

KS4 DESIGN TECHNOLOGY Knowledge Organiser

GCSE DT

NAME:

CLASS:

TEACHER:

Target Grade		WAG	Mod 1	Mod 2	Mod 3
DD Group	Bauhaus		Memphis	Art Nouveau	

MODULE REVIEW CLOSING THE LOOP	WWW	EBI
MODULE 1		
MODULE 2		
MODULE 3		
MODULE 4		
MODULE 5		
MODULE 6		

Intent, Implementation and Impact in KS4 Technology

Our Mission Statement:

'We aim to use an iterative and explorative design cycle to empower students to become creative and critical thinkers. To find solutions to everyday problems that meet users' needs and make the world a better environment for all in an inclusive way.'

What this means in your lessons:

➤ ***An iterative and explorative design cycle***

We want you to try to always be improving your ideas and looking for new solutions.

➤ ***Creative and critical thinkers***

We want you to think outside the box and challenge the ordinary designs you see every day.

➤ ***Solutions to everyday problems***

We want you to be the people who solve the challenges the world is facing through your new thoughts and exciting ideas.

➤ ***Meet users' needs***

We want you to think about what your users need every step of the way so your design is 'human centred.'

➤ ***Make the world a better environment***

We want you to help protect and improve the world for future generations to come.

➤ ***In an inclusive way***

We want you to design with an awareness of the challenges and barriers your customers may have.

Course Structure KS4 Design Technology

AQA GCSE Design Technology

Paper 1
What's assessed <ul style="list-style-type: none">• Core technical principles• Specialist technical principles• Designing and making principles
How it's assessed <ul style="list-style-type: none">• Written exam: 2 hours• 100 marks• 50% of GCSE
Questions <p>Section A – Core technical principles (20 marks)</p> <p>A mixture of multiple choice and short answer questions assessing a breadth of technical knowledge and understanding.</p> <p>Section B – Specialist technical principles (30 marks)</p> <p>Several short answer questions (2–5 marks) and one extended response to assess a more in depth knowledge of technical principles.</p> <p>Section C – Designing and making principles (50 marks)</p> <p>A mixture of short answer and extended response questions.</p>

50% Exam (2hours)

Core Design and technology knowledge + questions on the specific materials studied + designing skills

Non-exam assessment (NEA)
What's assessed <p>Practical application of:</p> <ul style="list-style-type: none">• Core technical principles• Specialist technical principles• Designing and making principles
How it's assessed <ul style="list-style-type: none">• Non-exam assessment (NEA): 30–35 hours approx• 100 marks• 50% of GCSE
Task(s) <ul style="list-style-type: none">• Substantial design and make task• Assessment criteria:<ul style="list-style-type: none">• Identifying and investigating design possibilities• Producing a design brief and specification• Generating design ideas• Developing design ideas• Realising design ideas• Analysing & evaluating• In the spirit of the iterative design process, the above should be awarded holistically where they take place and not in a linear manner• Contextual challenges to be released annually by AQA on 1 June in the year prior to the submission of the NEA• Students will produce a prototype and a portfolio of evidence• Work will be marked by teachers and moderated by AQA

50% NEA

Design and Make project with a design portfolio and manufacturing skills.

Learning Journey KS4 Design Technology

Core technical principles

New and emerging technologies
Energy generation and storage
Developments in new materials
Systems approach to designing



Designing

Basic sketching techniques
Using primary and secondary data
The work of other designers
How to produce a specification
Environmental, social and economic challenges
Design strategies



Specialist principles

Selection of material or components
Forces and stresses
Ecological and social footprint
Sources and origins



Tools & Equipment

Specialist techniques and processes
Surface treatments and finishes



Revision

Core principles
Design Process
Manufacturing processes and equipment



To A level and beyond



Materials

Mechanical devices
Materials and their working properties
Material properties



Making principles

Communication of design ideas
Prototype development
Testing materials, processes and components
Testing and evaluating



Modifying material

Using and working with materials
Using a brief to create a design portfolio
Scales of production
Evaluate and develop the design to the point of manufacture



Use a range of processes to create a final product
Project NEA



Design Technology Paper 1

- Section A: Core technical principles
- Section B: Specialist technical principles
- Section C: Designing and making principles

Content KS4 Design Technology

New and emerging technologies

- Automation and the use of robotics. Tools and equipment.
- Crowd funding, virtual marketing and retail, co-operatives, fair trade.
- How technology push/market pull affects choice. Changing job roles due to the emergence of new ways of working driven by technological change.
- Changes in fashion and trends in relation to new and emergent technologies.
- Respecting people of different faiths and beliefs.
- How products are designed and made to avoid having a negative impact on others: design for disabled, elderly, different religious groups.
- Positive and negative impacts new products have on the environment.

Energy generation and storage

- How power is generated from: coal, gas, oil. Arguments for and against the selection of fossil fuels.
- How nuclear power is generated. Arguments for and against the selection of nuclear power.
- How power is generated from: wind, solar, tidal, hydro-electrical, biomass.
- Arguments for and against the selection of renewable energy.
- Kinetic pumped storage systems. Alkaline and re-chargeable batteries.

Materials and their working properties

- Papers and board
- Natural and manufactured timbers
- manufactured boards
- Metals and alloys –
- Polymers
- Textiles
- Material properties

Selection of materials and components

- Functionality: application of use, ease of working.
- Aesthetics: surface finish, texture and colour.
- Environmental factors: recyclable or reused materials.
- Availability: ease of sourcing and purchase.
- Cost: bulk buying.
- Social factors: social responsibility.
- Cultural factors: sensitive to cultural influences.
- Ethical factors: purchased from ethical sources such as FSC.

Ecological issues in the design and manufacture of products

- Deforestation, mining, drilling and farming. Mileage of product from raw material source, manufacture, distribution, user location and final disposal. That carbon is produced during the manufacture of products.
- The six R's - Reduce, refuse, re-use, repair, recycle and rethink.
- Safe working conditions; reducing oceanic/ atmospheric pollution and reducing the detrimental (negative) impact on others.

Content KS4 Design Technology

Developments in new materials

- Modern materials e.g. Graphene, Metal foams and Titanium.
- Smart materials - That materials can have one or more properties that can be significantly changed in a controlled fashion by external stimuli, such as stress, temperature, moisture, or PH eg shape memory alloys, thermo chromic pigments and photochromic pigments.
- Composite materials - That composite materials are produced by combining two or more different materials to create an enhanced material e.g. glass reinforced plastic (GRP) and carbon fibre reinforced plastic (CRP).
- Technical textiles - How fibres can be spun to make enhanced fabrics e.g. conductive fabrics, fire resistant fabrics, Kevlar and microfibres incorporating micro encapsulation.

Systems approach to designing

- Inputs - The use of light sensors, temperature sensors, pressure sensors and switches.
- Processes - The use of programming microcontrollers as counters, timers and for decision making, to provide functionality to products and processes.
- Outputs - The use of buzzers, speakers and lamps, to provide functionality to products and processes.

Mechanical devices

- Types of movement - The functions of mechanical devices to produce linear, rotary, reciprocating and oscillating movements.
- Changing magnitude and direction of force - Levers: first order, second order, third order. Linkages: bell cranks, push/pull. Rotary systems: CAMs and followers, simple gear trains, pulleys and belts.

Specialist techniques and processes

- How to use measurement/reference points, templates, jigs and patterns where suitable.
- A range of tools, equipment and processes that can be used to shape, fabricate, construct and assemble high quality prototypes, as appropriate to the materials and/or components being used including:
 - Wastage, such as: die cutting, perforation, turning, sawing, milling, drilling, cutting and shearing
 - Addition, such as: brazing, welding, lamination, soldering, 3D printing, batik, sewing, bonding, printing
 - Deforming and reforming such as: vacuum forming, creasing, pressing, drape forming, bending, folding, blow moulding, casting, injection moulding, extrusion.
- Tolerance - the manufacture to minimum and maximum measurements.
- Commercial processes - Papers and boards (offset lithography and die cutting).
- Timber based materials (routing and turning).
- Metal based materials (milling and casting).
- Polymers (injection moulding and extrusion).
- Textile based materials (weaving, dyeing and printing).
- Electrical and mechanical systems (pick and place assembly and flow soldering).

Knowledge Organiser: KS4 Design Technology

New and Emerging Technologies: Industry and Enterprise

Automation

This is when machines and robotics help make products or make them for you. Often this is done by **CAD (Computer Aided Design)** and **CAM (Computer Aided Manufacture)**

This helps products be made quicker, with more accuracy. Reducing errors humans make to products. However, these machines are expensive to buy, need specialist training to use and need constant maintenance to keep them working properly

Virtual Marketing

This is when websites, social media and email are used to promote and sell products. This has become very popular in recent years, with big social media apps being funded by advertisers

Companies can also pay search engines to push their company further to the top of the results page, so customers are more likely to click it.

Cooperatives

A Cooperative is an Enterprise that is run by members that are part of the workforce or customers. This means the organisation is democratic and often supports the local community. They are set-up to protect the rights of their members and ensure the same rules apply to everyone

Enterprise

This is when an idea is developed into a business and produces a viable product. Often, one of the biggest enterprises in in apps for smartphones. To make sure ideas are protected from being copied, a **Patent** can be applied for. This legally protects your idea on invention from being stolen.

Crowdfunding

This is where ideas are funded by large groups of ordinary people. www.Kickstarter.com is a good example of this.

Fair Trade

This is an organisation that promotes fair pay, working conditions and better trade with farmers in developing countries. You can tell when something is Fairtrade as it will often have the symbol on the product or packaging. Common Fairtrade items include; bananas, cotton and chocolate.



Key words

Automation
Crowdfunding
Cooperative
Enterprise
Fair Trade
Virtual
Marketing
Patent
CAD
CAM

Curriculum Links

Maths: Profit, time scale, planning, business
Science: chemical and industrial processes.
English: research skills and written communication
ICT: word processing, flow charts, CAD
Careers/Cultural Capital: sectors and roles in DT, Enterprising ventures, analytical skills,

Knowledge Organiser: KS4 Design Technology

New and Emerging Technologies: CAD CAM, JIT & Lean Manufacturing

Key words

CAD
CAM
Just In Time
Lean
Manufacturing
CNC Router
Automation
3D printer
Laser cutter
Application
CNC Milling
machine
Prototype

CAD Computer Aided Design

Examples; 2D Design, Autodesk Inventor, Fusion 360, Photoshop, etc

Advantages

- Easy to change designs
- Designs are easily saved and sent
- Can be worked on by multiple people simultaneously
- Can be used for virtual testing
- Can produce high-quality designs

Disadvantages

- Complex and time-consuming to learn
- Expensive to buy
- PCs can crash or be hacked – causing work to be lost
- Takes up PC memory

CAM Computer Aided Manufacture

Examples; 3D Printing, Laser Cutting, CNC Router, Automated Machines and Robotics, etc

Advantages

- Faster and more accurate than traditional tools
- Repetitive accuracy/ consistent outcomes
- Machines can run 24/7

Disadvantages

- Expensive to buy the equipment, etc
- Training takes cost and time
- Need specialists to maintain and repair the machines
- Dependence on CAM can cause unemployment



Knowledge Organiser: KS4 Design Technology

New and Emerging Technologies: CAD CAM, JIT & Lean Manufacturing



Just-in-Time (JIT) Manufacture

This is where manufacturers only order materials, parts, etc when needed. The customer's order triggers the production process and the resources needed for that order are the only ones bought.

This can be used in any scale of production but is particularly useful for one-off production.

Advantages

- Saves on warehouse and storage costs
- Money is not tied-up in stock
- Little/minimal waste
- Customer often pays in advance so money is secure before production

Disadvantages

- All production stops if a part/material is missing
- Needs to have a fast, reliable and good quality supply chain to work properly
- Can be time-consuming

Flexible Manufacturing Systems

This is where automated machines are adaptable and can produce different products if needed.

If a manufacture is making a product with machines that are just dedicated to specific tasks they have to be reprogrammed and re-tooled before changing to a new task. This is time consuming and expensive.

Lean Manufacturing

This is where waste and energy is kept to a minimum.

This helps manufacturers save money and resources in production, as well as helping minimise the environmental impact of producing products.



Knowledge Organiser: KS4 Design Technology

New and Emerging Technologies: People, Society and Culture

Market Pull and Technology Push

Technology Push is the development of new technology, materials and manufacturing methods to create new products or improve old ones. Examples include; Smart Phones, Electricity, Mass Production, etc

Market pull is the demand from consumers for new products and improvements in old ones; this is often found via reviews, polls, surveys, etc Examples include; Product Aesthetics, making products easier to use, etc

Case Study: £5 note

Hindu, Sikh and some other faith-based communities may choose to follow a vegetarian diet, and this is part of their culture. In addition to not eating meat, many followers of these faiths, as well as vegans and vegetarians, take every opportunity to avoid using animal products in their day-to-day lives.

The revelation in 2016 that the new polymer Bank of England £5 note contained tallow, an animal fat-based substance, upset a number of communities. There was a prompt call for the Bank of England to find an alternative way to produce the note and in the first two days of an official petition well over 100,000 signatures were received.

Shortly after the Bank of England admitted that the new polymer £5 note contained the animal by-product, some establishments refused to take the notes as a method of payment. One café owner was repulsed by the idea that the note contained tallow and believed that her customers supported her view. They received no complaints.

The Bank of England say they currently have no plans to change the manufacturing process.



Key words

Market Pull
Technology Push
Aesthetics
Iconic design
Inclusive design
Exclusive design
Evolution of design
Trends

Curriculum Links

RE : Religion, Faith and Culture

Cultures, Faith and Belief

Different groups of people have different interests and have to be catered for. Different countries and cultures also react to products differently. E.g. In India McDonalds don't sell beef burgers as it has a large Hindu population, and cows are seen as sacred – in contrast the UK sells its most amount of fish and chips on a Friday as it is a Christian tradition to not eat meat on that day.

Knowledge Organiser: KS4 Design Technology

New and Emerging Technologies: People, Society and Culture

Fashion and Trends

Fashion and Trends will change quickly, and you can see major differences in fashions over decades. Designers have to make sure their products meet the fashion and trends of the area they are designing and selling the product to.

The change of products over time is called Product Evolution. This is caused by Market Pull, Technology Push and Fashion and Trends.



Some products are seen as timeless. These products are called Iconic Designs. These products are timeless because they were innovative, set a bench mark for following products, changed their industry and are often copied.

Examples include; iPod, iPhone, Angle-Poise Lamp, Swiss Army Knife, Converse Shoes, Levi's Jeans, Classic Mini Cooper



SPITFIRE
R.J. MITCHELL
1936



STRATOCASTER GUITAR
Electric Guitar Designed By
Leo Fender, George Fullerton,
and Freddie Tavares In 1954



SIR ALEC ISSIGONIS'
ORIGINAL MINI
1959



SONY WALKMAN
Walkman TPS-L2 (1979
1979



iPod Touch
2007

Inclusive vs. Exclusive Design

Inclusive Design: The aim to create a product that as many people as possible can use
Examples include; Cars, Doorframes, Adjustable Products, etc

Exclusive Design: The aim to create a product for a particular group and their needs
Examples include; Car seats for babies, Wheelchairs, Stair Lifts

Knowledge Organiser: KS4 Design Technology

Energy Generation and Storage

Renewable Energy Sources	This is when certain sources of energy will not run out.
Solar	<ul style="list-style-type: none">• Solar panels are used to collect light and convert it into electricity• There is no waste and a consistent supply• However, the panels are not effective at night or in countries where there isn't a lot of sunlight
Wind	<ul style="list-style-type: none">• Turbines harness wind energy• Not effective on non-windy days• Some people don't like turbines as they are noisy, and not attractive to look at
Hydro-Electrical	<ul style="list-style-type: none">• This harnesses energy from water held behind a dam• Has to be created by flooding land – damaging wildlife habitats• Tidal energy comes from using energy from waves
Biomass	<ul style="list-style-type: none">• This is fuel from natural sources e.g. crops, scrap woods and animal waste• Growing biomass crops produces oxygen and uses up CO₂• However, is a very expensive method

Non-Renewable Energy Sources	This is when certain sources of energy will run out eventually
Fossil Fuels	<ul style="list-style-type: none">• Coal, Oil and Gas• Burned to create steam, turned in turbines to create electricity.• Burning creates CO₂ which adds to Global Warming
Nuclear Power	<ul style="list-style-type: none">• Nuclear Fission controls the reactor (that creates the electricity). This requires Uranium which is non-renewable• Accidents and waste can severely damage the environment and cause radiation poisoning• Radiation poisoning can be fatal and cause physical deformations• Nuclear waste has to be disposed of properly and is hazardous for thousands of years.

Storing Energy

Pneumatics: This is the production of energy using compressed gas or air. E.g. Pistons in an engine

Hydraulics: Like a Pneumatic system, but uses water or oil under pressure. E.g. Wheelchair lifts

Kinetic: Energy that is generated by movement. This is stored by items like springs in a "clickable" pen or balloons.

Batteries: Electrical power can be stored in batteries. Rechargeable batteries are becoming increasingly popular.

Knowledge Organiser: KS4 Design Technology

Developments in new materials: Modern and Smart materials

Smart Materials are materials that change and react to the stimuli

Material	Key info	Examples
Thermochromic Pigments	Change colour in reaction to heat	Kettles, baby bottles, etc
Photochromic Pigments	Change colour in reaction to light	Colour changing glasses, windows, etc
Shape Memory Alloy	Returns to its original shape, in reaction to heat	Braces and glasses
Polymorph	Granules that once exposed to hot water, become a modelling material (like a dough or clay)	Modelling and repairs

Modern Materials are materials that have been developed recently

Material	Key info	Examples
Corn-starch Polymers	These are plant-based polymers that are a replacement for plastics that are biodegradable but cannot be recycled.	Plastic bottles, tubs, food containers, etc
Flexible MDF	Made in the same way as normal MDF but with grooves cut into the surface so it is flexible. Flexply is the same but for Plywood. These can easily be shaped into curves	Modern furniture, interior walls and room dividers
Titanium	High strength to weight ratio. Doesn't corrode or rust. Suitable for medical use as its hypo-allergenic	Prosthetics, medical applications, sports cars, etc
Kevlar	A woven polymer with a high strength to weight ratio.	Bullet-proof vests, tyres, helmets, etc

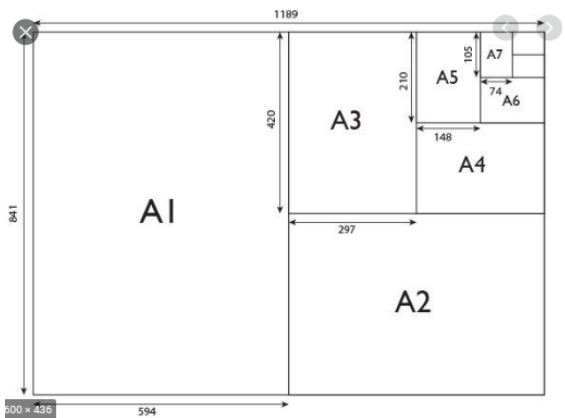
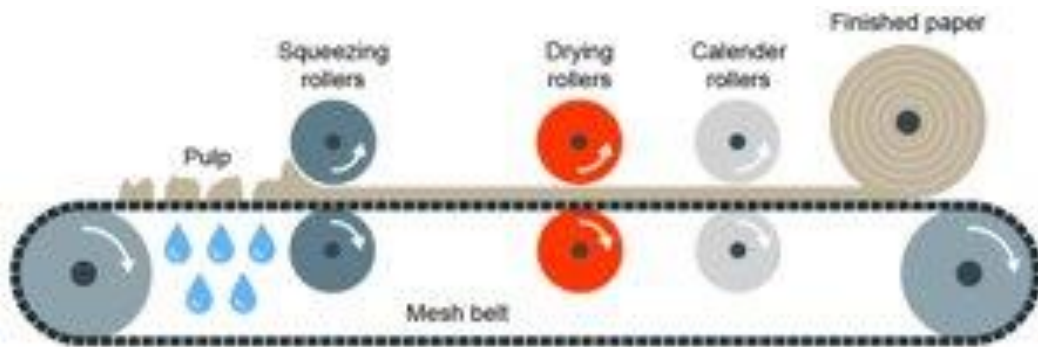


Knowledge Organiser: KS4 Design Technology

Developments in new materials: Modern, Smart, Papers and Boards

Papers and Boards come from trees.
The Stock forms for papers are: rolls, sheets, A4, A3, etc

Material	Key info	Uses/ Examples
Cartridge Paper	Thick white paper, completely opaque and more expensive than photocopy paper	Sketching, ink drawings
Layout Paper	Light, semi-translucent, good for blending inks and artist markers	Sketching, drawing and some tracing
Corrugated Cardboard	Strong but light. Rigid triangles of card sandwiched between a top and bottom layer.	Outer packaging, food packaging
Duplex Board	Light card with white outside layers. Waxy coating can be added	Cheap packaging. If waxy coating is applied, can be used for food
Foil-lined Board	White card coated with a thin aluminium layer. Foil is great for insulation and water resistance	Takeaway containers
Solid White Board	High-quality white card with a smooth finish. Stiff and holds colours well	Greetings cards, packaging and advertising

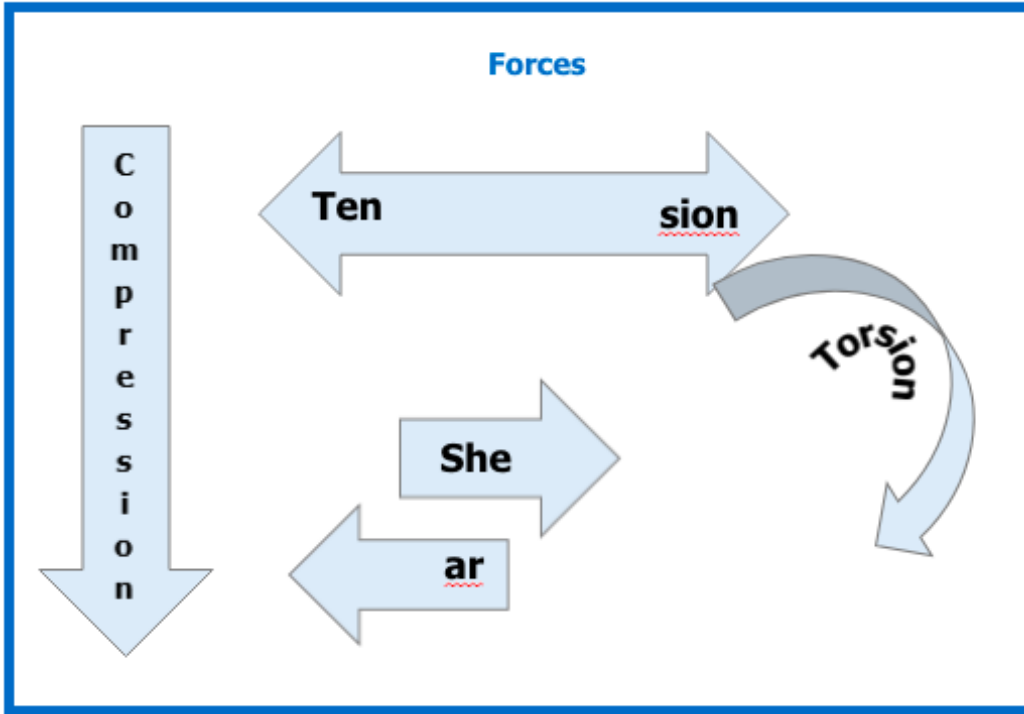


Key words

Modern materials, Smart materials,
Thermochromic, Kevlar, Nomex
Photochromic, SMA, Bleed,
Virgin paper
Paper = > 200gsm²
Board = < 200gsm²

Knowledge Organiser: KS4 Design Technology

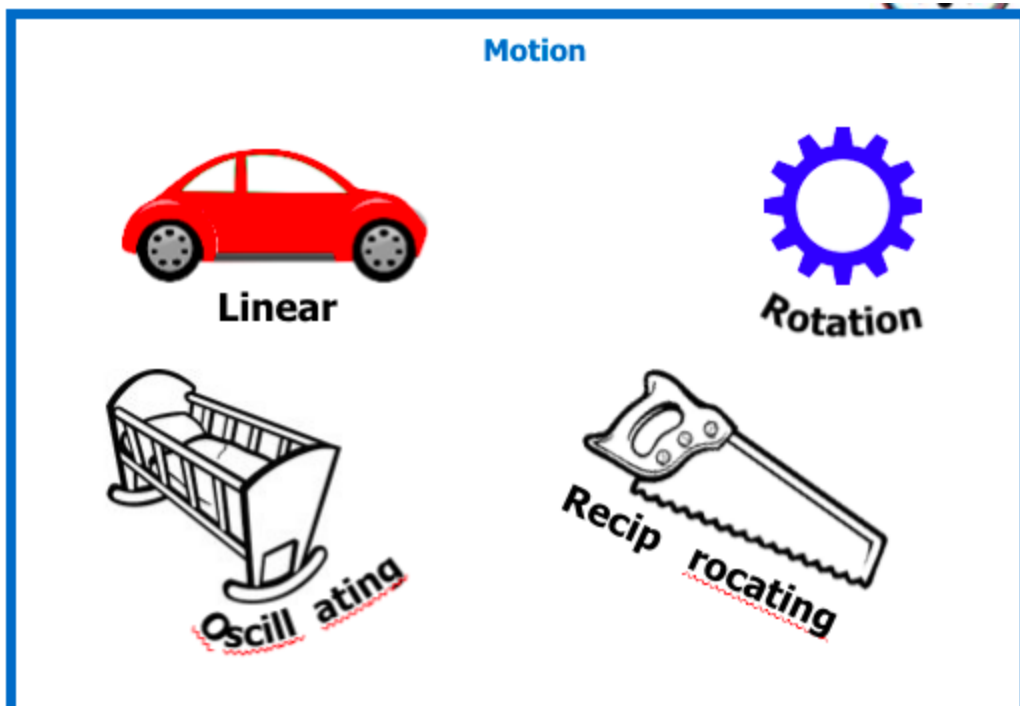
Mechanical Devices



Key words

Force
Levers
Mechanism
Motion
Linkages
Gear trains
Idler
Pivot/Fulcrum

Gear ratio =
Gear driven
divided by
gear driver



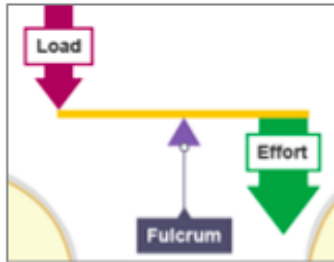
Curriculum Links

Physics:
Force, Levers,
Mechanisms

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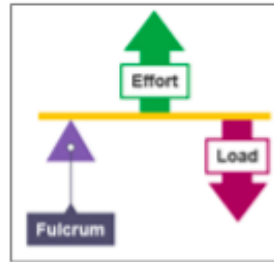
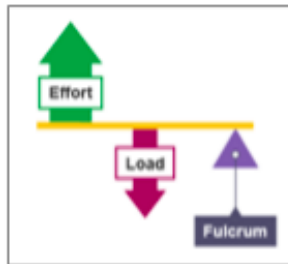
Mechanical Devices

Levers



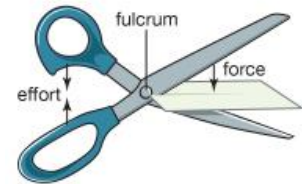
1st Class Lever:
Fulcrum in the centre
E.g. Scissors

2nd Class Lever:
Load in the centre
E.g. wheelbarrow



3rd Class Lever:
Force in the centre
E.g. Lifting a dumbbell

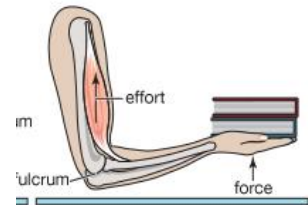
First-class lever



Second-class lever



Third-class lever



Gears and Pulleys

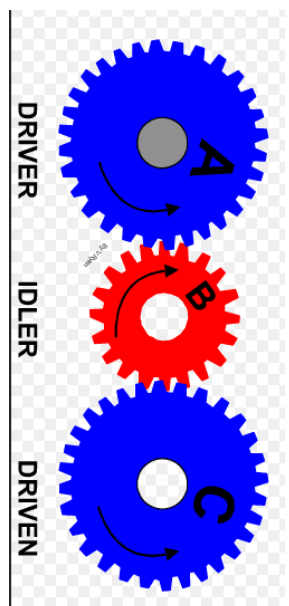
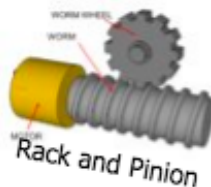


A Pulley is a grooved wheel, that has a belt running through it

This uses rotary motion and is often used to help with heavy loads, and transfer force from a motor to a tool in machines like drills, etc

Gears have teeth that mesh together with each other (like teeth on a zip)

They mainly focus on rotary motion on tools and machinery e.g. car steering and pillar drills



Knowledge Organiser: KS4 Design Technology

Materials and their working properties: Woods and Boards

Softwoods are generally cheaper than hardwoods as they are more available, since they grow quicker.

But because man-made boards are manufactured they are cheaper than timbers.

Man-made boards also come in a better variety of sizes since they don't depend on tree growth.

Stock forms for both include; sheets, dowel, planks, etc

Key words

Softwood
Hardwood
Man made
Board
Evergreen
Deciduous
Timber
Grain

Hardwoods come from Deciduous Trees. These trees lose leaves in winter and grow fruit and flowers in spring

Material	Key info	Examples
Ash	Flexible, tough and shock resistant	Sports equipment Tool Handles
Beech	Fine finish, tough and durable	Toys, furniture and veneers
Mahogany	Easily worked, durable, high quality finish	High-end furniture
Balsa	Very soft and spongy. Light	Modelling
Oak	Tough, durable and hard	Flooring, furniture and veneers

Softwoods come from Coniferous Trees. These have thin, needle-like leaves and grow all year round. Often have pine cones and sometimes nuts and seeds

Material	Key info	Examples
Larch	Durable, tough, good water resistance and finishes well	Furniture, flooring and used outdoors
Pine	Light, easy to work with but can split	Cheap furniture, construction and decking
Spruce	Easy to work with, high stiffness but can decay quickly	Furniture, musical instruments and construction

Knowledge Organiser: KS4 Design Technology

Materials and their working properties: Man made boards

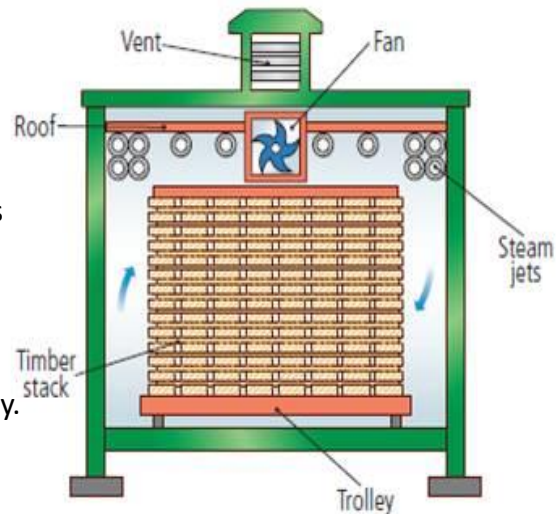
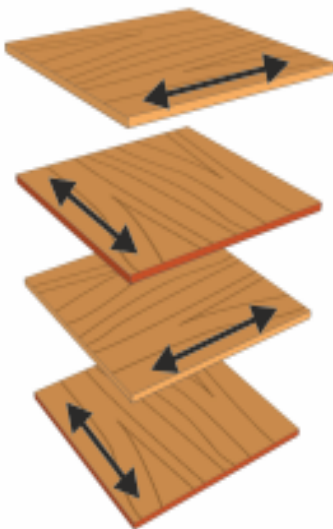
Manufactured boards are made from wood chips/dust/ layers and glue.		
Material	Key info	Examples
Chipboard	Prone to chipping but good compressive strength. Not-water resistant	Flooring, low-end furniture, flat-pack
MDF	Rigid and stable. Easy to finish. Absorbs liquid easily	Flat-pack furniture and kitchen unites
Plywood	Very stable. Exterior veneer can be used from more expensive woods	Shelving, furniture, toys

Primary Processing of Papers and Boards

Trees are cut then converted into planks by cut using saws
It is then seasoned to reduce the moisture in the wood. This is done by either:

Air-drying – Planks are stacked and air allowed to circulate; causing evaporation

Kiln-drying – Where planks are put into a kiln and dried rapidly. This process is more costly than air-drying



Manufactured boards can be either be made by lamination or compression

Lamination – Layers of woods and adhesive are layered and compressed together. Usually with a more expensive wooden veneer on the top

Compression – Wood is shredded, heated and compressed with adhesive under extreme pressure

We remember softwoods with this acronym - Soft Little Prickles

Knowledge Organiser: KS4 Design Technology

Materials and their working properties: Metals and Alloys

Metals come from ores in the ground. **Stock forms** are sheets, bars and rods

Ferrous Metals contain iron and are magnetic and rust

Material	Key info	Examples
Low Carbon Steel	Tough and ductile and easily machined and welded	Construction, screws, cars
High Carbon Steel	Hard and wears well	Tools, blades and knives
Cast Iron	Hard but brittle. Easily cast but hard to machine	Pots, pans, vices

Non-Ferrous Metals do not contain iron, aren't magnetic and don't rust

Material	Key info	Examples
Aluminium	Light, high strength to weight ratio and ductile	Pots, pans, cars, cans
Copper	Ductile, malleable and good conductor	Plumbing supplies and cables
Tin	Soft, malleable and good conductor	Used as a protective coating

Alloys are mixtures of 2 or more metals to get the best of their properties

Material	Key info	Examples
Brass	Malleable and easy to cast	Musical instruments, plumbing
Stainless Steel	Doesn't rust, hard and smooth	Cutlery, medical tools, etc

Key words

Ferrous
Non
Ferrous
Rust
Magnetic
Alloys



Knowledge Organiser: KS4 Design Technology

Materials and their working properties: Plastics

Plastics come from crude oil. **Stock forms** are sheets, powders, granules and rods

Thermoplastics can be reheated and reshaped and infinite amount of times		
Material	Key info	Examples
PET	Easily blow moulded , food safe and easily recycled	Bottles, packaging, etc
PVC	Flexible, tough, easily extruded	Pipes, tape, hard hats
HIPS	Flexible, lightweight, food safe and easily vacuum formed	Containers and yoghurt pots
Acrylic	Tough, brittle, easily scratched	Car lights, baths, displays/ signs

Thermosets once heated and set cannot be reshaped		
Material	Key info	Examples
Melamine Formaldehyde	Food safe, hygienic, hard and brittle	Kitchenware and work surfaces
Urea Formaldehyde	Good insulator, hard and brittle	Electrical casings, buttons and handles
Polyester Resin	Strong, heat resistant, can be transparent	Coatings, casings

Primary Processing of Metals and Alloys

Metals are mined from the earth and then go through an extraction process. Extraction happens by putting the ore in a blast furnace. The metal is then separated from the waste material.

Primary Processing of Plastics

Crude oil is extracted from the earth and then processes into different types of fuels, etc. This is called **Fractional Distillation**.

A process called **Cracking** then converts the large hydrocarbon molecules into plastics.

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Ecological issues in the design and manufacture of products

The 6Rs	Meaning
Reuse	To use a product again either for the same purpose or a different one
Reduce	To have less of material/packaging/pollution when making products by making them more efficient
Recycle	Breaking down and forming the material into another product
Refuse	Customers not buying or supporting products that make an environmental impact
Rethink	Designers and customer rethinking their decisions when making and buying products.
Repair	Fixing a product rather than throwing it away. Extending its life rather than using more resources to make another Often products are Designed for Maintenance so can easily be repaired. E.g. Using screws so even non-specialists can take a product apart, or using components that can easily be replaced like fuses or batteries

Key words

Ecological
Renewable
Sustainable
Deforestation
6Rs
Product
Airmiles
Carbon
Footprint
Disposal
Pollution
Finite
Obsolescence

Life Cycle Assessment



This is when a designer looks at the environmental impact a product makes over its life time and how it could be reduced. Including:

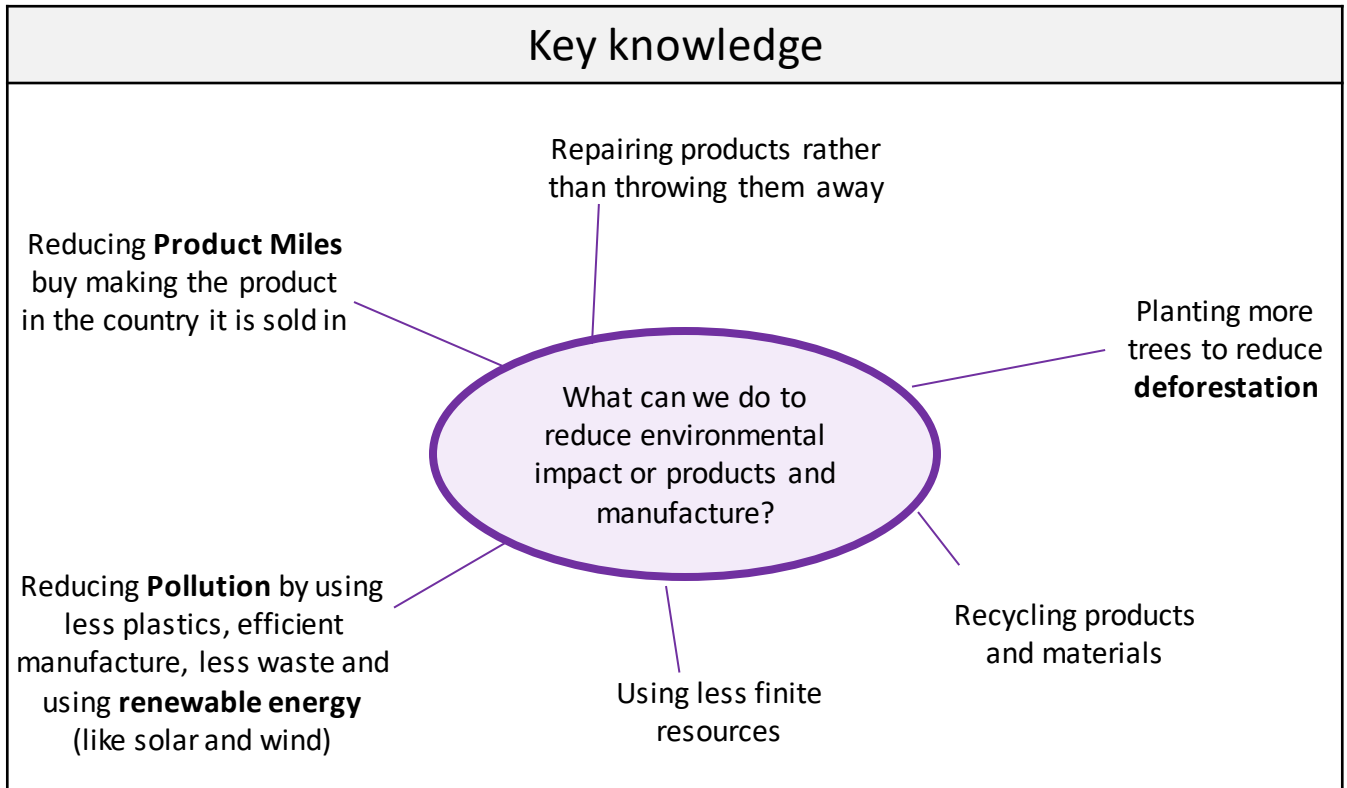
- Impact of materials
- Impact of processes
- Product Miles (how far a product has to travel to get from factory to consumer)
- Impact while in use
- Impact when disposed of (6Rs)

Curriculum Links

Geography :
Landfill,
airmiles,
carbon
footprint

Knowledge Organiser: KS4 Design Technology

Ecological issues in the design and manufacture of products



Sustainability is maintaining our planet and its resources and making a minimal negative impact

Finite Resources <i>Will run out of eventually</i>	Infinite Resources <i>Can be re-grown and re-bred. Will not run out of</i>
Plastics	Paper
Metals	Boards
Polymers (Textiles)	Natural Timbers
	Cotton
	Leather

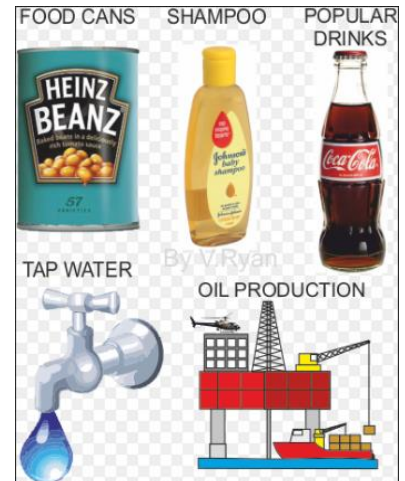
Planned Obsolescence

This is where products “die” after a certain amount of time. E.g. Disposable cups, Phones, Lightbulbs, Printer Ink, etc
This can have a big environmental impact as customers are throwing away lots of products, and resources are being used to create new ones.

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Scales of Production

Name/ Type	How many it makes	Key Info	Examples of Products
One-off Production	1	<ul style="list-style-type: none"> Also known as Bespoke or Prototype manufacture Custom-made products Specialist workers/ skills Specialist machines and materials High Quality but expensive 	<ul style="list-style-type: none"> Towers / Bridges One-off Houses Custom made clothes
Batch	10s-1000s	<ul style="list-style-type: none"> Uses a mix of workers and machinery Uses jigs, moulds and templates to help make identical products Stations of workers e.g. cutting station, painting station, etc Can have some variation e.g. colour, finish, flavour 	<ul style="list-style-type: none"> Baked foods Limited edition car Socks Chairs
Mass	10,000s - 100,000s	<ul style="list-style-type: none"> Big assembly lines (and sub-assembly lines) Heavily automated Standard and identical products Little worker input 	<ul style="list-style-type: none"> Cars Bottles Microchips Plain shirts
Continuous	100,00s +	<ul style="list-style-type: none"> 24/7 production Heavily automated Standard and identical products Little worker input 	<ul style="list-style-type: none"> Energy Water Paper Plastic



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Scales of Production

One-off Production	
Advantages	Disadvantages
<ul style="list-style-type: none">• Custom made• High Quality Materials• High Quality Craftsmanship	<ul style="list-style-type: none">• Time consuming• Specialist training for workers• Expensive to buy

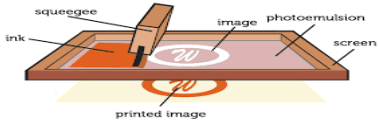
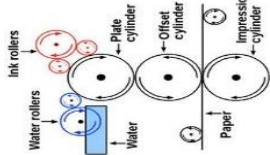
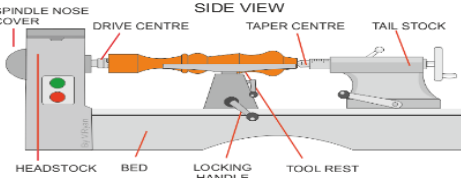
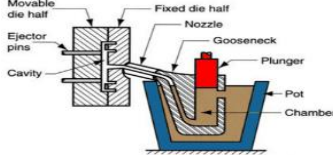
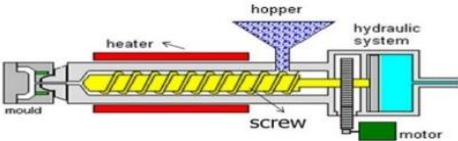
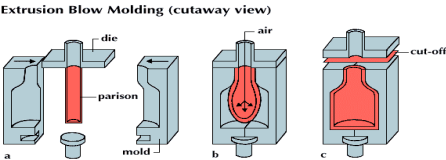
Mass Production	
Advantages	Disadvantages
<ul style="list-style-type: none">• Large amounts made at once• All products are identical and to same standard• Using automation reduced human error	<ul style="list-style-type: none">• Initial starting costs are high• If production line stops, the product can't be made• Workers become bored monitoring machines and repetitive tasks

Batch Production	
Advantages	Disadvantages
<ul style="list-style-type: none">• Lower cost than one-off• Jigs, moulds and templates help products look identical• Can have some variety	<ul style="list-style-type: none">• High storage costs• Jugs, moulds and templates have to be checked• Workers can become bored on their station

Continuous Production	
Advantages	Disadvantages
<ul style="list-style-type: none">• Large amounts made at once• All products are identical and to same standard• Using automation reduced human error	<ul style="list-style-type: none">• Initial starting costs are high• If production line stops, the product can't be made• Workers become bored monitoring machines and repetitive tasks

Knowledge Organiser: KS4 Design Technology

Specialist Techniques: Production Methods

Name of Process	Diagram	Material	Products Made
Screen-printing	 <p>The diagram shows a squeegee pushing ink through a screen with an image onto a surface below, creating a printed image. Labels include: squeegee, ink, image, photoemulsion, screen, and printed image.</p>	Papers and Textiles	Posters, signs and t-shirts
Offset Lithography	 <p>The diagram illustrates the offset lithography process involving ink rollers, water rollers, plate cylinder, offset cylinder, and impression cylinder. Labels include: Ink rollers, Water rollers, Plate cylinder, Water, Offset cylinder, Paper, and Impression cylinder.</p>	Papers and card (thin, flexible plastics)	Posters, newspapers, plastics bags
Lathe Turning	 <p>The diagram shows a lathe machine with a workpiece being turned. Labels include: SPINDLE NOSE COVER, DRIVE CENTRE, TAPER CENTRE, TAIL STOCK, HEADSTOCK, BED, LOCKING HANDLE, and TOOL REST.</p>	Wood and metal	Chair legs, baseball bats (cylindrical items)
Die Casting	 <p>The diagram shows a die casting machine with a plunger in a chamber, a nozzle, and a cavity. Labels include: Movable die half, Fixed die half, Nozzle, Gooseneck, Plunger, Pot, Chamber, Ejector pins, and Cavity.</p>	Metal	Car parts, engine components, etc
Injection Moulding	 <p>The diagram shows a screw in a barrel being heated and pushed into a mould. Labels include: hopper, heater, hydraulic system, screw, motor, and mould.</p>	Plastics	Chairs, toys, etc
Blow Moulding	 <p>The diagram shows three stages of extrusion blow moulding: (a) extrusion from a die, (b) inflation with air, and (c) cutting. Labels include: die, parison, mold, air, and cut-off.</p>	Plastics	Plastic bottles

Knowledge Organiser: KS4 Design Technology

Specialist Techniques: Production Methods

Name of Process	Key info
Screen-printing	Screen printing places paint on top of a screen. The screen has a stencil embedded in it, so when the paint is passed across it the desired shape is printed underneath. Good process in one-off and batch production as often done by hand
Offset Lithography	Rollers containing the colours and water go onto the plate cylinder. The water stops the colours sticking to certain places, creating the shape. The shape is transferred between rollers and onto the material. Can be used at batch and mass production
Lathe Turning	Material is placed between the tail stock and the headstock and spun at high speed. The material is then cut using specialist tools (either by hand or my automated machinery) to the desired shape. Can be used in one-off and batch production
Die Casting	Molten metal is poured into a chamber and a plunger forces the metal through the nozzle into the mould. Unlike sand casting, the mould is reusable. Good process for both one-off and batch production
Injection Moulding	Plastic granules are poured into the hopper and onto the screw. The screw moves the material towards the heater where it turns into a liquid. The liquid is then forced into the mould, cooled and released. Great process for mass production as it makes 100s+ of products at once, to a identical standard.
Blow Moulding	A Plastic parison is heated and put into the mould. The parison is then filled with air (like blowing up a balloon) and is forced to fit the mould shape. It is then cooled and then released. This is a great process for mass producing bottles.

Knowledge Organiser: KS4 Design Technology

Specialist techniques and processes: Finishes and standard components

Finishes are used to improve the **aesthetics** and **durability** of products

Material Type	Finishes Used
Papers and Boards	<ul style="list-style-type: none">• Paints• Varnishes• Laminating• Plastic coating• Wax coating
Timbers and Boards	<ul style="list-style-type: none">• Paints• Varnishes• Wax and Polish• Staining• Oil
Metals and Alloys	<ul style="list-style-type: none">• Painting• Lacquering• Electroplating• Galvanizing• Polishing• Plastic Coating• Powder Coating
Plastics	<ul style="list-style-type: none">• Polishing• Painting• Decals (stickers)

Standard Components

Standard components are parts or components manufactured in the 1000s+
They are readily available, don't require specialist knowledge or tools to replace them and are universally recognised

Material Type	Components used
Papers and Boards	<ul style="list-style-type: none">• Staples• Clips• Split pins
Timbers and Boards	<ul style="list-style-type: none">• Nails• Screws
Metals and Alloys	<ul style="list-style-type: none">• Nuts and bolts• Screw• Panel Pins• Hinges• Rivet• Washer
Plastics	<ul style="list-style-type: none">• Plastic hinges

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Specialist techniques and processes: Tolerances and Process Orders

Tolerances

The total amount a specific dimension or property is permitted to vary
This can apply to hole depth, length, angle, thickness, weight and elasticity
A gauge can be inserted into a gap or hole to check if the sizes fall within tolerance
If parts do not fit within the specified tolerances they are discarded or recycled

Quality Control and Quality Assurance

- QC is **product** oriented
Quality control is where products are regularly tested (during and after manufacture) to ensure they meet the defined set of quality criteria
- QA is **process** oriented
Quality assurance is ensuring that the processes used to test the product have been done correctly and consistently
You can test a product all you like, but if the tests are wrong/ inconsistent with each other than the results are invalid
- Below are examples of Quality Assurance symbols:



European Conformity



BSI Kitemark



Lion Mark

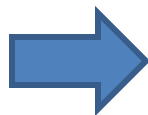


Registration Mark

Process Orders

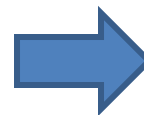
An Input is information/
stimuli that enters
a PC

An example would
be keyboard,
sensor, mouse,
etc



A Process is
process of
transforming
information into
an Output

An example
would be a PC









An Output is a
response to the
stimuli

An example
would be
speakers, text
on a screen,
alarm, lights, etc

Knowledge Organiser: KS4 Design Technology

The Work of Others

Image/ Example	Designer	Design Movement	Key info
	William Morris	Arts and Crafts	<ul style="list-style-type: none"> British designer in 1880s Simple natural crafts Useful and beautiful products (wallpapers, cushions, etc)
	Charles Rennie Mackintosh	Art Nouveau	<ul style="list-style-type: none"> Scottish designer in 1860s – 1920s Known for light and shadow Created stained glass and furniture Inspired by nature and geometric lines
	Ettore Sottas	Memphis	<ul style="list-style-type: none"> Italian designer in the 1950s/60s Enjoyed making everyday objects wacky and bold Used lots of bold colours and black lines

Image/ Example	Brand	Key info
	Alessi	<ul style="list-style-type: none"> Italian Design Company Homeware and kitchen utensils “Post-modern” style Phillipe Starke is a major designer
	Apple	<ul style="list-style-type: none"> USA-based tech company Famous for iconic designs of iPod and iPhone Steve Jobs and Johnathon Ive are major designers Known for innovative and modern design
	Dyson	<ul style="list-style-type: none"> British engineering company Famous for vacuum cleaners and innovative technology James Dyson is a major designer

Knowledge Organiser: KS4 Design Technology

The Work of Others



Research can be divided into 2 categories; **Primary Research** and **Secondary Research**.
Primary is research you complete yourself.
Secondary is research from resources others can gathered e.g. books, magazines and internet

Primary research is generally more reliable as it is done by the person using it and can double-check the data

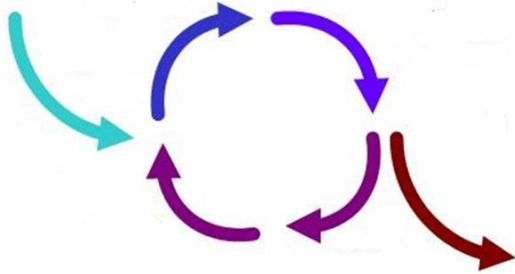
Another key piece of research, is **Anthropometrics and Ergonomics**. This helps develop the sizes of products, etc to make sure it fits the User

Anthropometrics	The study of measurements of the human body. E.g. Knowing the grip width of a palm, if designing a new travel coffee cup
Ergonomics	The application of anthropometrics to ensure products are safe and comfortable to use. This can also include; size, material, appearance, brightness, sound and texture. E.g. making sure the travel cup is the correct size, and an insulating smooth material to make it comfortable to hold for long periods

Knowledge Organiser: KS4 Design Technology

Design Strategies

Design Strategies are used to solve **Design Fixation**, and help develop creative design ideas.



Iterative Design

- A Proposal is made
- It is then planned and developed to meet the brief
- It is analysed and refined
- It is then tested and modelled

- Then evaluated against the brief – many versions fail but that then informs development to make the idea better
- The cycle then repeats and if the product is successful it is then made and sold on the market

Iterative Design

Advantages

- Consistent testing helps solve problems earlier
- Constant feedback
- Easy evidence of progress

Disadvantages

- Designers can lose sight of “the big picture”
- Time consuming

User-Centred Design

- This is when designs are based on fulfilling the needs and wants of the Users/Clients at every stage of the design process
- Questioning and testing is ongoing and is often found through interviews, questionnaires, surveys, etc

User-Centred

Advantages

- User feels listened to
- Makes sure the product meets their needs

Disadvantages

- Requires extra time to get customer feedback
- If focused on just one person it can limit appeal to others

Knowledge Organiser: KS4 Design Technology

Design Strategies

Systems Approach

- Usually used for electronic products
- Often uses diagrams to show systems in a visual way
- Planning the layout for the correct sequences e.g. inputs, outputs, timings, etc
- Electronics and mechanical systems need an ordered and logical approach

Systems Approach

Advantages

- Does not need specialist knowledge
- Easy to communicate stages
- Easy to find errors

Disadvantages

- Sometimes over-simplifies stages
- Can lead to unnecessary stages

Collaborative Approach

- Working with others to share data and solving problems and coming up with design proposals can help with creativity
- Numerous companies work in teams, and has been shown to improve the range and quality of ideas produced

Collaborative Approach

Advantages

- Gets multiple opinions and a range of views
- Working in groups can produce more ideas

Disadvantages

- Can be difficult to design ideas with opposing views
- Can be difficult to find time to communicate with multiple people

Knowledge Organiser: KS4 Design Technology

Communication of Design Ideas

Design Briefs

A Design Brief is the statement of how you will solve the Design Problem
It will often include:

- Constraints/ limitations
- What the product is
- Materials/processes
- Any key information you know



Design Specifications

A Design Specification is a list of requirements your product has to meet in order to be successful

It is also useful for evaluation. If your product hasn't met the Spec then it gives you a starting point for improvements.

Aesthetics	What the product looks like? Style? Colour Scheme? Design Movement?
Customer	Who would buy it? (Age, gender, socio-economic, personality) How does the design appeal to them?
Cost	How much will it cost? (min-max) Why?
Environment	Where will it be used? Why? How will you make it suitable?
Safety	How is it safe? How will it be checked? Why must it be safe?
Size	What is the maximum or minimum size? Why?
Function	What does the product do? What features make it do that function well? How is it unique from similar products?
Materials	What is it made from? Why?
Manufacture	How might it be made? Why? What scale of production? Why?

Knowledge Organiser: KS4 Design Technology

Communication of Design Ideas

Technique	Description/ notes	Diagram
Orthographic Projection/ Working Drawings	<ul style="list-style-type: none"> Includes "Front", "Plan" and "End" 2D Views, and often an Isometric 3D View Standardised method for scale, dimensions and line types <ul style="list-style-type: none"> Great for manufacturing 	<p>The diagram shows three 2D views of a stepped block. The 'Top' view is at the top, showing a rectangular shape with a notch. Below it are the 'Front' and 'Right Side' views, showing the block's profile from different angles.</p>
Isometric	<ul style="list-style-type: none"> Common 3D sketching method Can be drawn free-hand or using isometric paper and ruler <ul style="list-style-type: none"> Angles are at 30 degrees Great for seeing most of the products 	<p>A simple 3D isometric drawing of a cube, showing three faces: the top, front, and right side.</p>
1-Point Perspective	<ul style="list-style-type: none"> A 3D drawing method Often used by interior designers and architects <ul style="list-style-type: none"> Gives drawings depth Only uses 1 vanishing point 	<p>A 3D drawing showing several rectangular blocks of different sizes and orientations, all converging towards a single vanishing point in the distance, creating a sense of depth.</p>
2-Point Perspective	<ul style="list-style-type: none"> Used for 3D designs Exaggerates the 3D effect Objects can be drawn above or below the horizon line but must go to the 2 vanishing points 	<p>A 3D drawing of a cube in two-point perspective. Two lines from the top corners of the cube converge to a vanishing point on the left, and two lines from the bottom corners converge to a vanishing point on the right. A horizontal horizon line is shown between the two vanishing points.</p>
Annotated Drawings/ Free and Sketches	<ul style="list-style-type: none"> Quick and easy way of getting ideas down <ul style="list-style-type: none"> Range of ideas can be seen Annotation helps explain designs further 	<p>A collection of hand-drawn sketches of various watch designs, including different face shapes, straps, and features. Some sketches have small annotations or labels.</p>
Exploded View	<ul style="list-style-type: none"> Helps see a final design of a product and all its parts <ul style="list-style-type: none"> Can see where all the parts fit Great for manufacturers 	<p>An exploded view diagram of a mechanical assembly, showing various components like gears, bearings, and housing parts separated from each other to show their relative positions and how they fit together.</p>

Modelling and Development

Modelling and development are key to testing and improving products

This can be done physically using materials like; card, foam, clay, man-made boards or virtually in **CAD**. Modelling helps the designer get feedback from the customer, check aesthetics, function, sizes and even materials and production methods and change them if needed.

Knowledge Organiser: KS4 Design Technology

Revision Topics Checklist

Scales of Production	
Revised	
Exam Question	
Revised again	

Research and Investigation	
Revised	
Exam Question	
Revised again	

Developing and Communicating Ideas	
Revised	
Exam Question	
Revised again	

Production Methods	
Revised	
Exam Question	
Revised again	

Prototyping and Development	
Revised	
Exam Question	
Revised again	

Briefs and Specs	
Revised	
Exam Question	
Revised again	

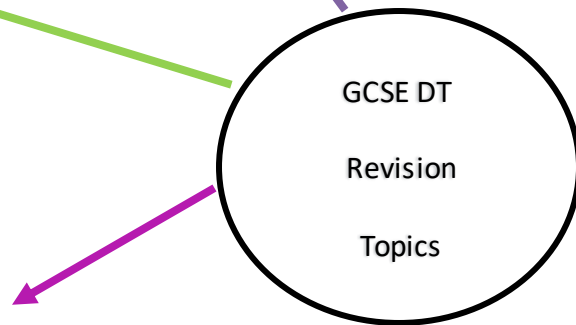
Tolerances	
Revised	
Exam Question	
Revised again	

Process and Manufacture

Designing Products

People, Society and Culture	
Revised	
Exam Question	
Revised again	

Work of Others	
Revised	
Exam Question	
Revised again	



Approaches to Design

Design Strategies	
Revised	
Exam Question	
Revised again	

Industry and Enterprise	
Revised	
Exam Question	
Revised again	

Environment	
Revised	
Exam Question	
Revised again	

Knowledge Organiser: KS4 Design Technology

Materials

Energy and Mechanisms

Process Orders

Revised	
Exam Question	
Revised again	

Paper and Boards	
Revised	
Exam Question	
Revised again	

Finishes	
Revised	
Exam Question	
Revised again	

Standard Components and Stock Forms	
Revised	
Exam Question	
Revised again	

Plastics	
Revised	
Exam Question	
Revised again	

Woods and Boards	
Revised	
Exam Question	
Revised again	

Mechanical Systems	
Revised	
Exam Question	
Revised again	

New and Smart Materials	
Revised	
Exam Question	
Revised again	

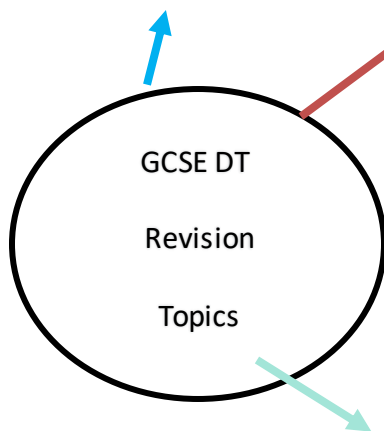
Properties of materials	
Revised	
Exam Question	
Revised again	

Energy Generation and Storage	
Revised	
Exam Question	
Revised again	

Energy	
Revised	
Exam Question	
Revised again	

Angles	
Revised	
Exam Question	
Revised again	

Maths & Science



Forces	
Revised	
Exam Question	
Revised again	

Environment	
Revised	
Exam Question	
Revised again	

Decimals	
Revised	
Exam Question	
Revised again	

Area and Volume	
Revised	
Exam Question	
Revised again	

Charts and Graphs	
Revised	
Exam Question	
Revised again	

Ratios, Fractions and Percentages	
Revised	
Exam Question	
Revised again	

Structuring your answers in Design Technology

P.E.E Chains



In Technology we use PEE chains to expand our answers so we are communicating our thoughts and ideas clearly. This makes sure that we say what we think and then back up, or justify, our thoughts with explanations and evidence from research which support them.

POINT	Say WHAT you think.	<i>I think the product should be...</i>
EXPLAIN	Say WHY you think it.	<i>This is because...</i>
EVIDENCE	Say what RESEARCH you've done to back this up.	<i>I know this from my research into...</i>

ACCESS FM

ACCESS FM is an analysis and annotation tool which makes sure we consider all the important design criteria and the impact they have on products we are investigating, designing or evaluating,

A	Appearance	Where did the designer get their inspiration? Could the product look better? Do you think it looks attractive or ugly, Why? What does the product look like? THINK shape, form, materials, size, beauty, ugliness.
C	Cost	Is it affordable to your customer? Will it make a profit? Is it value for money? How much does it cost to make?
C	Customer	What impact would it have on a customers life? Why would a customer buy it? What makes it suitable for them? Who would buy it? Who would use it?
E	Environment	What is the products impact on the environment? THINK batteries, rethink, refuse, reduce, reuse, recycle, lifecycle. How would the product be disposed of? Is the product needed or wanted? How long will it last?
S	Safety	Is the product high quality? Does it meet safety standards? How has the designer considered safety? Could the product hurt anyone? Are there any sharp edges?
S	Size	Is it an appropriate size? Would it work better if it was bigger or smaller? Does it come in different sizes? How big is it?
F	Function	Does the product work? Could the product work better? How does the product work? Why is the product needed? What does the product do? Is it easy to use?
M	Materials/ Manufacture	What impact could the designer's choice of material have on the environment? Would a different material make it better? What material has it been made from? What process would be used to make it?



Structure Strips in Design Technology

State			2 marks
<u>Example Question</u> State two reasons why corrugated cardboard is used as packaging for cooked pizzas.			
1	Reason 1 (1 mark)	It is a rigid material that won't flex and bend as easily as other types of cardboard which offers protection to the pizza.	
2	Reason 2 (1 mark)	The thermal properties of the material as cavities in the cardboard keep the pizza warm.	
Give			2 marks
<u>Example Question</u> In 2010 the use of renewable energy in the UK accounted for 6.5% of total energy usage. By 2015 this figure had increased to 25%. Give two reasons for the increase in the use of renewable energy sources.			
1	Reason 1 (1 mark)	The Government set specific targets to reduce CO2 emissions.	
2	Reason 2 (1 mark)	People now have an increased awareness of environmental issues and are more conscientious about them.	
Describe			4 marks
<u>Example Question</u> Describe two ways that materials and/or products are strengthened or reinforced. Give examples in your answer.			
1	Description 1 (1 mark)	Layering materials can make materials stronger as you can lay them with their grain in different directions. This ensures the weak lines of the grain are strengthened.	
2	Example (1 mark)	Plywood is created in layers to strengthen the material.	
3	Description 2 (1 mark)	Laminating is adding a plastic coating to a material to make it more rigid, tougher and weather resistant.	
4	Example (1 mark)	Plastic coating is added to card and paper to make the materials more wear resistant and rigid, for example a restaurant menu.	

Explain (written)			4 marks
<u>Example Question</u> Explain what is meant by the term 'anthropometrics' and why it is important for designers to consider.			
1	Define key word (1)	Anthropometrics is the study of human measurements.	
2	Give 3 reasons why (3)	Designers need to consider anthropometric data in order to: <ul style="list-style-type: none"> • ensure that wearable items fit • ensure that products are comfortable • ensure that products are easy to use 	
Explain (notes and sketches)			6 marks
<u>Example Question</u> Name one industrial process used in the manufacture of a polymer toy musical instrument. In the box below, use notes and/or sketches to explain this process in detail.			
1	Identify (1)	A suitable process would be Injection Moulding	
2	Describe (2)	A polymer is placed in the hopper and enters the chamber of the injection moulding machine. The chamber is heated until the plastic melts. The plastic is then forced in to a mould where it cools to create the shape of the object.	
3	Sketches to help with description (2)	Sketch of injection moulding machine and movement of plastic.	
4	Explain why (1)	Injection moulding is suitable because it is quick and cheap for mass produced parts and it does not require finishing.	
Evaluate			4 marks
<u>Example Question</u> Evaluate the apple watch in terms of its suitability for the user.			
1	Positives / Advantages (1-2)	<ul style="list-style-type: none"> • Waterproof which allows for use when outdoors and does not absorb sweat. • Clear display screen which is easy to read even when moving. 	
2	Negatives / Disadvantages (1-2)	<ul style="list-style-type: none"> • Flatscreen susceptible to reflection • Screen can scratch easily 	
3	Summary (1)	Overall the watch is well suited to the user as it has a range of specific features which are suited to the environment in which it will be used and the negative design features are minimal.	

Justify		8 Marks	
<p><u>Example Question</u></p> <p>Justify the design decisions which have been made to make the apple watch more aesthetically appealing and gender neutral for the user.</p>		Q:	
1	Identify / underline each key word	<ul style="list-style-type: none"> • Aesthetically appealing • Gender neutral 	
2	Define each key word (2)	<ul style="list-style-type: none"> • An aesthetically appealing product is one which looks attractive to its specific target market. • A gender neutral product is not aimed specifically at one gender, but it may have options to target each gender. 	
3	Promote Positives / Advantages (2)	<ul style="list-style-type: none"> • Black in colour which is neutral and sophisticated which will appeal to an adult target market. • A plain colour that will not date/go out of fashion and appropriate for a wide range of settings • Brightly coloured icons on the screen that are attractive and easy to recognise • Geometric, simple styling that can be worn by men or women. 	
4	Discount Negatives / Disadvantages (2)	<ul style="list-style-type: none"> • Black is a boring colour that will not excite, but you can purchase alternative straps to make it more personalised. • Square shape face may not appeal to all users or may appeal masculine, however, this has featured on previous products and they have sold well. 	
5	Summary (2)	<p>Previous sales show that the latest apple watch is appropriate for the target market as it sells in high volumes. As it can be personalised through different straps, the customer can tailor the watch to their personal style which makes it more aesthetically appealing to them and the original watch being gender neutral allows this to be done effectively.</p>	

Evaluate

10 marks

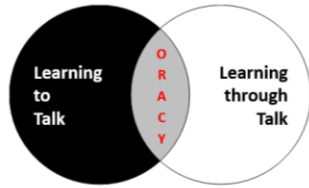
Example Question

Designers sometimes choose materials according to their impact on society and the environment.

Examples include the use of fair trade cotton, recycled components and biodegradable packaging. Evaluate how the use of such materials might be seen as the ethical choice.

1	Identify / underline each key word	<ul style="list-style-type: none">• Biodegradable Packaging• Fair trade Cotton• Recycled components• Ethical choice
2	Define each key word (3 marks)	<ul style="list-style-type: none">• Biodegradable Packaging is made from materials which decompose much more quickly so that less waste is left in landfill• Fair trade Cotton is produced by cotton farmers who are paid a living wage which allows them to survive and earn enough money to feed their families• Recycled Components are made from waste products where the material has been melted down and reformed.• An ethical choice is one which avoids harm to people, animals and the environment.
3	Positives / Advantages (3 marks)	<p>Biodegradable packaging:</p> <ul style="list-style-type: none">• Require less energy to process into a useable material.• Are easier to recycle/use less energy to recycle.• Are non-toxic when they break down. <p>Fair trade Cotton:</p> <ul style="list-style-type: none">• Ensures workers / farmers get a fair price for their labour / products.• It gives small scale farmers access to global markets.• Buying this product shows your support for these communities. <p>Recycled components:</p> <ul style="list-style-type: none">• Often contain valuable materials such as gold, copper, aluminium.• Saves landfill space.
4	Negatives / Disadvantages (3 marks)	<p>Biodegradable packaging:</p> <ul style="list-style-type: none">• Are relatively new materials and not currently widely used.• May be more expensive. <p>Fair trade Cotton:</p> <ul style="list-style-type: none">• Paying a higher wage results in products having a higher overall cost/price. <p>Recycled components:</p> <ul style="list-style-type: none">• Are non-renewable and are becoming more difficult and costly to find.
5	Summary (1 mark)	Overall, the main disadvantage of choosing these materials seems to be cost. However, I think that they are ethically right as they reduce the impact on the environment and are more socially acceptable as well and I think this is more important than the fact that products will be more expensive.

Oracy in Design Technology



Oracy means being able to express yourself clearly using spoken language. We build oracy tasks into Technology lessons to help you develop the technical language and understanding that you need to be able to communicate your ideas and opinions effectively to others. These are some of the activities which we use in lessons, but you can try them out at home too!

RANT

You need to discuss and explain all the negatives you can think of on the topic you have been given.

Success Criteria

- Consider all the potential negatives
- State your opinion clearly
- Take turns with your partner / group
- Explain your reasons
- Give examples
- Don't lose your temper!

Sentence Starters

- The problems are...
- I disagree with you because...
- The effects of that are...
- That's true but have you considered...
- I hear what you are saying but...



RAVE

You need to discuss and explain all the positives you can think of on the topic you have been given.

Success Criteria

- Consider all the potential positives
- State your opinion clearly
- Take turns with your partner / group
- Explain your reasons
- Give examples
- Be enthusiastic!

Sentence Starters

- The benefits of this are...
- I feel this is positive because...
- The effects of that are...
- That's true but have you considered...
- I hear what you are saying but...

Talk Detective

You need to observe conversations and identify examples of good oracy.

Success Criteria

- Look for what people are doing well
- Record specific phrases and names
- Give praise in your feedback
- Use positive body language when you feedback

Things to look for:

- | | |
|--|--|
| <ul style="list-style-type: none"> ✓ Invited someone else to contribute ✓ Challenged someone's opinion ✓ Summarised their thinking or the group opinion ✓ Clarified someone's idea | <ul style="list-style-type: none"> ✓ Gave a good example ✓ Used appropriate body language ✓ Used technical language / key words |
|--|--|

Talk Detective



Revision Strategies in Design Technology

Technique	Difficulty	Description	Used
Revision Cards	Hard Challenge	Write out 'flash cards' which have questions on the front and answers on the back which can be used for testing yourself/each other.	
Memory Map	Challenge	Mind map all the key points and key words related to the topics. Use images as appropriate.	
mneumonics	Hard Challenge	Use the first letter of key words to spell out a word or phrase to remember lists or large chunks of information e.g. Richard of York gave battle in vain (colours of the rainbow: red, orange, yellow, green, blue, indigo, violet) or ACCESS FM.	
Self Test	Challenge	Use flash cards or the practice questions in the book to test your knowledge of topics.	
	Hard Challenge	designing your own question and mark scheme for the topic	
	Extreme Challenge	Create a model answer for the question you designed.	
Smartass Lists	Extreme Challenge	Write down impressive/unusual key words or expressions which you could use to answer a question on that topic	
Example Q&A	Hard Challenge	Make up an example exam question on the topic and write a mark scheme for it using the revision guide. Then test a peer with the question, mark their work and work in pairs to develop the mark scheme.	
Songs/Poems	Hard Challenge	Write a poem or a rhyme (you could even include a tune) which will help you to remember the key words or points for a topic.	
Pictograms	Challenge	Draw images surrounded by key words which will remind you of the key information or help to summarise the topics. This may be a single image (e.g. materials/tools) or a storyboard (e.g. processes)	
Bullets/Lists	Challenge	Number or bullet point the key information on a topic. Try and list them in order of importance.	
Audio Tape	Challenge	Create an audio account of the key information which you can then play back to yourself to help you remember the key points.	
	Hard Challenge	In pairs write and record an interview which includes the key information about a topic and requires the interviewee to explain and justify the information being covered.	
Physical Map	Challenge	Put key points about a topic around the room. Move to that point and either read out loud or write down the fact/point/information. This means that the information then becomes associated with this specific place and thinking about the place should trigger the recall of information.	
Round Robin	Challenge	In teams of 3-4, take it in turns to relay the information about a topic until you run out of key points. Then check that you covered all the information by using the revision guide/notes as a checklist.	
Quiz Quiz Trade	Hard Challenge	Create quiz, quiz, trade cards and use them in small groups to cover the information for a topic. Each card should feature a question and a sub-question or hint on one side, with the answer on the reverse.	
Talk Pair Share/speed dating	Hard Challenge	Talk in pairs and cover the main points of a topic (make a note of what you remember together in your revision books) Then pair up with someone else and add to your notes, repeat this until you think you have all the information – then check against the revision guide.	
Talking Tables	Challenge	Similar to Talk, Pair, Share - working in teams of 3-4 cover the main points of a topic (make a note of what you remember together in your revision books) and then move teams and add to your notes, repeat this until you think you have all the information – then check against the revision guide.	
Consensus	Hard Challenge	Useful for key words. Independently define a key word, then in teams of 3-4 bring definitions together and synthesise the information to create the best definition possible. Can also be used to develop responses to exam questions.	

Personalised Learning Checklist: KS4 Design Technology

Create a **revision aid** for each of the statements below, to prove you can do each one.

•If you can definitely do the full task, tick green.

•If you can do some of the task, tick amber.

•If you can do less than half of the task, tick red.

If you have not ticked green, spend some extra time revising that area!

What's a revision aid? This could be revision notes, a mind map, a list, flashcards. Whatever works for you! Look at the revision strategies page for more ideas.

GCSE DT REVISION PLC

Topic	R	A	G
New and emerging technologies			
The design and organisation of the workplace including automation and the use of robotics			
Buildings and the place of work.			
Tools and equipment.			
Enterprise based on the development of an effective business innovation: crowd funding, virtual marketing and retail, co-operatives, fair trade.			
The impact of resource consumption on the planet: finite, non-finite, disposal of waste.			
How technology push/market pull affects choice. Changing job roles due to the emergence of new ways of working driven by technological change.			
Changes in fashion and trends in relation to new and emergent technologies. Respecting people of different faiths and beliefs.			
How products are designed and made to avoid having a negative impact on others: design for disabled, elderly, different religious groups.			
Positive and negative impacts new products have on the environment: continuous improvement, efficient working, pollution, global warming.			
The contemporary and potential future use of: automation, computer aided design (CAD), computer aided manufacture (CAM), flexible manufacturing systems (FMS), just in time (JIT), lean manufacturing.			
That it is important to consider scenarios from different perspectives and considering: planned obsolescence, design for maintenance, ethics, the environment.			
Target Topics:			

GCSE DT REVISION PLC

Topic	R	A	G
Energy generation and storage			
How power is generated from: coal, gas, oil. Arguments for and against the selection of fossil fuels.			
How nuclear power is generated. Arguments for and against the selection of nuclear power.			
How power is generated from: wind, solar, tidal, hydro-electrical, biomass. Arguments for and against the selection of renewable energy.			
Kinetic pumped storage systems. Alkaline and re-chargeable batteries.			
Developments in new materials			
Modern materials - Developments made through the invention of new or improved processes eg Graphene, Metal foams and Titanium. Alterations to perform a particular function eg Coated metals, Liquid Crystal Displays (LCDs) and Nanomaterials.			
Smart materials - That materials can have one or more properties that can be significantly changed in a controlled fashion by external stimuli, such as stress, temperature, moisture, or PH eg shape memory alloys, thermochromic pigments and photochromic pigments			
Composite materials - That composite materials are produced by combining two or more different materials to create an enhanced material eg glass reinforced plastic (GRP) and carbon fibre reinforced plastic (CRP).			
Technical textiles - How fibres can be spun to make enhanced fabrics eg conductive fabrics, fire resistant fabrics, kevlar and microfibres incorporating micro encapsulation.			
Systems approach to designing			
Inputs - The use of light sensors, temperature sensors, pressure sensors and switches.			
Processes - The use of programming microcontrollers as counters, timers and for decision making, to provide functionality to products and processes.			
Outputs - The use of buzzers, speakers and lamps, to provide functionality to products and processes.			
Mechanical devices			
Types of movement - The functions of mechanical devices to produce linear, rotary, reciprocating and oscillating movements.			
Changing magnitude and direction of force - Levers: first order, second order, third order. Linkages :bell cranks, push/pull. Rotary systems: CAMs and followers, simple gear trains, pulleys and belts.			
Target Topics:			

GCSE DT REVISION PLC

Topic	R	A	G
Materials and their working properties			
<p>Papers and board - You should have an overview of the main categories and types of papers including: bleed proof, cartridge paper, grid, layout paper, tracing paper boards including: corrugated card, duplex board, foil lined board, foam core board, ink jet card, solid white board.</p>			
<p>Natural and manufactured timbers – You should have an overview of the main categories and types of natural and manufactured timbers: hardwoods including: ash, beech, mahogany, oak, balsa softwoods including: larch, pine, spruce manufactured boards including: medium density fibreboard (MDF), plywood, chipboard.</p>			
<p>Metals and alloys – You should have an overview of the main categories and types of metals and alloys: Ferrous metals including: low carbon steel, cast Iron, high carbon/tool steel. Non ferrous metals including: aluminum, copper, tin, zinc alloys including: brass, stainless steel, high speed steel.</p>			
<p>Polymers – You should have an overview of the main categories and types of polymers: Thermoforming including: acrylic (PMMA), high impact polystyrene (HIPS, high density polythene (HDPE), polypropylene (PP), polyvinyl chloride (PVC), polyethylene terephthalate (PET) Thermosetting including: epoxy resin (ER), melamine-formaldehyde (MF), phenol formaldehyde (PF), polyester resin (PR), urea-formaldehyde (UF).</p>			
<p>Textiles – You should have an overview of the main categories and types of textiles: natural fibres including: cotton, wool, silk synthetic fibres including: polyester, polyamide (nylon), elastane (lycra) blended and mixed fibres including: cotton/polyester woven including: plain weave non-woven including: bonded fabrics, felted fabrics knitted textiles including: knitted fabrics.</p>			
<p>Material properties - In relation to the main categories outlined above (not the specific materials identified), students should know and understand physical properties such as: absorbency (resistance to moisture), density, fusibility, electrical and thermal conductivity. In relation to the main categories outlined above (not the specific materials identified), students should know and understand working properties such as: strength, hardness, toughness, malleability, ductility and elasticity.</p>			
<p>Target Topics:</p>			

GCSE DT REVISION PLC

Topic	R	A	G
Selection of materials and components In relation to at least one material category or system			
Functionality: application of use, ease of working. Aesthetics: surface finish, texture and colour. Environmental factors: recyclable or reused materials. Availability: ease of sourcing and purchase. Cost: bulk buying. Social factors: social responsibility. Cultural factors: sensitive to cultural influences. Ethical factors: purchased from ethical sources such as FSC.			
How materials can be reinforced, stiffened or made more flexible: eg lamination, bending, folding, webbing, fabric interfacing.			
Ecological issues in the design and manufacture of products In relation to at least one material category or system			
Deforestation, mining, drilling and farming. Mileage of product from raw material source, manufacture, distribution, user location and final disposal. That carbon is produced during the manufacture of products.			
The six R's - Reduce, refuse, re-use, repair, recycle and rethink.			
Safe working conditions; reducing oceanic/ atmospheric pollution and reducing the detrimental (negative) impact on others.			
Sources and origins In relation to at least one material category or system			
Primary sources of materials and the main processes involved in converting into workable forms for at least one material area. Paper and board (how cellulose fibres are derived from wood and grasses and converted into paper). Timber based materials (Seasoning, conversion and creation of manufactured timbers). Metal based materials (extraction and refining). Polymers (refining crude oil, fractional distillation and cracking). Textile based materials (obtaining raw material from animal, chemical and vegetable sources, processing and spinning).			
How materials can be reinforced, stiffened or made more flexible: eg lamination, bending, folding, webbing, fabric interfacing.			
Target Topics:			

GCSE DT REVISION PLC

Topic	R	A	G
Using and working with materials and the modification of properties for specific purposes In relation to at least one material category or system			
<p>Understand how different properties of materials and components are used in commercial products, how properties influence use and how properties affect performance.</p> <p>Understand the physical and mechanical properties relevant to commercial products in their chosen area as follows:</p> <p>Papers and boards (flyers/leaflets and card based food packaging).</p> <p>Timber based materials (traditional timber children’s toys and flat pack furniture).</p> <p>Metal based materials (cooking utensils and hand tools).</p> <p>Polymers (polymer seating and electrical fittings).</p> <p>Textile based materials (sportswear and furnishings).</p> <p>Electronic and mechanical systems (motor vehicles and domestic appliances).</p>			
<p>Additives to prevent moisture transfer (paper and boards).</p> <p>Seasoning to reduce moisture content of timbers (timber based materials).</p> <p>Annealing to soften material to improve malleability (metal based materials).</p> <p>Stabilisers to resist UV degradation (polymers).</p> <p>Flame retardants reduce combustion and fire hazards (textile based materials).</p> <p>Photosensitive PCB board in PCB manufacture and anodizing aluminium to improve surface hardness (electronic and mechanical systems).</p>			
<p>Papers and boards (how to cut, crease, score, fold and perforate card). Timber based materials (how to cut, drill, chisel, sand and plane).</p> <p>Metal based materials (how to cut, drill, turn, mill, cast, bronze and weld).</p> <p>Polymers (how to cut, drill, cast, deform, print and weld).</p> <p>Textile based materials (how to sew, pleat, gather, quilt and pipe). Electronic and mechanical systems (how to cut, drill and solder).</p>			
Stock forms, types and sizes - in relation to at least one material category or system			
<p>Commercially available types and sizes of materials and components.</p> <p>Papers and boards: sheet, roll and ply, sold by size eg A3, thickness, weight and colour, standard components eg fasteners, seals and bindings, cartridge paper and corrugated card.</p> <p>Timber based materials: planks, boards and standard moldings, sold by length, width, thickness and diameter, standard components eg woodscrews, hinges, KD fittings.</p>			
<p>Target Topics:</p>			

GCSE DT REVISION PLC

Topic	R	A	G
Stock forms, types and sizes - in relation to at least one material category or system			
<ul style="list-style-type: none"> • Metal based materials: sheet, rod, bar and tube, sold by length, width, thickness and diameter, standard components eg rivets, machine screws, nuts, and bolts. • Polymers: sheet, rod, powder, granules, foam and films, sold by length, width, gauge and diameter, standard components eg screws, nuts and bolts, hinges. • Textile based materials: yarns and fabrics, sold by roll size, width, weight and ply, standard components eg zips, press studs, velcro. • Electrical and mechanical components: sold by quantity, volt and current rating, standard components eg E12 resistor series, dual in line IC packages (DIL), microcontrollers (PIC). 			
Scales of production In relation to at least one material category or system			
<p>How products are produced in different volumes. The reasons why different manufacturing methods are used for different production volumes: prototype, batch, mass, continuous.</p>			
Specialist techniques and processes In relation to at least one material category or system			
<p>How to use measurement/reference points, templates, jigs and patterns where suitable.</p>			
<p>A range of tools, equipment and processes that can be used to shape, fabricate, construct and assemble high quality prototypes, as appropriate to the materials and/or components being used including: Wastage, such as: die cutting, perforation, turning, sawing, milling, drilling, cutting and shearing Addition, such as: brazing, welding, lamination, soldering, 3D printing, batik, sewing, bonding, printing Deforming and reforming such as: vacuum forming, creasing, pressing, drape forming, bending, folding, blow moulding, casting, injection moulding, extrusion.</p>			
<p>Tolerance - the manufacture to minimum and maximum measurements.</p>			
<p>Commercial processes - Papers and boards (offset lithography and die cutting). Timber based materials (routing and turning). Metal based materials (milling and casting). Polymers (injection molding and extrusion). Textile based materials (weaving, dying and printing). Electrical and mechanical systems (pick and place assembly and flow soldering).</p>			
<p>Target Topics:</p>			

GCSE DT REVISION PLC

Topic	R	A	G
Specialist techniques and processes In relation to at least one material category or system			
Quality control - Papers and boards (registration marks). Timber based materials (dimensional accuracy using go/no go fixture). Metal based materials (dimensional accuracy using a depth stop). Polymers (dimensional accuracy by selecting correct laser settings). Textile based materials (dimensional accuracy checking a repeating print against an original sample). Electrical and mechanical systems (UV exposure, developing and etching times in PCB manufacture).			
Surface treatments and finishes In relation to at least one material category or system			
The preparation and application of treatments and finishes to enhance functional and aesthetic properties. Papers and boards (printing, embossing and UV varnishing). Timber based materials (painting, varnishing and tanalising). Metal based materials (dip coating, powder coating and galvanizing). Polymers (polishing, printing and vinyl decals). Textile based materials (printing, dyes and stain protection). Electronic and mechanical systems (PCB lacquering, and lubrication).			
Designing and making principles			
End of life disposal - material identification, material separation, collection, processing, energy costs, subsequent usage, wastage			
Investigation, primary and secondary data			
How the following techniques are used and applied: market research, interviews and human factors including ergonomics, focus groups and product analysis and evaluation, the use of anthropometric data and percentiles.			
Students should consider their own needs, wants and interests and those of others.			
Why a designer considers alterations to a brief and modifying the brief as required.			
Target Topics:			

GCSE DT REVISION PLC

Topic	R	A	G
Environmental, social and economic challenge			
<p>The environment, social and economic challenges that influence design and making. How the following might present opportunities and constraints that influence the processes of designing and making: deforestation, possible increase in carbon dioxide levels leading to potential global warming, the need for fair trade.</p>			
The work of others			
<p>You should investigate the work of a minimum of two of the following designers: Harry Beck, Marcel Breuer, Coco Chanel, Norman Foster, Sir Alec Issigonis, William Morris, Alexander McQueen, Mary Quant, Louis Comfort Tiffany, Raymond Templer, Marcel Breuer, Gerrit Reitveld, Charles Rennie Macintosh, Aldo Rossi, Ettore Sottsass, Philippe Starck, Vivienne Westwood.</p> <p>You should investigate the work of a minimum of two of the following companies: Alessi, Apple, Braun, Dyson, Gap, Primark, Under Armour, Zara.</p>			
Design strategies			
<p>How different strategies can be applied, including: collaboration, user centered design, a systems approach, iterative design, avoiding design fixation.</p>			
<p>Exploring and developing ideas through sketching, modelling, testing, evaluation of their work to improve outcomes.</p>			
Communication of design ideas			
<p>Develop, communicate, record and justify design ideas using a range of appropriate techniques such as: freehand sketching, isometric and perspective, 2D and 3D drawings, system and schematic diagrams, annotated drawings that explain detailed development or the conceptual stages of designing Exploded diagrams to show constructional detail or assembly, working drawings: 3rd angle orthographic, using conventions, dimensions and drawn to scale, audio and visual recordings in support of aspects of designing: eg interviews with client or users, mathematical modelling, computer based tools, modelling: working directly with materials and components, eg card modelling, producing a toile when designing garments, constructing a circuit using breadboard.</p>			
<p>Target Topics:</p>			

GCSE DT REVISION PLC

Topic	R	A	G
Prototype development			
Design and develop prototypes in response to client wants and needs. Note the term prototype can be used to describe either a product or system. How the development of prototypes: satisfy the requirements of the brief, respond to client wants and needs, demonstrate innovation, are functional, consider aesthetics, are potentially marketable. Students should know and understand how to evaluate prototypes and be able to: reflect critically, responding to feedback when evaluating their own prototypes, suggest modifications to improve them through inception and manufacture, assess if prototypes are fit for purpose.			
Selection of materials and components			
Appropriate materials and components to make a prototype. How to select and use materials and components appropriate to the task considering: functional need, cost, availability.			
Tolerances			
Work accurately using tolerances. How a range of materials are cut, shaped and formed to designated tolerances. Why tolerances are applied during making activities.			
Material management			
The importance of planning the cutting and shaping of material to minimise waste eg nesting of shapes and parts to be cut from material stock forms. How additional material may be removed by a cutting method or required for seam allowance, joint overlap etc.			
The value of using measurement and marking out to create an accurate and quality prototype. The use of data points and coordinates including the use of reference points, lines and surfaces, templates, jigs and/or patterns			
Specialist tools and equipment			
How to select and use specialist tools and equipment, including hand tools, machinery, digital design & manufacture, appropriate for the material and/or task to complete quality outcomes. How to use them safely to protect themselves and others from harm.			
Target Topics:			

GCSE DT REVISION PLC

Topic	R	A	G
Specialist techniques and processes			
<p>The environment, social and economic challenges that influence design and making. How the following might present opportunities and constraints that influence the processes of designing and making: deforestation, possible increase in carbon dioxide levels leading to potential global warming, the need for fair trade.</p>			
<p>Students should know and understand that surface treatments and finishes are applied for functional and aesthetic purposes. How to prepare a material for a treatment or finish. How to apply an appropriate surface treatment or finish.</p>			
<p>Target Topics:</p>			

RED TOPIC STRATEGIES

Topics I need to review and practice more:	Topics I need peer support or to attend a DIG session for:	Topics I need 1-2-1 teacher support with: