# Year 11 Art and Design Autumn Term Knowledge Organiser

**Key Vocabulary:**

| | | |
|---|---|---|
| 1 | **The Formal Elements of Art** | The formal elements of art are used to make a piece of artwork. The art elements are line, tone, texture, shape, pattern and colour. They are often used together, and how they are organised in a piece of art determines what the finished piece will look like. |
| 2 | **line** | A line is a mark or link between two points. |
| 3 | **mark** | Mark making describes the different lines, dots, marks, patterns and textures used to produce a work of art. Artists use gesture to express their feeling and emotions in response to something seen or something felt . |
| 4 | **tone** | Tone refers to the light and dark values of an object when drawing. There are three different types of tone: shadows, mid tones and high lights. **Value** in art is essentially how light or dark something is on a scale and refers to tone. |
| 5 | **texture** | The texture stimulates two different senses: sight and touch. |
| 6 | **shape** | Shape is a flat, enclosed area such as a square or triangle. |
| 7 | **form** | A form can refer to a three-dimensional composition or object. |
| 8 | **pattern** | A repeated decorative design. |
| 9 | **colour** | Colour is the element of art that is produced when light, strikes an object, and is reflected back to the eye. A colour wheel is an illustrative organisation of colour hues around a circle, which shows the relationships between primary colours, secondary colours and tertiary colours. |

| | | |
|---|---|---|
| **10** | **scale** | The scale of something is its size. To scale something is to enlarge it. To scale down is to do a smaller version or reduction. |
| **11** | **balance** | If a picture or piece of art work has balance then each part of it works well together in a whole piece. |
| **12** | **composition** | The arrangement of elements in a piece of art. |
| **14** | **Annotation** | Writing notes and descriptions beside your work in order to understand what it is you have created. |
| **15** | **Artist Research** | Showing your understanding of an artists work or style and how they have influenced you. |
| **16** | **Artist Response** | Showing your understanding of an artists work or style and how they have influenced you. |
| **17** | **Critical Understanding** | Ability to analyse others art work. Engaging with ideas, images and identifying how values and meanings are conveyed. |

# Year 11 Hospitality and Catering Autumn Term Knowledge Organiser 3.1-3.3 Health and Safety

## Key Vocabulary:

| | | |
|---|---|---|
| 1 | **COSHH** | Control of Substances Hazardous to Health Regulations |
| 2 | **HASAWA** | Health and Safety at Work Act 1974 |
| 3 | **PPER** | Personal Protective Equipment at Work Regulations 1992 |
| 4 | **RIDDOR** | Report of Injuries, Diseases and Dangerous Occurrences Regulations 2013 |
| 5 | **Risk Assessment** | Evaluation of risks in the workplace, establishing necessary steps to take to reduce the risk to employers, employees, suppliers and customers. |
| 6 | **Manual Handling Operations Regulations** | The laws which employers and employees must adhere to with any lifting and carrying activities. |

## 8 COSHH

| What employers need to do by law | What paid employees need to do |
|---|---|
| Control substances that are dangerous to health. | Attend all training sessions regarding COSHH. |
| Provide correct storage for those substances and appropriate training for staff. | Follow instructions carefully when using the substances. |
| Some examples of substances that are dangerous to health include cleaning products, gases, powders and dust, fumes, vapours of cleaning products and biological agents. | Know the different types of symbols used to know different types of substances and how they can harm users and others when used incorrectly. |

## 9 HASAWA

| What employers need to do by law | What paid employees need to do |
|---|---|
| Protect the health, wellbeing and safety of employees, customers and others. | Take reasonable care of their own health and safety and the health and safety of others. |
| Review and assess the risks that could cause injuries. | Follow instructions from the employer and inform them of any faulty equipment. |
| Provide training for workers to deal with the risks. | Attend health and safety training sessions. |
| Inform staff of the risks in the workplace. | Not to misuse equipment. |

## 10 PPER

| What employers need to do by law | What paid employees need to do |
|---|---|
| Provide PPE e.g. masks, hats, glasses and protective clothes. | Attend training and wear PPE such as chef's jacket, protective footwear and gloves when using cleaning chemicals. |
| Provide signs to remind employees to wear PPE. | |
| Provide quality PPE and ensure that it is stored correctly. | |

## 11 RIDDOR

| What employers need to do by law | What paid employees need to do |
|---|---|
| Inform the Health and Safety Executive (HSE) of any accidents, dangerous events, injuries or diseases that happen in the workplace. | Report any concerns of health and safety matters to the employer immediately. If nothing is resolved then inform the HSE. |
| Keep a record of any injuries, dangerous events or diseases that happen in the workplace. | Record any injury in the accident report book. |

## 12 Manual Handling Operations Regulations

| What employers need to do by law | What paid employees need to do |
|---|---|
| Provide training for staff. | Ask for help if needed. |
| Assess and review any lifting and carrying activities that cannot be avoided. | Squat with feet either side of the item. Keep back straight as you start to lift. Keep the item close to your body whilst walking. Make sure you can see where you're going. |
| Store heavy equipment on the floor or on low shelves. | |
| Provide lifting and carrying equipment where possible. | |

## 13 Risks to health and security including the level of risk (low, medium, high) in relation to employers, employees, suppliers and customers

Review and assess level of risks in the workplace, e.g. slips, trips, falls, burns etc by completing a risk assessment to avoid from happening.

# Year 10 Hospitality and Catering Autumn Term Knowledge Organiser 2.1.1 The Importance of Nutrition

## Key Vocabulary:

| | | |
|---|---|---|
| 1 | **Amino acid** | The basic component of all proteins. |
| 2 | **High biological value (HBV) protein** | A protein that contains all of the essential amino acids. |
| 3 | **Low biological value (LBV) protein** | A protein that lacks one or more of the essential amino acids. |
| 4 | **Sugary foods** | Foods high in sugar, such as jam, cakes, biscuits and ice cream. |
| 5 | **Starchy foods** | Foods high in starch, such as pasta, rice, potatoes and bread. |
| 6 | **Fat-soluble vitamins** | Vitamins that dissolve in fat; these are vitamins A and D. |
| 7 | **Dietary fibre** | A type of carbohydrate found in the cell walls of vegetables, fruits, pulses and cereal grains. It is also known as non-starch polysaccharide (NSP). |
| 8 | **Immune system** | The processes of the body that protect against disease. |
| 9 | **Fortified cereals** | Cereals with added vitamins and minerals. |
| 10 | **Haemoglobin** | Part of the red blood cell that carries oxygen around the body. |
| 11 | **High blood pressure** | A higher than normal force of blood pushing against the arteries. |
| 12 | **Constipation** | A condition where emptying the bowels is difficult. |

## Nutrition at different life stages

| 13 | **Adults** |
|---|---|
| **Early** | Growth in regard to height of the body continues to develop until 21 years of age. Therefore, all micro-nutrients and macro-nutrients especially carbohydrates, protein, fats, vitamins, calcium and iron are needed for strength, to avoid diseases and to maintain being healthy. |
| **Middle** | The metabolic rate starts to slow down at this stage, and it is very easy to gain weight if the energy intake is unbalanced and there isn't enough physical activity. |
| **Elderly** | The body's systems start to slow down with age and a risk of blood pressure can increase as well as decrease in appetite, vision and long-term memory. Because of this, it is essential to keep the body strong and free from disease by continuing to eat a healthy, balanced diet. |

| 14 | **Children** |
|---|---|
| **Babies** | All nutrients are essential and important in babies, especially protein as growth and development of the body is very quick at this stage. Vitamins and minerals are also important. You should try to limit the amount of salt and free sugars in the diet. |
| **Toddlers** | All nutrients remain very important in the diet at this stage as growth remains. A variety of foods are needed for toddlers to have all the micro-nutrients and macro-nutrients the body needs to develop. |
| **Teenagers** | The body grows at a fast pace at different times at this stage as the body develops from a child to an adult, therefore all nutrients are essential within proportions. Girls start their menstruation which can sometimes lead to anaemia due to not having enough iron in the body. |

## Special dietary needs

The amount of energy the body needs is determined by lifestyles, occupation, age and activity level.

| 15 | **Medical conditions** |
|---|---|
| **Allergens** | Examples of food allergies include milk, eggs, nuts and seafood. |
| **Lactose intolerance** | Unable to digest lactose which is mainly found in milk and dairy products. |
| **Gluten intolerance** | Follows a gluten free diet and eats alternatives to food containing wheat, barley and rye. |
| **Diabetes (type 2)** | High level of glucose in the blood, therefore changes include reducing the amount of fat, salt and sugar in the diet. |
| **Cardiovascular disorder** | Needing a balanced, healthy diet with low levels of salt, sugar and fat. |
| **Iron deficiency** | Needing to eat more dark green leafy vegetables, fortified cereals and dried fruit. |

| 16 | **Dietary requirements** |
|---|---|
| **Religious beliefs** | Different religions have different dietary requirements. |
| **Vegetarian** | Avoids eating meats and fish but does eat dairy products and protein alternatives such as quorn and tofu. |
| **Vegan** | Avoids all animal foods and products but can eat all plant-based foods and protein alternatives such as tofu and tempeh. |
| **Pescatarian** | Follows a vegetarian diet but does eat fish products and seafood. |

# Year 11 Hospitality and Catering Autumn Term Knowledge Organiser 2.1-2.2 Operation of Front and Back of House

## Key Vocabulary:

| | | |
|---|---|---|
| 1 | **Workflow** | A logical layout to ensure customers will be able to enjoy organised, efficient service. It also allows the safe movement of staff and customers. |
| 2 | **Front of house** | Where customers are served |
| 3 | **Back of house** | Areas in the establishment where customers do not go. |
| 4 | **Dress code** | Employees must wear the correct uniform in order to create a good first impression. |
| 5 | **Administration and documents** | The paperwork needed to keep track of everything within the workplace. |

### Dress code

| | | |
|---|---|---|
| 6 | **Back of house** | The traditional chef's uniform is designed to show authority in the kitchen. Known as "chef's whites", they come in many colours. Key uniform items are: a long-sleeved, double-breasted jacket, long trousers, head covering, apron, and non-slip, toe-protected shoes. The clothing and shoes protect the wearer from injury while the head covering protects the food from hair and sweat. |

## Kitchen Workflow

| | | |
|---|---|---|
| 7 | **Delivery area** | Located at the kitchen entrance. Deliveries are checked against the order and temperatures of high-risk foods are recorded |
| 8 | **Storage area** | Cool area: contains fridges and freezers for storing high-risk foods, as well as space for storing fresh fruit and vegetables. Dry area: for storing canned and dry goods. |
| 9 | **Staffing area** | A separate area where employees can change into work clothing. Staff toilets and hand washing facilities are provided. This area may also be used as a breaktime lounge. |
| 10 | **Preparation area** | A large kitchen will have separate areas for the preparation of meat and poultry, fish, fruits and vegetables and pastries and desserts. |
| 11 | **Cooking area** | A large kitchen will have separate cooking areas for hot wet foods such as soups, sauces and steamed vegetables and a dry cooking area for roasting, baking, grilling and frying. |
| 12 | **Serving area** | A large kitchen will have separate areas for plating and presenting hot and cold foods. Waiters will collect orders from "the pass" to deliver to customers in the restaurant. |
| 13 | **Cleaning area** | This area should be separate from the main kitchen. Dirty crockery and cutlery as well as pots and pans from the kitchen are cleaned and stored in this area. |
| 14 | **Waste area** | This area should be separate from the main kitchen. Food waste and recyclable and non-recyclable waste is sorted and then disposed in the correct bins, which should be located outside. |

### Administration and documents

| | |
|---|---|
| 15 | Businesses may employ an administrator who keeps track of: staff employment and training records; stock orders, delivery records and invoices; health and safety documents; financial information; customer feedback and advertising. |

## Restaurant Workflow

| | | |
|---|---|---|
| 16 | **Reception** | Guests are greeted and shown to their seats in the dining area. |
| 17 | **Seating/ dining area** | In a large restaurant, this area is divided into stations. Each station is managed by a waitperson. |
| 18 | **Counter service** | Food is on display for customers to choose and pay at the end. Some restaurants also offer seated counter service. |
| 19 | **Bar** | An area for socialising or eating in a less formal space. |
| 20 | **Equipment station** | Small items such as cutlery and serviettes and food items such as condiments should be available to wait staff. |
| 21 | **Toilets** | Customer toilets should be clean and welcoming. |
| 22 | **Safety equipment** | : First aid boxes and fire extinguishers must be easily accessed. |

## Hotel Workflow

| | | |
|---|---|---|
| 23 | **Reception** | Guests are checked in and receive keys/key cards for their room. |
| 24 | **Lobby/ waiting area** | This area should have comfortable seating for the guests. Drinks may be available in the lobby. |
| 25 | **Stairs/lifts** | These provide access to rooms and other facilities. |
| 26 | **Toilets** | Customer toilets should be clean and welcoming. |

### Dress code

| | | |
|---|---|---|
| 27 | **Front of house** | The front of house dress creates a first impression. In some establishments a uniform may be worn. In other establishments, employees may be required to wear colours such as black and white. In addition: clothing must be clean and ironed; if worn, jewellery, perfume and make-up must be minimal; personal hygiene must be maintained; name badges may be required. |

# Macbeth Knowledge Organiser

| | |
|---|---|
| **Act One** | The play opens with three witches chanting on 'the heath'. In the next scene we hear a battle report in which a soldier Macbeth bravely fought in a battle to defend Scotland. On the return from battle, Macbeth and Banquo meet the three witches. The witches prophesy that Macbeth will be promoted twice: to Thane of Cawdor and King of Scotland. Banquo's descendants will be kings, but Banquo isn't promised any kingdom himself *'lesser than Macbeth and greater'.*. Soon afterwards, King Duncan names Macbeth Thane of Cawdor as a reward for his success in the recent battles. The promotion seems to support the prophecy. The King then proposes to make a visit to Macbeth's castle. Lady Macbeth receives news from her husband about the prophecy and his new title. Lady Macbeth vows to help him become king. |
| **Act Two** | Macbeth returns to his castle, followed almost immediately by King Duncan. Macbeth and Lady Macbeth discuss a plot to kill Duncan, we see lots of conflict in their relationship here as Lady Macbeth begins to manipulate Macbeth. Once they have agreed to kill the king, Lady Macbeth gives the guards drugged wine so Macbeth can enter and kill the King. Macbeth regrets this almost immediately, but his wife reassures him. She leaves the bloody daggers by the dead king just before Macduff arrives. Macduff, the Thane of Fife, discovers the murder 'O horror, horror, horror…'. Macbeth kills the drunken guards in a show of rage and retribution. Duncan's sons, Malcolm and Donalbain, flee, fearing for their own lives. |
| **Act Three** | Macbeth becomes King of Scotland but starts to become consumed with feelings of guilt and doubt. He remembers the prophecy that Banquo's descendants will inherit the throne and grows paranoid about Banquo. He arranges for Banquo and his son Fleance to be killed. Banquo is murdered, but his son escapes the assassins. At his state banquet that night, Macbeth sees the ghost of Banquo, a symbol of his guilt, and worries the courtiers with his mad response. Lady Macbeth dismisses the court and tries to calm her husband but is unsuccessful. |
| **Act Four** | Macbeth returns to find the witches as he begins to feel more uncertain about his future. The witches say that he will be safe until a local wood, Birnam Wood, marches into battle against him. He also need not fear anyone born of woman. They also prophesy that the Scottish succession will still come from Banquo's son. Macbeth embarks on a reign of terror, killing many, including Macduff's family. Macduff had gone to seek Malcolm (one of Duncan's sons who fled) at the court of the English king. Macduff persuades Malcolm to lead an army against Macbeth. |
| **Act Five** | Macbeth is in his remote castle at Dunsinane, where he feels safe, until he is told that Birnam Wood is moving towards him. Malcolm's army carrying branches from the forest as camouflage for their assault on Macbeth. Meanwhile, an overwrought and guilty Lady Macbeth begins to sleepwalk and tells her secrets to her doctor. She commits suicide. The final battle commences. Macbeth begins to realise that he will not win, and in the midst of a losing battle, Macduff challenges Macbeth.<br>Macbeth learns Macduff is the child of a caesarean birth and submits to his enemy. Macduff triumphs and brings the head of the traitor Macbeth to Malcolm. Malcolm declares peace and goes to Scone to be crowned king. |

# Macbeth Knowledge Organiser

| | | |
|---|---|---|
| **Macbeth:** Main protagonist, tragic hero, brave in battle, ambitious, easily manipulated, tyrannical, guilt driven, insecure.<br><br>*Macbeth is the main protagonist who begins the play as a hero in battle but is easily manipulated with the fatal flaw od ambition. He slowly descends into madness and desperation as he becomes obsessed with the witches prophecies of power.* | **Lady Macbeth**: Ambitious, lust for power, manipulative, controlling, emasculating, duplicitous, subvert stereotypes of Jacobean women,<br><br>*Lady Macbeth is Macbeth's wife. She controls Macbeth use her influence over him to drive him into making the decision to kill Duncan. At the end of the play, she cannot escape the consequences of her actions and dies as a result of her guilt.* | **Banquo**: brave, noble, loyal, father, friend to Macbeth at the beginning, later returns to haunt Macbeth as a symbol of guilt.<br><br>*Banquo is a loyal, noble character who is a soldier in the play like Macbeth, At the beginning of the play we see Macbeth and Banquo together, as heroes and equal. After the witches prophecies they both begin to take different paths with Banquo choosing to ignore the witches prophecies. Banquo is murdered by Macbeth and later returns to haunt him at the state banquet.* |
| **Duncan**: Rightful king, beloved, compassionate, mentor, trusting, some argued flawed.<br><br>*Duncan is the rightful king of Scotland. He awards Macbeth the honour of Thane of Cawdor after his heroics in battle. Duncan is murdered by Macbeth.* | **Macduff:** loyal to the rightful king, dubious and hostile towards Macbeth, noble.<br><br>*Macduff becomes suspicious of Macbeth and goes to England to persuade Malcolm to bring an army to fight Macbeth. While away, Macduff's wife and child are killed on Macbeth's orders. Macduff returns with Malcolm and the army to kill Macbeth.* | **The Witches:** Ruthless, Suspicious, untrustworthy, manipulative.<br><br>*The witches prophecies are the catalyst of the events in the play. They directly influence Macbeth with the temptation of a powerful future which sparks his ambition. Macbeth later returns to the witches for further prediction.* |

| Themes: | | |
|---|---|---|
| **Ambition** | **Guilt** | **Power** |
| **The Supernatural** | **Appearance vs Reality** | **Kingship** |

| Context | | |
|---|---|---|
| **Jacobean Era** | **The Divine Right of Kings** | **The Gunpowder Plot** |
| **Attitude to the Supernatural** | **Jacobean Women** | **Religion** |

# Year 11 Enterprise & Marketing AUTUMN Term Knowledge Organiser R065

## Customer Profiles

A Customer Profile is a detailed description of a business's main target customer. They're really specific depictions, so they often include the customer name and picture as well as other key details such as their age, gender, spending habits and lifestyle.

## Market Segmentation

Market segmentation is the process of dividing a market into groups – customers are grouped based on key characteristics such as their **age**, **gender**, **occupation**, **income** or **lifestyle**.

A women's magazine, for example, segments their market based on gender. Businesses segment their market so they can tailor products to suit their target audience and so they can focus their marketing at their target customer.

## Market Research

Anything a business does to find out potential customers' wants and needs is called market research.

**Primary** methods of research generate new data through **surveys**, **focus groups**, **observations** and **interviews**. Data can be expensive to gather, especially if a large amount is needed, but it will be more likely to suit a business's research needs.

**Secondary** sources of market research, such as **competitor research**, **government publications** and **published materials** (**books** and **magazines**) use data that already exists. Data is cheaper to obtain and quicker as it has already been generated. The data might not be fully applicable to the business's research needs though.

## Customer Profile Example

**Name**: Gary Asher
**Age**: 39
**Occupation**: Decorator

Gary lives in Derby with his wife who he married in 2015 and their two children Essie and Abbie.

He works full time and, as he has two young children, lives a busy life. He enjoys eating out with his family and plays football at the weekend with a group of friends. He is trying to save as much money as possible to put towards a new house.

# R065

## Knowledge Organiser

## Key Calculations

**Revenue:**

Selling Price x Number Sold

**Total Costs:**

Fixed Costs + (Variable Cost for 1 x Number Sold)

**Profit or loss:**

Revenue – Total Costs

*It's a loss if the answer is negative*

**Break-even:**

$$\frac{\text{Fixed Costs}}{\text{Selling Price – Variable Cost per Unit}}$$

*The answer is given in units, not pounds*

## Pricing

When businesses set a price for a product or service, they consider many factors including being able to cover their costs in order to make a **profit**.

**Pricing strategies** are specific approaches businesses can use when setting their prices and include:

**Competitive Pricing** – where businesses base their prices on those of their rivals.

**Psychological Pricing** – where businesses avoid round/whole numbers for their prices.

**Price Skimming** – where businesses set a high price for a new product and lower this price over time.

**Price Penetration** – where businesses set a low initial price, later increasing this price.

## Risk and Viability

Setting up a new business or launching a new product can be **risky** for a business. Market research helps reduce this risk.

**Viability** refers to how successful a product might be – often based on finances – is the break-even point realistic, for example.

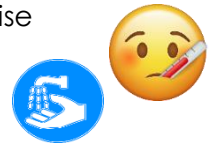
# HSC – Component 3: Health and Wellbeing Autumn Term Knowledge Organiser

## Learning Aim 3A - Factors that affect health & wellbeing

**5 factors that have positive or negative effects on Health and Wellbeing, not just promote the absence of disease or …**

### 1.The Physical and lifestyle factors

a) Genetic inheritance,
b) Diet (balance, quality)
c) Personal hygiene
d) Substance use - alcohol, nicotine, illegal drugs misuse of prescribed drugs
e) Ill health (acute and chronic)
f) Amount of exercise



### 2. The Social, emotional and cultural factors

S - Social interactions – supportive / unsupportive relationship,
E - Stress - work-related, home life – Mental Heath issues
C - Willingness to seek help or access services - influenced by culture, gender, education – Religious groups and community

### 3. Economic factors

***Financial*** – lots or little?
***Income*** – Wages from you job
***Financial support*** – family help / government help

### 4. Environmental factors

**levels of pollution** – lots of cars
**Noise pollution** – near loud places
**Type of Housing** – flats, council, cottage
Condition of house
**House location -** city, near a park or factory

### 5. The impact of life events relating to relationship changes and changes in life circumstances

**How people deal with**
bereavement, marriage, divorce, retirement, redundancy

## Learning Aim 3B - Interpreting health indicators (Data)

### B1 - Physiological indicators

1.Physiological indicators to ***measure health***:
a. Pulse (resting and recovery rate after exercise)
b. Blood
c. Peak flow
d. Body mass index (BMI)

**2. How to interpret data** relating to physiological indicators

**3. How to Identify potential** significance of abnormal readings: risks to physical health

### B2 Lifestyle indicators - what can be affected and what issue/topics can you collect data on

A) Smoking B)Alcohol consumption
B) Inactive lifestyles

## Learning Aim 3C - C1 Health and wellbeing improvement plans

**C1. Person-centred approach considering an individual's needs, wishes and circumstances**

a. What do they want to improve
b. What do they need and how can you help them

**2. Recommending Information to be included in plan:**
a. Actions to improve health and wellbeing
b. Setting short term (less than 6 months) and long term targets
c. Providing appropriate sources of support (Formal and/ or informal)

**C2 Identifying obstacles to implementing plans**
a. Emotional/ psychological – lack of motivation, low self-esteem, acceptance
b. Time constraints – work and family commitments
c. Availability of resources – financial, physical, e.g. equipment
d. Unachievable targets – unachievable for the individual or unrealistic time scale
e. Lack of support - from family and friends
f. Other factors specific to individual – ability/ disability, addiction
g. Barriers to accessing identified services

# Year 10 Music Autumn Term Knowledge Organiser

## Key Vocabulary:

| | | |
|---|---|---|
| 1 | Repetition | Repeating chord patterns/melody lines |
| 2 | Sequence | A melody that moves up and down in pitch but the pattern of the notes stays the same – for example, CDEFG – DEF#GA |
| 3 | Decoration | A melody that is played in higher pitch over the top of the original melody with faster rhythmic notes |
| 4 | Variation | Where you take an original melody and repeat it but each time you change the rhythm, key, speed, instrument etc. |
| 5 | Modulation | Changing key during the second section of your piece – major to minor, C major to G major etc |
| 6 | Use of contrast | Changing the overall musical effects by using speed, dynamics, pitch etc |
| 7 | Processes | Use of canon – one instrument starts – another joins in with the same melody and they play following each other |
| 8 | Instrumentation | Choice of instruments and the way they are played to create effects and change the timbre of the music |
| 9 | Texture | The layers of the sound – homophonic – 1 layer of music or all instruments playing the same thing, polyphonic – los of layers of music, contrapuntal |
| 10 | Chords | Use of broken chords, triads, arpeggios, major, minor, diminished chords |

## Music Theory

### 11 Composing

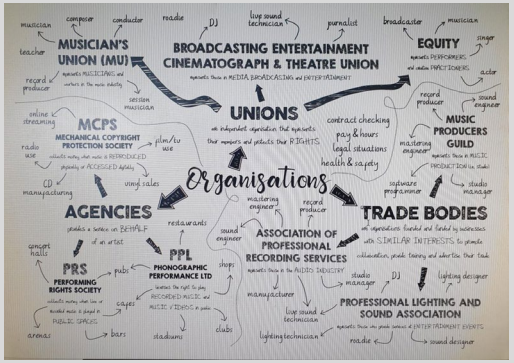
**Use different starting points, for example:**

- **melodic ideas and fragments**
- **rhythmic patterns**
- **chords and chord progressions**
- **harmonic systems**
- **textures**
- **riffs and hooks**
- **sound palettes**
- **improvisation and experimentation**
- **non-musical starting points such as themes , texts and images**

### 12 Reviewing your composition – every lesson

**1. What ideas have you composed?**
**2. What techniques did you use to develop your composition?**
**3. What sections of music have you added to your composition?**
**4. What do you need to improve next time?**
**5. Are there any techniques you need to add to develop your compositions further?**

### 13 Unions and how they work in the music industry

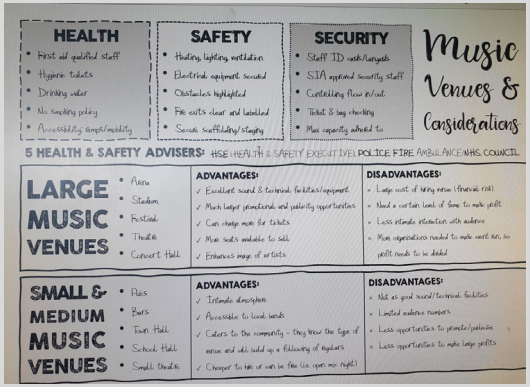



## Music Theory

### 14 Record labels – unit 1


What are record labels – who do they work with? Why?

### 15 Venues – unit 1




Music venues – what is their role in the music industry?

# AQA GCSE Biology (Combined Science) Unit 5: Homeostasis and Response Knowledge Organiser

## Homeostasis

**Homeostasis** is the regulation of a **constant internal environment**. The conditions are maintained to ensure optimum conditions for metabolism and changes in response to both internal and external fluctuations.

In humans, homeostasis regulates the **blood glucose** (sugar) levels, the body **temperature**, $CO_2$ levels and **water** levels.

The levels are monitored and regulated by automatic control systems which can be either nervous responses (coordinated by the **nervous system**) or chemical responses (coordinated by the **endocrine system**). Information about the environment is called a **stimulus** and is detected by a **receptor**. The information is processed by a **central coordination** system and a response is initiated by an **effector**.

## Synapses

A **synapse** is the gap where the ends of two neurons meet.

The information needs to be passed from one neuron to the next, but cannot be passed as an electrical impulse over the synapse (gap). Instead, the message is transmitted by chemical neurotransmitters.

When the electrical impulse arrives at the terminal of the first neuron, it causes a release of neurotransmitter chemicals into the synapse. They travel across the gap and bind to receptor sites on the terminal of the next neuron.

The receptor sites are specific for each type of neurotransmitter. A nerve impulse will only be created in the second neuron when a complimentary chemical binds.

## The Nervous Pathway

A stimulus is a change in the environment (internally or externally). In a typical response to stimuli, this information is received by the receptor and sent as an electrical impulse along a sensory neuron towards the central nervous system (CNS). The CNS is comprised of the brain and spinal cord. Here, the impulse is passed through relay neurons and a response to the stimulus is coordinated. This could be consciously or subconsciously. The CNS sends information about the response along a motor neuron as an electrical impulse. The effector receives the impulse and carries out the response.

**[stimulus] → receptor → sensory neuron → CNS → motor neuron → effector → [response]**

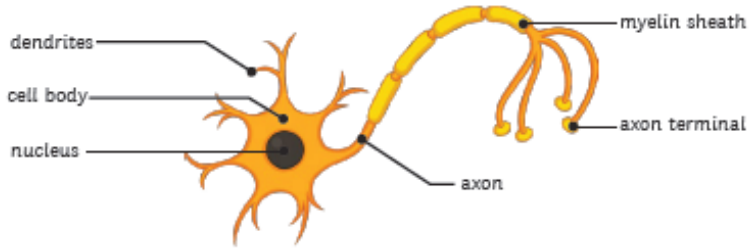
Examples of receptors include rod and cone cells within the eye which respond to light and allow us to see. Or it could be the cells in the skin which respond to pressure or temperature changes allowing us to feel.

An effector could be a muscle or a gland. In response, a muscle might contract to make a movement or a gland releases a chemical into the body.

## The Human Nervous System

The nervous system allows a fast, short-lived response to a stimulus in the surroundings. The information is received by a receptor, passed along the neurons (nerve cells) as an electrical impulse and results in a response.

You might have to label the parts of a typical neuron:




- The axon is the main part of the nerve cell. It is a long, stretched-out fibre of cytoplasm which the electrical impulse will travel along.
- Some axons are surrounded in a layer of fatty cells called the myelin sheath and it helps to insulate the electrical impulse.
- The branched endings, dendrites, connect the neurons together to create a network.

| sensory neuron | relay neuron | motor neuron |
|---|---|---|
|  |  |  |

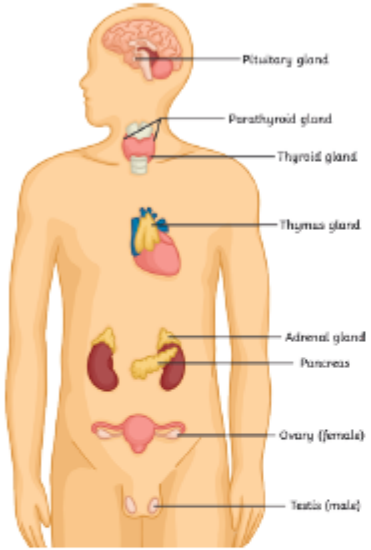
Rayner Stephens High School

Stamford Park Trust

# AQA GCSE Biology (Combined Science) Unit 5: Homeostasis and Response Knowledge Organiser

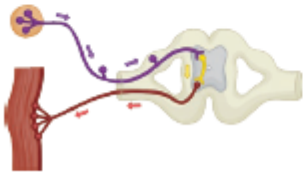
## The Endocrine System

You should be able to identify the major glands of the endocrine system, as shown below.




## Reflexes

A **reflex** is a fast and automatic response to a particular stimulus which may be harmful to the organism. They are quick because there is no conscious thought or process to deliver the response (they are an **involuntary** action). The pathway which carries the information about a reflex action is called a **reflex arc**.



A **reflex arc** begins with the **stimulus** e.g. a bee sting or a hot object on the skin. The stimulus is detected by the **receptor** cells and an electrical **impulse** is transmitted along the **sensory neuron**. The impulse is passed through **relay neurons** in the spinal cord or the **unconscious** areas of the brain. The response is coordinated **automatically** and sent along the **motor** neuron to the **effector** cells.

## Hormones

**Hormones** are **chemical** messengers transported in the **bloodstream** to an effector where they can activate a response. They are produced and released from glands around the body which all make up the **endocrine system**. Hormones do a similar job to the neurons of the nervous system but there are some differences.

| | neurons | hormones |
|---|---|---|
| speed | fast | slow |
| duration | short | long |
| target area | specific | general |

The hormones released travel in the blood plasma to their **target cells** and affect only those certain cells. Hormones act on organs or cells where constant adjustments are made to maintain a stable state.

Some examples you should know:

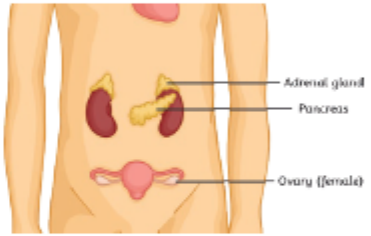
The **pituitary gland** produces a range of hormones including FSH and LH which help to regulate the menstrual cycle. The pituitary gland acts as a **master gland** because many of the hormones it releases control and coordinate the release of other hormones from other glands in the body.

## Diabetes

There are two types of diabetes: type 1 and type 2.

Type 1 diabetes is a disorder affecting the pancreas. In type 1 diabetes, the pancreas does not produce enough insulin to control the blood sugar level and so the levels become higher than normal. Type 1 diabetes is usually treated by injections of insulin.

Type 2 diabetes is a disorder of effector cells which no longer respond to the hormones released from the pancreas. Type 2 diabetes can usually be managed through lifestyle choices such as maintaining a carbohydrate-controlled diet and regular exercise.




The risk of developing type 2 diabetes is higher in people who are obese (have a BMI >30).

## Hormones in Human Reproduction

**Oestrogen** is the main reproductive hormone in females. It is produced in the **ovaries**. During puberty, this hormone increases and it stimulates an egg to be released from an ovary each month. This process is called **ovulation** and happens, on average, every 28 days.

**Testosterone** is the main reproductive hormone in males. It is produced in the **testes**. This hormone stimulates the production of sperm.

Rayner Stephens High School

STAMFORD PARK TRUST

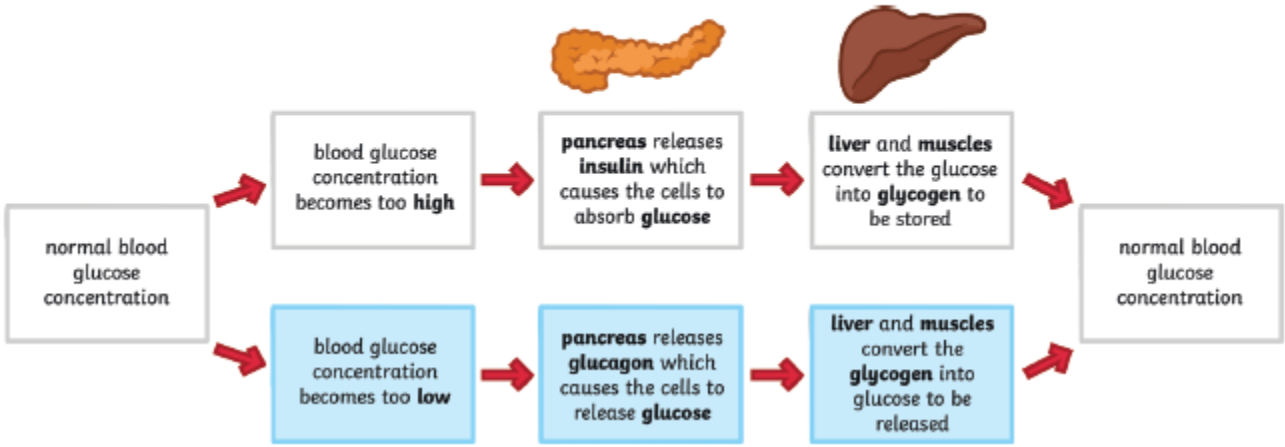
# AQA GCSE Biology (Combined Science) Unit 5: Homeostasis and Response Knowledge Organiser

## Control of Blood Glucose

The pancreas is the organ and gland which monitors and regulates the blood glucose concentration.

**(HT only)**

If the blood glucose concentration becomes too low, a negative feedback loop is triggered and the pancreas releases another hormone, **glucagon**, which acts on the liver and muscles to cause the stored **glycogen** to be converted back into **glucose** and released into the bloodstream.

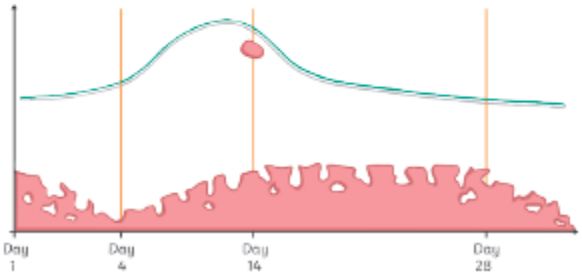



## The Menstrual Cycle

The **menstrual cycle** occurs in females, approximately every **28 days**. It is a cyclical process of the building of the lining of the **uterus** and **ovulation**. If the **egg** become fertilised by a sperm, then **pregnancy** follows. If the egg is not fertilised, then the lining of the uterus is shed away and leaves the body as the **menstruation** (or period).

The whole cycle is controlled by four main reproductive hormones:

- **follicle stimulating hormone (FSH)**
- **oestrogen**
- **luteinising hormone (LH)**
- **progesterone**




| Hormone | Where It Is Produced | Response Caused | Interaction with Other Hormones (HT only) |
|---|---|---|---|
| FSH | pituitary gland | An egg to develop in one of the ovaries. | Stimulates the production of oestrogen. |
| oestrogen | ovaries | The lining of the uterus builds up and thickens. | Stimulates the production of LH. Inhibits the production of FSH. |
| LH | pituitary gland | Ovulation (at around day 14 of the cycle). | Indirectly stimulates the production of progesterone. |
| progesterone | ovaries | The uterus lining to maintain. | Inhibits the production of LH. |

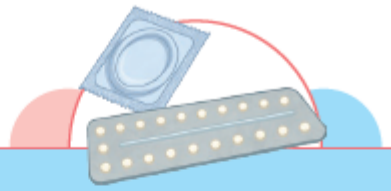
Rayner Stephens High School

Stamford Park Trust

# AQA GCSE Biology (Combined Science) Unit 5: Homeostasis and Response Knowledge Organiser

## Contraception

There are many different types of **contraceptive** (or birth control) methods. They are categorised as **hormonal** methods and **non-hormonal** methods.



| Method | Hormonal or Non-Hormonal | How It Works | Pros and Cons |
|---|---|---|---|
| **oral contraceptives ('the pill')** | hormonal | Pill taken which contains hormones to **inhibit FSH** so that an egg does not mature. | Easily self-administered. Short-term effects. Can easily be reversed. Very reliable.<br>May have mild side-effects associated. Could lead to pregnancy if missed. Does not protect from STIs. |
| **injection, implant or skin patch** | hormonal | Contains **progesterone** which is slowly released to inhibit the release of eggs for months or even years. | Administered through routine appointment at GP surgery. Requires little to no aftercare or maintenance. Very reliable.<br>May take some time for effects to be reversed once removed. Does not protect from STIs. |
| **condoms or diaphragm (female condom)** | non-hormonal | Creates a **physical barrier** to prevent the sperm from reaching the egg. | Easy to use. Short-term effects. Very reliable. Provides protection from most STIs.<br>Can fail. |
| **intrauterine devices (coil)** | hormonal | The device is attached to the lining of the uterus and **releases hormones or prevents the implantation** of an embryo. | Requires little to no aftercare or maintenance. Very reliable.<br>May take some time for effects to be reversed once removed. Does not protect from STIs. |
| **spermicidal agents** | non-hormonal | Contains chemicals to **kill** or **immobilise sperm** cells. | Easy to use. Short-term effects.<br>Does not protect from STIs. Less effective when used as the only method. |
| **abstaining from intercourse** (around the time of ovulation) | non-hormonal | Avoiding sexual intercourse when there is a likelihood of an egg being present in the oviduct. | inexpensive<br>Not always reliable. |
| **surgery** | non-hormonal | A surgical procedure carried out in men or women. In males, the vas deferens tubes are sealed or blocked to prevent the passage of sperm from the testes. In females, the fallopian tubes (oviducts) are sealed or blocked to prevent the passage of the egg from the ovaries. | Risks associated with surgery (such as infection).<br>Difficult to reverse (if at all possible). Can take several months to be reliable. |

# AQA GCSE Biology (Combined Science) Unit 5: Homeostasis and Response Knowledge Organiser

## Infertility (HT Only)

Depending on the reason for the **infertility**, there are different methods of treatment and technologies to help women become pregnant.

The hormones **FSH** and **LH** can be given in a '**fertility drug**' to help stimulate the normal cyclic processes and enable the woman to become **pregnant** naturally.

**In Vitro Fertilisation (IVF)** is a treatment which involves several stages:

- The woman is given FSH and LH to **stimulate the ovaries** to mature and release several eggs.
- The **eggs** are then collected from the woman and **fertilised** using **sperm** collected from the man. This is done in the lab (in vitro means "outside the living organism").
- The fertilised eggs develop into **embryos**.
- At the early stage of development (blastocyst), one or two embryos are inserted into the woman's **uterus** for **implantation**.
- If successful, the **pregnancy** progresses as normal.

Fertility treatments offer couples the chance to have their own baby. However, the processes are often very stressful and emotional. The success rates are low. The underlying causes of the infertility are not usually being treated. Fertility treatments can carry a higher chance of multiple births (twins, triplets or more), which carries a risk to both the mother and the unborn babies.

## Adrenaline and Thyroxine (HT Only)

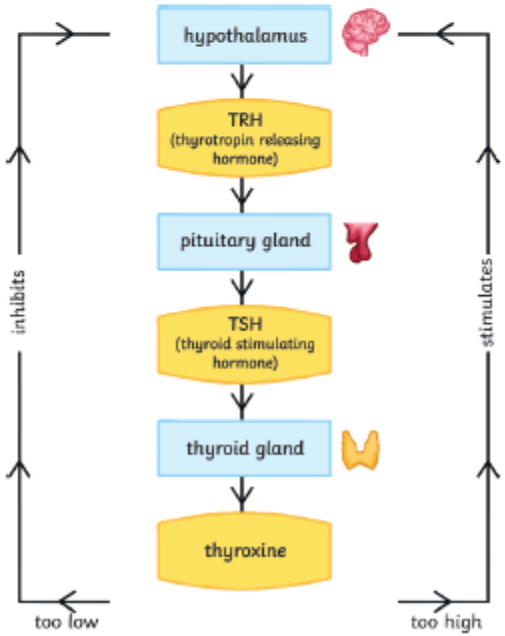
**Adrenaline** is a hormone produced by the **adrenal glands**. It is released in response to stress or fear. The hormone acts on major organs including the heart and lungs. The effect is to increase the heart rate and breathing rate and cause vasodilation (widening of the blood vessels), in order to supply the brain and muscles with more oxygen and glucose.

This prepares the body for a 'flight or fight' response to the fear or stress.

**Thyroxine** is a hormone produced by the **thyroid gland**. It stimulates the rate of **metabolism** in the body by controlling how quickly food products and oxygen are reacted, therefore controlling how quickly **energy** is released.

**Negative Feedback of Thyroxine**

A **negative feedback** system regulates the level of thyroxine in the body.




Rayner Stephens High School

Stamford Park Trust

# AQA GCSE Biology (Combined Science) Unit 5: Homeostasis and Response Knowledge Organiser

## Required practical activity 7: plan and carry out an investigation into the effect of a factor on human reaction time.

The aim of the investigation is to **investigate out whether reaction times can be reduced with practice.**

**Method:**

In this experiment you are working with a partner and you are always using the opposite hand to your writing hand.

1. One of the pair sits upright on a chair and places their forearm on the table so that their hand is hanging over the edge of the table.
2. The other partner places a ruler vertically between the person sitting down's thumb and first finger. The thumb and first finger should be as far apart as possible.
3. Ensure the 0cm end of the ruler is pointing downwards.
4. Place the 0cm mark level with the top of the thumb and drop without telling your partner you are going to do it. Do tell them that the aim is for them to catch the ruler as quickly as possible.
5. Reading from the top of the thumb, record how many centimetres it took to catch.
6. Repeat nine more times.
7. Swap roles with your partner.
8. Using the reaction time conversion tables, convert your results from centimetres to reaction times (s).

The **independent variable** is the method for improvement e.g. amount of practice, use of caffeine

The **dependent variable** is the reaction time in seconds (converted from the cm taken to catch the ruler).

# AQA GCSE Chemistry (Combined Science) Unit 7: Organic Chemistry Knowledge Organiser

## Crude Oil

**Hydrocarbons** are compounds that are made up of the elements **hydrogen** and **carbon** only.

Crude oil is a **non-renewable resource, a fossil fuel**. Crude oil is made up of a mixture of compounds, most of which are long- and short-chain hydrocarbons.

Most of the compounds in crude oil are hydrocarbons called **alkanes**. The alkanes form a **homologous series**. This is a family of hydrocarbons that all share the **same general formula** and have **chemical properties** that are **similar**.

Alkanes are held together by **single bonds**.

The general formula for an alkane is $C_nH_{2n+2}$.

They differ from the neighbouring alkane with the addition of a $CH_2$.

Alkanes are **saturated hydrocarbons**. This means that all their bonds are taken up and they cannot bond to any more atoms.

Alkanes have **similar chemical properties** but have **different physical properties** due to differences in chain length. The longer the chain, the higher the boiling point of the hydrocarbon.

The first four alkanes are: methane, ethane, propane and butane.

A mnemonic to help you remember the order of the alkanes: **m**ice **e**at **p**aper **b**ags.

## Fractional Distillation

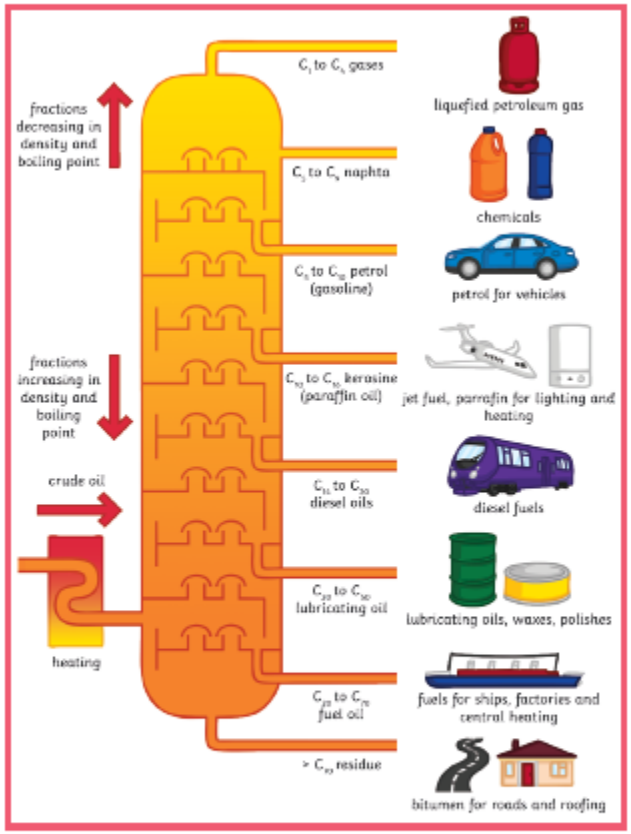
Fractional distillation is used to **separate** a mixture of long-chain hydrocarbons in crude oil into smaller, more useful fractions.

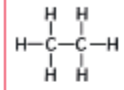
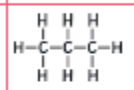
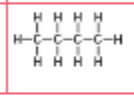
Hydrocarbons have different boiling points depending on their chain length. **Each fraction contains hydrocarbons of a similar chain length.** These fractions will boil at different temperatures due to the difference in sizes of the molecules. The different parts of crude oil are called fractions because they are a small part of the original mixture.

**Crude oil** is heated and enters at all column called a **fractioning column**. The column is **hot at the bottom** and decreases in temperature toward the top. As the crude oil is heated, it begins to evaporate and its vapours begin to rise up through the column. These vapours condense at the different fractions.

**Short-chain hydrocarbons** are found at the **top** of the column. This is because shorter chain molecules are held together by **weak intermolecular forces** resulting in low boiling points. These shorter chain hydrocarbons leave the column as **gas**.

**Long-chain hydrocarbons** are found at the bottom of the column and are held together by **strong intermolecular forces**, resulting in high boiling points.




| Name of Alkane | Structural Formula | Molecular Formula |
|---|---|---|
| methane |  | $CH_4$ |
| ethane |  | $C_2H_6$ |
| propane |  | $C_3H_8$ |
| butane |  | $C_4H_{10}$ |

## Combustion

**Complete combustion** occurs when there is **enough oxygen** for a fuel to burn. A hydrocarbon will react with oxygen to produce carbon dioxide and water.

**Incomplete combustion** occurs when there **isn't enough oxygen** for a fuel to burn. The products in this reaction are water and poisonous **carbon monoxide**.

Rayner Stephens High School

Stamford Park Trust

# AQA GCSE Chemistry (Combined Science) Unit 7: Organic Chemistry Knowledge Organiser

## Cracking

Cracking is an example of a **thermal decomposition reaction**. **Long-chain** hydrocarbons can be **broken** down into **shorter**, more useful hydrocarbon chains.

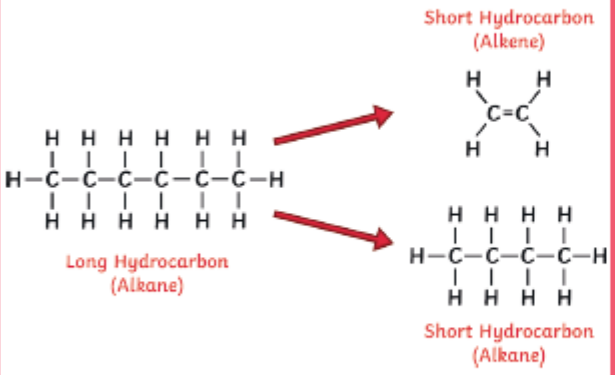
Cracking can be carried out with a catalyst in **catalytic cracking** or with steam in **steam cracking**.

Catalytic cracking involves heating a hydrocarbon to a high temperature (550°C) and passing over a hot catalyst.

**Cracking** of a long-chain hydrocarbon **produces** a **short-chain alkane** and an **alkene**.

Alkenes are another type of hydrocarbon that is double bonded. The general formula for an alkene is $C_nH_{2n}$.

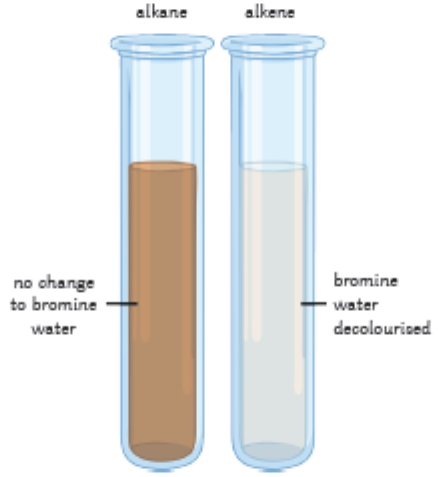
Alkenes are **unsaturated hydrocarbons**. In a chemical reaction, the double bond of the alkenes can break. This allows other atoms to bond to it.




## Test for Alkanes

Bromine, when added to an **alkane**, will **remain brown/orange**. Alkanes are saturated hydrocarbons, they have no double bonds which could be broken to accept the bromine molecule and so remain orange.

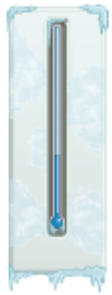
Bromine, when added to an **alkene**, will **change from brown/orange to colourless**. This is because alkenes are unsaturated hydrocarbons. The double bond breaks and the bromine molecule is accepted.




## Making Polymers

The fractional distillation of crude oil and cracking produces an array of hydrocarbons that are key to our everyday lives.

Alkenes are used to produce plastics such as poly(ethene) which is used to make plastic bags, drinks bottles and dustbins. Poly(propene), another polymer, forms very strong, tough plastic.

| Short-Chain Molecules | Increasing Chain Length → | Long-Chain Molecules |
|---|---|---|
|  | As chain length increases, the **boiling point** of the hydrocarbon chains also increases. → |  |
| thin  | **Viscosity** describes how easily a substance can flow e.g. treacle is very viscous; it is thick. → | thick  |
|  | **Flammability** is a measure of how easily a substance burns. → |  |

Rayner Stephens High School

STAMFORD PARK TRUST

# AQA Combined Science: **Physics Topic 5 Forces**

## Scalar and Vector Quantities

A **scalar** quantity has **magnitude** only. Examples include temperature or mass.

A **vector** quantity has both **magnitude** and **direction**. Examples include velocity.

**Speed** is the scalar magnitude of **velocity**.

A vector quantity can be shown using an arrow. The size of the arrow is relative to the magnitude of the quantity and the direction shows the associated direction.

## Contact and Non-Contact Forces

Forces either **push** or **pull** on an object. This is as a result of its interaction with another object.

Forces are categorised into two groups:

**Contact forces** – the objects are touching e.g. friction, air resistance, tension and contact force.

**Non-contact forces** – the objects are not touching e.g. gravitational, electrostatic and magnetic forces.

Forces are calculated by the equation: **force (N) = mass (kg) × acceleration (m/s$^2$)**

Forces are another example of a vector quantity and so they can also be represented by an arrow.


## Gravity

Gravity is the natural phenomenon by which any object with mass or energy is drawn together.

- The mass of an object is a scalar measure of how much matter the object is made up of. Mass is measured in **kilograms (kg)**.
- The weight of an object is a vector measure of how gravity is acting on the mass. Weight is measured in **newtons (N)**.

**weight (N) = mass (kg) × gravitational field strength (N/kg)**

(The gravitational field strength will be given for any calculations. On earth, it is approximately 9.8N/kg).

An object's **centre of mass** is the point at which the weight of the object is considered to be acting. It does not necessarily occur at the centre of the object.

The mass of an object and its **weight** are **directly proportional**. As the mass is increased, so is the weight. Weight is measured using a **spring-balance** (or **newton metre**) and is measured in **newtons (N)**.

## Resultant Forces

A **resultant force** is a single force which replaces several other forces. It has the same effect acting on the object as the combination of the other forces it has replaced.

The forces acting on this object are represented in a **free body diagram**.
The arrows are relative to the magnitude and direction of the force.

The car is being pushed to the left by a force of 30N. It is also being pushed to the right by a force of 50N.


The **resultant force** is 50N – 30N = 20N

The 20N resultant force is pushing to the right, **so the car will move right.**

When a resultant force is not zero, an object will **change speed** (**accelerate** or **decelerate**) or **change direction** (or both).

When an object is stationary, there are still forces acting upon it.

In this case, the **resultant force** is 30N – 30N = 0N.

The forces are in **equilibrium** and are **balanced**.

When forces are balanced, an object will either **remain stationary** or if it is moving, it will continue to move at a constant speed.

When resultant forces act along the same line, you calculate the resultant force as shown below.


Rayner Stephens High School

STAMFORD PARK TRUST

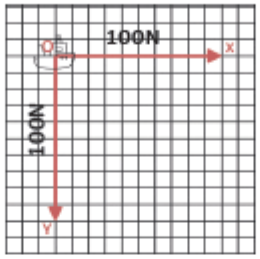
# AQA GCSE Physics (Separate Science) Unit 5: Forces

## Resultant Forces

A **vector diagram** can be used to determine the resultant of two forces that are not acting in a straight line.

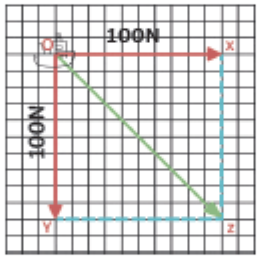
### Worked example 1:

A boat is being pulled toward the harbour by two winch motors. Each motor is pulling with a force of 100N and they are working at right angles to each other. These forces are represented by lines OX and OY.




Construction lines can be added to the diagram to form rectangle OXZY. The line OZ is the diagonal of this rectangle.

OZ is the resultant force. It is the hypotenuse of the right-angle triangles OYZ and OXZ.




We can use the Pythagoras' theorem to calculate its length.

$$a^2 + b^2 = c^2$$

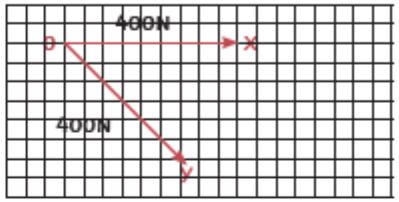
$100^2 + 100^2 = OZ^2$
$100^2 + 100^2 = 20\,000$
$\sqrt{20\,000} = 141.42$

The resultant force is 141.42N.

Alternatively, you can measure line OX and work out how many newtons are represented by each cm. Then measure the length of OZ and use your scale to calculate how many newtons the length represents.

### Worked example 2:

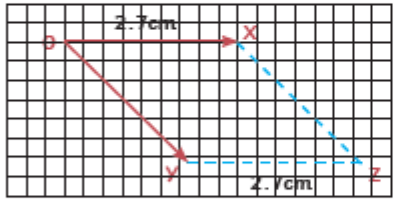
A horse drawn carriage is pulled by two horses with a force of 400N each. The horses are pulling in different directions and are not acting at an angle of 90°. OX and OY represent the force from each horse respectively, they represent the same magnitude of force so they will be the same length.




To calculate the resultant force in this situation we must use a **parallelogram of forces.**

First, measure the length of OX. In this example it is 2.7cm.

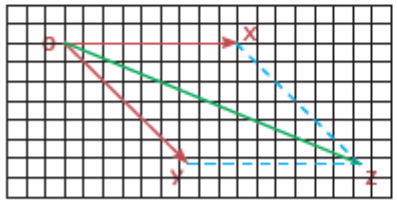
Draw a line 2.7cm long from Y, parallel to OX. Connect the end of this line to X to form a parallelogram.




The line OZ is the diagonal of this parallelogram. OZ is the resultant force.

The length of OX is 2.7cm and the force is 400N.

We can work out how many newtons are represented by each cm by doing the calculation:
400 ÷ 2.7 = 148.15
1cm = 148.15N




Measure OZ. In this example it is 5cm.
5 × 148.15 = 740.74
The resultant force is 740.74N.

## Work Done and Energy Transfer

When an object is moved by a force, the force transfers energy to the object. The amount of energy transferred to the object is the work done.

The work done on an object depends on the size of the force and the distance moved. It can be calculated using the equation:

**work done = force × distance**
**W = F s**

One joule of work is done when a force of one newton causes a displacement of one metre.

1 joule = 1 newton metre

### Worked example

A man's car has broken down and he is pushing it to the side of the road. He pushes the car with a force of 160N and the car is moved a total of 8m.

Calculate the work done.

work done = force × distance
= 160 × 8
= 1280J

Not all of the energy transferred when work is done on an object is useful. For example, work done against the frictional forces of an object causes a rise in temperature of the object.

Rayner Stephens High School
STAMFORD PARK TRUST

## Required Practical Investigation Activity 6: Investigate the Relationship Between Force and Extension for a Spring

$F = k \times e$

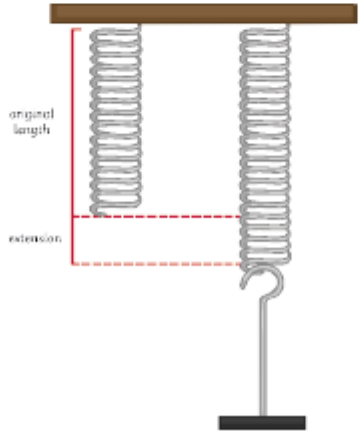
force applied (N) = spring constant (N/m) × extension (m)

You should be familiar with the equation above and the required practical shown to the right.

The spring constant is a value which describes the elasticity of a material. It is specific to each material. You can carry out a practical investigation and use your results to find the spring constant of a material.

1. Set up the equipment as shown.
2. Measure the original length of the elastic object, e.g. a spring, and record this.
3. Attach a mass hanger (remember the hanger itself has a weight). Record the new length of the spring.
4. Continue to add masses to the hanger in regular intervals and record the length each time.

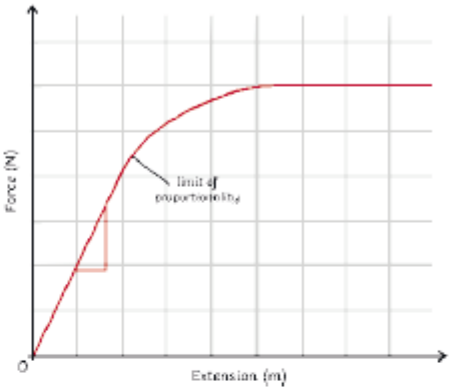
Once you have your results, you can find the extension for each mass using this formula: **spring length – original length**




The data collected is continuous so you would plot a **line graph** using the x-axis for extension (m) and the y-axis for force (N). As a result of Hooke's Law, you should have a **linear graph**. The **gradient of the graph is equal to the spring constant**. You can calculate it by rearranging the formula above or by calculating the gradient from your graph.

## Spring Constant and Hooke's Law

**Hooke's Law** describes that the extension of an elastic object is **proportional** to the force applied to the object. However, there is a maximum applied force for which the extension will still increase proportionally. If the **limit of proportionality** is exceeded, then the object becomes **permanently deformed** and can no longer return to its original shape. This can be identified on a graph of extension against force when the gradient stops being linear (a straight line) and begins to **plateau**. The limit is shown on the graph above and this is the specific object's **elastic limit**.




## Forces and Elasticity

When work is done on an elastic object, such as a spring, the energy is stored as elastic potential energy.

When the force is applied, the object changes shape and stretches. The energy is stored as elastic potential and when the force is no longer applied, the object returns to its original shape. The stored elastic potential energy is transferred as kinetic energy and the object recoils and goes back to its original shape.

Rayner Stephens High School

STAMFORD PARK TRUST

## Work Done: Elastic Objects

Work is done on elastic objects to stretch or compress them.

To calculate the work done (elastic potential energy transferred), use this equation:

$E\ (J) = 0.5 \times k \times e^2$

(elastic potential energy = 0.5 × spring constant × extension$^2$)

You might need to use this equation also: $F = k \times e$

### Worked example:

A bungee jumper jumps from a bridge with a weight of 800N. The elastic cord is stretched by 25m. Calculate the work done.

Step 1: find the spring constant using $F = k \times e$

Rearrange to $k = F \div e$

$800 \div 25 = 32N/m$

Step 2: use the value for k to find the elastic potential energy (work done) using $E\ (J) = 0.5 \times k \times e^2$

$0.5 \times 32 \times 25^2$

$E = 10\ 000J$

## Velocity

Velocity is a vector quantity. It is the speed of an object in a given direction.

**Circular Motion (Higher tier only)**

Objects moving in a circular path don't go off in a straight line because of a centripetal force caused by another force acting on the object.

For example, a car driving around a corner has a centripetal force caused by friction acting between the surface of the road and the tyres. When the Earth orbits around the Sun, it is held in orbit by gravity which causes the centripetal force.

When an object is moving in a circular motion, its speed is constant. Its direction changes constantly and because direction is related to velocity, this means that the velocity of the object is constantly changing too. The changes in velocity mean that the object is accelerating, even though it travels at a constant speed.

The acceleration occurs because there is a resultant force acting on the object. In this case, the resultant force is the velocity, which is greater than the centripetal force acting.

## Forces and Motion: Distance vs Displacement

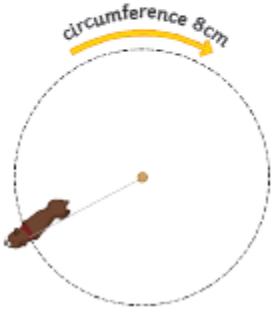
Distance is a scalar quantity. It measures how far something has moved and does not have any associated direction.

Displacement is a vector quantity. It measures how far something has moved and is measured in relation to the direction of a straight line between the starting and end points.

E.g. A dog is tethered to a post. It runs 360° around the post three times. Each 360° lap is 8m

distance = 8 × 3 = 24m

displacement = 0m (The dog is in the same position as when it started.)



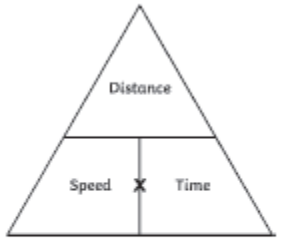

## Speed

You should be able to recall the typical speed of different transportation methods.

| Activity | Typical Value |
|---|---|
| walking | 1.5m/s |
| running | 3m/s |
| cycling | 6m/s |
| driving a car | 25mph (40km/h) |
| train travel | 60mph (95km/h) |
| aeroplane travel | 550mph (885km/h) |
| *speed of sound* | *330m/s* |

These values are average only. The speed of a moving object is rarely constant and always fluctuating.

speed = distance ÷ time




You should be able to use this equation and rearrange it to find the distance or time.

### Worked example:

John runs 5km. It takes him 25 minutes. Find his average speed in metres per second.

Step 1: convert the units

km ⟶ m (×1000) = 5000m

min ⟶ s (×60) = 1500s

Step 2: calculate s = d ÷ t

$s = 5000 \div 1500$

$s = 3.33m/s$

### Worked example 2:

Zi Xin has driven along the motorway. Her average speed is 65mph. She has travelled 15 miles. How long has her journey taken? Give your answer in minutes.

Step 1: calculate t = d ÷ s

$t = 15 \div 65$

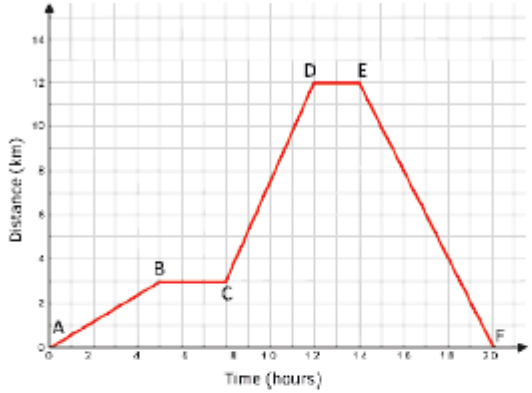
$t = 0.23$ (hours)

Step 2: convert units

hr ⟶ min (×60) = 13.8 minutes

## Distance-Time and Velocity-Time Graphs

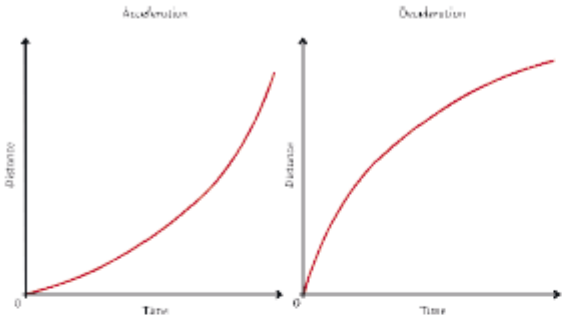
When an object travels in a straight line, we can show the distance which has been covered in a distance-time graph.




You should be able to understand what the features of the two types of graph can tell you about the motion of an object.

| Graph Feature | Distance-Time Graph | Velocity-Time Graph |
|---|---|---|
| x-axis | time | time |
| y-axis | distance | velocity |
| gradient | speed | acceleration (or deceleration) |
| plateau | stationary (stopped) | constant speed |
| uphill straight line | steady speed moving away from start point | acceleration |
| downhill straight line | steady speed returning to the start point | deceleration |
| uphill curve | acceleration | increasing acceleration |
| downhill curve | deceleration | increasing deceleration |
| area below graph | | distance travelled |

## Changing Speed on a D-T graph




When the graph is a straight line, it is representing a constant speed. A curve represents a changing speed, either acceleration or deceleration. The speed at any given point can be calculated by drawing a tangent from the curve and finding the gradient of the tangent.

## Terminal Velocity

When an object begins moving, the force accelerating the object is much greater than the force resisting the movement. A resistant force might be air resistance or friction, for example.

As the velocity of the object increases, the force resisting the movement also increases. This causes the acceleration of the object to be reduced gradually until the forces become equal and are balanced. This doesn't cause the object to stop moving. As the object is already in motion, balanced forces mean it will continue to move at a steady speed. This steady speed is the maximum that the object can achieve and is called the terminal velocity.

The terminal velocity of an object depends on its shape and weight. The shape of the object determines the amount of resistant force which can act on it. For example, an object with a large surface area will have a greater amount of resistance acting on it.

Consider a skydiver and his parachute. When the skydiver first jumps from the aeroplane, he has a small area where the air resistance can act. He will fall until he reaches a terminal velocity of approximately 120mph.

After the skydiver releases his parachute, the shape and area has been changed and so the amount of air resistance acting is increased. This causes him to decelerate and his terminal velocity is reduced to about 15mph. This makes it a much safer speed to land on the ground.

## Acceleration

Acceleration can be calculated using the equation:

$$\text{acceleration (m/s}^2\text{)} = \frac{\text{change in velocity (m/s)}}{\text{time taken (s)}}$$

### Worked example:

A dog is sitting, waiting for a stick to be thrown. After the stick is thrown, the dog is running at a speed of 4m/s. It has taken the dog 16s to reach this velocity. Calculate the acceleration of the dog.

$a = \Delta v \div t$

$a = (4-0) \div 16$

$A = 0.25 m/s^2$

Changes in velocity due to acceleration can be calculated using the equation below. This equation of motion can be applied to any moving object which is travelling in a straight line with a uniform acceleration.

$$\text{Final velocity}^2\text{ (m/s)} - \text{initial velocity}^2\text{ (m/s)} = 2 \times \text{acceleration (m/s}^2\text{)} \times \text{displacement (m)}$$

or

$$v^2 - u^2 = 2as$$

### Worked example:

A bus has an initial velocity of 2m/s and accelerates at $1.5 m/s^2$ over a distance of 50m. Calculate the final velocity of the bus.

Step 1: rearrange the equation: $v^2 - u^2 = 2as$

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

Step 2: insert known values and solve

$v^2 = (2 \times 1.5 \times 50) + 2^2$

$v^2 = (150) + 4$

$v^2 = 154$

$v = \sqrt{154}$

$v = 12.41 m/s$

## Braking Distance

The braking distance is the distance travelled by a vehicle once the brakes are applied and until it reaches a full stop.

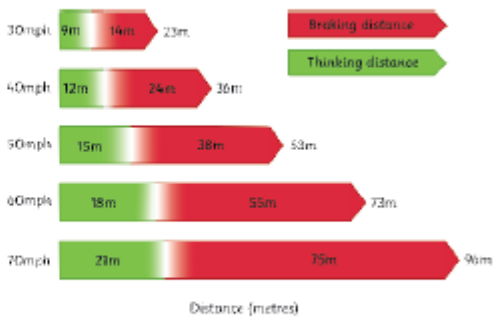
Braking distance is affected by:

- adverse weather conditions (wet or icy)
- poor vehicle condition (brakes or tyres)

When force is applied to the brakes, work is done by the friction between the car wheels and the brakes.

The work done reduces the kinetic energy and it is transferred as heat energy, increasing the temperature of the brakes.

increased speed = increased force required to stop the vehicle
increased braking force = increased deceleration

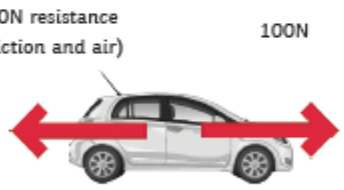



Large decelerations can cause a huge increase in temperature and may lead to the brakes overheating and the driver losing control over the vehicle

## Newton's Laws of Motion: Newton's First Law

If the resultant force acting on an object is zero...

- a stationary object will remain stationary.
- a moving object will continue at a steady speed and in the same direction.




Inertia – the tendency of an object to continue in a state of rest or uniform motion (same speed and direction).

## Newton's Laws of Motion: Newton's Second Law

The acceleration of an object is proportional to the resultant force acting on it and inversely proportional to the mass of the object

resultant force (N) = mass (kg) × acceleration ($m/s^2$)

Inertial mass – how difficult it is to change an objects velocity. It is defined as the ratio of force over acceleration.

## Newton's Laws of Motion: Newton's Third Law

When two objects interact, the forces acting on one another are always equal and opposite.

For example, when a book is laid on the table, it experiences a reaction force from the table. The table pushes up on the book. The book also pushes down on the table. These two forces are equal and opposite.

## Stopping Distance

The stopping distance of a vehicle is calculated by:

**stopping distance = thinking distance + braking distance**

Reaction time is the time taken for the driver to respond to a hazard. It varies from 0.2s to 0.9s between most people.

Reaction time is affected by:

- tiredness
- drugs
- alcohol
- distractions

You can measure human reaction time in the lab using simple equipment: a metre ruler and stopwatch can be used to see how quickly a person reacts and catches the metre ruler. The data collected is quantitative and you should collect repeat readings and calculate an average result.

## Momentum

**momentum (N) = mass (kg) × velocity (m/s)**

**The law of conservation of mass (in a closed system) states that the total momentum before an event is equal to the total momentum after an event.**

### Worked example:

Calculate the momentum of a 85kg cyclist travelling at 7m/s.

$p = m \times v$

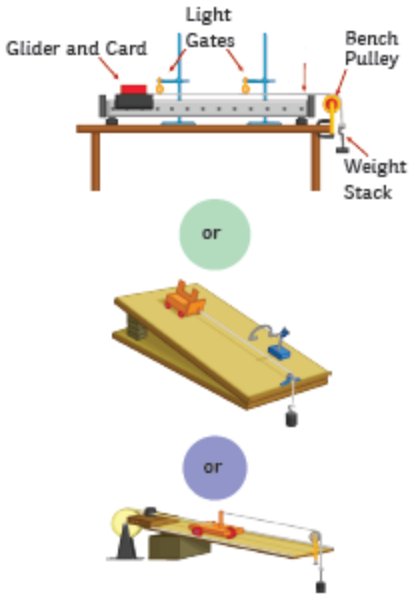
$p = 85kg \times 7m/s$

$p = 595kg\ m/s$

## Required Practical Investigation 7

Aim: investigate the effect of varying the force on the acceleration of an object of constant mass, and the effect of varying the mass of an object on the acceleration produced by a constant force.

You may be given any of the following apparatus set-ups to conduct these investigations:




Something is a fair test when only the independent variable has been allowed to affect the dependent variable.

The independent variable was force.

The dependent variable was acceleration.

The control variables were:

- same total mass
- same surface/glider/string/pulley (friction)
- same gradient if you used a ramp

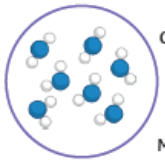
# AQA GCSE Chemistry (Combined Science) Unit 8: Chemical Analysis

## Pure Substances

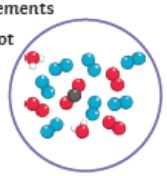
Pure substances, in chemistry, only contain **one type of element** or **one type of compound**. For example, pure water will just contain water (a compound).

In our everyday language, we use the word 'pure' differently to how it is used in chemistry. Pure can mean a **substance** that has had **nothing else added to it** and is in its natural state. An example of this is pure orange juice. This means that the bottle will just contain orange juice and no other substances.

**Elements** are made up of **one type of atom**. For example, oxygen is made up of oxygen atoms. Carbon is made up of carbon atoms.



**Compounds** are **two or more elements** that are **chemically joined** together. For example, NaCl which is sodium chloride.



**Mixtures** are **two or more elements or compounds** that are **not chemically joined** together. An example of this is a standard cup of coffee. Coffee contains water, milk, coffee and possibly sugar. The components of the cup of coffee are not bonded together.

**Pure** Substances have a **sharp melting point** compared to **impure** substances which **melt over a range** of temperatures.

## Formulations

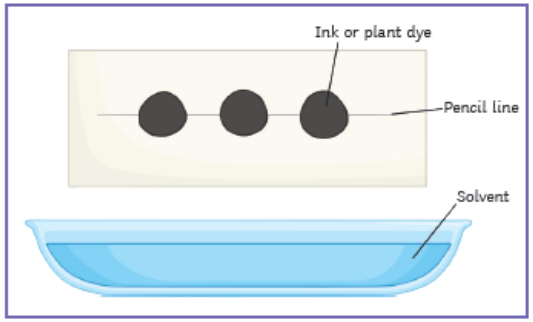
Formulations are **mixtures of compounds or substances** that **do not react together**. They do **produce a useful product** with desirable characteristics or properties to suit a particular function.

There are examples of formulations all around us such as medicines, cleaning products, deodorants, hair colouring, cosmetics and sun cream.

## Chromatography

Paper chromatography is a separation technique that is used to **separate** mixtures of **soluble substances**. How soluble a substance is determines how far it will travel across the paper.

In chromatography, there are **two phases**: the mobile and **stationary** phase.

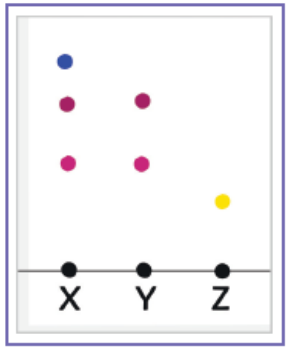



The **mobile phase moves** through the stationary phase. The **solvent** is the **mobile phase**. It moves through the paper carrying the different substances with it.

The **stationary phase** in paper chromatography is the **absorbent paper**.

Separation of the dissolved substances produces what is called a **chromatogram**. In paper chromatography, this can be used to **distinguish** between those substances that are **pure** and those that are **impure**.
**Pure substances** have **one spot** on a chromatogram as they are made from a single substance. **Impure substances** produce **two or more spots** as they contain multiple substances.

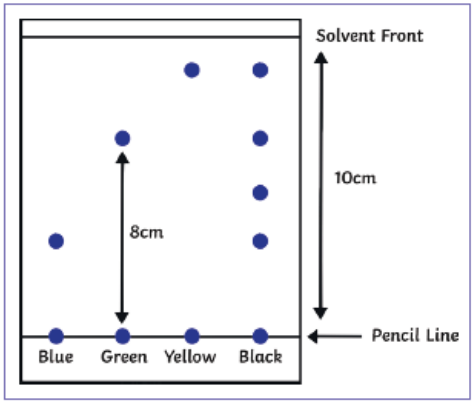
By calculating the **$R_f$ values** for each of the spots, it is possible to identify the unknown substances. Similarly, if an unknown substance produces the **same number** and **colour of spots**, it is possible to match it to a known substance.




## R Value

$$R_f = \frac{\text{distance travelled by substance}}{\text{distance travelled by solvent}}$$

Different compounds have different $R_f$ values in different solvents. The $R_f$ values of known compounds can be used to help identify unknown compounds.




Rayner Stephens High School

STAMFORD PARK TRUST

# AQA GCSE Chemistry (Combined Science) Unit 8: Chemical Analysis

## Required Practical – Paper Chromatography

Investigate how paper chromatography can be used to separate and distinguish between coloured substances.

**Step 1** – Using a ruler, measure 1cm from the bottom of the chromatography paper and mark with a small dot using a pencil. Rule a line across the bottom of the chromatography paper with a pencil, going through the dot you have just made.

**Step 2** – Using a pipette, drop small spots of each of the inks onto the pencil line. Leave a sufficient gap between each ink spot so that they do not merge.

**Step 3** – Pour a suitable solvent into the bottom of a container such as a beaker. The solvent should just touch the chromatography paper. The solvent line must not go over the ink spots as this will cause the inks to run into each other.

**Step 4** – Place the chromatography paper into the container and allow the solvent to move up through the paper.

**Step 5** – Just before the solvent line reaches the top of the paper, remove the chromatogram from the container and allow to dry.

**Step 6** – Once the chromatogram has dried, measure the distance travelled by the solvent.

**Step 7** – Measure the distance travelled by each ink spot.

**Step 8** – Calculate the $R_f$ value. Compare the $R_f$ values for each of the spots of ink.

$$R_f = \frac{\text{distance travelled by substance}}{\text{distance travelled by solvent}}$$

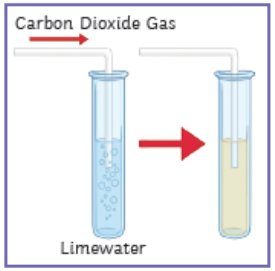
## Identification of the Common Gases

**The Test for Hydrogen**

Place a burning splint at the opening of a test tube. If hydrogen gas is present, it will burn rapidly with a **squeaky-pop sound**.

**The Test for Oxygen**

Place a glowing splint inside a test tube. The **splint will relight** in the presence of oxygen.




**The Test for Carbon Dioxide**

**Calcium hydroxide (lime water)** is used to test for the presence of carbon dioxide. When carbon dioxide is bubbled through or shaken with limewater, the limewater turns **cloudy**.

**The Test for Chlorine**

**Damp litmus paper** is used to test for chlorine gas. The litmus paper becomes **bleached and turns white**.

Rayner Stephens High School

Stamford Park Trust

# Inheritance, Variation and Evolution Knowledge Organiser

## Keywords

**allele** – An alternative form of a gene.

**asexual reproduction** – The production of offspring from a single parent by mitosis. The offspring are clones of the parent.

**chromosome** – Structures that contain the DNA of an organism and are found in the nucleus.

**cystic fibrosis** – A disorder of cell membranes that is caused by a recessive allele.

**DNA** - A polymer that is made up of two strands that form a double helix.

**dominant** – An allele that is always expressed, even if only one copy is present.

**fertilisation** – The fusion of male and female gametes.

**gamete** – Sperm cell and egg cell in animals; pollen and egg cell in plants.

**gene** – A small section of DNA that codes for a specific protein.

**genome** – The entire genetic material of an organism.

**genotype** – The combination of alleles.

**heterozygous** – A genotype that has two different alleles, one dominant and one recessive.

**homozygous** – A genotype that has two of the same alleles. Either two dominant alleles or two recessive alleles.

**meiosis** – The two-stage process of cell division that reduces the chromosome number of the daughter cells. It makes gametes for sexual reproduction.

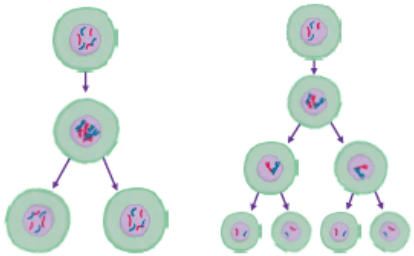
**mutation** – A change in DNA.

**phenotype** – The characteristic expressed because of the combination of alleles.

**polydactyly** – Having extra fingers or toes. It is caused by a dominant allele.

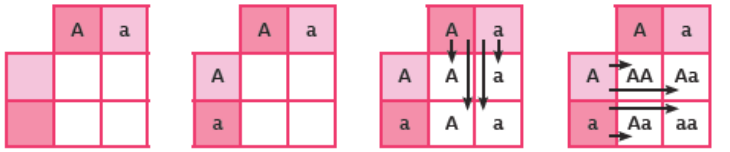
**recessive** – An allele that is only expressed if two copies of it are present.

**sexual reproduction** – The production of offspring by combining genetic information from the gametes of two parents. Leads to variation in the offspring.



| Mitosis | Meiosis |
|---|---|
| Produces two daughter cells. | Produces four daughter cells. |
| Daughter cells are genetically identical. | Daughter cells are not genetically identical. |
| The cell divides once. | The cell divides twice. |
| The chromosome number of the daughter cells is the same as the parent cells. In humans, this is 46 chromosomes. | The chromosome number is reduced by half. In humans, this is 23 chromosomes. |
| Used for growth and repair, and asexual reproduction. | Produces gametes for sexual reproduction. |

## How to Complete a Punnet Square

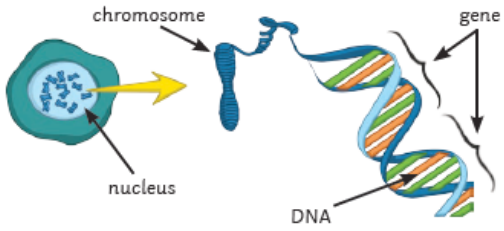



**Step 1:**
Put the two alleles from one parent into the boxes at the top. This parent is a heterozygote. This means they have one dominant and one recessive allele.

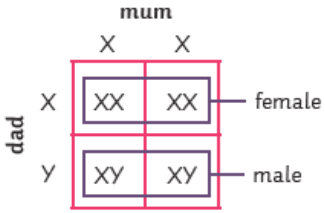
**Step 2:**
Put the two alleles from the second parent into the boxes on the left. This parent is also a heterozygote.

**Step 3:**
Put the alleles from the first parent into the two boxes underneath them.

**Step 4:**
Put the alleles from the second parent into the two boxes to the right of them.



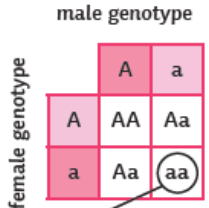

## Sex Determination




Females carry two X chromosomes.
Males carry one X and one Y chromosome.

## Probability

There are four possible combinations of gametes that offspring can inherit.




One of these four has the genotype aa – that's $\frac{1}{4}$, 25% or 0.25.

The recessive phenotype has a ratio of 1:3 because only one combination will show the phenotype while the other three will not.

Rayner Stephens High School

STAMFORD PARK TRUST

# Inheritance, Variation and Evolution Knowledge Organiser

## Keywords

**embryo screening** – Genetic tests carried out on an embryo to see whether it carries a faulty allele.

**evolution** – A change in the inherited characteristics of a population over time through a process of natural selection.

**evolutionary tree** – A method used to show how scientists believe organisms are related.

**extinction** – The permanent loss of all members of a species.

**fossils** – The remains of organisms from millions of years ago which are found in rocks.

**genetic engineering** – The process by which scientists manipulate and change the genotype of an organism.

**natural selection** – The process by which organisms that are better suited to an environment are more likely to survive and reproduce.

**selective breeding** – Humans selecting animals or plants, that have a required characteristic, for breeding.

**speciation** – The process by which two species evolve from a single original species by natural selection. The two populations have become so different that they can no longer interbreed to produce fertile offspring.

**variation** - Differences in characteristics of individuals in a population.

## Variation

Variation maybe be due to differences in:

- the genes that have been inherited (genetic causes);
- the conditions in which they have developed (environmental causes);
- a combination of genes and the environment.

## Evolution

All species of living things have evolved from simple life forms by natural selection.

- If a variant/characteristic is advantageous in an environment, then the individual will be better able to compete.
- This means they are more likely to survive and reproduce.
- Their offspring will inherit the advantageous allele.

## Fossils

Fossils could be:

- the actual remains of an organism that has not decayed;
- mineralised forms of the harder parts of an organism, such as bones;
- traces of organisms such as footprints or burrows.

Many early life forms were soft-bodied so have left few traces behind.

Fossils help us understand how much or little organisms have changed as life developed on earth.

## Resistant Bacteria

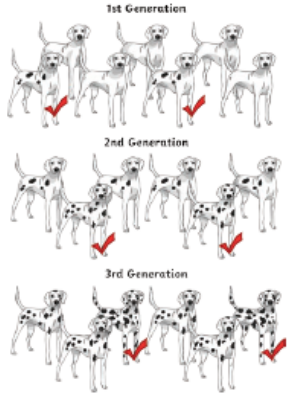

1. There is variation in the bacterial population. One bacterium develops a mutation by chance that means it is resistant to an antibiotic.
2. The antibiotic kills some of the bacteria, the resistant bacterium survives and reproduces.
3. The antibiotic kills the rest of the non-resistant bacteria so the person may start to feel a little better. The resistant bacterium has survived the antibiotic and continues to multiply.

To reduce the rate at which antibiotic-resistant strains appear:

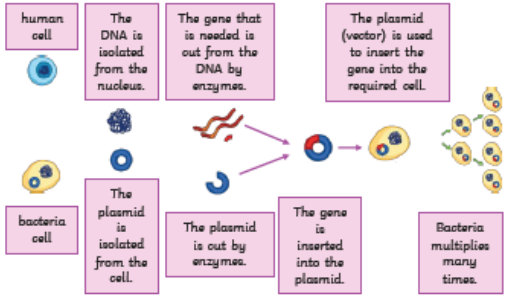
- Antibiotics should only be used when they are really needed, not for treating non-serious or viral infections.
- Patients should complete their courses of antibiotics, even if they start to feel better.
- The agricultural use of antibiotics should be restricted.

## Selective Breeding

1. Choose parents who have the desired characteristic.
2. Select the best offspring and breed these to make the next generation.
3. These offspring are then bred again and again, over many generations, until a desired result is achieved.




## Genetic Engineering




## Classification

Linnaeus classified living things into kingdom, phylum, class, order, family, genus and species.

Organisms are named by the binomial system of genus and species.

Due to evidence from chemical analysis, there is now a 'three-domain system' developed by Carl Woese.

| Domain | bacteria | archaea | eukaryota | | | |
|---|---|---|---|---|---|---|
| Kingdom | eubacteria | archaebacteria | protista | fungi | plantae | animalia |

Rayner Stephens High School

STAMFORD PARK TRUST

# Inheritance, Variation and Evolution Knowledge Organiser – Separate Science Knowledge Organiser

## Keywords

**allele** – An alternative form of a gene.

**asexual reproduction** – The production of offspring from a single parent by mitosis. The offspring are clones of the parent.

**chromosome** – Structures that contain the DNA of an organism and are found in the nucleus.

**cystic fibrosis** – A disorder of cell membranes caused by a recessive allele.

**DNA** - A polymer that is made up of two strands that form a double helix.

**dominant** – An allele that is always expressed, even if only one copy is present.

**fertilisation** – The fusion of male and female gametes.

**gamete** – Sperm cell and egg cell in animals; pollen and egg cell in plants.

**gene** – A small section of DNA that codes for a specific protein.

**genome** – The entire genetic material of an organism.

**genotype** – The combination of alleles.

**heterozygous** – A genotype that has two different alleles – one dominant and one recessive.

**homozygous** – A genotype that has two of the same alleles. Either two dominant alleles or two recessive alleles.

**meiosis** – The two-stage process of cell division that reduces the chromosome number of the daughter cells. It makes gametes for sexual reproduction.

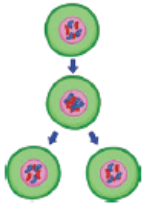
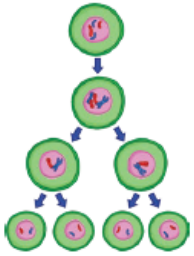
**mutation** – A change in DNA.

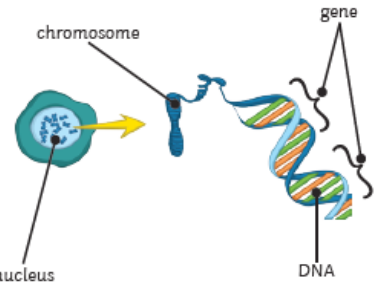
**phenotype** – The characteristic expressed because of the combination of alleles.

**polydactyly** – Having extra fingers or toes. Is caused by a dominant allele.

**recessive** – An allele that is only expressed if two copies of it are present.

**sexual reproduction** – The production of offspring by combining genetic information from the gametes of two parents. Leads to variation in the offspring.

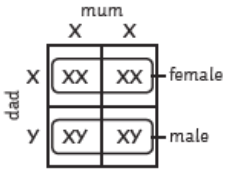
| Mitosis | Meiosis |
|---|---|
| Produces two daughter cells. | Produces four daughter cells. |
| Daughter cells are genetically identical. | Daughter cells are not genetically identical. |
| The cell divides once. | The cell divides twice. |
| The chromosome number of the daughter cells is the same as the parent cells. In humans, this is 46 chromosomes. | The chromosome number is reduced by half. In humans, this is 23 chromosomes. |
| Used for growth and repair, and asexual reproduction. | Produces gametes for sexual reproduction. |
|  |  |




## Sex Determination

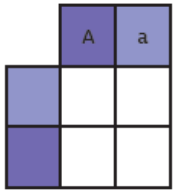
Females carry two X chromosomes.

Males carry one X and one Y chromosome.

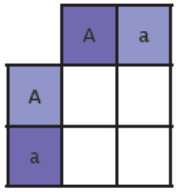



## How to Complete a Punnet Square

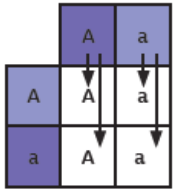
**Step 1**: Put the two alleles from one parent into the boxes at the top. This parent is a heterozygote. This means they have one dominant and one recessive allele.



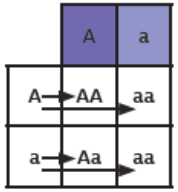

**Step 2**: Put the two alleles from the second parent into the boxes on the left. This parent is also a heterozygote.




**Step 3**: Put the alleles from the first parent into the two boxes beneath them.

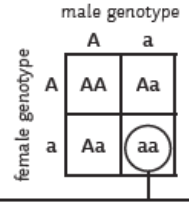



**Step 4**: Put the alleles from the second parent into the two boxes to the right of them.




## Probability

There are four possible combinations of gametes that offspring can inherit.




One of these four has the genotype aa, that's $\frac{1}{4}$, 25% or 0.25.

The recessive phenotype has a ratio of 1:3 because only one combination will show the phenotype, while the other three will not.

Rayner Stephens High School

Stamford Park Trust

## Keywords

**embryo screening** – Genetic tests carried out on an embryo to see whether it carries a faulty allele.

**evolution** – A change in the inherited characteristics of a population, over time, through a process of natural selection.

**evolutionary tree** – A method used to show how scientists believe organisms are related.

**extinction** – The permanent loss of all members of a species.

**fossils** – The remains of organisms from millions of years ago which are found in rocks.

**genetic engineering** – The process by which scientists manipulate and change the genotype of an organism.

**natural selection** – The process by which organisms that are better suited to an environment are more likely to survive and reproduce.

**selective breeding** – Humans selecting animals or plants, that have a required characteristic, for breeding.

**speciation** – The process by which two species evolve from a single original species by natural selection. The two populations have become so different that they can no longer interbreed to produce fertile offspring.

**variation** - Differences in characteristics of individuals in a population.

## Variation

Variation maybe be due to differences in:

- the genes that have been inherited (genetic causes);
- the conditions in which they have developed (environmental causes);
- a combination of genes and the environment.

## Evolution

All species of living things have evolved from simple life forms by natural selection.

- If a variant/characteristic is advantageous in an environment then the individual will be better able to compete.
- This means they are more likely to survive and reproduce.
- Their offspring will inherit the advantageous allele.

## Resistant Bacteria

To reduce the rate at which antibiotic resistant strains appear:

- Antibiotics should only be used when they are really needed, not for treating non-serious or viral infections.
- Patients should complete their courses of antibiotics, even if they start to feel better.
- The agricultural use of antibiotics should be restricted.

1. There is variation in the bacterial population. One bacterium develops a mutation by chance that means it is resistant to an antibiotic.
2. The antibiotic kills some of the bacteria, the resistant bacterium survives and reproduces.
3. The antibiotic kills the rest of the non-resistant bacteria so the person may start to feel a little better. The resistant bacterium has survived the antibiotic and continues to multiply.

## Fossils

Fossils could be:

- the actual remains of an organism that has not decayed;
- mineralised forms of the harder parts of an organism, such as bones;
- traces of organisms such as footprints or burrows.

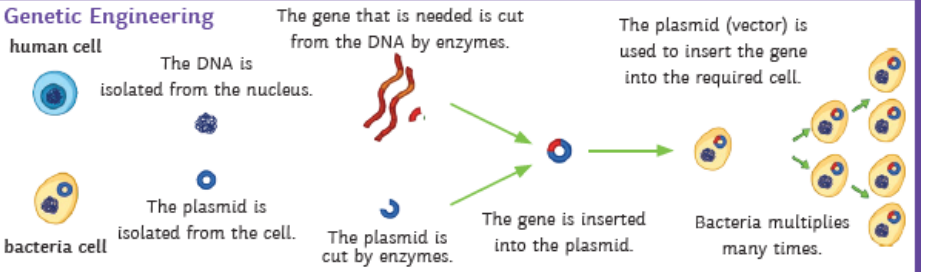
Many early life forms were soft-bodied so have left few traces behind.

Fossils help us understand how much or how little organisms have changed as life developed on earth.

## Selective Breeding

- Choose parents who have the desired characteristic.
- Select the best offspring and breed these to make the next generation.
- These offspring are then bred again and again, over many generations, until a desired result is achieved.


## Genetic Engineering




## Classification

Linnaeus classified living things into kingdom, phylum, class, order, family, genus and species.

Organisms are named by the binomial system of genus and species.

Due to evidence from chemical analysis, there is now a 'three-domain system' developed by Carl Woese.

| Domain | bacteria | archaea | eukaryota | | | |
|---|---|---|---|---|---|---|
| Kingdom | eubacteria | archaebacteria | protista | fungi | plantae | animilia |

Rayner Stephens High School

Stamford Park Trust

# AQA GCSE Chemistry (Combined Science) Unit 6: The Rate and Extent of Chemical Change

## Calculating Rates of Reactions

**Reactions** happen at **varying rates**. For example, a firework exploding is a fast reaction whereas a piece of iron rusting would take place over a longer period of time.

The **rate of a chemical reaction** tells us how quickly a **product is formed** or how quickly a **reactant is used up**.

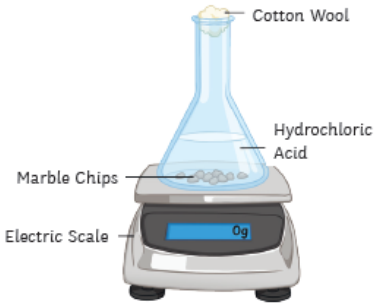
For a chemical reaction to occur, the reactant particles must collide with enough energy. Those collisions that produce a chemical reaction are called successful collisions.

$$\text{mean rate of reaction} = \frac{\text{quantity of reactant used}}{\text{time taken}}$$

$$\text{mean rate of reaction} = \frac{\text{quantity of product formed}}{\text{time taken}}$$

### Measuring the Mass of a Reaction Mixture

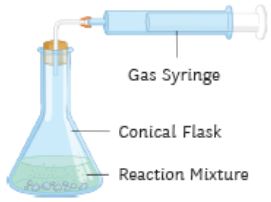
The changing mass of a reaction mixture can be measured during a reaction. This method is particularly useful when gases, such as carbon dioxide, are given off. **Gas escapes during the reaction and the mass of the reaction mixture decreases.** The mass can be measured at regular time intervals.

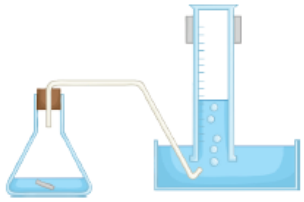



**units – g/s or g/min**

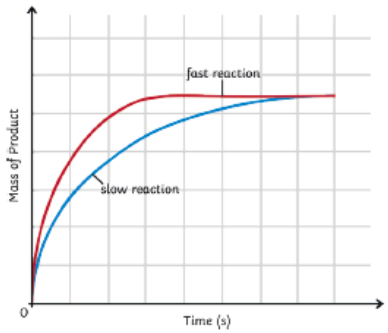
## Measuring the Volume of a Reaction Mixture

The changing volume of a reaction mixture can be measured during a reaction. This method is particularly useful when gases, such as carbon dioxide, are given off. The gas can be collected and its volume measured at regular time intervals. Different types of measuring equipment can be used to collect the gas such as a gas syringe, measuring cylinder or upside-down burette.



**units – $cm^3/s$ or $cm^3/min$**




Graphs are a useful way to **analyse** the results from a rate of reaction investigation. The graph above shows two lines, one red and one blue.

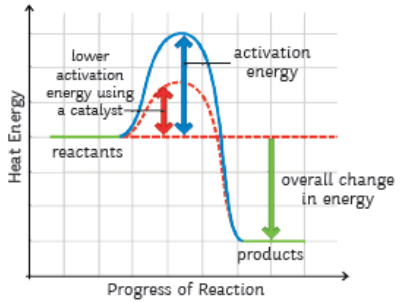
The red line represents a fast reaction and the blue line a slow reaction. We know the fast reaction occurs at a much faster rate as the line is steep. The fast reaction finishes before the slow reaction as the line plateaus sooner.

## Factors Affecting the Rate of a Chemical Reaction

- concentration and pressure
- catalyst
- surface area
- temperature

The rate of a chemical reaction will be increased if there are more frequent successful collisions between reactant particles.

## Catalyst



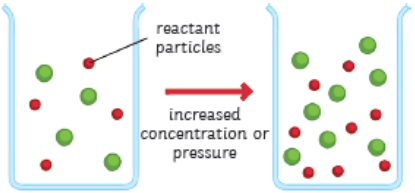

A catalyst is a **substance** that speeds up a chemical reaction without getting used up itself. Catalysts are able to offer an **alternative pathway** at a **lower activation energy**.

**Biological catalysts** are called **enzymes**.

When a catalyst is used in a chemical reaction (not all reactions have a catalyst that is suitable to use), the **frequency of collisions** is **unchanged**. More **particles** are able to react. The particles have **energy greater** than that of the **activation energy**. Consequently, there is in an **increase** in the **rate successful of collisions**.

## Concentration and Pressure

If the **number of reactant particles** in a given space is **doubled**, there will be **more frequent successful collisions** between reactant particles, therefore, **increasing** the **rate of reaction**.



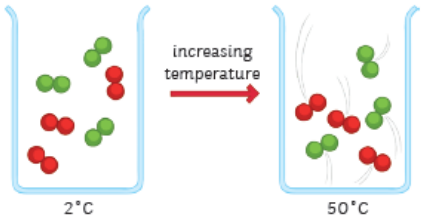

Rayner Stephens High School

Stamford Park Trust

# AQA GCSE Chemistry (Combined Science) Unit 6: The Rate and Extent of Chemical Change

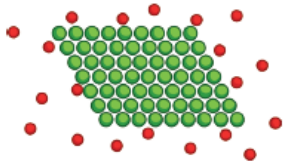
## Temperature

When the temperature of the reaction mixture is increased, the reactant particles **gain kinetic energy** and move much more quickly. This results in **more frequent successful collisions** between the reactant particles, therefore, **increasing the rate of the reaction**.




## Surface Area

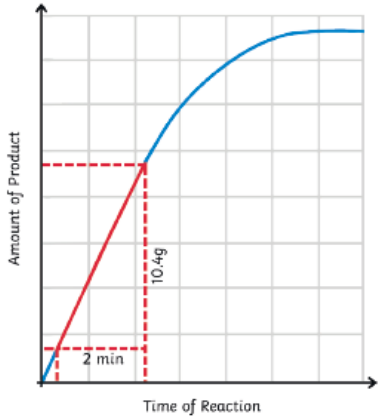
**Large lumps** of a solid have a **small surface area to volume ratio**. If the solid is broken up into smaller lumps or crushed into a powder, this will increase the surface area to volume ratio.



A larger area of the solid is now exposed to other reactant particles. This increases the frequency of successful collisions thus increasing the rate of reaction.

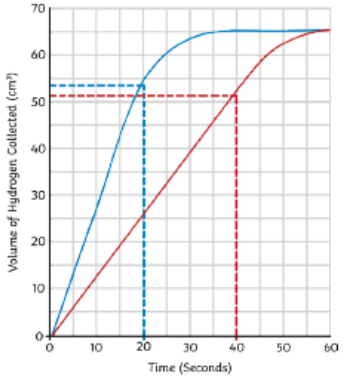
## Calculating Gradient (Higher Tier Only) gradient = $\frac{y}{x}$

On the graph, draw construction lines on the part of the graph that has a straight line. Measure the values of x and y.




In the graph below, the gradient of the first line is much steeper than the second line. This indicates that a faster reaction is taking place. Remember, the steeper the line, the faster the reaction.

To calculate the reaction rate at a specific time period, construction lines must first be drawn on the straightest part of the graph.




For the first line, what is the rate of reaction at 20 seconds?

54 ÷ 20 = 2.7cm³/s

For the second line, what is the rate of reaction at 40 seconds?

52 ÷ 40 = 1.3cm³/s

## Dynamic Equilibrium

In a **closed system** (this means nothing can get in or out), a reversible reaction can reach **dynamic equilibrium**. This is where the **forward** and **reverse reactions** are occurring at the **same rate** and the **concentrations** of all the substances that are reacting remain constant.

## Changing Conditions and the Effect on the Position of Equilibrium (Higher Tier Only)

The reaction between nitrogen and hydrogen to make ammonia is an industrial process called the Haber process. It requires a high temperature, high pressure and an iron catalyst.

The symbol equation for the reaction is as follows:

$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$

According to **Le Chatelier's Principle**, the position of equilibrium can be altered by changing the conditions of the reaction i.e. the pressure, concentration and/or the temperature. The **position** of the **equilibrium** will shift to **counteract** any changes made.

Increasing the **temperature** of the reaction in the forward direction (exothermic) will result in the equilibrium shifting in favour of the reverse direction (endothermic) to reduce the temperature.

From the equation, it is clear that on the **left-hand side**, there are **four molecules** and on the **right-hand side**, there are **two molecules**. If the **pressure** in the system were **increased**, the equilibrium **position would shift to the right** as there are fewer molecules. If the pressure in the system were **decreased**, the equilibrium **position would shift to the left** as there are a larger number of molecules.

If the **concentration** of one of the **reactants were increased**, then the equilibrium position would move in **favour of the products**. This would result in more product being produced. If the concentration of the **products were decreased**, equilibrium would shift to **favour the products**. More reactants would react until equilibrium is reached.

Rayner Stephens HIGH SCHOOL

STAMFORD PARK TRUST

# AQA GCSE Chemistry (Combined Science) Unit 6: The Rate and Extent of Chemical Change

## Reversible Reactions

A reversible reaction is one in which the **reactants form products**. The products are then able to react together to **reform the reactants**.

For example:
A reacts with B to form C and D.
C and D are able to react to form A and B.

The equation would be as follows (where the **double arrow symbol** represents a **reversible reaction** is taking place):

$A + B \rightleftharpoons C + D$

The **forward reaction** goes to the **left** and the **backwards reaction** goes to the **right**. For example, if the forward reaction is exothermic then the backward reaction will be endothermic. The amount of energy that is transferred is the same for both the forward and reverse reaction.

**Hydrated** copper sulfate is a blue substance. We say that the copper sulfate is hydrated as it **contains water**. The copper sulfate is heated and the water evaporates leaving a white substance known as **anhydrous** copper sulfate. Anhydrous meaning **no water**.

The word equation for the reaction is as follows:

hydrated copper sulfate $\rightleftharpoons$ anhydrous copper sulfate + water

$CuSO_4.5H_2O(s) \rightleftharpoons CuSO_4(s) + H_2O(l)$

The reaction can be reversed when water is added to the anhydrous copper sulfate.

## Required Practical 5: Measuring the Production of a Gas

This method outlines one way to carry out an investigation to collect a gas from a chemical reaction.

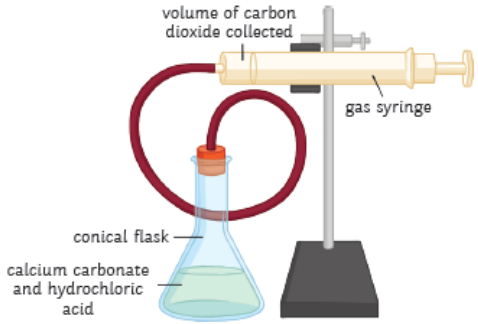
The practical involves changing the concentration of hydrochloric acid and measuring the volume of carbon dioxide gas produced when the acid reacts with calcium carbonate.

The word equation for the reaction is as follows:

calcium carbonate + hydrochloric acid → calcium chloride + water + carbon dioxide

The symbol equation for the reaction is:

$CaCO_3 + 2HCl \rightarrow CaCl_2 + H_2O + CO_2$




### Method

Step 1 – Clamp a gas syringe to a retort stand using a boss and clamp. Ensure the syringe is a quarter of the way from the top of the stand. Place the delivery tube to the end of the gas syringe.

Step 2 – Measure out 50ml of hydrochloric acid using a measuring cylinder and pour into a conical flask.

Step 3 – Using a top pan balance, measure out 0.5g of powdered calcium carbonate and place in the conical flask.

Step 4 – Immediately connect the bung and delivery tube to the conical flask. Start the stopwatch.

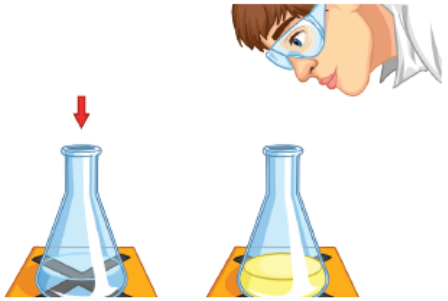
Step 5 – Record the volume of carbon dioxide gas produced every 10 seconds.

Step 6 – When the reaction has finished and there are no more bubbles of gas being produced, clean the equipment and repeat using four other different concentrations of hydrochloric acid.

When analysing the results from the practical investigation, plot a graph of Time (s) against Volume of Gas Produced ($cm^3$). Draw a curve of best fit through the points. A graph should be plotted for each concentration of acid.

Calculate the mean rate of reaction ($cm^3/s$) for each concentration of acid used. This can be calculated by dividing the total mass of gas produced ($cm^3$) by the reaction time (s).

## Required Practical 5: Investigating a Change in Colour



This method outlines one way to carry out an investigation into the effect of increased temperature on the rate of a reaction.

The word equation for this reaction is as follows:

sodium thiosulfate + hydrochloric acid → sodium chloride + water + sulfur dioxide + sulfur

The symbol equation for this reaction is:

$Na_2S_2O_3 + 2HCl \rightarrow 2NaCl + H_2O + SO_2 + S$

The reaction between sodium thiosulfate and hydrochloric acid produces a **precipitate**. **Sulfur** is responsible for the formation of the precipitate. A precipitate is a **solid** that is formed in a solution. It is the formation of this precipitate that causes the reaction mixture to become **cloudy**; the cloudiness is a way to measure the **reaction time**.

**Method**

Sodium thiosulfate from three different temperatures may be used, for example, ice cold, room temperature and hot.

**Step 1** – Place a black cross on a white tile.

**Step 2** – Using the first temperature, measure out 35cm$^3$ of sodium thiosulfate using a measuring cylinder. Place the liquid in a conical flask and position over the black cross on the white tile.

**Step 3** – Measure out 5cm$^3$ of water and 10cm$^3$ of hydrochloric acid in separate measuring cylinders.

**Step 4** – Pour the water and acid into the conical flask.

**Step 5** – Pour the measured amount of sodium thiosulfate into the conical flask and immediately start the stopwatch.

**Step 6** – Look down through the conical flask to the black cross below. When the black cross is no longer visible, stop the stopwatch and record the results in a table.

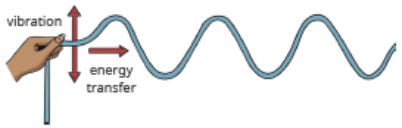
**Step 7** – Repeat the steps with the remaining temperatures of sodium thiosulfate.

# AQA GCSE Combined Science Waves **Knowledge Organiser**

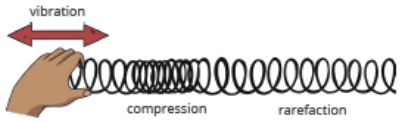
## Transverse and Longitudinal Waves

Waves can be either **transverse** or **longitudinal**.

In a **transverse** wave, the vibrations of the particles are **perpendicular** (at right angles) to the direction of energy transfer. The wave has **peaks** (or crests) and **troughs**. Examples of transverse waves include **water waves** and **electromagnetic waves**.




In a **longitudinal** wave, the vibrations of the particles are **parallel** to (in the same direction as) the direction of energy transfer. A longitudinal wave has areas of **compression** and **rarefaction. Sound waves** travelling through air are an example of this type of wave.

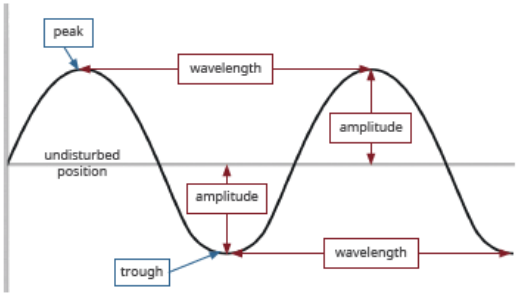



When a wave travels through a medium, energy is transferred by the particles but the matter itself does not move.

This can be shown by placing a cork in a tank of water and generating ripples across the surface. The cork will move up and down on the oscillations of the wave, but it will not travel across the tank.

Similarly, when sound waves move from a speaker towards the ear, the air particles next to the speaker do not move towards the ear; they vibrate around their original position.

## Wave Properties




The **amplitude** of a wave is the distance from the undisturbed position to the peak or trough of the wave.

The **wavelength** is the distance from a point on one wave to the same point on the next wave, measured in **metres** (m).

The **frequency** of a wave is the number of waves that pass a given point every second, measured in **hertz** (Hz).

The **period** of a wave is the time taken for a full wave to pass a given point, measured in **seconds** (s).

$$\textbf{period} = \frac{1}{\textbf{frequency}} \text{ or } T = \frac{1}{f}$$

Wave speed is how quickly energy is transferred through a medium (or how quickly the wave travels), measured in **metres per second** (m/s).

$$\textbf{wave speed} = \textbf{frequency} \times \textbf{wavelength} \text{ or } v = f\lambda$$

The speed of a **sound wave** travelling through the air can be measured using a simple method. A person stands a measured distance from a large flat wall, e.g. 100m. The person then claps their hands and the time taken to hear the echo is measured. The speed of sound can be calculated using the equation:

$$\text{speed} = \frac{\textbf{distance}}{\textbf{time}}$$

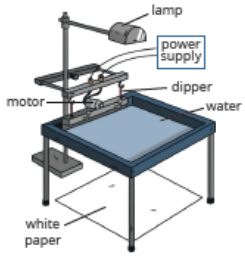
Remember, the distance that the sound wave has travelled will be double the distance between the person and the wall because the wave has travelled to the wall and back again. It is important to take several measurements and calculate the mean to reduce the effect of human error in your measurements.

## Required Practical: Observing Waves

Make observations to identify the suitability of apparatus to measure the frequency, wavelength and speed of waves.

### Waves in a Ripple Tank

The diagram shows the apparatus most commonly used for this investigation.



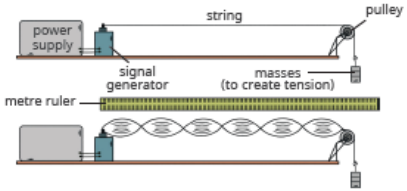

Method:

1. Set up the apparatus as shown in the diagram.
2. Turn on the power supply and observe the waves produced in the water. Make any necessary adjustments to the equipment, for example altering the potential difference of the power supply, so that the waves are clear to observe.
   **The lower the frequency of the waves, the easier it will be for measurements to be made.**
3. To measure the **wavelength**, use a metre ruler to measure the length of 10 waves and divide this value by 10 to find one wavelength. Repeat this several times and calculate the mean wavelength. A **stroboscope** can be used to freeze the wave pattern to make it easier to measure the waves.
4. To measure the **frequency**, mark a point on the white paper and count the number of waves that pass this point in 10 seconds. Divide the number of waves by 10 to find the number of waves that pass per second. Repeat this several times and calculate the mean frequency.
5. To calculate **wave speed**, use the equation:

**wave speed = frequency × wavelength**

### Waves in a Solid

Waves in a solid can be observed using the apparatus shown in the diagram.




When the signal generator is switched on, the string begins to vibrate.

The frequency of the signal generator, the length of the string or the tension in the string is adjusted until a clear wave pattern can be seen. The wave should not look like it is moving.

To find the **wavelength**, count the number of half wavelengths (single loops) in 1 metre, then divide the length by the number of half wavelengths and multiply by two.

The **frequency** of the wave is the frequency of the signal generator.

**Wave speed** can be calculated using the equation:

**wave speed = frequency × wavelength**

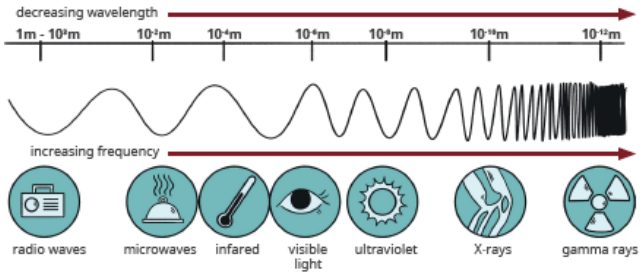
Rayner Stephens High School

STAMFORD PARK TRUST

# AQA GCSE Combined Science Waves **Knowledge Organiser**

## The Electromagnetic Spectrum

Electromagnetic waves are transverse waves. They transfer energy from a source to an absorber. All electromagnetic waves travel at the same speed through a vacuum or air. They are grouped by their wavelength and frequency to form a continuous spectrum.




**Remember:** Roman **M**en **I**nvented **V**ery **U**nusual **X**-ray **G**uns

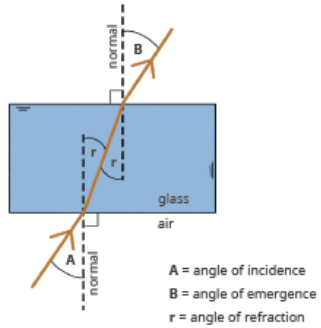
## Properties of Electromagnetic Waves

When a wave moves into a medium with a different density (e.g. from air into glass), the wave changes direction. This is called **refraction**. This can be represented by a ray diagram.

When a wave enters the glass block at an angle to the normal, it bends towards the normal. The angle of refraction is smaller than the angle of incidence. The angle at which the wave leaves the glass block (angle of emergence) is equal to the angle at which it enters the glass block (angle of incidence).

If a wave enters a different medium at 90° (perpendicular) to the boundary, it will not change direction but instead carry on in a straight line.

**(HT only)** Refraction occurs due to the difference in density of the two materials. When a wave moves from a less dense medium to a more dense medium (e.g. from a gas to a solid), it slows down and bends towards the normal. When a wave moves from a more dense medium to a less dense medium (e.g. from a solid to a gas), it speeds up and bends away from the normal.




**A** = angle of incidence
**B** = angle of emergence
**r** = angle of refraction

| Electromagnetic Wave | Uses and Applications | Explanation (HT only) | Extra Information |
|---|---|---|---|
| radio waves | terrestrial television and radio communications | Radio waves can be transmitted over long distances by reflecting them off a layer of the Earth's atmosphere called the ionosphere. | **(HT Only)** Oscillations in electrical circuits can produce radio waves.<br>**(HT Only)** An alternating current can be produced when radio waves are absorbed. |
| microwaves | satellite communication, satellite television, heating food | Microwaves can penetrate the Earth's atmosphere to communicate with satellites. When water molecules absorb microwaves, it causes their internal energy store, and therefore their temperature, to increase. | Microwaves are used in mobile phone communications as well as satellite television. |
| infrared | cooking, thermal imaging camera, electric heaters, short-range communications (remote controls) | Infrared waves cause heating as they are absorbed by matter. Infrared cameras can detect infrared radiation to produce thermal images. | Infrared radiation can cause burns to skin. |
| visible light | vision, fibre optic communication | In fibre-optic cables, pulses of visible light are used to send coded signals over large distances. | The human eye can only detect visible light waves. |
| ultraviolet | energy efficient lamps, sun tanning, detecting forged bank notes, sterilising water | Some chemicals absorb energy from ultraviolet waves and then emit this energy as visible light. This is known as fluorescence. | Absorption of ultraviolet waves by the skin can increase the risk of skin cancer and lead to premature ageing of the skin. |
| X-rays | medical imaging, airport security | X-rays can penetrate soft tissue, such as muscles and skin, but are absorbed by hard structures like bones. | X-ray absorption by human tissues can lead to gene mutation and cancer. |
| gamma rays | sterilising medical equipment, sterilising food, radiotherapy for cancer treatment | Gamma rays are highly penetrating and can easily pass through body tissues. The ionising ability of gamma rays means that they can damage cancerous cells (as well as healthy ones). | Gamma rays are produced by changes in the nucleus of an atom. Gamma ray absorption by human tissues can lead to gene mutation and cancer. |

### Hazards and Risks of Electromagnetic Waves

Ultraviolet waves, X-rays and gamma rays have some risks associated with them.

How dangerous electromagnetic radiation is depends on the type of wave and the dosage.

Radiation dosage is measured in sieverts (Sv) or millisieverts (mSv).

Safe limits of exposure of each type of radiation are known and can be referred to when assessing the risk of using electromagnetic radiation.

Rayner Stephens HIGH SCHOOL

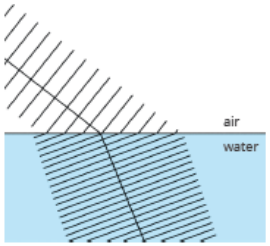
STAMFORD PARK TRUST

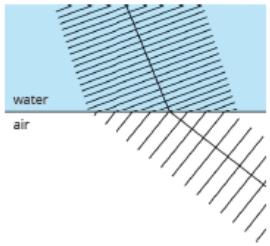
## Properties of Electromagnetic Waves

**(HT Only)** Different substances absorb, reflect, refract or transmit electromagnetic waves in different ways. This may change depending on the wavelength of the electromagnetic wave.

A wave front diagram shows that as a wave moves from a less dense to a more dense medium (e.g. from air into water), at an angle to the normal, it slows down and its wavelength decreases. One side of the wave reaches the more dense medium first, causing the wave to change direction. Although the wavelength decreases, the frequency of the wave remains the same due to its change in speed.

When a wave moves from a more dense medium into a less dense medium, the reverse happens. The wave speeds up and its wavelength increases. The frequency of the wave remains the same.



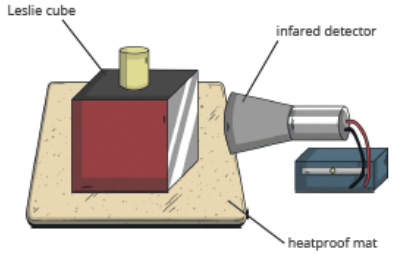




## Required Practical: Radiation and Absorption

Investigate how the nature of a surface affects the amount of infrared radiation absorbed or radiated by that surface.

In this investigation, you are finding out which type of surface emits the most **Infrared** radiation:

- **dark and matt**
- **dark and shiny**
- **light and matt**
- **light and shiny**




Method:

1. Place the **Leslie cube** on a heatproof mat.
2. Boil some water in a kettle, fill the Leslie cube with hot water and put the lid on.
3. Use a thermometer or an **Infrared detector** to measure the amount of infrared radiation emitted from one of the surfaces of the Leslie cube.
4. Repeat the experiment for each surface of the Leslie cube, ensuring that the infrared detector is an equal distance from each surface.

You should find that a dark, matt surface emits much more infrared radiation than a light, shiny surface.

# AQA Combined Science: **Physics Topic 7 Magnetism and Electromagnetism**

## Poles of a Magnet

A magnet has two ends called **poles**: the **north pole** and the **south pole**. The magnetic forces of the magnet are strongest at the poles.


When two magnets are brought close together, they will **attract** or **repel**, depending on which poles are brought together:

- **Like poles** will **repel** one another e.g. N-N or S-S.
- **Opposite poles** will **attract** e.g. N-S.

The forces exerted between the poles of two magnets are a type of **non-contact force**: the magnets do not have to be touching for the effect to be observed.

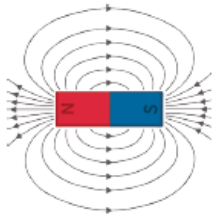
Remember that only **iron**, **cobalt** and **nickel** (or alloys containing these metals) are magnetic.

A **permanent magnet** is one with its own magnetic field. The magnetism cannot be turned on or off e.g. a bar magnet or a horseshoe magnet.

An **induced magnet** is a material which becomes magnetic only when placed within a magnetic field. Induced magnets only attract other materials and lose most (if not all) of their magnetism when removed from the magnetic field e.g. iron filings.

## Magnetic Fields

The **magnetic field** is the area surrounding a magnet where the force is acting on another magnet or magnetic material. It can be observed using a compass placed at different points around a bar magnet. The field lines can be drawn by using the compass to mark the direction at a range of points.




A magnet always causes a magnetic material to be **attracted**. The strength of the magnetic field is determined by the proximity to the magnet.

When looking at a diagram of magnetic field lines, the force is strongest where the lines are closest together. The magnetic field of the magnet is strongest at the poles. The direction of the magnetic field shows the direction the force would act on another north pole.
As a result, magnetic field lines always come away from the north pole (like poles repel) and towards the south pole (unlike poles attract).

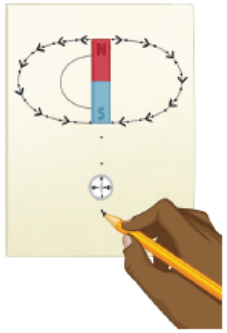

The earth produces a magnetic field and a magnetic compass uses this to help aid navigation. The core of the earth is made of iron (a magnetic material). A compass contains a small bar magnet shaped as a needle, which points in the direction of the earth's magnetic field.

## Plotting Magnetic Field Lines

A magnetic compass can be used to plot and draw the magnetic field lines around a magnet.

You should be able to describe this method for a bar magnet.

1. Place the bar magnet in the centre of a sheet of plain paper.
2. Using a magnetic compass, position it on the paper somewhere around the magnet.
3. Observe the direction of the needle and carefully draw a dot at the circumference of the magnet, in line with each end of the needle. Make sure you include an arrow to indicate the direction of north.
4. Repeat steps 2 and 3 for several positions around the magnet.
5. Join the arrows to complete the magnetic field lines and whole pattern.



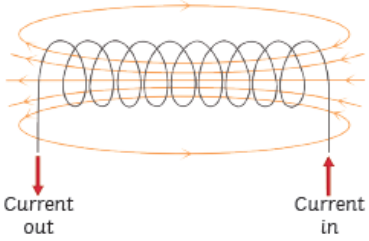

## Electromagnetism

A circular **magnetic field** is produced when a current is passed through a conducting wire. This produces an **induced magnet**.

Switching off the current causes the magnetism to be lost.

The strength of the magnetic field can be increased by increasing the current flowing through the wire. The strength of the magnetic field is stronger closer to the wire.

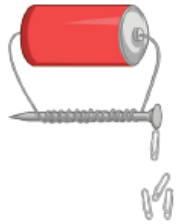
Coiling the wire to form a **solenoid** will also increase the strength of the magnetic field. The strength of the magnetic field created by a solenoid is strong and uniform throughout.




To increase the strength of the magnetic field around a solenoid you can...

- add an iron core;
- increase the number of turns in the coil;
- increase the current passing through the wire.

An **electromagnet** is a solenoid with an iron core. Electromagnets are **induced magnets** and can be turned on and off.



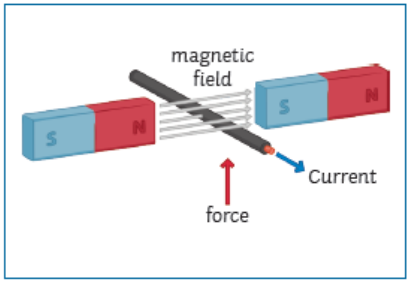
Electric motors, loudspeakers, electric bells and remotely controlled door locks all use **electromagnets**.

Rayner Stephens High School

STAMFORD PARK TRUST

## The Motor Effect and Flemings Left-Hand Rule

When a wire carrying a current is exposed to the magnetic field of another magnet, then a **force** is produced on the wire at a **right angle** to the direction of the magnetic field produced.




This is called the **motor effect**.

The force produced by the motor effect can be calculated using this equation:

**force (N) = magnetic flux density (T) × current (A) × length (m)**

For example:
A current of 8A is flowing through a wire that is 75cm long. The magnetic field acting at a right angle on the wire is 0.5T. Calculate the force.

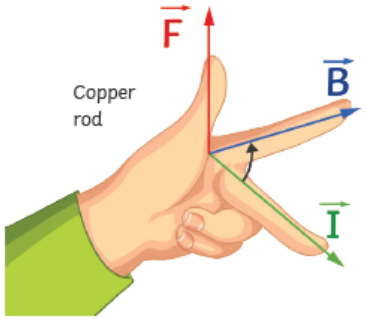
$F = B \times I \times l$

Remember: the equation uses length measured in m. The question gives you the length in cm so you need to convert it before you calculate your answer.

$F = 0.5 \times 8 \times 0.75$

$F = 3N$

From the equation we can see that the force acting on a given length of wire (e.g. 1m) will be increased if the current increases or the magnetic flux density increases. If the current flowing through a wire is **parallel** to the magnetic field, then **no force** is produced – there is no motor effect.



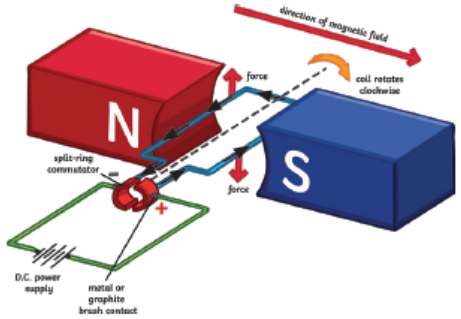

You might be shown a diagram and asked to indicate the direction of the force produced. **Fleming's left-hand rule** can help you do this because it represents the **relative orientation** of the force produced by the motor effect.

Remember:

- Use your **left hand**!
- The angle between your index finger and middle finger should be a **right angle** on the horizontal plane.
- The angle between your index finger and thumb should be a **right angle** on the vertical plane.
- Your **thumb** represents the direction of the **force**.
- Your **index finger** represents the direction of the **magnetic field**.
- Your **middle finger** represents the direction of the **current** flowing through the wire.

## Electric Motors

When the wire carrying the current is **coiled**, the motor effect acting on it causes the wire to **rotate**. This is how an **electric motor** works.




As the **current** flows (from negative to positive), the force produced in each side of the coil acts in **opposite directions**, causing the coil to **rotate** overall.

When the coil reaches a **vertical position**, the force produced is now **parallel** to the magnetic field line and so would be **zero**. This would cause the motor to stop rotating.

To maintain the rotation of the coiled wire, a **split ring commutator** is used to supply the current to the wire. The DC supply reaches the split ring via graphite or metal **brushes** which maintain the connection while allowing it to rotate freely on the **axle**.

The two halves of the split ring commutator ensure that the **current supplied** to the wire **changes direction** each half-turn (or that the current supplied is the same direction on each side of the motor) and as a result, the force produced maintains a **constant rotation** in one direction overall.

# Topic 3
# Distinctive Landscapes

## What is a landscape?

A landscape has visible features that make up the surface of the land. Landscapes can be broken down into four 'elements'.

**Landscape Elements**

| Physical | Biological |
|---|---|
| • Mountains<br>• Coastlines<br>• Rivers | • Vegetation<br>• Habitats<br>• Wildlife |
| **Human** | **Variable** |
| • Buildings<br>• Infrastructure<br>• Structures | • Weather<br>• Smells<br>• Sounds/Sights |

## Relief of the UK

Relief of the UK can be divided into uplands and lowlands. Each have their own characteristics.

Key

Lowlands

Uplands

**Areas +600m: Peaks and ridges cold, misty and snow common. i.e. Scotland**

**Areas -200m: Flat or rolling hills. Warmer weather. i.e. Fens**

## 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 dissolved 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. |

## 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. |

## Glaciation in the UK

Over many thousands of years, glaciation has made an impression on the UK's landscape. Today, much of upland Britain is covered in u-shaped valleys and eroded steep mountain peaks.

**During the ice age**

Ice covered areas eroded and weathered landscapes to create dramatic mountain scenery.

**After the ice age**

Deep valleys and deposition of sediment revealed

## Geology of the UK

The UK is made from a variation of different rock types. The varied resistance of these rocks influences the landscape above.

**Igneous Rock**
Volcanic/molten rock brought up to the Earth's surface and cooled into solid rock.

**Sedimentary Rock**
Made from broken fragments of rock worn down by weathering on Earth's surface.

**Metamorphic Rock**
Rock that is folded and distorted by heat and pressure.

## Soil & Landscape

- Soils are created from weathered rocks, organic material and water. Rock types have influence over fertility of soil.
- Low-laying areas such as the Cambridgeshire Fens have deep soil whereas uplands have thin soil.
- Deep soil is more often associated with deciduous woodland rather than coniferous woodlands.

## Human activity on Landscape

| | | |
|---|---|---|
| **Farming has changed the vegetation which grows there.** | **Much of the rural landscape has been replaced by urban sprawls.** | **Infrastructure such as roads and pylons cover most of the UK.** |
| **Over thousands of years, much of the UK's woodlands have gone.** | **Increasing population of the UK means more houses are needed.** | **UK's marshes and moorlands are heavily managed by people.** |

## Climate and Weather in the UK

The variations of climate and weather means there are different influences on the UK's landscape.

### Climate

The rainfall map of the UK shows variations in average rain.

- **Less** precipitation occurs in low land areas. East England
- **Most** precipitation occurs in upland areas. Scotland.

***These differences mean…***
Uplands experience more weathering, erosion and mass movement.

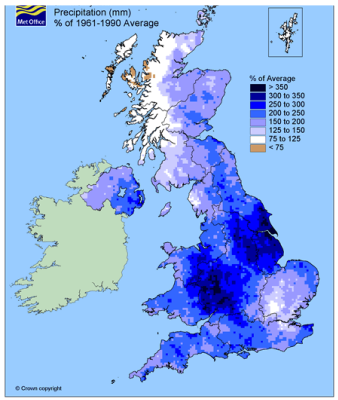
### Weathering

**Mechanical**
Caused by the physical action of rain, frost and wind.

**Chemical**
Action of chemicals within rain dissolving the rock.

**Biological**
Rocks that have been broken down by living organisms.

## Average rainfall in the UK

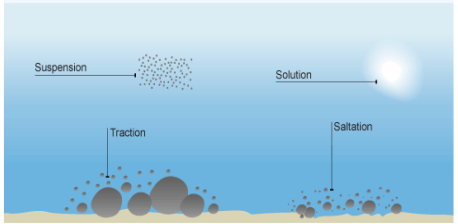



## Freeze-thaw weathering

**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.

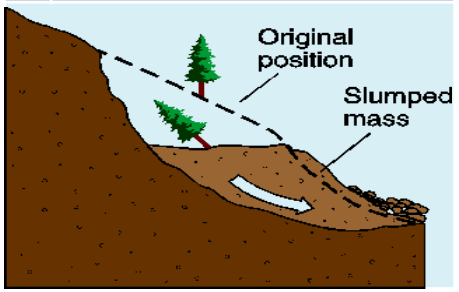
**Stage Three**
With repeated freeze-thaw cycles, the rock breaks off.




## 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.**

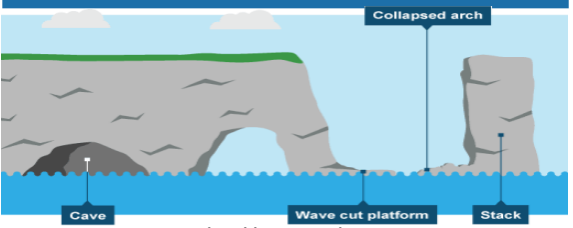
| | |
|---|---|
| 1 | Rain saturates the permeable rock above the impermeable rock making it heavy. |
| 2 | Waves or a river will erode the base of the slope making it unstable. |
| 3 | Eventually the weight of the permeable rock above the impermeable rock weakens and collapses. |
| 4 | The debris at the base of the cliff is then removed and transported by waves or river. |



## 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 Coastal Stack




Example: Old Harry Rocks, Dorset

1) Hydraulic action widens cracks in the cliff 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.<br>✗ 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<br>✓ Protects from flooding<br>✗ Curved shape encourages erosion of beach deposits. |
| Gabions or Rip Rap | Cages of rocks/boulders absorb the waves energy, protecting the cliff behind. | ✓ Cheap<br>✓ Local material can be used to look less strange.<br>✗ Will need replacing. |

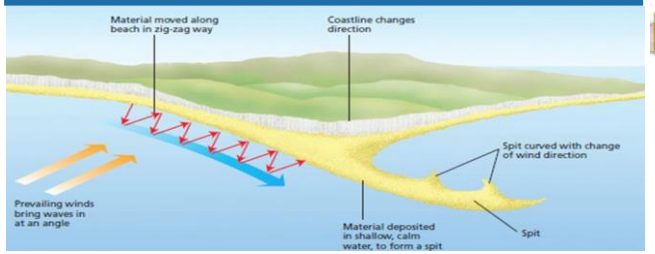
### Soft Engineering Defences

| | | |
|---|---|---|
| Beach Nourishment | Beaches built up with sand, so waves have to travel further before eroding cliffs. | ✓ Cheap<br>✓ Beach for tourists.<br>✗ Storms = need replacing.<br>✗ Offshore dredging damages seabed. |
| Managed Retreat | Low value areas of the coast are left to flood and erode naturally. | ✓ Reduce flood risk<br>✓ Creates wildlife habitats.<br>✗ Compensation for land. |

## Formation of Bays and Headlands


1) Waves attack the coastline.
2) Softer rock is eroded by the sea quicker forming a bay, calm area cases deposition.
3) More resistant rock is left jutting out into the sea. This is a headland and is now more vulnerable to erosion.

## Formation of Coastal Spits - Deposition



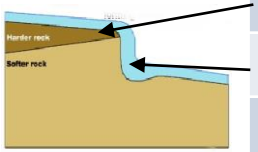

Example: Spurn Head, Holderness Coast

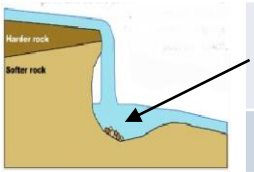
1) Swash moves up the beach at the angle of the prevailing wind.
2) Backwash moves down the beach at 90° to coastline, due to gravity.
3) Zigzag movement (Longshore Drift) transports material along beach.
4) Deposition causes beach to extend, until reaching a river estuary.
5) Change in prevailing wind direction forms a hook.
6) Sheltered area behind spit encourages deposition, salt marsh forms.

## Upper Course of a River

Near the source, the river is 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



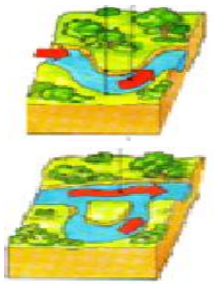




1) River flows over alternative types of rocks.
2) River erodes soft rock faster creating a step.
3) Further hydraulic action and abrasion form a plunge pool beneath.
4) Hard rock above is undercut leaving cap rock which collapses providing more material for erosion.
5) Waterfall retreats leaving steep 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.

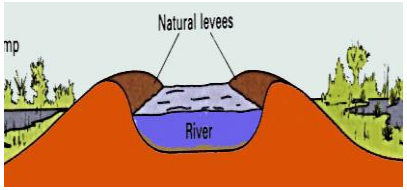
## Lower Course of a River

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

**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.

### Hard Engineering

**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.

## Case Study: The Holderness Coast

**Location and Background**
Located along the North-East coast in the county of Yorkshire. The coast extends 50km from Flamborough Head to Spurn Head.

**Geomorphic Processes**
-Flamborough Head is made from more resistant chalk. Features: wave-cut platforms, caves and stacks
-South from Flamborough Head the less resistant boulder clay is dominate. This coasts erodes 1.8m per year and is the fastest in Europe. Cliff slumping can be evident.
-Further south, Spurn Head is a coastal spit created by continual deposition from LSD that extents out to sea.

**Management**
-Rapid erosion means there are a number of different management schemes from soft to hard engineering.
-High population centres such as Withersea and Horsea are protected by 'hold the line' defence measures such as sea walls, groynes & heavy beach nourishment.
-Underpopulated & economic centres, such as farmland, are under 'managed retreat' schemes.

## Case Study: The River Tees

**Location and Background**
Located in the North of England 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 reduce impact from flooding.

# Year 11 Drama Autumn Term 1 Knowledge Organiser

## Component 3: Responding to a brief

### Responding to a brief

**A Brief:** Will be the assignment overview given to us by the exam board.
**Theme**: This will be the focus of the devised performance/workshop

### Key Knowledge

Creating devised work using a theme allows you to produce a piece of imaginative theatre that can relate to your age group and include your own thoughts and opinions. The intention can be to inform, educate and even shock!

### Key Language

**Theme:** The topic of the piece
**Staging**: Where actors and set are in the space.
**Lighting**: To create mood and atmosphere: Angle, intensity, position.
**Costume:** To develop character
**Characterisation**: Use of vocal and physical skills.
**Style:** The way it is presented
**Moral:** Message for the audience
**Sound:** To create mood and atmosphere: Pitch, tempo, Rhythm.
**Target Audience:** Specific age and focus for performance content

### Key Skills

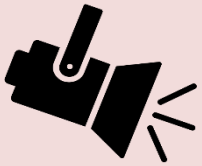
Fiction reading
Script writing
Creative thinking
Responding to a stimulus.
Performance skills/techniques.

### Rehearsal Skills

**Devising**: is a method of theatre - making in which the performance originates from collaborative, often improvisatory work by a performing ensemble.
**Researching:** Collecting evidence for the content and moral of a performance; Includes facts, interviews and personal thought.

### Props, Costume, sound and lighting effects.

Lighting



Character

Atmosphere

# Year 11 Drama Autumn Term Knowledge Organiser

## Component 3: Responding to a Brief

### Performance Keywords

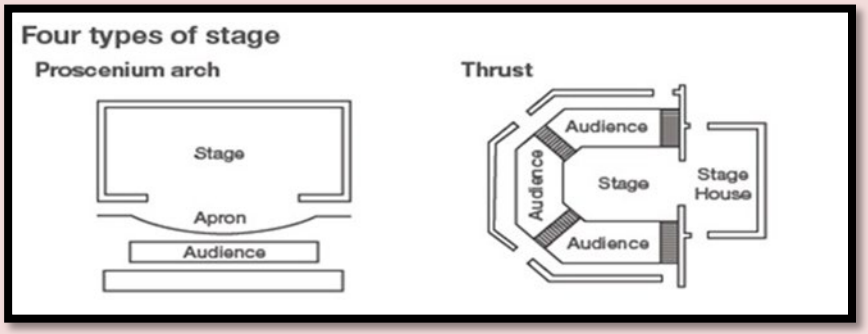
**Mime**: Movement/copying physical action
**Slow-motion:** The slowing down of real-life speed to highlight a key moment.
**Improvisation:** Create spontaneously or without preparation
**Atmosphere:** The mood or feeling of a narrative.
**Climax** (Peak of Tension): The highest point of suspense, where danger, uncertainty is at its greatest.
**Pace**: The speed at which the story is delivered, or with which something happens or changes
**Tone:** A quality in the voice which expresses the speaker's feelings or thoughts.
**Pause:** A short period in which something such as a sound or activity is stopped before starting again.
**Facial Expressions** – matches the character's feelings/emotions
**Body Language** – over exaggerated to create identifiable characters to a young audience
**Gestures** – Exaggerated hand movements
**Levels** – Status, power, relationships
**Voice** – clear use of voice using relevant vocabulary.

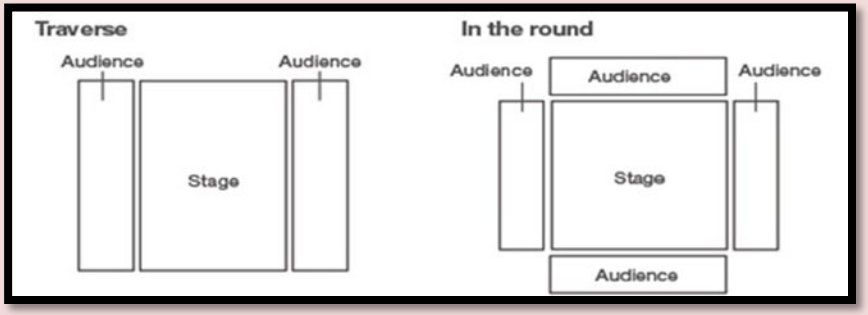
### Staging Positions

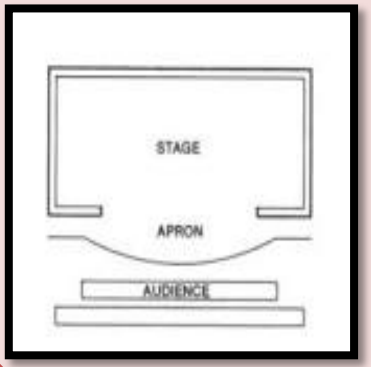
# Year 11 Drama Autumn Term Knowledge Organiser

## Component 3: Responding to a brief

### Staging Positions




Where the audience sit effects their involvement and perspective of either naturalistic or stylised performances.

### Rehearsal Techniques

**Hot seating** – answering questions in character Improvisation.

**Conscience alley** – The cast makes two lines and one actor walks down the middle, listening to advice.

**Thought tracking** – saying what your character would be thinking at any moment.

**Role on the wall** – a drawn outline of your character, filled-in with information from the play

# Year 11 BTEC Sport; Unit 6 Leading Sports Activities Autumn Term Knowledge Organiser

## Sport Leaders

| | | |
|---|---|---|
| 1 | **Types**<br>  <br> | This can be anyone who leads a sport or an activity. For example, sports coaches, fitness instructors, dance teachers, local/professional club coaches. |
| 2 | **Attributes**<br>  <br>  | These are **key skills** that coaches must have in order to be successful at sports leading. For example, communication, organisation of equipment and knowledge. **Advanced skills** also include activity structure, target setting, use of language, evaluation.<br>**Qualities** of the coach should also be considered which include things such as appearance, enthusiasm, confidence, leadership style, motivation, humour, personality. |
| 3 | **Responsibilities**<br>  <br>  <br> | **Core responsibilities** include professional conduct, health and safety, equality.<br><br>**Wider responsibilities** include insurance, child protection, legal obligations, ethics and values, rules and regulations. |

## My sports session checklist

| | | |
|---|---|---|
| 4 | **Leading** | When leading it is important to demonstrate key attributes so that you are seen a positive role model. |
| 5 | **Measure of success** | As a leader, you need to ensure that you plan well using of the STEP principles.<br><br>You will also need to check whether the aims and objectives have been met that were set out at the beginning of the session.<br>As a leaders you will also consider how safe and inclusive the session was. |
| 6 | **Targets for development** | SMARTER targets (specific, measurable, achievable, realistic, time-related, exciting, recorded).<br>Development plan which includes aims and objectives, goals, SMARTER targets, activities and opportunities,<br>e.g. training, courses, qualifications and possible barriers. |
| 7 | **Review** | Feedback from participants, supervisor, observers, self-analysis.<br>Methods, e.g. questionnaires, comment cards, observation records, direct verbal feedback.<br>Strengths and areas for improvement (demonstration of attributes, completion of responsibilities, e.g. planning, content, organization, health and safety, communication, target setting, enjoyment). |

## Planning Sports Activities

| | |
|---|---|
| 8 | **Participants information** e.g. age, ability, gender, numbers, medical and specific needs.<br><br>**Aims and objectives**, e.g. target setting, expected outcomes.<br><br>**Resources,** e.g. equipment, time, environment.<br><br>**Warm-up**,<br>• Pulse raiser: activities that can be used to gradually increase the pulse rate.<br>• Mobilise: activities to mobilise the main joints of the body such as knees, hips, shoulders, ankles and wrists.<br>• Stretching (different types of stretches for the main muscles used in sports activity sessions – deltoids, triceps, obliques, quadriceps, hamstrings, gastrocnemius).<br><br>**Main component/components of activity**, e.g. skill introduction, development, conditioned game, final activity. Incorporate safe activities to minimise injury.<br><br>**Cool down** and pulse lowering: activities that gradually decrease in intensity.<br>• Followed by maintenance and developmental stretches with the main muscles that were used in the activity session, including deltoids, biceps, triceps,, abdominals, obliques, hip flexors, gluteus maximus, quadriceps, hamstrings, gastrocnemius.<br><br>**Health and safety** considerations: adhere to health and safety guidelines, and consider appropriate risk management strategies via a risk assessment. |

# Early Elizabethan England: Queen, government and religion 1558-1569
# Year 11 Knowledge Organiser

| Subject: GCSE History – Edexcel 9-1 | Unit Title: Early Elizabethan England: Queen, government and religion 1558-1569 |
|---|---|

**Summary of content:**
**In this topic I will study the main challenges that Elizabeth I faced following her accession to the throne in 1558. I will look in detail at the society of England and the nature of Elizabeth's government. I will then investigate the threats she faced from abroad and different religious groups at home.**

| Learning focus | What do I need to know? |
|---|---|
| **The situation on Elizabeth's accession** | 1. Elizabethan society and government 2. Elizabeth's initial problems and character – legitimacy, gender and marriage, financial weaknesses |
| **Religion and foreign threats** | 1. Religious divisions in England and Elizabeth's religious settlement. 2. The Church of England: its role in society. 3. The nature and extent of the challenge to the religious settlement from the Puritans and the Catholics. 4. Mary, Queen of Scots – her claim to the throne and arrival in England. |

## Timeline

1558 – Elizabeth becomes Queen Elizabeth I after the death of her sister Mary. England is in an expensive war with France.

1559 – The religious settlement – including both the Act of Supremacy and the Act of Uniformity. **Mary, Queen of Scots becomes the Queen of France**.

1562 – Religious war breaks out in France.

1567 - Mary, Queen of Scots is forced to abdicate the Scottish throne.

1568 – Mary, Queen of Scots arrives in England

## Individuals

Elizabeth I – Queen of England from 1558 until

Pope – Leader of the Catholic Church and seen as God's representative on earth.

Mary, Queen of Scots – Catholic queen of Scotland. Elizabeth's cousin and heir to the throne.

William Cecil – Chief advisor to Elizabeth. Severed as Secretary of State from 1558-1572 and then in charge of the Treasury until his death in 1598.

| Terminology | Definition |
|---|---|
| Accession | The attainment of a position of rank or power. |
| Hierarchical | A system in which members are ranked according to status or authority. |
| Parliament | The law making body in England – consisting of the monarch, the House of Lords and the House of Commons. Elizabeth decided when to call Parliament. |
| Privy Council | A group of 19 ministers who were appointed by Elizabeth to advise her. Led by the Secretary of State. |
| Illegitimate | A child born to parents who are not lawfully married to each other. |
| Catholic | A member of the Roman Catholic Church, a religion headed by the Pope |
| Protestant | A member of any of the Churches that separated from the Catholic Church. |
| Puritans | Extreme Puritans who wanted the Protestant Church purified of all Catholic practices. |
| Act of Supremacy | The Act which made Elizabeth Head of the Church. |
| Act of Uniformity | This Act specified how Church services had to be practiced throughout England. |
| Clergy | People who have been trained and approved for carrying out religious services. |

| Target progress range: | Dev (3-5) | Adv (4-6) | Ma (7-9) |
|---|---|---|---|
| Progress range shown in classwork: | Dev (3-5) | Adv (4-6) | Ma (7-9) |

# Early Elizabethan England: Challenges to Elizabeth at home and abroad 1569-1588
# Year 11 Knowledge Organiser

| Subject: GCSE History – Edexcel 9-1 | Unit Title: Early Elizabethan England: Challenges to Elizabeth at home and abroad 1569-1588 |
|---|---|
| **Summary of content:**<br>**In this topic will study the many different challenges Elizabeth faced. I will first look at the different rebellions and plots that tried to remove Elizabeth from power within England, and why each one failed. I will then learn about the difficult relationship with Spain that led to the Armada in 1588.** | |
| **Learning focus** | What do I need to know? |
| **Plots and revolts at home** | 1. Causes and significance of the Revolt of the Northern Earls 2. Features and significance of the Ridolfi, Throckmorton and Babington plots. 3. Walsingham and the use of spies. 4. The reasons for, and significance of, Mary, Queen of Scots execution |
| **Relations and war with Spain** | 1. Reasons for the poor relationship with Spain: Political, religious and commercial rivalry. The New World, privateering and the significance of Drake. 2. Importance of the English involvement in the Netherlands and the role of Robert Dudley. 3. The raid on Cadiz 4. Spanish invasion plans. The reasons, and consequences of, the English victory. |

## Timeline

1569 – Revolt of the Northern Earls – led by the Catholic Dukes of Norfolk, Northumberland and Westmoreland.

1570 – Pope Pius V excommunicates Elizabeth.

1571 – The Ridolfi Plot

1573 – Francis Walsingham sets up a network of spies and informers across England

1583 – The Throckmorton Plot

1585 – The Treaty of Nonsuch is signed where Elizabeth promises to send an army to help the Dutch who are fighting a war against Spain.

1586 – The Babington Plot. In this year Philip II also begins building his Armada.

1587 – Mary, Queen of Scots is executed. In this year Drake also launches his raid on Cadiz where 30 Spanish battleships are sunk.

1588 – Spain sends the Armada to invade England. Defeated in the same year.

| | | | |
|---|---|---|---|
| Target progress range: | Dev (3-5) | Adv (4-6) | Ma (7-9) |
| Progress range shown in classwork: | Dev (3-5) | Adv (4-6) | Ma (7-9) |

## Individuals

Roberto Ridolfi – Italian banker involved the Revolt of the Northern Earls and the Ridolfi Plot. He had connections with senior Catholics across England and Europe.

Francis Throckmorton – Catholic who plotted against Elizabeth. He met many of Mary's agents while living abroad. Executed in July 1584.

Anthony Babington – Catholic involved in a failed plot against Elizabeth in 1586. Captured and executed in the same year.

Francis Walsingham – Chief advisor to Elizabeth and served as Secretary of State from 1573 until his death in 1590. Also known as Elizabeth's 'Spymaster'.

King Philip II – Catholic king of Spain who reigned between 1556-1598. Was married to Elizabeth's sister (Mary I) between 1554-1558.

Francis Drake – A sea captain, privateer and slave trader. Disrupted the Spanish invasion plans and then was involved in the defeat of the Armada.

Lord Howard – English nobleman who became Lord High Admiral in 1585. He commanded all of the naval forces during the Armada.

Robert Dudley – Commanded English forces in the Netherlands for Elizabeth from 1585.

| Terminology | Definition |
|---|---|
| Excommunication | Expulsion from the Roman Catholic Church. |
| Recusant | A person who refuses to submit to an authority or comply with a regulation. In this topic it refers to Catholics who refused to take part in Protestant Church services or accept the religious settlement. |
| Cipher | A code used in writing to conceal its meaning. |
| Double agent | An agent who pretends to act as a spy for one country or organisation, while in fact acting on behalf of an enemy. |
| Ambassador | An official sent by one ruler or state to another to be its representative there. |
| Commerce | Trading goods between different countries. |
| New World | Name given to North and South America after their discovery in the late 1400's. |
| Privateers | Sailors whose ships were authorised by a government during wartime to attack and capture enemy vessels. |
| Cadiz | Spanish port in the south of the country. This was the main naval base for the Spanish Empire. |
| Armada | Spanish term for a fleet of warships. |

# Early Elizabethan England: Elizabethan society and exploration 1558-158
# Year 11 Knowledge Organiser

| Subject: GCSE History – Edexcel 9-1 | Unit Title: Early Elizabethan England: Elizabethan society and exploration 1558-158 |
|---|---|

**Summary of content:**
**In this topic will study Elizabethan society in depth. I will investigate education and leisure at the time, as well as the growing problem of poverty at the time. I will also learn about the growth in exploration during this period and the beginnings of the English settlement of the Americas.**

| Learning focus | What do I need to know? |
|---|---|
| **Elizabethan society** | 1. Education in the home, schools and universities. 2. Sport, pastimes and the theatre. 3. The reasons for the increase in vagabondage during these years. 4. Changing attitudes and policies towards the poor. |
| **Exploration, discovery and Virginia** | 1. Factors prompting exploration – including new technology and trade. 2. The reasons for, and significance of, Drake's circumnavigation of the world. 3. The significance of Raleigh and the attempted colonisation of Virginia, including reasons for the failure of the colonies. |

| | | | |
|---|---|---|---|
| Target progress range: | Dev (3-5) | Adv (4-6) | Ma (7-9) |
| Progress range shown in classwork: | Dev (3-5) | Adv (4-6) | Ma (7-9) |

## Timeline

1563 – Act for the Relief of the Poor is introduced.

1570 – Inflation begins to increase in England.

1572 – Vagabonds Act is introduced.

1576 – Act for the Relief of the Poor is updated.

1577-1580 – Drake's circumnavigation of the world.

1585 – First settlement of Virginia. Starving colonists rescued in 1586.

1587 – Second attempt to settle Virginia. No trace left of the settlers in 1590.

## Individuals

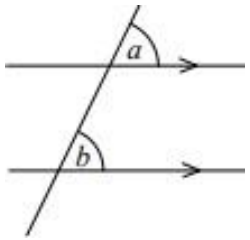
Walter Raleigh - nobleman, author and explorer. Responsible for organising the expeditions to Virginia.

| Terminology | Definition |
|---|---|
| Reformation | The movement in the 16th Century to change (reform) the Catholic Church. Led to the establishment of Protestantism. |
| Renaissance | Name given to the period of great learning from the late 1400's until the 1600's. |
| Leisure | The name given to the time when people are not working or occupied. Free time. |
| Illiterate | Unable to read and write. |
| Etiquette | The standard code of polite behaviour in society. |
| Mystery Plays | Plays based on the Bible or stories of the saints. Very popular before the Reformation. |
| Vagabonds | A person who wanders from place to place without a home or a job. |
| Inflation | The general increase in prices and the fall in the value of money. |
| Dissolution of the monasteries | The closing down of the monasteries in England by Henry VIII in the 1530's. |
| Social mobility | Term used to describe your ability to change your position in society. |
| Deserving poor/Idle poor | Deserving poor were those who needed help and support (the old, the infirm) while idle poor were those |
| Justices of the Peace (JPs) | Land owners who were responsible for law and order in their local area. |
| Astrolabe | An instrument used by sailors to calculate their position using the stars. |
| Empire | A group of countries or states controlled by a single more powerful country. |
| Colony | The name given to each individual country or state in an empire. Gaining control over the people of an area is called colonisation. |

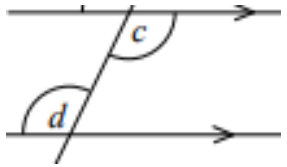
# Year 11 Autumn Term Knowledge Organiser for Maths

## Angles in Parallel Lines

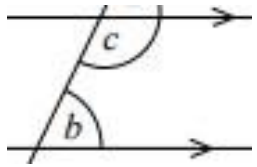
Corresponding
Corresponding angles are equal, a = b.




Alternate
Alternate angles are equal, c = d.



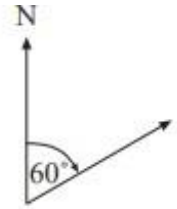

Co-Interior
Co-interior angles add up to 180.




b + c = 180°.

## Bearings

Bearings
Start at North.
Go clockwise.
Have 3 figures.

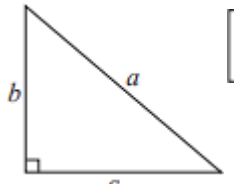



Bearing 060 °


Bearing 330 °

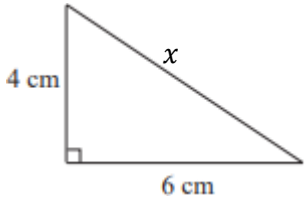
## Pythagoras

Pythagoras Theorem can be used to find missing sides of right-angled triangles.



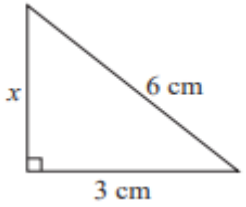

$$a^2 = b^2 + c^2$$

Pythagoras – finding the hypotenuse:




$$x^2 = 4^2 + 6^2$$
$$x^2 = 52$$
$$x = \sqrt{52}$$
$$x = 7.2cm$$

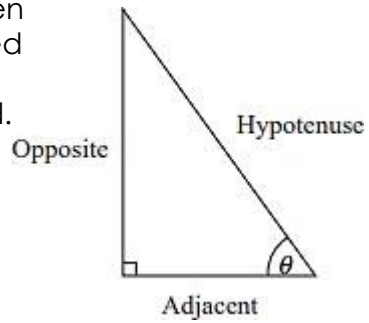
Pythagoras – finding the shorter side:




$$6^2 = x^2 + 3^2$$
$$6^2 - 3^2 = x^2$$
$$x^2 = 27$$
$$x = \sqrt{27}$$
$$x = 5.2cm$$

## Trigonometry

Trigonometry is used when angles need to be considered.

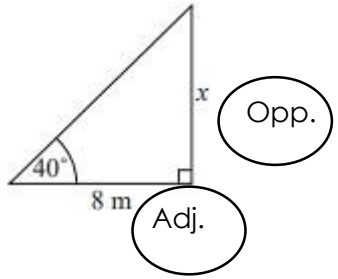



$$Sin\theta = \frac{opposite}{hypotenuse}$$

$$Cos\theta = \frac{adjacent}{hypotenuse}$$

$$Tan\theta = \frac{opposite}{adjacent}$$

Trigonometry – Finding a missing side:




$$Tan\theta = \frac{opposite}{adjacent}$$

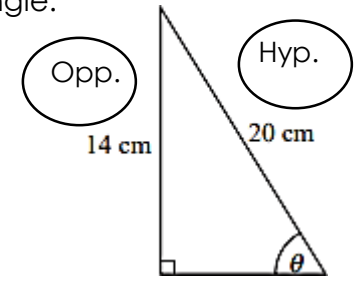
$$tan40° = \frac{x}{8}$$

$$8tan40° = x$$

$$x = 8tan40°$$

$$x = 6.7\ metres\ to\ 1\ dp$$

Trigonometry – Finding a missing angle:




$$Sin\theta = \frac{opposite}{hypotenuse}$$

$$Sin\theta = \frac{14}{20}$$

$$\theta = sin^{-1}\left(\frac{14}{20}\right)$$

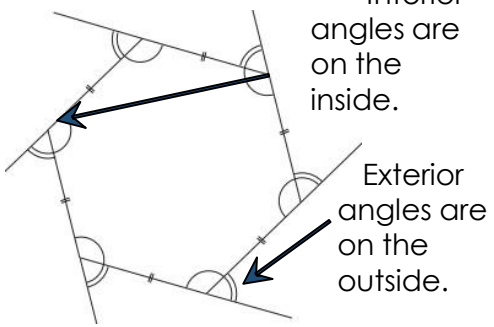
Using 'shift' and 'sin; for 'sin$^{-1}$' gives…

$$\theta = 44.4°\ to\ 1\ dp$$

# Year 11 Autumn Term Knowledge Organiser for Maths

## Angles in Polygons

Interior and Exterior Angles



Interior angles are on the inside.

Exterior angles are on the outside.

The Sum of Interior and Exterior Angles

Interior and exterior angles always add up to $180^0$

Remember angles on a straight line add up to $180^\circ$

The Sum of all Interior Angles

Sum of Interior Angles = (n – 2) x 180

Where n is the number of sides.

The Sum of all Exterior Angles

Sum of Exterior Angles = $360^\circ$

## Area and Circumference of a Circle

Area of a Circle

Area = $\pi \times r^2$


Example:

Area = $\pi \times 5^2$

$= \pi \times 25$

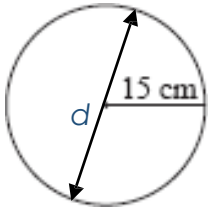
$= 78.5cm^2$

Circumference of a Circle

Circumference = $\pi \times d$

Example:

Diameter = radius x 2




C = π x 30

= π x 30

= 94.2cm

## Standard Form

Standard Form is used to write large and small numbers concisely.

In standard form, numbers are written as

$a \times 10^n$

where $1 \leq a < 10$ and $n$ is an integer.

Large Numbers

Large numbers are written like this…

$$473\,000 = 4.73 \times 100000$$

$$= 4.73 \times 10^5$$

Small Numbers

Small numbers are written like this…

$$0.000621 = \frac{6.21}{10000}$$

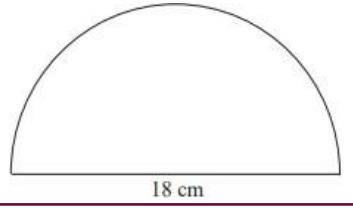
$$= \frac{6.21}{10^4}$$

$$= 6.21 \times 10^{-4}$$

## Area and Perimeter of Circle Parts

Area and Circumference of a Semi-Circle

Work out the values for a full circle first…




Area Example:

Full Circle Area

= π x $9^2$

= π x 81

= 81π

Area

= ½ x 81π

= $127.2cm^2$

Perimeter Example:

Full Circle Circumference

= π x 18 = 18π

Semi-Circle Perimeter

= ½ x 18π = 9π

Add the straight side…

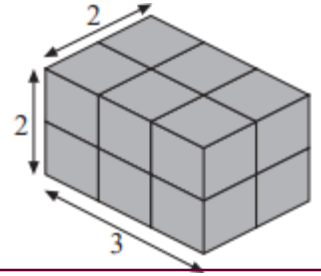
= 9π + 18 = 46.3cm

## Volume and Surface Area

Volume of a Prism

Volume =

Area of the cross section x depth




V = 2x3 x 2

= 6 x 2

= $12units^3$

Volume of a Triangular Prism

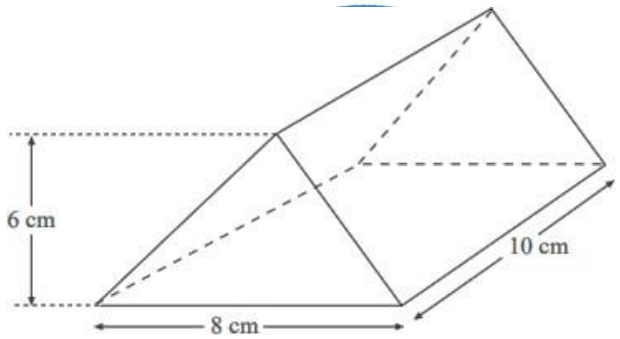
Volume =

Area of the cross section x depth

$V = \frac{6 \times 8}{2} \times 10$

$= 24 \times 10$

$= 240units^3$




Surface Area - Surface area is the total area of all the faces.

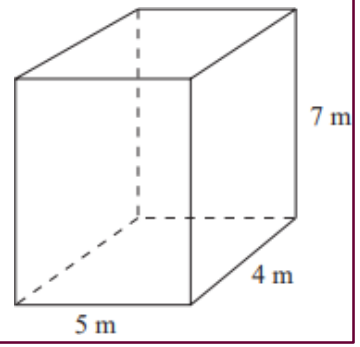
6 Faces

5x7 x 2 = $70m^2$ (front/back)

4x7 x 2 = $56m^2$ (left/right)

5x4 x 2 = $40m^2$ (top/bottom)

Total = $166m^2$



# Year 11 Autumn Term Knowledge Organiser for Maths

## Averages

### The Mean

5, 6, 2, 4, 7, 8, 3, 5, 6, 6

Add up the data and then share it out…

$$\frac{5+6+2+4+7+8+3+5+6+6}{10}$$

$$= \frac{52}{10} \quad = 5.2.$$

### The Median

5, 6, 2, 4, 7, 8, 3, 5, 6, 6

Order the number and find the middle…

2, 3, 4, 5, 5, 6, 6, 6, 7, 8

There are two middle values so find half-way between…

$$\text{median} = \frac{5+6}{2} \quad = \frac{11}{2}$$

$$= 5.5.$$

### The Mode

5, 6, 2, 4, 7, 8, 3, 5, 6, 6

The mode is the most common = 6

### The Range

5, 6, 2, 4, 7, 8, 3, 5, 6, 6

The range is not an average, it measures how spread out the data is…

Biggest – Smallest = 8 – 2 = 6

### The Mean From Frequency

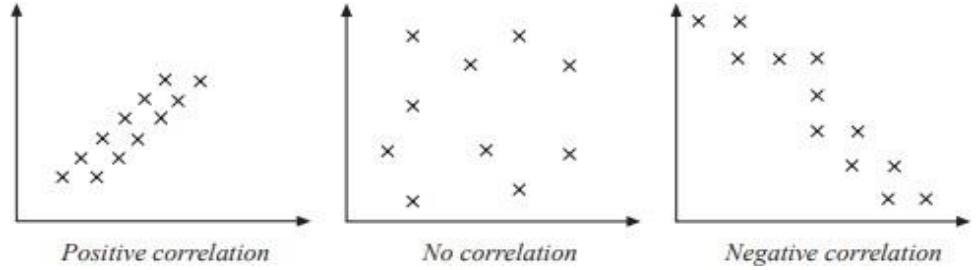
| *No. of Goals* | *Frequency* | *No. of Goals × Frequency* |
|---|---|---|
| 0 | 8 | 0 × 8 = 0 |
| 1 | 10 | 1 × 10 = 10 |
| 2 | 12 | 2 × 12 = 24 |
| 3 | 3 | 3 × 3 = 9 |
| 4 | 5 | 4 × 5 = 20 |
| 5 | 2 | 5 × 2 = 10 |
| **TOTALS** | **40** | **73** |

$$\text{Mean} = \frac{73}{40}$$

$$= 1.825$$

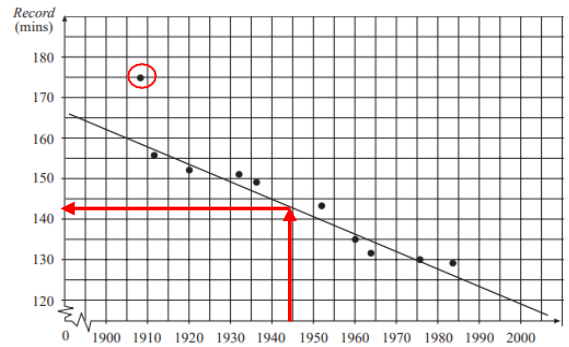
## Scatter Graphs

Correlation – the three types of correlation…




Line of Best Fit – This graph shows Olympic records for marathon runs since 1900 with a line of best fit added. The line of best fit should go through the middle of the points with roughly the same number of points above as there are below. Anomalies, known as outliers – like the point circled – can be ignored.

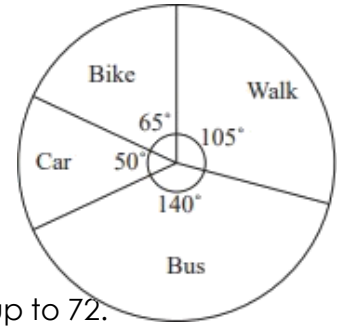
Using the line of best fit, we can estimate the record in 1945 was 143mins.




## Pie Charts

### Pie Charts - Reading

This pie chart shows how 72 people travel.




$\frac{360°}{72} = 5°$ per child. This means…

$\frac{65°}{5°} = 13$ children travel by bike.

Work out the rest. Check they add up to 72.

### Pie Charts – Drawing

This is how a student spends their pocket money.

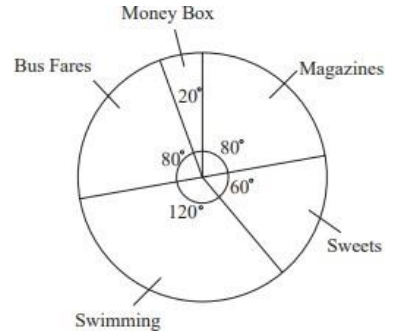
| | |
|---|---|
| Magazines | £4 |
| Sweets | £3 |
| Swimming | £6 |
| Bus fares | £4 |
| Money box | £1 |

The total is £18, and…

$$\frac{360°}{18} = 20°$$

… so each pound gets $20^0$

| | |
|---|---|
| Magazines | 4 × 20° = 80° |
| Sweets | 3 × 20° = 60° |
| Swimming | 6 × 20° = 120° |
| Bus fares | 4 × 20° = 80° |
| Money box | 1 × 20° = 20° |



# Y11 Design Technology Knowledge Organiser

**Sustainability:** Sustainability is the ability to meet the needs of the present without compromising the ability of future generations to meet their own needs.

## THE 6Rs

**Consumers** have a **responsibility** to consider their impact on the planet through the choices they make and the products they buy. **Designer** have a **responsibility** to create products that are sustainable. This reduces the burden on the earth's natural resources to help protect the environment for future generation.

## Example - Car

**Recycle**: Breaking down or melting a car and using it to make a new one.

**Reuse**: This is better than recycling because you don't have to use energy.

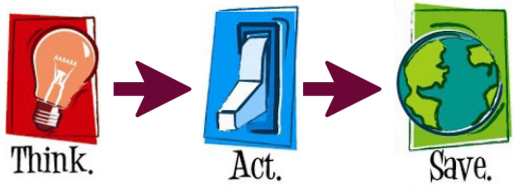
**Repair**: Mending parts so that they last longer.

**Refuse**: Not accepting aspects of a design that are bad for the environment.

**Reduce**: Designing a car which use a smaller amount of raw material.

**Refuse:** Not accepting aspects of a design that are bad for the environment.

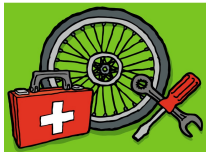

**Rethink:** Do we make too many products? Design in a way that considers people and the environment.




**Reduce:** Designing products which use a smaller amount of raw material.


**Reuse:** Using an object again. This is better than recycling because you don't have to use energy.


**Repair:** Mending parts so that they last longer.



**Recycle:** Breaking down or melting an object and using it to make a new one.

# KS4 Design Technology Knowledge Organiser

## Key Vocabulary

### Sustainability

Anthropometrics
Ergonomics
Computer Aided Design (CAD)
Computer Aided Manufacture (CAM)
MDF
Man-made boards
Laser cutting
Profile
Interlocking
Knock-down
Interference Fit
Standard components
Inclusive Design
Stereotype
Traditional
Feature
Nesting
Accuracy
Repeatability
Tolerance
Dimension
Finger joint
Adjustment

## DESIGN PROCESS


## Evaluating

This should include one from the users and one from the designer.

Think about the following to produce a user questionnaire and your own depth product evaluation.

- Strengths
- Weaknesses
- Matching specification
- Meeting the needs of client
- Materials
- Quality of manufacture
- Overall success of product
- Client product testing and review
- Suggestions for modifying

## Health and Safety

**Remove any jewellery and tie back long hair.** **Wear an apron and roll up your sleeves.** **Walk safely and calmly around the classroom/ workshop.** **Keep your work area and floor area clear.** **Make sure that you are wearing the correct equipment for tasks.** **Report all spillages and clean up properly after yourself**

# Mi ciudad

Places in town | Town descriptions | Activities | Shops

## My city

**En mi ciudad/pueblo hay**… - In my city/town there is…

**Mi ciudad/pueblo tiene**… - My city/town has…

**un ayuntamiento** – a town hall
**un bar/muchos bares** – a bar/lots of bars
**un castillo (en ruinas)** – a (ruined) castle
**un cine –** a cinema
**un mercado** – a market
**una piscina** – a swimming pool
**un supermercado** – a supermarket
**una playa** – a beach
**un museo** – a museum
**una plaza mayor** – a town square
**un parque** – a park
**una plaza de toros** – a bull ring
**un polideportivo** – a sports centre
**una pista de hielo** – an ice rink
**un puerto** – a port/harbour
**una oficina de correos** – a post office
**un restaurante** – a restaurant
**una bolera** – a bowling alley
**un teatro** – a theatre
**una iglesia** – a church
**una biblioteca** – a library
**una comisería** – a police station
**una estación de trenes/autobuses** – a train/bus station
**un gran almacén** – a department store
**un centro comercial** – a shopping centre
**muchos lugares de interés** – lots of sights

**Es una ciudad/un pueblo**_____- It's a ____ city/town

**histórico/a** – historic
**tranquilo/a** – calm/quiet
**animado/a** – lively
**turístico** – touristy
**famoso/a** – famous
**moderno/a** – modern
**ruidoso/a** – noisy
**aburrido/a** – boring
**industrial** – industrial
**conocido/a por**… - known for…

**Está situado** – it's situated…

**al lado del río** – next to the river
**está rodeado de**… - it's surrounded by

**Tiene unos impresionantes paisajes naturales** – it has some amazing natural landscapes
**Tiene varios influencias culturales** – it has various cultural influences
**Tiene el bullicio de la ciudad** – it has the hustle and bustle of the city
**Es mi ciudad natal** – it's my home town
**Hay mucho que hacer/hay mucha marcha** – there's lots to do
**No hay nada que hacer** – there's nothing to do
**Hay una zona peatonal** – there's a pedestrian zone

## Activities

**Se puede**… - you can

**estar mucho tiempo al aire libre** – spend a lot of time in the open air
**subir la torre** – go up the tower
**hacer un recorrido en autobús** – do a bus tour
**disfrutar de las vistas** – enjoy the views
**apreciar la arquitectura variada** – appreciate the variety of the architecture
**aprovechar del buen tiempo** – make the most of the good weather
**probar platos típicos** – try local dishes
**practicar deportes acuáticos** – do water sports
**practicar senderismo** – go hiking/trekking
**ir de compras** – go shopping

## Shops

**Un estanco** – a tobacconist's
**Un banco** – a bank
**Una cafeteria** – a café
**Una carnicería** – a butcher's
**Una farmacia** – a pharmacy/chemist's
**Una frutería** – a greengrocer's
**Una joyería** – a jeweller's
**Una librería** – a bookshop
**Una panadería** – a bakery
**Una papelería** - a stationery shop
**Una pastelería** - a cake shop
**Una peluquería** - a hairdresser's
**Una pescadería** - a fishmonger's
**Una tienda de ropa** - a clothes shop
**Una zapatería** - a shoe shop
**Una juguetería** - a toy shop
**Una tienda de comestibles** - a grocery store/supermarket

| | |
|---|---|
| Vivo en **Liverpool**, una ciudad **grande** | I live in **Liverpool**, a big **city** |
| que **está situado** en el **noroeste de Inglaterra**, | which **is situated** in the **Northwest of England** |
| al lado del río **Mersey**. | next to the river **Mersey**. |
| Vivo en **las afueras** y | I live in **the outskirts** and |
| **me chifla** mi barrio porque hay mucho para los habitantes. | **I love** my neighbourhood because there is lots for the residents. |
| Por ejemplo, se puede **visitar los museos**, **hacer un recorrido en autobús** o **ir de compras** | For example, you can **visit the museums**, **go on a bus tour** or **go shopping** |
| **ya que** hay un centro commercial enorme. | **because** there is an enormous shopping centre. |
| También hay un lago donde se puede hacer esquí acuático. | Also, there is a lake where you can go water skiing. |
| **Desafortunadamente** no hay **piscina**. | **Unfortunately** there is no **swimming pool**. |
| **¡Qué pena!** Me flipa hacer natación. | **What a shame!** I'm crazy about swimming. |
| En mi opinión Liverpool es muy **turística dado que** | In my opinion Liverpool is very **touristy because** |
| hay muchos **museos**, dos **catedrales** | there are lots of **museums**, two **cathedrals** |
| y **es conocido por los Beatles** | and **it's known for the Beatles** |
| y **el fútbol**. ¡Hay dos **estadios de fútbol**! | and **football**. There are **two football stadiums**! |
| Tiene **el bullicio de la ciudad** y | It has **the hustle and bustle of a city** and |
| varios influencias culturales. | various cultural influences. |
| Es mi ciudad natal | It's my home town |
| y me encanta. | and I love it. |

## A model text on my city

# Mi ciudad

Advantages and disadvantages | Changes | In the past

## Advantages and disadvantages

| | |
|---|---|
| **Lo mejor de vivir en la ciudad es que**… - the best thing about living in the city is that… | **es tan fácil desplazarse** – it's so easy to get around<br>**hay una red de transporte público** – there's a public transport network<br>**hay tantas diversiones** – there's so much to do<br>**hay muchas posibilidades de trabajo** – there are lots of job opportunities<br>**la vida es más interesante** – life is more interesting |
| **Lo peor que que**… - the worst thing is that… | **el centro es tan ruidoso** – the centre is so noisy<br>**hay tanto tráfico** – there's so much traffic<br>**se lleva una vida tan frenética** – life is so hectic<br>**la gente no se conoce** – people don't know each other<br>**hay demasiado contaminación** – there's too much pollution |
| **En el campo**… - in the countryside | **el transporte público no es fiable** – the public transport isn't reliable<br>**hay bastante desempleo** – there's quite a lot of unemployment<br>**yo conozco a todos mis vecinos** – I know all of my neighbours<br>**se puede aprovechar del aire libre** – you can enjoy the fresh air<br>**la vida es más tranquila** – life is calmer<br>**la vida es más aburrida** – life is more boring |

## Changes

| | |
|---|---|
| **Si fuera posible** – if it were possible | **introduciría transporte público gratis** – I would introduce free public transport<br>**renovaría los edificios viejos** – I would renovate the old buildings<br>**mejoraría el sistema de transporte público** – I would improve the public transport system<br>**crearía más trabajos** – I would create more jobs<br>**crearía más espacios verdes** – I would create more green spaces<br>**invertiría en la educación** – I would invest in education<br>**plantaría más árboles** – I would plant more trees<br>**constuiría más tiendas en el centro** – I would build more shops in the centre<br>**reduciría la contaminación** – I would reduce pollution<br>**prohibiría los coches** – I would ban cars |

## My city in the past

| | | |
|---|---|---|
| **En el pasado** – in the past<br>**Hace (10) años** – 10 years ago<br>**En los años sesenta** – in the 60s<br>**Mis padres/mis abuelos dicen que** – my parents/grandparents say that… | **la ciudad era** – the city was<br>**había** – there was<br>**tenía** – it had | **más/menos que hacer** – more/less to do<br>**mucho despempleo** – there was a lot of unemployment<br>**más/menos pobreza** – more/less poverty<br>**más/menos industrial** – more/less industrial<br>**un puerto importante** – an important port |
| | **los Beatles se volvían famosos** – the Beatles became famous<br>**Liverpool era la capital de cultura durante el año dos mil ocho (2008)** – Liverpool was the Capital of Culture in 2008<br>**la ciudad ha cambiado a lo largo de los siglos** – the city has changed throughout the centuries | |

| | |
|---|---|
| **Lo mejor** de vivir en la ciudad es que | **The best thing** about living in the city is that |
| es **tan fácil desplazarse** ya que | it's **so easy to get around** |
| hay **una red de transporte público muy fiable**. | because there is **a really reliable public transport network**. |
| Además, **merece la pena madrugar** porque | Moreover, **it's worth getting up early** because |
| hay mucho que hacer. | There's a lot to do. |
| Hay **cines**, **tiendas** y **boleras** y | There are **cinemas**, **shops** and **bowling alleys** and |
| **mucha gente dice que la vida es más interesante**. | **lots of people say that life is more interesting**. |
| En mi opinión, se lleva una vida tan frenética en la ciudad | In my opinion life is so hectic in the city |
| y por eso, **preferiría vivir** en el campo. | therefore **I would prefer to live** in the countryside. |
| **Me parece que** hay **bastante desempleo** | **It seems that** there is **a lot of unemployment** |
| sin embargo la vida es **más tranquila** y | however life **is calmer** and |
| se puede aprovechar del aire libre. | you can enjoy the fresh air. |
| **Si fuera posible** cambiaría muchas cosas de mi ciudad. | **If it were possible** I would change a lot of things in my city. |
| Por ejemplo **reduciría la contaminación** y | For example I would **reduce pollution** and |
| **plantaría más árboles** ya que | **plant more trees** because |
| en el pasado era muy **industrial**. | in the past it was very **industrial**. |

A model text on advantages and disadvantages of the city