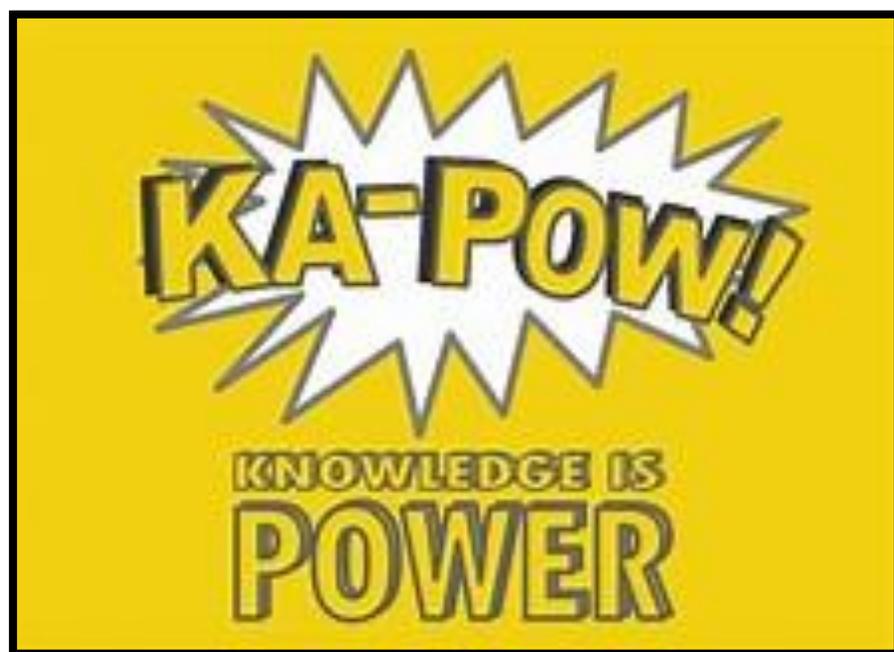




Year 9
Knowledge Organiser
Booklet
Half Term 3



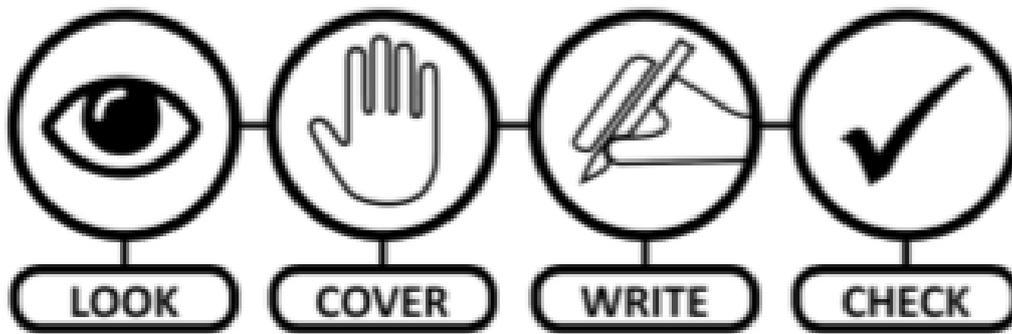
Name

Self-Quizzing Book

Knowledge organisers contain **critical** knowledge you must know. They will help you **remember more** and learn complex information and concepts. Using knowledge organisers will make you more successful in your subjects.

You need to bring your knowledge organiser booklet and self-quizzing book with you **every day**.

For homework you will be asked to self-quiz using your knowledge organisers. You will do this in this book using look, cover, write, check.



Look: Spend a small amount of time reading a section of the knowledge organiser and trying to memorise the content.

Cover: Cover up that section of your knowledge organiser.

Write: In your self-quizzing book, write out the information you have tried to memorise from the knowledge organiser.

Check: Uncover the section of your knowledge organiser and check every word, including spellings. Make any corrections using a **green pen**. If it is all correct, tick what has been written.

Repeat this process until **one whole page** of your self-quizzing book is full, with **no whole lines left empty**.

Respect

Resilience

Responsibility

Expectations

You should be proud of the work you produce and how hard you have worked.

There should be no wasted space on each page.

No whole lines should be left empty.

Corrections should be made in a **green pen**.

Example

The image shows a page of handwritten notes on lined paper. The notes are written in black ink, with corrections and additions in green ink. The text is organized into three sections, each separated by a solid black horizontal line. The first section is titled 'History' and dated 'Tuesday 20th October'. It lists five main problems William faced after the Battle of Hastings. The second section is a repeat of the first section, and the third section is another repeat. Annotations in boxes point to various features: 'Subject, underlined' points to 'History'; 'Date in full, underlined' points to 'Tuesday 20th October'; 'Corrections made in green pen.' points to green ink corrections; 'Each line checked and ticked if correct.' points to checkmarks at the end of lines; 'Solid black line after each attempt' points to the lines separating the repeats; 'No whole lines left empty except between repeats.' points to the lines between the repeats; and 'Repeat until the whole page is full' points to the overall structure of the repeats.

Subject, underlined

Date in full, underlined

Corrections made in green pen.

Each line checked and ticked if correct.

Solid black line after each attempt

No whole lines left empty except between repeats.

Repeat until the whole page is full

Respect

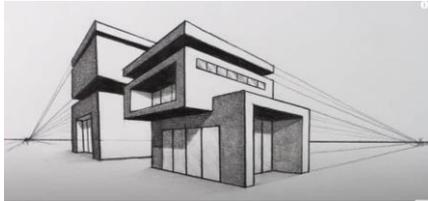
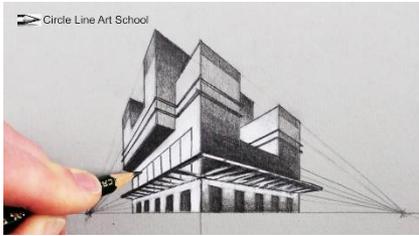
Resilience

Responsibility

URBAN ARCHITECTURE

Urban architecture involves the design of homes, towns and cities, streets and spaces. Often architecture is made of linear (straight) lines but can also be influenced by organic (natural) shapes such as honeycombs.

Architectural drawings like these artists can involve measurements, precise lines and perspective (3D depth).



Artist **Ian Murphy** creates **mixed media** drawings of **ornate** (old and well decorated) doorways and windows.




He uses **layering** of different materials to build up **texture** and **tone**, giving it a detailed and aged atmosphere.




Minty Sainsbury draws famous landmarks and iconic buildings. He puts a lot of effort into recording (drawing) the details. He also obscures (covers) the images by putting the shapes of new buildings over them. These are all white to show how built up cities have become and the more interesting and unique buildings are now disappearing behind a wall of glass and metal structures.




The main concepts (ideas) of the Boyle Family –

- **Photography/casts** and Photorealist **painting** of 3d sculptures to capture an area.
- **Random** selection techniques to isolate a rectangle of the Earth's surface.
- Nothing is excluded as a potential subject; the particular is chosen to serve as a representative of the whole.
- No motive on behalf of the artist, **they attempt to present a slice of reality as they found it at the moment of selection**
- Earth studies: three dimensional casts of the surface of the earth which record and document random sites with great accuracy.
- These works **combine real material** from the site (stones, dust, twigs etc) with paint and resins.

SHAMEKH AI-BLUWI

Using nothing but his surroundings and some paper cut-outs, artist **Shamekh Al-Bluwi** creates one-of-a-kind dress designs, putting a unique spin on fashion illustration.

He carefully selects a background that is interesting and considers the formal elements: Line, Shape, Form, Tone, Colour, Pattern, Texture.





Design Strategies

You can use design strategies to come up with initial design ideas without getting you on a bad one. Designing is a really complex process and there are several different ways of doing it:

User-Centred design: The wants and needs of the client are prioritised- their thoughts are given a lot of attention at every stage of design and manufacture

When you are designing a product it is easy to get stuck on a particular idea. This is called design fixation and it can stop you thinking creatively and coming up with innovative ideas.

Following the design strategy can help you avoid design fixation and encourage you to look at your design in a critical way to make improvements. Other ways to avoid are-

- Collaboration
- Honest feedback
- Focusing on new solutions
- Using fresh approaches

You can also annotate your designs to fully explain further using ACCESSFM

- A= Aesthetics
- C= Cost
- C= Customer
- E= Environment
- S= Size
- S= Safety
- F= Function
- M= Materials

Find an existing design and use this formula ACCESS FM to analyse your products.

Cross curriculum topics

Science

- Structure of polymers
- How long does it take for plastic to degrade?

Geography

- Impact of pollution on the wider world.
- How has the geography landscape changed with the rise in pollution?

Maths

- Sizing and tolerances of products
- Use of time within a practical task

English

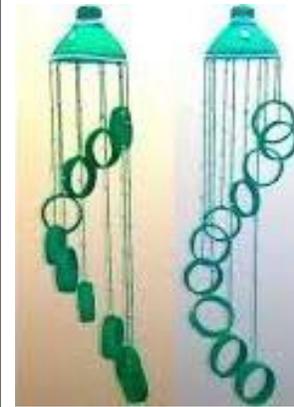
- Justification of practical choices, evaluation techniques and improvement comments

History

- What materials were used before plastics? How in history have other countries dealt with pollution?

PSHE

- Creation of sensory items for the health hub and sensory garden at OSSMA



Drama
Year 9
Performing Arts



Costume design

Costume is an important aspect of a production, as it helps to: establish a character, convey the context of the play and support the style of the production. Other aspects to consider when designing a costume include: accessories, hair and make-up, practicalities, shape and texture. Colour is a very important aspect as it can convey as symbolic idea or reveal something about the character.

Vocal skills

Accent: Accent refers to a particular way of talking and pronouncing words, and is associated with a geographical area or social class.

Volume: Volume refers to how loud or quiet the voice is. While performers will need to be loud enough to be heard by everyone in the audience, they can change their volume to express a character's emotions.

Tone: Tone is the emotional sound of the voice, eg frightened, angry or joyful, and is very important in revealing the subtext of a line.

Emphasis: Emphasis is where a performer will stress a particular word or phrase within a sentence to indicate importance.

Pace: Pace is the speed at which lines are delivered. The speed of speech can often convey how someone is feeling.

Rhythm: Rhythm is related to pace, and refers to the pattern of sound when speaking.

Pause: A pause (or beat) is a short break in speech for dramatic effect. A performer may choose to pause to show hesitation, that they are overwhelmed with emotion, or that they are thinking.

Pitch: Pitch is how high or low the voice sounds

Quality: Quality refers to the basic sound of the voice and is largely influenced by how sound moves through the vocal folds.

Resonance: Resonance refers to the placement of the voice and where the sound resonates, eg in the chest, throat or nose.

Lighting design

One of the most important functions of lighting design is illuminating the action on stage. Lighting is needed so that the audience can see clearly what is happening.

Lighting can help to create mood and atmosphere on stage. For example, to create a cold, damp jail cell, a lighting designer might use a cool, blue light with a low intensity.

When designing lighting, there are several aspects to consider, including: colour, focus, intensity, position and direction.

Stage design

The set helps show where and when the story of a play takes place, while also conveying meaning to the audience.

When designing a set, there are several aspects to consider, including: colour, condition, practicalities and scale. Designers will also consider: shape, staging configuration, texture, transition and health and safety.

Projections are becoming more common within set design and can be used to add detail and texture on stage.

A flat is a piece of scenery used to represent a wall or to conceal a backstage area.

Revolves are sometimes used which is a turntable built into the stage floor on which scenery can be set and turned.

Physical skills

Body language: Body language includes posture and stance and can convey a character's feelings or personality.

Eye contact: Eye contact is the state in which two people look directly into one another's eyes. It can be used to reveal the status and relationship between characters.

Facial expressions: Facial expressions are the way the face moves to convey an emotional state.

Gait: Gait is a person's manner of walking. The way a performer walks on stage will form part of their characterisation.

Gesture: Gesture is the way people communicate with their hands or other parts of the body. It can be used to show a character's emotions, eg shaking a fist to represent anger.

Pace: Pace is the speed of a performer's movement. As well as focusing on pace individually, the pace of movement within a scene can completely change the atmosphere on stage.

Space: Space refers to how performers or items are positioned on stage. The process of placing performers in a specific space is called blocking.

Levels: Levels refer to the use of different heights, eg through standing or sitting, to convey meaning on stage. They can be used to create visual interest but they can also signal status and character relationships.

Year 9 – Poetry Unit – Edexcel GCSE Link

Belonging Poems

William Wordsworth
To my Sister (1798)

John Clare
Sunday Dip (1800s)

Emily Bronte
Mild the Mist Upon the Hill (1839)

Letitia Elizabeth Landon
Captain Cook (*To My Brother*) (c.1820)

Robert Bridges
Clear and Gentle Stream (1873)

Thomas Hood
I Remember, I Remember (1914)

Grace Nicholls
Island Man (1984)

Amy Blakemore
Peckham Rye Lane (2007)

Benjamin Zephaniah
We Refugees (2000)

Zaffar Kunial
Us (2018)

Imtiaz Dharker
In Wales, Wanting to be Italian (2014)

Kayo Chingonyi
Kumukanda (2017)

Raymond Antrobus
Jamaican British (2018)

Choman Hardi
My Mother's Kitchen (2004)

Carol Rumens
The Emigree (1993)

Poetry Devices - Structure

Chronological	In order of time
Caesura	A big break in the middle of a line
Enjambment	A sentence runs over more than one line
Iambic pentameter	5 sets of weak/strong beats in a line
Juxtaposition	Two opposites
Layout	Position of lines/words on the page
Anaphora	Repeated first few words at start of lines
Oxymoron	Two opposite words next to each other
Rhyme scheme	The organisation of the rhyme
Rhyming couplet	Two lines that rhyme next each other
Rhythm	The beat
Stanza/Verse	A paragraph in a poem
Volta	The turning point of a poem
Repetition	Something repeated

Poetry Devices - Form

Auto-biographical	About the poet
Ballad	Story poems – often 4 line stanzas
Blank Verse	Verse with no rhyme – usually 10 syllables
Dramatic Monologue	A character speaks to the reader
Epic	Tragic/heroic story poems
First person	'I'
Free verse	Non regular rhyme/rhythm
Haiku	3 lines, syllables 5/7/5. Often about nature
Lyrical	Emotional and beautiful
Narrative	A story
Ode	Lyrical poem often addressed to one person
Phonetic spelling	Written like it sounds
Rhetoric	Persuasive
Sonnet	14 lines, ababcdcdefgg. Often love poem
Shape poem	Poem is in a shape of the main subject
Third person	He/She/They

Poetry Devices – Language

Alliteration	Repeated first letter
Assonance	Repeated vowel sound
Cliché	Over-used phrase
Consonance	Repeated consonant sound
Colloquial language	Local/casual language
Emotive	Makes you feel emotional
Euphemism	Alternative words to make something nasty sound okay
Extended metaphor	A series of metaphors all relating to each other
Half rhyme	Nearly rhymes
Imagery	Something used to describe something else
Internal rhyme	Rhyme that is on the same line
Metaphor	Something is described as being something else
Mood	Atmosphere
Onomatopoeia	A verb sounds like what it does
Personification	A non-human thing is given human qualities
Plosive	Letters p/t/k/b/d/g
Rhyme	Words that sound the same
Semantic field	Words that are about the same thing
Sibilance	A repeated 's' sound
Simile	Using like/as to compare two things
Tone/Voice	Emotion

Example question and how to get top marks the poetry aspects of the Edexcel Exam

Both unseen poems will be printed on the question paper.

Q1 - You will answer one question on the Belonging cluster

Q2 – You will compare the unseen poems printed on the sheet.

AO's (Question one only)	<ul style="list-style-type: none"> •Critical, exploratory conceptualized response to task and text AO1 •Judicious use of precise references to support interpretation(s) AO1 •Analysis of Language, form and structure AO2 •Context of the writers. AO3
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AO's (Question one and two)	<ul style="list-style-type: none"> •Analysis of writer's methods with subject terminology used judiciously AO2 •Exploration of effects of writer's methods on reader
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Assessment Objectives

AO1 - Read, understand and respond to texts. Students should be able to: maintain a critical style & develop an informed personal response plus use textual references, including quotations, to support & illustrate interpretations.

AO2 - Analyse the language, form and structure used by a writer to create meanings and effects, using relevant subject terminology where appropriate.

Spanish Knowledge Organiser

Year 9 - Spring 1

Week 1&2

- **Me gusta** la fruta **porque** es dulce, **la** como **tres veces al día** - **I like** fruit **because** it is sweet, I eat it **three times a day**.
- **No me gustan mucho** las verduras **pero las** como **de vez en cuando** - **I don't really like** vegetables **but** I eat **them from time to time**.
- **Odio** el agua, **casi nunca lo** bebo - I **hate** water, I **almost never** drink it.
- **En mi opinión** llevo una dieta **bastante** sana - **In my opinion** I have **quite** a healthy diet.

Week 3&4

- **Una vez al mes** juego al baloncesto **pero prefiero** jugar al fútbol **porque** es divertido - **Once a month** I play basketball **but I prefer** to play football **because** it is fun.
- Hago natación **dos veces a la semana**, me encanta porque es relajante. - I do swimming **twice a week**, I **love it because** it is relaxing.
- **Acabo de empezar** a hacer artes marciales - **I have just started** to do martial arts.
- **Prefiero** los deportes en equipo, **sobre todo** el baloncesto. **Sin embargo** mi hermano **prefiere** el tenis - **I prefer** team sports, **especially** basketball. **However** my brother **prefers** tennis.

Week 5&6

- Me despierto **muy** temprano **y** me levanto **enseguida**. - I wake up **very** early **and** I get up **straight away**.
- **Normalmente** desayuno algo sano **y después** voy al gimnasio - **Normally** I have something healthy for breakfast **and afterwards** I go to the gym.
- Para llevar una vida sana **se debe** comer fruta y verduras **y** dormir ocho horas al día - In order to lead a healthy life **you must** eat fruit and vegetables **and** sleep for eight hours a day.
- Para estar en forma bebo **mucho** agua, **sin embargo** estoy adicto a chocolate - In order to keep fit I drink **a lot of** water, **however** I am addicted to chocolate.

French Knowledge Organiser

Year 9 - Spring 1

Week 1&2

- **Quand j'étais** petit, **j'allais** à l'école primaire et **j'aimais** jouer avec mes amis - **When I was** small **I used to go** to primary school and **I used to like** playing with my friends.
- **Quand j'étais** petit **je détestais** les légumes **et je mangeais trop** de bonbons. - **When I was** little I used to hate vegetables **and I used to eat too many** sweets.
- **Je préférais** mon école primaire, mon prof **était plus** sympa - **I preferred** my primary school, my teacher **was** kinder.
- À l'école primaire **j'étudiais** l'Espagnol **mais** au collège j'étudie le Français - At primary school **I studied** Spanish **but** at secondary school I study French.

Week 3&4

- **Il y a dix ans** écouter de la radio **était plus** populaire, aujourd'hui on utilise Spotify - **10 years ago** listening to the radio **was more popular**, now we use Spotify.
- **Il y a quinze ans** on **achetait** des CDs pour écouter de la musique. - **15 years ago** we **used to buy** CDs to listen to music.
- **Avant je n'aimais pas de tout** la musique rock mais **maintenant j'adore** jouer de la guitare. - **Before I didn't like** rock music **at all, now I love** to play the guitar.
- **Autrefois** le Rap et le Hip-hop **était moins** populaire **que maintenant** - Before Rap and Hip-hop **were less** popular **than** they are **now**.

Week 5&6

- Quand mes parents **avaient** mon âge **était plus** difficile écouter de la musique - When my parents **were** my age **it was more** difficult to listen to music.
- **J'aime surtout** écouter du R'n'B, je **le** trouve relaxant. - **I especially like** listening to R'n'B, I find **it** relaxing.
- Quand mon père **était** jeune **il aimait** le rock **mais aujourd'hui il préfère** la musique classique - when my dad **was** young he **liked** rock music **but now he prefers** classical music.
- **J'habitais** dans un petit village **mais maintenant** j'habite dans une grande ville - **I used to live** in a small village **but now** I live in a big town.

Year 9 Food Knowledge Organiser: Principles of Nutrition

Macronutrients

Needed in large amounts to help the body to function properly

Protein:

These are made up of **essential amino-acids** and **non-essential amino-acids**. (Our bodies can make non-essential amino acids, but we need to get essential amino acids from our food).

Source

HBV – these have all the essential amino acids

- Meat, fish, dairy, eggs (animal sources)
- Tofu

LBV – these are missing at least one essential amino acid

- Seeds, nuts, beans, pulses, cereals, Quorn (plant sources)

Function

Growth
Repair
maintenance



Not enough

Kwashiorkor
Oedema
Anaemia
Slow growth in children

Too much

Excess protein can be converted to energy. If unused turns to fat.

Complementary actions

Combining 2 or more LBV proteins helps get a balance of essential amino acids. e.g. beans on toast.

[Watch this video to learn more](#)

<https://www.youtube.com/watch?v=cKRf531737E>

Dietary Reference Values	
Age	Amount
1-3	15g
4-6	20g
7-10	28g
11-14	42g
15-18	55g
19-50	55g
50+	53g

Fats, oils and lipids:

Too much fat is bad for you, but so is not enough.

Source

Saturated Fats

(From Animal sources. They are also called unhealthy fats. They are generally solid at room temperature)

Sausages / Bacon / Lard / Dairy



Unsaturated Fats

(These are healthier. They are often liquid at room temperature.)

- Monounsaturated fats
– olive oil / avocados
- Polyunsaturated fats
– sunflower oil / seeds

Omega-3. These are Polyunsaturated and called "healthy" fats as your body needs them but can't make them. They are good for your heart.
– Oily fish / Nuts / Seeds

Function

Energy
Warmth
Protection of organs
Source of fat soluble vitamins
Hormone production

Dietary Reference Values

DRI	Men	Women
Total fat	95g	70g
Sat fat	30g	20g

Too much

Obesity
Heart disease
Type 2 diabetes
Stroke
Cancer

Not enough

Vitamin deficiency (fat soluble)
Unprotected organs

Carbohydrates

There are 2 kinds, simple and complex - Sugar & Starches

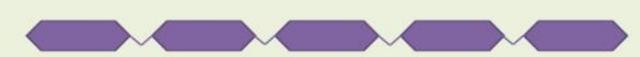
Monosaccharides (one sugar)



Disaccharides (two sugars)



Polysaccharides (many sugars)



Source

Simple - these are sugars (monosaccharides, disaccharides)
Cakes, jam, soft drinks

Complex - these are starches (polysaccharides)
Bread, potatoes, Flour, Pasta, Rice.

Function

Simple
Quick burst of energy

Complex
Longer lasting energy



Free sugars

These give you no nutritional benefit other than energy.

Dietary advice

- Reduce the amount of sugar that we eat, no more than 5% of our diet.
- Complex Carbohydrates should make up half of the energy we eat.
- Wholegrain cereals are a good source of fibre

Not enough

Can make blood sugar level drop

- hunger,
- dizziness,
- Tiredness
- Lack of energy

Our body will use protein for energy (leads to loss of muscle)

Too much

- Excess is turned into fat
- Can cause obesity
- Too much sugar leads to dental problems
- Can lead to type 2 diabetes

Dietary Needs

People have different dietary needs; this affects what they can and cannot eat.

Key Words:

- **Allergy:** an adverse reaction by the body to certain substances.
- **Intolerance:** a condition that makes people avoid certain food because of the effects on their body
- **Allergic reaction:** the way someone responds to certain food. For example: a rash/swelling/anaphylactic shock

Some people make a choice not to eat certain foods. Reasons include:



➤ Religious beliefs



➤ Medical reasons



➤ Taste/texture of food



➤ Ethical beliefs

Vegetarians

There are many different types of vegetarian depending on which animal foods are included in the diet. People may follow a vegetarian diet for different reasons

- They do not like the thought of eating dead animals, fish, birds
- They think it is cruel to kill for food
- Their religion does not allow them to eat meat, fish, poultry.
- They think it is healthier to eat a vegetarian diet.

The three main types of vegetarian are lacto-vegetarian, lacto-ovo vegetarian and vegan.



lacto-vegetarian –will not eat any meat, fish or eggs, but will consume milk and dairy products.

lacto-ovo vegetarian –will not eat any meat, or fish, but will consume eggs, milk and dairy products.



Vegan – will not eat any food that is made directly or indirectly from an animal. They also refuse to use product such as soap and cosmetics which involve the use of animal oils or fats.

Diet Related Health Problems

Obesity - When the body has too much fat.



- BMI (Body Mass Index) is used to calculate body mass
BMI of 18.5 – 25 is normal, 30 + is obese.

Cause: energy in > energy out; Eating too many high energy foods (fat & sugar); Low exercise levels.

Problems: High blood pressure and cholesterol = heart problems; Increased risk of type 2 diabetes & cancer

Breathing difficulties, fatigue & low self esteem.

Coronary Heart Disease Arteries clogged with cholesterol



- Cause: saturated fats, low physical activity, smoking & high blood pressure.

Health Problems: Blood cannot pass through arteries properly which causes heart to pump faster and harder, causing chest pains (angina); blood flow and oxygen to the heart gets blocked which causes heart attacks



Tooth Decay

Plaque is a substance which contains bacteria. This builds up from food in the mouth. Bacteria feed on sugars and form acids which eat away at tooth enamel and cause tooth decay (caries/cavities) Cause: high sugar foods.

Religious Reasons

Islam



➤ Do not eat pork

➤ Meat must be halal

➤ No alcohol or shellfish

Judaism



➤ No pork or shellfish

➤ No milk and meat together

➤ Meat must be kosher

Hindus



➤ No beef or beef products

➤ Mostly vegetarians

➤ No alcohol

Name of medical condition	Food/drinks to avoid	Reason to avoid
Diabetes	Starchy food/ high in sugar	High in saturated fat. Can lead to heart disease, while excess sugars can cause unwanted weight gain and blood sugar spikes
Nut allergy	Nuts, blended cooking oil, margarine with nuts oils and often seeds	the immune system overreacts to proteins in these foods
Lactose intolerance	Milk, cheese, yogurt, processed food	cannot metabolize lactose properly; they lack lactase, an enzyme required in the digestive system to break down lactose . Patients typically experience bloating, flatulence, and diarrhoea
Gluten intolerance (coeliac)	Wheat, wholemeal, bran, pasta, rye, beer	Celiac disease is caused by a reaction to a gluten protein found in wheat, barley, rye, and sometimes oats. Symptoms include chronic diarrhoea , weight loss and fatigue

Medical reasons

The Design Process

Brief



A brief is a set of **instructions** given to a designer by a company (**client**) about a job or task they wish to be completed.

A **company** (client) will ask a **graphic designer** to create a **product**. A product means an item that can be sold to people (**consumers**).

A brief will set out clearly what it is that should be made (**constructed**) and what requirements (**specifics**) will need to be included in the **design process**.

Isometric



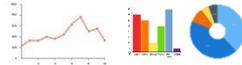
When the concept drawing is finished, the design will be turned into an isometric drawing where the size (**dimensions**) of the parts are finalised. Specific measurements (**metric – CM, MM**) are used so that it can be copied many times (**mass produced**).

The design will be computerised (**digitally formatted**) so that it can be **saved, shared** and **inputted** into the machines that produce it.

Market Research



Companies will employ people to conduct **surveys**. A survey is a set of **questions** that are asked to many people. Often companies would decide which people they will ask (**target audience**). They wish know peoples **preferences** and **spending habits**.



The answers are important to the **design process** and can influence the way the product is **designed**. To make it easy to see large amounts of **data**, companies use **graphs**.

Testing Models



When isometric drawings are complete, it will go through a process of being made **3D**. A number of **machines** will be used to create practice models (**prototypes**) to see how the product works. It must be easy for a human to use (**ergonomics**). **3D printers** are often used.

If the product is made out of different **materials** such as glass, metal or wood, these would require different methods of construction (**manufacturing**).

Design Process



Designers will explore lots of ideas before selecting the right one. Often this involves creating **mind maps**, **sketches** and **mood boards**.

A mind map starts with a single word and then **explores ideas** around it, these are sorted into **categories**.

When drawing sketches, designers will work out how it works (**functions**). Ideas at this stage can be really **creative** and **imaginative**.

A mood board is a collections of pictures, drawings, text (**typography**) and **materials** to do with the **theme**.

Packaging



When a final product has been made and passed safety standards, it will be labelled and have its own (**custom**) **packaging**.

Packing must –

- Be eye catching (**visually pleasing**) to attract customers to buy it.
- Protect the item inside it to **avoid damage** or **contamination**.
- Provide **accurate information** about the product inside.
- Stack easily for **transportation** from factory to shops.

Concept Art



Artists/**illustrators** will draw a number of different sketches of the product from different angles.

When designing, **colour** and **style** is important. It is important to think about how it looks (**aesthetics**). Designs will consider the mood board and specifics.

Drawings can be in **traditional** materials (pen, pencil, paint) or using **CAD** (Computer Aided Design) and electric drawing pads (**graphics tablets**).

Advertising



For companies to make money (**financial income**), they must tell as many people as possible about their product.

This often happens through **social media**, **adverts**, **radio stations**, **magazines** and **displays** in shops.

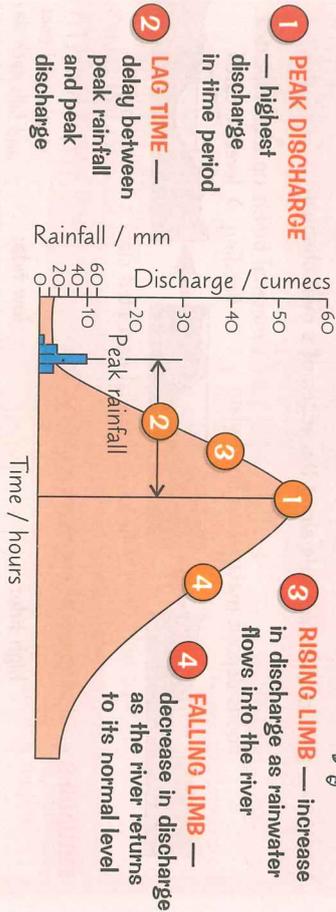
Its important that the product is well received by its target audience so that people buy it and share reviews of it. Companies make a **profit** when they sell items for more than the price of making it. .

Flooding and Flood Management

Hydrographs

RIVER DISCHARGE — volume of water flowing per second. Measured in cumecs (cubic metres per second, m³/s).

HYDROGRAPH — a graph that shows how discharge at a certain point in a river changes over time in relation to rainfall.



Lag time occurs because most rainwater enters rivers indirectly (e.g. surface runoff or infiltration).

Factors Affecting Flood Risk

PHYSICAL FACTORS

- Relief**
Steeper valley sides → water flows into channel faster → discharge increases more rapidly
- Geology**
Clay soils and some rocks are impermeable, increasing runoff.

- Heavy rainfall**
Water arrives too quickly to infiltrate. Lots of surface runoff increases discharge.
- Prolonged rainfall**
Saturates the soil so further rainfall can't infiltrate, increasing runoff into rivers.

HUMAN FACTORS

- Land use**
Impermeable building materials / surfaces (e.g. concrete / tarmac) increase surface runoff. Drains rapidly transport runoff to rivers, increasing discharge.
- Trees intercept and store rainwater**
→ cutting them down increases the amount of water entering river channels.

Remember, higher peak discharge = higher flood risk

Flooding and Flood Management

Management Strategies for Flooding

HARD ENGINEERING — structures built to control the flow of rivers and reduce flooding.

Method	Benefits	Disadvantages
Dams and reservoirs	Control water flow. Potential for hydroelectric power.	Dams are expensive. Construction can flood settlements.
Channel straightening	Water leaves area faster → less build up.	Flooding may happen downstream. Fast-moving water causes erosion.
Embankments	River capacity increased.	Expensive. Can overflow / break.
Flood relief channels	Control over diverted water.	Increased discharge where relief channel rejoins the river.

SOFT ENGINEERING — schemes set up using knowledge of a river and its processes.

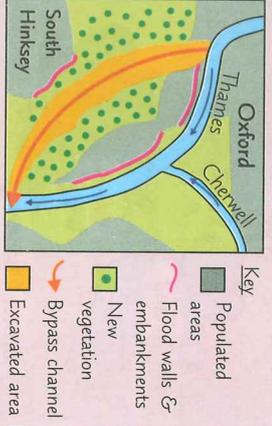
Method	Benefits	Disadvantages
Flood warnings & preparation	Give people time to move possessions / evacuate.	Not preventative. Building modification is expensive. False sense of security.
Flood plain zoning	Fewer impermeable surfaces reduces flood risk and impacts.	Urban expansion limited. Can't help existing settlements.
Planting trees	Less discharge and soil erosion.	Less farmland available.
River restoration	Lower discharge. Requires little maintenance. Better habitats.	Local flood risk can increase.

Flood Management Scheme — Oxford

Scheme will protect city centre, divert water from densely populated areas and involve:

- increased water storage
- bypass channel
- planting trees
- flood walls

2007 floods → 250 homes evacuated.



Issues	Benefits
<p>Environ. 2000 trees felled.</p>	<p>New riverside habitats.</p>
<p>Econ. Expensive (£120m).</p>	<p>1000+ buildings protected. Cheaper insurance.</p>
<p>Social Forced land sales. Noisy construction.</p>	<p>Footpaths improved. Residents feel more secure.</p>

Year 8 Half-term 3- The World after World War II- knowledge organiser created by Mr Pritchard

What was the Cold War?

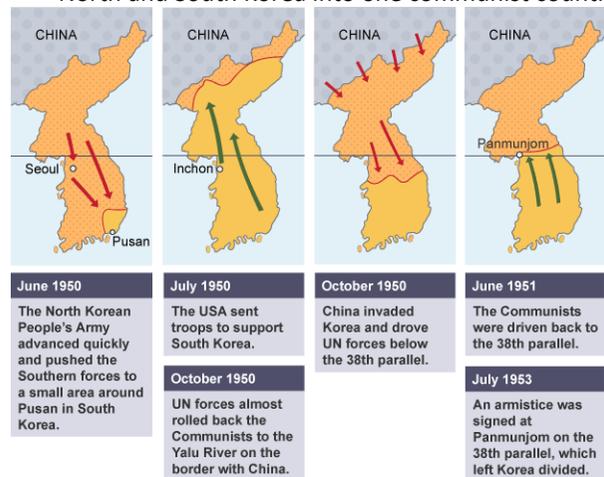
- During the Second World War, the Soviet Union, USA and Britain formed the 'Grand Alliance'. These countries had different ideologies. Britain and the USA were capitalist. The Soviet Union was Communist.
- Between 1944-5 the Soviet Union 'freed' countries in Eastern Europe from the Nazis. Stalin was reluctant to give up control of these countries because they were a useful buffer zone. He turned them into satellite states which meant they were under Soviet control.

Capitalism- capitalists believe everyone should be free to own property and business and to make money.

Communism- communists believe all property should belong to the state to ensure that every member of society has a fair share.

The Korean War

- After World War Two, Korea had been divided at the 38th parallel into the Soviet backed communist North Korea, led by **Kim Il-Sung**, and non-communist, American-backed South Korea under **Syngman Rhee**.
- In June 1950, with the support of China and the Soviet Union, North Korea launched an attack on South Korea across the 38th parallel. Kim Il-Sung planned to unify North and South Korea into one communist country.



The differences between communism and capitalism

	Soviet Union	USA & Britain
Politics	Single-party rule	Free elections with a choice of parties
Social structure	Classless society, everyone is equal	Some people have more power than others (because of family background, wealth, education or achievements)
Economy	All property owned by the state, not individuals	Private ownership and a competitive workplace
Rights	Rights of all workers more important than individual rights	Individual freedoms valued but limited by majority opinion

Berlin 1958-63

- **The refugee problem in Berlin, 1958-** In 1949- Germany divided into two. W. Germany received Marshall Aid and became prosperous. E. Germany received less aid from Soviet Union, suffered from low living standards and shortages. 3 million East Germans moved to West Germany by 1958- choosing capitalism over communism.
- **The Berlin Ultimatum, 27 November 1958-** Demanded Berlin be demilitarised, Western troops withdrawn and that Berlin become a free city. Khrushchev saw his demands as essential action to stop the flood of skilled citizens leaving E. Germany.
- **Summit meetings 1959-61-** there were 4 meetings to solve the 'Berlin problem'. But no formal agreement was ever made.
- **Building the Berlin Wall-** On night of 12 August 1961, East German troops built a barbed wire fence around Berlin and between East and West Berlin, followed up by building a concrete wall. It solved problem of division of Berlin. Refugees were unable to leave East Germany; USSR avoided war with USA; Communism survived in East Berlin.

The Cuban Missile Crisis

- **The Cuban Revolution-** January 1959, revolutionaries toppled the pro-American government of Cuba.
- **The Bay of Pigs incident-** 17 April 1961 a group of Cuban exiles, trained by the CIA, invaded at the 'Bay of Pigs' in Cuba to try to topple Castro's regime but it was a complete failure.
- 14 October 1962 an American US spy plane took pictures of launch pads for medium range ballistic missiles on Cuba. Kennedy felt this had to be stopped.
- The **Thirteen Days**, 16-28 October 1962, were tense. President Kennedy called an Executive Committee to discuss what to do. A naval blockade was decided. The US public were informed of the missiles on Cuba.
- 24 October, Soviet ships reached the blockade and then turned around- the Soviets had avoided conflict.
- A sequence of telegrams between the USA and Soviet Union reached a deal to remove the missiles from Cuba: a secret part of the deal said the USA would remove their missile from Turkey.

Czechoslovakia, 1968-9

Czechoslovakia was ruled by the Soviet Union and the economy was run for the benefit of the Soviet Union.

The Prague Spring

- 1968 Alexander Dubcek was elected as First Secretary of the Czech Communist Party (head of government).
- Dubcek believed in communism but wanted to offer socialism with a 'human face' and introduced a series of reforms known as the 'Prague Spring' which included a relaxation of censorship, more power to trade unions and regional governments, freedom to travel and increased trade with the west.

The Soviet Reaction

- 20 August 1968 500,000 Warsaw Pact troops invaded Czechoslovakia and ended the Prague Spring.
- **The Brezhnev Doctrine** was issued on 26 September- it said the actions of any individual communist country affected all communist countries and all should take steps to stop such actions. In effect it prevented all communist countries from introducing reforms.

Year 9 Knowledge Organiser ICT – Functional Skills

Email Key words

Communication – The sharing or exchanging of information by speaking, writing, or using some other medium such as email.

Email – Messages sent by electronic means from one device to one or more people.

Compose – To write or create something.

Send – To make an email be delivered to the email address it is addressed to.

Attachment – A file, which could be a piece of work or a picture that is sent with the email.

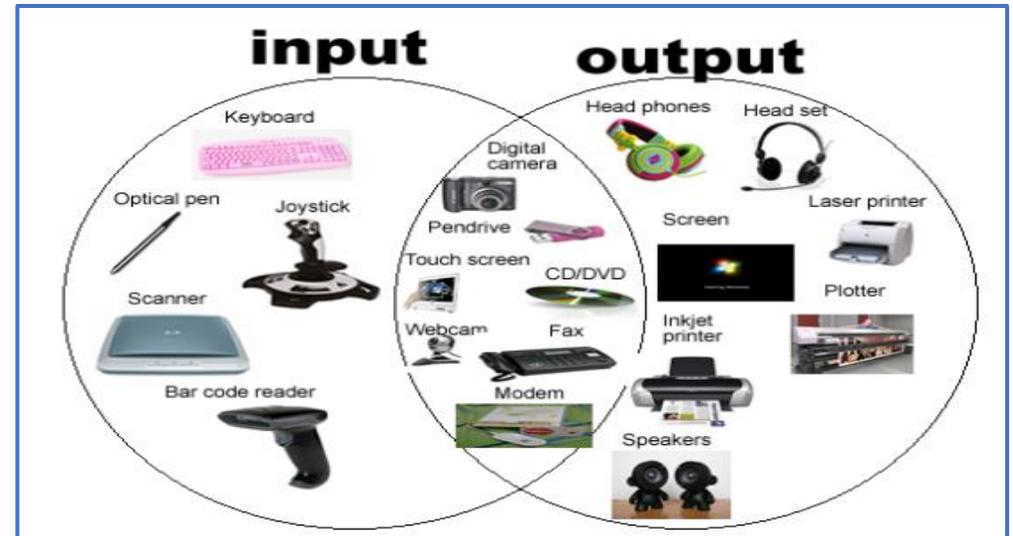
Address book – A list of people who you regularly send an email to.

Save to draft – Allows you to save an email that you are working on and send it later.

Password – A secret word, phrase or combination of letters, numbers and symbols that must be used to gain admission to a site or application such as email.

CC – A way of sending a copy of your email to other people so they can see the information in it.

Formatting – Allows you to change the way the text of an email looks. For example, you can make the text bold or underline it.



Using the internet safely

Malware - malicious - software intended to cause harm.

Penetration Testing - Organisations employ professionals to try and hack their network so that they can find areas of weakness.

User Access Levels - Different employees have different levels of access to programs, websites and data.

Encryption - data is scrambled so that it cannot be understood if intercepted. It can only be decrypted with a key.

Types of Malware Virus - attach themselves to files and copy themselves when the user copies or opens a file.

Worm - copy themselves without the user doing anything.

Trojan - malicious software pretending to be a legitimate program

Copyright – protects written, music, video, software and images being used without permission.

Cloud Storage

Examples are Microsoft One Drive or Google Drive

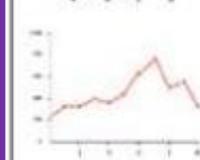
Stores files online enabling files to be accessed on any device with internet access.

Share files with others and automatic backup

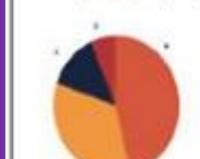
Representing Data Graphically



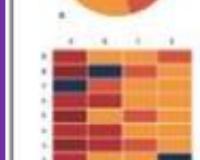
Bar charts are used to **compare variables**. They can appear vertically (also called a column chart) or horizontally.



Line graphs are used to show **trends over time**.



Pie charts are used to show the **components of a larger whole**.



Conditional formatting applies formatting to a range based on the contents of the cells. A common approach is a **heat map** like the example to the left.

Features of a strong password

A mix of letters, capitals, symbols, numbers 8 or more characters

**No dictionary words
No personal information
Consider replacing letters with numbers e.g. the letter E and 3**

Year 9 Knowledge Organiser ICT – Functional Skills

	 Word	 Excel	 PowerPoint	 Outlook	 Microsoft Teams
Type of program	Word processor	Spreadsheet	Presentation	Email	Chat-based collaboration
Description	Used mainly for creating documents such as letters, brochures, learning activities, tests, quizzes and students' homework assignments. Make changes easily, such as correcting spelling, adding, deleting, formatting and relocating text. Document can be printed quickly and accurately saved for later modifications.	Used to create spreadsheets, which are documents in which data is laid out in rows and columns — like a big table. Helpful and powerful program for data analysis and documentation. Store, organize and manipulate data by creating spreadsheets. Data can be manipulated mathematically using arithmetic operations and functions. Typically used to organize data and perform financial analysis.	Used to create dynamic, informational slides through the use of text, graphics, and animation. Visually display information, using anything from basic slideshows to professional multimedia presentations. Combine text, graphics and multimedia content.	Used mainly to send and receive emails. It can also be used to manage various types of personal data including calendar appointments and similar entries, tasks, contacts, and notes.	Provides a modern conversation experience for today's teams. The core capabilities include business messaging, calling, video meetings and file sharing.
Features	Create documents with different font, styles, sizes, colours. Spelling and grammar check, Thesaurus, Translate, Language preference. Insert tables, images, shapes, charts	Use of formulas e.g. sum or average on a large amount of data all at once. Analyse data to discover trends. Graphs and charts can summarize the data and store it in an organized way. Tools for sorting, filtering and searching.	Add text, images, art, and videos. Select a professional design with PowerPoint Designer. Add transitions, animations, and motion.	Send, receive and organise mail. Save and edit contacts lists. Create and manage tasks and alerts. Send and receive meeting invitations. View and manage your calendar.	Conversations within channels and teams. A chat function between teams, groups, or individuals. Document storage and sharing. Online video calling and screen sharing.

Word Processing Key Words

- Alignment** – the orientation of the lines of a paragraph with respect to the margins.
- Editing** – making modifications to an existing document.
- Font Style**– adds emphasis to a font: bold, italic and underline.
- Bullet** – A dot or symbol that marks an important line of information or designates items in a list.
- Vertical Alignment** – The position of text in relation to the top and bottom page margins.
- Horizontal Alignment** – The position of text in relation to the left and right page margins
- Autocorrect** – A word feature that automatically corrects common spelling errors as you type.
- Editing** – making modifications to an existing document.
- Menu Bar** - The menu bar typically appears at the top of the word processing application's window and contains a listing of the main commands in the form of text

Spreadsheet Keywords

- Active Cell** - The active cell is the cell in the spreadsheet that is currently selected for data entry.
- Cell** - A cell is a rectangular area formed by the intersection of a column and a row.
- Data** - Data refers to the type of information that can be stored in the cells of a spreadsheet.
- Formula** - A formula is a spreadsheet data type that will calculate a result and display it in the active cell.
- Labels** - Labels refer to text that is typed into the cells of a spreadsheet.
- Range** - A range is a group of cells in a spreadsheet that have been selected.
- Rows** - Rows run horizontally on the spreadsheet screen.
- Workbook** - A workbook is a collection of worksheets that are saved together in one file.
- Column** - Columns run vertically on the spreadsheet screen.
- Column / Bar Chart:** A column or bar chart is a style of chart that is used to summarize and compare categorical data.

KS3 PE THEORY KNOWLEDGE ORGANISER

Nutrition

Carbohydrate – The main and preferred source of energy for all types of activity. Required for High-Low intensity energy. Provided in bread, potatoes and sugary foods.



Fats – Used for low intensity energy. Comes in two forms; saturated fats (unhealthy) and unsaturated fats (healthy).



Protein – Required for tissue growth and repair and for a small amount of energy. Provided by meat, fish, eggs and dairy.



Minerals – Required for bone growth and maintenance of a healthy body. Found in vegetables, dairy and more



Vitamins – Required for health, energy and maintaining normal body functions. Found in vegetables and fruit.



Fibre – Required to reduce cholesterol and helps the digestive system (preventing constipation)



Anaerobic – Exercise without the presence of oxygen. Short distance/time and high intensity – 100m – Usain Bolt

Energy Systems



Aerobic – Exercise in the presence of Oxygen. Long distance and low intensity – Marathon Runner – Mo Farah

Types of Training

Continuous Training – Long distance steady state exercise – good for distance athletes



Fartlek Training – Altering the speed (Walk, Jog, Run, Sprint) – Good for games players



Interval Training – Periods of work and rest. (HIIT). Good for sports with rest periods



Weight Training – Lifting a resistance to increase muscle strength – Good for all athletes.



Plyometrics – Jumping, Bounding and Hopping to build power – Good for jumping athletes.



Circuit Training – Organisation of different exercises into a circuit – Good for all athletes as can be made specific.



Static Stretching – Isometric stretching to increase the flexibility of muscles – Helps prevent injury in all sports.



Types of Bones

Long Bones – Used for movement and blood cell production – Femur



Flat Bones – Strong, flat plates of bone used for protection – Ribs



Short Bones – Wide as they are long. Used for support – tarsals



Sesamoid Bones – Bone found in a tendon to allow smooth movement – Patella



Irregular Bones –



These simply do not fall into another category – Vertebrae

B2: Cells and control

Lesson sequence	
1. Mitosis	
2. Animal growth	
3. Plant growth	
4. Stem cells	
5. Nervous system	
6. Neurotransmission	
7. Controlling movement	

1. Mitosis	
*Cell cycle	The life of a cell comprising interphase and mitosis.
*Interphase	Preparation for mitosis in which extra cell parts are made and DNA chromosomes are replicated (copied).
*Mitosis	When one cell divides into two genetically identical daughter cells.
*(I)PMATC	The stages of mitosis: interphase (not mitosis), prophase, metaphase, anaphase, telophase, cytokinesis.
**Prophase	The membrane of the nucleus breaks down and spindle fibres start to form.
**Metaphase	Spindle fibres fully form and chromosomes line up across the middle of the cell.
**Anaphase	Chromosome copies separate and move to each end of the cell.
**Telophase	A new membrane forms around each set of chromosomes to form two nuclei.
**Cytokinesis	The two new cells fully separate.
*Cancer	When mitosis happens out of control forming large lumps of cells called tumours.

2. Animal growth	
*Growth	Increase in size due to increased numbers of cells.

*Percentile	A measure of the growth of a child that compares them to other children of the same age.
*90th percentile	A child is taller than 90% of children of the same age.
*50th percentile	Average for height/mass for the age.
*Percentile graphs	Graphs showing how height/mass change with age with different lines for each percentile.
*Cell differentiation	When a cell divides by mitosis to produce two different types of cell (not two identical ones).
*Specialised cell	A cell special features designed for a specific job.
**Importance of differentiation in animals	To produce all the different types of cell the body needs such as red blood cells, fat cells, nerve cells and muscle cells.

3. Plant growth	
*Plant growth	Cell division creates more cells, elongation makes these cells get bigger.
**Meristems	Areas just behind the tips of roots and shoots where cell division and differentiation happens.
**Importance of differentiation in plants	To produce all the different types of cell a plant needs such as root hair cells and xylem cells.
**Calculating percentage changes	$\% \text{ change} = (\text{final value} - \text{starting value}) / \text{starting value} \times 100$

4. Stem cells	
*Stem cell	A cell that can differentiate when it divides, to produce two different cells.
**Embryonic stem cell	A stem cell that can become any kind of cell. Found in developing embryos.
**Adult stem cell	A stem cell that can only become a few types of cell. Found in animals after birth.

*Stem cells in medicine	It is hoped they can be used to replace damaged cells in diseases like type 1 diabetes or leukaemia, or to grow new organs for transplant.
**Problems with stem cells	They may potentially cause cancer, stem cells can only be used in the person they have come from.

5. Nervous system	
*Nervous system	All the nerves in your body working together to gather information, make decisions and control responses.
*Central nervous system	The brain and spinal cord – makes decisions (aka CNS).
**Peripheral nervous system	All your other nerves – gathers information from your sense and carries messages from the CNS to your muscles.
*Neurone	A nerve cell
*Impulse	Electrical message carried by a neuron.
**Cell body	The central part of a nerve cell containing its nucleus.
**Dendron and axon	The long parts of a nerve cell carrying impulses towards the cell body (dendron) and away from it (axon)
**Myelin sheath	A fatty layer around the axon and dendron that insulates it to prevent the impulse from escaping and speeds the impulse up.

6. Neurotransmission	
**Neurotransmission	The travelling of an impulse along a neuron and into another.
**Dendrites	Branches at the beginning of a dendron that connect to receptor cells or another neuron.
**Axon terminals	Branches at the end of an axon that connect to a muscle or another neuron.

**Synapse	Small gap between two neurons where the axon terminals of one meet the dendrites of another.
**Neurotransmitter	Chemicals released by axon terminals that diffuse across the synapse to trigger a new impulse the dendrite of another neuron.
**Sensory neuron	Nerve cell that carries impulses from sense organs to the CNS. Has a long dendron and a long axon.
**Relay neuron	Nerve cell in the CNS that makes decisions. Dendrites join onto cell body, short axon.
**Motor neuron	Nerve cell that carries impulses from the CNS to muscles. Dendrites join onto cell body, long axon.

7. Controlling movement	
*Stimulus	A piece of information detected by the nervous system.
*Receptor	Cells that detect a stimulus.
*Response	The action that the nervous system makes happen.
*Effector	The body part that produces the response, often a muscle.
**Voluntary movement	A stimulus is detected by a receptor, causing an impulse to be carried by a sensory neuron to the brain. Relay neurones in the brain decide what to do and send another impulse down a motor neuron to the effector (muscle) to cause a response.
*Reflexes	Automatic responses that happen very quickly without conscious thought to keep the body safe.
**Reflex arc	Movement is caused in the same way as for voluntary movement, except the spinal cord makes the decision without needing the brain to think.

C3 & 4: Atoms and the periodic table

Lesson sequence

1. Structure of atoms
2. Detailed structure of atoms
3. Isotopes
4. Mendeleev's periodic table
5. The modern periodic table
6. Electron configuration

1. Structure of atoms

*Particle	The tiny pieces that all matter is made from.
*Atom	The smallest independent particle. Everything is made of atoms.
**Size of atoms	About 1×10^{-10} m in diameter.
**Dalton's model of atoms	- Tiny hard spheres - Can't be broken down - Can't be created or destroyed - Atoms of an element are identical - Different elements have different atoms
*Subatomic particles	Smaller particles that atoms are made from.
*Proton	Mass = 1 Charge = +1 Location = nucleus
*Neutron	Mass = 1 Charge = 0 Location = nucleus
*Electron	Mass = $1/1835$ (negligible) Charge = -1 Location = shells orbiting nucleus
*Nucleus	Central part of an atom, 100,000 times smaller than the overall atom

2. Detailed structure of atoms

**Alpha particle	Small positively charged particle made of two protons and two neutrons.
**Scattering	When particles bounce back or change direction.

**Rutherford's experiment	Fired alpha particles at gold leaf, used a phosphor-coated screen to track where they went.
**Rutherford's results	Most alpha particles went through, some scattered (changed direction).
**Rutherford's explanation	Scattered particles hit a solid nucleus. Most did not hit it, therefore nucleus is small
*Atomic number	The bottom number on the periodic table, gives the number of protons and electrons.
*Atomic mass	The top number on the periodic table, gives the total protons and neutrons together.
*Number of protons	The atomic number.
*Number of electrons	The atomic number.
*Number of neutrons	Atomic mass minus atomic number.
*Number of protons and electrons	Equal, because each negative electron is attracted to a positive proton in the nucleus.

3. Isotopes

**Isotopes	Atoms with the same number of protons but different number of neutrons.
**Describing isotopes	Mass after the name (e.g. boron-10) or superscript mass before the symbol (^{10}B).
*Nuclear fission	Large unstable atoms break into two smaller stable ones.
**Uses of fission	Nuclear power, nuclear weapons.
**Relative atomic mass, A_r	The weighted average of the masses of all of the isotopes of an element.
**Isotopic abundance	The percentage of an element that is made of a particular isotope.
**Calculating A_r	- Multiply each mass by the decimal % - Add these up Note: (decimal % = %/100)

4. Mendeleev's periodic table

*Dmitri Mendeleev	Russian chemist, developed the periodic table.
*Mendeleev's periodic table	Ordered by increasing A_r , some elements switched according to their properties.
*Chemical properties	Includes reaction with acid and formula of oxide.
*Physical properties	Includes melting point and density.
**Gaps in Mendeleev's periodic table	Mendeleev left gaps where no known element fitted and predicted these would be filled with newly discovered elements.
**Eka-aluminium	An element that Mendeleev thought would fill a gap. He predicted its properties, which matched gallium when discovered.

5. The modern periodic table

*Noble gases	Gases that do not react: He, Ne, Ar, Kr.
**Moseley's experiment	Fired electrons at samples of elements and measured X-rays produced.
**Moseley's results	Energy of x-rays produced proportional to the positive charge of the element.
**Conc. from Moseley's work	The atomic number must be the number of protons in the atoms.

**Pair reversals	Elements (like Ar and K) that are not in order of increasing mass.
**Explaining pair reversals	It means elements should be order elements by increasing atomic number instead.

6. Electron configuration

*Shells	Electrons orbit atoms in shells.
*First shell	Holds up to two electrons.
*Second shell	Holds up to eight electrons.
*Third shell	Holds up to eight electrons.
*Number of electrons	Given by the atomic number.
*Filling shells	Fill shells from the first shell out. Move up a shell when current one is full.
*Electron configuration	The number of electrons in each shell (e.g. Al is 2.8.3).
*Outer shell	The last shell with any electrons in it.
**Groups	Columns in the periodic table, tell you the number of electrons in the outer shell.
**Periods	Rows in the periodic table, tell you the number of electron shells.

1	2											3	4	5	6	7	0								
7 Li lithium 3	9 Be beryllium 4																	4 He helium 2							
<table border="1"> <tr> <td colspan="2">Key</td> </tr> <tr> <td>relative atomic mass</td> <td>atomic symbol</td> </tr> <tr> <td colspan="2">name</td> </tr> <tr> <td colspan="2">atomic (proton) number</td> </tr> </table>																		Key		relative atomic mass	atomic symbol	name		atomic (proton) number	
Key																									
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23 Na sodium 11	24 Mg magnesium 12	45 Sc scandium 21	48 Ti titanium 22	51 V vanadium 23	52 Cr chromium 24	55 Mn manganese 25	56 Fe iron 26	59 Co cobalt 27	59 Ni nickel 28	63.5 Cu copper 29	65 Zn zinc 30	70 Ga gallium 31	73 Ge germanium 32	75 As arsenic 33	79 Se selenium 34	80 Br bromine 35	84 Kr krypton 36								
85 Rb rubidium 37	88 Sr strontium 38	89 Y yttrium 39	91 Zr zirconium 40	93 Nb niobium 41	96 Mo molybdenum 42	[98] Tc technetium 43	101 Ru ruthenium 44	103 Rh rhodium 45	106 Pd palladium 46	108 Ag silver 47	112 Cd cadmium 48	115 In indium 49	119 Sn tin 50	122 Sb antimony 51	128 Te tellurium 52	127 I iodine 53	131 Xe xenon 54								
133 Cs caesium 55	137 Ba barium 56	139 La* lanthanum 57	178 Hf hafnium 72	181 Ta tantalum 73	184 W tungsten 74	186 Re rhenium 75	190 Os osmium 76	192 Ir iridium 77	195 Pt platinum 78	197 Au gold 79	201 Hg mercury 80	204 Tl thallium 81	207 Pb lead 82	209 Bi bismuth 83	[209] Po polonium 84	[210] At astatine 85	[222] Rn radon 86								
[223] Fr francium 87	[226] Ra radium 88	[227] Ac* actinium 89	[261] Rf rutherfordium 104	[262] Db dubnium 105	[266] Sg seaborgium 106	[264] Bh bohrium 107	[277] Hs hassium 108	[268] Mt meitnerium 109	[271] Ds darmstadtium 110	[272] Rg roentgenium 111	Elements with atomic numbers 112-116 have been reported but not fully authenticated														

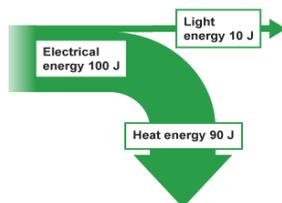
P3: Energy

Lesson sequence

1. Storing and transferring energy
2. Energy efficiency
3. Insulation
4. Stored energy
5. Non-renewable energy resources
6. Renewable energy resources

1. Storing and transferring energy

*Energy	The capacity to do work.
*Joules	The units of energy, symbol = J.
*Kilojoules	1000 J, symbol = kJ.
*Thermal energy	Energy stored on hot objects.
*Kinetic energy	Energy stored in moving objects.
*Chemical energy	Energy stored in chemicals such as fuels.
*Nuclear energy	Aka atomic energy. Energy stored in the nucleus of atoms.
**Gravitational potential energy	Energy stored in objects based on how high they are.
**Elastic potential energy	Aka strain energy. Energy stored in bent or stretched objects.
**Other forms of energy	Light, sound, electrical.
**First law of thermodynamics	Energy cannot be created or destroyed, just transferred from one form to another.
**Energy transfers	Say what form the energy starts as <i>and</i> what it becomes.



**Sankey diagram	Shows energy transfers. The thickness of the arrow relates to the amount of energy.
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2. Energy efficiency

**Dissipation	The way energy spreads out, becoming less useful as it does.
*Wasted energy	Energy that is transferred into forms that can't be used.
*Friction	Causes energy loss as heat when two surfaces rub together.
**Lubrication	Allows surfaces to move smoothly, reduces energy loss from friction.
**Electrical resistance	Causes wires to heat up, wasting electrical energy.
*Calculating efficiency	$\text{Efficiency} = \frac{\text{useful energy transferred}}{\text{total energy transferred}}$
**Energy efficiency numbers	Efficiency is between 0 and 1. 1 = no energy wasted, 0 = all energy wasted.

3. Insulation

*Convection	Heat transfer caused when hot fluids (gas or liquid) rise because they are less dense.
*Conduction	Heat transfer through solids caused by vibrating particles bumping into each other.
*Radiation	Heat transfer by infrared radiation which heats objects up when they absorb it.
**Insulation	Materials that contain lots of tiny air pockets that prevent heat loss by conduction.
**Thermal conductivity	A measure of how well a material conducts heat.
**Draught-proofing	Sealing gaps around doors and windows to prevent heat loss by convection.

4. Stored energy

*Calculating kinetic energy	$KE = \frac{1}{2}mv^2$
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	Where 'KE' is kinetic energy in J, 'm' is mass in kg, 'v' is velocity in m/s.
**Calculating v from KE	$v = \sqrt{\frac{2KE}{m}}$
**Gravitational field strength	The strength of gravity. Different on different planets. On earth: 10 N/kg.
**Calculating gravitational potential energy	$GPE = mgh$ Where 'GPE' is gravitational potential energy in J, 'm' is mass in kg, 'g' is gravitational field strength in N/kg, 'h' is height change in m.

5. Non-renewable energy resources

*Fossil fuels	Coal, oil, natural gas. All are non-renewable.
*Non-renewable resource	A resource that will one day run out because it is being used faster than it is being made.
**Harm from burning fossil fuels	Carbon dioxide gas is released which causes global warming. Sulfur dioxide is released which causes acid rain.
*Renewable resource	A resource will not run out.
*Nuclear power	Electricity generated from nuclear fuels such as uranium.
**Nuclear power pros and cons	<input type="checkbox"/> Lasts a long time, releases no carbon dioxide ☹️ Produces very harmful waste, expensive to decommission, although rare, accidents are very dangerous.

6. Renewable energy resources

*Wind power	Large turbines spun by the wind. <input type="checkbox"/> No CO ₂ ☹️ Lots needed, ugly?, no wind no power
*Solar power	Solar cells turn sunlight to electricity. <input type="checkbox"/> No CO ₂

	☹️ No sun no power, need lots of space, not suitable for all countries
**Tidal power	Uses water movement from tides to spin turbines
**Tidal barrage	A damn built across an estuary that fills up when tide goes in. <input type="checkbox"/> Huge amounts of energy, no CO ₂ ☹️ Destroys important mudflat habitats
**Hydroelectricity	A damn is built across a river valley, water released from the damn spins turbines. <input type="checkbox"/> Lots of energy, no CO ₂ ☹️ Destroys habitat by flooding
*Biofuels	Fuels made from recently plant or animal matter, often waste. <input type="checkbox"/> Carbon neutral ☹️ Needs a lot of land, increases food prices
**Carbon neutral	When burning a fuel releases the same CO ₂ it absorbed when it was growing, so there is no CO ₂ increase.