Space

Creating green spaces in urban areas can improve places for people who want to live there.

- Provide natural cooler areas for people to relax in.
- Encourages people to exercise.
- Reduces the risk of flooding from surface runoff.

Waste Recycling

More recycling means fewer resources are used. Less waste reduces the amount that eventually goes to landfill.

- Collection of household waste.
- More local recycling facilities.
- Greater awareness of the benefits in recycling.

AQA

Sustainable Urban Living Example: Freiburg

Background & Location

Freiburg is in west Germany. The city has a population of about 220,000. In 1970 it set the goal of focusing on social, economic and environmental sustainability.

Sustainable Strategies

- The city's waste water allows for rainwater to be retained.
- The use of sustainable energy such as solar and wind is becoming more important.
- 40% of the city is forested with many open spaces for recreation, clean air and reducing flood risk.

Integrated Transport System

This is the linking of different forms of public and private transport within a city and the surrounding area.

Brownfield Site

Brownfield sites is an area of land or premises that has been previously used, but has subsequently become vacant, derelict or contaminated.

Traffic Management

Urban areas are busy places with many people travelling by different modes of transport. This has caused urban areas to experience different traffic congestion that can lead to various problems.

Environmental problems

- Traffic increases air pollution which releases greenhouse gases that is leading to climate change.

Economic problems

- Congestion can make people late for work and business deliveries take longer. This can cause companies to loose money.

Social Problems

- There is a greater risk of accidents and congestion is a cause of frustration. Traffic can also lead to health issues for pedestrians.

Congestion Solutions

- Widen roads to allow more traffic to flow easily.
- Build ring roads and bypasses to keep through traffic out of city centres.
- Introduce park and ride schemes to reduce car use.
- Encourage car-sharing schemes in work places.
- Have public transport, cycle lanes & cycle hire schemes.
- Having congestion charges discourages drivers from entering the busy city centres.

Traffic Management Example: Bristol

In 2012 Bristol was the most congested city in the UK. Now the city aims to develop it's integrated transport system to encourage more people to use the public transport. The city has also invested in cycle routes and hiring schemes.

Greenbelt Area

This is a zone of land surrounding a city where new building is strictly controlled to try to prevent cities growing too much and too fast.

Urban Regeneration

The investment in the revival of old, urban areas by either improving what is there or clearing it away and rebuilding.

Urban Change in a Major UK City: Bristol Case Study

Location and Background

Bristol is the largest city in the south west of England. It has a population of 440500. The population is expected to reach half a million by 2029.

Migration to Bristol

Between 1851 and 1891 Bristol's population doubled as people arrived looking for work. In recent years migration from abroad has accounted for about half of Bristol's population growth. This has included large numbers from EU countries, in particular Poland and Spain. Compared to elsewhere in the UK, a higher proportion of migrants coming to Bristol intend to stay permanently.

City Challenges

Social: Inequalities: Filwood has more than a third of its population living in very low income households. Stoke Bishop on the other hand is home to many millionaires.

Economic: Changes in the economy and industry have led to challenges areas have become run down and high concentration of redundant buildings

Environmental: The amount of waste produced in Bristol is 23% lower than the UK average, however, the city still produces over half a million tonnes a year.

City's Importance

- It holds a strategic position on the M4 corridor with easy access to London and rail and ferry services across Europe.
- Bristol airport links the city to major European centres and the USA.
- There has been a change in from the dependence of traditional industry like tobacco and paper, to the development of global industries such as finance and business, service, aerospace and defence
- There has been a high level of inward investment, including FDI (Foreign Direct Investment).
- Bristol University attracts students from all over the world.

City's Opportunities

Social: Bristol's youthful population means there is a vibrant underground music scene. Bristol has two professional football teams and a rugby union team.

Economic: High-Tech industries have developed. There are 50 micro-electronic and silicon design businesses in Bristol.

Environmental: In 2015 Bristol became the first UK city to be awarded the status of European Green Capital.

Temple Quarter Regeneration

Aims: The target is to create 4000 new jobs by 2020 and 17000 by 2037. There will be 240000m2 of new or refurbished buildings.

Main features: Bristol Arena that can house up to 12,000 spectators and Brunel's Engine Shed. A new 1.7million innovation centre, home to high-teach creative and low-carbon sector companies. This will add to Bristol's importance as a major UK high-tech centre.

Change in a Major NEE City: RIO DE JANEIRO Case Study

Location and Background

Rio is a coastal city situated in the South East region of Brazil within the continent of South America. It is the second most populated city in the country (6.5 million) after Sao Paulo.

Migration to Rio De Janeiro

The city began when Portuguese settlers with slaves arrived in 1502. Since then, Rio has become home to various ethnic groups.

However, more recently, millions of people have migrated from rural areas that have suffered from drought, lack of services and unemployment to Rio. People do this to search for a better quality of life.

This expanding population has resulted in the rapid urbanisation of Rio de Janeiro.

City Challenges

Social: There is a severe shortage of housing, schools and healthcare centres available. Large scale social inequality, is creating tensions between the rich and poor.

Economic: The rise of informal jobs with low pay and no tax contributions. There is high employment in shanty towns called Favelas

Environmental: Shanty towns called Favelas are established around the city, typically on unfavourable land, such as hills.

City's Importance

- Has the second largest GDP in Brazil It is headquarters to many of Brazil's main companies, particularly with Oil and Gas.
- Sugar Loaf mountain is one of the seven wonders of the world.
- One of the most visited places in the Southern Hemisphere.
- Hosted the 2014 World Cup and 2016 Summer Olympics.

City's Opportunities

Social: Standards of living are gradually improving. The Rio Carnival is an important cultural event for traditional dancing and music.

Economic: Rio has one of the highest incomes per person in the country. The city has various types of employment including oil, retail and manufacturing.

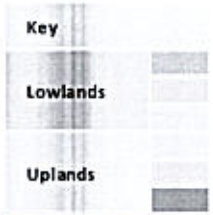
Environmental: The hosting of the major sporting events encouraged more investment in sewage works and public transport systems.

Self-help schemes - Rocinha, Bairro Project

- The authorities have provided basic materials to improve peoples homes with safe electricity and sewage pipes.
- Government has demolished houses and created new estates.
- Community policing has been established, along with a tougher stance on gangs with military backed police.
- Greater investment in new road and rail network to reduce pollution and increase connections between rich and poor areas.

Relief of the UK

Relief of the UK can be divided into uplands and lowlands. Each have their own characteristics.



Areas +600m: Peaks and ridges cold, misty and snow common. i.e. Scotland

Areas - 200m: Flat or rolling hills. Warmer weather. i.e. Fens

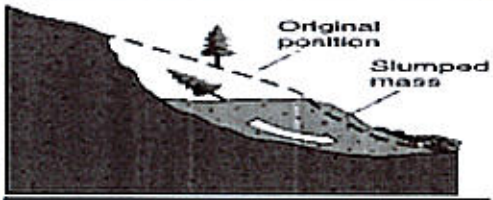
Types of Erosion	
The break down and transport of rocks – smooth, round and sorted.	
Attrition	Rocks that bash together to become smooth/smaller.
Solution	A chemical reaction that dissolves rocks.
Abrasion	Rocks hurled at the base of a cliff to break pieces apart.
Hydraulic Action	Water enters cracks in the cliff, air compresses, causing the crack to expand.

Types of Transportation	
A natural process by which eroded material is carried/transported.	
Solution	Minerals dissolve in water and are carried along.
Suspension	Sediment is carried along in the flow of the water.
Saltation	Pebbles that bounce along the sea/river bed.
Traction	Boulders that roll along a river/sea bed by the force of the flowing water.

Mass Movement

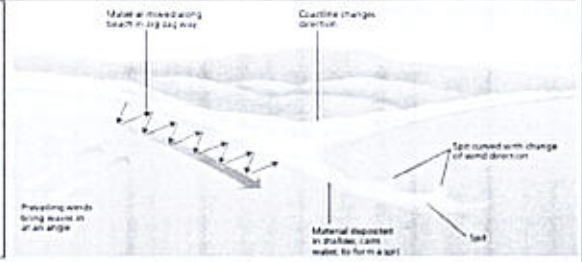
A large movement of soil and rock debris that moves down slopes in response to the pull of gravity in a vertical direction.

1	Rain saturates the permeable rock above the impermeable rock making it heavy.
2	Waves or a river will erode the base of the slope making it unstable.
3	Eventually the weight of the permeable rock above the impermeable rock weakens and collapses.
4	The debris at the base of the diff is then removed and transported by waves or river.



Formation of Coastal Spits - Deposition

Example: Spurn Head, Holderness Coast.



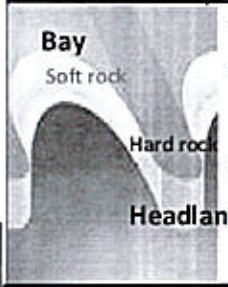
1) Swash moves up the beach at the angle of the prevailing wind.
2) Backwash moves down the beach at 90° to coastline, due to gravity.
3) Zigzag movement (Longshore Drift) transports material along beach.
4) Deposition causes beach to extend, until reaching a river estuary.
5) Change in prevailing wind direction forms a hook.
6) Sheltered area behind spit encourages deposition, salt marsh forms.

Types of Weathering	
Weathering is the breakdown of rocks where they are.	
Carbonation	Breakdown of rock by changing its chemical composition.
Mechanical	Breakdown of rock without changing its chemical composition.

What is Deposition?

When the sea or river loses energy, it drops the sand, rock particles and pebbles it has been carrying. This is called deposition.

Formation of Bays and Headlands



1) Waves attack the coastline.
2) Softer rock is eroded by the sea quicker forming a bay, calm area eases deposition.
3) More resistant rock is left jutting out into the sea. This is a headland and is now more vulnerable to erosion.

Unit 1c

Physical Landscapes in the UK

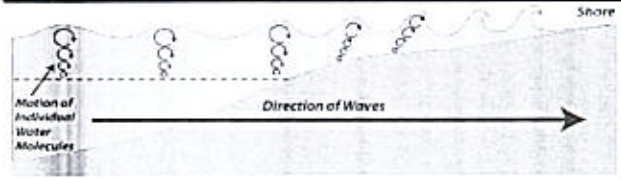
AQA

How do waves form?

Waves are created by wind blowing over the surface of the sea. As the wind blows over the sea, friction is created - producing a swell in the water.

Why do waves break?

1	Waves start out at sea.
2	As waves approaches the shore, friction slows the base.
3	This causes the orbit to become elliptical.
4	Until the top of the wave breaks over.



Mechanical Weathering Example: Freeze-thaw weathering

Stage One
Water seeps into cracks and fractures in the rock.

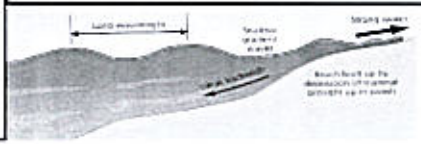
Stage Two
When the water freezes, it expands about 9%. This wedges apart the rock.

Stage Three
With repeated freeze-thaw cycles, the rock breaks off.

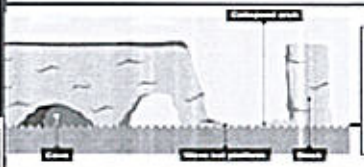
Size of waves
• Fetch how far the wave has travelled • Strength of the wind. • How long the wind has been blowing for.

Types of Waves

Constructive Waves	Destructive Waves
This wave has a **swash that is stronger** than the backwash. This therefore builds up the coast.	This wave has a **backwash that is stronger** than the swash. This therefore erodes the coast.



Formation of Coastal Stack



Example: Old Harry Rocks, Dorset

1) Hydraulic action widens cracks in the diff face over time.
2) Abrasion forms a wave cut notch between HT and LT.
3) Further abrasion widens the wave cut notch to from a cave.
4) Caves from both sides of the headland break through to form an arch.
5) Weather above/erosion below –arch collapses leaving stack.
6) Further weathering and erosion eaves a stump.

Coastal Defences

Hard Engineering Defences

Groynes	Wood barriers prevent longshore drift, so the beach can build up.	✓ Beach still accessible. ✗ No deposition further down coast = erodes faster.
Sea Walls	Concrete walls break up the energy of the wave . Has a lip to stop waves going over.	✓ Long life span ✓ Protects from flooding ✗ Curved shape encourages erosion of beach deposits.
Gabions or Rip Rap	Cages of rocks/boulders absorb the waves energy, protecting the cliff behind.	✓ Cheap ✓ Local material can be used to look less strange. ✗ Will need replacing.

Soft Engineering Defences

Beach Nourishment	Beaches built up with sand, so waves have to travel further before eroding cliffs.	✓ Cheap ✓ Beach for tourists. ✗ Storms = need replacing. ✗ Offshore dredging damages seabed.
Managed Retreat	Low value areas of the coast are left to flood & erode.	✓ Reduce flood risk ✓ Creates wildlife habitats. ✗ Compensation for land.

Case Study: Lyme Regis

Issues- Lyme Regis is a Jurassic Coastline(fossils) and a key tourist location in South of England.
Much of the town is built on unstable cliffs, with a rapidly eroding coastline dues to waves from SW. Many properties have been destroyed and seawall breached.

How the coastline is managed – The initial scheme was set up in the early 90's, and the works were completed in 2015.
Phase 1 – Completed 1995 (sea wall & promenade constructed) In winter 2003-04 an emergency project stabilised the cliffs.
Phase 2 – Costs of £22 million – new sea wall, promenade, creation of wide, shingle beach. Extension of rock armour.
Phase 3 – Plan not undertaken.
Phase 4 – 2013-15: Cost £20 million, involving the east coastline – 390m seawall constructed in front of old sea wall. Extensive nailing, piling and drainage applied to stabilise the cliffs.

Outcomes -
-+ outcomes: new beaches increased visitor numbers, new defences stood up to the recent storms and the harbour is now better protected for the fishermen.

-: Increased visitor numbers have led to conflicts due to increased congestion and litter, new sea wall interferes with coastal processes and stabilising cliffs may reveal fossils.

Precipitation	Moisture falling from clouds as rain, snow or hail.
Interception	Vegetation prevent water reaching the ground.
Surface Runoff	Water flowing over surface of the land into rivers
Infiltration	Water absorbed into the soil from the ground.
Transpiration	Water lost through leaves of plants.

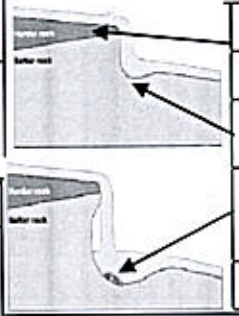
Physical and Human Causes of Flooding.

Physical: Prolong & heavy rainfall Long periods of rain causes soil to become saturated leading runoff.	*Physical:* Geology Impermeable rocks causes surface runoff to increase river discharge.
Physical: Relief Steep-sided valleys channels water to flow quickly into rivers causing greater discharge.	*Human:* Land Use Tarmac and concrete are impermeable. This prevents infiltration & causes surface runoff.

Upper Course of a River

Near the source, the river flows over steep gradient from the hill/mountains. This gives the river a lot of energy, so it will erode the riverbed vertically to form narrow valleys.

Formation of a Waterfall



1) River flows over alternative types of rocks.
2) River erodes soft rock faster creating a step.
3) Further hydraulic action and abrasion form a plunge pool beneath.
4) Hard rock above is undercut leaving cap rock which collapses providing more material for erosion.
5) Waterfall retreats leaving steep sided gorge.

Middle Course of a River

Here the gradient get gentler, so the water has less energy and moves more slowly. The river will begin to erode laterally making the river wider.

Formation of Ox-bow Lakes

Step 1
Erosion of outer bank forms river cliff. Deposition inner bank forms slip off slope.

Step 2
Further hydraulic action and abrasion of outer banks, neck gets smaller.

Step 3
Erosion breaks through neck, so river takes the fastest route, redirecting flow

Step 4
Evaporation and deposition cuts off main channel leaving an oxbow lake.

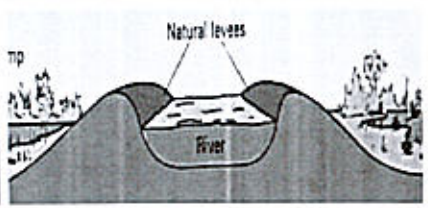
Lower Course of a River

Near the river's mouth, the river widens further and becomes flatter. Material transported is deposited.

Formation of Floodplains and levees

When a river floods, fine silt/alluvium is deposited on the valley floor. Closer to the river's banks, the heavier materials build up to form natural levees.

✓ Nutrient rich soil makes it ideal for farming.
✓ Flat land for building houses.



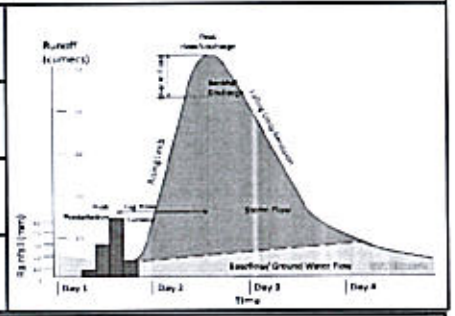
River Management Schemes

Soft Engineering	Hard Engineering
Afforestation – plant trees to soak up rainwater, reduces flood risk. **Demountable Flood Barriers** put in place when warning raised. **Managed Flooding** – naturally let areas flood, protect settlements.	**Straightening Channel** – increases velocity to remove flood water. **Artificial Levees** – heightens river so flood water is contained. **Deepening or widening river** to increase capacity for a flood.

Hydrographs and River Discharge

River discharge is the volume of water that flows in a river. Hydrographs who discharge at a certain point in a river changes over time in relation to rainfall

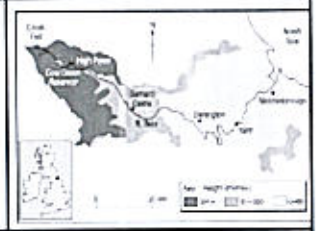
1. **Peak discharge** is the discharge in a period of time.
2. **Lag time** is the delay between peak rainfall and peak discharge.
3. **Rising limb** is the increase in river discharge.
4. **Falling limb** is the decrease in river discharge to normal level.



Case Study: The River Tees

Location and Background
Located in the North of England and flows 137km from the Pennines to the North Sea at Red Car.

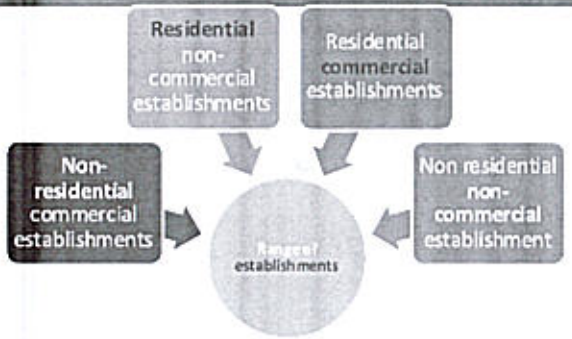
Geomorphic Processes
Upper – Features include V-Shaped valley, rapids and waterfalls. Highforce Waterfall drops 21m and is made from harder Whinstone and softer limestone rocks. Gradually a gorge has been formed.
Middle – Features include meanders and ox-bow lakes. The meander near Yarm encloses the town.
Lower – Greater lateral erosion creates features such as floodplains & levees. Mudflats at the river's estuary.



Management
-Towns such as Yarm and Middleborough are economically and socially important due to houses and jobs that are located there.
-Dams and reservoirs in the upper course, controls river's flow during high & low rainfall.
- Better flood warning systems, more flood zoning and river dredging reduces flooding.

AC 1.1
The structure of the hospitality and catering industry

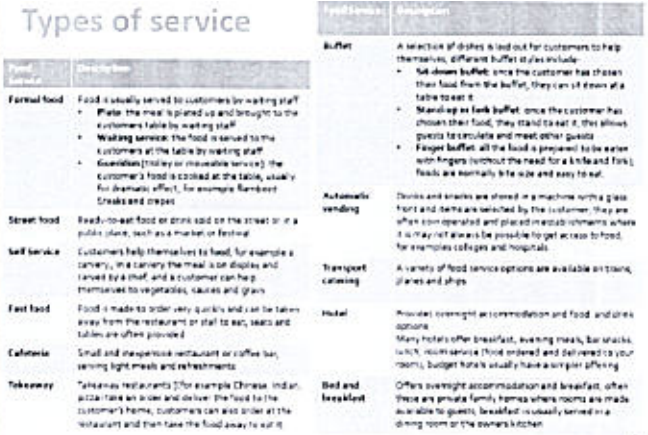
1. Types of Provider



Establishment	Service provided	Examples
Commercial residential	Accommodation, house keeping, food, beverages, conference or training facilities	Hotels, guest houses, campsites, bed and breakfasts, holiday parks, farmhouses
Commercial non-residential	Food and beverage to eat in or take away, areas to sit to eat and drink	Restaurants, cafes, tea rooms, coffee shops, fast food outlets, pubs and bars, street food and pop up restaurants, mobile vans
Non-commercial residential	Accommodation, food and beverages	Hospitals, care homes, prisons, armed forces, boarding schools, colleges, universities.
Non-commercial non-residential	Food and beverages	Canteens in offices, day-care centres, schools and nurseries, charity food suppliers, for example soup kitchen

2. Suppliers

Types of service



Food service	Description
Formal food	Food is usually served to customers by waiting staff • Plate: the meal is plated up and brought to the customers table by waiting staff • Waiting service: the food is served to the customers at the table by waiting staff • Guéridon (trolley or moveable service): the customer's food is cooked at the table, usually for dramatic effect, for example flambéed breakfast crepes
Street food	Ready-to-eat food or drink sold on the street or in a public place, such as a market or festival
Self service	Customers help themselves to food, for example a cafeteria, in a cafeteria the meal is on display and served by a chef, and a customer can help themselves to vegetables, sauces and gravy
Fast food	Food is made to order very quickly and can be taken away from the restaurant or staff to eat, seats and tables are often provided
Cafeteria	Small and inexpensive restaurant or coffee bar, serving light meals and refreshments
Takeaway	Takeaway restaurants (for example Chinese, Indian, pizza) take an order and deliver the food to the customer's home, customers can also order at the restaurant and then take the food away to eat it
Buffet	A selection of dishes is laid out for customers to help themselves, different buffet styles include: • Sit down buffet: once the customer has chosen their food from the buffet, they can sit down at a table to eat it • Standing or fork buffet: once the customer has chosen their food, they stand to eat it, this allows guests to circulate and meet other guests • Finger buffet: all the food is prepared to be eaten with fingers (without the need for a knife and fork), foods are normally bite size and easy to eat
Automatic vending	Drinks and snacks are stored in a machine with a glass front and items are selected by the customer, they are often coin operated and placed in areas where it is not always possible to get access to food, for example colleges and hospitals
Transport catering	A variety of food service options are available on trains, planes and ships
Hotel	Provides overnight accommodation and food and drink options Many hotels offer breakfast, evening meals, bar snacks, lunch, room service (food ordered and delivered to your room), budget hotels usually have a simpler offering
Bed and breakfast	Offers overnight accommodation and breakfast, often these are private family homes where rooms are made available to guests, breakfast is usually served in a dining room or the owners kitchen

Hospitality at non-catering venues

Contract Caterers

provide:

- food for functions such as weddings, banquets and parties in private houses.
- prepare and cook food and deliver it to the venue, or cook it on site.
- They may also provide staff to serve the food, if required.
- Complete catering solutions for works canteens etc

3. Standards and ratings

Hotel and Guest house standards

Hotels and guest houses are often given a star rating. Star ratings help customers to know what services and facilities they can expect at a hotel or guest house. The quality of the service provided is rated on a scale of one to five stars

3. Standards and ratings

Food hygiene standards

The Food standards agency runs a scheme with local authorities where they score businesses on a scale from zero to five to help customers make an informed choice about where to eat. The rating is usually displayed as a sticker in the window of the premises. The scores mean:

Restaurant standards

The three main restaurant rating systems used in the UK are Michelin stars, AA Rosette Awards and The Good Food Guide reviews:
Michelin stars are a rating system used to grade restaurants for their quality:
One star is a very good restaurant
Two star is excellent cooking
Three stars is exceptional cuisine

AA Rosette Awards score restaurants from one (a god restaurant that stands out from the local competition) to five (cooking that compares with the best in the world)

The Good Food Guide gives restaurants a score from one (capable cooking but some inconsistencies) to ten (perfection)

Environmental standards

The Sustainable Restaurant Association awards restaurants a one-two-three star rating in environmental standards. To achieve this the restaurant has to complete an online survey about sourcing, society and the environment. It is then given an overall percentage for environmental standards:
One star: 50-59%
Two star: 60-69%
Three stars: more than 70%

Keywords

Extended reading

Exam question

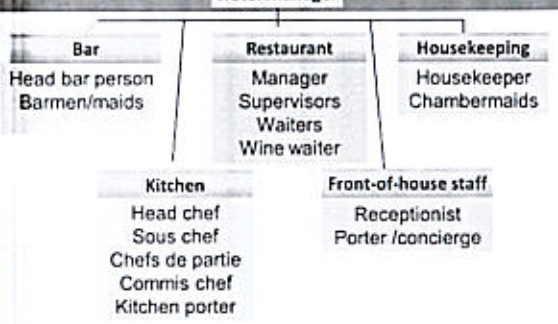
Video links

Revision Techniques

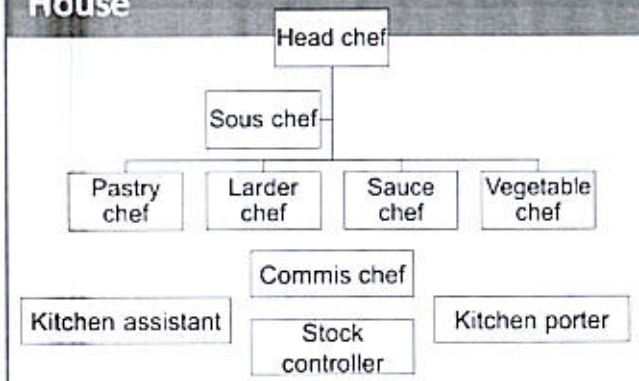
AC 1.2 Job roles in the Hospitality and Catering industry

4. Job roles in the industry

Staff structure in a hotel



5. The Kitchen brigade- Back of House



Most large establishments could have **chefs de partie** in the following areas:

- **Sauce chef-** Le Saucier
- **Pastry chef-** Le Patissier- baked goods and dessert
- **Fish chef-** Le Poissonier
- **Vegetable chef-** L'entremetier
- **Soup chef-** Le Potager
- **Larder chef-** Le garde manger- cold starters and salads
- The **commis chef** or assistant chef is a chef in training
- The **kitchen porter** washes up and may do basic vegetable preparation
- The **stock controller** is in charge of all aspects of store keeping and stock control.

6. Front of House roles

Reception
Receptionist: meet customers and direct them to the correct person or place; they manage visitor lists and booking systems
Porter/ Concierge; assist hotel guests by making reservations, booking taxis and booking tickets for local attractions and events.

Restaurant and bar
Restaurant manager (Maître d'Hote): The restaurant manager is in overall charge of the restaurant,; they take bookings, relay information to the head chef, complete staff rotas, ensure the smooth running of the restaurant
Head waiter (ess): Second in charge of the restaurant,. Greets and seats customers, relays information to the staff, Deals with complaints and issues referred by the waiting staff.

Waiting staff Serve customers, clear and lay tables, check the customers are satisfied with the food and service. May give advice on choices from the menu and special order foods

Wine waiter- Le sommelier: Specialises in all areas of wine and matching food, advises customers on their choices of wine, Wine waiters serve the wine to the customer and can advise customers on their choices as well

Bar staff serve drinks and take food orders , wash up, clear tables, change barrels and fill shelves.

Baristas make and serve hot and cold beverages, in particular different types of coffee such as espresso, cappuccino and latte.

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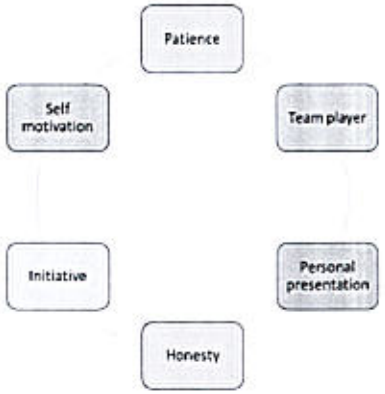
7. Average salaries in the hospitality and catering industry

Role	Average Salary
Hotel Management	£37,310
Head executive chef	£36,613
Pastry chef	£30,530
Housekeeper	£24,055
Receptionist	£21,596
Porter	£17,718
Waiting and bar staff	£16,735
Kitchen staff	£16,556

8. Training

Level	Types of training
Key stage 4 school courses	Level 1/2 Vocational award in Hospitality and Catering
Post 16-19	Colleges offer many courses for those leaving school after Year 11, for example: • Certificate in Hospitality and Catering Level 1 • Certificate in Introduction to Culinary Skills Level 1 • Diploma in Introduction to Professional Cookery Level 1 • Diploma in Hospitality and Catering Level 2 • Diploma in Professional Cookery Level 2
Universities	Universities offer degree, HND and HNC courses in subjects such as: • Catering • Hospitality • Culinary Arts • Hotel management • Food and beverage service
Apprenticeships	These provide both work experience and training
In-house training	On-the-job training provided by the organisation you work for

9. Personal attributes



Job Role	Desirable Attributes
Waiter/waitress	Attentive listener, good memory, clear communicator, diplomatic, calm and assured, high level of focus and attention, multitasker, can work in a team, physical stamina, courteous and polite, hardworking.
Receptionist	Professional, positive attitude and behaviour, clear communicator, helpful, an work in a team, courteous and polite, can learn skills quickly, calm, composed, approachable.
Housekeeper	Physical stamina, tactful, diplomatic, calm, courteous and polite, good memory, can work in a team.
Head Chef	Organised, able to accept criticism, physical stamina, creative, attention to detail, can handle highly stressful situations, passion for food and cooking.
Commis chef	Attentive listener, clear communicator, can work in a team, passion for food and cooking, physical stamina, creative.

Keywords

Extended reading

Exam question

Video links

Revision Techniques

1.3 Working conditions across the hospitality and catering industry

1.3 Working conditions across the hospitality and catering industry

Employers want to employ most workers when they have busy times

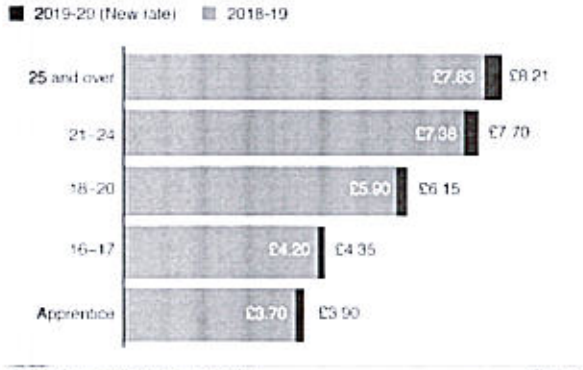
Busy times of year	Days of the week	Time of day
• Christmas	• Friday	• Lunchtime
• Tourist season	• Saturday	• Afternoon
• School holidays	• Sunday	• Dinner time
• Mothers day	• Pay day	• (breakfast)
• valentines		

10. Working hours

- Hospitality and Catering jobs tend to be long hours, early starts for breakfast in a hotel to late nights for dinner in a restaurant.
- Staff will still get 2 days off a week but it will be quieter days instead of the weekend
- Shifts could be 6-3. 11-6. 3-11 or other hours.
- Monthly salaried staff may not have set hours eg Head Chef who might work from early morning to late night every day

11. The national Minimum Wage

New minimum wage rates



12. Contracts of employment

Full-time and part-time employees must have

1. a written statement of employment or **contract** setting out their duties, rights and responsibilities
2. the statutory minimum level of paid holiday 28 days for full time workers
3. a pay slip showing all deductions, eg National insurance, tax . Earning above £166 a week
4. the statutory minimum length of rest breaks- one 20 min break for 6 hrs worked
5. Statutory Sick Pay (SSP) £94.25 pw for 28 weeks (some may get full wages for a limited amount of time)
6. Maternity, paternity and adoption pay and leave-90% of earnings for 6 weeks then ££148.68 for next 33 weeks

Casual **staff / Agency staff**

- work for specific functions and can be employed through an agency.
- They do not have a contract or set hours of work.
- They are needed at busier times of the year e.g. at Christmas or for weddings, New years eve

Temporary **staff**

- Employed for a specific length of time such as the summer tourist season or the month of December.
- Temporary staff have the same rights as permanent staff for the duration of their contract.
- Temporary staff employed for longer than 2 years become permanent by law

Zero Hours Contract

This type of contract is between the employer and a worker, where the worker may sign an agreement to be available to work when they are needed, but no specific number of hours or times to start or end work are given. The employer is not required to offer the person any work and the worker is not required to accept the work.

13. Remuneration

Remuneration is a term used for the reward that people receive from working somewhere. It includes their basic pay, plus extra money t top u their income from:

- **Tips and gratuities-** money given to someone by a customer as a way of saying 'thank you' for good service
- **Service charge-** a percentage added to the customers bill to reward the employees who have provided the customer with a service
- **Bonus payments and rewards-** given by some employers as a way of rewarding hard work throughout the year and helping make the business successful.

It is quite common for all he tips, gratuities and service charges to be divided equally amongst all the workers in, e.g. restaurant. This is known as a tronc arrangement, and the person who works out and distributes the extra money is known as a 'troncmaster'.

14. Paid annual leave

- All workers are entitled to 28 days paid leave annually
- **no** legal right for employees to be given Bank and Public Holidays. Most hospitality staff would work these days

To calculate holiday entitlement,
Multiply the full-time entitlement (28 days) by the number of days worked and divide by the number of days full-time staff work
Entitlement for 3 days a week: 28 x 3/5 = 16.8 days

15. Compulsory Rest Breaks

Adult workers are entitled to 24 hours off in each 7 day period and young workers (15-18) are entitled to 2 days in 7.
Adult workers are entitled to at least 20 minutes uninterrupted rest if their working day is longer than 6 hours.
Young workers are entitled to 30 minutes rest if their working day is over 4.5 hours long.

Keywords

Extended reading

Exam question

Video links

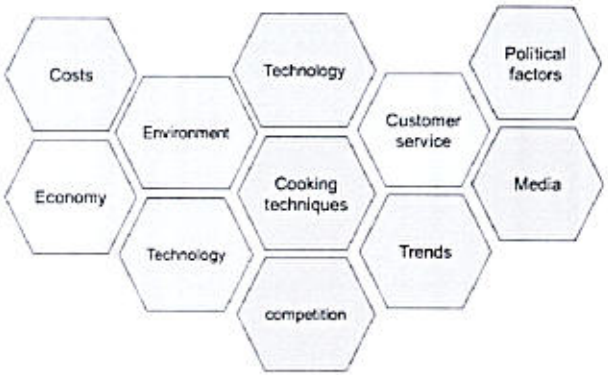
Revision Techniques

1.4 Factors that affect the success of Hospitality and catering providers

16. Reasons for failure

1. **A saturated market** – there is a fine line between competition & too many for the number of customers
2. **General business incompetence** – 46% of business fail due to lack of business knowledge
3. Lack of capital – not enough money to get through the first few months
4. **Location** – either not enough people walk past (foot-fall) live & work nearby
5. **Quality of life** - most restaurateurs work 60 hours a week – not the glamorous life they thought
6. **Lack of industry experience** – most successful restaurateurs tend to have previous industry experience
7. **Failure to create a good enough brand** – They did not incorporate the 12 Ps of restaurant branding,(Place, Product, Price, People, Promotion, Promise, Principles, Props, Production, Performance, Positioning and Press)
8. **Name of the restaurant is too long-** A restaurant with a name that is brief, descriptive and attractive is more likely to succeed.
9. **Lack of differentiation** -the brand is not different enough
10. **Poor financial controls** – Main costs – labour and food exceeded 60% of sales

17. Factors affecting success



Costs - need to make a profit. Consider cost of everything you buy and selling price.

- Material - Anything involved in making product
- Labour - Costs of staff
- Overheads - Anything not connected with making products

Economy - when the economy slows down, business have lower sales as consumers eat out less because they have less disposable income

Environment – 3 R's, packaging, food waste, global warming, carbon footprint, clean eating

Technology - Using technology to improve service, delivery and stock control – touch screen customer ordering, EPOS systems, stock management, apps for delivery services

Emerging and innovative cooking techniques – sous vide, clean eating, steaming, new restaurants,

Customer demographics and lifestyle – delivery services Facebook Twitter

Customer service–customer satisfaction – free WiFi, order online

Competition - Low cost food (£1 menu, coffee McDs espresso v Starbucks)

Trends healthy food options, pop-up bars, cafes and restaurants, cronut, clean eating, low carb, good fats,

Political factors - Increasing regulations – from government due to health issues, Brexit, use of migrant labour, migrants – ethnic foods

Media - Strong global brand, Good community reputation – children's charities / Ronald McDonald House, celebrity chefs, celebrity endorsements, Masterchef,

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18. Costs for an establishment

Materials costs
Soap, loo roll,
Menus
Order pads
Cleaning materials
flowers

Food costs
Ingredients
Pre made foods
Bar food and drink
Food and drink for staff

Costs for an establishment

Overhead costs
Heating, lighting
Furniture
Maintenance of equipment
Curtains, carpets

Personnel costs wages
Chefs
Kitchen assistants
Bar staff
Waiting staff
Managers
Casual staff

19. Costing a recipe

Costing recipes

In order to calculate selling price and profit for dishes you need to calculate the recipe cost

$$\text{Ingredient cost} = \frac{\text{Pack cost}}{\text{Pack weight}} \times \text{weight used}$$

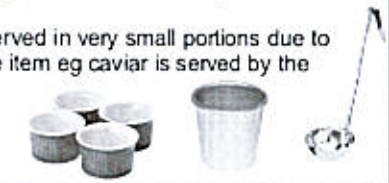
Divide by the number of portions made for the portion cost

Selling price

$$\text{Selling price} = \frac{\text{Portion cost}}{30} \times 100$$

20. What is portion control?

- Portion control is the amount of each menu item that is served to the customer.
- It depends on the type of customer, the type of food served,
- some foods are served in very small portions due to the high cost of the item eg caviar is served by the teaspoon



Keywords

Extended reading

Exam question

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Revision Techniques

LO3 Understand how hospitality and catering provision meets health and safety requirements

3.1 Personal safety responsibilities in the workplace

It is both the employer's and employee's responsibility to make sure they follow health and safety rules at work because:

- They help prevent accidents
- They ensure the business is a safe place to work
- They ensure food is safe to eat

Abbreviation	Full name
HASAWA	Health and safety at work act 1974
RIDDOR	Reporting of injuries diseases and dangerous occurrences regulations 2013
COSHH	Control of substances hazardous to health regulations 2002
PPER	Personal protective equipment at work regulations 1992 http://www.hse.gov.uk/pubns/indg174.pdf
MHR	Manual handling operations regulations 1993

HASAWA 1974

Employers must ensure that:

- Equipment is tested for safety and correctly maintained
- Chemicals are stored and used correctly by trained staff
- Risk assessments are completed
- A health and safety policy statement is given to employees
- Safety equipment and clothing are provided
- Health and safety training is given and updated regularly

Employees must ensure that they:

- Work in a safe way so they do not put others in danger
- Follow the health and safety rules set by the employer
- Wear safety clothing and equipment provided by the employer
- Report anything that poses a health and safety risk, or something that could be a risk.

Risk assessments : a way of identifying things that could cause harm to people in the workplace

Health and safety policy statement : a written statement by an employer of its commitment to health and safety for employees and the public

RIDDOR 2013

This regulation require employers to report certain workplace incidents to the Health and Safety Executive (HSE) such as:

- Death and serious injury (for example serious burns)
- Dangerous occurrences (for example near-miss events such as the collapse of equipment)
- Work-related diseases (for example occupational dermatitis)
- Flammable gas incidents (for example leaking gas)
- Dangerous gas fitting (for example faulty gas cooker)

Employers must also keep a record of any injury, disease or dangerous accident.
An employee must ensure that:

- They tell their line manager or union representative if they see any health and safety issue that concerns them
- Any injury at work are recorded in an accident book

If nothing is done about a health and safety concern that an employee has reported, it can be reported to the HSE.

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COSHH 2002

The control of Substances Hazardous to Health (COSHH Regulations covers substances that are hazardous to health, for example:

- Chemicals, for example cleaning materials
- Fumes, from machinery and cooking processes
- Dusts, for example from icing sugar and flour
- Vapours from cleaning chemicals, for example oven cleaner
- Gases from cookers

Any substances hazardous to health must be:

- Stored, handled and disposed of according to COSHH Regulations
- Identified on the package or container
- Shown in writing and given a risk rating
- Labelled as toxic, harmful, irritant, corrosive, explosive or oxidising.

An employer should ensure that employee use of and exposure to these substances is kept to a minimum.
An employee should ensure that they are trained in the use of these substances. They should take note of the intentional symbols that are used to identify the different types of substances and how they can cause harm

PPER

Personal Protective Equipment (PPE) is clothing or equipment designed to protect the wearer from injury. It is sometimes necessary when cleaning as the chemicals used in the workplace are often stronger that those we may use at home.
These regulations require employers to provide suitable high-quality protective clothing and equipment to employees who may be exposed to a risk to their health and safety while at work. This can include:

- **Gloves** to protect hands from cleaning materials and metallic-style gloves to be used when cutting meat
- **Goggles** to prevent eyes being splashed with chemicals
- **Facemasks** to prevent inhalation of any chemicals or powder
- **Long sleeves** to prevent contact with skin on arms
- Waterproof aprons to be worn on top of clothing

Signs to remind employees what PPE to wear and when should also be visible.
Employees are expected to attend training sessions on how to wear PPE and to wear it in the workplace as instructed by the employer

MHR

The manual Handling Operations Regulations protect employees from injury or accident when they are lifting or moving heavy or awkward shaped boxes. Items that are hot, frozen or sharp may also need to be carried in the hospitality industry-this is also covered by these regulations.
Employers must complete a risk assessment whenever items need to be moved, and provide adequate training.
Employees must be trained in correct manual handling techniques and lifting; moving equipment should be provided when appropriate.

Lifting

When handling boxes, cartons and trays, there is a correct way to lift:

- Always keep your back straight when lifting
- Bend your knees and use the strength in your arms
- Never reach forward
- Keep the item close to your body and make sure you hold the item firmly
- Use protective clothing if there are sharp edges to boxes or cartons
- Never attempt to carry items that are too heavy-always get help.

Keywords

Extended reading

Exam question

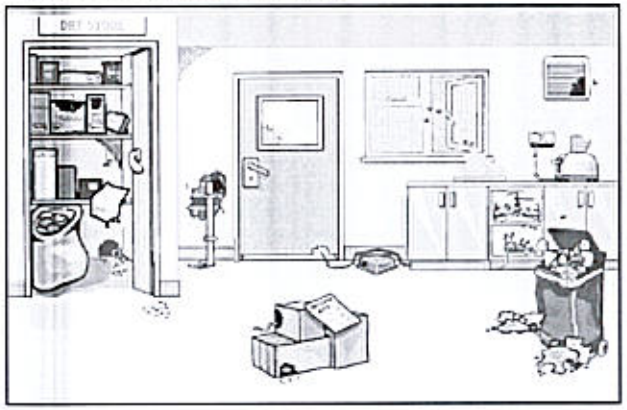
Video links

Revision Techniques

LO3 Understand how hospitality and catering provision meets health and safety requirements

3.2 Risks to personal safety in hospitality and catering

Can you spot the 17 hazards in the image below. Write them down in your book



Potential risks to employees, suppliers and customers

Risk to employees

Stress, fatigue, Using equipment, Trip hazards, Food and drink spillages, Using hazardous chemicals, Inadequate clothing worn, Using electrical appliances, Moving and lifting objects, Fire and explosion, Bullying and harassment, Injuries, Inadequate lighting, Inadequate ventilation, Inadequate signage, Theft, Assault ,Undesirable people on the premises

Risk to suppliers

Using equipment, Trip hazards, Food and rink spillages, Inadequate clothing worn, Moving and lifting objects, Fire and explosion, Injuries, Inadequate lighting, Inadequate signage

Risk to customers

Food poisoning, Food allergies, Trip hazards, Food and drink spillages, Fire and explosion, Theft, Assault, Undesirable people on premises.

Risks to health and personal safety

Risks to security

Levels of risks

A risk assessment should be carried out to identify risks. It is a way of identifying things that could cause harm to people in the workplace. All workplaces must have the necessary risk assessments in place. In business there are five steps to risk assessment:

1. Identify the hazard
2. Decide who might be hard and how
3. Evaluate the risk and decide on controls (precautions)
4. Record the findings and implement them.
5. Review the assessment and update if necessary.

Calculating Risk

It is possible to calculate whether the level of risk is high, medium, or low. To do this, the hazard severity and the likelihood of it happening are given a score on a scale of one to five. They can then be multiplied together to give a level of risk. The overall aim is to reduce the risk to an acceptable level (as close to 1 as possible)

Scales used to calculate the level of risk:

Hazard severity	Likelihood of occurrence	Scale
Trivial	Remote(almost never)	1
Minor	Unlikely (occurs rarely)	2
Moderate	Possible (uncommon)	3
Serious	Likely (not frequent)	4
Fatal	Very likely (frequently)	5

Level of risk = hazard severity X likelihood of occurrence

Low risk 1-8	Medium risk 9-12	High risk 15-25
Continue to review regularly to ensure controls remain effective	Continue but implement additional controls where possible and monitor regularly	Stop the activity]Identify new controls Activity must not proceed until risks are reduced to a low or medium level

Keywords

Extended reading

Exam question

Video links

Revision Techniques

LO3 Understand how hospitality and catering provision meets health and safety requirements

3.3 Personal safety control measures for hospitality and catering provision

Control measures for employees

The control measures outlined in the table can be put in place to help protect employee's personal safety

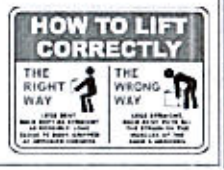
Hazard	Control
Stress, fatigue	Employees need to be monitored closely and adequate rest breaks should be allocated
Using equipmen t	The instruction manual needs to be followed, with training given if needed
Trip hazards	Floors need to be clutter free; exits and entrances need to be clear
Food and rink spillages	Clear up spillages immediately and use warning signs
Using hazardous chemicals	Wear protective clothing where necessary; training should be given on use of chemical; chemicals should be stored correctly; COSHH regulations need to be followed
Inadequat e clothing worn	The correct PPE should be worn at all times; wear aprons that are done up correctly; shoe laces should be tied up.
Using electrical appliances	The equipment should be maintained and cleaned regularly; training should be given if necessary; it should be given if necessary; it should be PAT tested regularly by a qualified electrician
Moving and lifting objects	Wear correct PPE; training on safe lifting techniques should be given

Control measures for employees cont.

Hazard	Control
Fire and explosion	Under the Fire Safety Order 2005, employers must ensure there is a low risk of fire and explosion by: • Having fire alarms and making sure they are tested regularly • Making sure escape routes are clear and adequately signed • Having suitable equipment such as fire extinguishers available
Bullying and harassment	Protocols and policies should be in place to ensure that this does not happen; there should be an open culture if anyone needs to report it.
Injuries	Kitchens and restaurants can be dangerous places- there should be a first aid kit and a trained first aider
Inadequate lighting	Lighting must be bright enough to work safely in; if a light is broken it should be fixed
Inadequate ventilation	Good ventilation is needed in a catering kitchen; this is normally provided by extractor fans, which remove steam, heat and smells; the kitchen may be hot so drinking water should be available
Inadequate signage	Signs need to be clear and visible; staff need to be made aware of what the signs mean
Theft	A secure area should be available for staff to leave personal belongings
Assault	Train staff on how to deal with aggressive customers and diffuse volatile situations
Undesirable people on premises	Have a security system to monitor who is entering the premises; any suspicious person should be reported; effective signage in and out procedures are required.

Control measures for customers

Hazard	Control
Food poisoning	Hazard Analysis and Critical Control Point (HACCP) systems put in place to ensure food prepared, cooked and served is safe to eat
Food allergies	Detailed information must be given to customers on any allergens in the dishes
Trip hazards	Make sure areas where customers go are well lit and that there are no trailing wires or clutter on the floor
Food and drink spillages	Spillages must be cleared up straight away and appropriate signage used
Fire and explosions	Emergency exits must be well lit and signposted; fire extinguishers should be in place and staff should be trained in how to use them
Assault	Staff should be ensure the safety of customers if another person is aggressive
Theft/fraud	Ensure that card transactions are done in front of the customer; provide a secure place for their belongings
Undesirable people on premises	Any suspicious person should be challenged and not allowed to mix with customers



Keywords

Extended reading

Exam question

Video links

Revision Techniques

Paper 1 Q2: Language Subject Terminology

1. Word Classes

Noun	Identifies a person (girl), thing (wall), idea (luckiness) or state (anger).
Verb	Describes an action (jump), event (happen), situation (be) or change (evolve).
Adjective	Describes a noun (happy girl, grey wall).
Adverb	Gives information about a verb (jump quickly), adjective (very pretty) or adverb (very quickly).

2. Sentence Structures

Fragment	An incomplete sentence (no subject verb agreement). "Nothing." "Silence everywhere."
Simple	A sentence with one independent clause. "She went to the shop."
Compound	A sentence with multiple independent clauses. "She went to the shop and bought a banana"
Complex	A sentence with one independent clause and at least one dependent clause. "Sometimes, when she goes to the shop, she likes to buy a banana."

3. Language Techniques

Lexis	The vocabulary of a language.
Hyperbole	The use of extreme exaggeration.
Imagery	When the writer provides mental "pictures".
Irony	Like sarcasm, where the opposite is implied.
Juxtaposition	Two ideas together which contrast each other.
List (of three)	A number of connected items (three= effect).
Metaphor	Something is presented as something else.
Oxymoron	Contradictory terms together "bittersweet".
Pathos	Language used to appeal to the emotions.
Personification	Giving human traits to something non-human.
Repetition	When a word, phrase or idea is repeated.
Semantic Field	A set of words from a text related in meaning.
Simile	Something is presented as like something else.
Symbolism	An idea is reflected by an object/character etc.
Syntax	The way words and phrases are arranged.

4. This Quotation/ Reference...

Achieves	Advances	Affects
Allows	Alludes to	Builds
Concludes	Confirms	Conveys
Denotes	Develops	Demonstrates
Displays	Justifies	Exaggerates
Encourages	Enhances	Establishes
Exemplifies	Emphasises	Explores
Exposes	Forces	Generates
Highlights	Hints	Identifies
Ignites	Illustrates	Impacts
Implies	Identifies	Indicates
Initiates	Introduces	Involves
Justifies	Juxtaposes	Kindles
Launches	Leads to	Maintains
Manifests	Notifies	Offers
Portrays	Presents	Produces
Progresses	Promotes	Prompts
Provokes	Questions	Represents
Reveals	Reinforces	Signifies
Sparks	Suggests	Supports
Symbolises	Transforms	Triggers
Typifies	Upholds	Underscores
Validates	Verifies	Yields

5. Stock Phrases

Creates a picture of...

Paints an image of...

Reinforces the view that...

Emphasises the writer's point that...

Exemplifies the idea that...

Sophisticated Discourse Markers

Whilst	Although	Despite
	Since	

7.Cause and Effect Discourse Markers

Therefore	Thus	As a result
	Consequently	

Paper 1 Q3: Structural Subject Terminology

8. Types of Narrator

Limited 3rd person	External narrator with knowledge of one character's feelings (he).
Omniscient 3rd person	External narrator- knowledge of more than one character's feelings (he).
1st person	Told from a character's perspective (I).
2nd person	Directed to the reader (you).
Unreliable narrator	When the perspective offered makes us question the narrator's credibility.

9. Narrative Styles

Linear	Events are told chronologically.
Non-Linear	Events are not told chronologically.
Dual	Told from multiple perspectives.
Cyclical	Ends the same way it begins.

10. Explaining the Extract.

Focusing	Our attention is aimed somewhere.
Introducing	An idea or character is first shown.
Building	When an idea/tension is increased.
Developing	An earlier point is extended.
Changing	A shift is created for an event/idea.
Concluding	Ideas/ events are drawn to a close.

11. Structural Techniques

Atmosphere	The mode or tone set by the writer.
Climax	The most intense or decisive point.
Dialogue	The lines spoken by characters.
Exposition	The start where ideas are initiated.
Analepsis	(flashback) Presents past events.
Prolepsis	flashforward Present future events
Foreshadowing	Hints what is to come(can mislead).
Motif	A .
Resolution	Th recurring element in a story e answer or solution to conflict.
Setting	A geographical/historical moment.
Spotlight	Emphasis is placed on something.
Shift	A switch or change of focus.
Tension	The feeling of emotional strain.

Question 3: Language Subject Terminology

Word Classes

Noun	Identifies a person (girl), thing (wall), idea (luckiness) or state (anger).
Verb	Describes an action (jump), event (happen), situation (be) or change (evolve).
Adjective	Describes a noun (**happy** girl, **grey** wall).
Adverb	Gives information about a verb (jump **quickly**), adjective (**very** pretty) or adverb (**very quickly**).

Sentence Structures

Fragment	An incomplete sentence (no subject verb agreement). *"Nothing." "Silence everywhere."*
Simple	A sentence with one independent clause. *"She went to the shop."*
Compound	A sentence with multiple independent clauses. *"She went to the shop and bought a banana"*
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Stock Phrases

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Emphasises the writer's point that...
Exemplifies the idea that...

Sophisticated Discourse Markers

Whilst		
Although	Despite	Since

Cause and Effect Discourse Markers

therefore	thus	As a result
consequently		

Question 4: Viewpoints and perspectives

Key Words

Viewpoint	The views and ideas held by the writer.
Perspective	The particular attitude towards something (can shaped by time/place)
Attitude	The tone the writer adopts to emphasise or covey their ideas.
Methods	The ways in which the writer communicates their views and ideas.

The writer...

thinks	encourages	says	asks
feels	reacts	implores	reveals
believes	wants	would like	presents

Explaining the Source.

Focusing	Our attention is aimed somewhere
Introducing	An idea or character is first shown.
Building	When an idea/tension is increased.
Developing	An earlier point is extended.
Changing	A shift is created for an event/idea.
Concluding	Ideas/ events are drawn to a close.

Discourse markers to compare and contrast

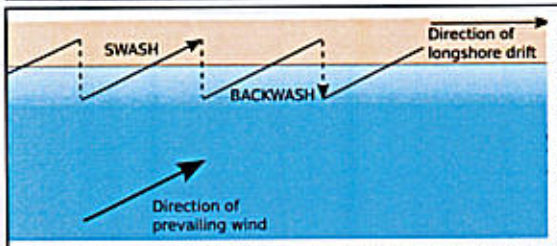
Compare	Contrast
Similarly, ...	On the other hand, ...
In the same way, ...	Whereas...
Equally, ...	In contrast to this, ...
Compared with ...	Unlike...
As with	Alternatively, ...

SQI

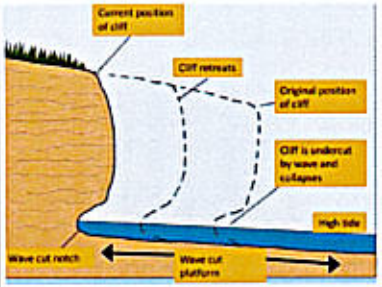
Statement	Answers the question
	A clear point made
Quotation(s)	Precise and embedded
	Might group quotations
Inference	What is suggested/implied

The **coast** is a narrow zone where the land and sea overlap and interact. The processes that affect rivers in terms of **erosion, weathering, transportation** and **deposition** also affect the coast too. For more information please refer to the rivers KO.

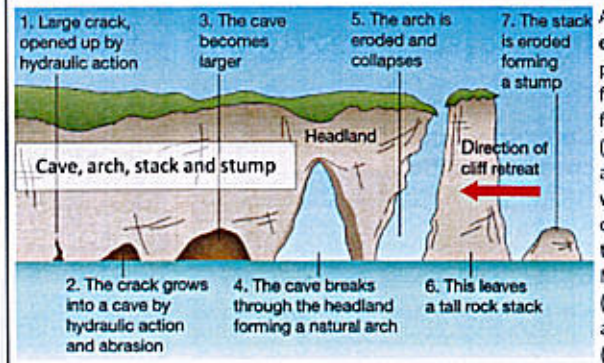
Type of wave	Formation (wind/ speed etc)	Swash/ Backwash	Wave length	Processes (Movement, erosion, deposition)
Destructive	Strong Winds Large Fetch (distance) High Energy (powerful) Waves tall and steep Waves closely spaced (short wavelength)	Swash Weak Backwash Strong	Short 11-15 waves p/min	Erosion (Hydraulic Action/ Abrasion) Beach would be narrow and steep if present at all
Constructive	Light Winds Less energy (gentle) Low in height Widely Spaced	Swash Strong Backwash Weak	Long 6-9 waves p/min	Deposition Builds breaches



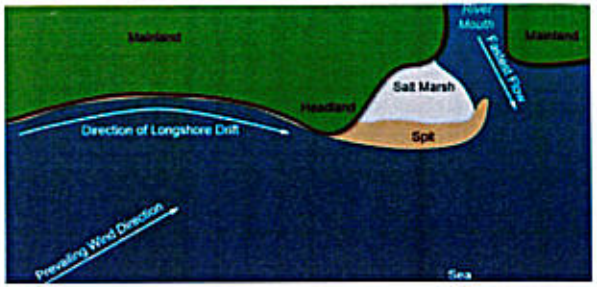
Longshore Drift - Waves can approach the coast at an **acute angle** because of the direction of the prevailing wind (SW in the UK).
The **swash** of the waves carries material **up** the beach at an angle (45°). The **backwash** then flows **down** to the sea in a straight line at 90°. **Longshore drift:** The Continual **swash** and **backwash transports** material sideways along the coast. This movement of material occurs in a zigzag.



Wave Cut Platform - This process occurs on **hard rock** such as a headland. **Destructive waves** attack the cliff at its base.
A point of weakness is attacked by **Hydraulic Action** and **Abrasion**, wearing away the bottom of the cliff to create a **Wave-cut notch**.
Weathering above the waterline and at the top of the cliff, from **mechanical** (freeze thaw) and **chemical** (acids) processes also weakens the cliff from above. The cliff becomes unsupported and collapses. The cliff retreats and creates a **Wave Cut Platform**. This is often covered in high tide and exposed during low tide.



As well as **erosional** processes forming these features (hydraulic action and abrasion), **weathering** also occurs at the top of the arch. Mechanical (freeze thaw) and chemical (acids).



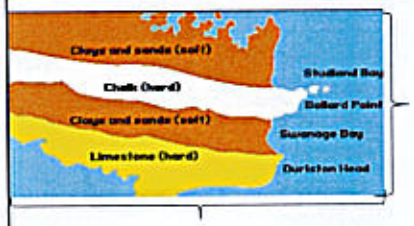
A spit is formed when sediment is moved along the beach due to **longshore drift**, which takes the direction of the prevailing wind (SW in the UK). This works by sediment being moved up the beach by the **swash** at an angle and then straight back down the beach due to gravity by the **backwash**.
If the coastline **changes direction**, the sediment continues to build out into the sea to form the start of a spit. The spit will grow if the rate of deposition is **greater** than the rate of erosion.
The end of the spit will be affected by a change in wind directions over time to form a series of '**hooks**' at the end of the spit. The area behind the spit is protected from the sea and the energy is reduced. This allows deposition to occur (from coastal and river sediment) and salt from the sea to be trapped. This forms a **Saltmarsh**, a coastal wetland habitat for birds and marine life.

A **bar** is formed in the same way as a spit, however this usually forms between 2 **headlands**. The process of longshore drift continues so that the deposited material reaches land and is **attached at both sides**. Behind the bar a **lagoon** is formed, which is a section of water separated from the sea.

Coasts Knowledge Organiser

Rates of Erosion
Sea Level Rising – More land is exposed to erosion - Caused by Climate Change
Geology – Rock type and strength of the rock (hard and soft). Soft erodes faster.
Rock Structure – Cracks and joints exposes more of the rock to water
Storms – Increase in the frequency and strength of storms - Caused by climate Change
Human effects – Coastal management can increase or decrease the rate of erosion

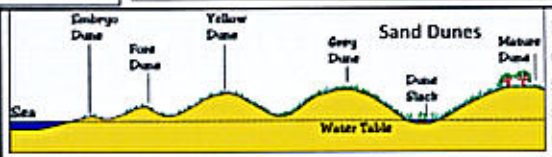
Causes of Coastal Erosion
Rising Sea Levels - Levels are expected to increase by another 11-16cm by 2030 due to Global Warming. **Storms and Storm Surges** - a large scale increase in sea level due to gale force winds (Up to 3m)
UK Weather and Climate - Rainfall causes weathering leading to mass movement. Increased storms means higher erosion rates.



Discordant coasts have different bands of rock type These form headlands (hard) and bays (soft)

Concordant coasts have the same rock type all the way along – Limited features

Headlands and bays form on a **discordant** coastline, which means that that there are differences in rock type.
Over time, erosional processes, such as **hydraulic action** and **abrasion** wear the soft rock away more quickly. This is because it is **less resistant** to erosion.
Eventually there will be **headlands** that stick out to sea and **bays** where the land has worn back. As waves **refract** against the headland, they too will be eroded and features such as wave cut platforms and cave, **arches**, stacks and **stumps** may appear. As wave energy is less in the bay, a **beach** may form.



Embryo dunes develop where wind speeds slow and sand is deposited (usually around obstructions like seaweed or rocks). Drought and salt tolerant plants such as marram grass begin to grow in the sand.
Foredunes will develop as more sand is accumulated and the Marram grass' long roots stabilise the dunes. This will lead to tall yellow dunes *(5-10m in height).*
Increased nutrients in the soil allow a greater variety of plants to colonise the yellow dunes. The dunes start to become more stable.
Further inland *(50-100m, from the sea)* the grey dunes are covered in up to 100% vegetation and the sand has now turned into a brown colour with added humus (decayed organic matter).
Dune slacks develop between grey dunes. They occur when the water table reaches the ground surface and may be permanently waterlogged.

Hard Engineering - Sea Wall - Walls made of concrete or stone which reflect wave energy. Very effective/ Provide a walk way along beach. Very expensive/ Restrict access
Rock Armour – Pieced of hard igneous or metamorphic rock placed at the foot of the cliff to absorb wave energy. Long Lasting/ Low Maintenance. High transport costs/ Unsightly
Groynes – Walls built at right angles on beach. Reduce longshore drift by trapping sediment on one side. Widens beach/ Contributes to tourism. Increases erosion down coast.
Soft Engineering - Beach nourishment - Sand or shingle is added to the beach to make it higher or wider. Natural/ cheap/ attracts tourists. Needs constant maintenance.
Managed Retreat – Coastline is allowed to change naturally, but the process is managed. Usually used on low value land. Cheap. Land is lost/ owners need to be compensated.

CASE EXAMPLE – Holderness Coast
Fastest eroding coastline in Europe – 2-3m per year. Weak boulder clay. 1991 build rock armour and groynes to stop erosion at Mappleton (100 settlements) but caused further erosion at Aldbrough. Further conflict from loss of local roads and farmland and use of council tax to pay for management strategies for the few. Spurn Head spit now in disrepair and won't be hard engineered.